

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

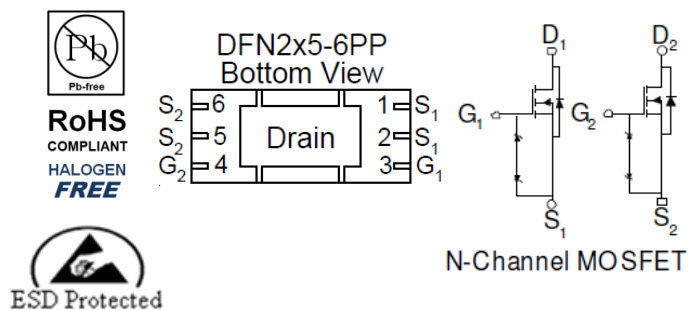
### Key Features:

- 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) |
| 20              | 9.5 @ $V_{GS} = 4.5V$      | 16        |
|                 | 13 @ $V_{GS} = 2.5V$       | 13        |



### 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>                     | $I_D$          | $T_A = 25^\circ\text{C}$ | 16               |
|                                                           |                | $T_A = 70^\circ\text{C}$ | 11.3             |
| Pulsed Drain Current <sup>b</sup>                         | $I_{DM}$       | 50                       |                  |
| Continuous Source Current (Diode Conduction) <sup>a</sup> | $I_S$          | 5.2                      | A                |
| Power Dissipation <sup>a</sup>                            | $P_D$          | $T_A = 25^\circ\text{C}$ | 3.5              |
|                                                           |                | $T_A = 70^\circ\text{C}$ | 1.8              |
| 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> | $R_{\theta JA}$ | $t \leq 10$ sec | 36    |
|                                          |                 | Steady State    | 76    |

### Notes

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

## Electrical Characteristics

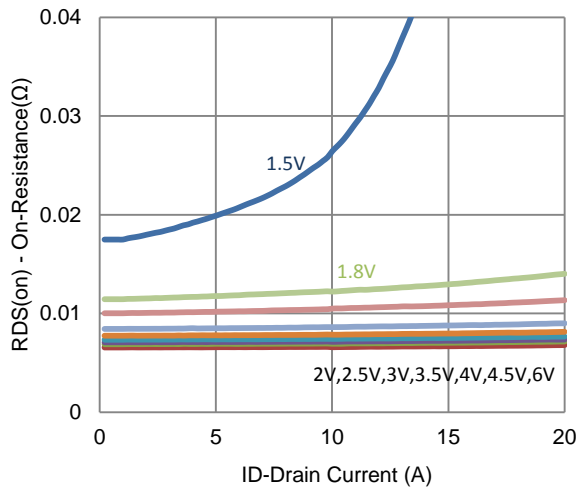
| Parameter                               | Symbol       | Test Conditions                                                                       | Min | Typ  | Max      | Unit       |
|-----------------------------------------|--------------|---------------------------------------------------------------------------------------|-----|------|----------|------------|
| <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                       | $I_{GSS}$    | $V_{DS} = 0 V, V_{GS} = \pm 8 V$                                                      |     |      | $\pm 10$ | $\mu A$    |
| Zero Gate Voltage Drain Current         | $I_{DSS}$    | $V_{DS} = 16 V, V_{GS} = 0 V$                                                         |     |      | 1        | $\mu A$    |
|                                         |              | $V_{DS} = 16 V, V_{GS} = 0 V, T_J = 55^\circ C$                                       |     |      | 25       |            |
| On-State Drain Current <sup>a</sup>     | $I_{D(on)}$  | $V_{DS} = 5 V, V_{GS} = 4.5 V$                                                        | 25  |      |          | A          |
| Drain-Source On-Resistance <sup>a</sup> | $r_{DS(on)}$ | $V_{GS} = 4.5 V, I_D = 11 A$                                                          |     |      | 9.5      | m $\Omega$ |
|                                         |              | $V_{GS} = 2.5 V, I_D = 9 A$                                                           |     |      | 13       |            |
| Forward Transconductance <sup>a</sup>   | $g_{fs}$     | $V_{DS} = 15 V, I_D = 11 A$                                                           |     | 16   |          | S          |
| Diode Forward Voltage <sup>a</sup>      | $V_{SD}$     | $I_S = 2.6 A, V_{GS} = 0 V$                                                           |     | 0.67 |          | V          |
| <b>Dynamic <sup>b</sup></b>             |              |                                                                                       |     |      |          |            |
| Total Gate Charge                       | $Q_g$        | $V_{DS} = 10 V, V_{GS} = 4.5 V,$<br>$I_D = 11 A$                                      |     | 19   |          | nC         |
| Gate-Source Charge                      | $Q_{gs}$     |                                                                                       |     | 3.4  |          |            |
| Gate-Drain Charge                       | $Q_{gd}$     |                                                                                       |     | 4.5  |          |            |
| Turn-On Delay Time                      | $t_{d(on)}$  | $V_{DS} = 10 V, R_L = 1 \Omega, I_D = 11 A,$<br>$V_{GEN} = 4.5 V, R_{GEN} = 6 \Omega$ |     | 15   |          | ns         |
| Rise Time                               | $t_r$        |                                                                                       |     | 52   |          |            |
| Turn-Off Delay Time                     | $t_{d(off)}$ |                                                                                       |     | 82   |          |            |
| Fall Time                               | $t_f$        |                                                                                       |     | 35   |          |            |
| Input Capacitance                       | $C_{iss}$    | $V_{DS} = 15 V, V_{GS} = 0 V, f = 1 \text{ Mhz}$                                      |     | 2109 |          | pF         |
| Output Capacitance                      | $C_{oss}$    |                                                                                       |     | 204  |          |            |
| Reverse Transfer Capacitance            | $C_{rss}$    |                                                                                       |     | 201  |          |            |

## Notes

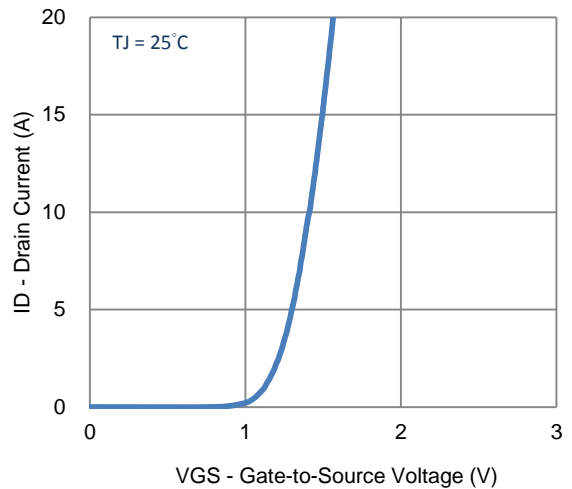
- Pulse test:  $PW \leq 300 \mu s$  duty cycle  $\leq 2\%$ .
- Guaranteed by design, not subject to production testing.

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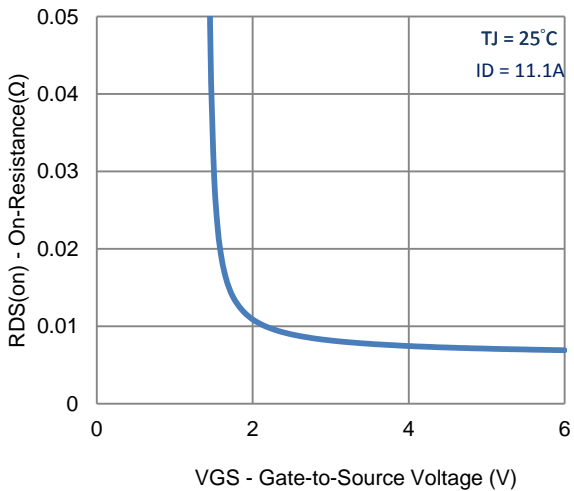
Typical Electrical Characteristics



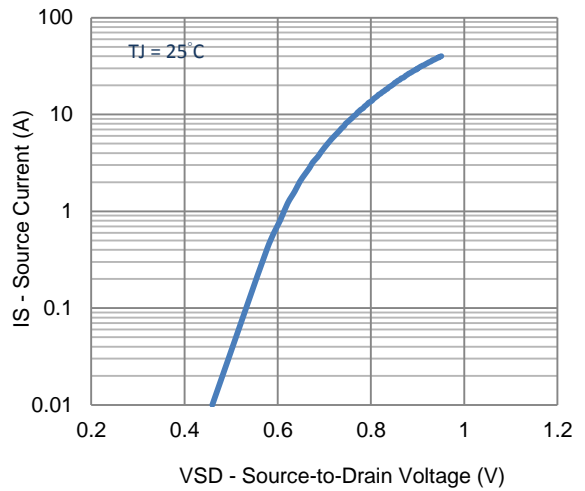
1. On-Resistance vs. Drain Current



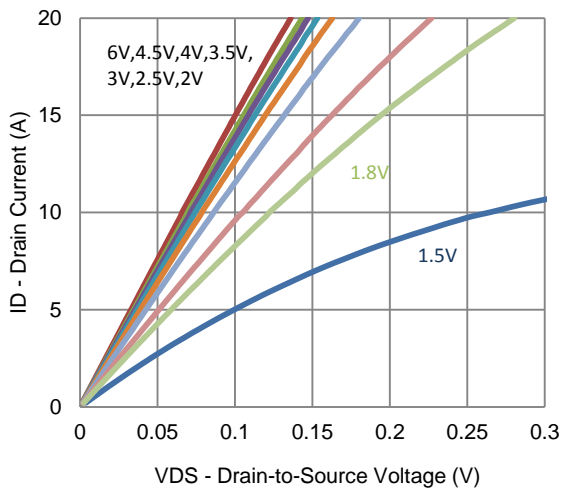
2. Transfer Characteristics



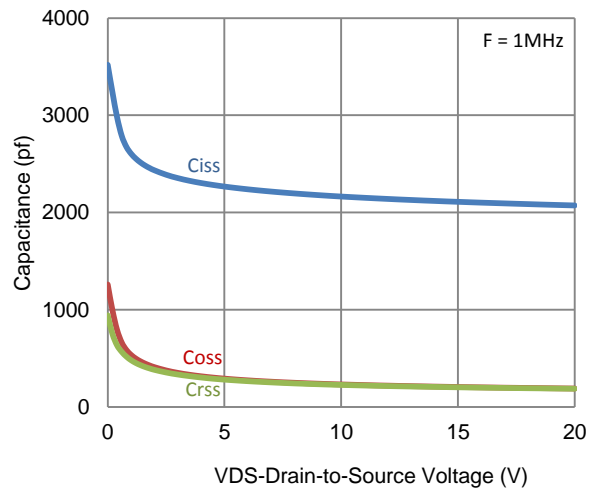
3. On-Resistance vs. Gate-to-Source Voltage



4. Drain-to-Source Forward Voltage

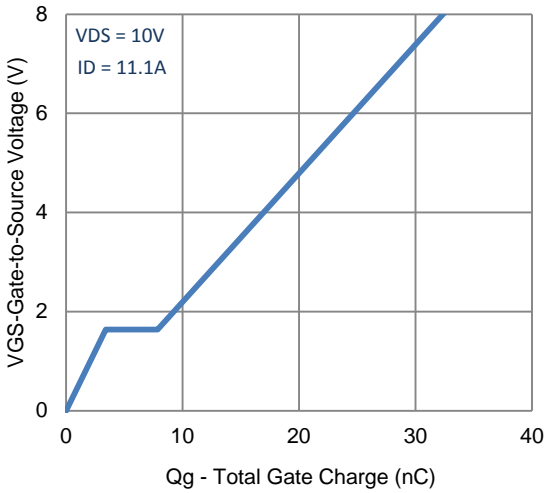


5. Output Characteristics

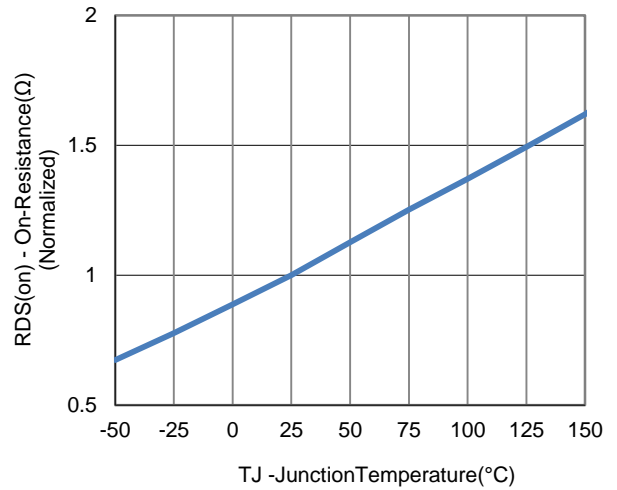


6. Capacitance

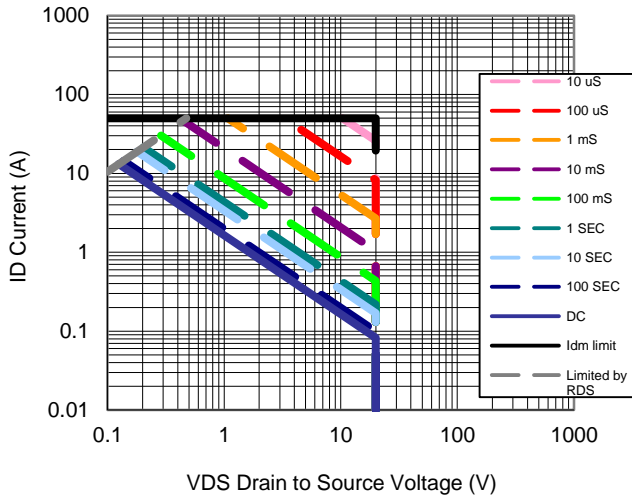
Typical Electrical Characteristics



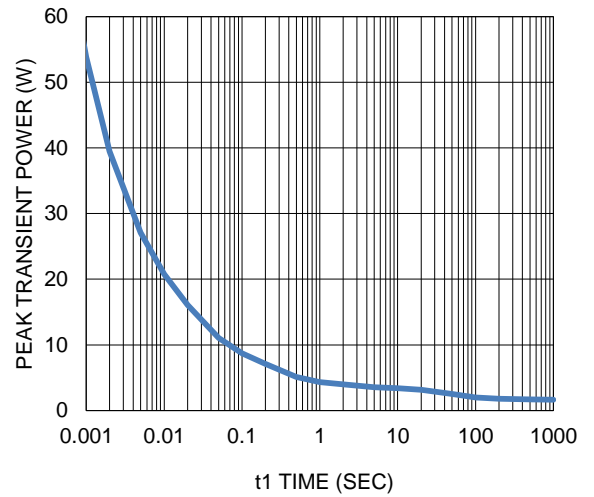
7. Gate Charge



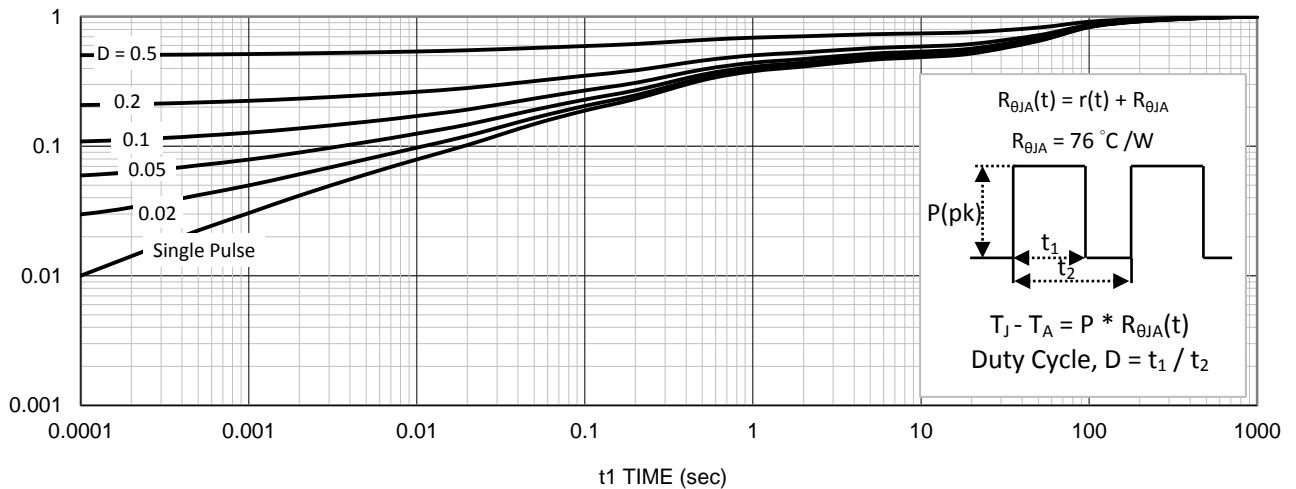
8. Normalized On-Resistance Vs Junction Temperature



9. Safe Operating Area

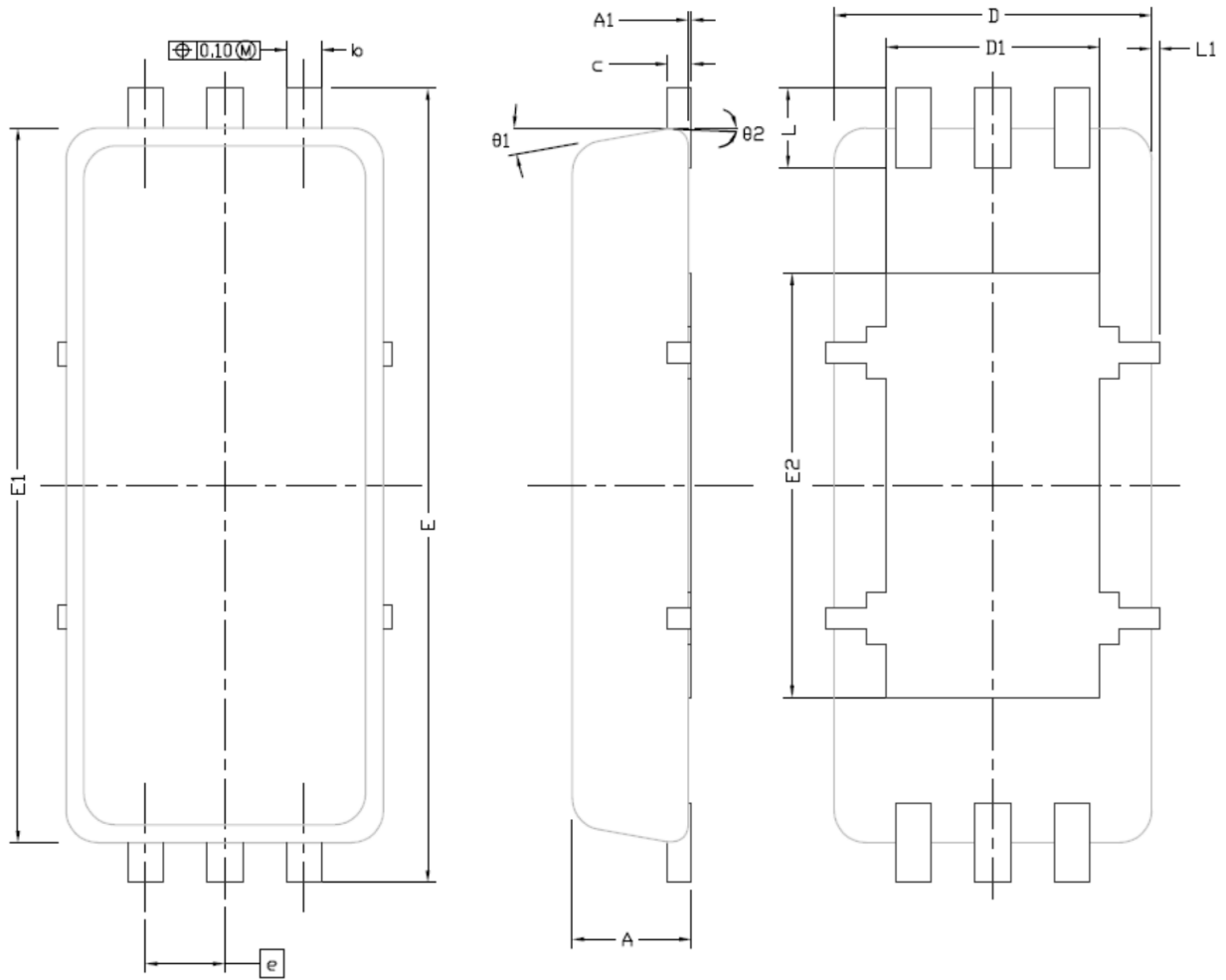


10. Single Pulse Maximum Power Dissipation



11. Normalized Thermal Transient Junction to Ambient

Package Information



| DIM.   | MILLIMETERS |       |       | INCHES    |        |        |
|--------|-------------|-------|-------|-----------|--------|--------|
|        | MIN         | NOM   | MAX   | MIN       | NOM    | MAX    |
| A      | 0.70        | 0.75  | 0.80  | 0.028     | 0.030  | 0.0315 |
| A1     | 0.00        | ---   | 0.05  | 0.000     | ---    | 0.002  |
| b      | 0.20        | 0.225 | 0.30  | 0.008     | 0.009  | 0.012  |
| c      | 0.10        | 0.152 | 0.20  | 0.004     | 0.006  | 0.008  |
| D      | 2.00 BSC    |       |       | 0.079 BSC |        |        |
| D1     | 1.30        | 1.35  | 1.55  | 0.051     | 0.053  | 0.061  |
| E      | 5.00 BSC    |       |       | 0.197 BSC |        |        |
| E1     | 4.50 BSC    |       |       | 0.177 BSC |        |        |
| E2     | 2.60        | 2.67  | 2.95  | 0.102     | 0.105  | 0.116  |
| e      | 0.50 BSC    |       |       | 0.020 BSC |        |        |
| L      | 0.40        | 0.50  | 0.600 | 0.016     | 0.0197 | 0.0236 |
| L1     | 0           | ---   | 0.100 | 0         | ---    | 0.004  |
| theta1 | 0°          | 10°   | 12°   | 0°        | 10°    | 12°    |
| theta2 | 3° BSC      |       |       | 3° BSC    |        |        |