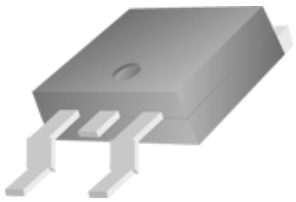
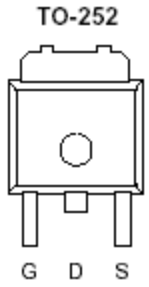
# P-Channel 40-V (D-S) MOSFET

These miniature surface mount MOSFETs utilize a high cell density trench process to provide low $r_{DS(on)}$ and to ensure minimal power loss and heat dissipation. Typical applications are DC-DC converters and power management in portable and battery-powered products such as computers, printers, PCMCIA cards, cellular and cordless telephones.

| PRODUCT SUMMARY | | |
|---|---|---|
| $V_{DS}$ (V) | $r_{DS(on)}$ m(Ω) | $I_D$ (A) |
| -40 | 30 @ $V_{GS}$ = -10V | 36 |
| | 40 @ $V_{GS}$ = -4.5V | 29 |

- Low $r_{DS(on)}$ provides higher efficiency and extends battery life
- Low thermal impedance copper leadframe DPAK saves board space
- Fast switching speed
- High performance trench technology







| ABSOLUTE MAXIMUM RATINGS ($T_A$ = 25 °C UNLESS OTHERWISE NOTED) | | | | |
|---|---|---|---|---|
| Parameter | | Symbol | Maximum | Units |
| Drain-Source Voltage | | $V_{DS}$ | -40 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±20 | |
| Continuous Drain Current[a] | $T_A$=25°C | $I_D$ | 36 | A |
| Pulsed Drain Current[b] | | $I_{DM}$ | ±40 | |
| Continuous Source Current (Diode Conduction)[a] | | $I_S$ | -30 | A |
| Power Dissipation[a] | $T_A$=25°C | $P_D$ | 50 | W |
| Operating Junction and Storage Temperature Range | | $T_J$, $T_{stg}$ | -55 to 175 | °C |

| THERMAL RESISTANCE RATINGS | | | |
|---|---|---|---|
| Parameter | Symbol | Maximum | Units |
| Maximum Junction-to-Ambient[a] | $R_{\theta JA}$ | 50 | °C/W |
| Maximum Junction-to-Case | $R_{\theta JC}$ | 3.0 | °C/W |

Notes

a. Surface Mounted on 1" x 1" FR4 Board.

b. Pulse width limited by maximum junction temperature

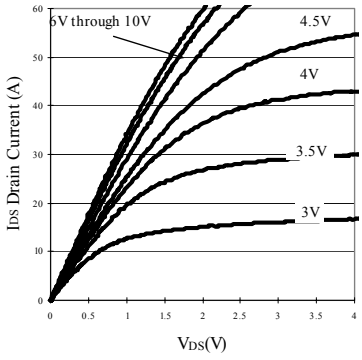
| SPECIFICATIONS ($T_A$ = 25°C UNLESS OTHERWISE NOTED) | | | | | | |
|---|---|---|---|---|---|---|
| **Parameter** | **Symbol** | **Test Conditions** | **Limits** | | | **Unit** |
| | | | **Min** | **Typ** | **Max** | |
| **Static** | | | | | | |
| Gate-Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = -250 uA | -1 | | | |
| Gate-Body Leakage | $I_{GSS}$ | $V_{DS}$ = 0 V, $V_{GS}$ = ±25 V | | | ±100 | nA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = -24 V, $V_{GS}$ = 0 V | | | -1 | uA |
| | | $V_{DS}$ = -24 V, $V_{GS}$ = 0 V, $T_J$ = 55°C | | | -5 | |
| On-State Drain Current[A] | $I_{D(on)}$ | $V_{DS}$ = -5 V, $V_{GS}$ = -10 V | -41 | | | A |
| Drain-Source On-Resistance[A] | $r_{DS(on)}$ | $V_{GS}$ = -10 V, $I_D$ = -36 A | | | 30 | mΩ |
| | | $V_{GS}$ = -4.5 V, $I_D$ = -29 A | | | 40 | |
| Forward Tranconductance[A] | $g_{fs}$ | $V_{DS}$ = -15 V, $I_D$ = -36 A | | 31 | | S |
| Diode Forward Voltage | $V_{SD}$ | $I_S$ = -41 A, $V_{GS}$ = 0 V | | -0.7 | | V |
| **Dynamic[b]** | | | | | | |
| Total Gate Charge | $Q_g$ | $V_{DS}$ = -15 V, $V_{GS}$ = -4.5 V, $I_D$ = -36 A | | 13.9 | 30 | nC |
| Gate-Source Charge | $Q_{gs}$ | | | 5.2 | 20 | |
| Gate-Drain Charge | $Q_{gd}$ | | | 5.8 | 20 | |
| Input Capacitance | $C_{iss}$ | $V_{DS}$ = -15 V, $V_{GS}$ = 0 V, f = 1MHz | | 1583 | 4000 | pF |
| Output Capacitance | $C_{oss}$ | | | 278 | 600 | |
| Reverse Transfer Capacitance | $C_{rss}$ | | | 183 | 400 | |
| **Switching** | | | | | | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DD}$ = -15 V, $R_L$ = 15 Ω , ID = -41 A, VGEN = -10 V, RG = 6Ω | | 15 | | nS |
| Rise Time | $t_r$ | | | 12 | | |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 62 | | |
| Fall-Time | $t_f$ | | | 46 | | |

Notes

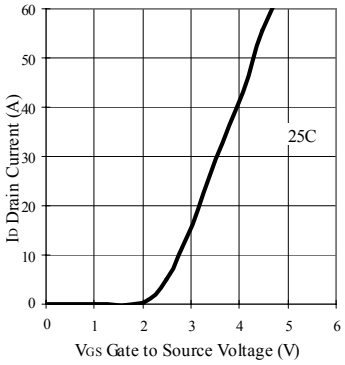
a. Pulse test: PW <= 300us duty cycle <= 2%.

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

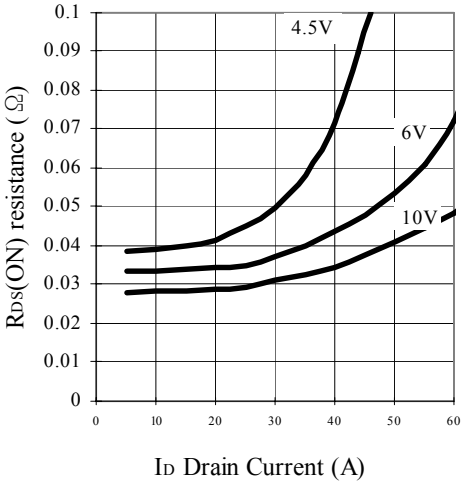
# Typical Electrical Characteristics



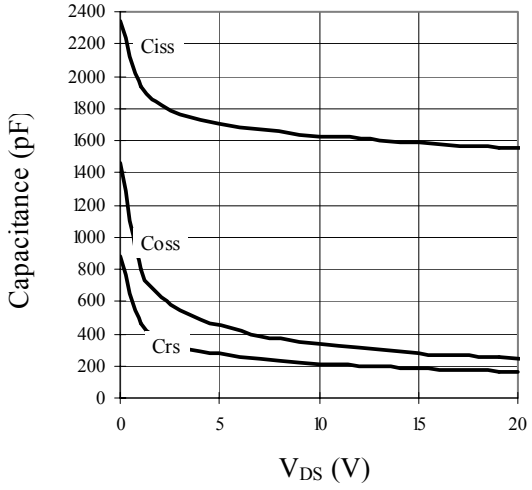

**Output Characteristics**



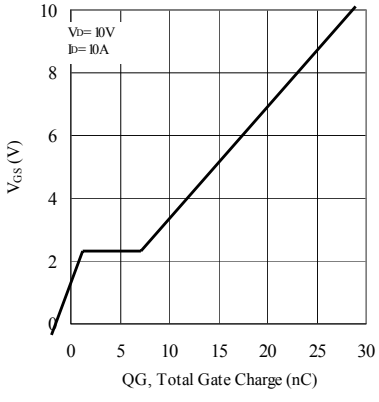

**Transfer Characteristics**



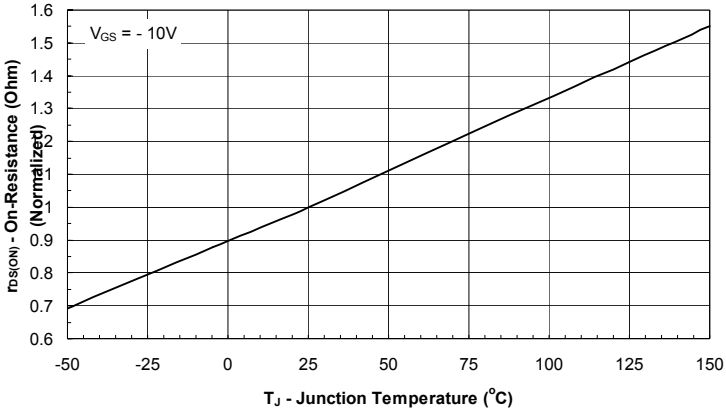

**On Resistance Vs Vgs Voltage**




**Capacitance**

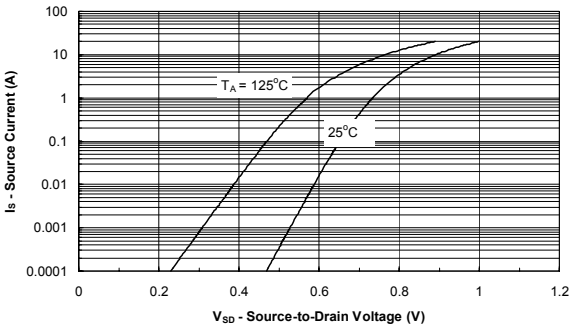



**Gate Charge**

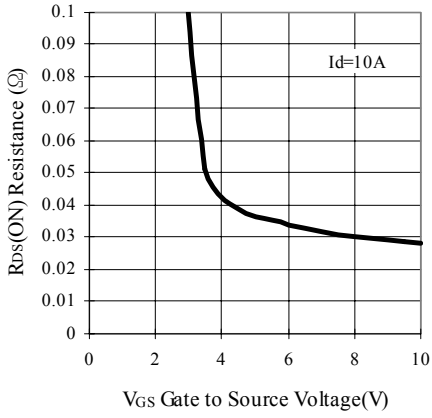



**On-Resistance vs. Junction Temperature**

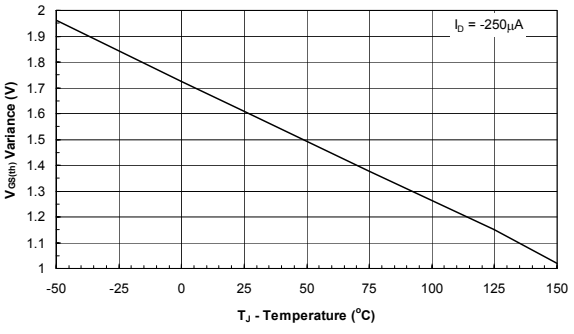
# Typical Electrical Characteristics




**Source-Drain Diode Forward Voltage**




**On-Resistance with Gate to Source Voltage**




**Threshold Voltage**

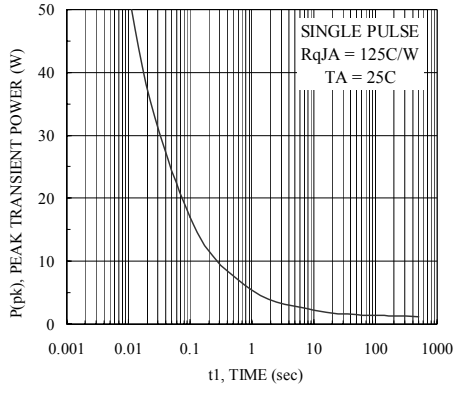



**Figure 10. Single Pulse Maximum Power Dissipation**

**Normalized Thermal Transient Junction to Ambient**

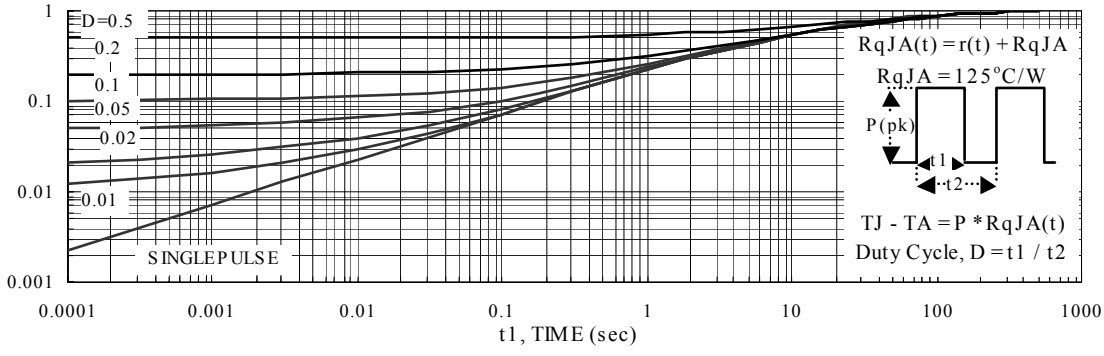
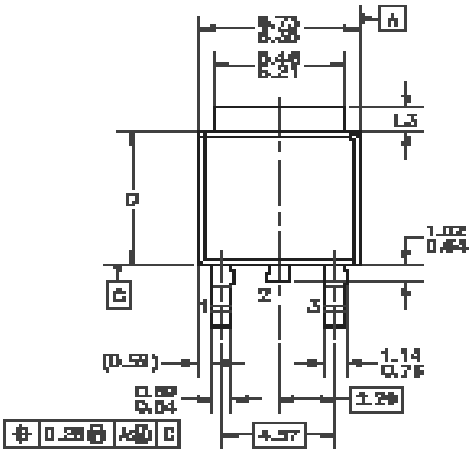
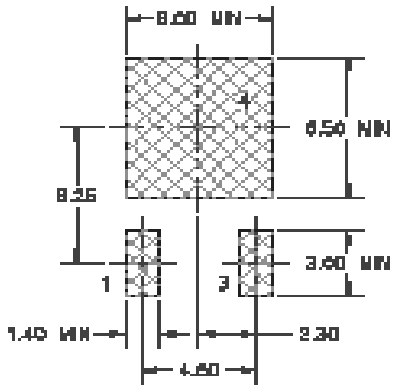


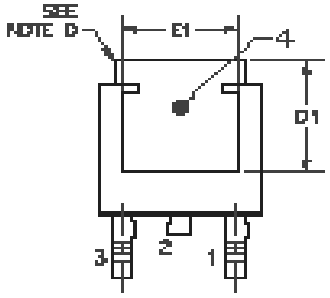

**Figure 11. Transient Thermal Response Curve**

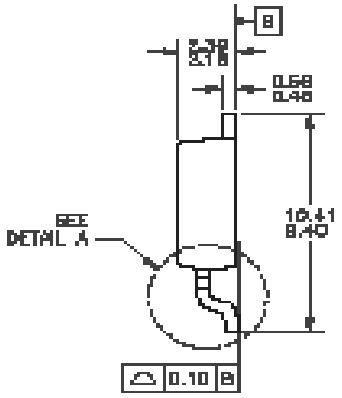
# Package Information

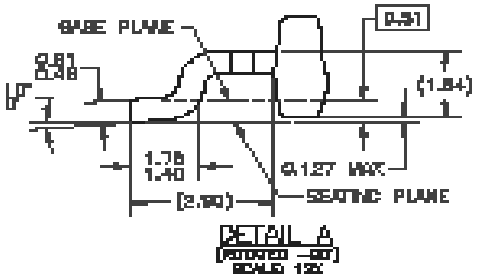



LAND PATTERN RECOMMENDATION




NOTES: UNLESS OTHERWISE SPECIFIED
A) ALL DIMENSIONS ARE IN MILLIMETERS.
B) THIS PACKAGE CONFORMS TO JEDEC, TO-263, ISSUE C, VARIATION AA, Ø REF, DATED NOV. 1989.
C) DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.
D) HEAT SINK TOP EDGE COULD BE IN CHAMFERED CORNERS OR EDGE PROTRUSION.
E) DIMENSIONS L3,D,E1 & D1 TABLE:

| | OPTION A1 | OPTION A2 |
|---|---|---|
| L3 | 0.08–1.27 | 1.02–2.59 |
| D | 8.07–8.83 | 8.44–8.89 |
| E1 | 4.32 MIN | 3.81 MIN |
| D1 | 3.81 MIN | 4.57 MIN |