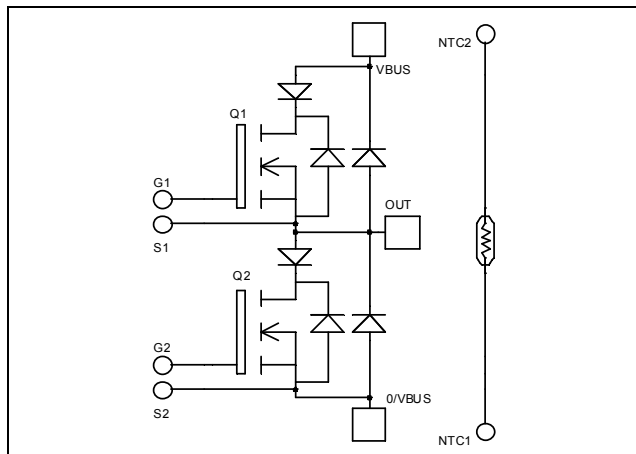


*Phase leg  
Schottky Series &  
parallel diodes  
MOSFET Power Module*

$$V_{DSS} = 500V$$

$$R_{DSon} = 19m\Omega \text{ max @ } T_j = 25^{\circ}C$$

$$I_D = 170A \text{ @ } T_c = 25^{\circ}C$$



## Application

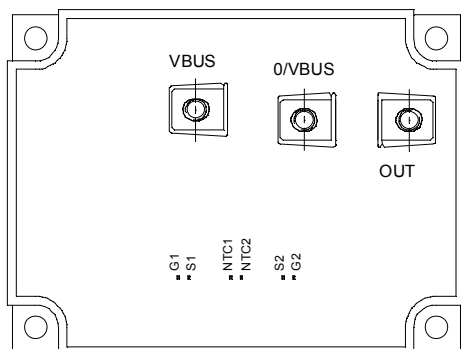
- Motor control
- Switched Mode Power Supplies
- Uninterruptible Power Supplies

## Features

- Power MOS 7<sup>®</sup> MOSFETs
  - Low  $R_{DSon}$
  - Low input and Miller capacitance
  - Low gate charge
  - Avalanche energy rated
  - Very rugged
- Kelvin source for easy drive
- Very low stray inductance
  - Symmetrical design
  - M5 power connections
- Internal thermistor for temperature monitoring
- High level of integration

## Benefits

- Outstanding performance at high frequency operation
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Solderable terminals for signal and M5 for power for easy PCB mounting



## Absolute maximum ratings

| Symbol     | Parameter                                         | Max ratings         | Unit       |
|------------|---------------------------------------------------|---------------------|------------|
| $V_{DSS}$  | Drain - Source Breakdown Voltage                  | 500                 | V          |
| $I_D$      | Continuous Drain Current                          | $T_c = 25^{\circ}C$ | A          |
|            |                                                   | $T_c = 80^{\circ}C$ |            |
| $I_{DM}$   | Pulsed Drain current                              | 360                 |            |
| $V_{GS}$   | Gate - Source Voltage                             | $\pm 30$            | V          |
| $R_{DSon}$ | Drain - Source ON Resistance                      | 19                  | m $\Omega$ |
| $P_D$      | Maximum Power Dissipation                         | $T_c = 25^{\circ}C$ | W          |
| $I_{AR}$   | Avalanche current (repetitive and non repetitive) | 46                  | A          |
| $E_{AR}$   | Repetitive Avalanche Energy                       | 50                  | mJ         |
| $E_{AS}$   | Single Pulse Avalanche Energy                     | 2500                |            |

**CAUTION:** These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed.

All ratings @  $T_j = 25^\circ\text{C}$  unless otherwise specified

## Electrical Characteristics

| Symbol       | Characteristic                   | Test Conditions                                       | Min | Typ | Max       | Unit      |
|--------------|----------------------------------|-------------------------------------------------------|-----|-----|-----------|-----------|
| $BV_{DSS}$   | Drain - Source Breakdown Voltage | $V_{GS} = 0V, I_D = 500\mu A$                         | 500 |     |           | V         |
| $I_{DSS}$    | Zero Gate Voltage Drain Current  | $V_{GS} = 0V, V_{DS} = 500V, T_j = 25^\circ\text{C}$  |     |     | 500       | $\mu A$   |
|              |                                  | $V_{GS} = 0V, V_{DS} = 400V, T_j = 125^\circ\text{C}$ |     |     | 2000      |           |
| $R_{DS(on)}$ | Drain - Source on Resistance     | $V_{GS} = 10V, I_D = 85A$                             |     |     | 19        | $m\Omega$ |
| $V_{GS(th)}$ | Gate Threshold Voltage           | $V_{GS} = V_{DS}, I_D = 10mA$                         | 3   |     | 5         | V         |
| $I_{GSS}$    | Gate - Source Leakage Current    | $V_{GS} = \pm 30V, V_{DS} = 0V$                       |     |     | $\pm 200$ | nA        |

## Dynamic Characteristics

| Symbol       | Characteristic               | Test Conditions                                                                                                                      | Min | Typ  | Max | Unit    |
|--------------|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|-----|------|-----|---------|
| $C_{iss}$    | Input Capacitance            | $V_{GS} = 0V$<br>$V_{DS} = 25V$<br>$f = 1MHz$                                                                                        |     | 22.4 |     | nF      |
| $C_{oss}$    | Output Capacitance           |                                                                                                                                      |     | 4.8  |     |         |
| $C_{rss}$    | Reverse Transfer Capacitance |                                                                                                                                      |     | 0.36 |     |         |
| $Q_g$        | Total gate Charge            | $V_{GS} = 10V$<br>$V_{Bus} = 250V$<br>$I_D = 170A$                                                                                   |     | 492  |     | nC      |
| $Q_{gs}$     | Gate - Source Charge         |                                                                                                                                      |     | 132  |     |         |
| $Q_{gd}$     | Gate - Drain Charge          |                                                                                                                                      |     | 260  |     |         |
| $T_{d(on)}$  | Turn-on Delay Time           | <b>Inductive switching @ <math>125^\circ\text{C}</math></b><br>$V_{GS} = 15V$<br>$V_{Bus} = 333V$<br>$I_D = 170A$<br>$R_G = 1\Omega$ |     | 18   |     | ns      |
| $T_r$        | Rise Time                    |                                                                                                                                      |     | 35   |     |         |
| $T_{d(off)}$ | Turn-off Delay Time          |                                                                                                                                      |     | 87   |     |         |
| $T_f$        | Fall Time                    |                                                                                                                                      |     | 77   |     |         |
| $E_{on}$     | Turn-on Switching Energy ❶   | <b>Inductive switching @ <math>25^\circ\text{C}</math></b><br>$V_{GS} = 15V, V_{Bus} = 333V$<br>$I_D = 170A, R_G = 1\Omega$          |     | 3020 |     | $\mu J$ |
| $E_{off}$    | Turn-off Switching Energy ❷  |                                                                                                                                      |     | 2904 |     |         |
| $E_{on}$     | Turn-on Switching Energy ❶   | <b>Inductive switching @ <math>125^\circ\text{C}</math></b><br>$V_{GS} = 15V, V_{Bus} = 333V$<br>$I_D = 170A, R_G = 1\Omega$         |     | 4964 |     | $\mu J$ |
| $E_{off}$    | Turn-off Switching Energy ❷  |                                                                                                                                      |     | 3384 |     |         |

## Series Schottky diode ratings and characteristics

| Symbol      | Characteristic                  | Test Conditions                         | Min | Typ  | Max | Unit |
|-------------|---------------------------------|-----------------------------------------|-----|------|-----|------|
| $I_{F(AV)}$ | Maximum Average Forward Current | 50% duty cycle $T_c = 85^\circ\text{C}$ |     | 120  |     | A    |
| $V_F$       | Diode Forward Voltage           | $I_F = 120A$                            |     | 0.77 |     | V    |
|             |                                 | $I_F = 120A, T_j = 125^\circ\text{C}$   |     | 0.62 |     |      |

❶  $E_{on}$  includes diode reverse recovery.

❷ In accordance with JEDEC standard JESD24-1.

## Parallel diode ratings and characteristics

| Symbol      | Characteristic                  | Test Conditions                                                                 |                           | Min | Typ  | Max | Unit |
|-------------|---------------------------------|---------------------------------------------------------------------------------|---------------------------|-----|------|-----|------|
| $I_{F(AV)}$ | Maximum Average Forward Current | 50% duty cycle                                                                  | $T_c = 70^\circ\text{C}$  |     | 180  |     | A    |
| $V_F$       | Diode Forward Voltage           | $I_F = 180\text{A}$                                                             |                           |     | 1.6  | 1.8 | V    |
|             |                                 | $I_F = 360\text{A}$                                                             |                           |     | 1.9  |     |      |
|             |                                 | $I_F = 180\text{A}$                                                             | $T_j = 125^\circ\text{C}$ |     | 1.4  |     |      |
| $t_{rr}$    | Reverse Recovery Time           | $I_F = 180\text{A}$<br>$V_R = 400\text{V}$<br>$di/dt = 600\text{A}/\mu\text{s}$ | $T_j = 25^\circ\text{C}$  |     | 130  |     | ns   |
|             |                                 |                                                                                 | $T_j = 125^\circ\text{C}$ |     | 170  |     |      |
| $Q_{rr}$    | Reverse Recovery Charge         | $I_F = 180\text{A}$<br>$V_R = 400\text{V}$<br>$di/dt = 600\text{A}/\mu\text{s}$ | $T_j = 25^\circ\text{C}$  |     | 660  |     | nC   |
|             |                                 |                                                                                 | $T_j = 125^\circ\text{C}$ |     | 2760 |     |      |

## Thermal and package characteristics

| Symbol     | Characteristic                                                                                     |                |    | Min  | Typ | Max  | Unit                      |
|------------|----------------------------------------------------------------------------------------------------|----------------|----|------|-----|------|---------------------------|
| $R_{thJC}$ | Junction to Case                                                                                   | Transistor     |    |      |     | 0.1  | $^\circ\text{C}/\text{W}$ |
|            |                                                                                                    | Series Diode   |    |      |     | 0.5  |                           |
|            |                                                                                                    | Parallel diode |    |      |     | 0.32 |                           |
| $V_{ISOL}$ | RMS Isolation Voltage, any terminal to case $t = 1\text{ min}$ , $I_{isol} < 1\text{mA}$ , 50/60Hz |                |    | 2500 |     |      | V                         |
| $T_J$      | Operating junction temperature range                                                               |                |    | -40  |     | 150  | $^\circ\text{C}$          |
| $T_{STG}$  | Storage Temperature Range                                                                          |                |    | -40  |     | 125  |                           |
| $T_C$      | Operating Case Temperature                                                                         |                |    | -40  |     | 100  |                           |
| Torque     | Mounting torque                                                                                    | To heatsink    | M5 | 2    |     | 3.5  | N.m                       |
|            |                                                                                                    | For terminals  | M5 | 2    |     | 3.5  |                           |
| Wt         | Package Weight                                                                                     |                |    |      |     | 620  | g                         |

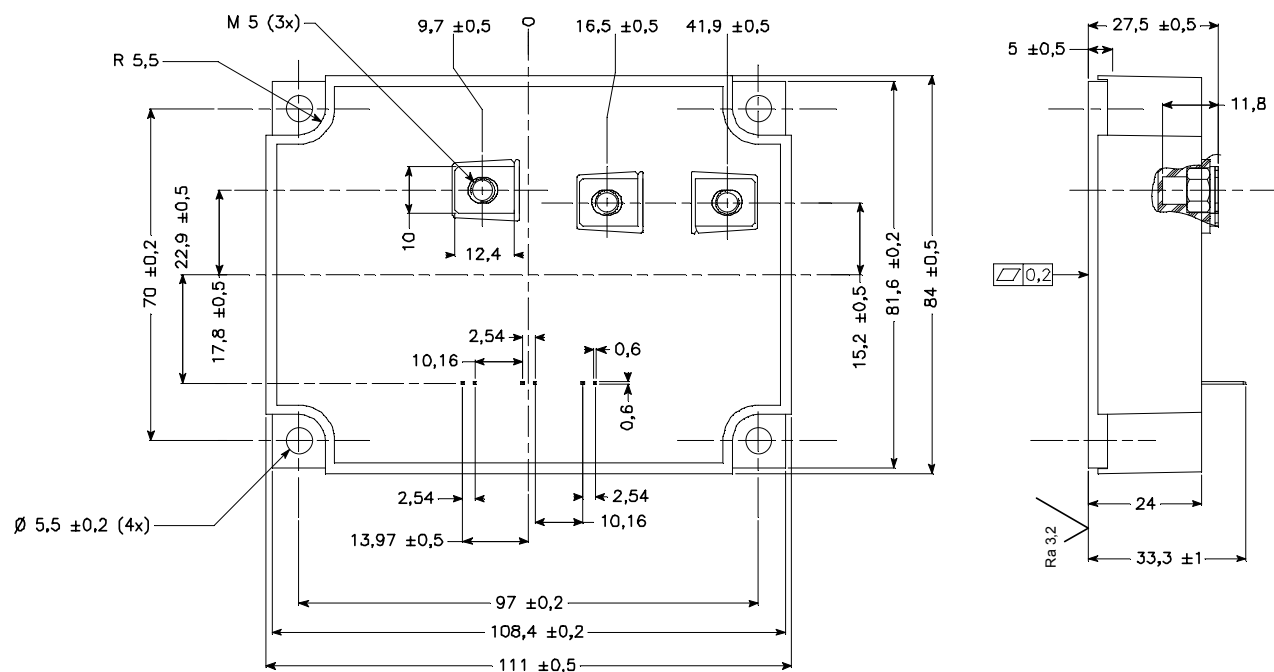
## Temperature sensor NTC

| Symbol      | Characteristic                  | Min | Typ  | Max | Unit             |
|-------------|---------------------------------|-----|------|-----|------------------|
| $R_{25}$    | Resistance @ $25^\circ\text{C}$ |     | 68   |     | $\text{k}\Omega$ |
| $B_{25/85}$ | $T_{25} = 298.16\text{ K}$      |     | 4080 |     | K                |

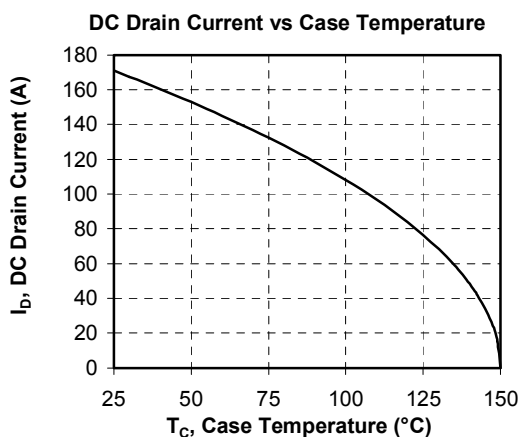
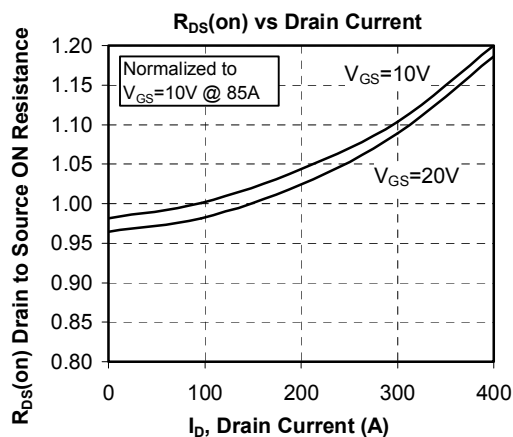
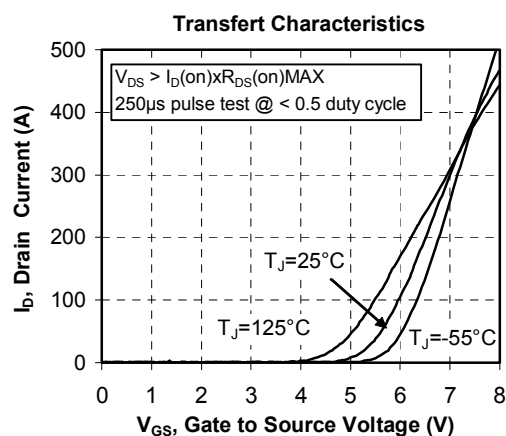
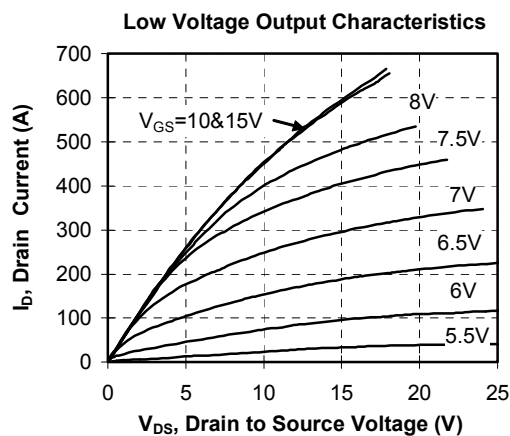
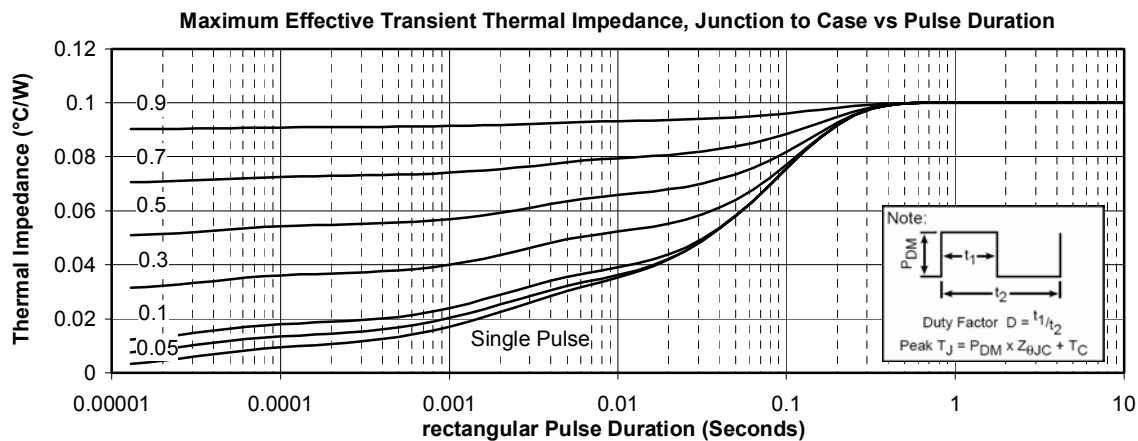
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

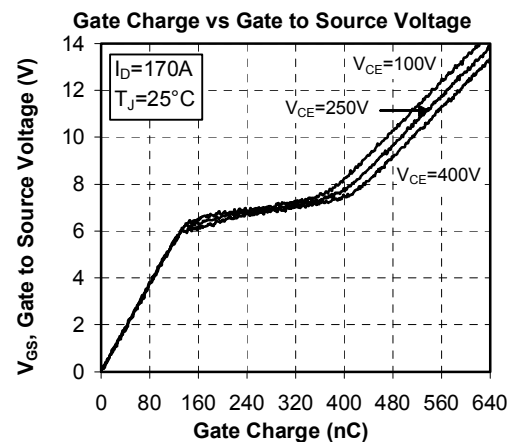
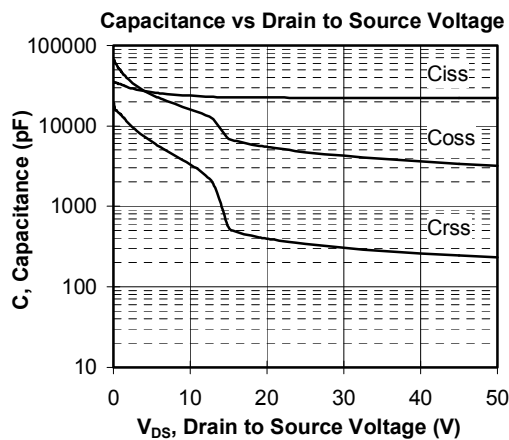
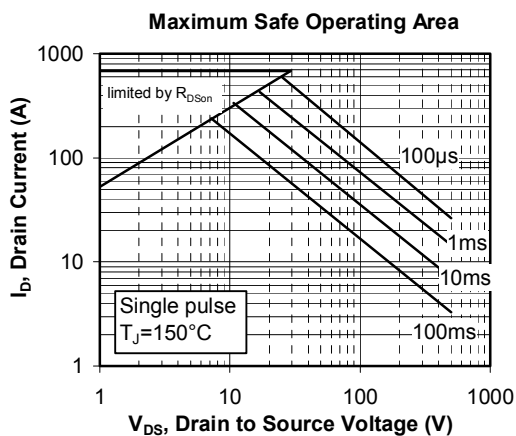
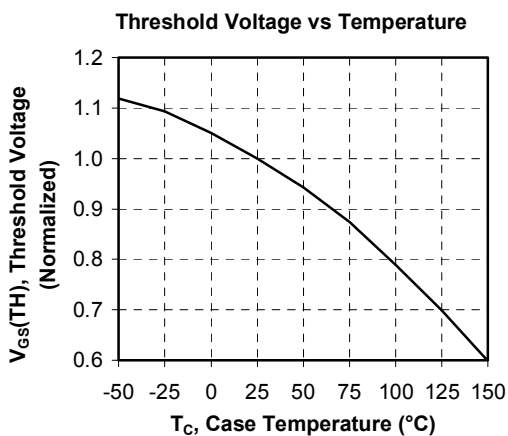
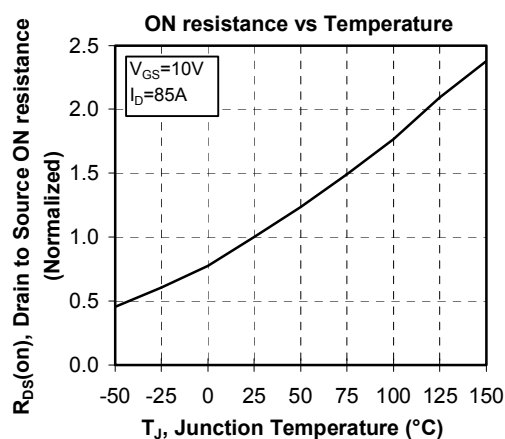
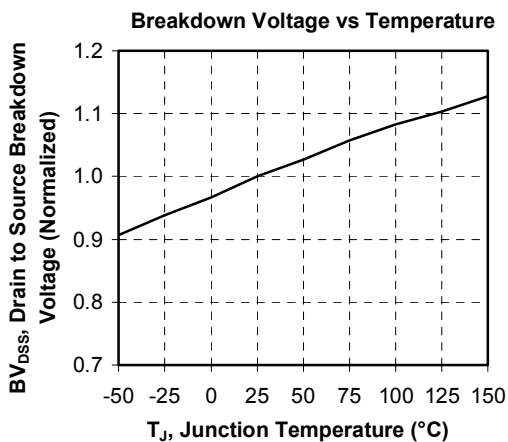
T: Thermistor temperature  
 $R_T$ : Thermistor value at T

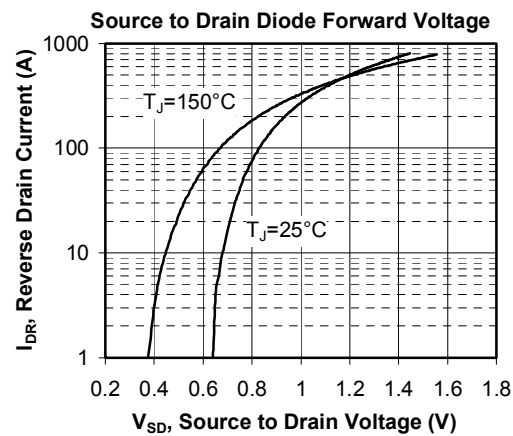
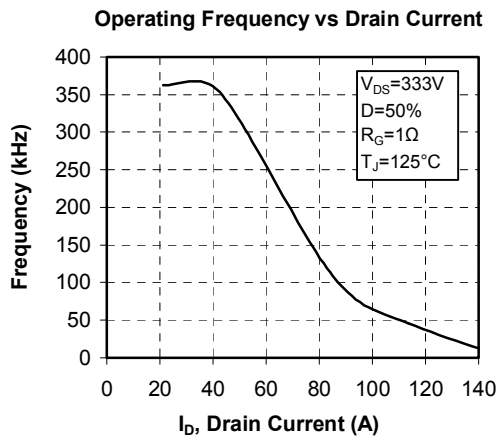
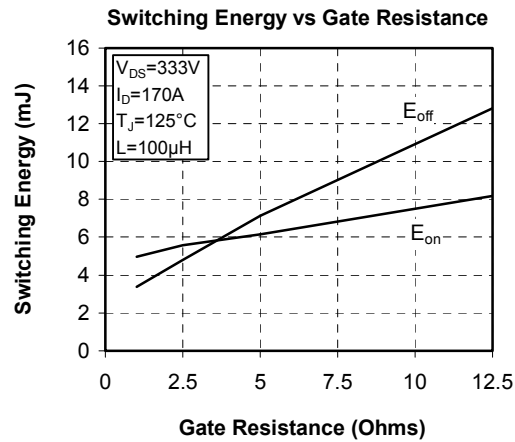
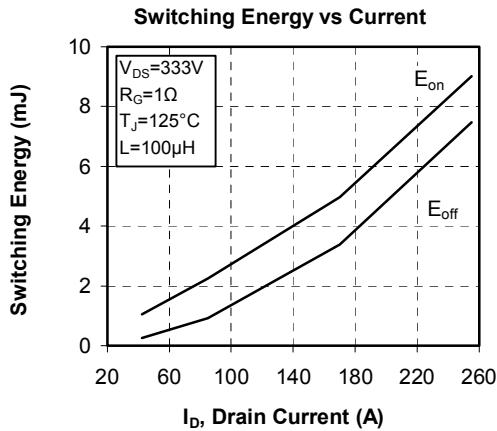
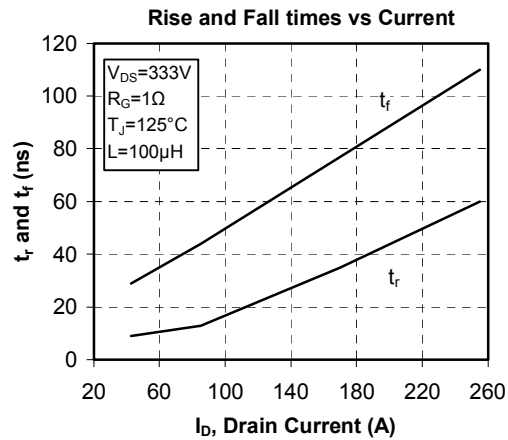
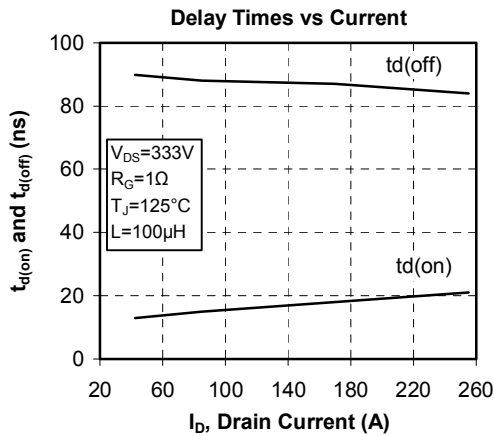
## Package outline



## Typical Performance Curve







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