

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

### Key Features:

- Low  $r_{DS(on)}$  trench technology
- Low thermal impedance
- Fast switching speed

### Typical Applications:

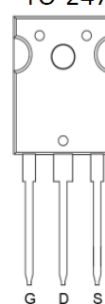
- White LED boost converters
- Automotive Systems
- Industrial DC/DC Conversion Circuits

| PRODUCT SUMMARY |                            |                  |
|-----------------|----------------------------|------------------|
| $V_{DS}$ (V)    | $r_{DS(on)}$ (m $\Omega$ ) | $I_D$ (A)        |
| -60             | 20 @ $V_{GS} = -10V$       | -90 <sup>a</sup> |
|                 | 28 @ $V_{GS} = -4.5V$      |                  |

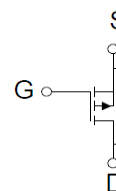


RoHS  
COMPLIANT  
HALOGEN  
FREE

TO-247



DRAIN  
connected  
to TAB



P-Channel MOSFET

### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)

| Parameter   | Symbol         | Limit      | Units            |
|---|----------------|------------|------------------|
| Drain-Source Voltage                                      | $V_{DS}$       | -60        | V                |
| Gate-Source Voltage                                       | $V_{GS}$       | $\pm 20$   |                  |
| Continuous Drain Current <sup>a</sup>                     | $I_D$          | -90        | A                |
| Pulsed Drain Current <sup>b</sup>                         | $I_{DM}$       | -360       |                  |
| Continuous Source Current (Diode Conduction) <sup>a</sup> | $I_S$          | -90        | A                |
| Power Dissipation <sup>a</sup>                            | $P_D$          | 500        | W                |
| Operating Junction and Storage Temperature Range          | $T_J, T_{stg}$ | -55 to 175 | $^\circ\text{C}$ |

### THERMAL RESISTANCE RATINGS

| Parameter                                | Symbol          | Maximum | Units                     |
|--|-----------------|---------|---------------------------|
| Maximum Junction-to-Ambient <sup>c</sup> | $R_{\theta JA}$ | 40      | $^\circ\text{C}/\text{W}$ |
| Maximum Junction-to-Case                 | $R_{\theta JC}$ | 0.29    |                           |

### Notes

- Package Limited
- Pulse width limited by maximum junction temperature
- Surface Mounted on 1" x 1" FR4 Board.

## Electrical Characteristics

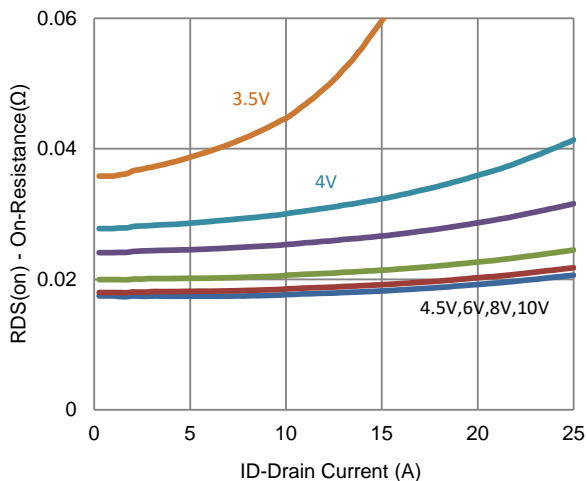
| Parameter                               | Symbol       | Test Conditions  | Min  | Typ  | Max       | Unit       |
|---|--------------|--|------|------|-----------|------------|
| <b>Static</b>                           |              |  |      |      |           |            |
| Gate-Source Threshold Voltage           | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = -250 \mu A$  | -1   |      |           | V          |
| Gate-Body Leakage                       | $I_{GSS}$    | $V_{DS} = 0 V, V_{GS} = \pm 20 V$  |      |      | $\pm 100$ | nA         |
| Zero Gate Voltage Drain Current         | $I_{DSS}$    | $V_{DS} = -48 V, V_{GS} = 0 V$   |      |      | -1        | uA         |
|   |              | $V_{DS} = -48 V, V_{GS} = 0 V, T_J = 55^\circ C$   |      |      | -10       |            |
| On-State Drain Current <sup>a</sup>     | $I_{D(on)}$  | $V_{DS} = -5 V, V_{GS} = -10 V$  | -110 |      |           | A          |
| Drain-Source On-Resistance <sup>a</sup> | $r_{DS(on)}$ | $V_{GS} = -10 V, I_D = -20 A$  |      |      | 20        | m $\Omega$ |
|   |              | $V_{GS} = -4.5 V, I_D = -16 A$   |      |      | 28        |            |
| Forward Transconductance <sup>a</sup>   | $g_{fs}$     | $V_{DS} = -15 V, I_D = -20 A$  |      | 10   |           | S          |
| Diode Forward Voltage <sup>a</sup>      | $V_{SD}$     | $I_S = -45 A, V_{GS} = 0 V$  |      | 0.75 |           | V          |
| <b>Dynamic <sup>b</sup></b>             |              |  |      |      |           |            |
| Total Gate Charge                       | $Q_g$        | $V_{DS} = -30 V, V_{GS} = -4.5 V,$<br>$I_D = -20 A$  |      | 22   |           | nC         |
| Gate-Source Charge                      | $Q_{gs}$     |  |      | 10   |           |            |
| Gate-Drain Charge                       | $Q_{gd}$     |  |      | 9.3  |           |            |
| Turn-On Delay Time                      | $t_{d(on)}$  | $V_{DS} = -30 V, R_L = 1.5 \Omega,$<br>$I_D = -20 A,$<br>$V_{GEN} = -10 V, R_{GEN} = 6 \Omega$ |      | 9    |           | ns         |
| Rise Time                               | $t_r$        |  |      | 9    |           |            |
| Turn-Off Delay Time                     | $t_{d(off)}$ |  |      | 85   |           |            |
| Fall Time                               | $t_f$        |  |      | 27   |           |            |
| Input Capacitance                       | $C_{iss}$    | $V_{DS} = -15 V, V_{GS} = 0 V, f = 1 \text{ Mhz}$  |      | 4464 |           | pF         |
| Output Capacitance                      | $C_{oss}$    |  |      | 216  |           |            |
| Reverse Transfer Capacitance            | $C_{rss}$    |  |      | 163  |           |            |

## Notes

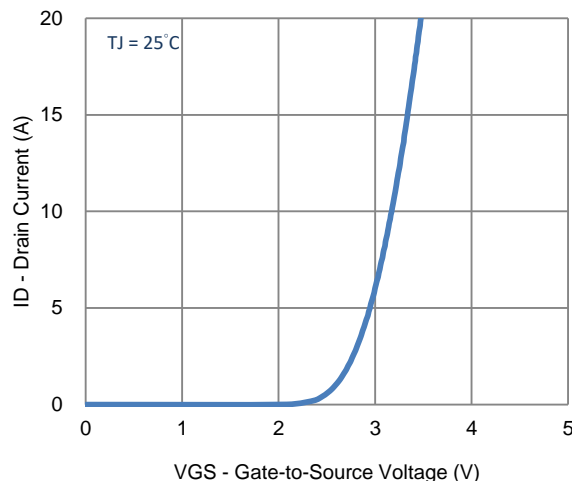
- Pulse test: PW  $\leq$  300us duty cycle  $\leq$  2%.
- Guaranteed by design, not subject to production testing.

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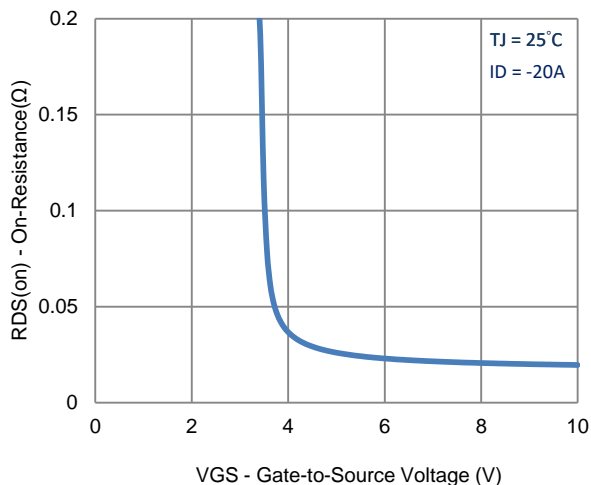
Typical Electrical Characteristics



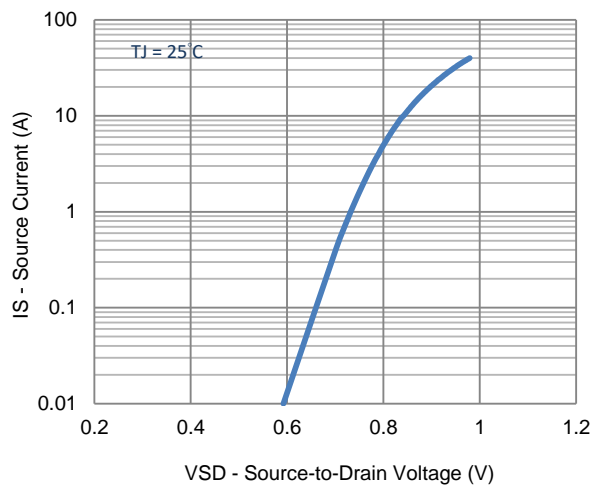
1. On-Resistance vs. Drain Current



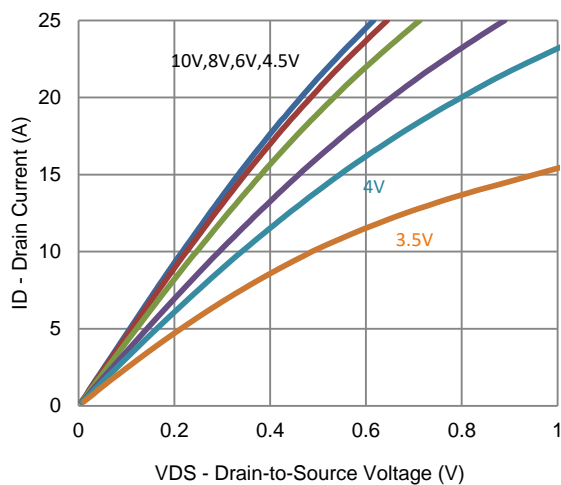
2. Transfer Characteristics



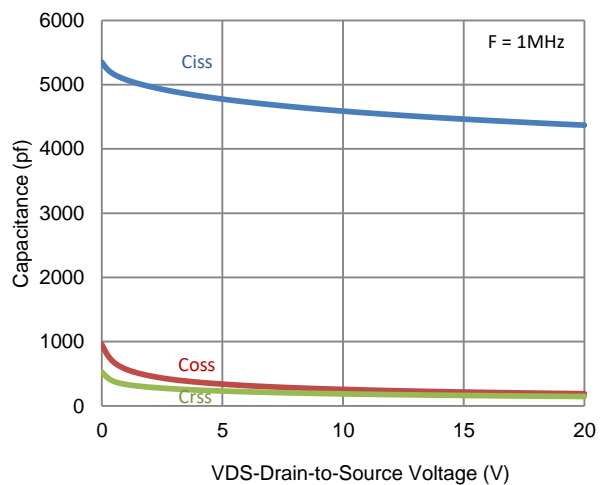
3. On-Resistance vs. Gate-to-Source Voltage



4. Drain-to-Source Forward Voltage

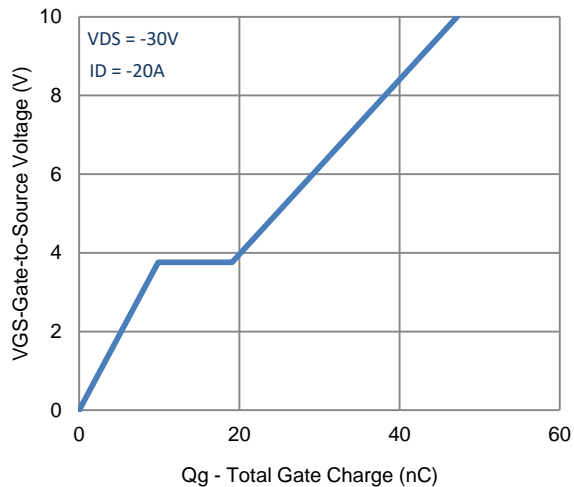


5. Output Characteristics

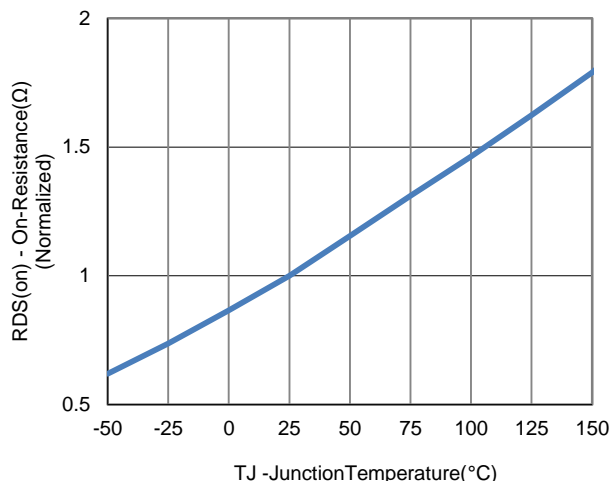


6. Capacitance

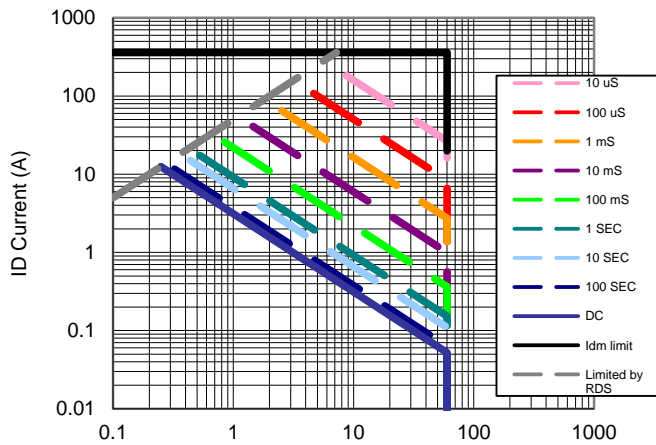
Typical Electrical Characteristics



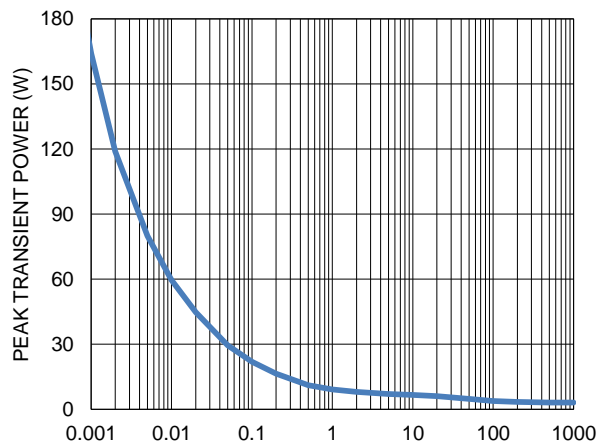
7. Gate Charge



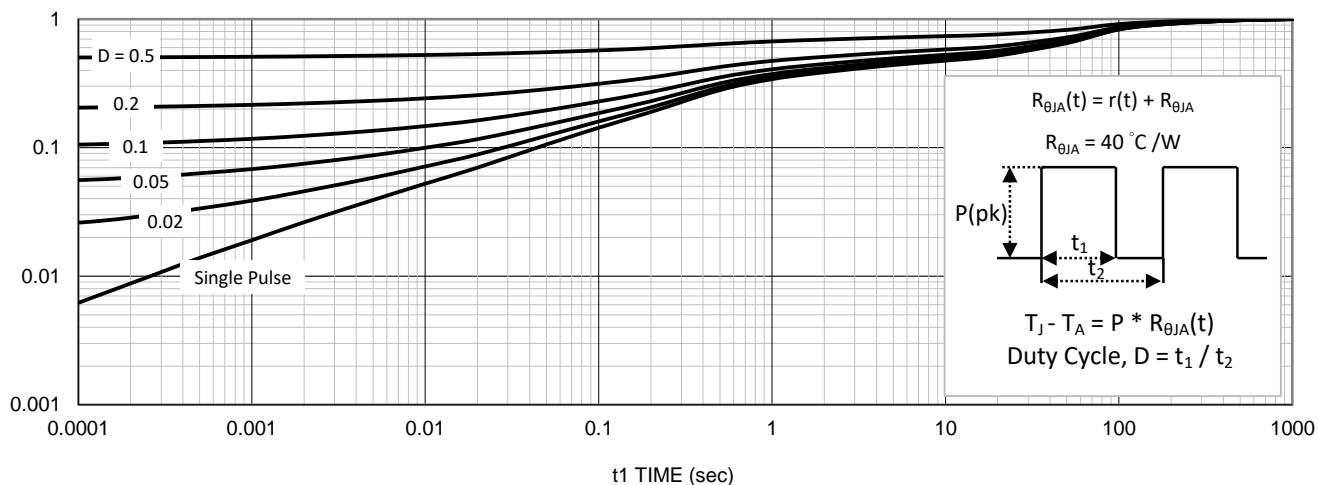
8. Normalized On-Resistance Vs Junction Temperature



9. Safe Operating Area

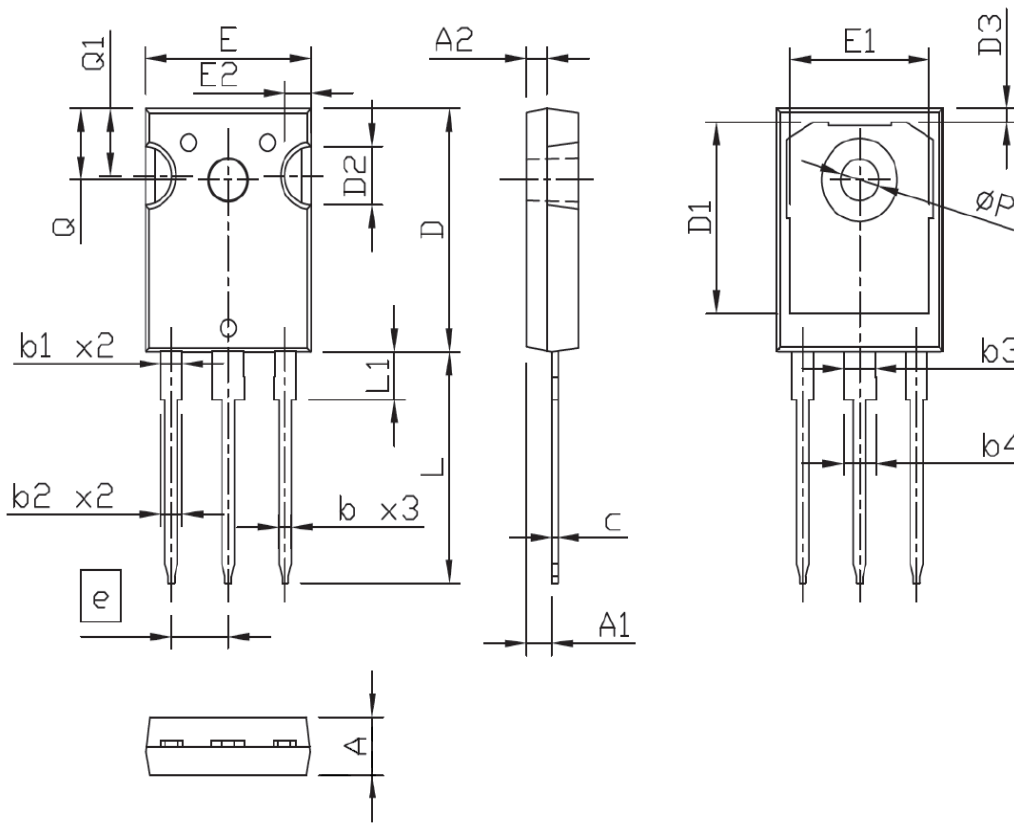


10. Single Pulse Maximum Power Dissipation



11. Normalized Thermal Transient Junction to Ambient

Package Information



| SYMBOLS | DIMENSIONS IN MILLIMETERS |       |       |
|---------|---------------------------|-------|-------|
|         | MIN                       | NOM   | MAX   |
| A       | 4.90                      | 5.00  | 5.10  |
| A1      | 2.32                      | 2.42  | 2.52  |
| A2      | 1.90                      | 2.00  | 2.10  |
| b       | 1.17                      | 1.22  | 1.27  |
| b1      | 1.97                      | 2.02  | 2.07  |
| b2      | 2.00                      | 2.10  | 2.20  |
| b3      | 2.97                      | 3.02  | 3.07  |
| b4      | 3.00                      | 3.10  | 3.20  |
| c       | 0.59                      | 0.62  | 0.66  |
| D       | 20.90                     | 21.00 | 21.10 |
| D1      | 16.25                     | 16.55 | 16.85 |
| D2      | 5.00 TYP                  |       |       |
| D3      | 1.05                      | 1.20  | 1.35  |
| e       | 5.44 BSC                  |       |       |
| E       | 15.70                     | 15.80 | 15.90 |
| E1      | 13.06                     | 13.26 | 13.46 |
| E2      | 2.50 TYP                  |       |       |
| L       | 19.72                     | 19.92 | 20.12 |
| L1      | ---                       | ---   | 4.30  |
| Q       | 6.15 BSC                  |       |       |
| Q1      | 5.60                      | 5.80  | 6.00  |
| ØP      | 3.55                      | 3.60  | 3.65  |