

## VOLTAGE REGULATOR WITH ON/OFF SWITCH

### FEATURES

- Low Dropout Voltage
- Electronic ON/OFF Switch
- Very Low Standby Current (ON, No Load)
- Internal Thermal Shutdown
- Short Circuit Protection
- Very Low (<100 nA) Current in OFF Mode
- Customized Versions Are Available

### DESCRIPTION

The TK114xx is a low power, linear regulator with a built-in electronic switch. The internal electronic switch can be controlled by an external pull-up resistor and an open drain or open collector transistor. The device is in the OFF state when the control pin is biased from  $V_{IN}$  through the pull-up resistor.

An internal PNP pass-transistor is used in order to achieve low dropout voltage (typically 200 mV at 50 mA load current). The device has very low quiescent current (500  $\mu$ A) in the ON mode with no load and 2 mA with 30 mA load. The quiescent current is typically 4 mA at 60 mA load. An internal thermal shutdown circuit limits the junction temperature to below 150 °C. The load current is internally monitored and the device will shut down (no load current) in the presence of a short circuit at the output. The device is available in a small SOT-23L surface mount package.

### APPLICATIONS

- Battery Powered Systems
- Cellular Telephones
- Pagers
- Personal Communications Equipment
- Portable Instrumentation
- Portable Consumer Equipment
- Radio Control Systems
- Toys
- Low Voltage Systems

## ORDERING INFORMATION

TK114

Tape/Reel Code

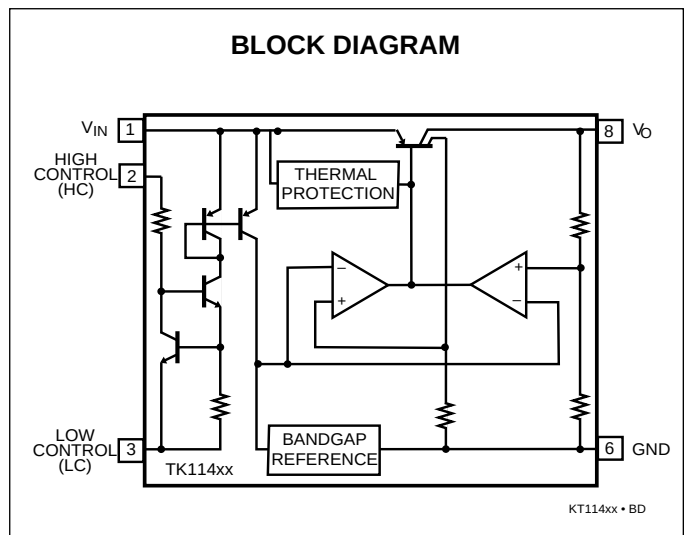
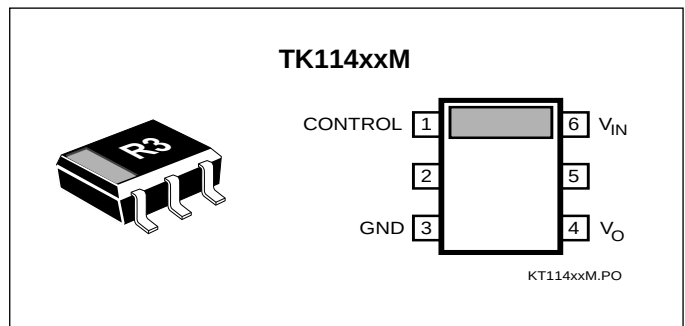
Voltage Code

### VOLTAGE CODE

|             |             |
|-------------|-------------|
| 30 = 3.0 V  | 47 = 4.75 V |
| 32 = 3.25 V | 50 = 5.0 V  |
| 35 = 3.5 V  | 55 = 5.5 V  |
| 37 = 3.75 V | 57 = 5.75 V |
| 40 = 4.0 V  | 60 = 6.0 V  |
| 45 = 4.5 V  | 80 = 8.0 V  |

### TAPE/REEL CODE

BX : Bulk/Bag  
TL : Tape Left



# TK114xx

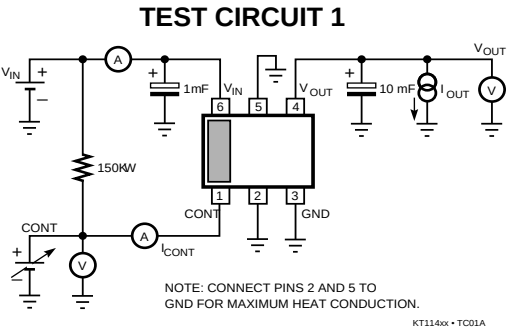
## ABSOLUTE MAXIMUM RATINGS

|                                  |                |                                      |               |
|----------------------------------|----------------|--------------------------------------|---------------|
| Supply Voltage .....             | 16 V           | Operating Temperature Range .....    | -30 to +80 °C |
| Load Current .....               | 180 mA         | Lead Soldering Temp. (10 sec.) ..... | 240 °C        |
| Power Dissipation (Note 1) ..... | 400 mW         | Junction Temperature .....           | 150 °C        |
| Storage Temperature Range .....  | -55 to +150 °C |                                      |               |

## TK11430 ELECTRICAL CHARACTERISTICS

| SYMBOL             | PARAMETER                              | TEST CONDITION                                                                     | MIN                  | TYP  | MAX             | UNITS   |
|--------------------|----------------------------------------|------------------------------------------------------------------------------------|----------------------|------|-----------------|---------|
| I <sub>IN1</sub>   | Supply Current 1                       | V <sub>IN</sub> = 4 V, I <sub>O</sub> = 0 mA                                       |                      | 500  | 900             | μA      |
| I <sub>IN2</sub>   | Supply Current 2                       | V <sub>IN</sub> = 2.5 V, I <sub>O</sub> = 0 mA                                     |                      | 1    | 2.5             | μA      |
| I <sub>INS</sub>   | Standby Current                        | V <sub>IN</sub> = 10 V, Output Off                                                 |                      |      | 0.1             | μA      |
| V <sub>O</sub>     | Output Voltage Regulation              | V <sub>IN</sub> = 4 V, I <sub>O</sub> = 30 mA                                      | 2.9                  | 3.0  | 3.1             | %       |
| V <sub>DROP</sub>  | Dropout Voltage                        | I <sub>O</sub> = 30 mA                                                             |                      | 0.12 | 0.3             | V       |
| I <sub>O</sub>     | Output Current                         |                                                                                    | 70                   | 110  |                 | mA      |
| I <sub>OR</sub>    | Recommended Output Current             |                                                                                    |                      |      | 70              | mA      |
| LinReg             | Line Regulation                        | V <sub>IN</sub> = 4 V → 9 V                                                        |                      | 5    | 30              | mV      |
| LoaReg             | Load Regulation                        | I <sub>O</sub> = 0 mA to 30 mA                                                     |                      | 18   | 50              | mV      |
|                    |                                        | I <sub>O</sub> = 0 mA to 60 mA                                                     |                      | 36   | 80              | mV      |
| RR                 | Ripple Rejection                       | 100 mV(rms), f = 400 Hz<br>V <sub>IN</sub> = 4.5 V, I <sub>O</sub> = 10 mA         |                      | 55   |                 | dB      |
| ΔV/ΔT              | V <sub>O</sub> Temperature Coefficient | V <sub>IN</sub> = 4.5 V, I <sub>O</sub> = 10 mA<br>-20 °C ≤ T <sub>A</sub> ≤ 75 °C |                      | ±0.3 |                 | mV/°C   |
| V <sub>N</sub>     | Output Noise Voltage                   | V <sub>IN</sub> = 4.5 V, I <sub>O</sub> = 10 mA                                    |                      | 180  |                 | μV(rms) |
| <b>Control Pin</b> |                                        |                                                                                    |                      |      |                 |         |
| I <sub>CONT</sub>  | Control Pin Current                    | On Mode                                                                            |                      | 35   | 120             | μA      |
| V <sub>Coff</sub>  | Control Pin Voltage                    | Off Mode                                                                           | V <sub>IN</sub> -0.2 |      | V <sub>IN</sub> | V       |
| V <sub>Con</sub>   | Control Pin Voltage                    | On Mode                                                                            | 0                    |      | 0.6             | V       |

Note 1: Power dissipation must be derated at the rate of 1.6 mW/ °C for operation above T<sub>A</sub> = 25 °C.



## TK11432 ELECTRICAL CHARACTERISTICS

| SYMBOL              | PARAMETER                     | TEST CONDITION                                                                                                       | MIN          | TYP       | MAX      | UNITS                |
|---------------------|-------------------------------|----------------------------------------------------------------------------------------------------------------------|--------------|-----------|----------|----------------------|
| $I_{IN1}$           | Supply Current 1              | $V_{IN} = 4.2\text{ V}$ , $I_O = 0\text{ mA}$                                                                        |              | 500       | 900      | $\mu\text{A}$        |
| $I_{IN2}$           | Supply Current 2              | $V_{IN} = 2.5\text{ V}$ , $I_O = 0\text{ mA}$                                                                        |              | 1         | 2.5      | $\mu\text{A}$        |
| $I_{INS}$           | Standby Current               | $V_{IN} = 10\text{ V}$ , Output Off                                                                                  |              |           | 0.1      | $\mu\text{A}$        |
| $V_O$               | Output Voltage Regulation     | $V_{IN} = 4.2\text{ V}$ , $I_O = 30\text{ mA}$                                                                       | 3.13         | 3.25      | 3.37     | %                    |
| $V_{DROP}$          | Dropout Voltage               | $I_O = 30\text{ mA}$                                                                                                 |              | 0.12      | 0.3      | V                    |
| $I_O$               | Output Current                | (Note 2)                                                                                                             | 70           | 110       |          | mA                   |
| $I_{OR}$            | Recommended Output Current    |                                                                                                                      |              |           | 70       | mA                   |
| LinReg              | Line Regulation               | $V_{IN} = 4.2\text{ V} \rightarrow 9.2\text{ V}$                                                                     |              | 6         | 30       | mV                   |
| LoaReg              | Load Regulation               | $V_{IN} = 4.2\text{ V}$ , $I_O = 0\text{ mA}$ to $30\text{ mA}$                                                      |              | 20        | 50       | mV                   |
|                     |                               | $V_{IN} = 4.2\text{ V}$ , $I_O = 0\text{ mA}$ to $60\text{ mA}$                                                      |              | 40        | 80       | mV                   |
| RR                  | Ripple Rejection              | 100 mV(rms), $f = 400\text{ Hz}$<br>$V_{IN} = 4.7\text{ V}$ , $I_O = 10\text{ mA}$                                   |              | 55        |          | dB                   |
| $\Delta V/\Delta T$ | $V_O$ Temperature Coefficient | $V_{IN} = 4.7\text{ V}$ , $I_O = 10\text{ mA}$<br>$-20\text{ }^\circ\text{C} \leq T_A \leq 75\text{ }^\circ\text{C}$ |              | $\pm 0.3$ |          | mV/ $^\circ\text{C}$ |
| $V_N$               | Output Noise Voltage          | 10 Hz $\leq f \leq$ 100 KHz, $I_O = 10\text{ mA}$                                                                    |              | 180       |          | $\mu\text{V(rms)}$   |
| <b>Control Pin</b>  |                               |                                                                                                                      |              |           |          |                      |
| $I_{CONT}$          | Control Pin Current           | On Mode                                                                                                              |              | 35        | 120      | $\mu\text{A}$        |
| $V_{Coff}$          | Control Pin Voltage           | Off Mode                                                                                                             | $V_{IN}-0.2$ |           | $V_{IN}$ | V                    |
| $V_{Con}$           | Control Pin Voltage           | On Mode                                                                                                              | 0            |           | 0.6      | V                    |

Note 2:  $I_O$  (Load Current) is current when  $V_O$  drop down 0.3V from  $V_O$  at  $I_O = 30\text{ mA}$ .

## TK11435 ELECTRICAL CHARACTERISTICS

| SYMBOL              | PARAMETER                     | TEST CONDITION                                                                                                       | MIN          | TYP       | MAX      | UNITS                |
|---------------------|-------------------------------|----------------------------------------------------------------------------------------------------------------------|--------------|-----------|----------|----------------------|
| $I_{IN1}$           | Supply Current 1              | $V_{IN} = 4.5\text{ V}$ , $I_O = 0\text{ mA}$                                                                        |              | 500       | 900      | $\mu\text{A}$        |
| $I_{IN2}$           | Supply Current 2              | $V_{IN} = 2.5\text{ V}$ , $I_O = 0\text{ mA}$                                                                        |              | 1         | 2.5      | $\mu\text{A}$        |
| $I_{INS}$           | Standby Current               | $V_{IN} = 10\text{ V}$ , Output Off                                                                                  |              |           | 0.1      | $\mu\text{A}$        |
| $V_O$               | Output Voltage Regulation     | $V_{IN} = 4.5\text{ V}$ , $I_O = 30\text{ mA}$                                                                       | 3.38         | 3.5       | 3.62     | %                    |
| $V_{DROP}$          | Dropout Voltage               | $I_O = 30\text{ mA}$                                                                                                 |              | 0.12      | 0.3      | V                    |
| $I_O$               | Output Current                | (Note 2)                                                                                                             | 70           | 110       |          | mA                   |
| $I_{OR}$            | Recommended Output Current    |                                                                                                                      |              |           | 70       | mA                   |
| LinReg              | Line Regulation               | $V_{IN} = 4.5\text{ V} \rightarrow 9.5\text{ V}$                                                                     |              | 7         | 35       | mV                   |
| LoaReg              | Load Regulation               | $I_O = 0\text{ mA to } 30\text{ mA}$                                                                                 |              | 20        | 55       | mV                   |
|                     |                               | $I_O = 0\text{ mA to } 60\text{ mA}$                                                                                 |              | 40        | 95       | <b>mV</b>            |
| RR                  | Ripple Rejection              | 100 mV(rms), $f = 400\text{ Hz}$<br>$V_{IN} = 4.5\text{ V}$ , $I_O = 10\text{ mA}$                                   |              | 55        |          | dB                   |
| $\Delta V/\Delta T$ | $V_O$ Temperature Coefficient | $V_{IN} = 4.5\text{ V}$ , $I_O = 10\text{ mA}$<br>$-20\text{ }^\circ\text{C} \leq T_A \leq 75\text{ }^\circ\text{C}$ |              | $\pm 0.3$ |          | mV/ $^\circ\text{C}$ |
| $V_N$               | Output Noise Voltage          | $V_{IN} = 4.5\text{ V}$ , $I_O = 10\text{ mA}$                                                                       |              | 180       |          | $\mu\text{V(rms)}$   |
| <b>Control Pin</b>  |                               |                                                                                                                      |              |           |          |                      |
| $I_{CONT}$          | Control Pin Current           | On Mode                                                                                                              |              | 35        | 120      | $\mu\text{A}$        |
| $V_{Coff}$          | Control Pin Voltage           | Off Mode                                                                                                             | $V_{IN}-0.2$ |           | $V_{IN}$ | V                    |
| $V_{Con}$           | Control Pin Voltage           | On Mode                                                                                                              | 0            |           | 0.6      | V                    |

Note 2:  $I_O$  (Load Current) is current when  $V_O$  drop down 0.3V from  $V_O$  at  $I_O = 30\text{ mA}$ .

## TK11437 ELECTRICAL CHARACTERISTICS

| SYMBOL              | PARAMETER                     | TEST CONDITION                                                                                                       | MIN          | TYP       | MAX      | UNITS                |
|---------------------|-------------------------------|----------------------------------------------------------------------------------------------------------------------|--------------|-----------|----------|----------------------|
| $I_{IN1}$           | Supply Current 1              | $V_{IN} = 4.7\text{ V}$ , $I_O = 0\text{ mA}$                                                                        |              | 500       | 900      | $\mu\text{A}$        |
| $I_{IN2}$           | Supply Current 2              | $V_{IN} = 2.7\text{ V}$ , $I_O = 0\text{ mA}$                                                                        |              | 1         | 2.5      | $\mu\text{A}$        |
| $I_{INS}$           | Standby Current               | $V_{IN} = 10\text{ V}$ , Output Off                                                                                  |              |           | 0.1      | $\mu\text{A}$        |
| $V_O$               | Output Voltage Regulation     | $V_{IN} = 4.7\text{ V}$ , $I_O = 30\text{ mA}$                                                                       | 3.62         | 3.75      | 3.88     | %                    |
| $V_{DROP}$          | Dropout Voltage               | $I_O = 30\text{ mA}$                                                                                                 |              | 0.12      | 0.3      | V                    |
| $I_O$               | Output Current                | (Note 2)                                                                                                             | 70           | 110       |          | mA                   |
| $I_{OR}$            | Recommended Output Current    |                                                                                                                      |              |           | 70       | mA                   |
| LinReg              | Line Regulation               | $V_{IN} = 4.7\text{ V} \rightarrow 9.7\text{ V}$                                                                     |              | 7         | 35       | mV                   |
| LoaReg              | Load Regulation               | $I_O = 0\text{ mA}$ to $30\text{ mA}$                                                                                |              | 20        | 110      | mV                   |
|                     |                               | $I_O = 0\text{ mA}$ to $60\text{ mA}$                                                                                |              | 40        | 100      | mV                   |
| RR                  | Ripple Rejection              | 100 mV(rms), $f = 400\text{ Hz}$<br>$V_{IN} = 5.2\text{ V}$ , $I_O = 10\text{ mA}$                                   |              | 55        |          | dB                   |
| $\Delta V/\Delta T$ | $V_O$ Temperature Coefficient | $V_{IN} = 5.2\text{ V}$ , $I_O = 10\text{ mA}$<br>$-20\text{ }^\circ\text{C} \leq T_A \leq 75\text{ }^\circ\text{C}$ |              | $\pm 0.4$ |          | mV/ $^\circ\text{C}$ |
| $V_N$               | Output Noise Voltage          | $V_{IN} = 4.5\text{ V}$ , $I_O = 10\text{ mA}$                                                                       |              | 180       |          | $\mu\text{V(rms)}$   |
| <b>Control Pin</b>  |                               |                                                                                                                      |              |           |          |                      |
| $I_{CONT}$          | Control Pin Current           | On Mode                                                                                                              |              | 35        | 120      | $\mu\text{A}$        |
| $V_{Coff}$          | Control Pin Voltage           | Off Mode                                                                                                             | $V_{IN}-0.2$ |           | $V_{IN}$ | V                    |
| $V_{Con}$           | Control Pin Voltage           | On Mode                                                                                                              | 0            |           | 0.6      | V                    |

Note 2:  $I_O$  (Load Current) is current when  $V_O$  drop down 0.3V from  $V_O$  at  $I_O = 30\text{ mA}$ .

## TK11440 ELECTRICAL CHARACTERISTICS

| SYMBOL              | PARAMETER                     | TEST CONDITION                                                                                                       | MIN          | TYP       | MAX      | UNITS                |
|---------------------|-------------------------------|----------------------------------------------------------------------------------------------------------------------|--------------|-----------|----------|----------------------|
| $I_{IN1}$           | Supply Current 1              | $V_{IN} = 5\text{ V}$ , $I_O = 0\text{ mA}$                                                                          |              | 500       | 900      | $\mu\text{A}$        |
| $I_{IN2}$           | Supply Current 2              | $V_{IN} = 3.0\text{ V}$ , $I_O = 0\text{ mA}$                                                                        |              | 1         | 2.5      | $\mu\text{A}$        |
| $I_{INS}$           | Standby Current               | $V_{IN} = 10\text{ V}$ , Output Off                                                                                  |              |           | 0.1      | $\mu\text{A}$        |
| $V_O$               | Output Voltage Regulation     | $V_{IN} = 5\text{ V}$ , $I_O = 30\text{ mA}$                                                                         | 3.86         | 4.0       | 3.1      | %                    |
| $V_{DROP}$          | Dropout Voltage               | $I_O = 30\text{ mA}$                                                                                                 |              | 0.12      | 0.3      | V                    |
| $I_O$               | Output Current                | (Note 2)                                                                                                             | 70           | 110       |          | mA                   |
| $I_{OR}$            | Recommended Output Current    |                                                                                                                      |              |           | 70       | mA                   |
| LinReg              | Line Regulation               | $V_{IN} = 5\text{ V} \rightarrow 10\text{ V}$                                                                        |              | 8         | 40       | mV                   |
| LoaReg              | Load Regulation               | $I_O = 0\text{ mA}$ to $30\text{ mA}$                                                                                |              | 24        | 60       | mV                   |
|                     |                               | $I_O = 0\text{ mA}$ to $60\text{ mA}$                                                                                |              | 48        | 100      | mV                   |
| RR                  | Ripple Rejection              | 100 mV(rms), $f = 400\text{ Hz}$<br>$V_{IN} = 5.5\text{ V}$ , $I_O = 10\text{ mA}$                                   |              | 55        |          | dB                   |
| $\Delta V/\Delta T$ | $V_O$ Temperature Coefficient | $V_{IN} = 5.5\text{ V}$ , $I_O = 10\text{ mA}$<br>$-20\text{ }^\circ\text{C} \leq T_A \leq 75\text{ }^\circ\text{C}$ |              | $\pm 0.4$ |          | mV/ $^\circ\text{C}$ |
| $V_N$               | Output Noise Voltage          | $V_{IN} = 5.5\text{ V}$ , $I_O = 10\text{ mA}$                                                                       |              | 180       |          | $\mu\text{V(rms)}$   |
| <b>Control Pin</b>  |                               |                                                                                                                      |              |           |          |                      |
| $I_{CONT}$          | Control Pin Current           | On Mode                                                                                                              |              | 35        | 120      | $\mu\text{A}$        |
| $V_{Coff}$          | Control Pin Voltage           | Off Mode                                                                                                             | $V_{IN}-0.2$ |           | $V_{IN}$ | V                    |
| $V_{Con}$           | Control Pin Voltage           | On Mode                                                                                                              | 0            |           | 0.6      | V                    |

Note 2:  $I_O$  (Load Current) is current when  $V_O$  drop down 0.3V from  $V_O$  at  $I_O = 30\text{ mA}$ .

## TK11445 ELECTRICAL CHARACTERISTICS

| SYMBOL              | PARAMETER                     | TEST CONDITION                                                                                                     | MIN          | TYP       | MAX      | UNITS                |
|---------------------|-------------------------------|--------------------------------------------------------------------------------------------------------------------|--------------|-----------|----------|----------------------|
| $I_{IN1}$           | Supply Current 1              | $V_{IN} = 5\text{ V}$ , $I_O = 0\text{ mA}$                                                                        |              | 500       | 900      | $\mu\text{A}$        |
| $I_{IN2}$           | Supply Current 2              | $V_{IN} = 3.5\text{ V}$ , $I_O = 0\text{ mA}$                                                                      |              | 1         | 2.5      | $\mu\text{A}$        |
| $I_{INS}$           | Standby Current               | $V_{IN} = 10\text{ V}$ , Output Off                                                                                |              |           | 0.1      | $\mu\text{A}$        |
| $V_O$               | Output Voltage Regulation     | $V_{IN} = 5.5\text{ V}$ , $I_O = 30\text{ mA}$                                                                     | 4.34         | 4.5       | 4.66     | %                    |
| $V_{DROP}$          | Dropout Voltage               | $I_O = 30\text{ mA}$                                                                                               |              | 0.12      | 0.3      | V                    |
| $I_O$               | Output Current                | (Note 2)                                                                                                           | 70           | 110       |          | mA                   |
| $I_{OR}$            | Recommended Output Current    |                                                                                                                    |              |           | 70       | mA                   |
| LinReg              | Line Regulation               | $V_{IN} = 5.5\text{ V} \rightarrow 10.5\text{ V}$                                                                  |              | 8         | 40       | mV                   |
| LoaReg              | Load Regulation               | $I_O = 0\text{ mA to } 30\text{ mA}$                                                                               |              | 25        | 65       | mV                   |
|                     |                               | $I_O = 0\text{ mA to } 60\text{ mA}$                                                                               |              | 55        | 110      | mV                   |
| RR                  | Ripple Rejection              | 100 mV(rms), $f = 400\text{ Hz}$<br>$V_{IN} = 6\text{ V}$ , $I_O = 10\text{ mA}$                                   |              | 55        |          | dB                   |
| $\Delta V/\Delta T$ | $V_O$ Temperature Coefficient | $V_{IN} = 6\text{ V}$ , $I_O = 10\text{ mA}$<br>$-20\text{ }^\circ\text{C} \leq T_A \leq 75\text{ }^\circ\text{C}$ |              | $\pm 0.5$ |          | mV/ $^\circ\text{C}$ |
| $V_N$               | Output Noise Voltage          | $V_{IN} = 6\text{ V}$ , $I_O = 10\text{ mA}$                                                                       |              | 180       |          | $\mu\text{V(rms)}$   |
| <b>Control Pin</b>  |                               |                                                                                                                    |              |           |          |                      |
| $I_{CONT}$          | Control Pin Current           | On Mode                                                                                                            |              | 35        | 120      | $\mu\text{A}$        |
| $V_{Coff}$          | Control Pin Voltage           | Off Mode                                                                                                           | $V_{IN}-0.2$ |           | $V_{IN}$ | V                    |
| $V_{Con}$           | Control Pin Voltage           | On Mode                                                                                                            | 0            |           | 0.6      | V                    |

Note 2:  $I_O$  (Load Current) is current when  $V_O$  drop down 0.3V from  $V_O$  at  $I_O = 30\text{ mA}$ .

## TK11447 ELECTRICAL CHARACTERISTICS

| SYMBOL              | PARAMETER                     | TEST CONDITION                                                                                         | MIN          | TYP       | MAX      | UNITS                |
|---------------------|-------------------------------|--------------------------------------------------------------------------------------------------------|--------------|-----------|----------|----------------------|
| $I_{IN1}$           | Supply Current 1              | $V_{IN} = 5.7 \text{ V}$ , $I_O = 0 \text{ mA}$                                                        |              | 500       | 900      | $\mu\text{A}$        |
| $I_{IN2}$           | Supply Current 2              | $V_{IN} = 3.7 \text{ V}$ , $I_O = 0 \text{ mA}$                                                        |              | 1         | 2.5      | $\mu\text{A}$        |
| $I_{INS}$           | Standby Current               | $V_{IN} = 10 \text{ V}$ , Output Off                                                                   |              |           | 0.1      | $\mu\text{A}$        |
| $V_O$               | Output Voltage Regulation     | $V_{IN} = 5.7 \text{ V}$ , $I_O = 30 \text{ mA}$                                                       | 4.58         | 4.75      | 4.92     | %                    |
| $V_{DROP}$          | Dropout Voltage               | $I_O = 30 \text{ mA}$                                                                                  |              | 0.12      | 0.3      | V                    |
| $I_O$               | Output Current                | (Note 2)                                                                                               | 70           | 110       |          | mA                   |
| $I_{OR}$            | Recommended Output Current    |                                                                                                        |              |           | 70       | mA                   |
| LinReg              | Line Regulation               | $V_{IN} = 5.7 \text{ V} \rightarrow 10.7 \text{ V}$                                                    |              | 8         | 40       | mV                   |
| LoaReg              | Load Regulation               | $I_O = 0 \text{ mA to } 30 \text{ mA}$                                                                 |              | 25        | 70       | mV                   |
|                     |                               | $I_O = 0 \text{ mA to } 60 \text{ mA}$                                                                 |              | 50        | 120      | mV                   |
| RR                  | Ripple Rejection              | 100 mV(rms), $f = 400 \text{ Hz}$<br>$V_{IN} = 6.2 \text{ V}$ , $I_O = 10 \text{ mA}$                  |              | 55        |          | dB                   |
| $\Delta V/\Delta T$ | $V_O$ Temperature Coefficient | $V_{IN} = 6.2 \text{ V}$ , $I_O = 10 \text{ mA}$<br>$-20^\circ\text{C} \leq T_A \leq 75^\circ\text{C}$ |              | $\pm 0.6$ |          | mV/ $^\circ\text{C}$ |
| $V_N$               | Output Noise Voltage          | $V_{IN} = 6.2 \text{ V}$ , $I_O = 10 \text{ mA}$                                                       |              | 180       |          | $\mu\text{V(rms)}$   |
| <b>Control Pin</b>  |                               |                                                                                                        |              |           |          |                      |
| $I_{CONT}$          | Control Pin Current           | On Mode                                                                                                |              | 35        | 120      | $\mu\text{A}$        |
| $V_{Coff}$          | Control Pin Voltage           | Off Mode                                                                                               | $V_{IN}-0.2$ |           | $V_{IN}$ | V                    |
| $V_{Con}$           | Control Pin Voltage           | On Mode                                                                                                | 0            |           | 0.6      | V                    |

Note 2:  $I_O$  (Load Current) is current when  $V_O$  drop down 0.3V from  $V_O$  at  $I_O = 30 \text{ mA}$ .



## TK11450 ELECTRICAL CHARACTERISTICS

| SYMBOL              | PARAMETER                     | TEST CONDITION                                                                                                       | MIN          | TYP       | MAX      | UNITS                |
|---------------------|-------------------------------|----------------------------------------------------------------------------------------------------------------------|--------------|-----------|----------|----------------------|
| $I_{IN1}$           | Supply Current 1              | $V_{IN} = 6.0\text{ V}$ , $I_O = 0\text{ mA}$                                                                        |              | 500       | 900      | $\mu\text{A}$        |
| $I_{IN2}$           | Supply Current 2              | $V_{IN} = 4.0\text{ V}$ , $I_O = 0\text{ mA}$                                                                        |              | 1         | 2.5      | $\mu\text{A}$        |
| $I_{INS}$           | Standby Current               | $V_{IN} = 10\text{ V}$ , Output Off                                                                                  |              |           | 0.1      | $\mu\text{A}$        |
| $V_O$               | Output Voltage Regulation     | $V_{IN} = 6.0\text{ V}$ , $I_O = 30\text{ mA}$                                                                       | 4.83         | 5.0       | 5.17     | %                    |
| $V_{DROP}$          | Dropout Voltage               | $I_O = 30\text{ mA}$                                                                                                 |              | 0.12      | 0.3      | V                    |
| $I_O$               | Output Current                | (Note 2)                                                                                                             | 70           | 110       |          | mA                   |
| $I_{OR}$            | Recommended Output Current    |                                                                                                                      |              |           | 70       | mA                   |
| LinReg              | Line Regulation               | $V_{IN} = 6\text{ V} \rightarrow 11\text{ V}$                                                                        |              | 8         | 40       | mV                   |
| LoaReg              | Load Regulation               | $I_O = 0\text{ mA to } 30\text{ mA}$                                                                                 |              | 25        | 70       | mV                   |
|                     |                               | $I_O = 0\text{ mA to } 60\text{ mA}$                                                                                 |              | 60        | 120      | mV                   |
| RR                  | Ripple Rejection              | 100 mV(rms), $f = 400\text{ Hz}$<br>$V_{IN} = 6.5\text{ V}$ , $I_O = 10\text{ mA}$                                   |              | 55        |          | dB                   |
| $\Delta V/\Delta T$ | $V_O$ Temperature Coefficient | $V_{IN} = 6.5\text{ V}$ , $I_O = 10\text{ mA}$<br>$-20\text{ }^\circ\text{C} \leq T_A \leq 75\text{ }^\circ\text{C}$ |              | $\pm 0.6$ |          | mV/ $^\circ\text{C}$ |
| $V_N$               | Output Noise Voltage          | $V_{IN} = 6.5\text{ V}$ , $I_O = 10\text{ mA}$                                                                       |              | 180       |          | $\mu\text{V(rms)}$   |
| <b>Control Pin</b>  |                               |                                                                                                                      |              |           |          |                      |
| $I_{CONT}$          | Control Pin Current           | On Mode                                                                                                              |              | 35        | 120      | $\mu\text{A}$        |
| $V_{Coff}$          | Control Pin Voltage           | Off Mode                                                                                                             | $V_{IN}-0.2$ |           | $V_{IN}$ | V                    |
| $V_{Con}$           | Control Pin Voltage           | On Mode                                                                                                              | 0            |           | 0.6      | V                    |

Note 2:  $I_O$  (Load Current) is current when  $V_O$  drop down 0.3V from  $V_O$  at  $I_O = 30\text{ mA}$ .

## TK11455 ELECTRICAL CHARACTERISTICS

| SYMBOL              | PARAMETER                     | TEST CONDITION                                                                                                       | MIN          | TYP       | MAX      | UNITS                |
|---------------------|-------------------------------|----------------------------------------------------------------------------------------------------------------------|--------------|-----------|----------|----------------------|
| $I_{IN1}$           | Supply Current 1              | $V_{IN} = 6.5\text{ V}$ , $I_O = 0\text{ mA}$                                                                        |              | 500       | 900      | $\mu\text{A}$        |
| $I_{IN2}$           | Supply Current 2              | $V_{IN} = 4.5\text{ V}$ , $I_O = 0\text{ mA}$                                                                        |              | 1         | 2.5      | $\mu\text{A}$        |
| $I_{INS}$           | Standby Current               | $V_{IN} = 10\text{ V}$ , Output Off                                                                                  |              |           | 0.1      | $\mu\text{A}$        |
| $V_O$               | Output Voltage Regulation     | $V_{IN} = 6.5\text{ V}$ , $I_O = 30\text{ mA}$                                                                       | 5.31         | 5.5       | 5.69     | %                    |
| $V_{DROP}$          | Dropout Voltage               | $I_O = 30\text{ mA}$                                                                                                 |              | 0.12      | 0.3      | V                    |
| $I_O$               | Output Current                | (Note 2)                                                                                                             | 70           | 110       |          | mA                   |
| $I_{OR}$            | Recommended Output Current    |                                                                                                                      |              |           | 70       | mA                   |
| LinReg              | Line Regulation               | $V_{IN} = 6.5\text{ V} \rightarrow 11.5\text{ V}$                                                                    |              | 8         | 40       | mV                   |
| LoaReg              | Load Regulation               | $I_O = 0\text{ mA to } 30\text{ mA}$                                                                                 |              | 30        | 75       | mV                   |
|                     |                               | $I_O = 0\text{ mA to } 60\text{ mA}$                                                                                 |              | 65        | 130      | mV                   |
| RR                  | Ripple Rejection              | 100 mV(rms), $f = 400\text{ Hz}$<br>$V_{IN} = 7.0\text{ V}$ , $I_O = 10\text{ mA}$                                   |              | 55        |          | dB                   |
| $\Delta V/\Delta T$ | $V_O$ Temperature Coefficient | $V_{IN} = 7.0\text{ V}$ , $I_O = 10\text{ mA}$<br>$-20\text{ }^\circ\text{C} \leq T_A \leq 75\text{ }^\circ\text{C}$ |              | $\pm 0.7$ |          | mV/ $^\circ\text{C}$ |
| $V_N$               | Output Noise Voltage          | $V_{IN} = 7.0\text{ V}$ , $I_O = 10\text{ mA}$                                                                       |              | 180       |          | $\mu\text{V(rms)}$   |
| <b>Control Pin</b>  |                               |                                                                                                                      |              |           |          |                      |
| $I_{CONT}$          | Control Pin Current           | On Mode                                                                                                              |              | 35        | 120      | $\mu\text{A}$        |
| $V_{Coff}$          | Control Pin Voltage           | Off Mode                                                                                                             | $V_{IN}-0.2$ |           | $V_{IN}$ | V                    |
| $V_{Con}$           | Control Pin Voltage           | On Mode                                                                                                              | 0            |           | 0.6      | V                    |

Note 2:  $I_O$  (Load Current) is current when  $V_O$  drop down 0.3V from  $V_O$  at  $I_O = 30\text{ mA}$ .

## TK11460 ELECTRICAL CHARACTERISTICS

| SYMBOL              | PARAMETER                     | TEST CONDITION                                                                                                       | MIN          | TYP       | MAX      | UNITS                |
|---------------------|-------------------------------|----------------------------------------------------------------------------------------------------------------------|--------------|-----------|----------|----------------------|
| $I_{IN1}$           | Supply Current 1              | $V_{IN} = 7.0\text{ V}$ , $I_O = 0\text{ mA}$                                                                        |              | 500       | 900      | $\mu\text{A}$        |
| $I_{IN2}$           | Supply Current 2              | $V_{IN} = 5.0\text{ V}$ , $I_O = 0\text{ mA}$                                                                        |              | 1         | 3.0      | $\mu\text{A}$        |
| $I_{INS}$           | Standby Current               | $V_{IN} = 10\text{ V}$ , Output Off                                                                                  |              |           | 0.1      | $\mu\text{A}$        |
| $V_O$               | Output Voltage Regulation     | $V_{IN} = 7.0\text{ V}$ , $I_O = 30\text{ mA}$                                                                       | 5.79         | 6.0       | 6.21     | %                    |
| $V_{DROP}$          | Dropout Voltage               | $I_O = 30\text{ mA}$                                                                                                 |              | 0.12      | 0.3      | V                    |
| $I_O$               | Output Current                | (Note 2)                                                                                                             | 70           | 110       |          | mA                   |
| $I_{OR}$            | Recommended Output Current    |                                                                                                                      |              |           | 70       | mA                   |
| LinReg              | Line Regulation               | $V_{IN} = 7.0\text{ V} \rightarrow 12\text{ V}$                                                                      |              | 8         | 40       | mV                   |
| LoaReg              | Load Regulation               | $I_O = 0\text{ mA to } 30\text{ mA}$                                                                                 |              | 30        | 80       | mV                   |
|                     |                               | $I_O = 0\text{ mA to } 60\text{ mA}$                                                                                 |              | 65        | 140      | mV                   |
| RR                  | Ripple Rejection              | 100 mV(rms), $f = 400\text{ Hz}$<br>$V_{IN} = 7.5\text{ V}$ , $I_O = 10\text{ mA}$                                   |              | 55        |          | dB                   |
| $\Delta V/\Delta T$ | $V_O$ Temperature Coefficient | $V_{IN} = 7.5\text{ V}$ , $I_O = 10\text{ mA}$<br>$-20\text{ }^\circ\text{C} \leq T_A \leq 75\text{ }^\circ\text{C}$ |              | $\pm 0.7$ |          | mV/ $^\circ\text{C}$ |
| $V_N$               | Output Noise Voltage          | $V_{IN} = 7.5\text{ V}$ , $I_O = 10\text{ mA}$                                                                       |              | 180       |          | $\mu\text{V(rms)}$   |
| <b>Control Pin</b>  |                               |                                                                                                                      |              |           |          |                      |
| $I_{CONT}$          | Control Pin Current           | On Mode                                                                                                              |              | 35        | 120      | $\mu\text{A}$        |
| $V_{Coff}$          | Control Pin Voltage           | Off Mode                                                                                                             | $V_{IN}-0.2$ |           | $V_{IN}$ | V                    |
| $V_{Con}$           | Control Pin Voltage           | On Mode                                                                                                              | 0            |           | 0.6      | V                    |

Note 2:  $I_O$  (Load Current) is current when  $V_O$  drop down 0.3V from  $V_O$  at  $I_O = 30\text{ mA}$ .

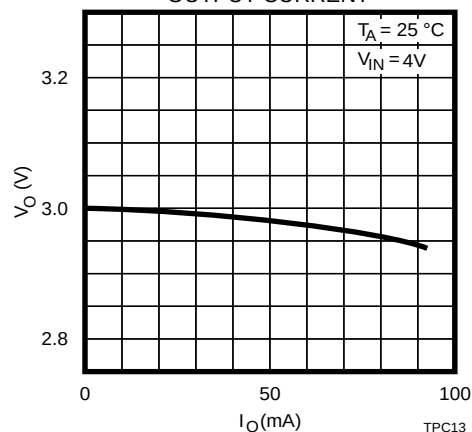
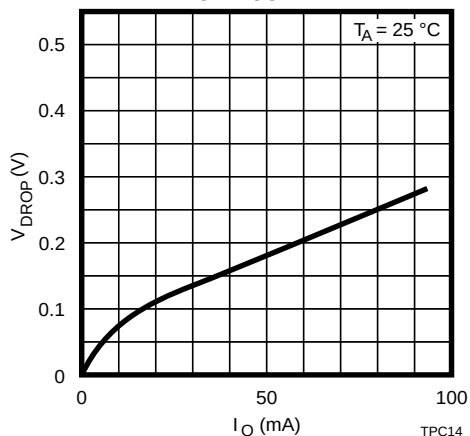
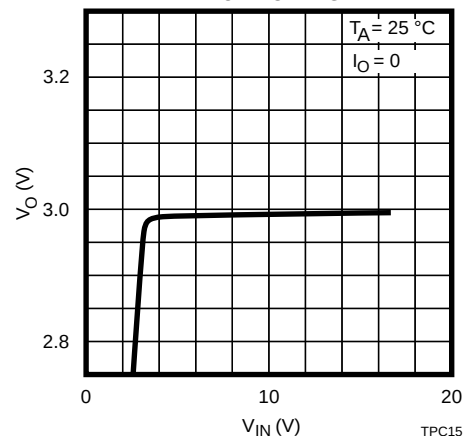
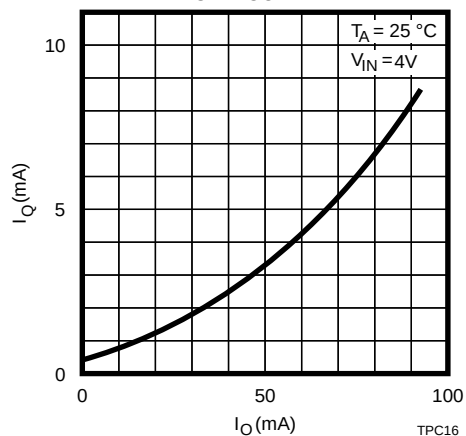
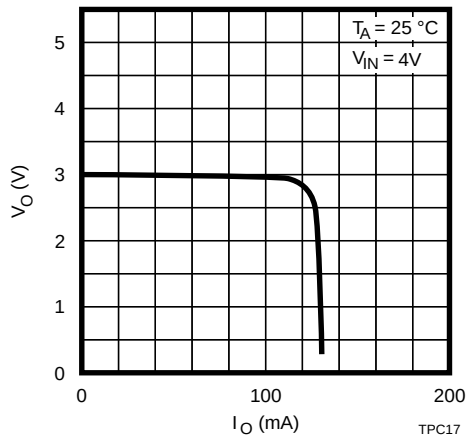
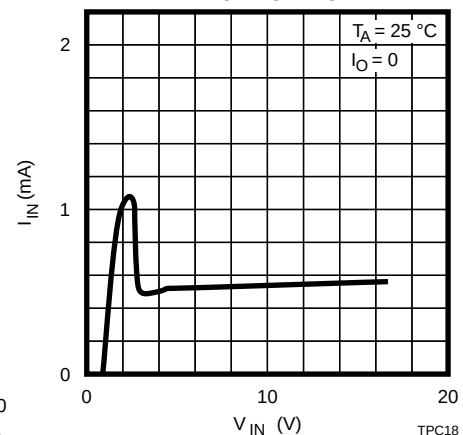
## TK11480 ELECTRICAL CHARACTERISTICS

| SYMBOL              | PARAMETER                     | TEST CONDITION                                                                                                       | MIN          | TYP       | MAX      | UNITS                |
|---------------------|-------------------------------|----------------------------------------------------------------------------------------------------------------------|--------------|-----------|----------|----------------------|
| $I_{IN1}$           | Supply Current 1              | $V_{IN} = 9.0\text{ V}$ , $I_O = 0\text{ mA}$                                                                        |              | 500       | 900      | $\mu\text{A}$        |
| $I_{IN2}$           | Supply Current 2              | $V_{IN} = 7.0\text{ V}$ , $I_O = 0\text{ mA}$                                                                        |              | 1         | 3.0      | $\mu\text{A}$        |
| $I_{INS}$           | Standby Current               | $V_{IN} = 10\text{ V}$ , Output Off                                                                                  |              |           | 0.1      | $\mu\text{A}$        |
| $V_O$               | Output Voltage Regulation     | $V_{IN} = 9.0\text{ V}$ , $I_O = 30\text{ mA}$                                                                       | 7.72         | 8.0       | 8.28     | %                    |
| $V_{DROP}$          | Dropout Voltage               | $I_O = 30\text{ mA}$                                                                                                 |              | 0.12      | 0.3      | V                    |
| $I_O$               | Output Current                | (Note 2)                                                                                                             | 70           | 110       |          | mA                   |
| $I_{OR}$            | Recommended Output Current    |                                                                                                                      |              |           | 70       | mA                   |
| LinReg              | Line Regulation               | $V_{IN} = 9\text{ V} \rightarrow 13\text{ V}$                                                                        |              | 8         | 40       | mV                   |
| LoaReg              | Load Regulation               | $I_O = 0\text{ mA to } 30\text{ mA}$                                                                                 |              | 30        | 100      | mV                   |
|                     |                               | $I_O = 0\text{ mA to } 60\text{ mA}$                                                                                 |              | 65        | 180      | mV                   |
| RR                  | Ripple Rejection              | 100 mV(rms), $f = 400\text{ Hz}$<br>$V_{IN} = 9.5\text{ V}$ , $I_O = 10\text{ mA}$                                   |              | 55        |          | dB                   |
| $\Delta V/\Delta T$ | $V_O$ Temperature Coefficient | $V_{IN} = 9.5\text{ V}$ , $I_O = 10\text{ mA}$<br>$-20\text{ }^\circ\text{C} \leq T_A \leq 75\text{ }^\circ\text{C}$ |              | $\pm 0.7$ |          | mV/ $^\circ\text{C}$ |
| $V_N$               | Output Noise Voltage          | $V_{IN} = 9.5\text{ V}$ , $I_O = 10\text{ mA}$                                                                       |              | 220       |          | $\mu\text{V(rms)}$   |
| <b>Control Pin</b>  |                               |                                                                                                                      |              |           |          |                      |
| $I_{CONT}$          | Control Pin Current           | On Mode                                                                                                              |              | 35        | 120      | $\mu\text{A}$        |
| $V_{Coff}$          | Control Pin Voltage           | Off Mode                                                                                                             | $V_{IN}-0.2$ |           | $V_{IN}$ | V                    |
| $V_{Con}$           | Control Pin Voltage           | On Mode                                                                                                              | 0            |           | 0.6      | V                    |

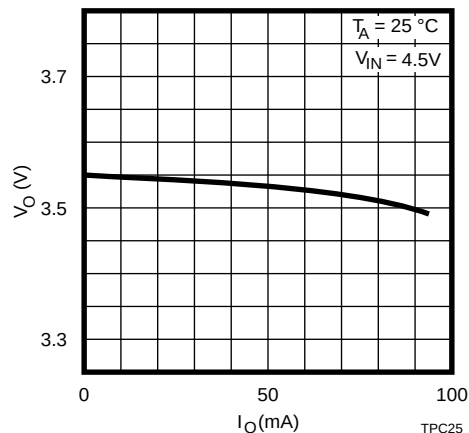
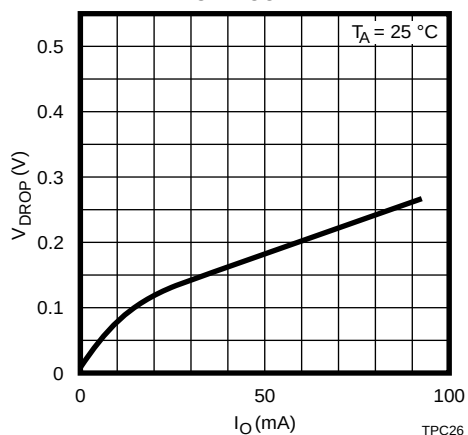
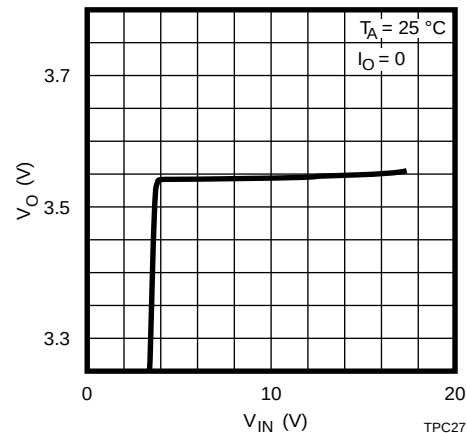
Note 2:  $I_O$  (Load Current) is current when  $V_O$  drop down 0.3V from  $V_O$  at  $I_O = 30\text{ mA}$ .

## TYPICAL PERFORMANCE CHARACTERISTICS

## TK11430

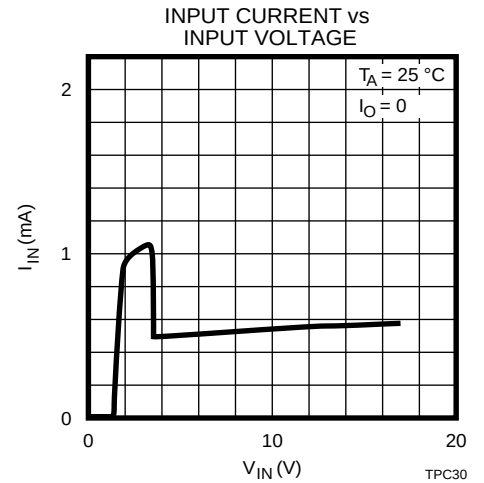
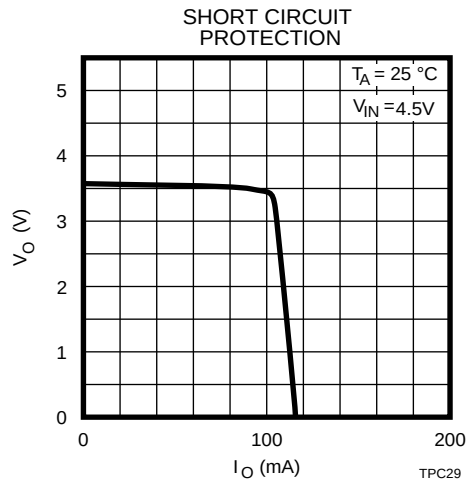
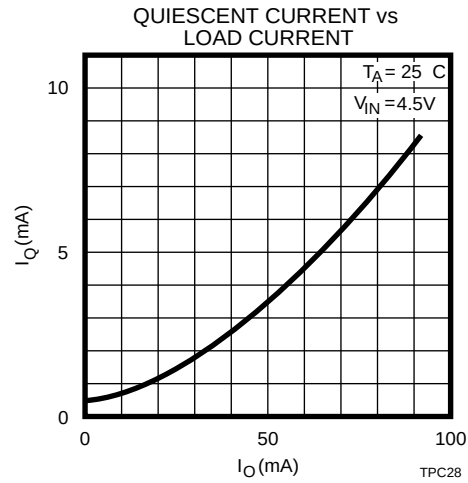
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OUTPUT CURRENTDROPOUT VOLTAGE vs  
LOAD CURRENTOUTPUT VOLTAGE vs  
INPUT VOLTAGEQUIESCENT CURRENT vs  
LOAD CURRENTSHORT CIRCUIT  
PROTECTIONINPUT CURRENT vs  
INPUT VOLTAGE

## TK11435

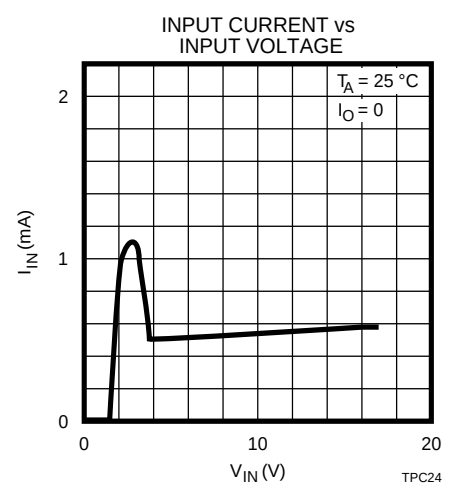
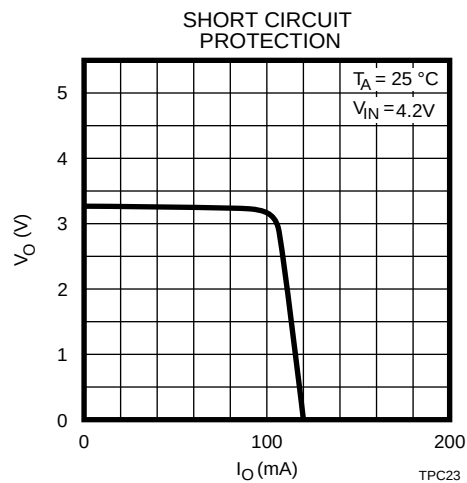
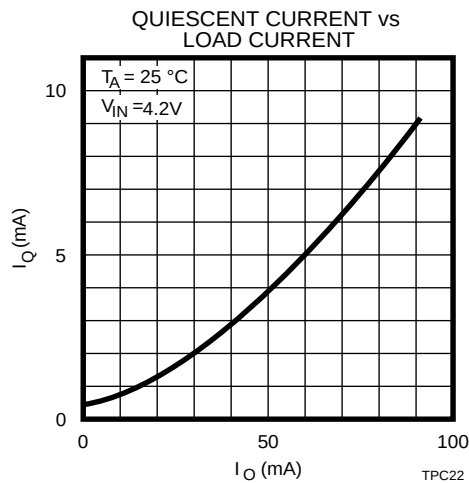
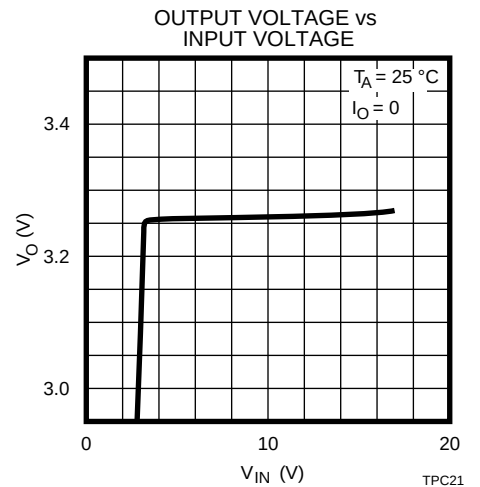
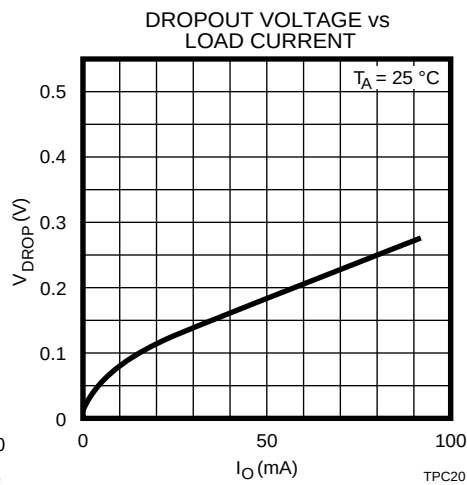
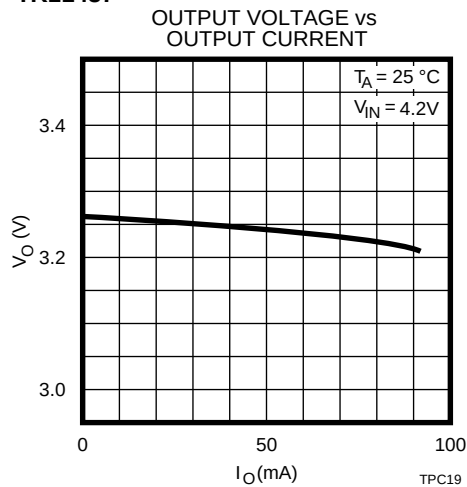
OUTPUT VOLTAGE vs  
OUTPUT CURRENTDROPOUT VOLTAGE vs  
LOAD CURRENTOUTPUT VOLTAGE vs  
INPUT VOLTAGE

## TYPICAL PERFORMANCE CHARACTERISTICS (CONT.)

### TK11435 (CONT.)

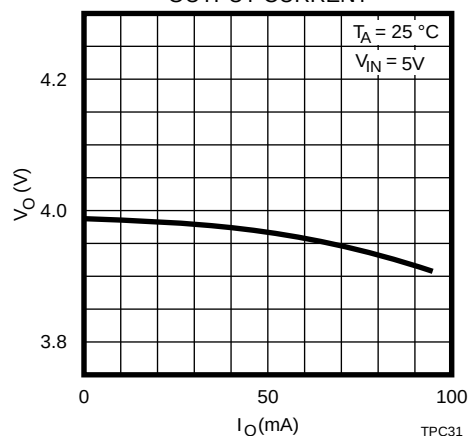
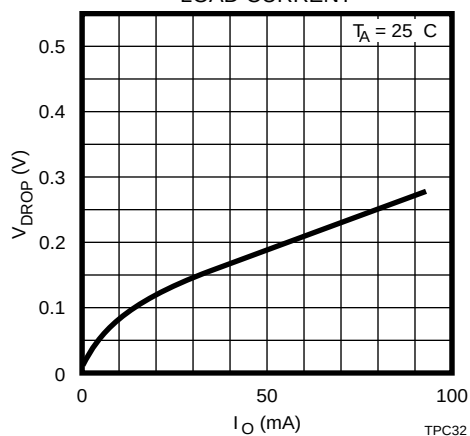
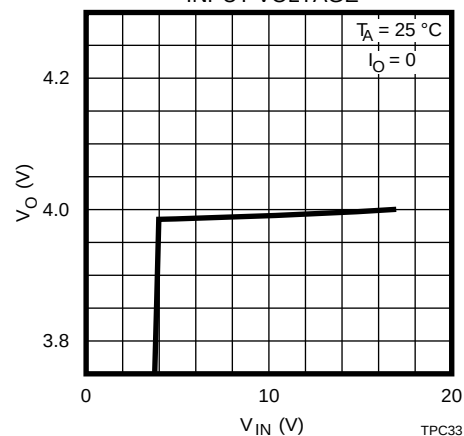
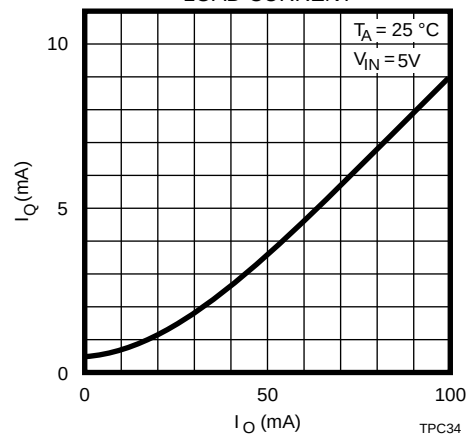
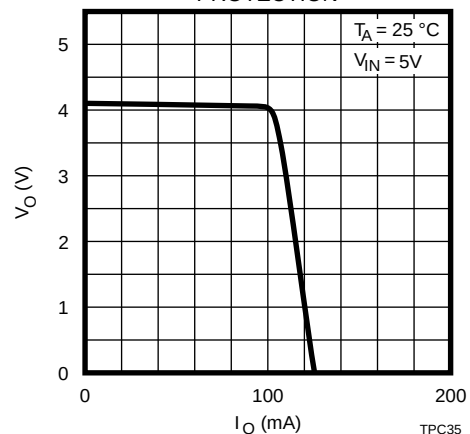
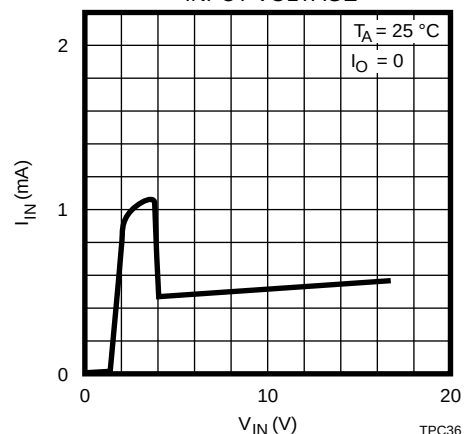


### TK11437

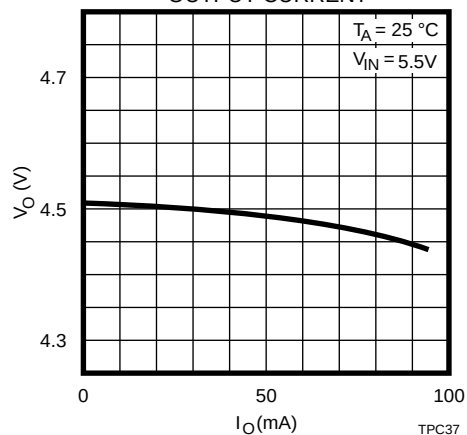
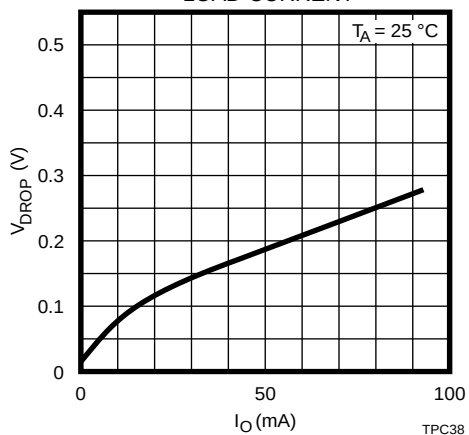
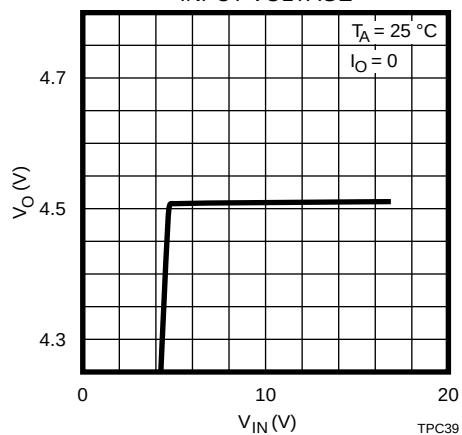


## TYPICAL PERFORMANCE CHARACTERISTICS (CONT.)

## TK11440

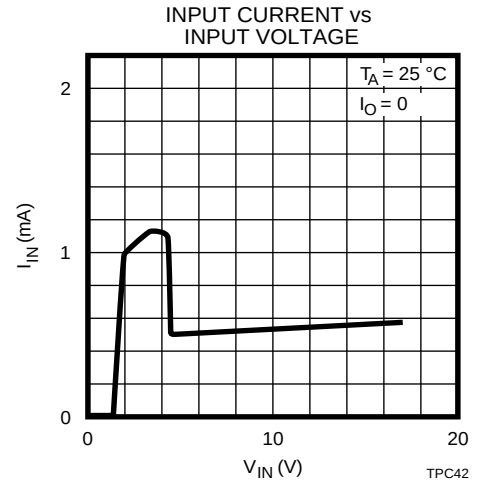
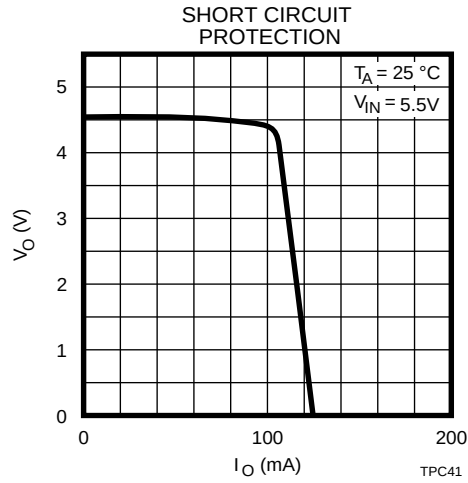
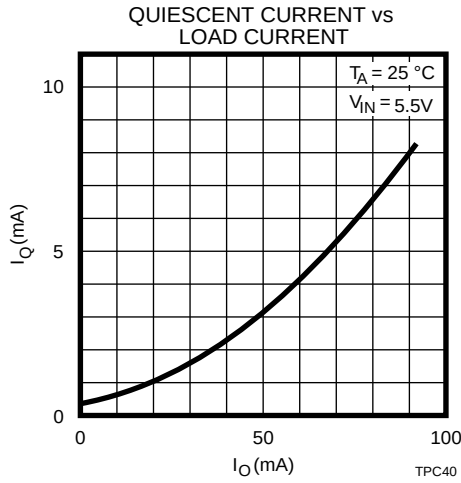
OUTPUT VOLTAGE vs  
OUTPUT CURRENTDROPOUT VOLTAGE vs  
LOAD CURRENTOUTPUT VOLTAGE vs  
INPUT VOLTAGEQUIESCENT CURRENT vs  
LOAD CURRENTSHORT CIRCUIT  
PROTECTIONINPUT CURRENT vs  
INPUT VOLTAGE

## TK11445

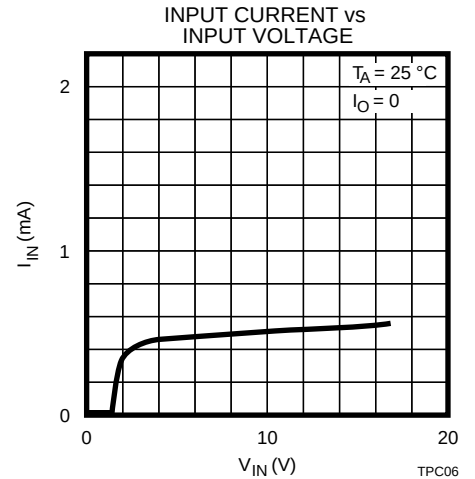
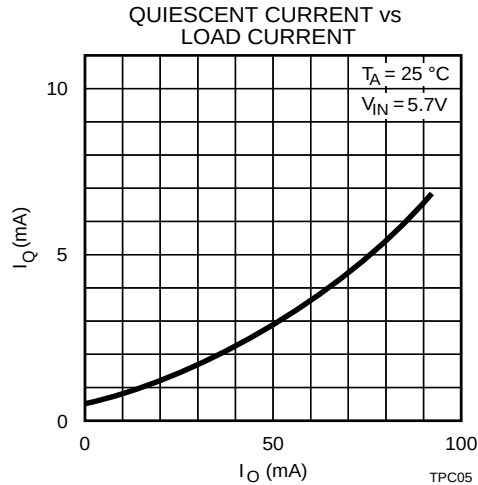
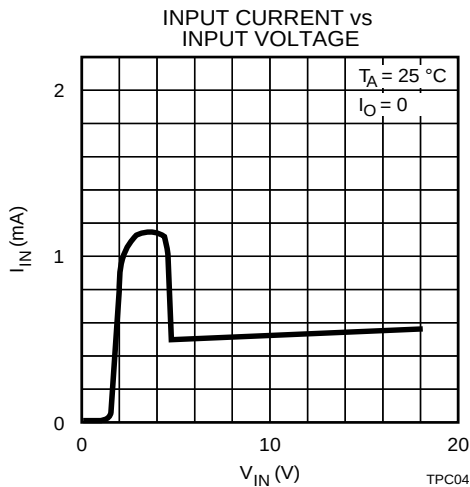
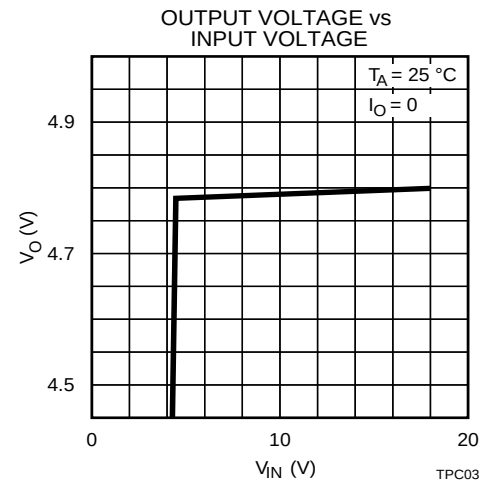
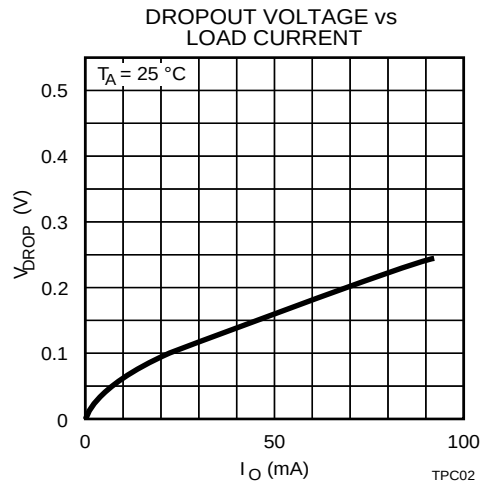
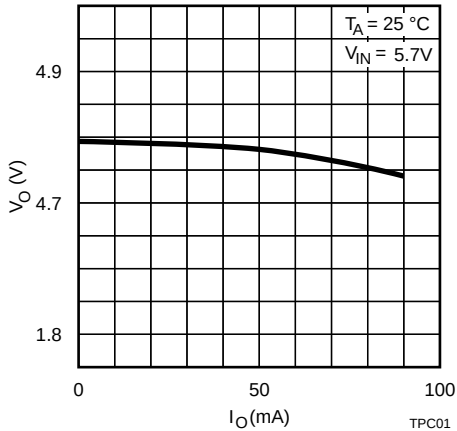
OUTPUT VOLTAGE vs  
OUTPUT CURRENTDROPOUT VOLTAGE vs  
LOAD CURRENTOUTPUT VOLTAGE vs  
INPUT VOLTAGE

## TYPICAL PERFORMANCE CHARACTERISTICS (CONT.)

### TK11445 (CONT.)



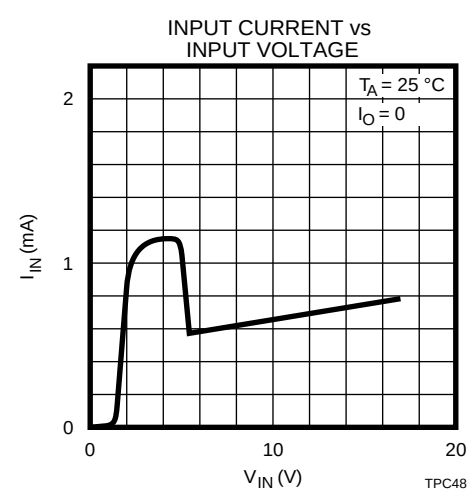
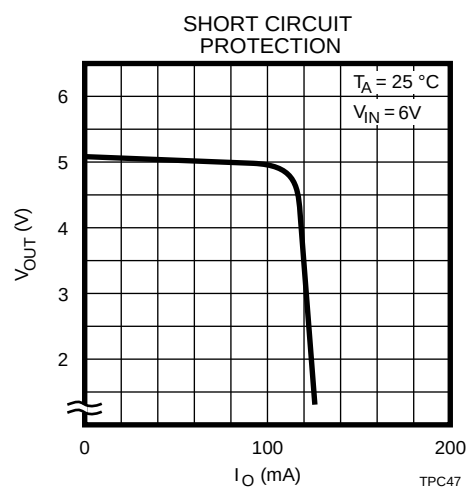
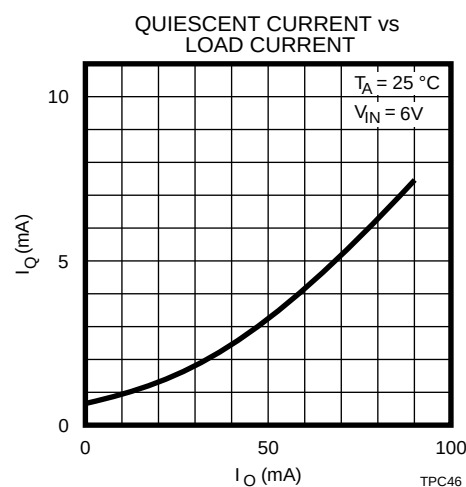
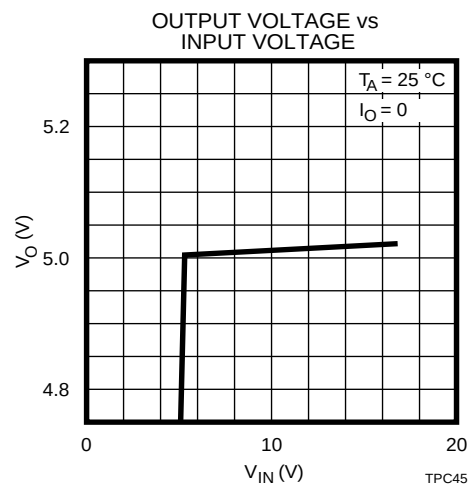
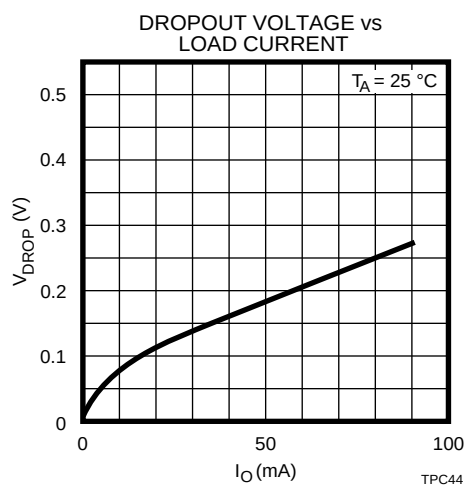
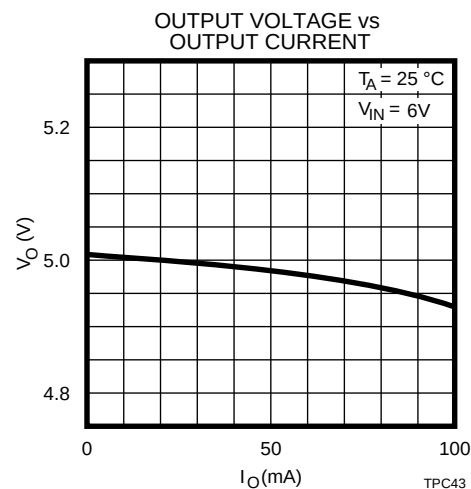
### TK11447 OUTPUT VOLTAGE vs OUTPUT CURRENT



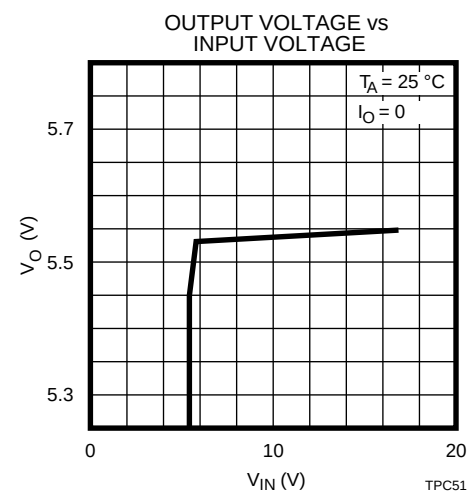
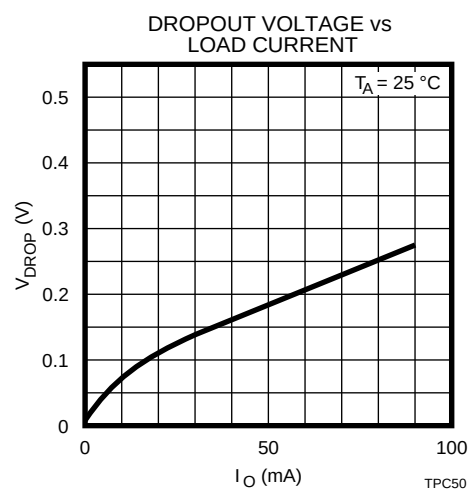
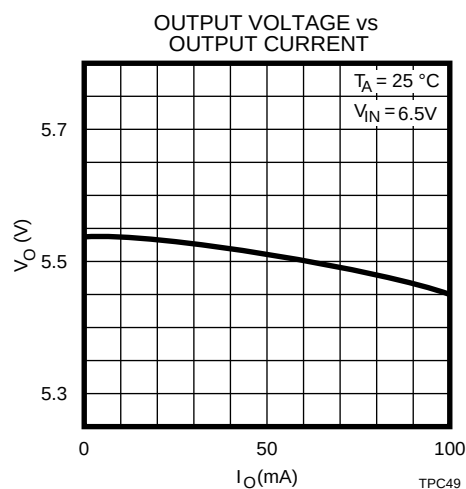


## TYPICAL PERFORMANCE CHARACTERISTICS (CONT.)

## TK11450

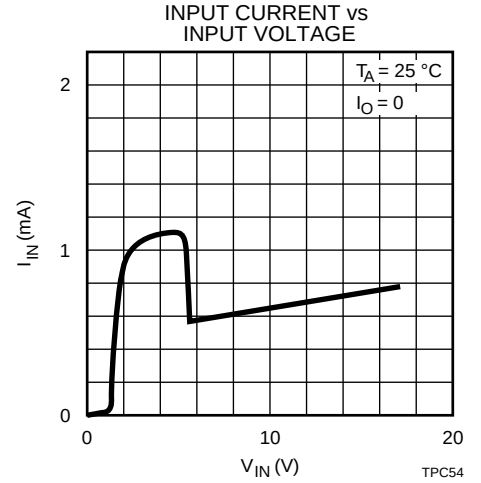
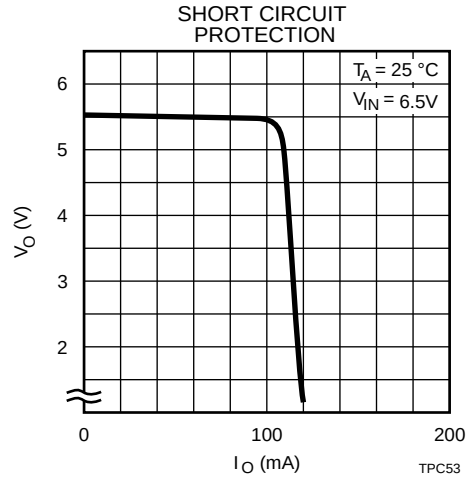
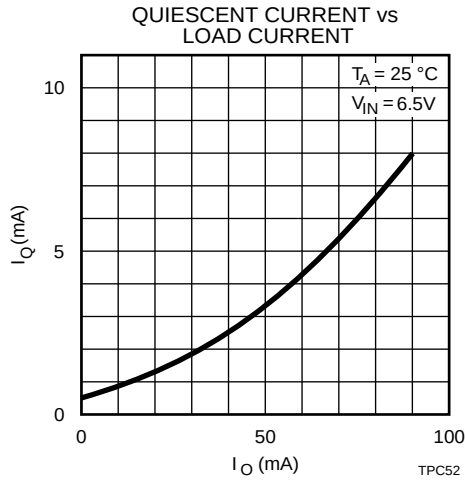


## TK11455

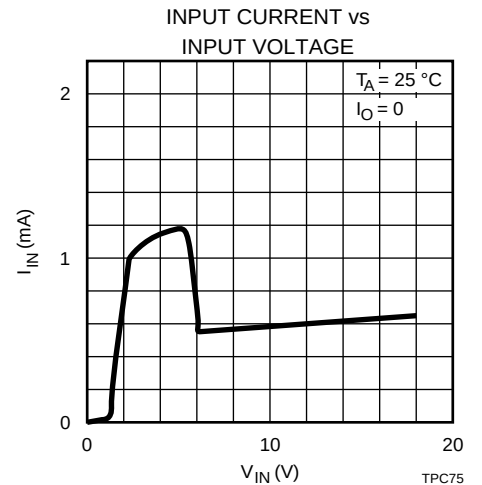
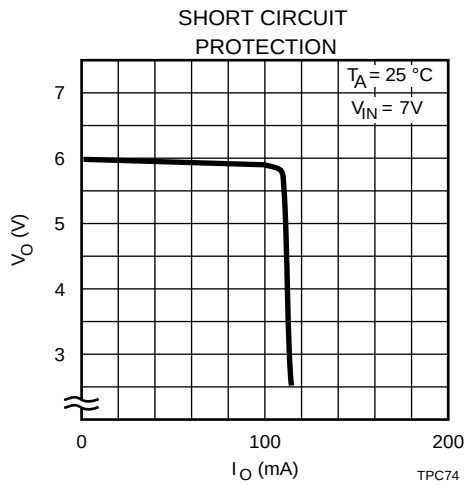
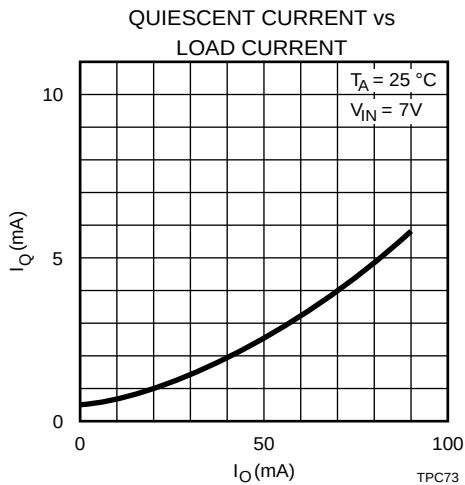
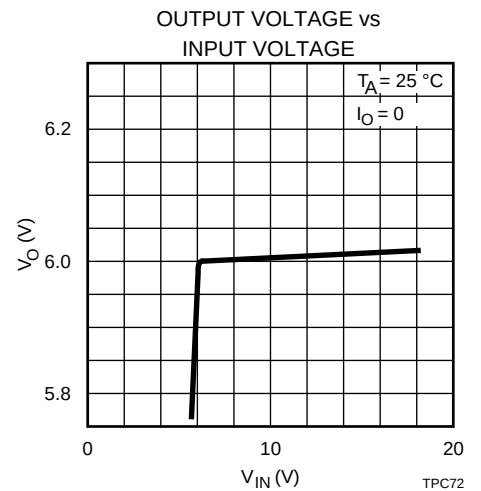
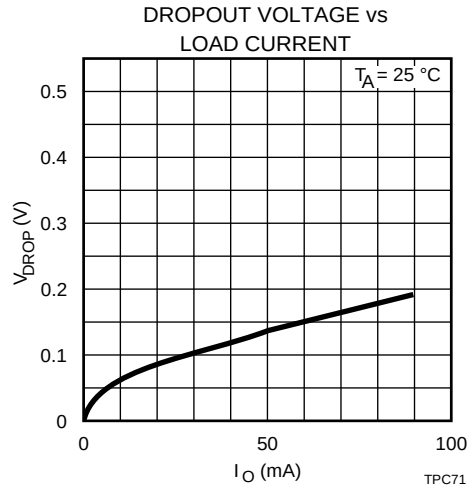
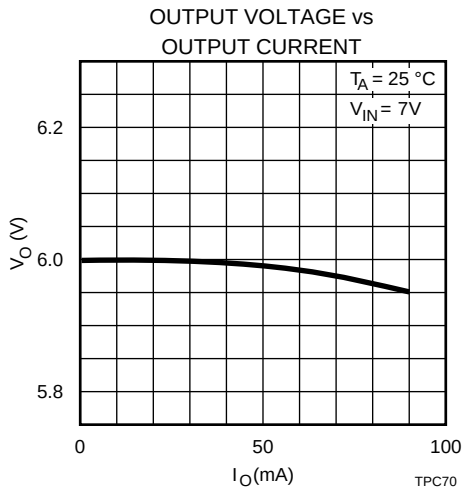


## TYPICAL PERFORMANCE CHARACTERISTICS (CONT.)

### TK11455 (CONT.)

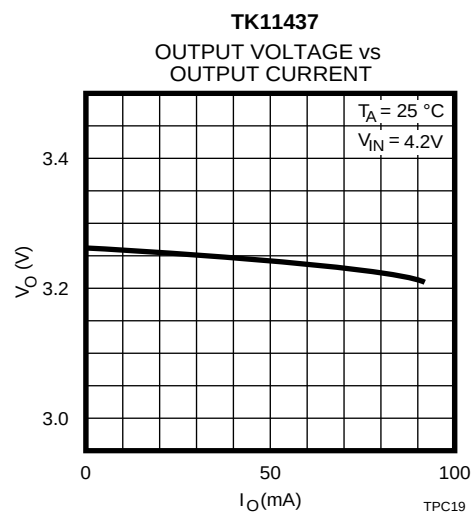
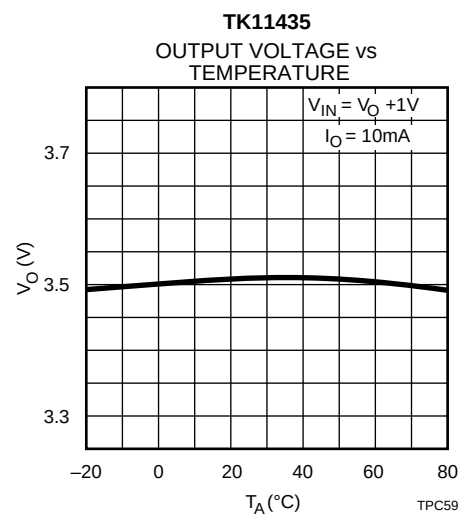
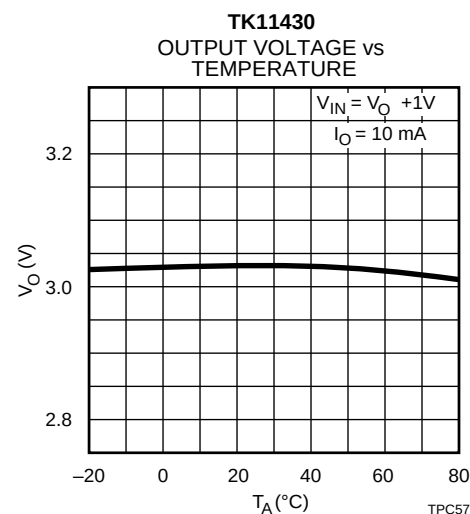
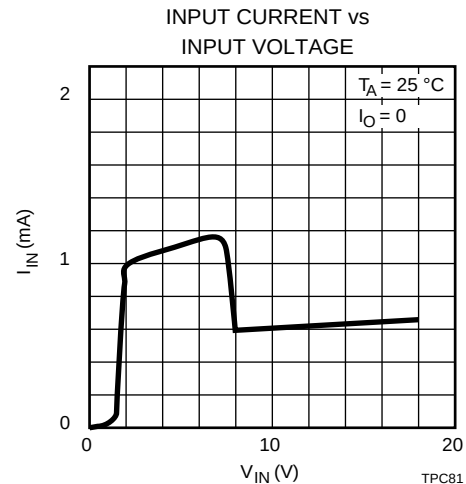
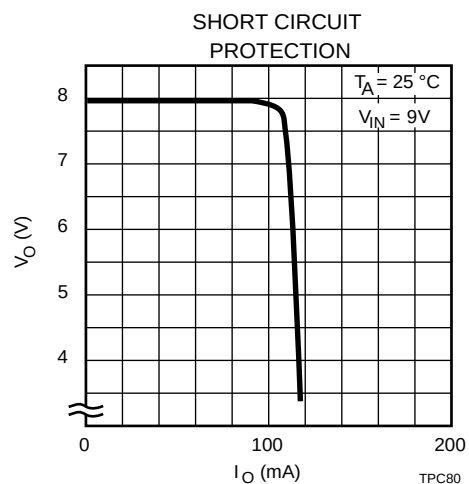
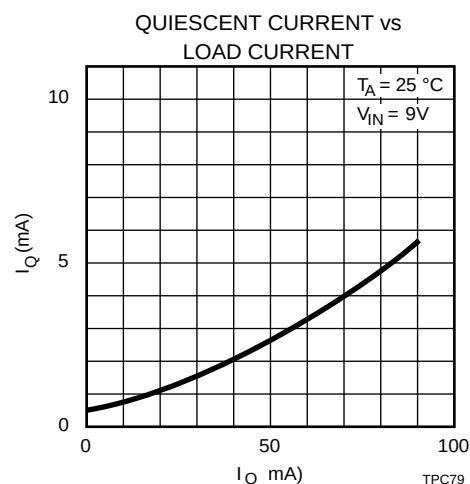
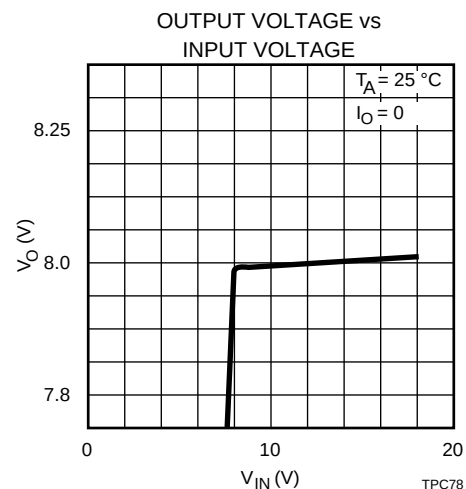
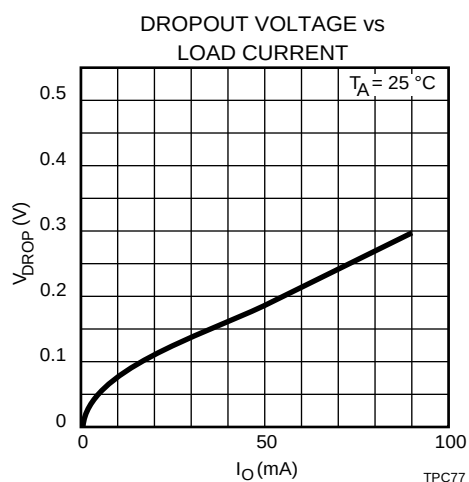
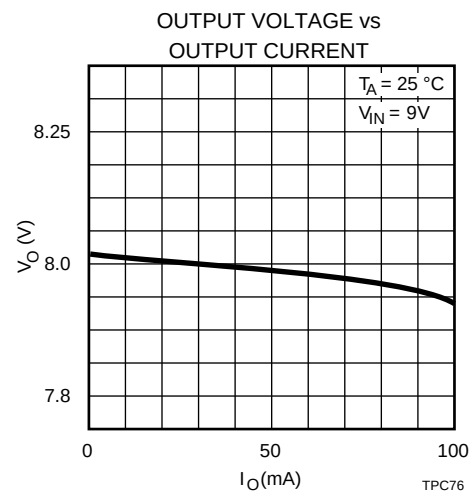


### TK11460



## TYPICAL PERFORMANCE CHARACTERISTICS (CONT.)

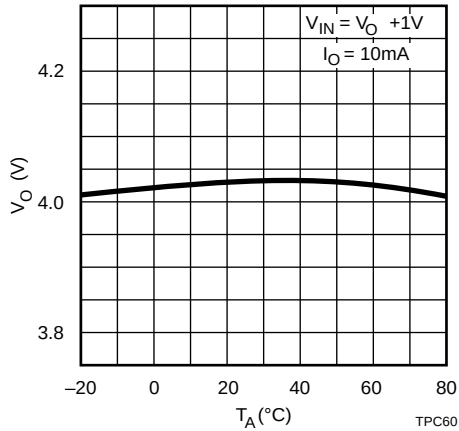
TK11480



## TYPICAL PERFORMANCE CHARACTERISTICS (CONT.)

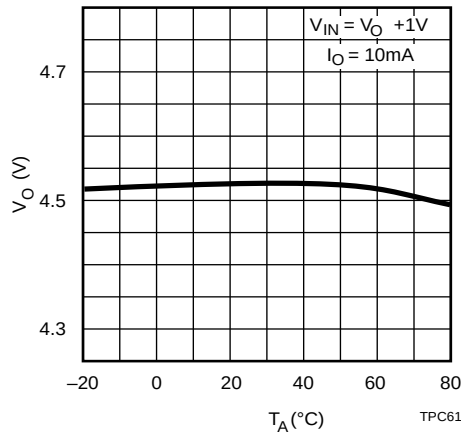
**TK11440**

OUTPUT VOLTAGE vs  
TEMPERATURE



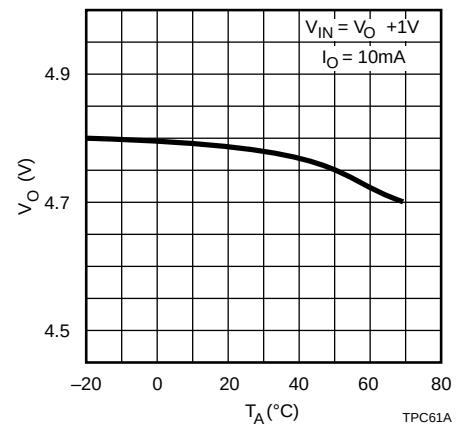
**TK11445**

OUTPUT VOLTAGE vs  
TEMPERATURE



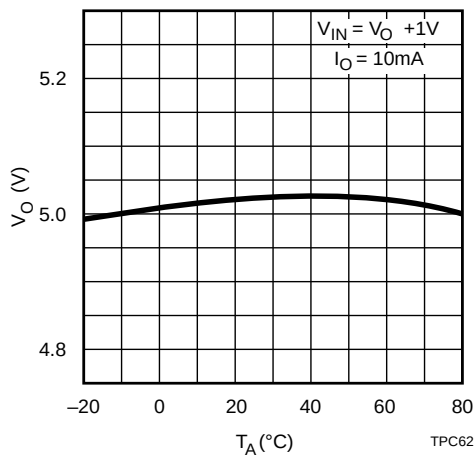
**TK11447**

OUTPUT VOLTAGE vs  
TEMPERATURE



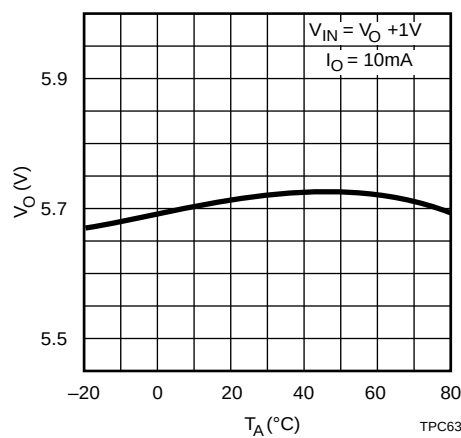
**TK11450**

OUTPUT VOLTAGE vs  
TEMPERATURE



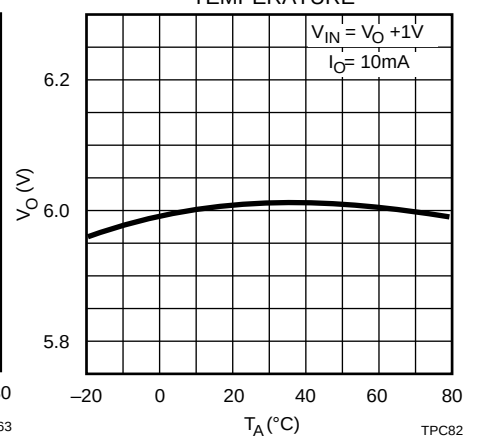
**TK11457**

OUTPUT VOLTAGE vs  
TEMPERATURE



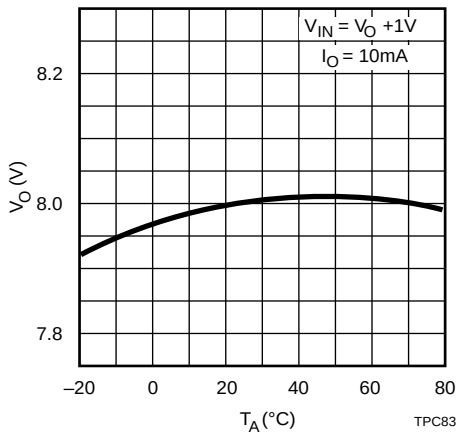
**TK11460**

OUTPUT VOLTAGE vs  
TEMPERATURE



**TK11480**

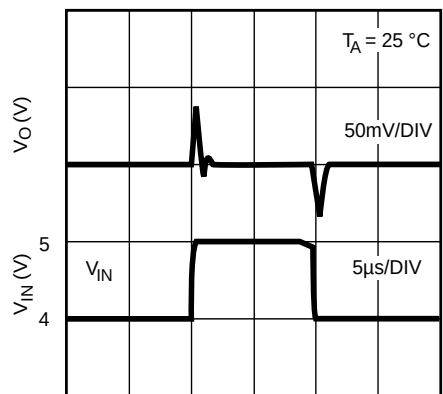
OUTPUT VOLTAGE vs  
TEMPERATURE



## TYPICAL PERFORMANCE CHARACTERISTICS (CONT.)

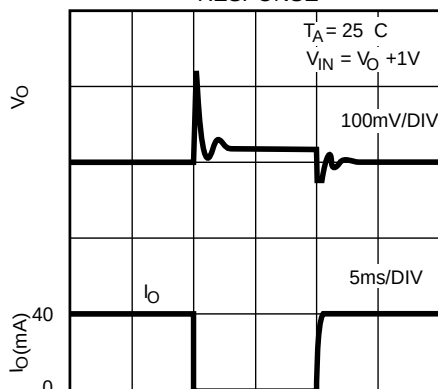
## COMMON CHARACTERISTICS

LINE TRANSIENT RESPONSE



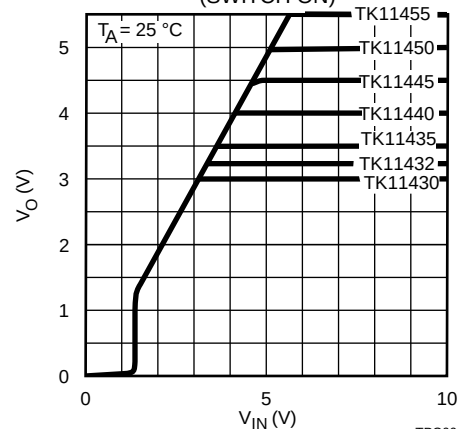
TPC64

LOAD TRANSIENT RESPONSE



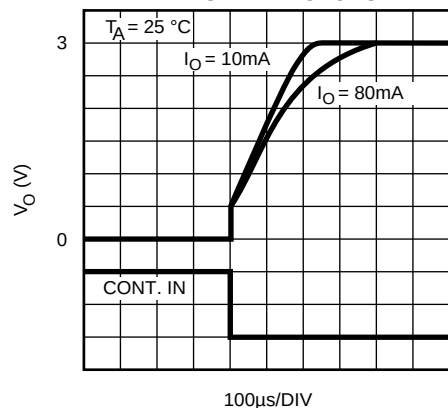
TPC65

INPUT OUTPUT CHARACTERISTICS (SWITCH ON)



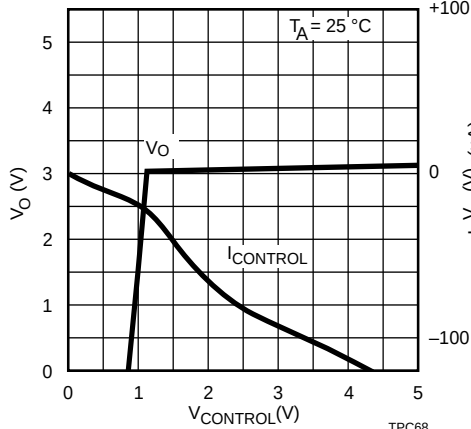
TPC66

TURN ON TRANSIENT RESPONSE



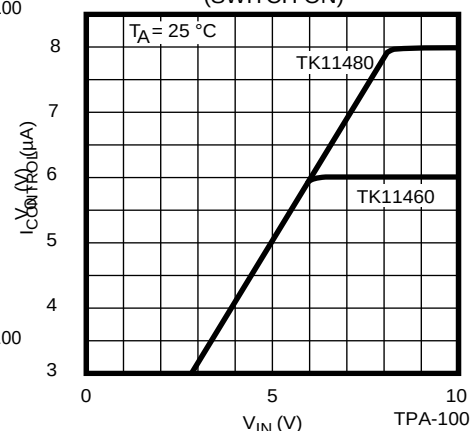
TPC67

CONTROL PIN CHARACTERISTICS

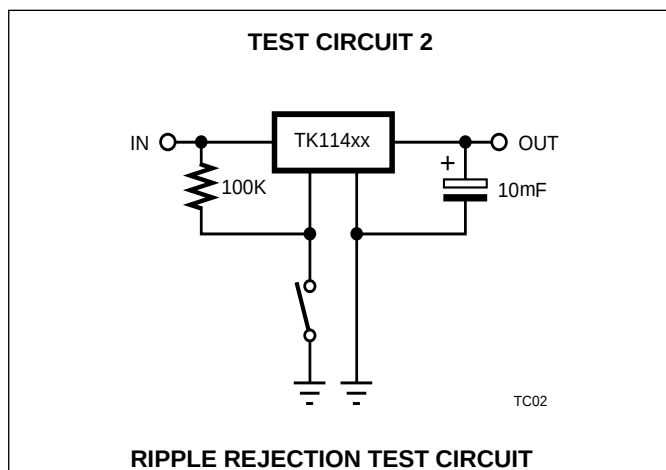


TPC68

INPUT OUTPUT CHARACTERISTICS (SWITCH ON)



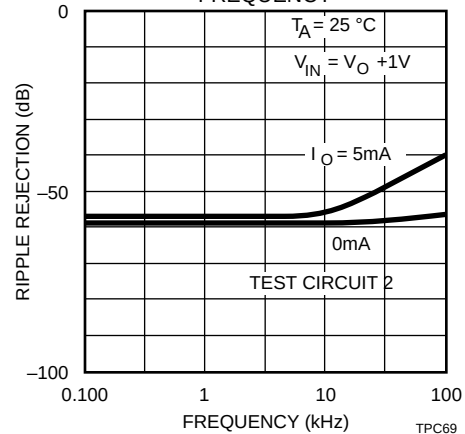
TPA-100



TC02

RIPPLE REJECTION TEST CIRCUIT

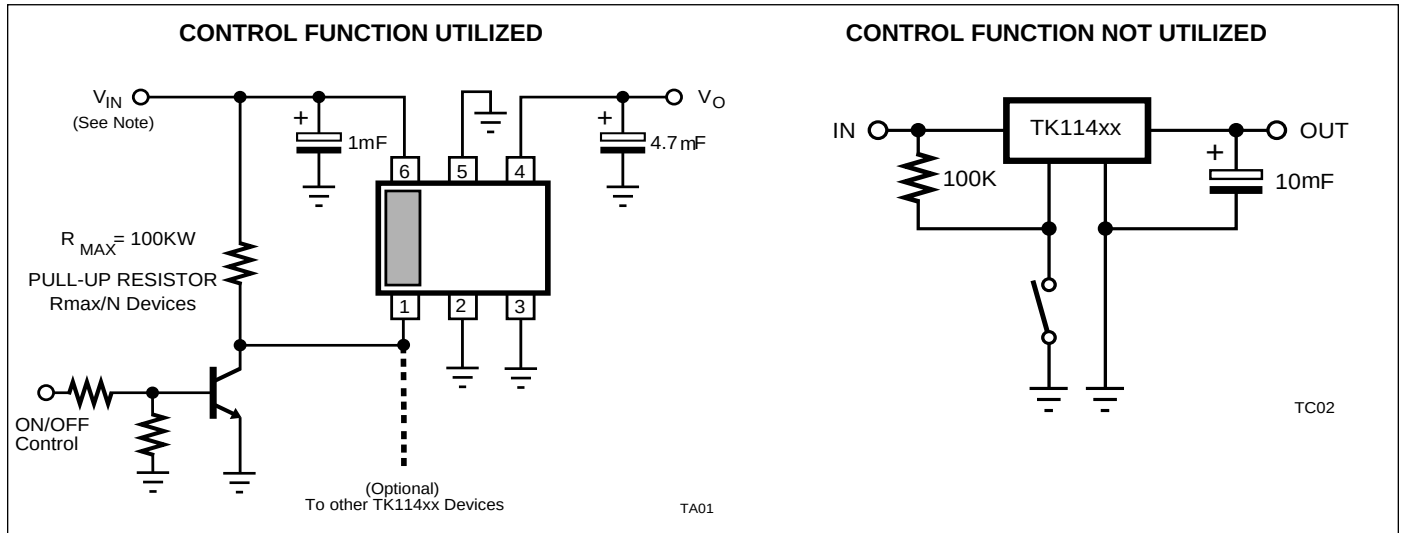
RIPPLE REJECTION vs FREQUENCY



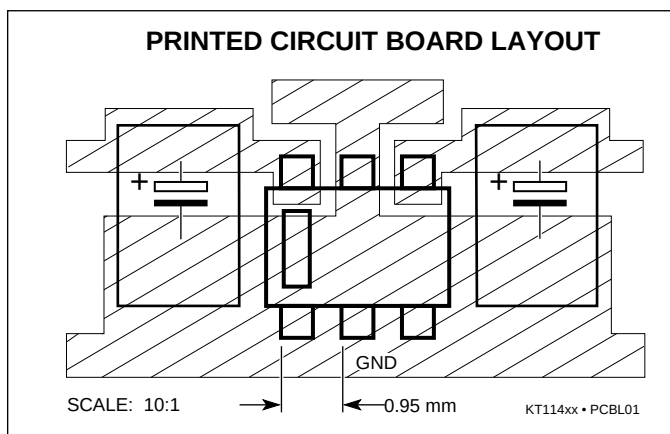
TPC69

# TK114xx

## TYPICAL APPLICATIONS



Note: Parallel connection of control pins is allowed if all devices use identical input voltage.



### Application Hints

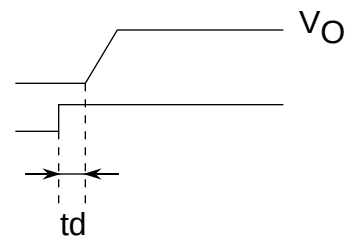
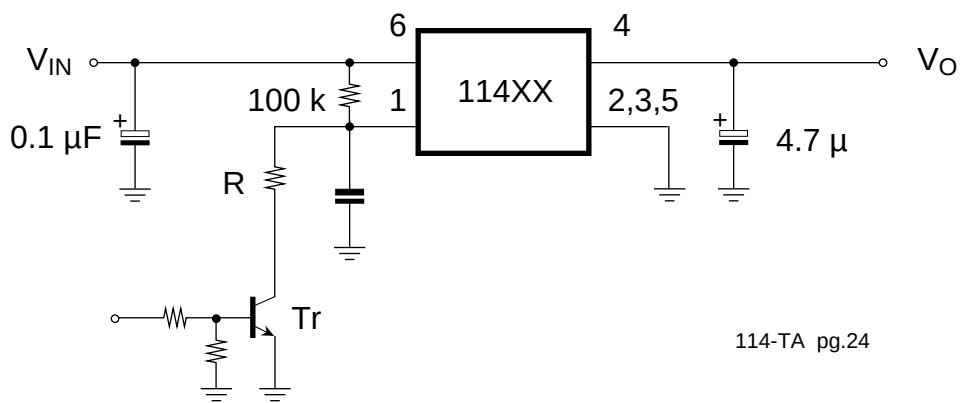
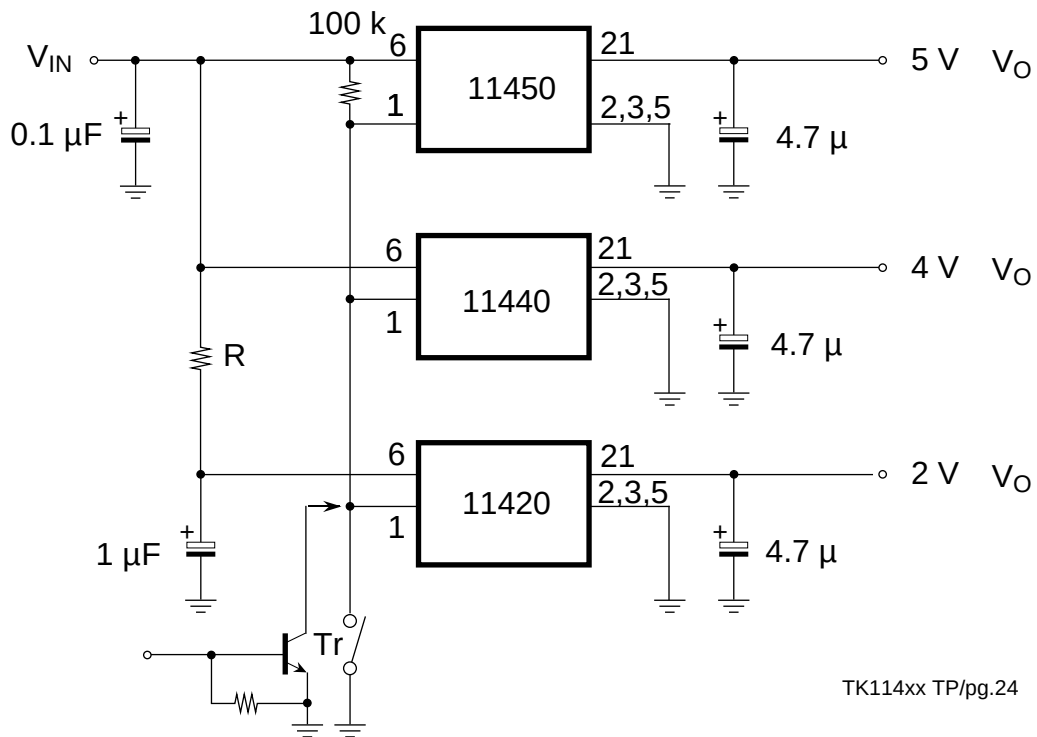
Maximize copper foil area connecting to all IC pins for optimum performance. Place input and output bypass capacitors close to the GND pin. For best transient behavior and lowest output impedance, use as large a capacitor value as possible. The temperature coefficient of the capacitance and Equivalent Series Resistance (ESR) should be taken into account. These parameters can influence power supply noise and ripple rejection. In extreme cases, oscillation may occur. In order to maintain stability, the output bypass capacitor value should be minimum 2.2  $\mu F$  for a Tantalum electrolytic or 4.7  $\mu F$  for an Aluminum electrolytic.

### Handling Molded Resin Packages

All plastic molded packages absorb some moisture from the air. If moisture absorption occurs prior to soldering the device into the printed circuit board, increased separation of the lead from the plastic molding may occur, degrading the moisture barrier characteristics of the device. This property of plastic molding compounds should not be overlooked, particularly in the case of very small packages, where the plastic is very thin.

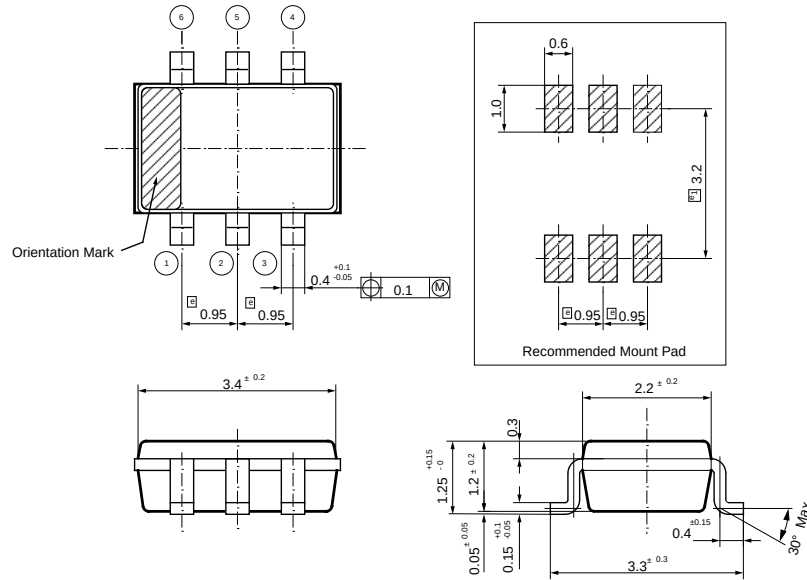
In order to preserve the original moisture barrier properties of the package, devices are stored and shipped in moisture proof bags, filled with dry air. The bags should not be opened or damaged prior to the actual use of the devices. If this is unavoidable, the devices should be stored in a low relative humidity environment (40 to 65%) or in an enclosed environment with desiccant.

## TYPICAL APPLICATIONS (CONT.)



## PACKAGE OUTLINE

### SOT-23L



Unit:mm

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