

Dual N & P-Channel PowerTrench[®] MOSFET

N-Channel: 40V, 30A, 24mΩ P-Channel: -40V, -30A, 30mΩ

Features

n-chann

$$V_{DS} (V) = 40V, I_D = 30A (V_{GS}=10V)$$

$$R_{DS(ON)} < 24m\Omega (V_{GS}=10V)$$

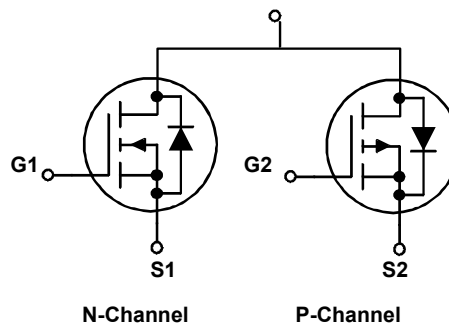
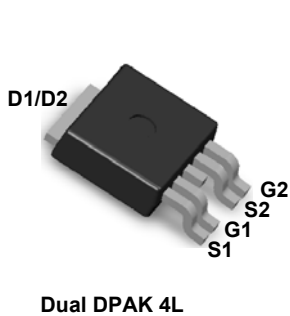
$$R_{DS(ON)} < 30m\Omega (V_{GS}=4.5V)$$

p-channel

$$V_{DS} (V) = -40V, I_D = -30A (V_{GS}=-10V)$$

$$R_{DS(ON)} < 30m\Omega (V_{GS} = -10V)$$

$$R_{DS(ON)} < 36m\Omega (V_{GS} = -4.5V)$$



| ABSOLUTE MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$, unless otherwise noted) | | | | | |
|--|---------------------------|----------------|---------------|-----------|------------------|
| PARAMETER | | SYMBOL | N-CHANNEL | P-CHANNEL | UNIT |
| Drain-Source Voltage | | V_{DS} | 40 | - 40 | V |
| Gate-Source Voltage | | V_{GS} | ± 20 | | |
| Continuous Drain Current ^a | $T_C = 25^\circ\text{C}$ | I_D | 30 | -30 | A |
| | $T_C = 125^\circ\text{C}$ | | 35 | -35 | |
| Continuous Source Current (Diode Conduction) ^a | | I_S | 30 | -30 | |
| Pulsed Drain Current ^b | | I_{DM} | 150 | -150 | |
| Single Pulse Avalanche Current | L = 0.1 mH | I_{AS} | 30 | - 30 | |
| Single Pulse Avalanche Energy | | E_{AS} | 245 | 245 | mJ |
| Maximum Power Dissipation ^b | $T_C = 25^\circ\text{C}$ | P_D | 108 | 108 | W |
| | $T_C = 125^\circ\text{C}$ | | 32 | 32 | |
| Operating Junction and Storage Temperature Range | | T_J, T_{stg} | - 55 to + 175 | | $^\circ\text{C}$ |
| Soldering Recommendations (Peak Temperature) | | | 260 | | |

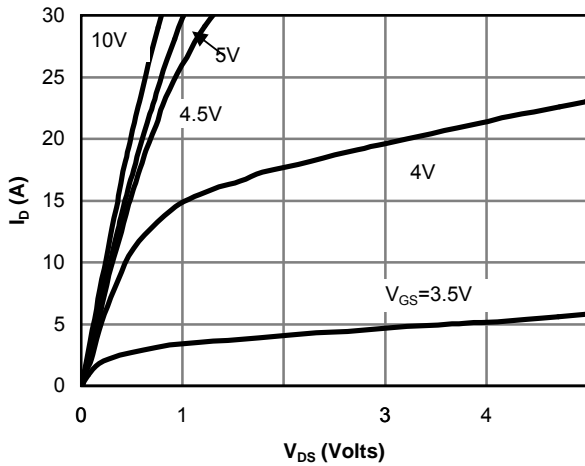
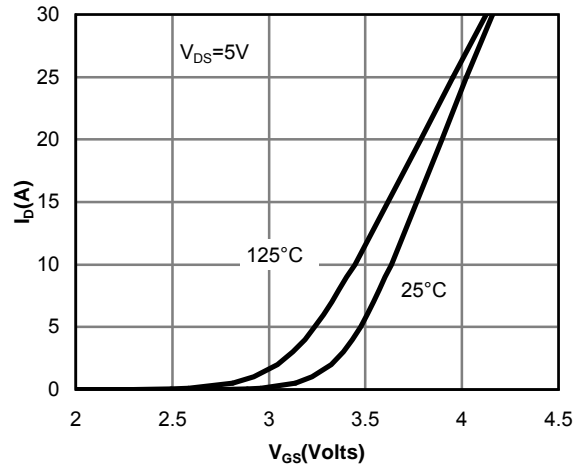
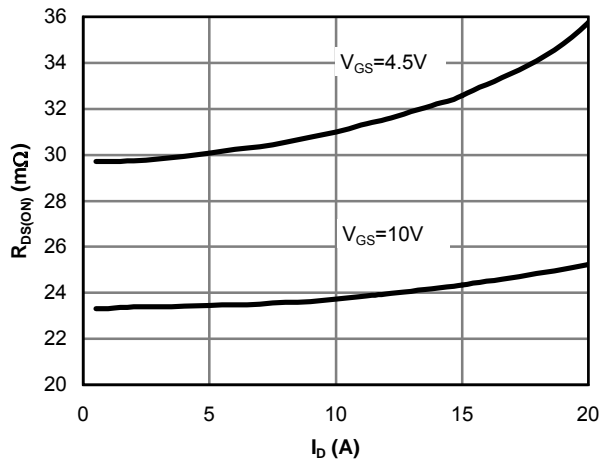
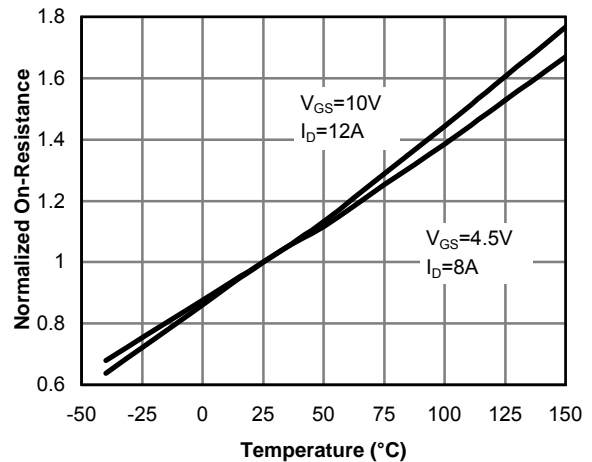
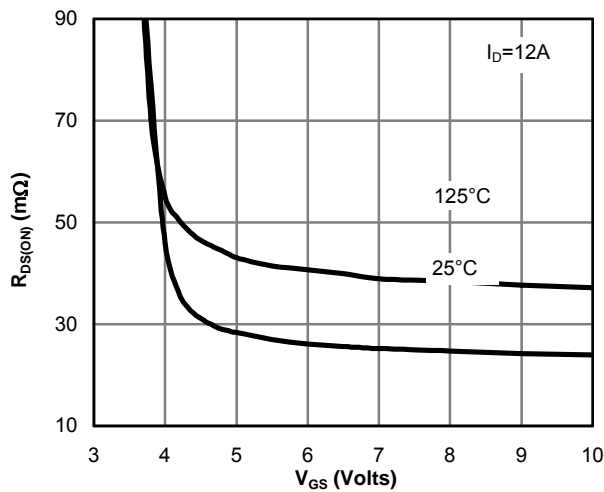
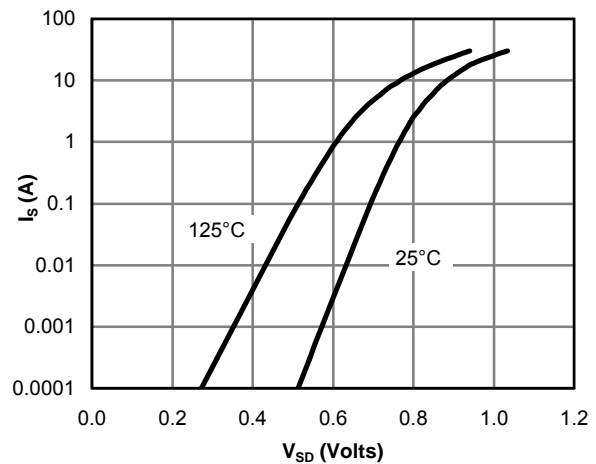
| THERMAL RESISTANCE RATINGS | | | | | |
|-----------------------------------|------------------------|------------|-----------|-----------|--------------------|
| PARAMETER | | SYMBOL | N-CHANNEL | P-CHANNEL | UNIT |
| Junction-to-Ambient | PCB Mount ^c | R_{thJA} | 85 | 85 | $^\circ\text{C/W}$ |
| Junction-to-Case (Drain) | | R_{thJC} | 3.1 | 3.1 | |

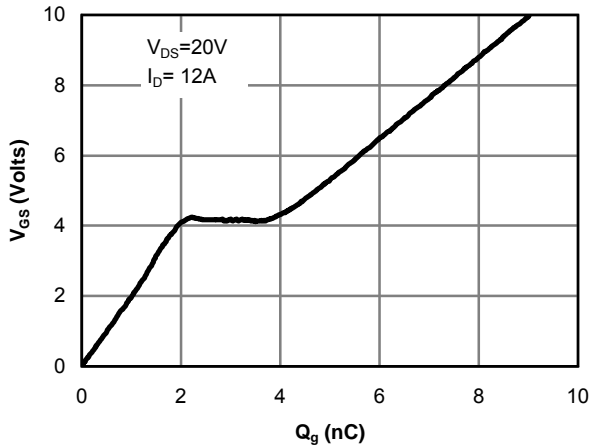
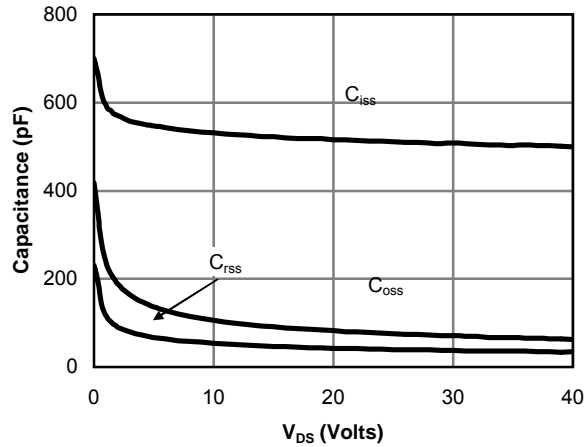
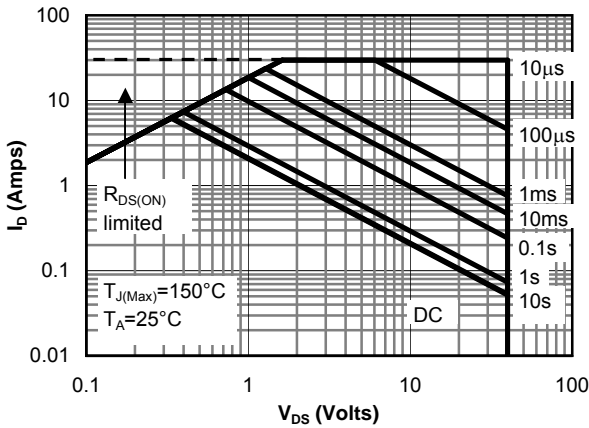
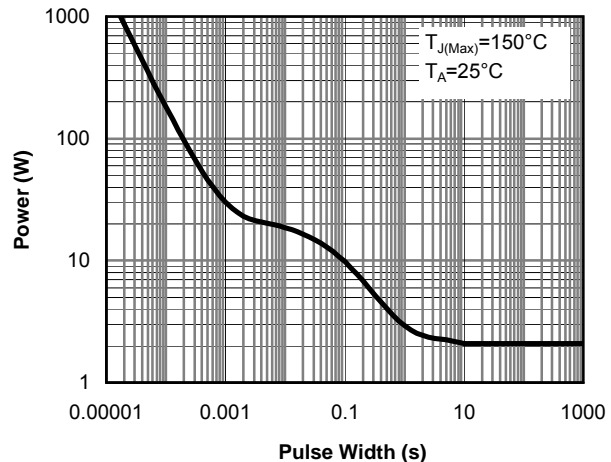
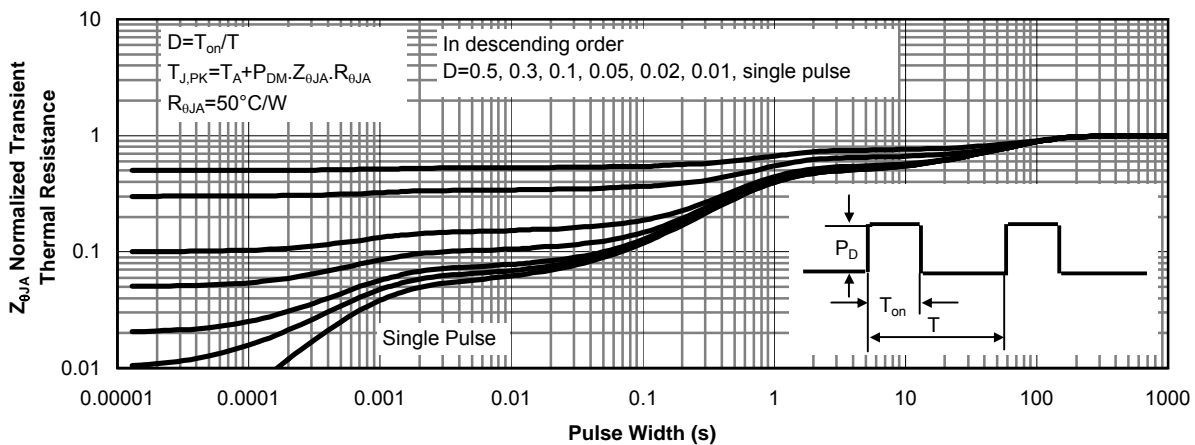
Notes

- Package limited.
- Pulse test; pulse width $\leq 300 \mu\text{s}$, duty cycle $\leq 2\%$.
- When mounted on 1" square PCB (FR4 material).
- Parametric verification ongoing.

N Channel Electrical Characteristics ($T_J=25^\circ\text{C}$ unless otherwise noted)

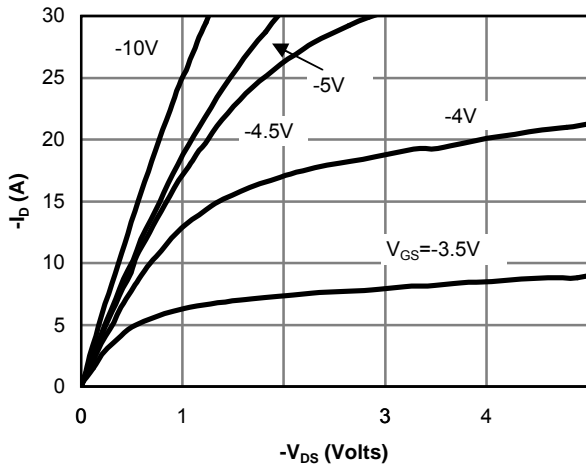
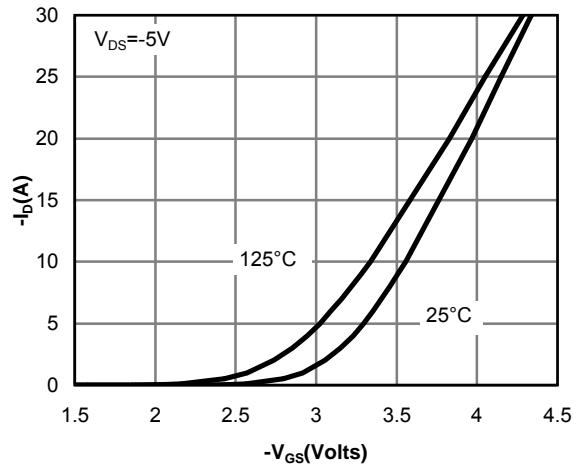
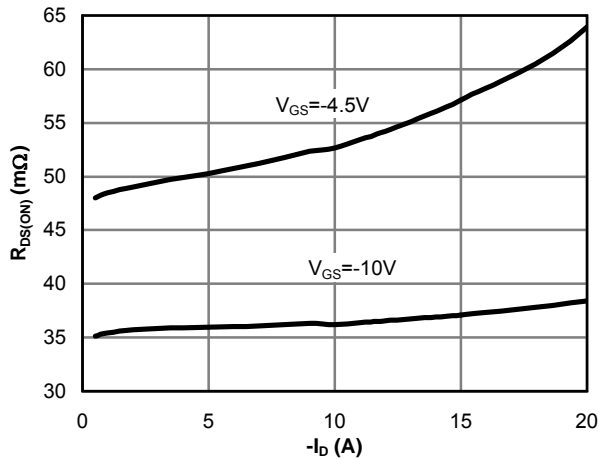
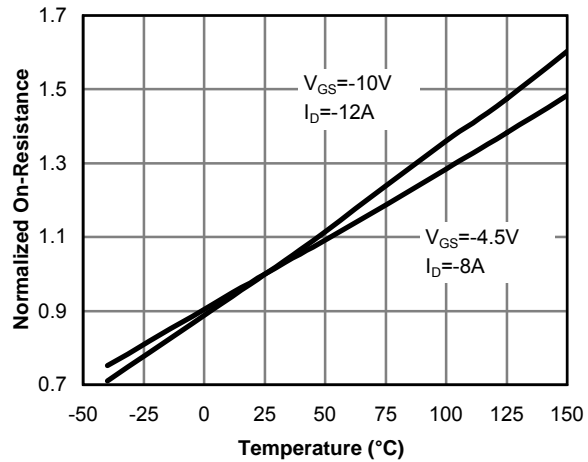
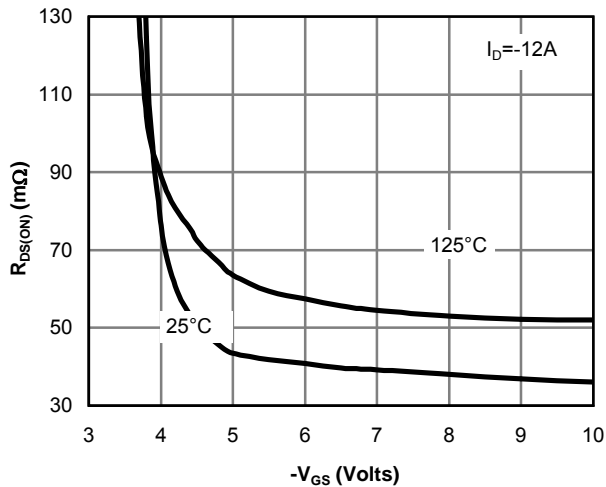
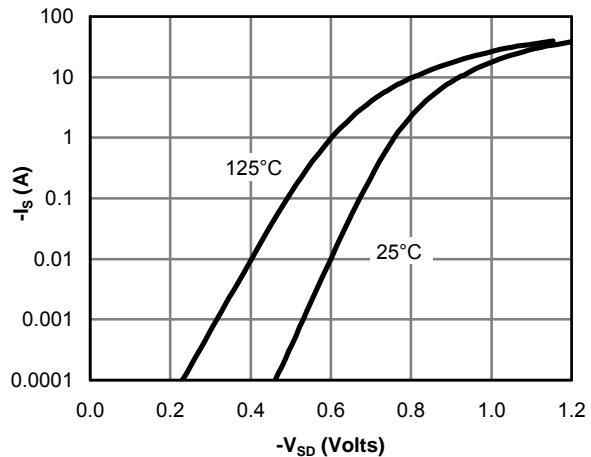
| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|-----------------------------|---------------------------------------|--|-----|------|-----------|---------------|
| STATIC PARAMETERS | | | | | | |
| BV_{DSS} | Drain-Source Breakdown Voltage | $I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$ | 40 | | | V |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS}=40\text{V}$, $V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$ | | | 1 5 | μA |
| I_{GSS} | Gate-Body leakage current | $V_{DS}=0\text{V}$, $V_{GS}=\pm 20\text{V}$ | | | ± 100 | nA |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}=V_{GS}$, $I_D=250\mu\text{A}$ | 1.7 | 2.5 | 3 | V |
| $I_{D(ON)}$ | On state drain current | $V_{GS}=10\text{V}$, $V_{DS}=5\text{V}$ | 30 | | | A |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS}=10\text{V}$, $I_D=30\text{A}$ | | 24 | | m Ω |
| | | $V_{GS}=4.5\text{V}$, $I_D=20\text{A}$ | | 30 | | |
| g_{FS} | Forward Transconductance | $V_{DS}=10\text{V}$, $I_D=30\text{A}$ | | 23 | | S |
| V_{SD} | Diode Forward Voltage | $I_S=1\text{A}$, $V_{GS}=0\text{V}$ | | 0.76 | 1 | V |
| I_S | Maximum Body-Diode Continuous Current | | | | 2 | A |
| DYNAMIC PARAMETERS | | | | | | |
| C_{iss} | Input Capacitance | $V_{GS}=0\text{V}$, $V_{DS}=20\text{V}$, $f=1\text{MHz}$ | | 1000 | 1500 | pF |
| C_{oss} | Output Capacitance | | | 150 | | pF |
| C_{riss} | Reverse Transfer Capacitance | | | 100 | | pF |
| R_g | Gate resistance | $V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$ | | 1.5 | 3.5 | Ω |
| SWITCHING PARAMETERS | | | | | | |
| $Q_g(10\text{V})$ | Total Gate Charge | $V_{GS}=10\text{V}$, $V_{DS}=20\text{V}$, $I_D=30\text{A}$ | | 8.3 | 10.8 | nC |
| Q_{gs} | Gate Source Charge | | | 2.3 | | nC |
| Q_{gd} | Gate Drain Charge | | | 1.6 | | nC |
| $t_{D(on)}$ | Turn-On DelayTime | $V_{GS}=10\text{V}$, $V_{DS}=20\text{V}$, $R_L=1.4\Omega$, $R_{GEN}=3\Omega$ | | 6.4 | | ns |
| t_r | Turn-On Rise Time | | | 3.6 | | ns |
| $t_{D(off)}$ | Turn-Off DelayTime | | | 16.2 | | ns |
| t_f | Turn-Off Fall Time | | | 6.6 | | ns |
| t_{rr} | Body Diode Reverse Recovery Time | $I_F=12\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$ | | 18 | 24 | ns |
| Q_{rr} | Body Diode Reverse Recovery Charge | $I_F=12\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$ | | 10 | | nC |

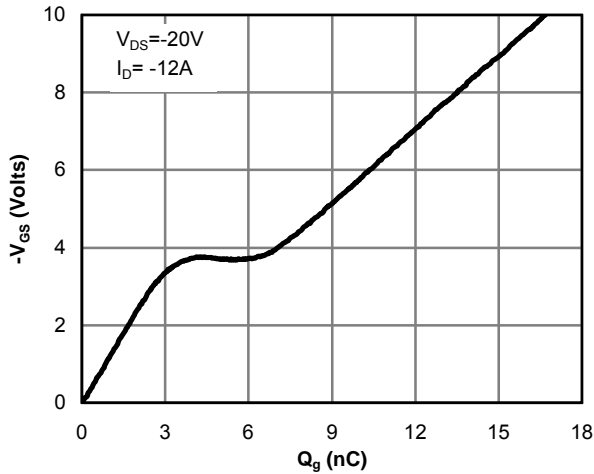
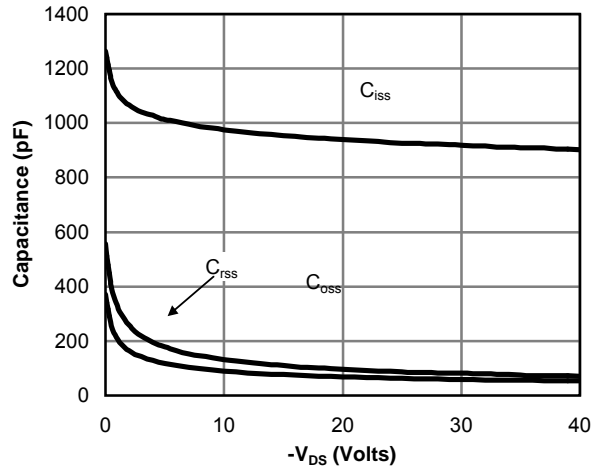
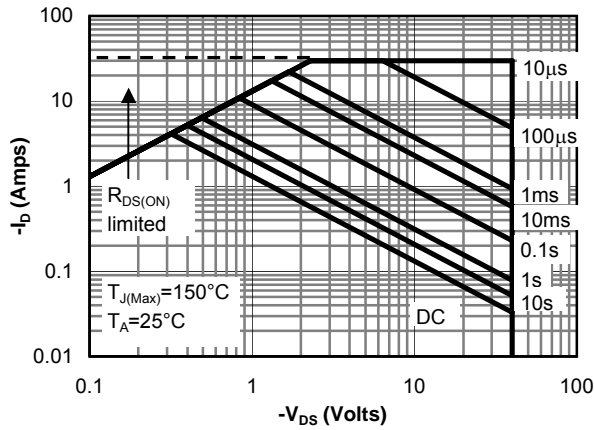
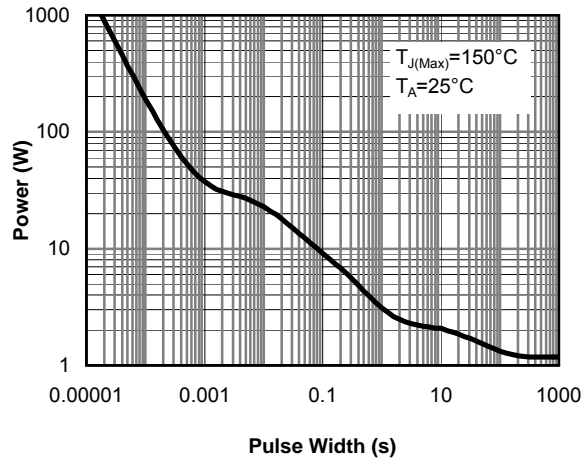
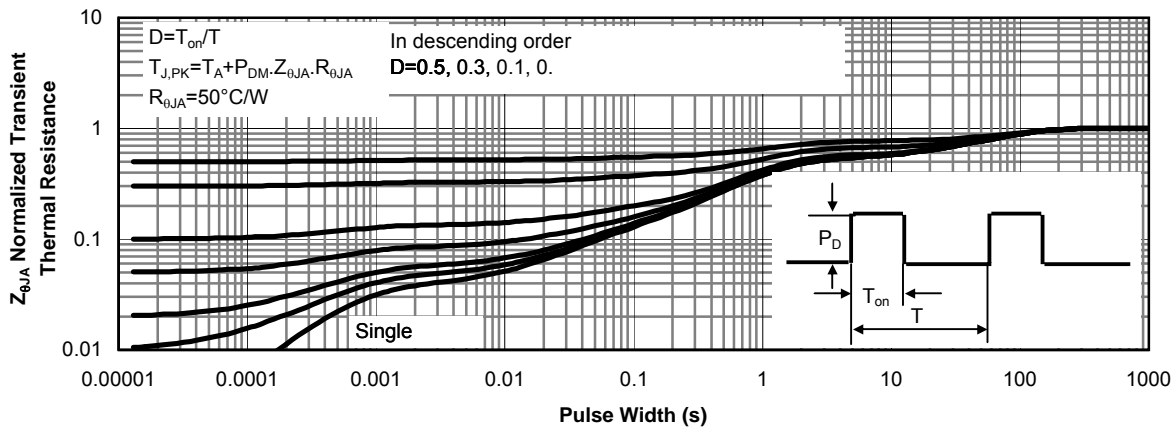
TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: N-CANNEL

Fig 1: On-Region Characteristics

Figure 2: Transfer Characteristics

Figure 3: On-Resistance vs. Drain Current and Gate Voltage

Figure 4: On-Resistance vs. Junction Temperature

Figure 5: On-Resistance vs. Gate-Source Voltage

Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: N-CHANNEL

Figure 7: Gate-Charge Characteristics

Figure 8: Capacitance Characteristics

Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

Figure 11: Normalized Maximum Transient Thermal Impedance

P-Channel Electrical Characteristics (T_J=25°C unless otherwise noted)

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|-----------------------------|---------------------------------------|---|------|-------|----------|-------|
| STATIC PARAMETERS | | | | | | |
| BV _{DSS} | Drain-Source Breakdown Voltage | I _D = -250μA, V _{GS} =0V | -40 | | | V |
| I _{DSS} | Zero Gate Voltage Drain Current | V _{DS} = -40V, V _{GS} =0V T _J =55°C | | | -1 -5 | μA |
| I _{GSS} | Gate-Body leakage current | V _{DS} =0V, V _{GS} = ±20V | | | ±100 | nA |
| V _{GS(th)} | Gate Threshold Voltage | V _{DS} =V _{GS} I _D = -250μA | -1.7 | -2 | -3 | V |
| I _{D(ON)} | On state drain current | V _{GS} = -10V, V _{DS} = -5V | -30 | | | A |
| R _{DS(ON)} | Static Drain-Source On-Resistance | V _{GS} = -10V, I _D = -30A | | 30 | | mΩ |
| | | V _{GS} = -4.5V, I _D = -20A | | 36 | | |
| g _{FS} | Forward Transconductance | V _{DS} = -10V, I _D = -30A | | 22 | | S |
| V _{SD} | Diode Forward Voltage | I _S = -1A, V _{GS} =0V | | -0.76 | -1 | V |
| I _S | Maximum Body-Diode Continuous Current | | | | -2 | A |
| DYNAMIC PARAMETERS | | | | | | |
| C _{iss} | Input Capacitance | V _{GS} =0V, V _{DS} = -20V, f=1MHz | | 1500 | 2600 | pF |
| C _{oss} | Output Capacitance | | 200 | | pF | |
| C _{rss} | Reverse Transfer Capacitance | | 150 | | pF | |
| R _g | Gate resistance | V _{GS} =0V, V _{DS} =0V, f=1MHz | | 10 | | Ω |
| SWITCHING PARAMETERS | | | | | | |
| Q _g (-10V) | Total Gate Charge | V _{GS} = -10V, V _{DS} = -20V, I _D = -30A | | 16.2 | 21 | nC |
| Q _g (-4.5V) | Total Gate Charge | | 7.2 | 9.4 | nC | |
| Q _{gs} | Gate Source Charge | | 3.8 | | nC | |
| Q _{gd} | Gate Drain Charge | | 3.5 | | nC | |
| t _{D(on)} | Turn-On DelayTime | V _{GS} = -10V, V _{DS} = -20V, R _L =1.4Ω, R _{GEN} =3Ω | | 6.2 | | ns |
| t _r | Turn-On Rise Time | | 8.4 | | ns | |
| t _{D(off)} | Turn-Off DelayTime | | 44.8 | | ns | |
| t _f | Turn-Off Fall Time | | 41.2 | | ns | |
| t _{rr} | Body Diode Reverse Recovery Time | I _F = -12A, dI/dt=100A/μs | | 21 | 27 | ns |
| Q _{rr} | Body Diode Reverse Recovery Charge | I _F = -12A, dI/dt=100A/μs | | 14 | | nC |

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: P-CHANNEL

Fig 12: On-Region Characteristics

Figure 13: Transfer Characteristics

Figure 14: On-Resistance vs. Drain Current and Gate Voltage

Figure 15: On-Resistance vs. Junction Temperature

Figure 16: On-Resistance vs. Gate-Source Voltage

Figure 17: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: P-CHANNEL

Figure 18: Gate-Charge Characteristics

Figure 19: Capacitance Characteristics

Figure 20: Maximum Forward Biased Safe Operating Area (Note E)

Figure 21: Single Pulse Power Rating Junction-to-Ambient (Note E)

Figure 22: Normalized Maximum Transient Thermal Impedance