

## N-Channel 250-V (D-S) MOSFET

### Key Features:

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

### Typical Applications:

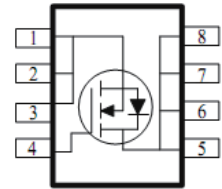
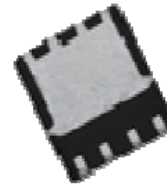
- White LED boost converters
- Automotive Systems
- Industrial DC/DC Conversion Circuits

| PRODUCT SUMMARY |                            |           |
|-----------------|----------------------------|-----------|
| $V_{DS}$ (V)    | $r_{DS(on)}$ (m $\Omega$ ) | $I_D$ (A) |
| 250             | 280 @ $V_{GS} = 10V$       | 3.5       |
|                 | 340 @ $V_{GS} = 5.5V$      | 3.2       |



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

DFN5X6-8L



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

| Parameter                                                 |                          | Symbol         | Limit      | Units            |
|-----------------------------------------------------------|--------------------------|----------------|------------|------------------|
| Drain-Source Voltage                                      |                          | $V_{DS}$       | 250        | V                |
| Gate-Source Voltage                                       |                          | $V_{GS}$       | $\pm 20$   |                  |
| Continuous Drain Current <sup>a</sup>                     | $T_A = 25^\circ\text{C}$ | $I_D$          | 3.5        | A                |
|                                                           | $T_A = 70^\circ\text{C}$ |                | 2.8        |                  |
| Pulsed Drain Current <sup>b</sup>                         |                          | $I_{DM}$       | 15         |                  |
| Continuous Source Current (Diode Conduction) <sup>a</sup> |                          | $I_S$          | 6.9        | A                |
| Power Dissipation <sup>a</sup>                            | $T_A = 25^\circ\text{C}$ | $P_D$          | 5          | W                |
|                                                           | $T_A = 70^\circ\text{C}$ |                | 3.2        |                  |
| Operating Junction and Storage Temperature Range          |                          | $T_J, T_{stg}$ | -55 to 150 | $^\circ\text{C}$ |

### THERMAL RESISTANCE RATINGS

| Parameter                                |                         | Symbol          | Maximum | Units              |
|------------------------------------------|-------------------------|-----------------|---------|--------------------|
| Maximum Junction-to-Ambient <sup>a</sup> | $t \leq 10 \text{ sec}$ | $R_{\theta JA}$ | 25      | $^\circ\text{C/W}$ |
|                                          | Steady State            |                 | 65      |                    |

### Notes

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

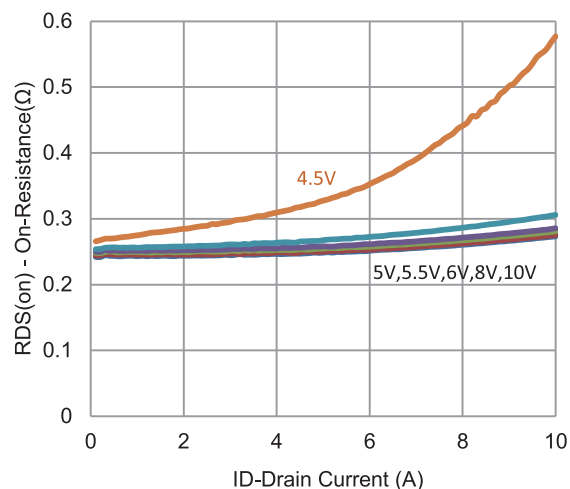
## Electrical Characteristics

| 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                       | $I_{GSS}$    | $V_{DS} = 0 V, V_{GS} = \pm 20 V$                                                          |     |      | $\pm 10$ | $\mu A$    |
| Zero Gate Voltage Drain Current         | $I_{DSS}$    | $V_{DS} = 200 V, V_{GS} = 0 V$                                                             |     |      | 1        | $\mu A$    |
|                                         |              | $V_{DS} = 200 V, V_{GS} = 0 V, T_J = 55^\circ C$                                           |     |      | 25       |            |
| On-State Drain Current <sup>a</sup>     | $I_{D(on)}$  | $V_{DS} = 5 V, V_{GS} = 10 V$                                                              | 5   |      |          | A          |
| Drain-Source On-Resistance <sup>a</sup> | $r_{DS(on)}$ | $V_{GS} = 10 V, I_D = 2 A$                                                                 |     |      | 280      | m $\Omega$ |
|                                         |              | $V_{GS} = 5.5 V, I_D = 1.6 A$                                                              |     |      | 340      |            |
| Forward Transconductance <sup>a</sup>   | $g_{fs}$     | $V_{DS} = 15 V, I_D = 2 A$                                                                 |     | 14   |          | S          |
| Diode Forward Voltage <sup>a</sup>      | $V_{SD}$     | $I_S = 3.45 A, V_{GS} = 0 V$                                                               |     | 0.75 |          | V          |
| <b>Dynamic <sup>b</sup></b>             |              |                                                                                            |     |      |          |            |
| Total Gate Charge                       | $Q_g$        | $V_{DS} = 100 V, V_{GS} = 4.5 V,$<br>$I_D = 2 A$                                           |     | 13   |          | nC         |
| Gate-Source Charge                      | $Q_{gs}$     |                                                                                            |     | 4.5  |          |            |
| Gate-Drain Charge                       | $Q_{gd}$     |                                                                                            |     | 7.3  |          |            |
| Turn-On Delay Time                      | $t_{d(on)}$  | $V_{DS} = 100 V, R_L = 50 \Omega,$<br>$I_D = 2 A,$<br>$V_{GEN} = 10 V, R_{GEN} = 6 \Omega$ |     | 13   |          | ns         |
| Rise Time                               | $t_r$        |                                                                                            |     | 10   |          |            |
| Turn-Off Delay Time                     | $t_{d(off)}$ |                                                                                            |     | 44   |          |            |
| Fall Time                               | $t_f$        |                                                                                            |     | 21   |          |            |
| Input Capacitance                       | $C_{iss}$    | $V_{DS} = 15 V, V_{GS} = 0 V, f = 1 Mhz$                                                   |     | 1793 |          | pF         |
| Output Capacitance                      | $C_{oss}$    |                                                                                            |     | 129  |          |            |
| Reverse Transfer Capacitance            | $C_{rss}$    |                                                                                            |     | 52   |          |            |

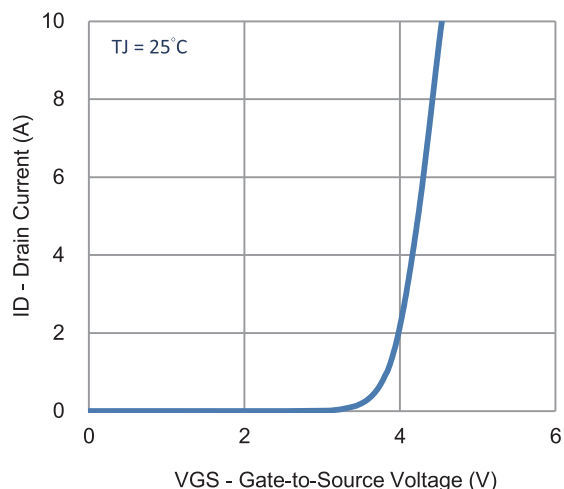
## Notes

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

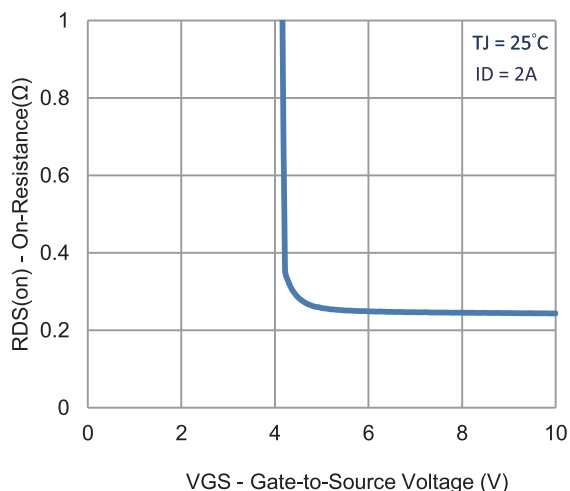
## Typical Electrical Characteristics



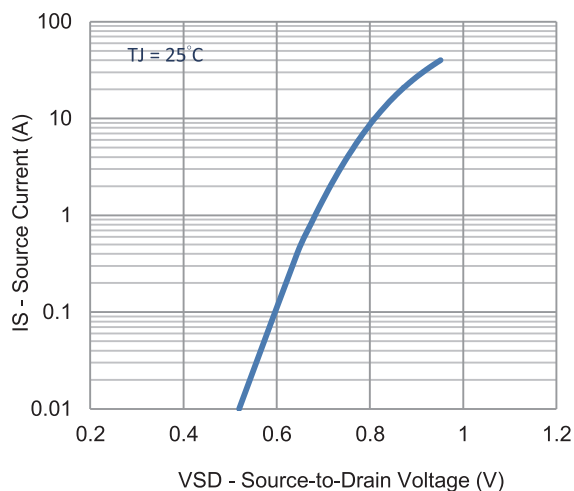
1. On-Resistance vs. Drain Current



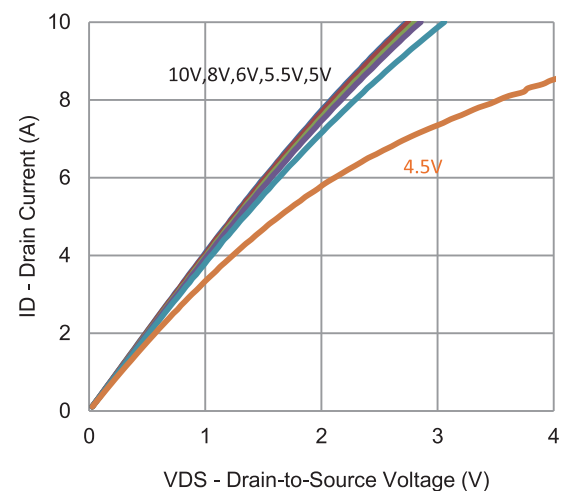
2. Transfer Characteristics



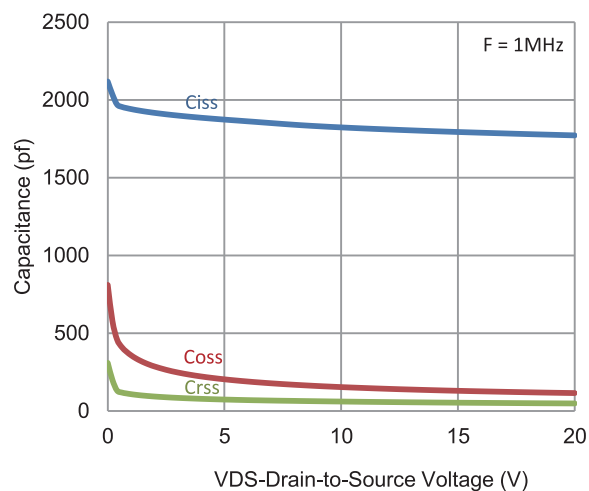
3. On-Resistance vs. Gate-to-Source Voltage



4. Drain-to-Source Forward Voltage

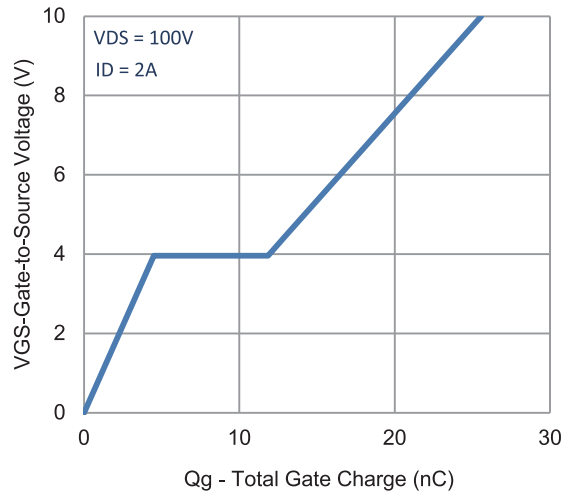


5. Output Characteristics

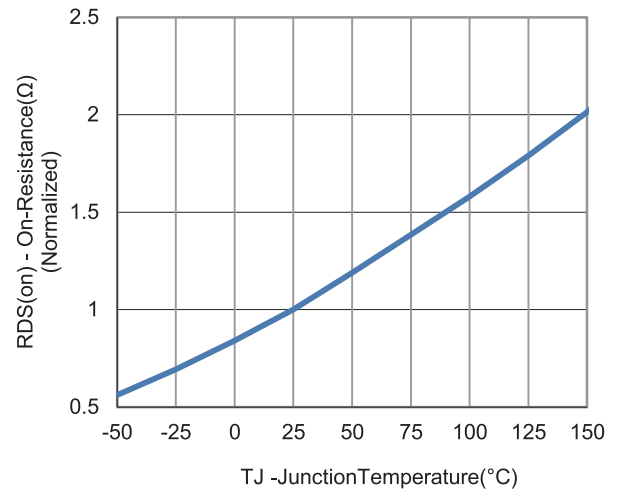


6. Capacitance

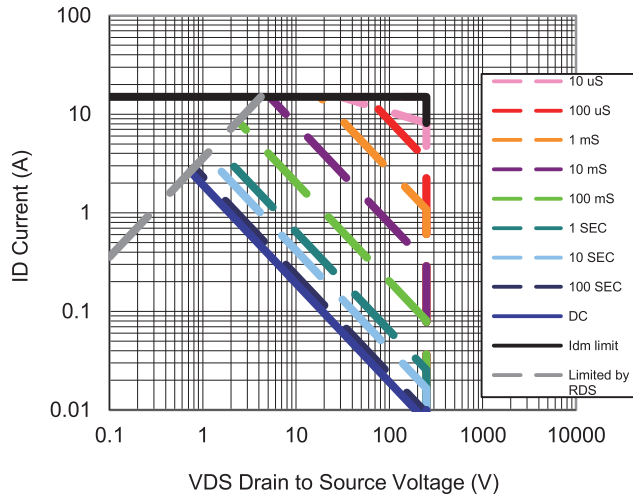
## Typical Electrical Characteristics



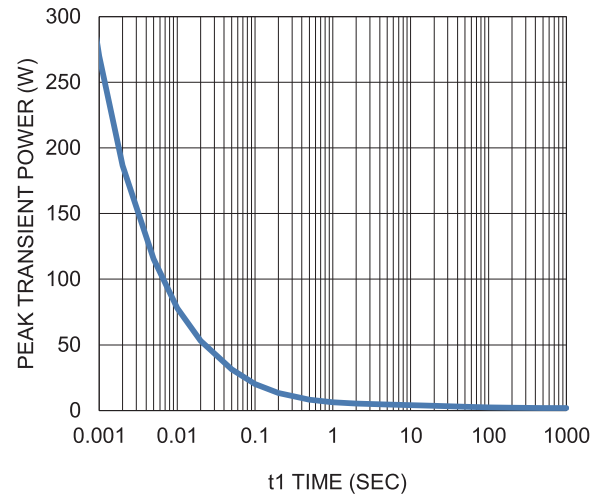
7. Gate Charge



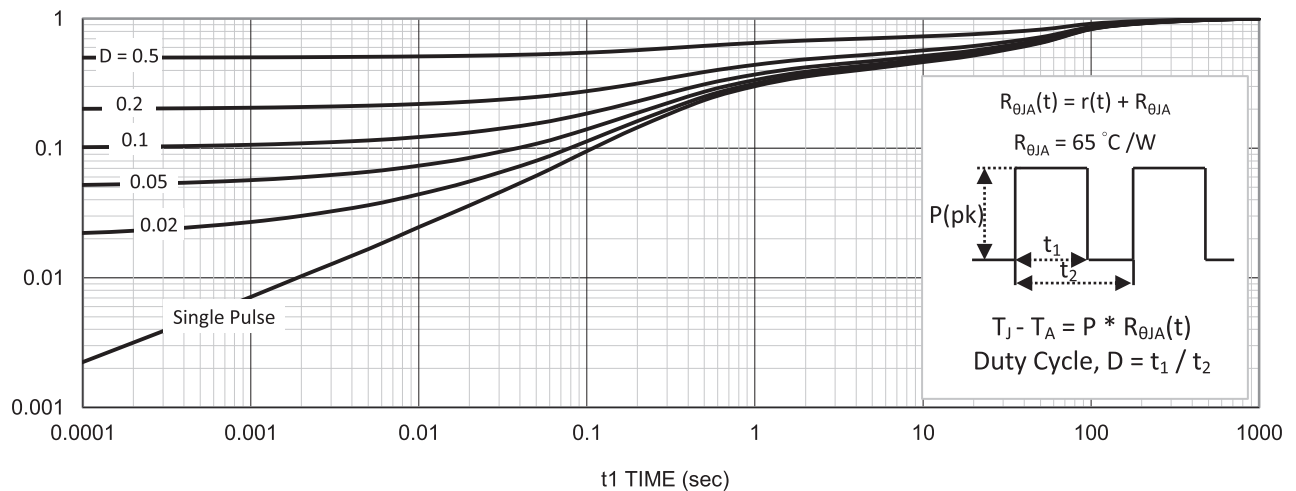
8. Normalized On-Resistance Vs Junction Temperature



9. Safe Operating Area

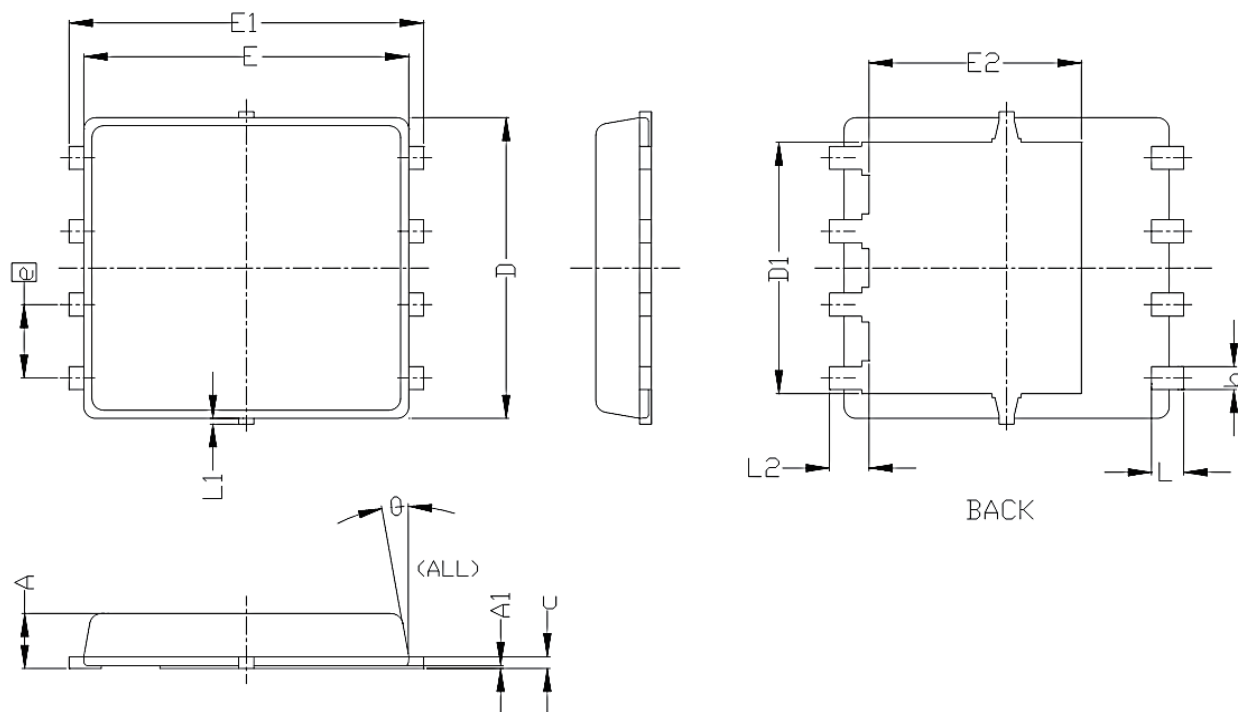


10. Single Pulse Maximum Power Dissipation



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°   |