# P-Channel 60 V (D-S) MOSFET

| PRODUCT SUMMARY | | | |
|---|---|---|---|
| $V_{DS}$ (V) | $R_{DS(on)}$ (mΩ) (Typ.) | $I_D$ (A)[a] | $Q_g$ (Typ.) |
| - 60 | 107 at $V_{GS}$ = - 10 V | - 30 | 25 nC |
| | 130 at $V_{GS}$ = - 4.5 V | | |

## FEATURES

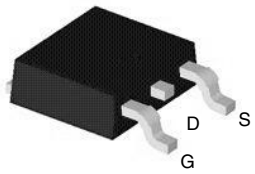
- DT-Trench Power MOSFET
- 100 % $R_g$ and UIS Tested
- Compliant to RoHS Directive 2002/95/EC

RoHS COMPLIANT

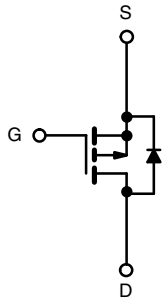
## APPLICATIONS

- DC/DC Converters

TO-252 Pin Configuration




Top View




P-Channel MOSFET

| ABSOLUTE MAXIMUM RATINGS ($T_C$ = 25 °C, unless otherwise noted) | | | | |
|---|---|---|---|---|
| PARAMETER | | SYMBOL | LIMIT | UNIT |
| Drain-Source Voltage | | $V_{DS}$ | - 60 | V |
| Gate-Source Voltage | | $V_{GS}$ | ± 20 | |
| Continuous Drain Current ($T_J$ = 150 °C)[a] | $T_C$ = 25 °C | $I_D$ | - 30 | A |
| | $T_C$ = 100 °C | | - 22 | |
| Pulsed Drain Current[b] | | $I_{DM}$ | - 90 | |
| Single Avalanche Energy | | $E_{AS}$ | 82 | mJ |
| Maximum Power Dissipation[c] | $T_C$ = 25 °C | $P_D$ | 45 | W |
| | $T_C$ = 100 °C | | 18 | |
| Operating Junction and Storage Temperature Range | | $T_J$, $T_{stg}$ | - 55 to +150 | °C |

| THERMAL RESISTANCE RATINGS | | | |
|---|---|---|---|
| PARAMETER | SYMBOL | MAX | UNIT |
| Junction-to-Ambient (PCB Mount)[d] | $R_{thJA}$ | 65 | °C/W |
| Junction-to-Case (Drain) | $R_{thJC}$ | 2.77 | |

**Notes**

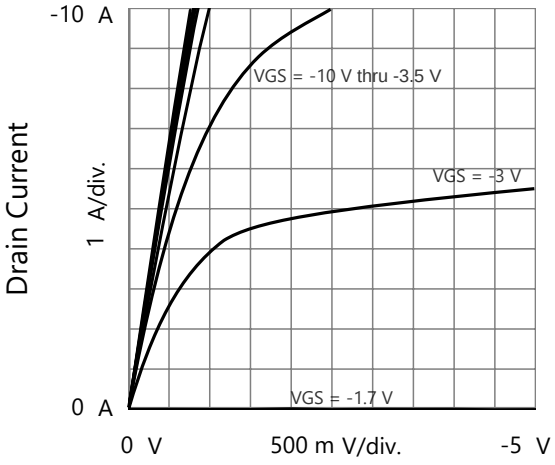
a. Calculated continuous current based on maximum allowablejunction temperature.
b. Repetitive rating; pulse width limited by max. junction temperature.
c. Pd is based on max. junction temperature, using junction-case thermal resistance.
d. The value of $R_{\theta JA}$ is measured with the device mounted on 1 in 2 FR-4 board with 2oz. Copper,in a still air environment with Ta=25 °C.

| **SPECIFICATIONS** ($T_J$ = 25 °C, unless otherwise noted) | | | | | | |
|---|---|---|---|---|---|---|
| **Parameter** | **Symbol** | **Test Conditions** | **Min.** | **Typ.** | **Max.** | **Unit** |
| **Static** | | | | | | |
| Drain-Source Breakdown Voltage | $V_{DS}$ | $V_{GS}$ = 0 V, $I_D$ = - 250 µA | - 60 | | | V |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = - 250 µA | - 1 | | - 3 | |
| Gate-Body Leakage | $I_{GSS}$ | $V_{DS}$ = 0 V, $V_{GS}$ = ± 20 V | | | ± 100 | nA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = - 60 V, $V_{GS}$ = 0 V | | | - 1 | µA |
| | | $V_{DS}$ = - 48 V, $V_{GS}$ = 0 V, $T_J$ = 125 °C | | | - 50 | |
| | | $V_{DS}$ = - 48 V, $V_{GS}$ = 0 V, $T_J$ = 150 °C | | | - 100 | |
| On-State Drain Current[a] | $I_{D(on)}$ | $V_{DS}$ = - 5 V, $V_{GS}$ = - 10 V | - 35 | | | A |
| Drain-Source On-State Resistance[a] | $R_{DS(on)}$ | $V_{GS}$ = - 10 V, $I_D$ = - 10A | | 107 | 119 | mΩ |
| | | $V_{GS}$ = - 4.5 V, $I_D$ = - 5 A | | 130 | 145 | |
| Forward Transconductance[a] | $g_{fs}$ | $V_{DS}$ = - 5 V, $I_D$ = - 10A | | 10 | | S |
| **Dynamic[b]** | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{GS}$ = 0 V, $V_{DS}$ = - 30V,= 1 MHz | | 862 | | pF |
| Output Capacitance | $C_{oss}$ | | | 53 | | |
| Reverse Transfer Capacitance | $C_{rss}$ | | | 39.9 | | |
| Total Gate Charge[c] | $Q_g$ | $V_{DS}$ = - 30 V, $V_{GS}$ = - 10 V, $I_D$ = - 10 A | | 25 | | nC |
| Gate-Source Charge[c] | $Q_{gs}$ | | | 4 | | |
| Gate-Drain Charge[c] | $Q_{gd}$ | | | 10 | | |
| Gate Resistance | $R_g$ | f = 1 MHz | | 16 | | Ω |
| Turn-On Delay Time[c] | $t_{d(on)}$ | $V_{DD}$ = - 30 V, $R_L$ = 5 Ω<br>$V_{GEN}$ = - 10 V, $R_G$ = 3 Ω | | 9 | | ns |
| Rise Time[c] | $t_r$ | | | 6 | | |
| Turn-Off Delay Time[c] | $t_{d(off)}$ | | | 29 | | |
| Fall Time[c] | $t_f$ | | | 10 | | |
| **Source-Drain Diode Ratings and Characteristics** $T_C$ = 25 °C[b] | | | | | | |
| Continuous Current | $I_S$ | | | | - 30 | A |
| Pulsed Current | $I_{SM}$ | | | | - 90 | |
| Forward Voltage[a] | $V_{SD}$ | $I_F$ = - 30 A, $V_{GS}$ = 0 V | | - 0.7 | - 1.5 | V |
| Reverse Recovery Time | $t_{rr}$ | $I_F$ = - 10 A, dI/dt = 100 A/µs | | 26 | | ns |

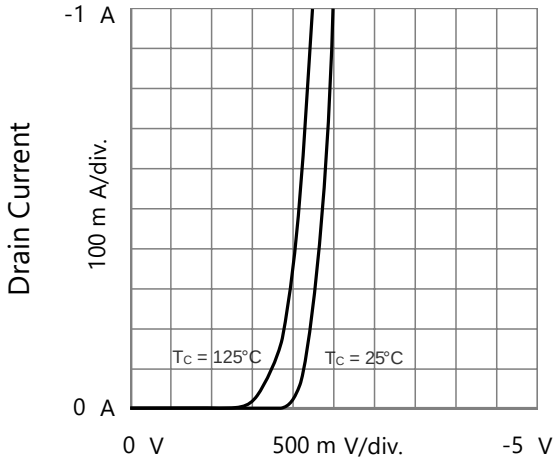
Notes:
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.
c. Independent of operating temperature.

*Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.*

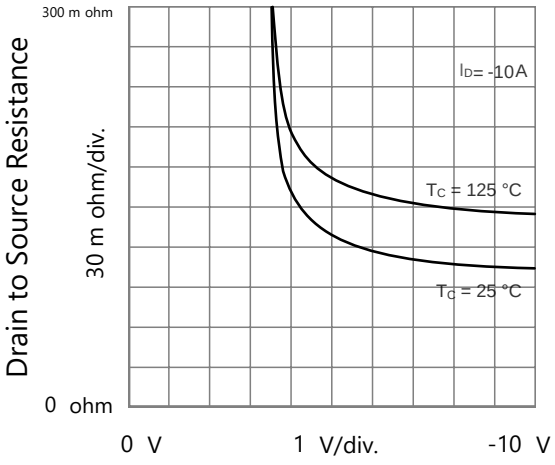
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



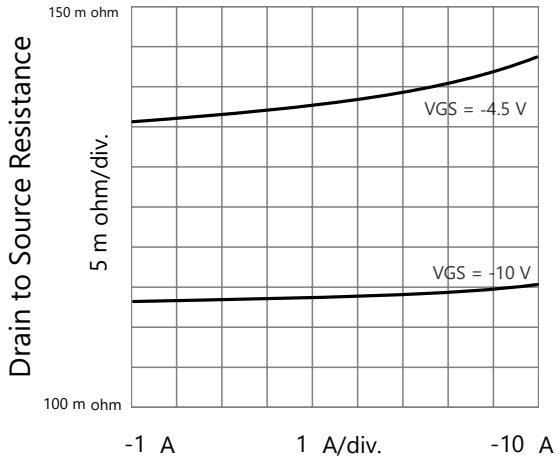

Drain to Source Voltage
Output Characteristics



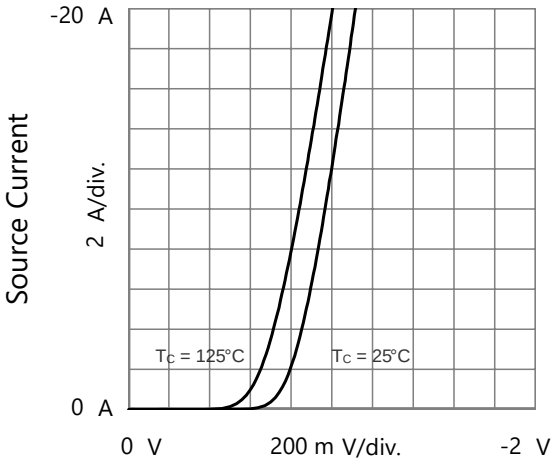

Gate to Source Voltage
Transfer Characteristics



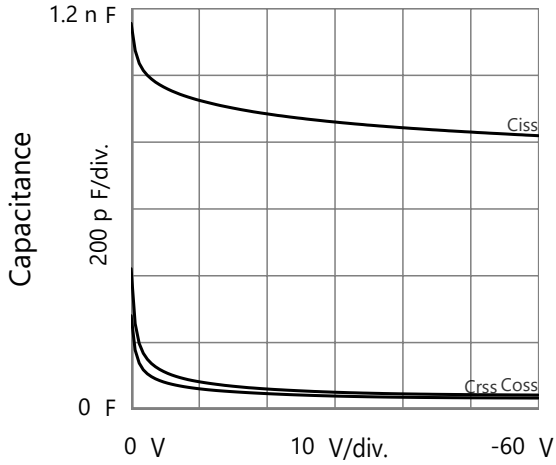

Gate to Source Voltage
Drain to Source Resistance vs. Gate to Source Voltage




Drain Current
Drain to Source Resistance vs. Drain Current

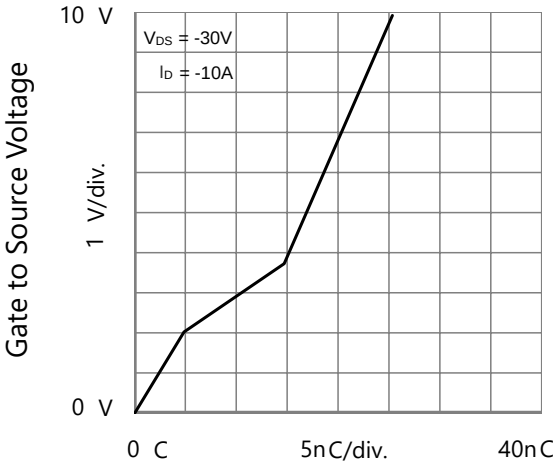



Source to Drain Voltage
Body Diode Forward Characteristics

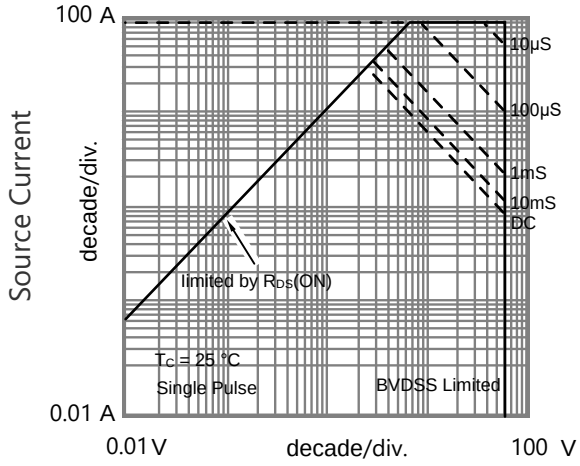



Drain to Source Voltage
Capacitances

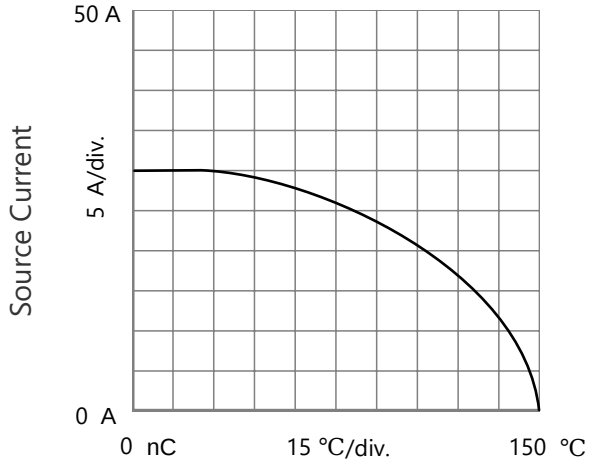
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



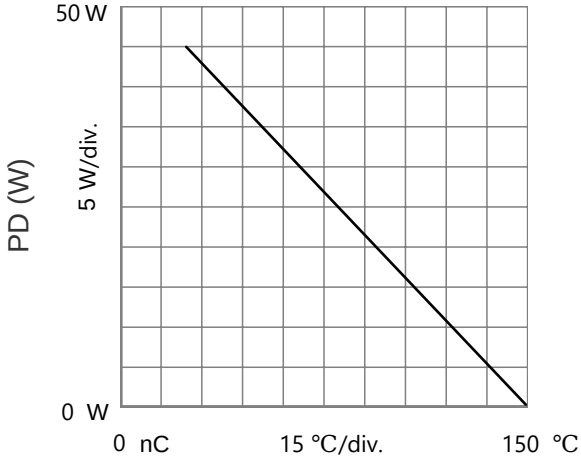

Gate to Source Voltage vs. GateCharge



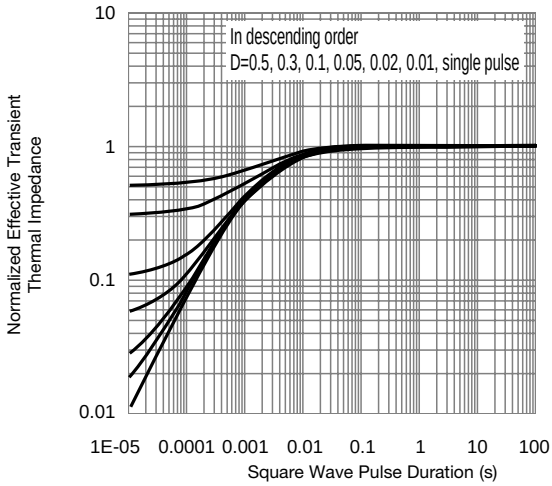

Safe Operating Area, Junction-to-Ambient




Current Derating

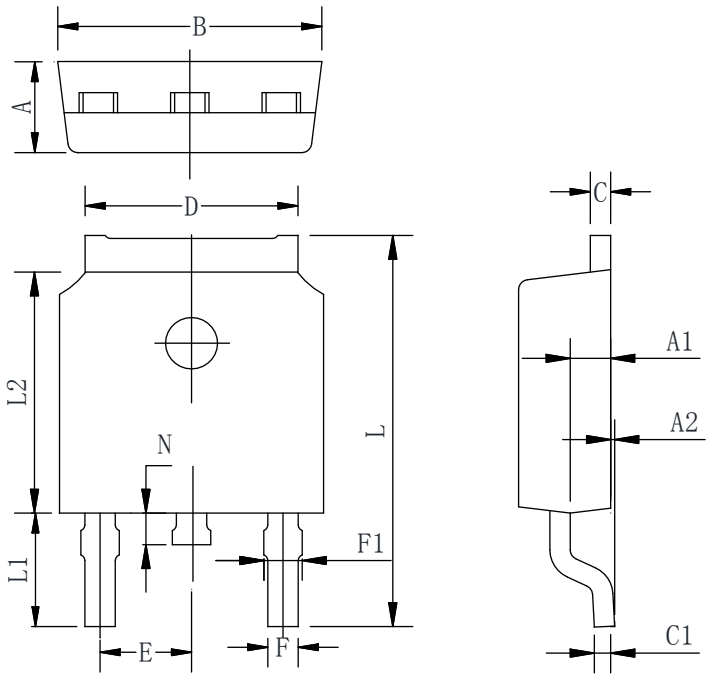



Power Derating




**Normalized Thermal Transient Impedance, Junction-to-Case**

# TO-252-2L PACKAGE OUTLINE




COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

| Symbol | Min | Typ | Max |
|---|---|---|---|
| A | 2.10 | 2.30 | 2.50 |
| A1 | 0.88 | 1.01 | 1.16 |
| A2 | 0.00 | 0.15 | 0.28 |
| B | 6.40 | 6.60 | 6.80 |
| C | 0.42 | 0.50 | 0.63 |
| C1 | 0.42 | 0.50 | 0.63 |
| D | 5.08 | 5.32 | 5.65 |
| E | | 2.286 TYP | |
| F | 0.63 | 0.76 | 0.89 |
| F1 | 0.64 | 0.86 | 1.08 |
| L | 9.30 | 9.90 | 10.80 |
| L1 | 2.4 | 2.8 | 3.6 |
| L2 | 5.90 | 6.10 | 6.55 |
| N | 0.57 | 0.80 | 1.05 |

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