

## General Description

The WSF3047 is the highest performance trench N-ch and P-ch MOSFETs with extreme high cell density , which provide excellent RDSON and gate charge for most of the synchronous buck converter applications .

The WSF3047 meet the RoHS and Green Product requirement 100% EAS guaranteed with full function reliability approved.

## Features

- Advanced high cell density Trench technology
- Super Low Gate Charge
- Excellent CdV/dt effect decline
- 100% EAS Guaranteed
- Green Device Available

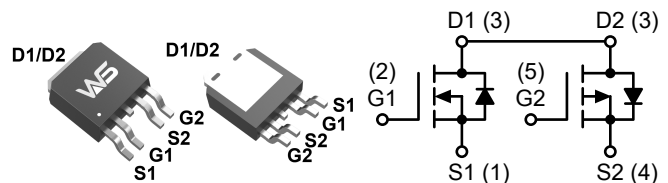
## Product Summary

| BVDSS | RDSON | ID   |
|-------|-------|------|
| 30V   | 15mΩ  | 36A  |
| -30V  | 16mΩ  | -30A |

## Applications

- High Frequency Point-of-Load Synchronous Buck Converter for MB/NB/UMPC/VGA
- Networking DC-DC Power System
- CCFL Back-light Inverter

## TO-252-4L Pin Configuration



## Absolute Maximum Ratings

| Symbol            | Parameter                                                  | Rating     |            | Units        |
|-------------------|------------------------------------------------------------|------------|------------|--------------|
|                   |                                                            | N-Ch       | P-Ch       |              |
| $V_{DS}$          | Drain-Source Voltage                                       | 30         | -30        | V            |
| $V_{GS}$          | Gate-Source Voltage                                        | $\pm 20$   | $\pm 20$   | V            |
| $I_D$             | Continuous Drain Current, $V_{GS(NP)}=10V, T_a=25^\circ C$ | 36         | -30        | A            |
|                   | Continuous Drain Current, $V_{GS(NP)}=10V, T_a=70^\circ C$ | 25         | -23        | A            |
| $I_{DM}^a$        | Pulsed Drain Current, $T_a=25^\circ C$                     | 108        | -90        | A            |
| $E_{AS}^c$        | Avalanche Energy, Single pulse , $L=0.5mH$                 | 34         | 72         | mJ           |
| $I_{AS}^c$        | Avalanche Current, Single pulse , $L=0.5mH$                | 26         | -38        | A            |
| $P_D$             | Total Power Dissipation, $T_a=25^\circ C$                  | 5.25       | 5.25       | W            |
| $T_{STG}$         | Storage Temperature Range                                  | -55 to 175 | -55 to 175 | $^\circ C$   |
| $T_J$             | Operating Junction Temperature Range                       | 175        | 175        | $^\circ C$   |
| $R_{\theta JA}^b$ | Thermal Resistance-Junction to Ambient, Steady State       | 60         | 60         | $^\circ C/W$ |
| $R_{\theta JC}$   | Thermal Resistance-Junction to Case, Steady State          | 6.25       | 6.25       | $^\circ C/W$ |

Note \* : Max. current is limited by bonding wire.

Note a : Pulse width limited by max. junction temperature.

Note b :  $R_{\theta JA}$  steady state  $t=999s$ .  $R_{\theta JA}$  is measured with the device mounted on  $1in^2$ , FR-4 board with 2oz. Copper.

Note c : UIS tested and pulse width limited by maximum junction temperature  $175^\circ C$  (initial temperature  $T_J=25^\circ C$ ).

**N-Electrical Characteristics (T<sub>J</sub>=25 °C, unless otherwise noted)**

| Symbol                           | Parameter                         | Conditions                                                                                                       | Min. | Typ. | Max. | Unit |
|----------------------------------|-----------------------------------|------------------------------------------------------------------------------------------------------------------|------|------|------|------|
| BV <sub>DSS</sub>                | Drain-Source Breakdown Voltage    | V <sub>GS</sub> =0V, I <sub>D</sub> =250uA                                                                       | 30   | ---  | ---  | V    |
| R <sub>DS(ON)</sub> <sup>d</sup> | Static Drain-Source On-Resistance | V <sub>GS</sub> =10V, I <sub>D</sub> =8A                                                                         | ---  | 15   | 18   | mΩ   |
|                                  |                                   | V <sub>GS</sub> =4.5V, I <sub>D</sub> =5A                                                                        | ---  | 20   | 24   |      |
| V <sub>GS(th)</sub>              | Gate Threshold Voltage            | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA                                                         | 1.0  | 1.6  | 2.3  | V    |
| I <sub>DSS</sub>                 | Drain-Source Leakage Current      | V <sub>DS</sub> =20V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C                                                  | ---  | ---  | 1    | uA   |
|                                  |                                   | V <sub>DS</sub> =20V, V <sub>GS</sub> =0V, T <sub>J</sub> =85°C                                                  | ---  | ---  | 30   |      |
| I <sub>GSS</sub>                 | Gate-Source Leakage Current       | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V                                                                       | ---  | ---  | ±100 | nA   |
| R <sub>g</sub>                   | Gate Resistance                   | V <sub>DS</sub> =0V, V <sub>GS</sub> =0V, f=1MHz                                                                 | ---  | 3.7  | ---  | Ω    |
| Q <sub>g</sub> <sup>e</sup>      | Total Gate Charge                 | V <sub>DS</sub> =15V, V <sub>GS</sub> =4.5V,<br>I <sub>DS</sub> =8A                                              | ---  | 8.2  | ---  | nC   |
| Q <sub>gs</sub> <sup>e</sup>     | Gate-Source Charge                |                                                                                                                  | ---  | 1.0  | ---  |      |
| Q <sub>gd</sub> <sup>e</sup>     | Gate-Drain Charge                 |                                                                                                                  | ---  | 1.8  | ---  |      |
| T <sub>d(on)</sub> <sup>e</sup>  | Turn-On Delay Time                | V <sub>DD</sub> =15V, R <sub>L</sub> =15R,<br>I <sub>DS</sub> =1A, V <sub>GEN</sub> =10V,<br>R <sub>G</sub> =6R. | ---  | 5.5  | ---  | ns   |
| T <sub>r</sub> <sup>e</sup>      | Rise Time                         |                                                                                                                  | ---  | 10   | ---  |      |
| T <sub>d(off)</sub> <sup>e</sup> | Turn-Off Delay Time               |                                                                                                                  | ---  | 16   | ---  |      |
| T <sub>f</sub> <sup>e</sup>      | Fall Time                         |                                                                                                                  | ---  | 3.6  | ---  |      |
| C <sub>iss</sub> <sup>e</sup>    | Input Capacitance                 | V <sub>DS</sub> =15V, V <sub>GS</sub> =0V, f=1MHz                                                                | ---  | 400  | ---  | pF   |
| C <sub>oss</sub> <sup>e</sup>    | Output Capacitance                |                                                                                                                  | ---  | 105  | ---  |      |
| C <sub>rss</sub> <sup>e</sup>    | Reverse Transfer Capacitance      |                                                                                                                  | ---  | 42   | ---  |      |

**Diode Characteristics**

| Symbol                       | Parameter                 | Conditions                                                    | Min. | Typ. | Max. | Unit |
|------------------------------|---------------------------|---------------------------------------------------------------|------|------|------|------|
| I <sub>S</sub>               | Continuous Source Current | V <sub>G</sub> =V <sub>D</sub> =0V, Force Current             | ---  | ---  | 36   | A    |
| V <sub>SD</sub> <sup>d</sup> | Diode Forward Voltage     | V <sub>GS</sub> =0V, I <sub>S</sub> =1A, T <sub>J</sub> =25°C | ---  | ---  | 1.2  | V    |

Note d : Pulse test ; pulse width≤300μs, duty cycle≤2%.

Note e : Guaranteed by design, not subject to production testing.

**P-Channel Electrical Characteristics ( $T_J=25^\circ\text{C}$ , unless otherwise noted)**

| Symbol         | Parameter                         | Conditions                                                      | Min. | Typ. | Max.      | Unit      |
|----------------|-----------------------------------|-----------------------------------------------------------------|------|------|-----------|-----------|
| $BV_{DSS}$     | Drain-Source Breakdown Voltage    | $V_{GS}=0V, I_D=-250\mu A$                                      | -30  | ---  | ---       | V         |
| $R_{DS(ON)}^d$ | Static Drain-Source On-Resistance | $V_{GS}=-10V, I_D=-12A$                                         | ---  | 16   | 20        | $m\Omega$ |
|                |                                   | $V_{GS}=-4.5V, I_D=-5A$                                         | ---  | 22   | 25        |           |
| $V_{GS(th)}$   | Gate Threshold Voltage            | $V_{GS}=V_{DS}, I_D=-250\mu A$                                  | -1.0 | -1.4 | -2.0      | V         |
| $I_{DSS}$      | Drain-Source Leakage Current      | $V_{DS}=-20V, V_{GS}=0V, T_J=25^\circ\text{C}$                  | ---  | ---  | -1        | $\mu A$   |
|                |                                   | $V_{DS}=-20V, V_{GS}=0V, T_J=85^\circ\text{C}$                  | ---  | ---  | -30       |           |
| $I_{GSS}$      | Gate-Source Leakage Current       | $V_{GS}=\pm 20V, V_{DS}=0V$                                     | ---  | ---  | $\pm 100$ | nA        |
| $Q_g^e$        | Total Gate Charge                 | $V_{DS}=-15V, V_{GS}=-4.5V, I_D=-12A$                           | ---  | 13   | ---       | nC        |
| $Q_{gs}^e$     | Gate-Source Charge                |                                                                 | ---  | 2.0  | ---       |           |
| $Q_{gd}^e$     | Gate-Drain Charge                 |                                                                 | ---  | 4.0  | ---       |           |
| $T_{d(on)}^e$  | Turn-On Delay Time                | $V_{DD}=-15V, V_{GS}=-10V, R_G=6\Omega, I_D=-1A, R_L=15\Omega,$ | ---  | 9    | ---       | ns        |
| $T_r^e$        | Rise Time                         |                                                                 | ---  | 11   | ---       |           |
| $T_{d(off)}^e$ | Turn-Off Delay Time               |                                                                 | ---  | 55   | ---       |           |
| $T_f^e$        | Fall Time                         |                                                                 | ---  | 34   | ---       |           |
| $C_{iss}^e$    | Input Capacitance                 | $V_{DS}=-15V, V_{GS}=0V, f=1\text{MHz}$                         | ---  | 755  | ---       | pF        |
| $C_{oss}^e$    | Output Capacitance                |                                                                 | ---  | 140  | ---       |           |
| $C_{rss}^e$    | Reverse Transfer Capacitance      |                                                                 | ---  | 100  | ---       |           |

**Diode Characteristics**

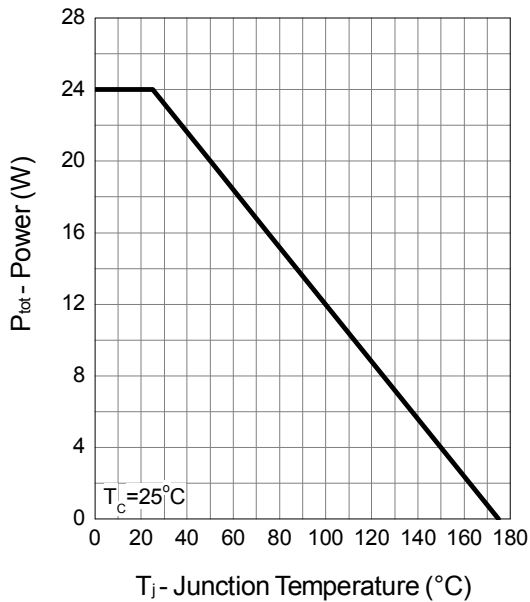
| Symbol     | Parameter                 | Conditions                                 | Min. | Typ. | Max. | Unit |
|------------|---------------------------|--------------------------------------------|------|------|------|------|
| $I_S$      | Continuous Source Current | $V_G=V_D=0V$ , Force Current               | ---  | ---  | -30  | A    |
| $V_{SD}^e$ | Diode Forward Voltage     | $V_{GS}=0V, I_S=-1A, T_J=25^\circ\text{C}$ | ---  | ---  | -1.2 | V    |

Note d : Pulse test; pulse width $\leq 300\mu s$ , duty cycle $\leq 2\%$ .

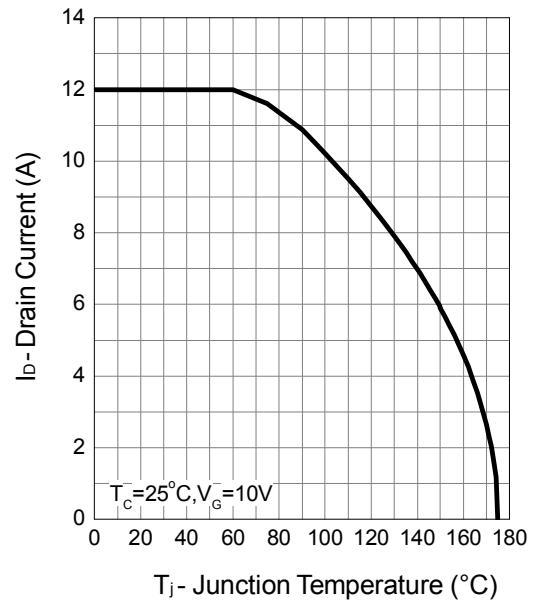
Note e : Guaranteed by design, not subject to production testing.

## N-Channel Typical Characteristics

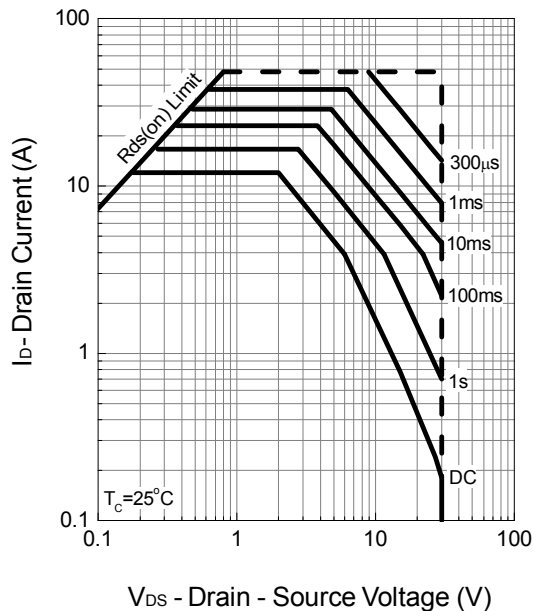
**Power Dissipation**



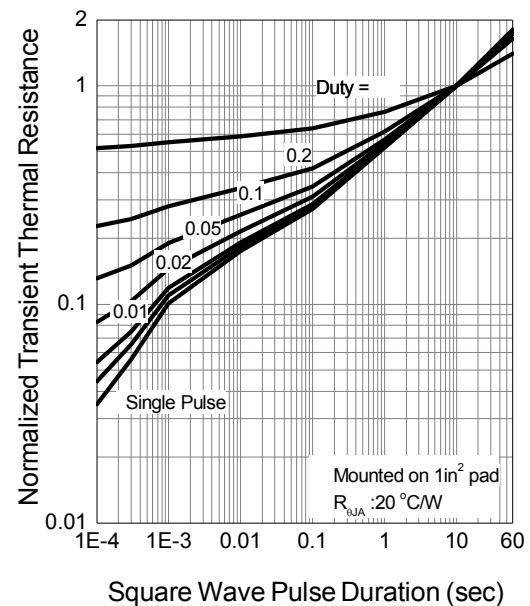
**Drain Current**



**Safe Operation Area**

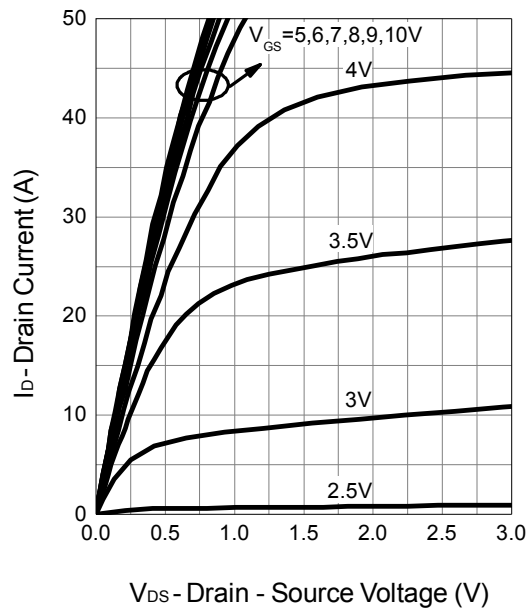


**Thermal Transient Impedance**

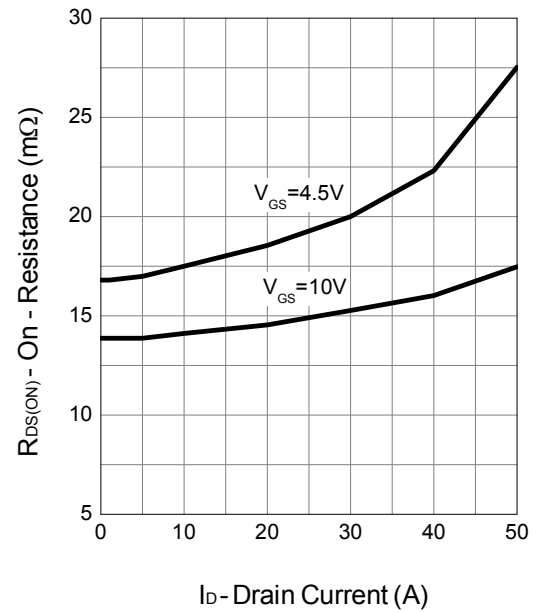


## N-Channel Typical Characteristics

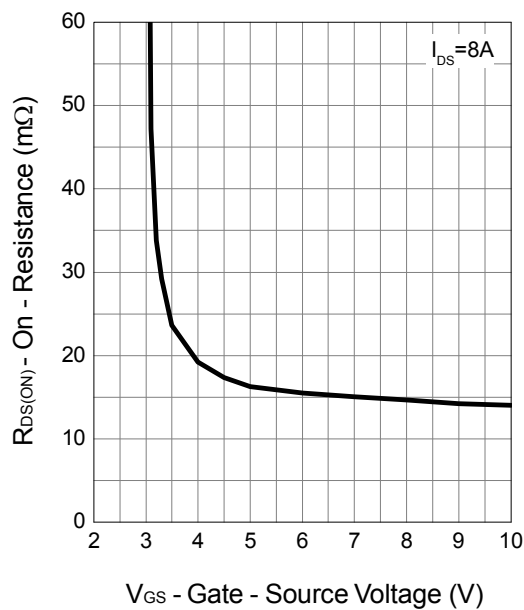
**Output Characteristics**



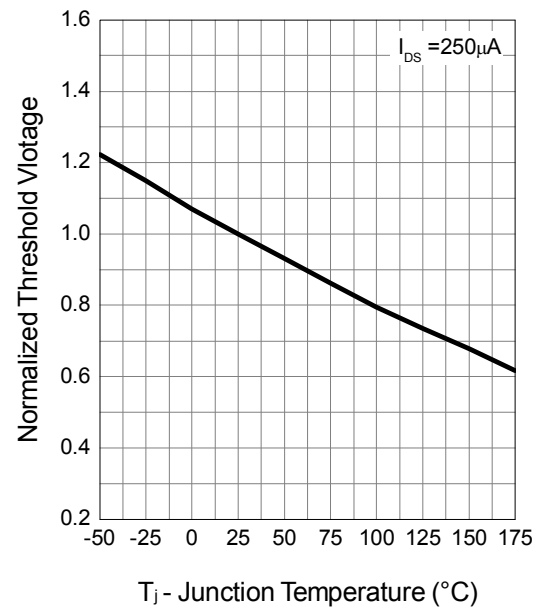
**Drain-Source On Resistance**



**Gate-Source On Resistance**

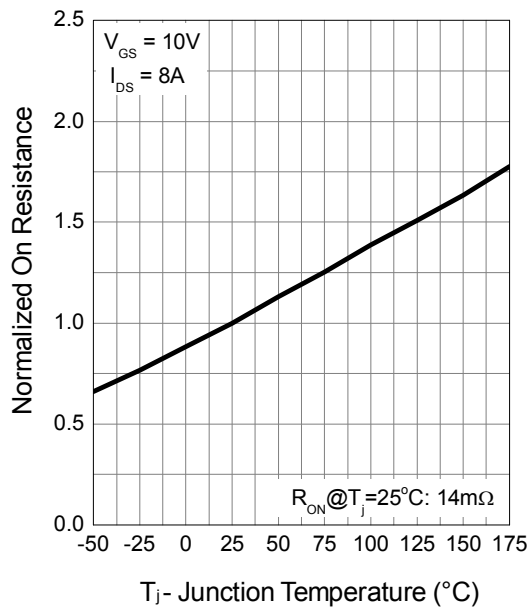


**Gate Threshold Voltage**

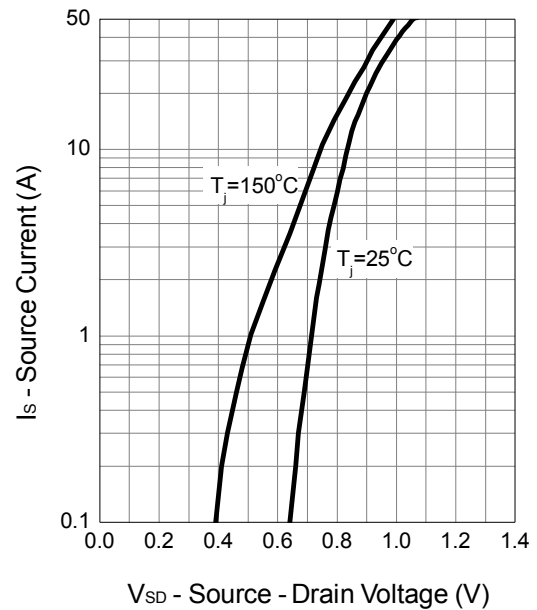


## N-Channel Typical Characteristics

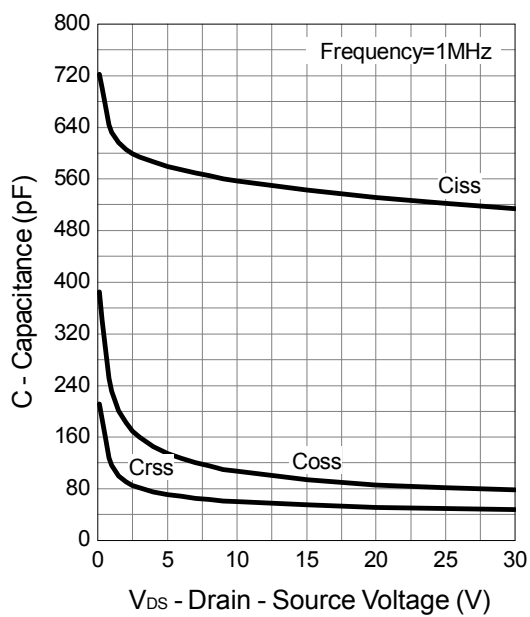
**Drain-Source On Resistance**



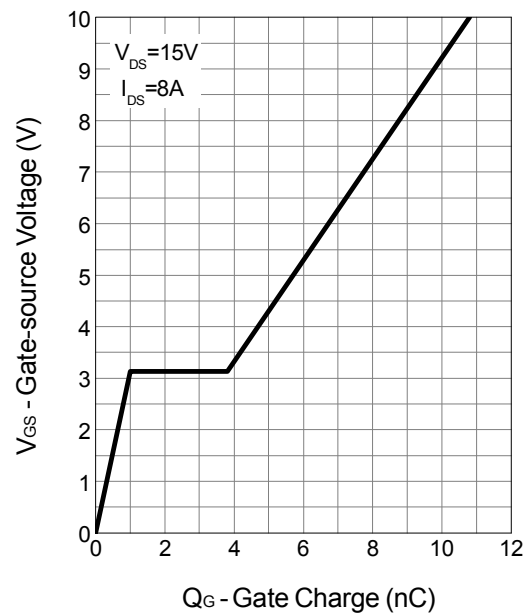
**Source-Drain Diode Forward**



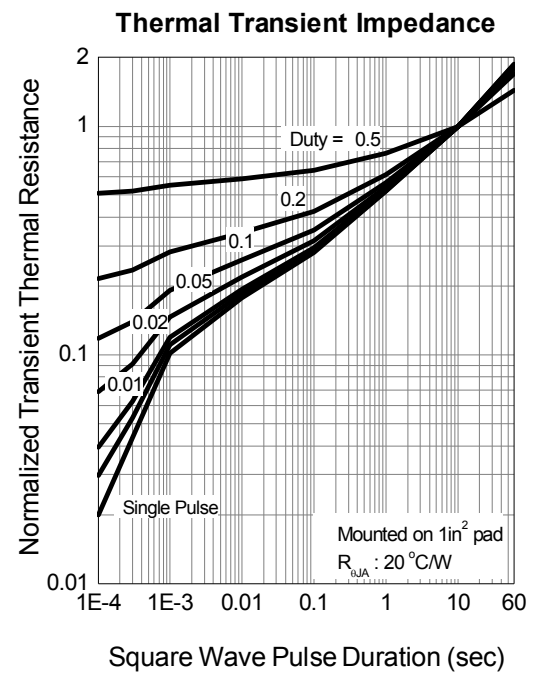
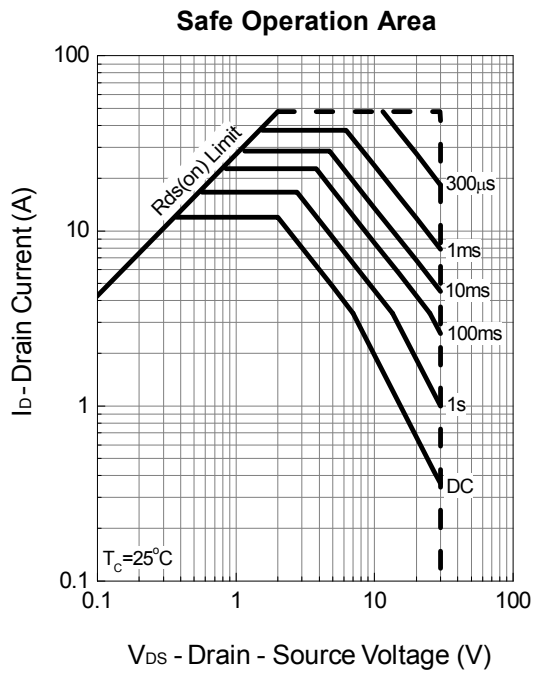
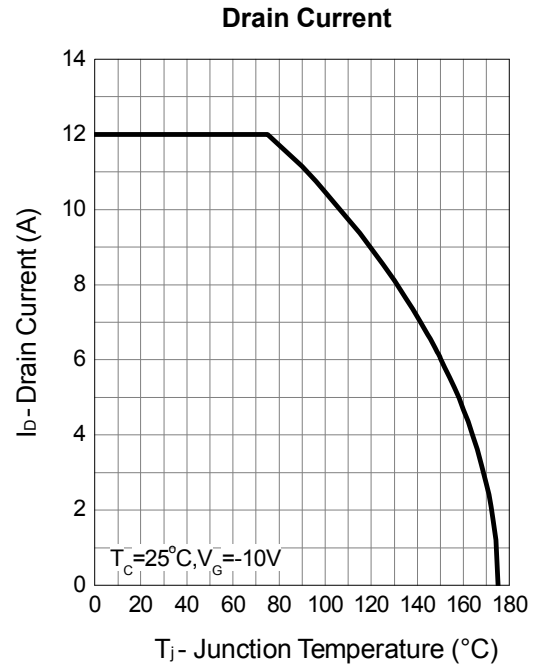
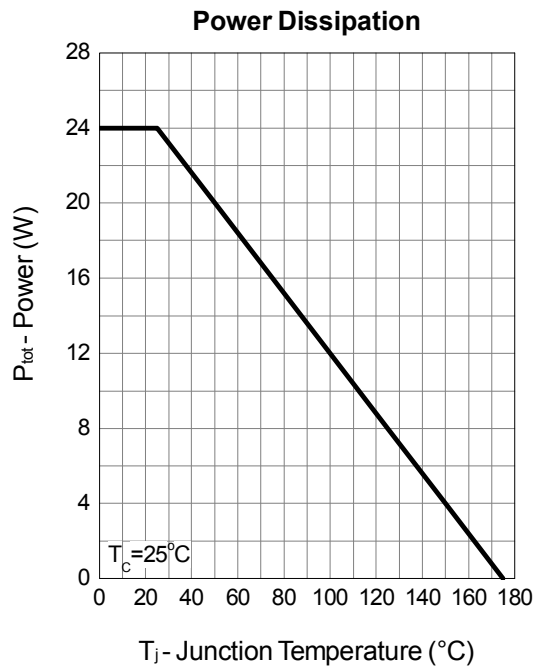
**Capacitance**



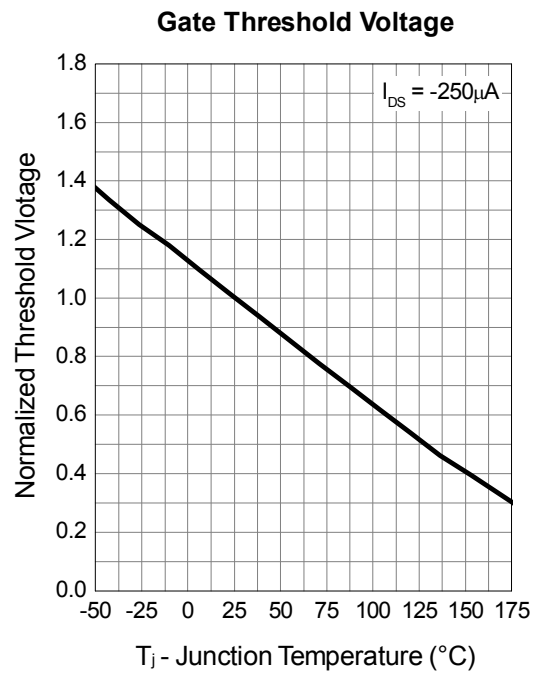
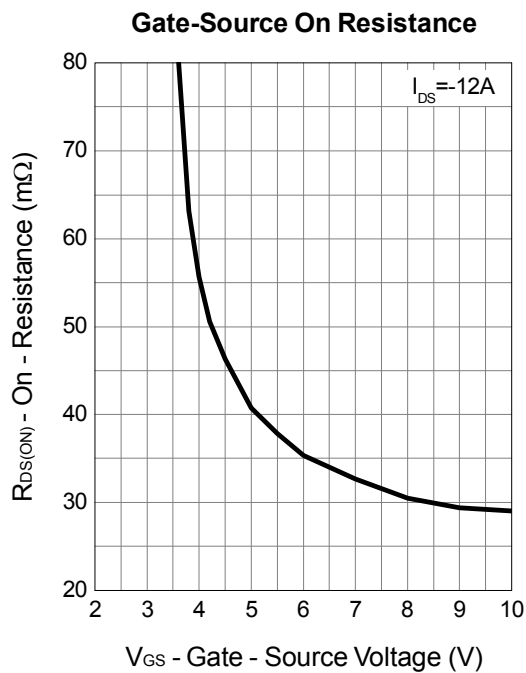
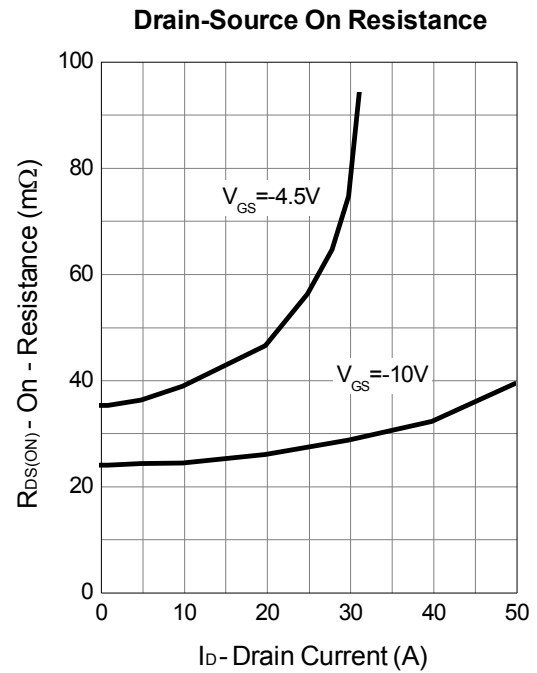
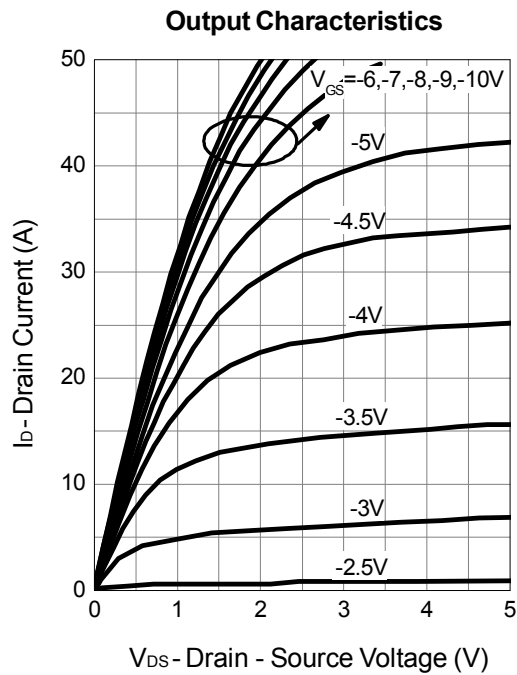
**Gate Charge**

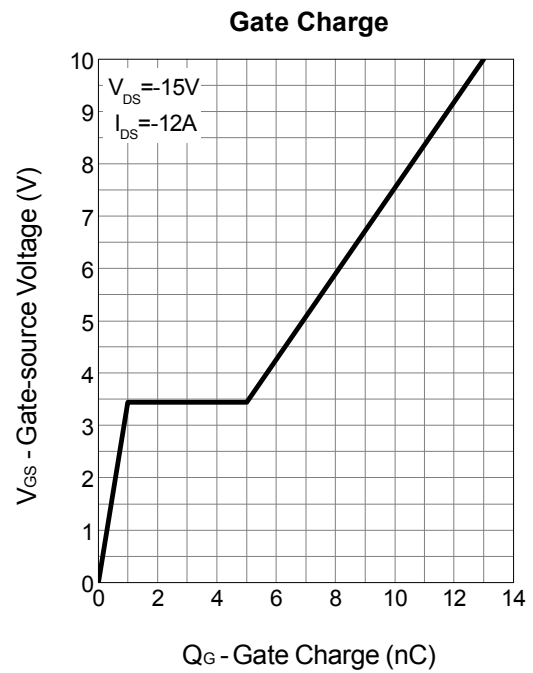
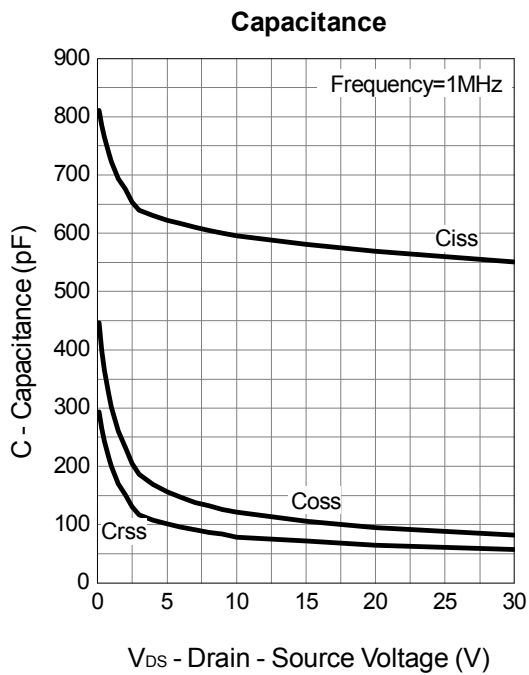
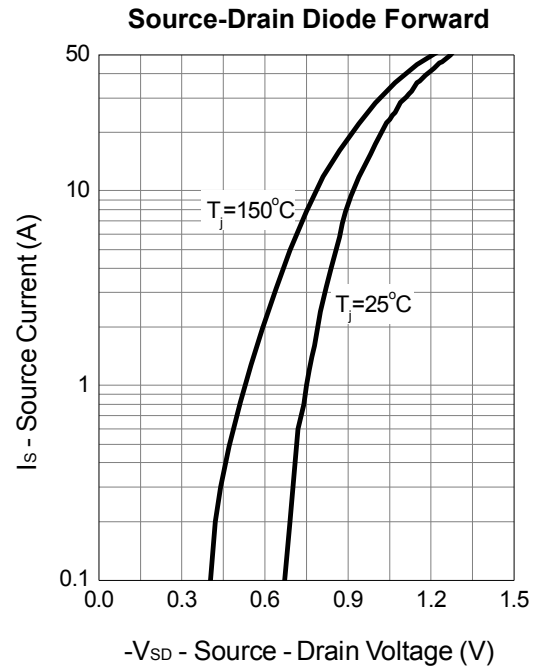
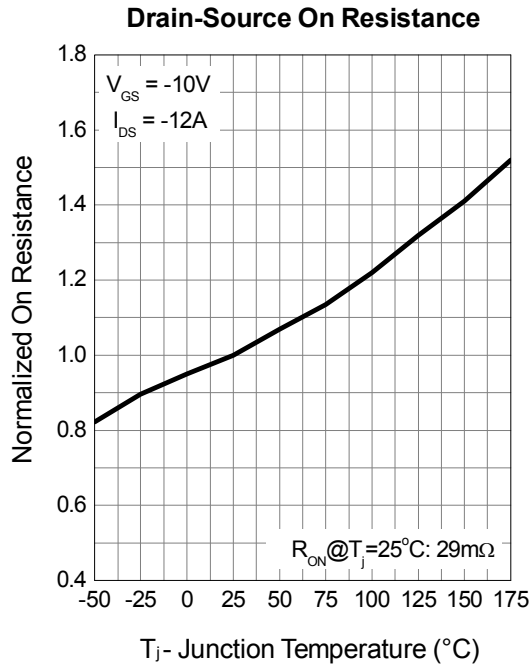


## P-Channel Typical Characteristics

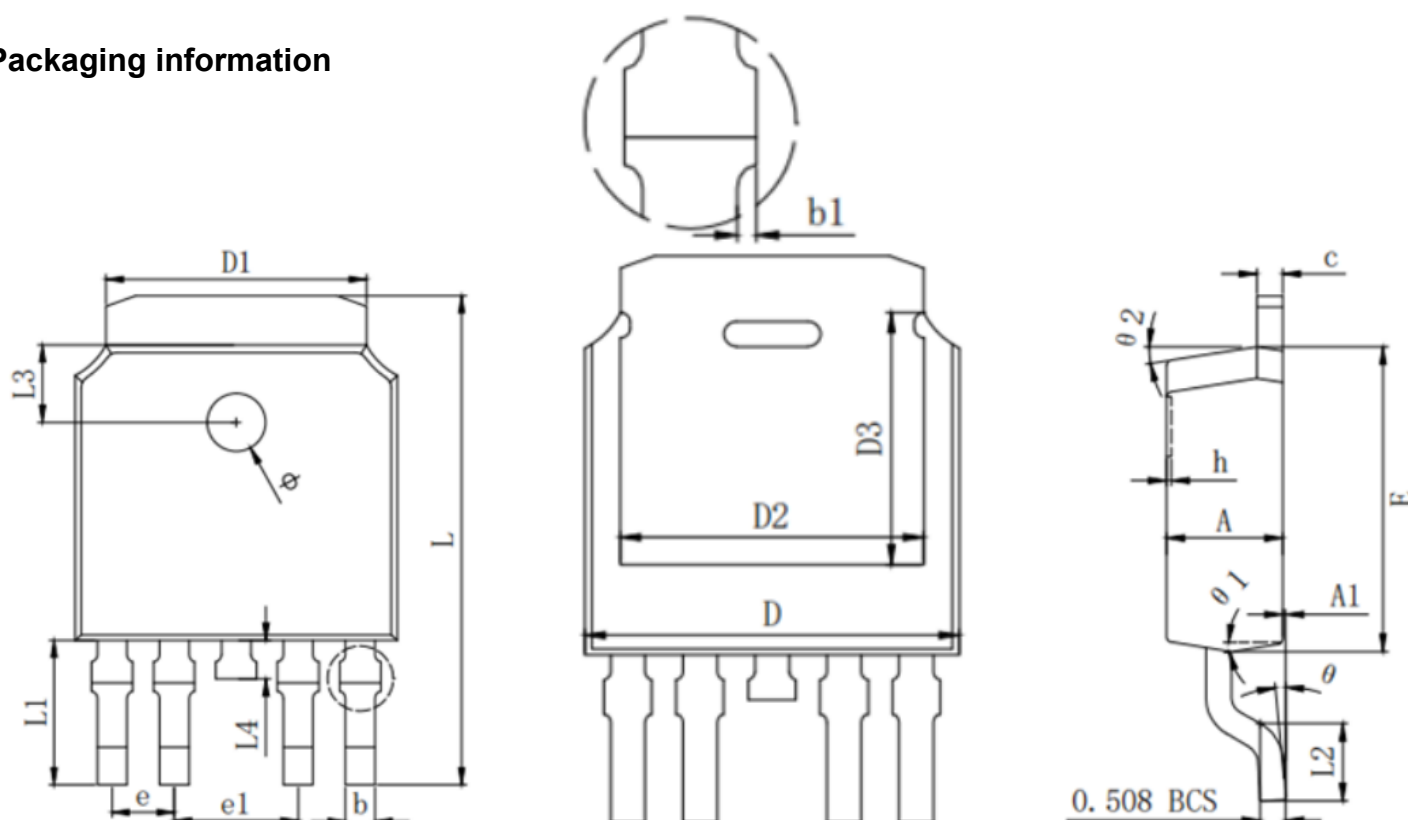


## P-Channel Typical Characteristics



**P-Channel Typical Characteristics**


## Packaging information



| SYMBOLS | MILLIMETERS |        |        |
|---------|-------------|--------|--------|
|         | MIN.        | Typ.   | MAX.   |
| A       | 2.200       | 2.300  | 2.400  |
| A1      | 0.000       | -      | 0.127  |
| b       | 0.550       | 0.600  | 0.650  |
| b1      | 0.000       | -      | 0.120  |
| c(电镀后)  | 0.460       | 0.520  | 0.580  |
| D       | 6.500       | 6.600  | 6.700  |
| D1      | 5.334 REF   |        |        |
| D2      | 5.346 REF   |        |        |
| D3      | 4.490 REF   |        |        |
| E       | 6.000       | 6.100  | 6.200  |
| e       | 1.270 TYP   |        |        |
| e1      | 2.540 TYP   |        |        |
| h       | 0.000       | 0.100  | 0.200  |
| L       | 9.900       | 10.100 | 10.300 |
| L1      | 2.988 REF   |        |        |
| L2      | 1.400       | 1.550  | 1.700  |
| L3      | 1.600 REF   |        |        |
| L4      | 0.700       | 0.800  | 0.900  |
| Φ       | 1.100       | 1.200  | 1.300  |
| θ       | 0°          | -      | 8°     |
| θ 1     | 9° TYP      |        |        |
| θ 2     | 9° TYP      |        |        |

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