

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

### Key Features:

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

### Typical Applications:

- DC/DC Conversion Circuits
- Motor Drives

### PRODUCT SUMMARY

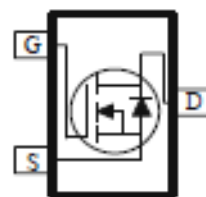
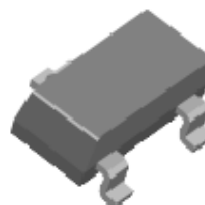
| $V_{DS}$ (V) | $r_{DS(on)}$ (m $\Omega$ ) | $I_D$ (A) |
|--------------|----------------------------|-----------|
| 60           | 194 @ $V_{GS} = 10V$       | 2.2       |
|              | 273 @ $V_{GS} = 4.5V$      | 1.8       |



RoHS  
COMPLIANT  
HALOGEN  
FREE



SOT-23



### 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>                     | $T_A = 25^\circ\text{C}$ | $I_D$      | 2.2              |
|   | $T_A = 70^\circ\text{C}$ |            | 1.7              |
| Pulsed Drain Current <sup>b</sup>                         | $I_{DM}$                 | 10         | A                |
| Continuous Source Current (Diode Conduction) <sup>a</sup> | $I_S$                    | 1.8        | A                |
| Power Dissipation <sup>a</sup>                            | $T_A = 25^\circ\text{C}$ | $P_D$      | 1.3              |
|   | $T_A = 70^\circ\text{C}$ |            | 0.8              |
| 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> | $R_{\theta JA}$ | $t \leq 10 \text{ sec}$ | 100   |
|  |                 | Steady State            | 166   |

### Notes

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

## Electrical Characteristics

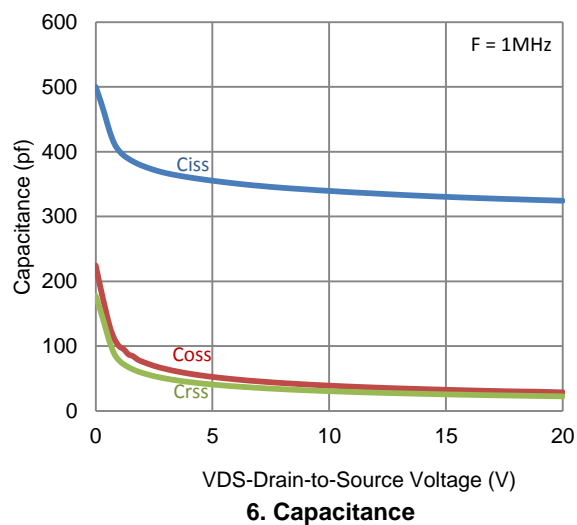
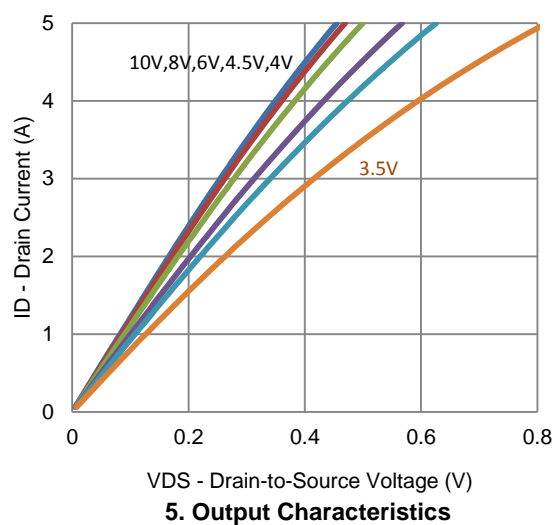
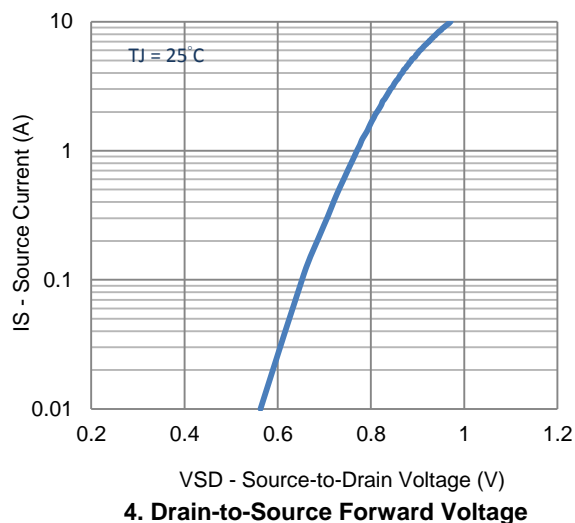
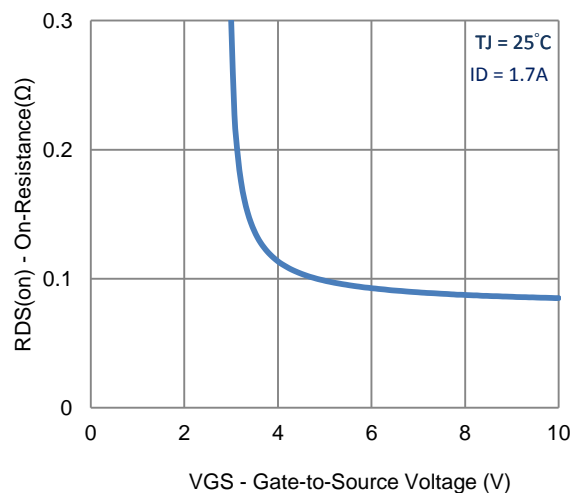
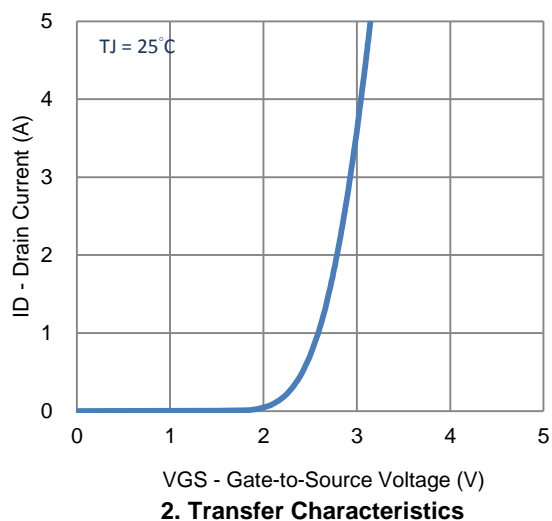
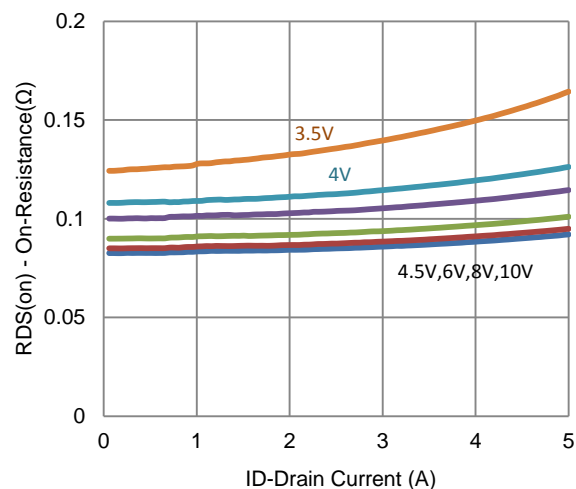
| Parameter                               | Symbol       | Test Conditions   | Min | Typ  | Max      | Unit       |
|---|--------------|---|-----|------|----------|------------|
| <b>Static</b>                           |              |   |     |      |          |            |
| Gate-Source Threshold 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         | $I_{DSS}$    | $V_{DS} = 48 V, V_{GS} = 0 V$   |     |      | 1        | $\mu A$    |
|   |              | $V_{DS} = 48 V, V_{GS} = 0 V, T_J = 55^\circ C$   |     |      | 25       |            |
| On-State Drain Current <sup>a</sup>     | $I_{D(on)}$  | $V_{DS} = 5 V, V_{GS} = 10 V$   | 3.5 |      |          | A          |
| Drain-Source On-Resistance <sup>a</sup> | $r_{DS(on)}$ | $V_{GS} = 10 V, I_D = 1.7 A$  |     |      | 194      | m $\Omega$ |
|   |              | $V_{GS} = 4.5 V, I_D = 1.4 A$   |     |      | 273      |            |
| Forward Transconductance <sup>a</sup>   | $g_{fs}$     | $V_{DS} = 15 V, I_D = 1.7 A$  |     | 14   |          | S          |
| Diode Forward Voltage <sup>a</sup>      | $V_{SD}$     | $I_S = 0.9 A, V_{GS} = 0 V$   |     | 0.77 |          | V          |
| <b>Dynamic <sup>b</sup></b>             |              |   |     |      |          |            |
| Total Gate Charge                       | $Q_g$        | $V_{DS} = 30 V, V_{GS} = 4.5 V,$<br>$I_D = 1.7 A$   |     | 4.3  |          | nC         |
| Gate-Source Charge                      | $Q_{gs}$     |   |     | 1.4  |          |            |
| Gate-Drain Charge                       | $Q_{gd}$     |   |     | 1.9  |          |            |
| Turn-On Delay Time                      | $t_{d(on)}$  | $V_{DS} = 30 V, R_L = 17.7 \Omega,$<br>$I_D = 1.7 A,$<br>$V_{GEN} = 10 V, R_{GEN} = 6 \Omega$ |     | 3    |          | ns         |
| Rise Time                               | $t_r$        |   |     | 5    |          |            |
| Turn-Off Delay Time                     | $t_{d(off)}$ |   |     | 25   |          |            |
| Fall Time                               | $t_f$        |   |     | 6    |          |            |
| Input Capacitance                       | $C_{iss}$    | $V_{DS} = 15 V, V_{GS} = 0 V, f = 1 \text{ Mhz}$  |     | 330  |          | pF         |
| Output Capacitance                      | $C_{oss}$    |   |     | 33   |          |            |
| Reverse Transfer Capacitance            | $C_{rss}$    |   |     | 26   |          |            |

## Notes

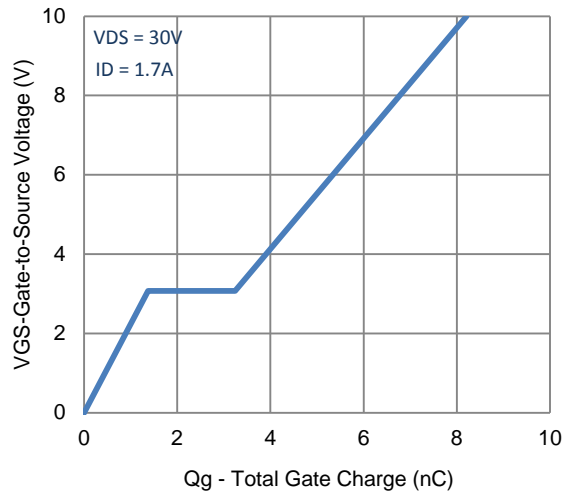
- a. Pulse test: PW ≤ 300us duty cycle ≤ 2%.
- b. Guaranteed by design, not subject to production testing.

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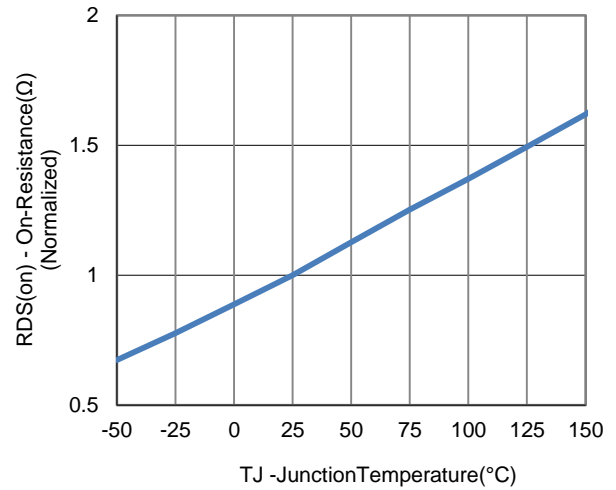
## Typical Electrical Characteristics



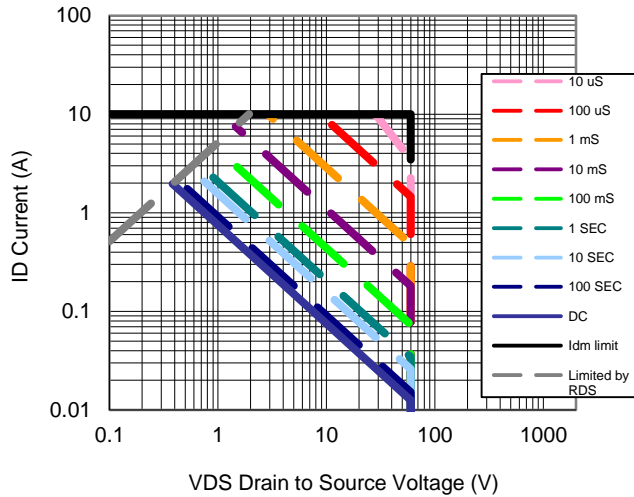
## Typical Electrical Characteristics



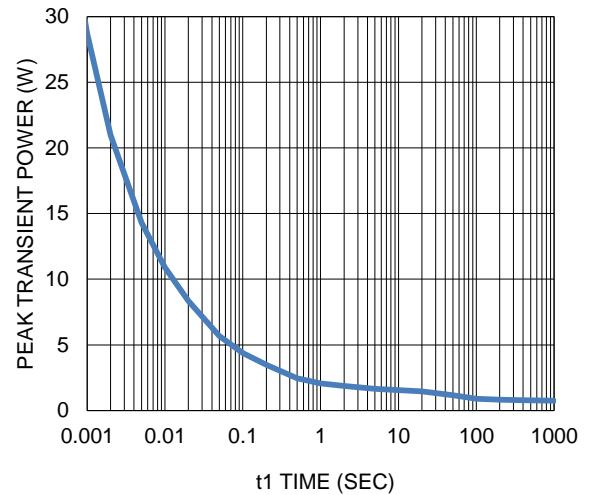
7. Gate Charge



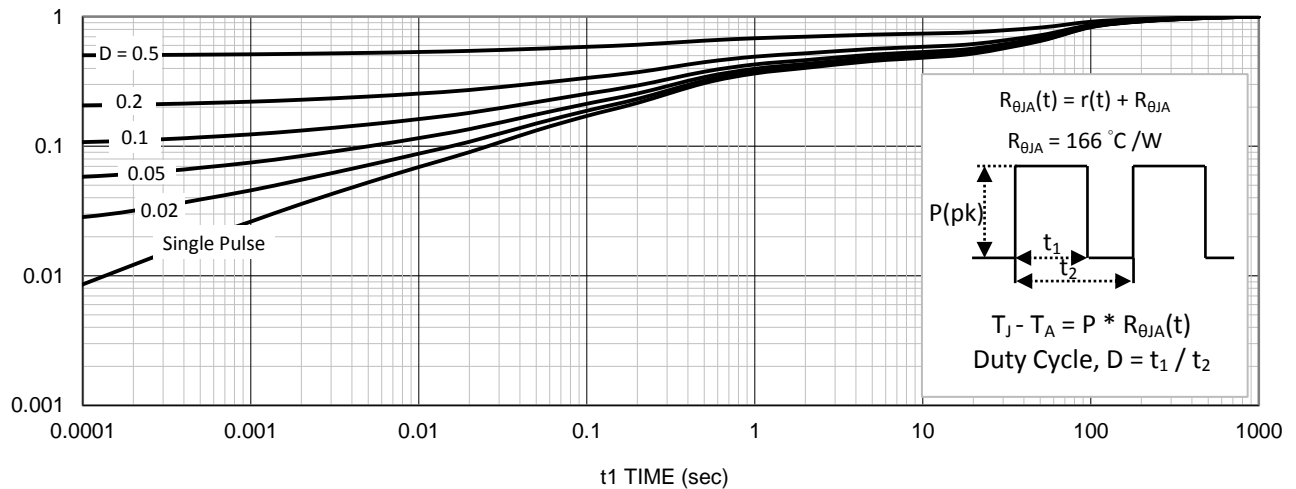
8. Normalized On-Resistance Vs Junction Temperature



9. Safe Operating Area

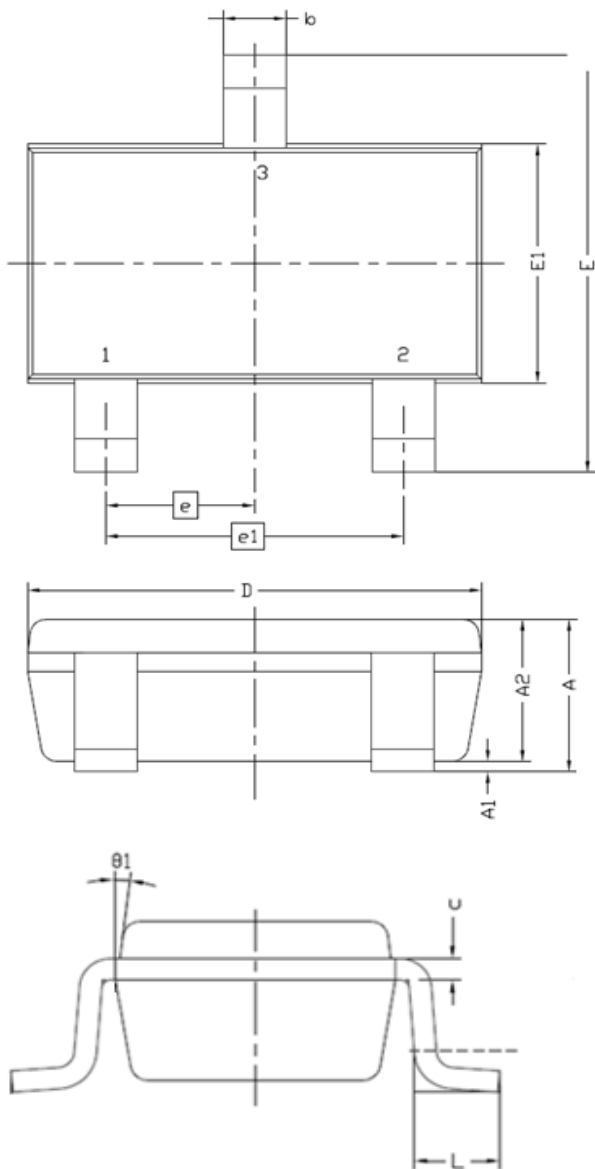


10. Single Pulse Maximum Power Dissipation



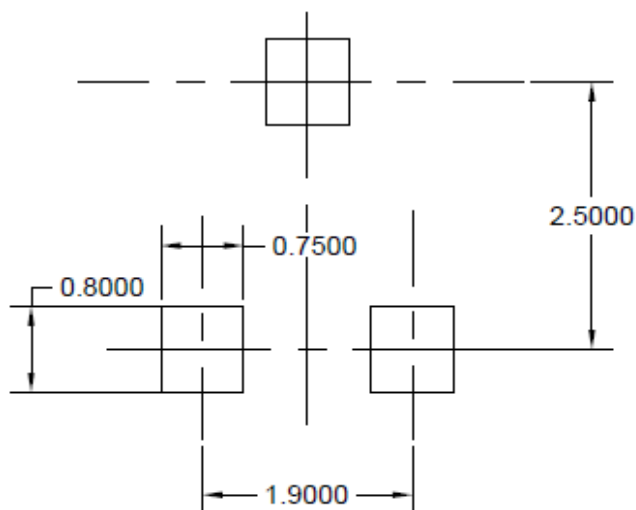
11. Normalized Thermal Transient Junction to Ambient

## Package Information



| Symbol | MILLIMETERS |     |
|--------|-------------|-----|
|        | MIN         | MAX |
| A      | 0.8         | 1.2 |
| A1     | 0           | 0.1 |
| A2     | 0.7         | 1.1 |
| b      | 0.3         | 0.5 |
| c      | 0.1         | 0.2 |
| D      | 2.7         | 3.1 |
| E      | 2.6         | 3   |
| E1     | 1.4         | 1.8 |
| e      | 0.95 BSC    |     |
| e1     | 1.9 BSC     |     |
| L      | 0.3         | 0.6 |
| θ1     | 7° NOM      |     |

## Recommended Pad Layout



Note: Drain opening is recommended to be solder mask defined in a copper fill for improved thermal performance

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