

## N-Channel 20-V (D-S) MOSFET

### Key Features:

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

### Typical Applications:

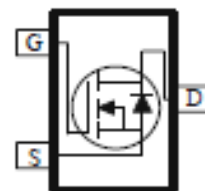
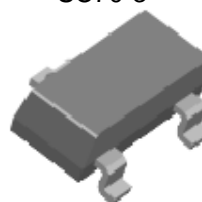
- Power Routing
- Li Ion Battery Packs
- Level Shifting and Driver Circuits

| PRODUCT SUMMARY |                            |           |
|-----------------|----------------------------|-----------|
| $V_{DS}$ (V)    | $r_{DS(on)}$ (m $\Omega$ ) | $I_D$ (A) |
| 20              | 58 @ $V_{GS} = 4.5V$       | 2.0       |
|                 | 82 @ $V_{GS} = 2.5V$       | 1.7       |



RoHS  
COMPLIANT  
HALOGEN  
FREE

SC70-3



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

| Parameter   | Symbol         | Limit                  | Units            |
|---|----------------|------------------------|------------------|
| Drain-Source Voltage                                      | $V_{DS}$       | 20                     | V                |
| Gate-Source Voltage                                       | $V_{GS}$       | $\pm 8$                |                  |
| Continuous Drain Current <sup>a</sup>                     | $I_D$          | $T_A=25^\circ\text{C}$ | 2.0              |
|   |                | $T_A=70^\circ\text{C}$ | 1.6              |
| Pulsed Drain Current <sup>b</sup>                         | $I_{DM}$       | 8                      | A                |
| Continuous Source Current (Diode Conduction) <sup>a</sup> | $I_S$          | 0.5                    | A                |
| Power Dissipation <sup>a</sup>                            | $P_D$          | $T_A=25^\circ\text{C}$ | 0.34             |
|   |                | $T_A=70^\circ\text{C}$ | 0.22             |
| 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 sec | 375   |
|  |                 | Steady State    | 430   |

### Notes

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

## Electrical Characteristics

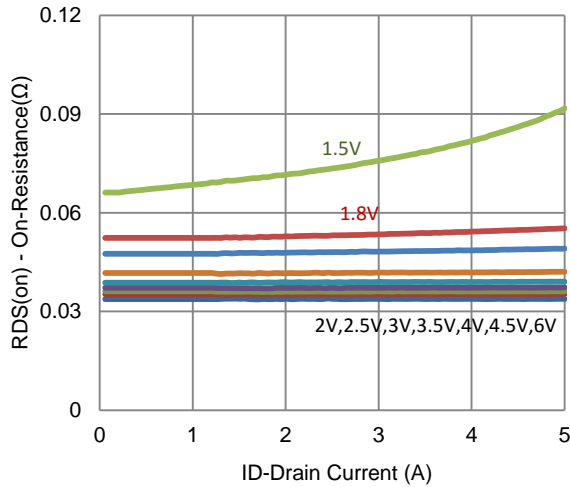
| Parameter                               | Symbol       | Test Conditions   | Min | Typ  | Max       | Unit |
|---|--------------|---|-----|------|-----------|------|
| <b>Static</b>                           |              |   |     |      |           |      |
| Gate-Source Threshold Voltage           | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = 250 \mu A$  | 0.4 |      |           | V    |
| Gate-Body Leakage                       | $I_{GSS}$    | $V_{DS} = 0 V, V_{GS} = \pm 8 V$  |     |      | $\pm 100$ | nA   |
| Zero Gate Voltage Drain Current         | $I_{DSS}$    | $V_{DS} = 16 V, V_{GS} = 0 V$   |     |      | 1         | uA   |
|   |              | $V_{DS} = 16 V, V_{GS} = 0 V, T_J = 55^\circ C$   |     |      | 10        |      |
| On-State Drain Current <sup>a</sup>     | $I_{D(on)}$  | $V_{DS} = 5 V, V_{GS} = 4.5 V$  | 3   |      |           | A    |
| Drain-Source On-Resistance <sup>a</sup> | $r_{DS(on)}$ | $V_{GS} = 4.5 V, I_D = 1.6 A$   |     |      | 58        | mΩ   |
|   |              | $V_{GS} = 2.5 V, I_D = 1.3 A$   |     |      | 82        |      |
| Forward Transconductance <sup>a</sup>   | $g_{fs}$     | $V_{DS} = 15 V, I_D = 1.6 A$  |     | 3    |           | S    |
| Diode Forward Voltage <sup>a</sup>      | $V_{SD}$     | $I_S = 0.25 A, V_{GS} = 0 V$  |     | 0.58 |           | V    |
| <b>Dynamic <sup>b</sup></b>             |              |   |     |      |           |      |
| Total Gate Charge                       | $Q_g$        | $V_{DS} = 10 V, V_{GS} = 4.5 V,$<br>$I_D = 1.6 A$   |     | 6    |           | nC   |
| Gate-Source Charge                      | $Q_{gs}$     |   |     | 0.8  |           |      |
| Gate-Drain Charge                       | $Q_{gd}$     |   |     | 1.6  |           |      |
| Turn-On Delay Time                      | $t_{d(on)}$  | $V_{DS} = 10 V, R_L = 6.3 \Omega,$<br>$I_D = 1.6 A,$<br>$V_{GEN} = 4.5 V, R_{GEN} = 6 \Omega$ |     | 12   |           | ns   |
| Rise Time                               | $t_r$        |   |     | 16   |           |      |
| Turn-Off Delay Time                     | $t_{d(off)}$ |   |     | 51   |           |      |
| Fall Time                               | $t_f$        |   |     | 15   |           |      |
| Input Capacitance                       | $C_{iss}$    | $V_{DS} = 15 V, V_{GS} = 0 V, f = 1 \text{ Mhz}$  |     | 433  |           | pF   |
| Output Capacitance                      | $C_{oss}$    |   |     | 63   |           |      |
| Reverse Transfer Capacitance            | $C_{rss}$    |   |     | 49   |           |      |

## Notes

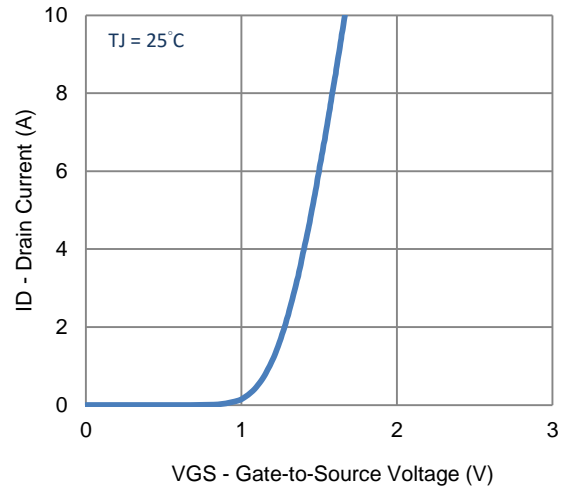
- Pulse test:  $PW \leq 300 \mu s$  duty cycle  $\leq 2\%$ .
- Guaranteed by design, not subject to production testing.

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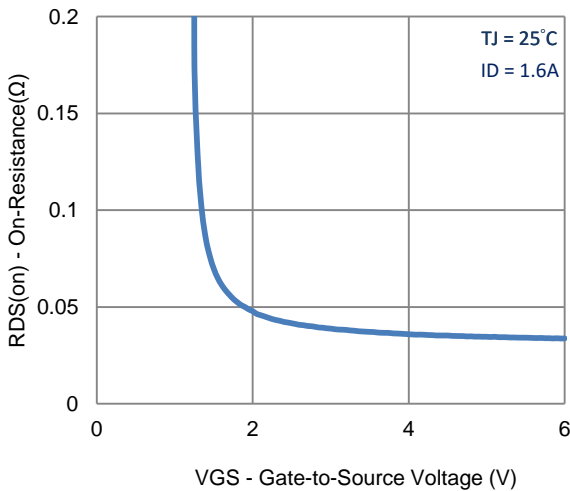
Typical Electrical Characteristics



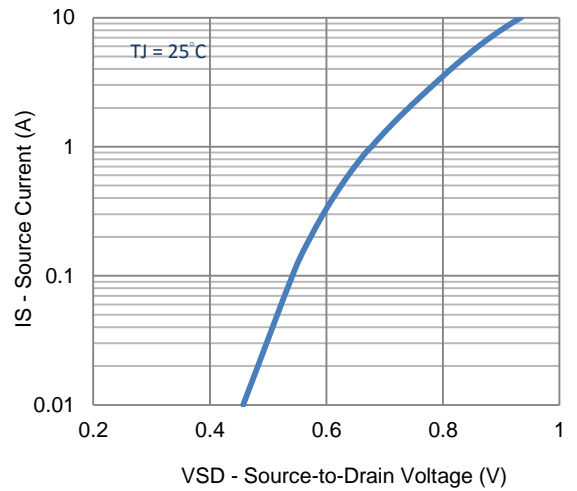
1. On-Resistance vs. Drain Current



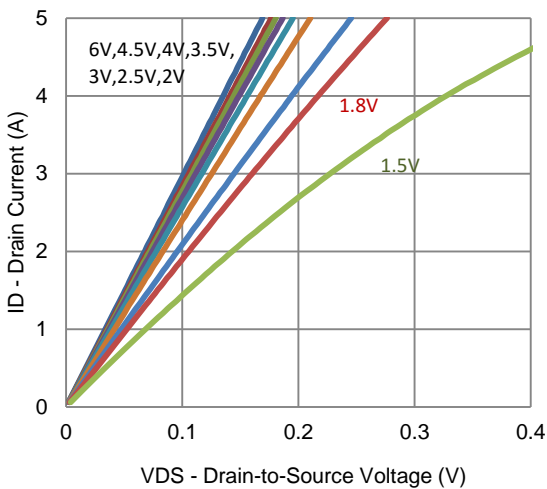
2. Transfer Characteristics



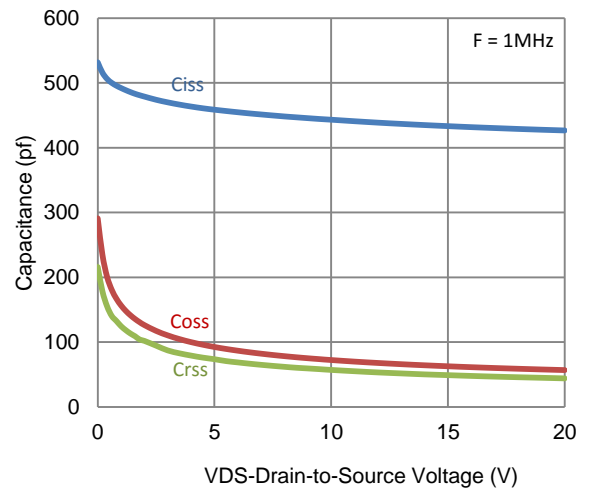
3. On-Resistance vs. Gate-to-Source Voltage



4. Drain-to-Source Forward Voltage

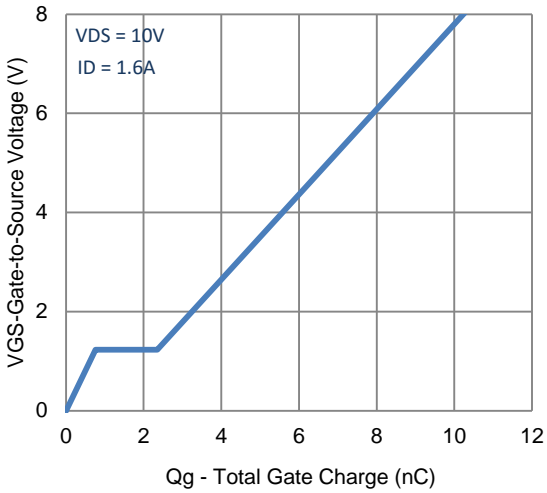


5. Output Characteristics

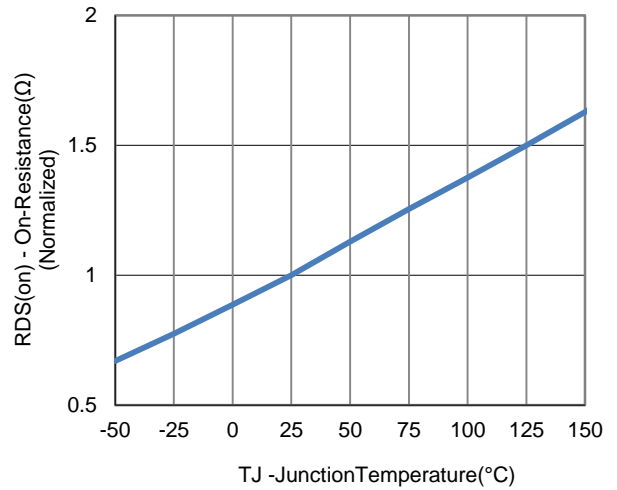


6. Capacitance

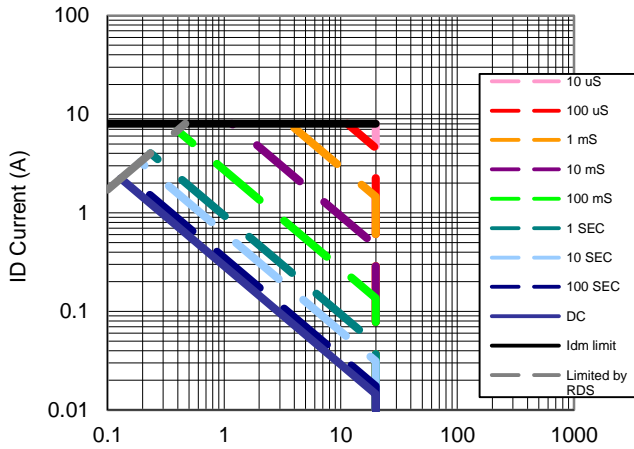
Typical Electrical Characteristics



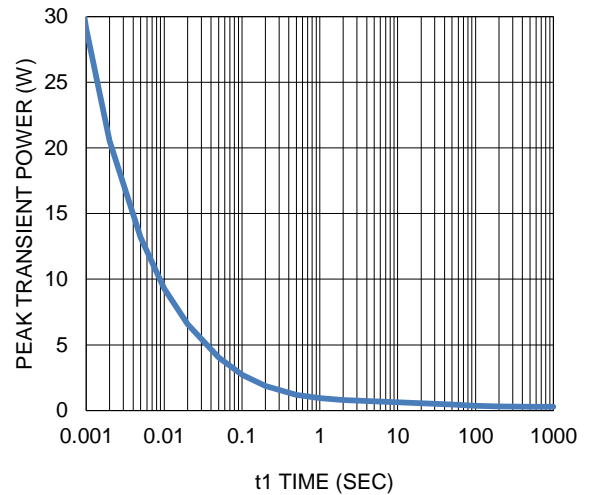
7. Gate Charge



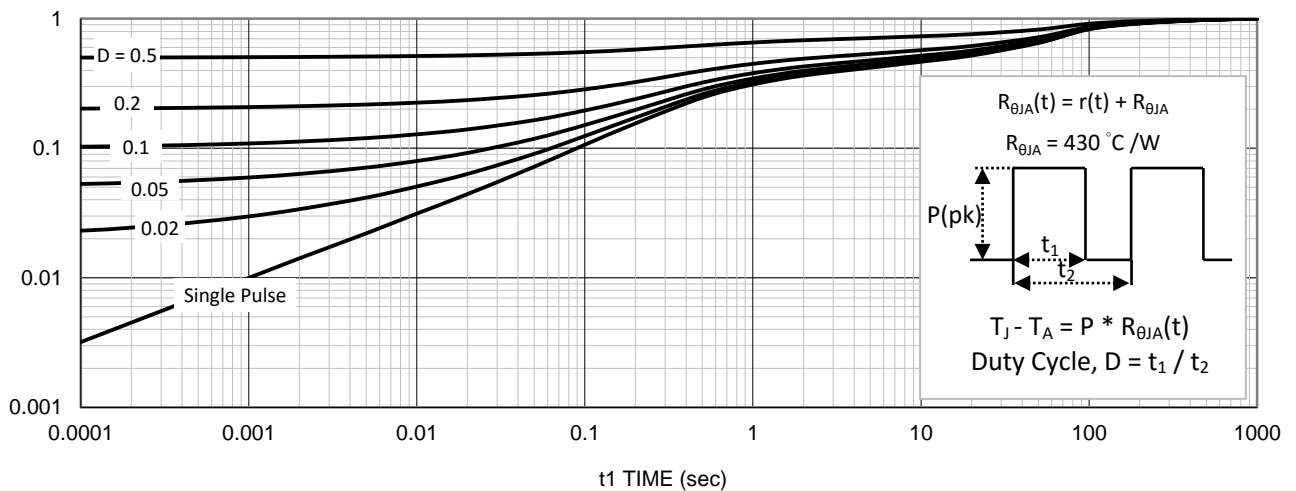
8. Normalized On-Resistance Vs Junction Temperature



9. Safe Operating Area

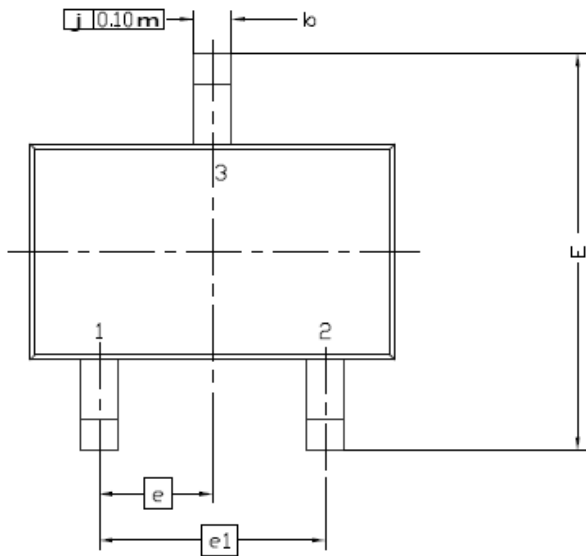


10. Single Pulse Maximum Power Dissipation



11. Normalized Thermal Transient Junction to Ambient

Package Information



| DIM.      | MILLIMETERS |       |      | INCHES    |       |       |
|-----------|-------------|-------|------|-----------|-------|-------|
|           | MIN         | NOM   | MAX  | MIN       | NOM   | MAX   |
| A         | 0.900       | 0.95  | 1.10 | 0.035     | 0.037 | 0.043 |
| A1        | 0.00        | ---   | 0.10 | 0.000     | ---   | 0.004 |
| A2        | 0.70        | 0.90  | 1.00 | 0.028     | 0.035 | 0.039 |
| b         | 0.15        | 0.22  | 0.30 | 0.006     | 0.016 | 0.012 |
| c         | 0.08        | 0.127 | 0.20 | 0.003     | 0.005 | 0.008 |
| D         | 2.10 BSC    |       |      | 0.083 BSC |       |       |
| E         | 2.30 BSC    |       |      | 0.091 BSC |       |       |
| E1        | 1.30 BSC    |       |      | 0.051 BSC |       |       |
| e         | 0.65 BSC    |       |      | 0.026 BSC |       |       |
| e1        | 1.30 BSC    |       |      | 0.051 BSC |       |       |
| L         | 0.26        | 0.40  | 0.46 | 0.010     | 0.015 | 0.018 |
| L2        | 0.254 BSC   |       |      | 0.010 BSC |       |       |
| R         | 0.10        | ---   | ---  | 0.004     | ---   | ---   |
| $\theta$  | 0°          | 4°    | 8°   | 0°        | 4°    | 8°    |
| $\theta1$ | 7°NOM       |       |      | 7°NOM     |       |       |

