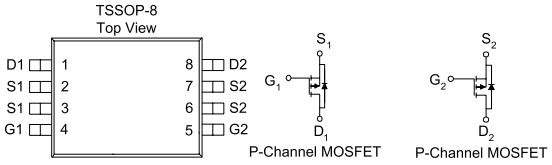
# Dual P-Channel 12-V (D-S) MOSFET

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.

- Low $r_{DS(on)}$ provides higher efficiency and extends battery life
- Low thermal impedance copper leadframe TSSOP-8 saves board space
- Fast switching speed
- High performance trench technology

| PRODUCT SUMMARY | | |
|---|---|---|
| $V_{DS}$ (V) | $r_{DS(on)}$ (OHM) | $I_D$ (A) |
| -12 | 0.022 @ $V_{GS}$ = -4.5V | -5.7 |
| | 0.027 @ $V_{GS}$ = -2.5V | -4.9 |
| | 0.032 @ $V_{GS}$ = -1.8V | -4.0 |




| ABSOLUTE MAXIMUM RATINGS ($T_A$ = 25 °C UNLESS OTHERWISE NOTED) | | | | |
|---|---|---|---|---|
| Parameter | | Symbol | Maximum | Units |
| Drain-Source Voltage | | $V_{DS}$ | -12 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±8 | |
| Continuous Drain Current[a] | $T_A$=25°C | $I_D$ | -5.7 | A |
| | $T_A$=70°C | | -4.7 | |
| Pulsed Drain Current[b] | | $I_{DM}$ | -10 | |
| Continuous Source Current (Diode Conduction)[a] | | $I_S$ | ±1.6 | A |
| Power Dissipation[a] | $T_A$=25°C | $P_D$ | 1.15 | W |
| | $T_A$=70°C | | 0.7 | |
| Operating Junction and Storage Temperature Range | | $T_J$, $T_{stg}$ | -55 to 150 | °C |

| THERMAL RESISTANCE RATINGS | | | | | |
|---|---|---|---|---|---|
| Parameter | | Symbol | Typ | Max | |
| Maximum Junction-to-Ambient[a] | t <= 10 sec | $R_{thJA}$ | 93 | 110 | °C/W |
| | Steady State | | 130 | 150 | |

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 | -0.4 | | | V |
| Gate-Body Leakage | $I_{GSS}$ | $V_{DS}$ = 0 V, $V_{GS}$ = +/-8 V | | | ±100 | nA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = -9.6 V, $V_{GS}$ = 0 V | | | -1 | uA |
| | | $V_{DS}$ = -9.6 V, $V_{GS}$ = 0 V, $T_J$ = 55°C | | | -10 | |
| On-State Drain Current[A] | $I_{D(on)}$ | $V_{DS}$ = -5 V, $V_{GS}$ = -10 V | -3 | | | A |
| Drain-Source On-Resistance[A] | $r_{DS(on)}$ | $V_{GS}$ = -4.5 V, $I_D$ = -4.0 A | | | 0.022 | Ω |
| | | $V_{GS}$ = -2.5 V, $I_D$ = -3.6 A | | | 0.027 | |
| | | $V_{GS}$ = -1.8 V, $I_D$ = -3.2 A | | | 0.032 | |
| Forward Tranconductance[A] | $g_{fs}$ | $V_{DS}$ = -5 V, $I_D$ = -4.0 A | | 3 | | S |
| Diode Forward Voltage | $V_{SD}$ | $I_S$ = -1.6 A, $V_{GS}$ = 0 V | | -0.7 | | V |
| **Dynamic[b]** | | | | | | |
| Total Gate Charge | $Q_g$ | $V_{DS}$ = -5 V, $V_{GS}$ = -4.5 V, $I_D$ = -4.0 A | | 19 | | nC |
| Gate-Source Charge | $Q_{gs}$ | | | 4.5 | | |
| Gate-Drain Charge | $Q_{gd}$ | | | 5.3 | | |
| Input Capacitance | $C_{iss}$ | P-Channel VDS=-6V, VGS=0V, f=1MHz | | 1800 | | pF |
| Output Capacitance | $C_{oss}$ | | | 400 | | |
| Reverse Transfer Capacitance | $C_{rss}$ | | | 300 | | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DD}$ = -5 V, $R_L$ = 5 OHM, $V_{GEN}$ = -4.5 V, $R_G$ = 6 OHM | | 240 | | ns |
| Rise Time | $t_r$ | | | 580 | | |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 7 | | |
| Fall-Time | $t_f$ | | | 4.2 | | |

Notes

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

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

# Typical Electrical Characteristics

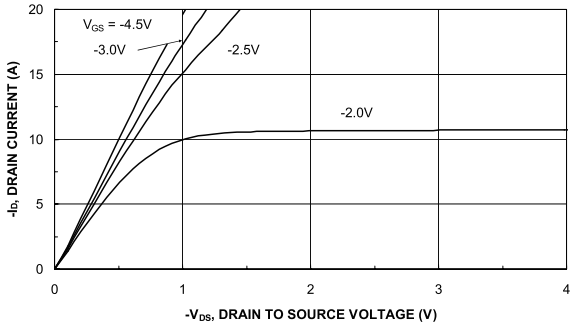



**Figure 1. Output Characteristics**

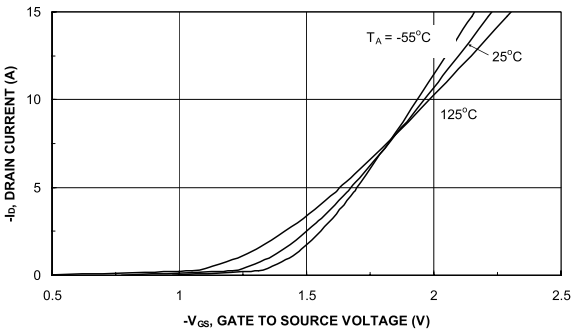



**Figure 2. Transfer Characteristics**

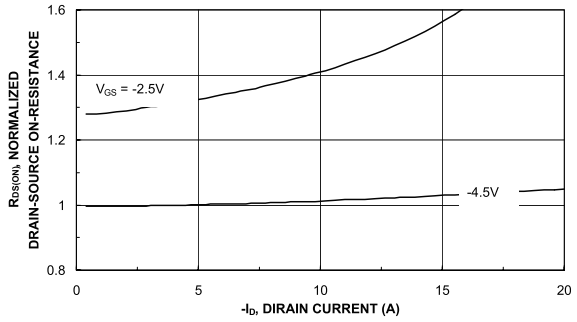



**Figure 3. On-Resistance vs. Drain Current**

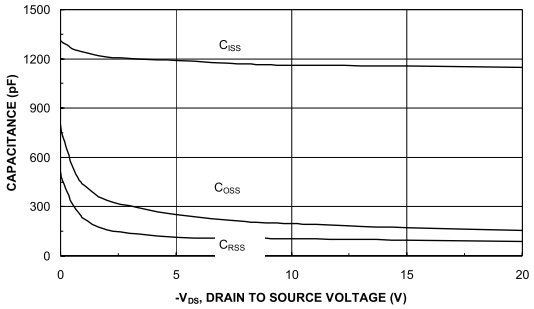



**Figure 4. Capacitance**

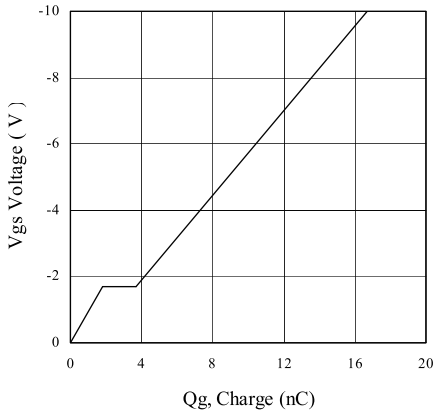



**Figure 5. Gate Charge**

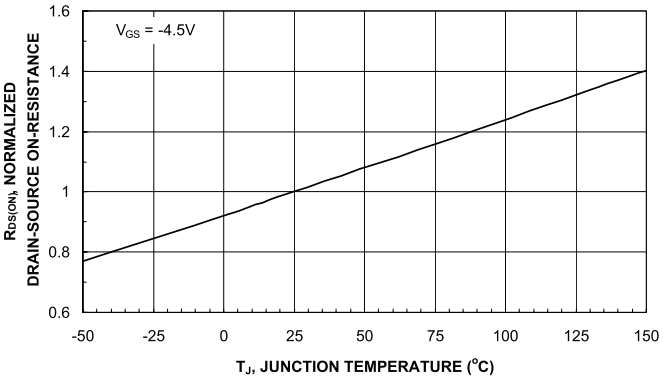



**Figure 6. On-Resistance vs. Junction Temperature**

# Typical Electrical Characteristics

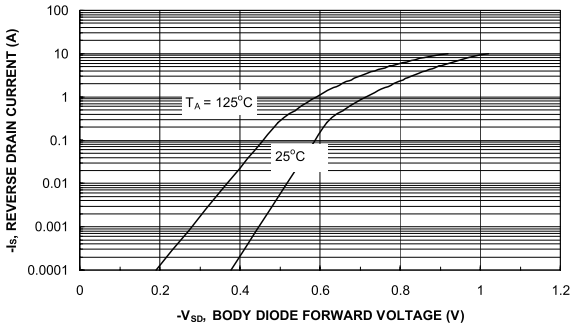



**Figure 7. Source-Drain Diode Forward Voltage**

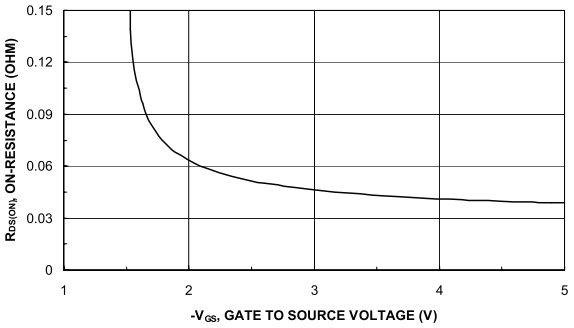



**Figure 8. On-Resistance with Gate to Source Voltage**

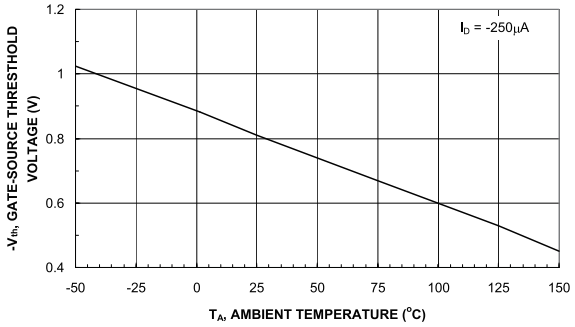



**Figure 9. Vth Gate to Source Voltage Vs Temperature**

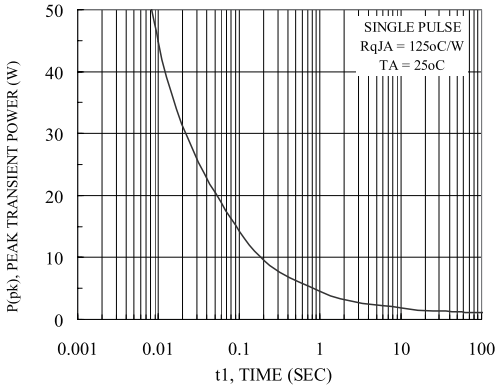



**Figure 10. Single Pulse Maximum Power Dissipation**

**Normalized Thermal Transient Junction to Ambient**

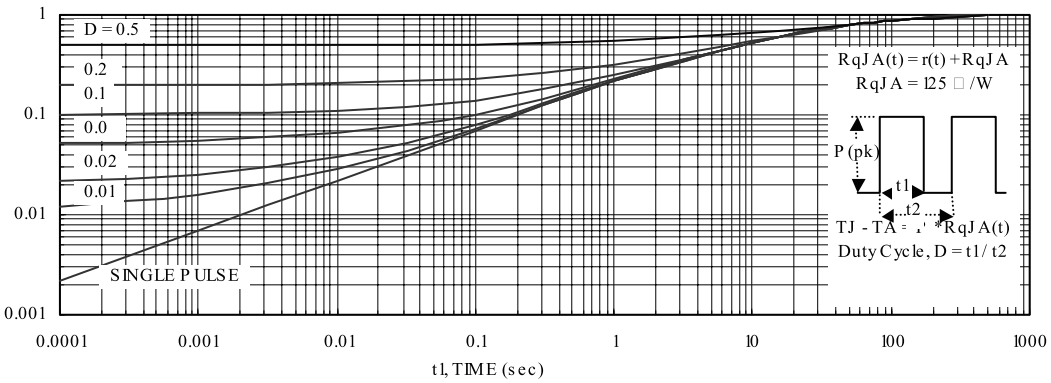
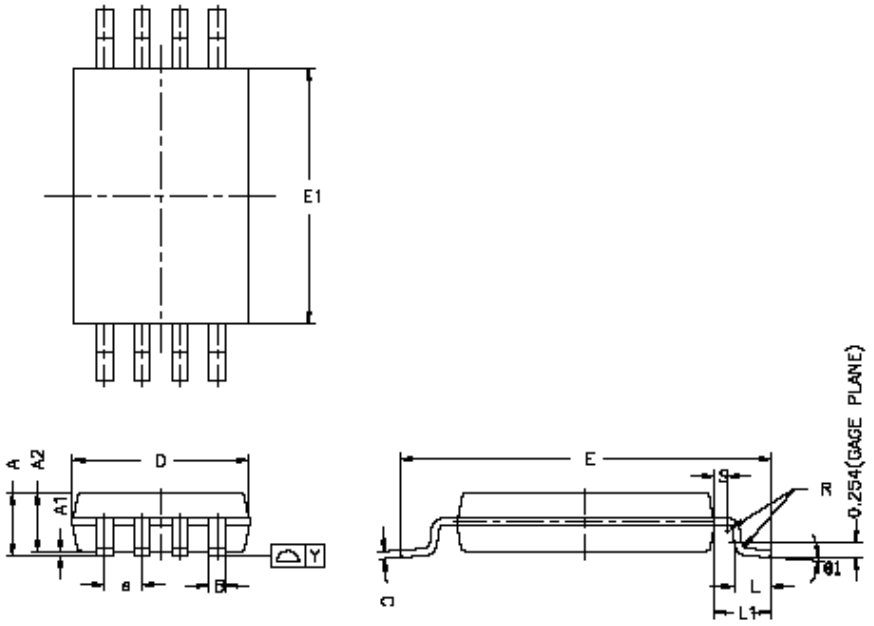



**Figure 11. Transient Thermal Response Curve**

# Package Information

**TSSOP-8: 8LEAD**




| DIM. | MILLIMETERS | | |
|---|---|---|---|
| | MIN. | NOM. | MAX. |
| A | 1.05 | 1.10 | 1.20 |
| A(1) | 0.05 | 0.10 | 0.15 |
| A(2) | 0.99 | 1.02 | 1.05 |
| B | 0.19 | 0.25 | 0.30 |
| C | -- | 0.127 | -- |
| D | 2.90 | 3.00 | 3.10 |
| E | 6.20 | 6.40 | 6.60 |
| E1 | 4.30 | 4.40 | 4.50 |
| e | 0.65BSC | | |
| L | 0.45 | 0.60 | 0.75 |
| L1 | 0.90 | 1.00 | 1.10 |
| Y | -- | -- | 0.10 |
| θ1 | 0° | 4° | 8° |
| R | 0.09 | -- | -- |
| S | 0.20 | -- | -- |