# P-Channel 40-V (D-S) MOSFET

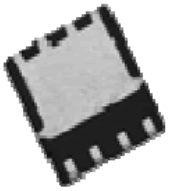
**Key Features:**
- Low $r_{DS(on)}$ trench technology
- Low thermal impedance
- Fast switching speed

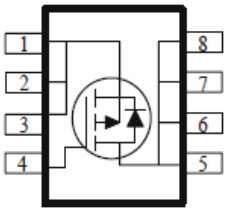
**Typical Applications:**
- White LED boost converters
- Automotive Systems
- Industrial DC/DC Conversion Circuits

| PRODUCT SUMMARY | | |
|---|---|---|
| $V_{DS}$ (V) | $r_{DS(on)}$ (mΩ) | $I_D$(A) |
| -40 | 7.6 @ $V_{GS}$ = -10V | 21 |
| | 9.6 @ $V_{GS}$ = -4.5V | 19 |

Pb-free
RoHS COMPLIANT
HALOGEN FREE

DFN5X6-8L






| ABSOLUTE MAXIMUM RATINGS ($T_A$ = 25°C UNLESS OTHERWISE NOTED) | | | | |
|---|---|---|---|---|
| **Parameter** | | **Symbol** | **Limit** | **Units** |
| Drain-Source Voltage | | $V_{DS}$ | -40 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±20 | |
| Continuous Drain Current [a] | $T_A$=25°C | $I_D$ | 21 | A |
| | $T_A$=70°C | | 16.8 | |
| Pulsed Drain Current [b] | | $I_{DM}$ | -100 | |
| Continuous Source Current (Diode Conduction) [a] | | $I_S$ | -2.1 | A |
| Power Dissipation [a] | $T_A$=25°C | $P_D$ | 5 | W |
| | $T_A$=70°C | | 3.2 | |
| Operating Junction and Storage Temperature Range | | $T_J$, $T_{stg}$ | -55 to 150 | °C |

| THERMAL RESISTANCE RATINGS | | | | |
|---|---|---|---|---|
| **Parameter** | | **Symbol** | **Maximum** | **Units** |
| Maximum Junction-to-Ambient [a] | t <= 10 sec | $R_{\theta JA}$ | 25 | °C/W |
| | Steady State | | 65 | |

Notes
a. Surface Mounted on 1” x 1” FR4 Board.
b. Pulse width limited by maximum junction temperature

## Electrical Characteristics

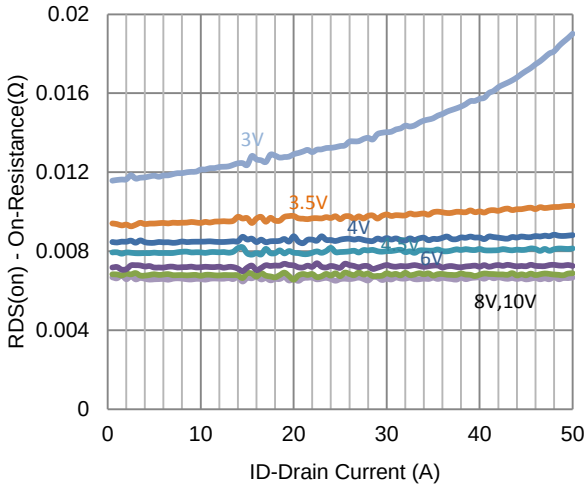
| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Static** | | | | | | |
| Gate-Source Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = -250 uA | -1 | | | V |
| Gate-Body Leakage | $I_{GSS}$ | $V_{DS}$ = 0 V, $V_{GS}$ = ±20 V | | | ±100 | nA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = -32 V, $V_{GS}$ = 0 V | | | -1 | uA |
| | | $V_{DS}$ = -32 V, $V_{GS}$ = 0 V, $T_J$ = 55°C | | | -25 | |
| On-State Drain Current | $I_{D(on)}$ | $V_{DS}$ = -5 V, $V_{GS}$ = -10 V | -40 | | | A |
| Drain-Source On-Resistance | $r_{DS(on)}$ | $V_{GS}$ = -10 V, $I_D$ = -16.2 A | | | 7.6 | mΩ |
| | | $V_{GS}$ = -4.5 V, $I_D$ = -14.9 A | | | 9.6 | |
| Forward Transconductance | $g_{fs}$ | $V_{DS}$ = -15 V, $I_D$ = -16.2 A | | 30 | | S |
| Diode Forward Voltage | $V_{SD}$ | $I_S$ = -1.1 A, $V_{GS}$ = 0 V | | -0.69 | | V |
| **Dynamic** | | | | | | |
| Total Gate Charge | $Q_g$ | $V_{DS}$ = -20 V, $V_{GS}$ = -4.5 V, $I_D$ = -16.2 A | | 116 | | nC |
| Gate-Source Charge | $Q_{gs}$ | | | 35 | | |
| Gate-Drain Charge | $Q_{gd}$ | | | 46 | | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DS}$ = -20 V, $R_L$ = 1.3 Ω, $I_D$ = -16.2 A, $V_{GEN}$ = -10 V, $R_{GEN}$ = 6 Ω | | 19 | | ns |
| Rise Time | $t_r$ | | | 39 | | |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 300 | | |
| Fall Time | $t_f$ | | | 122 | | |
| Input Capacitance | $C_{iss}$ | $V_{DS}$ = -15 V, $V_{GS}$ = 0 V, f = 1 MHz | | 9763 | | pF |
| Output Capacitance | $C_{oss}$ | | | 871 | | |
| Reverse Transfer Capacitance | $C_{rss}$ | | | 716 | | |

Notes

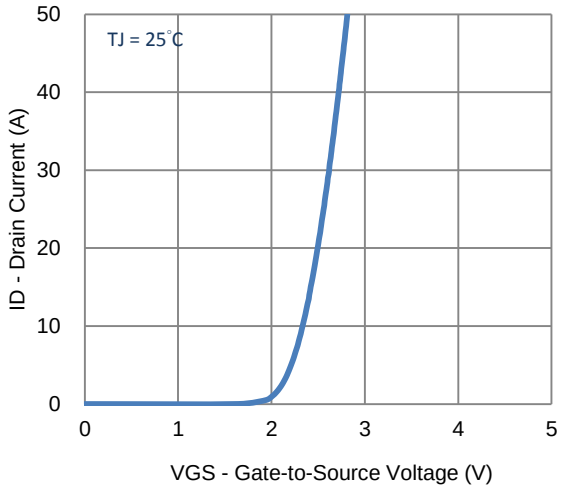
a. Pulse test: PW <= 300us duty cycle <= 2%.

b. Guaranteed by design, not subject to production testing.

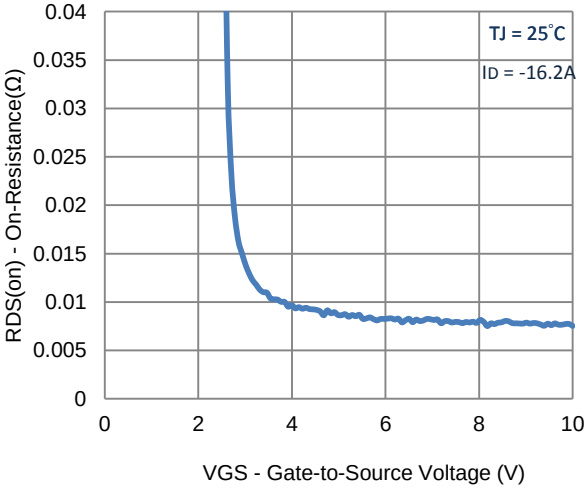
## Typical Electrical Characteristics



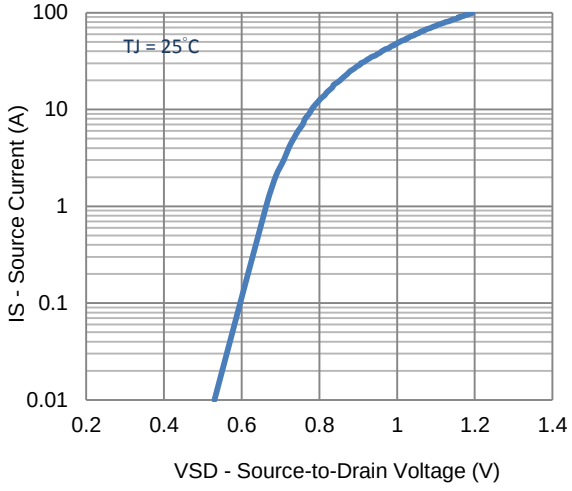

**1. On-Resistance vs. Drain Current**



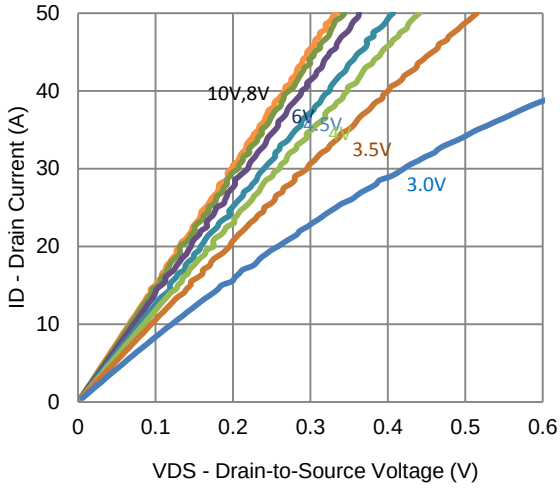

**2. Transfer Characteristics**



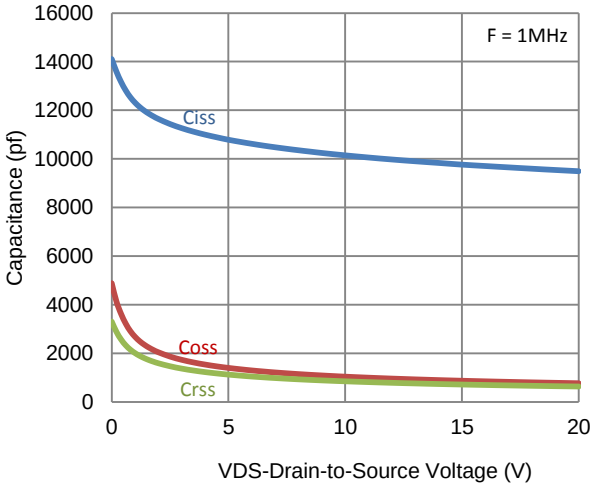

**3. On-Resistance vs. Gate-to-Source Voltage**




**4. Drain-to-Source Forward Voltage**

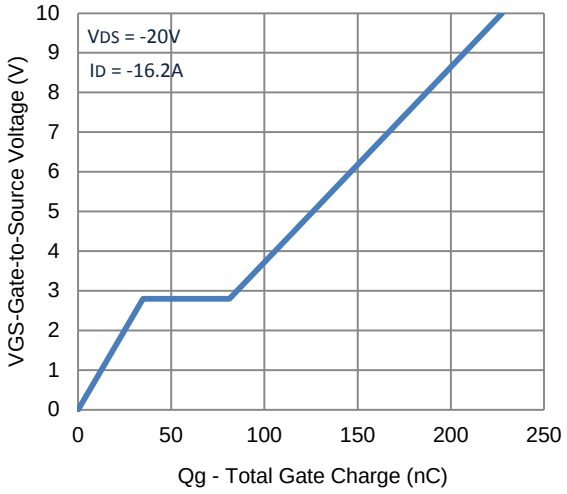



**5. Output Characteristics**

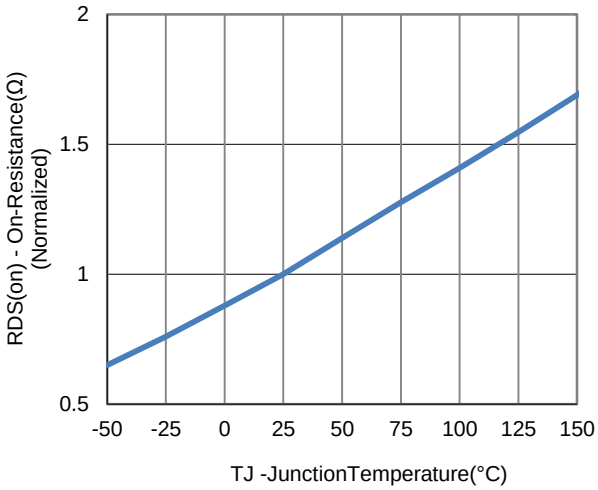



**6. Capacitance**

## Typical Electrical Characteristics

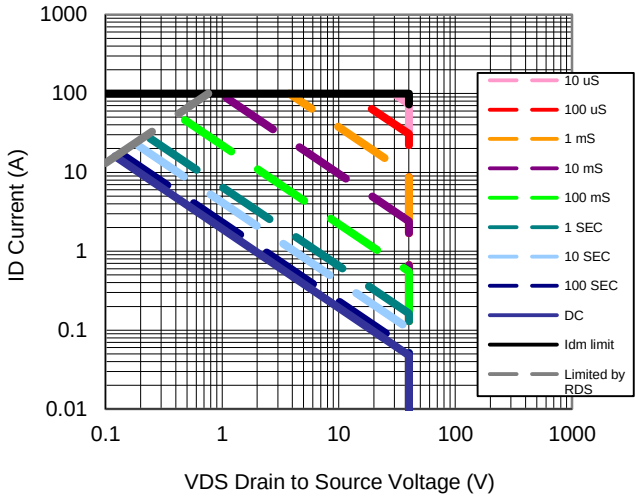



**7. Gate Charge**

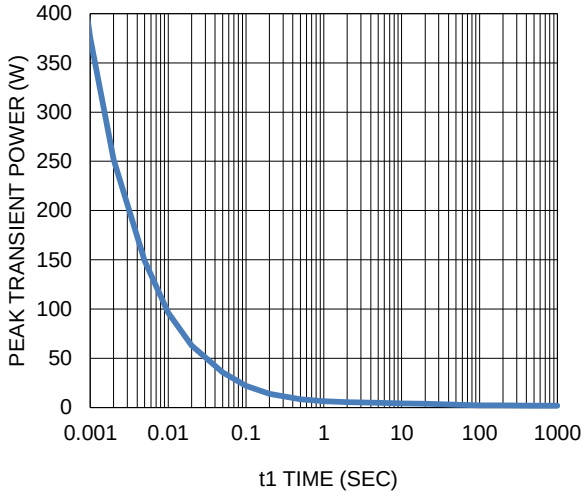



**8. Normalized On-Resistance Vs Junction Temperature**

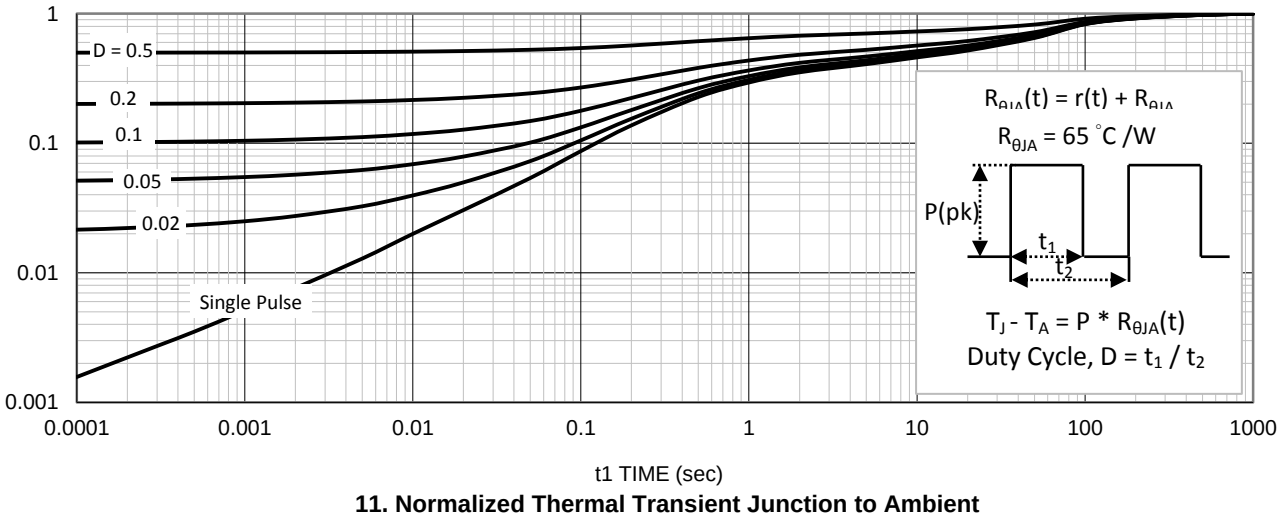
ID = 2.3A




**9. Safe Operating Area**

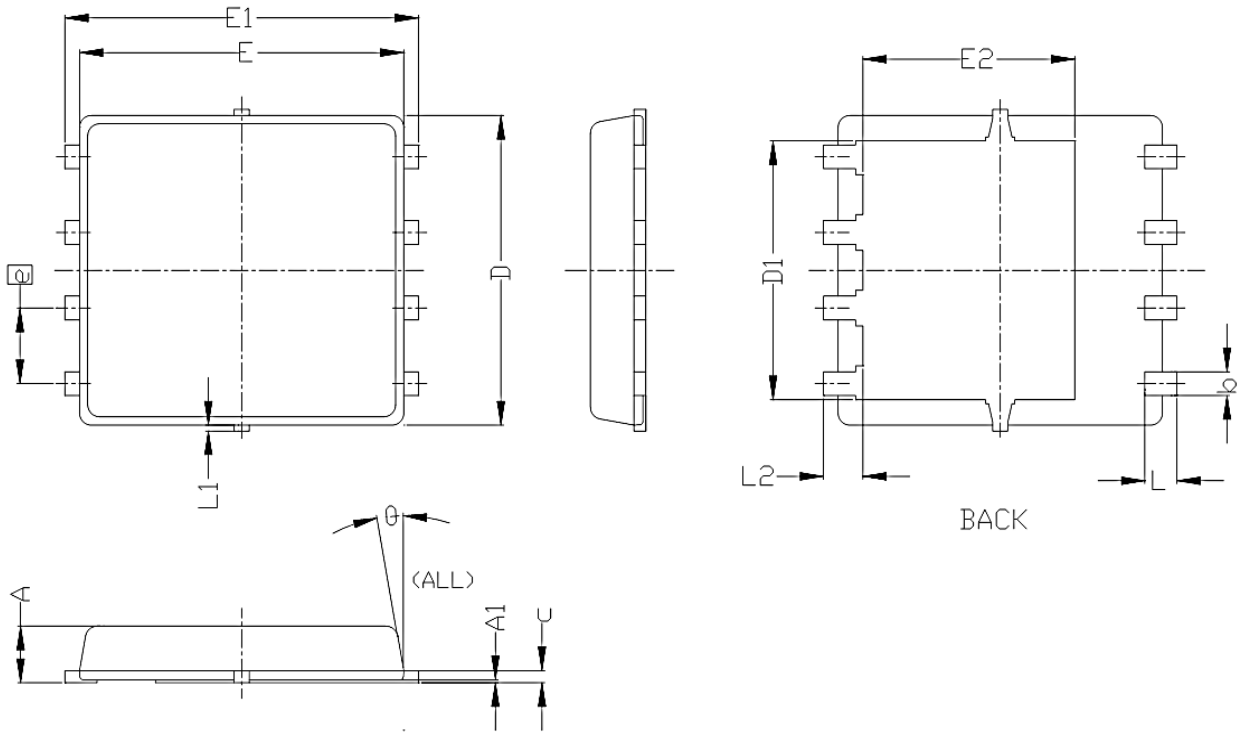



**10. Single Pulse Maximum Power Dissipation**




**11. Normalized Thermal Transient Junction to Ambient**

## Package Information




| SYMBOLS | DIMENSIONS IN MILLIMETERS | | | DIMENSIONS IN INCHES | | |
|---|---|---|---|---|---|---|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 0.85 | 0.95 | 1.00 | 0.033 | 0.037 | 0.039 |
| A1 | 0.00 | —— | 0.05 | 0.000 | —— | 0.002 |
| b | 0.30 | 0.40 | 0.50 | 0.012 | 0.016 | 0.020 |
| c | 0.15 | 0.20 | 0.25 | 0.006 | 0.008 | 0.010 |
| D | | 5.20 BSC | | | 0.205 BSC | |
| D1 | | 4.35 BSC | | | 0.171 BSC | |
| | | | | | | |
| E | | 5.55 BSC | | | 0.219 BSC | |
| E1 | | 6.05 BSC | | | 0.238 BSC | |
| E2 | | 3.62 BSC | | | 0.143 BSC | |
| e | | 1.27 BSC | | | 0.050 BSC | |
| L | 0.45 | 0.55 | 0.65 | 0.018 | 0.022 | 0.026 |
| L1 | 0 | --- | 0.15 | 0 | --- | 0.006 |
| L2 | | 0.68 REF | | | 0.027 REF | |
| θ | 0° | --- | 10° | 0° | --- | 10° |