

## P-Channel 40-V (D-S) MOSFET

### Key Features:

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

### Typical Applications:

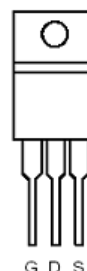
- Automotive Systems
- DC/DC Conversion Circuits
- Battery Powered Power Tools

| PRODUCT SUMMARY |                            |           |
|-----------------|----------------------------|-----------|
| $V_{DS}$ (V)    | $r_{DS(on)}$ (m $\Omega$ ) | $I_D$ (A) |
| -40             | 4.5 @ $V_{GS} = -10V$      | -95       |
|                 | 6.5 @ $V_{GS} = -4.5V$     | -79       |

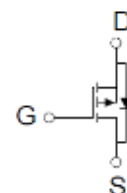


**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

TO-220CFM



Top View



P-Channel MOSFET

| ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED) |                          |                |            |                  |
|-----------------------------------------------------------------------------|--------------------------|----------------|------------|------------------|
| Parameter                                                                   |                          | Symbol         | Limit      | Units            |
| Drain-Source Voltage                                                        |                          | $V_{DS}$       | -40        | V                |
| Gate-Source Voltage                                                         |                          | $V_{GS}$       | $\pm 20$   |                  |
| Continuous Drain Current <sup>a</sup>                                       | $T_C = 25^\circ\text{C}$ | $I_D$          | -95        | A                |
| Pulsed Drain Current <sup>b</sup>                                           |                          | $I_{DM}$       | -380       |                  |
| Continuous Source Current (Diode Conduction) <sup>a</sup>                   | $T_C = 25^\circ\text{C}$ | $I_S$          | -95        | A                |
| Power Dissipation <sup>a</sup>                                              | $T_C = 25^\circ\text{C}$ | $P_D$          | 60         | W                |
| Operating Junction and Storage Temperature Range                            |                          | $T_J, T_{stg}$ | -55 to 175 | $^\circ\text{C}$ |

| THERMAL RESISTANCE RATINGS               |                 |         |                    |
|------------------------------------------|-----------------|---------|--------------------|
| Parameter                                | Symbol          | Maximum | Units              |
| Maximum Junction-to-Ambient <sup>c</sup> | $R_{\theta JA}$ | 62.5    | $^\circ\text{C/W}$ |
| Maximum Junction-to-Case                 | $R_{\theta JC}$ | 2.5     |                    |

### Notes

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

## Electrical Characteristics

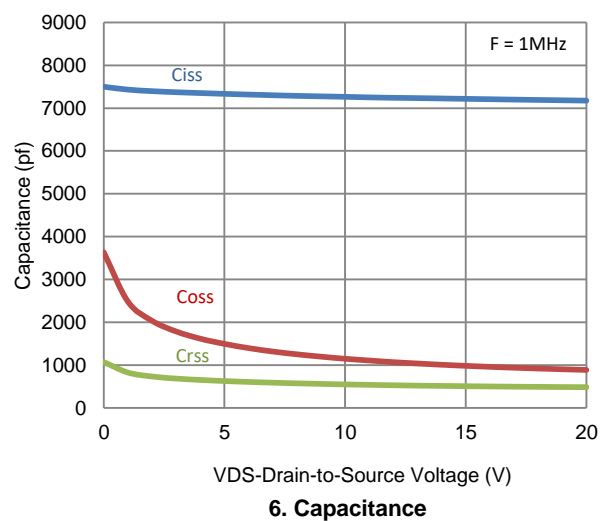
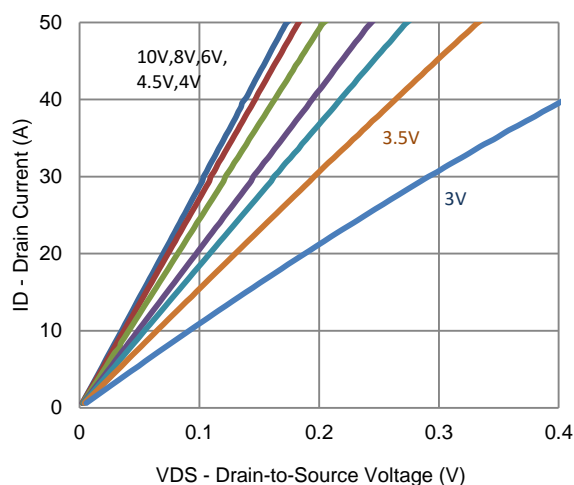
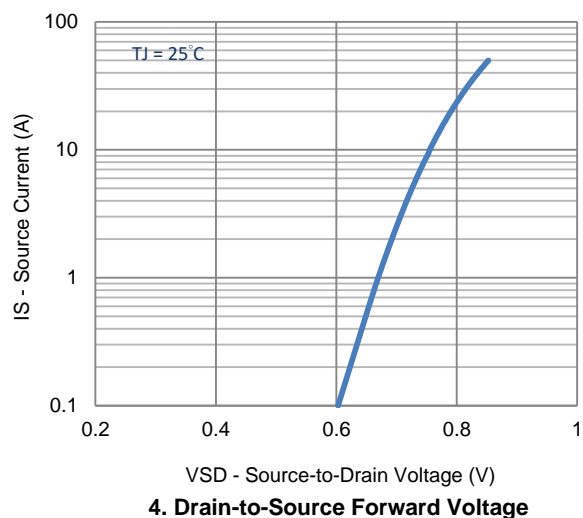
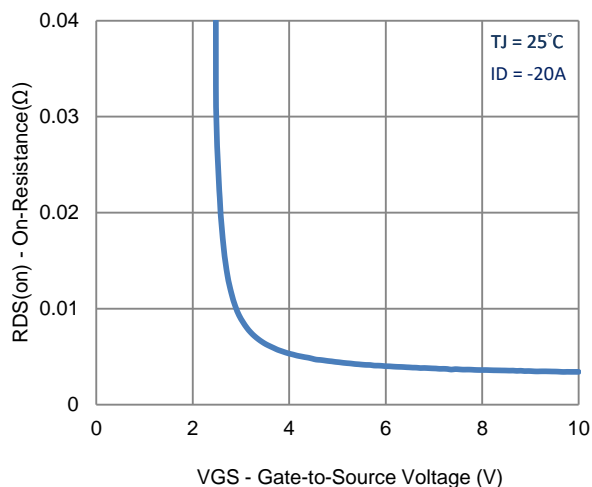
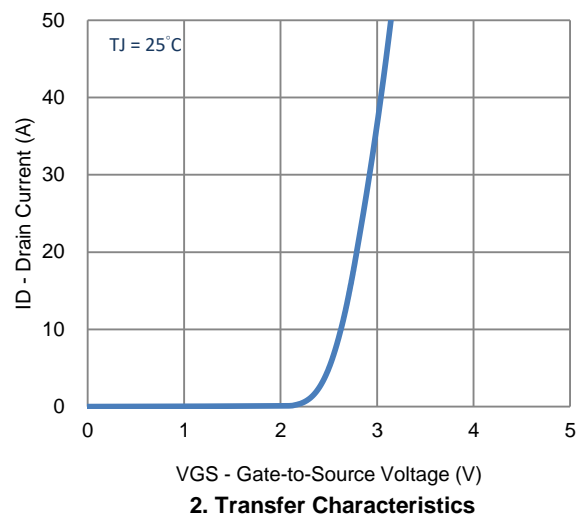
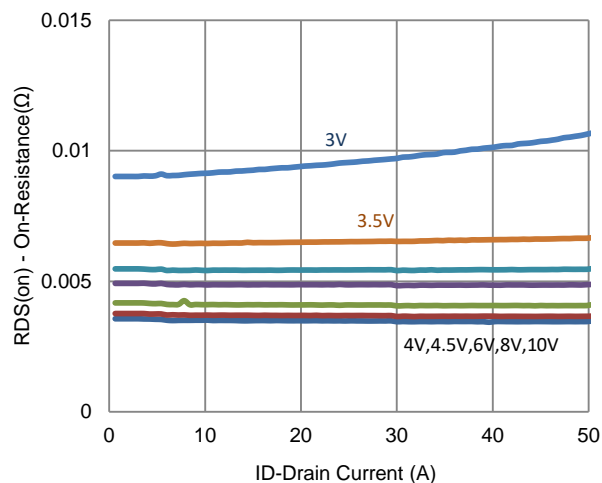
| Parameter                               | Symbol       | Test Conditions                                                                                      | Min  | Typ   | Max       | Unit       |
|-----------------------------------------|--------------|------------------------------------------------------------------------------------------------------|------|-------|-----------|------------|
| <b>Static</b>                           |              |                                                                                                      |      |       |           |            |
| Gate-Source Threshold Voltage           | $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = -250 \mu A$                                                               | -1   |       |           | V          |
| Gate-Body Leakage                       | $I_{GSS}$    | $V_{DS} = 0 V$ , $V_{GS} = \pm 20 V$                                                                 |      |       | $\pm 100$ | nA         |
| Zero Gate Voltage Drain Current         | $I_{DSS}$    | $V_{DS} = -32 V$ , $V_{GS} = 0 V$                                                                    |      |       | -1        | $\mu A$    |
|                                         |              | $V_{DS} = -32 V$ , $V_{GS} = 0 V$ , $T_J = 55^\circ C$                                               |      |       | -10       |            |
| On-State Drain Current <sup>a</sup>     | $I_{D(on)}$  | $V_{DS} = -5 V$ , $V_{GS} = -10 V$                                                                   | -120 |       |           | A          |
| Drain-Source On-Resistance <sup>a</sup> | $r_{DS(on)}$ | $V_{GS} = -10 V$ , $I_D = -50 A$                                                                     |      |       | 4.5       | m $\Omega$ |
|                                         |              | $V_{GS} = -4.5 V$ , $I_D = -40 A$                                                                    |      |       | 6.5       |            |
| Forward Transconductance <sup>a</sup>   | $g_{fs}$     | $V_{DS} = -15 V$ , $I_D = -50 A$                                                                     |      | 76    |           | S          |
| Diode Forward Voltage <sup>a</sup>      | $V_{SD}$     | $I_S = -50 A$ , $V_{GS} = 0 V$                                                                       |      | -0.85 |           | V          |
| <b>Dynamic <sup>b</sup></b>             |              |                                                                                                      |      |       |           |            |
| Total Gate Charge                       | $Q_g$        | $V_{DS} = -20 V$ , $V_{GS} = -4.5 V$ ,<br>$I_D = -20 A$                                              |      | 118   |           | nC         |
| Gate-Source Charge                      | $Q_{gs}$     |                                                                                                      |      | 42    |           |            |
| Gate-Drain Charge                       | $Q_{gd}$     |                                                                                                      |      | 28    |           |            |
| Turn-On Delay Time                      | $t_{d(on)}$  | $V_{DS} = -20 V$ , $R_L = 1 \Omega$ ,<br>$I_D = -20 A$ ,<br>$V_{GEN} = -10 V$ , $R_{GEN} = 6 \Omega$ |      | 21    |           | ns         |
| Rise Time                               | $t_r$        |                                                                                                      |      | 29    |           |            |
| Turn-Off Delay Time                     | $t_{d(off)}$ |                                                                                                      |      | 421   |           |            |
| Fall Time                               | $t_f$        |                                                                                                      |      | 128   |           |            |
| Input Capacitance                       | $C_{iss}$    | $V_{DS} = -20 V$ , $V_{GS} = 0 V$ , $f = 1 \text{ Mhz}$                                              |      | 7175  |           | pF         |
| Output Capacitance                      | $C_{oss}$    |                                                                                                      |      | 887   |           |            |
| Reverse Transfer Capacitance            | $C_{rss}$    |                                                                                                      |      | 484   |           |            |

## Notes

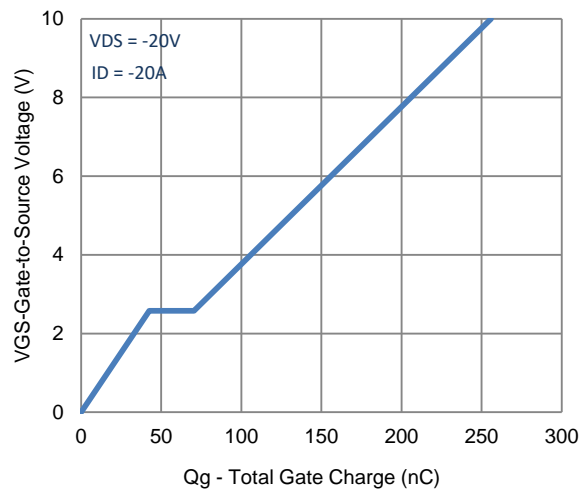
- Pulse test: PW  $\leq$  300us duty cycle  $\leq$  2%.
- Guaranteed by design, not subject to production testing.

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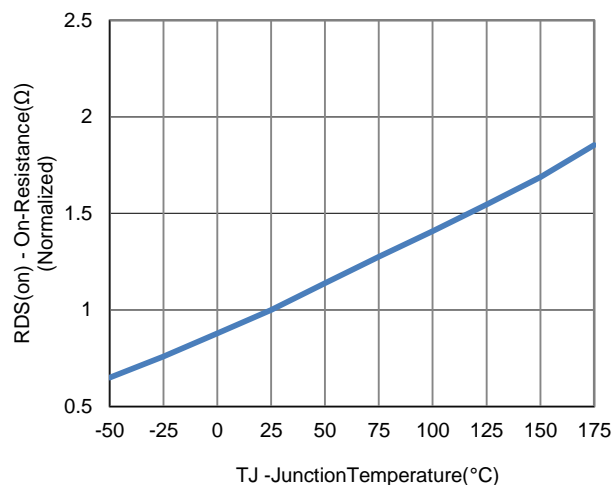
## Typical Electrical Characteristics



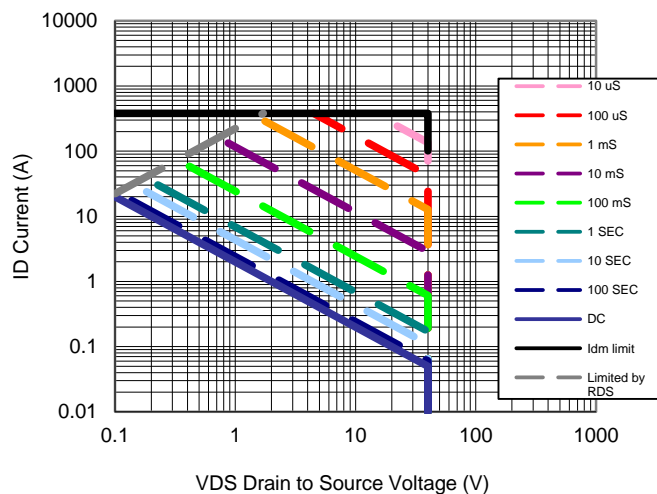
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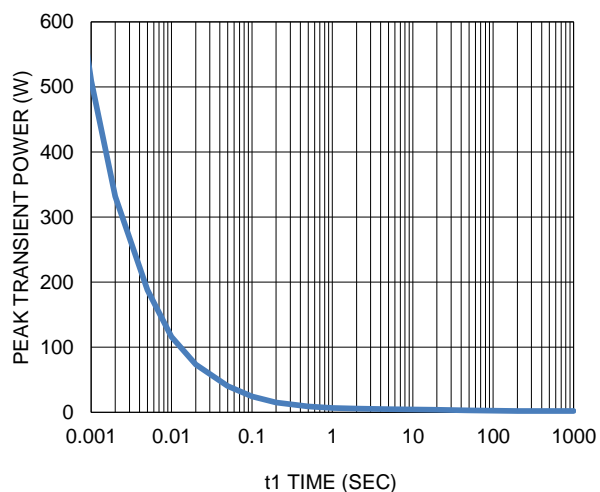
7. Gate Charge



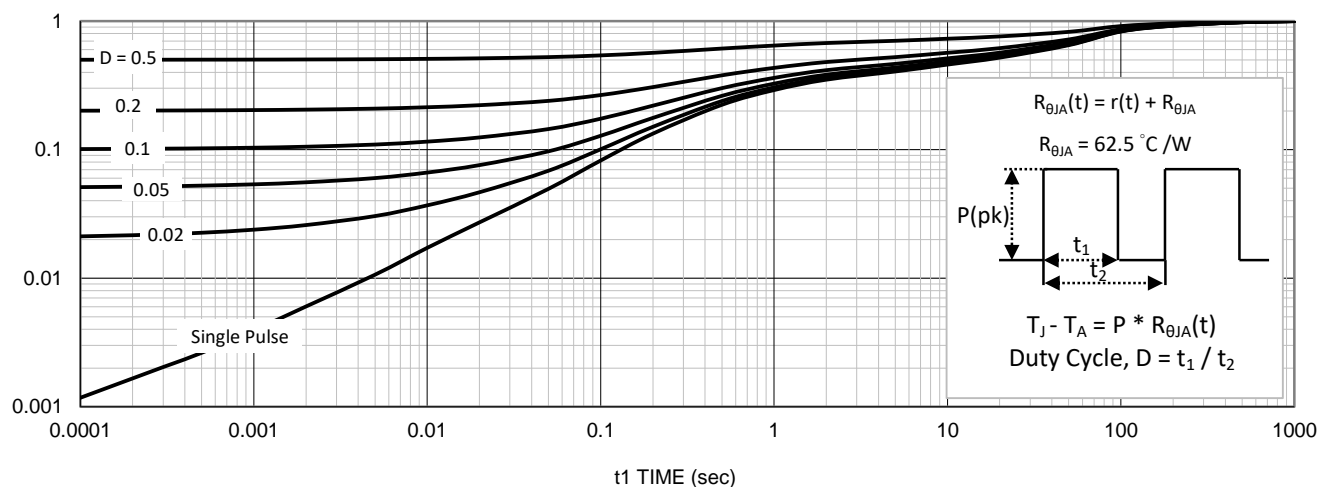
8. Normalized On-Resistance Vs Junction Temperature



9. Safe Operating Area

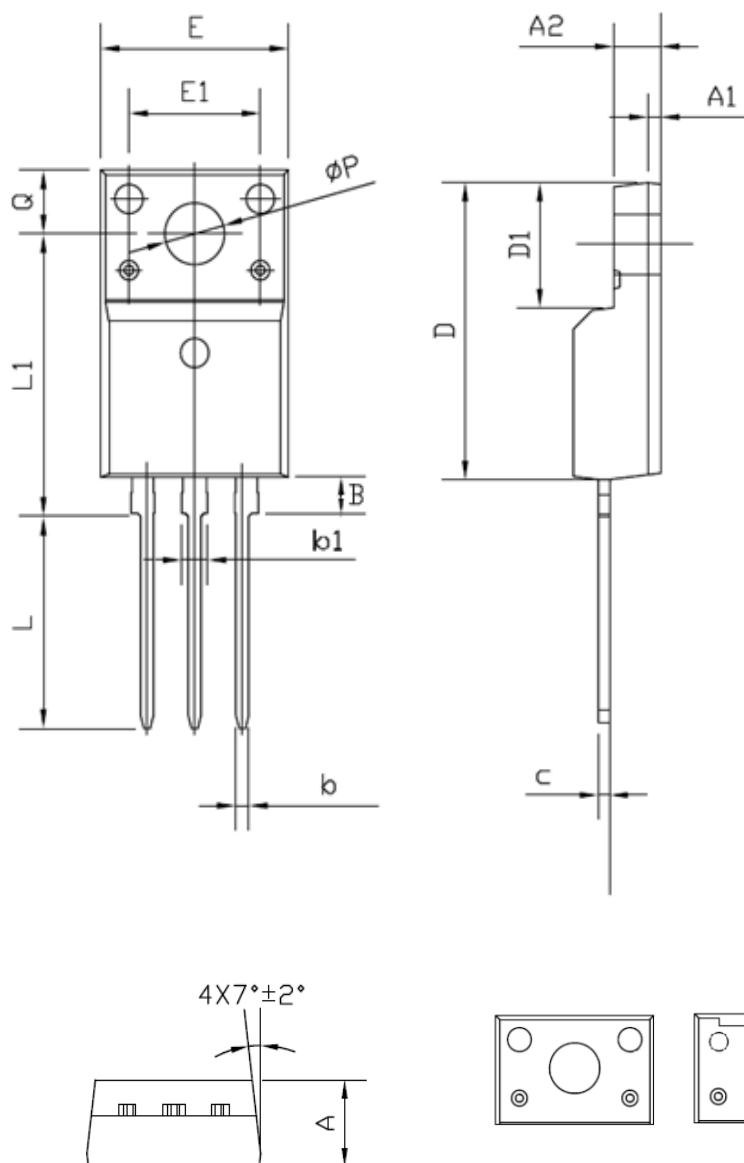


10. Single Pulse Maximum Power Dissipation



11. Normalized Thermal Transient Junction to Ambient

## Package Information



| DIM. | MILLIMETERS |       |
|------|-------------|-------|
|      | MIN         | MAX   |
| A    | 4.24        | 4.72  |
| A1   | 1.11        | 1.41  |
| A2   | 2.22        | 2.7   |
| B    | 2.6         | 3.9   |
| b    | 0.66        | 0.94  |
| b2   | 1.17        | 1.45  |
| c    | 0.4         | 0.6   |
| D    | 14.5        | 15.74 |
| D1   | 8.4         | 9.65  |
| D2   | 12.08       | 12.48 |
| E    | 9.7         | 10.54 |
| E1   | 8           | 8.4   |
| e    | 2.49        | 2.59  |
| L    | 12.27       | 14.5  |
| ØP   | 3.55        | 3.89  |
| Q    | 2.58        | 2.98  |

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