

Complementary 30-V (D-S) MOSFET

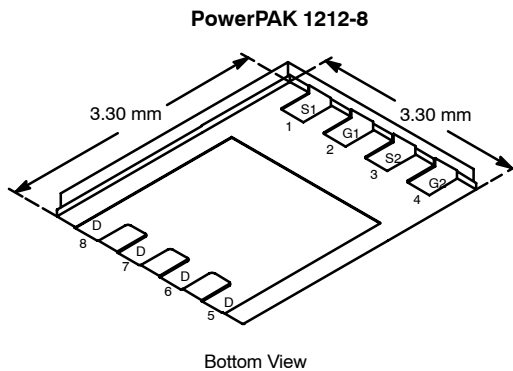
| PRODUCT SUMMARY | | | |
|-----------------|--------------|---------------------------|-----------|
| | V_{DS} (V) | $r_{DS(on)}$ (Ω) | I_D (A) |
| P-Channel | -30 | 0.051 @ $V_{GS} = -10$ V | -6.4 |
| | | 0.075 @ $V_{GS} = -6$ V | -5.3 |
| N-Channel | 30 | 0.035 @ $V_{GS} = 10$ V | 7.7 |
| | | 0.050 @ $V_{GS} = 4.5$ V | 6.5 |

FEATURES

- TrenchFET® Power MOSFET
- New Low Thermal Resistance PowerPAK® Package with Low 1.07-mm Profile

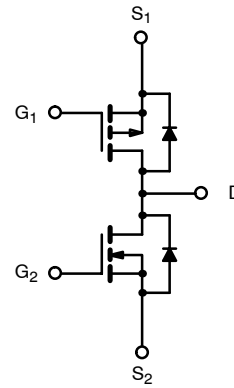
APPLICATIONS

- Backlight Inverter
- DC/DC Converter
 - 4-Cell Battery



Bottom View

Ordering Information: Si7501DN-T1—E3



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

| Parameter | Symbol | P-Channel | | N-Channel | | Unit | |
|---|----------------|--------------------------|--------------|-----------|--------------|------------------|---|
| | | 10 secs | Steady State | 10 secs | Steady State | | |
| Drain-Source Voltage | V_{DS} | -30 | | 30 | | V | |
| Gate-Source Voltage | V_{GS} | ± 25 | | ± 20 | | V | |
| Continuous Drain Current ($T_J = 150^\circ\text{C}$) ^a | I_D | $T_A = 25^\circ\text{C}$ | -6.4 | -4.5 | 7.7 | 5.4 | A |
| | | $T_A = 70^\circ\text{C}$ | -5.1 | -3.6 | 4.7 | 4.3 | |
| Pulsed Drain Current | I_{DM} | -25 | | 25 | | A | |
| Continuous Source Current (Diode Conduction) ^a | I_S | -2.6 | -1.3 | 2.6 | 1.3 | A | |
| Maximum Power Dissipation ^a | P_D | $T_A = 25^\circ\text{C}$ | 3.1 | 1.6 | 3.1 | 1.6 | W |
| | | $T_A = 70^\circ\text{C}$ | 3 | 1.0 | 2 | 1.0 | |
| Operating Junction and Storage Temperature Range | T_J, T_{stg} | -55 to 150 | | | | $^\circ\text{C}$ | |

THERMAL RESISTANCE RATINGS

| Parameter | Symbol | Typical | Maximum | Unit | |
|--|------------|-----------------|---------|--------------------|--------------------|
| Maximum Junction-to-Ambient ^a | R_{thJA} | $t \leq 10$ sec | 32 | 40 | $^\circ\text{C/W}$ |
| | | Steady State | 65 | 81 | |
| Maximum Junction-to-Foot (Case) | R_{thJC} | 5 | 6.3 | $^\circ\text{C/W}$ | |

Notes

a. Surface Mounted on 1" x 1" FR4 Board.

| SPECIFICATIONS (T _J = 25 °C UNLESS OTHERWISE NOTED) | | | | | | | |
|--|---------------------|---|------|------|-------|-------|------|
| Parameter | Symbol | Test Condition | | Min | Typ | Max | Unit |
| Static | | | | | | | |
| Gate Threshold Voltage | V _{GS(th)} | V _{DS} = V _{GS} , I _D = -250 μA | P-Ch | -1.0 | | -3 | V |
| | | V _{DS} = V _{GS} , I _D = 250 μA | N-Ch | 1.0 | | 3 | |
| Gate-Body Leakage | I _{GSS} | V _{DS} = 0 V, V _{GS} = ±25 V | P-Ch | | | ±200 | nA |
| | | V _{DS} = 0 V, V _{GS} = ±20 V | N-Ch | | | ±100 | |
| Zero Gate Voltage Drain Current | I _{DSS} | V _{DS} = -30 V, V _{GS} = 0 V | P-Ch | | | -1 | μA |
| | | V _{DS} = 30 V, V _{GS} = 0 V | N-Ch | | | 1 | |
| | | V _{DS} = -30 V, V _{GS} = 0 V, T _J = 55 °C | P-Ch | | | -5 | |
| | | V _{DS} = 30 V, V _{GS} = 0 V, T _J = 55 °C | N-Ch | | | 5 | |
| On-State Drain Current ^a | I _{D(on)} | V _{DS} ≥ -5 V, V _{GS} = -10 V | P-Ch | -25 | | | A |
| | | V _{DS} ≤ 5 V, V _{GS} = 10 V | N-Ch | 25 | | | |
| Drain-Source On-State Resistance ^a | r _{DS(on)} | V _{GS} = -10 V, I _D = -6.4 A | P-Ch | | 0.041 | 0.051 | Ω |
| | | V _{GS} = 10 V, I _D = 7.7 A | N-Ch | | 0.028 | 0.035 | |
| | | V _{GS} = -6 V, I _D = -5.3 A | P-Ch | | 0.055 | 0.075 | |
| | | V _{GS} = 4.5 V, I _D = 6.5 A | N-Ch | | 0.040 | 0.050 | |
| Forward Transconductance ^a | g _{fs} | V _{DS} = -15 V, I _D = -6.4 A | P-Ch | | 13 | | S |
| | | V _{DS} = 15 V, I _D = 7.7 A | N-Ch | | 15 | | |
| Diode Forward Voltage ^a | V _{SD} | I _S = -1.7 A, V _{GS} = 0 V | P-Ch | | -0.80 | -1.2 | V |
| | | I _S = 1.7 A, V _{GS} = 0 V | N-Ch | | 0.80 | 1.2 | |
| Dynamic^b | | | | | | | |
| Total Gate Charge | Q _g | P-Channel V _{DS} = -15 V, V _{GS} = -10 V, I _D = -6.4 A N-Channel V _{DS} = 15 V, V _{GS} = 10 V, I _D = 7.7 A | P-Ch | | 12.5 | 19 | nC |
| | | | N-Ch | | 9 | 14 | |
| Gate-Source Charge | Q _{gs} | | P-Ch | | 2.5 | | |
| | | | N-Ch | | 2 | | |
| Gate-Drain Charge | Q _{gd} | | P-Ch | | 3.6 | | |
| | | | N-Ch | | 1.3 | | |
| Gate Resistance | R _g | P-Ch | | 9 | | Ω | |
| | | N-Ch | | 3 | | | |
| Turn-On Delay Time | t _{d(on)} | P-Ch | | 10 | 15 | ns | |
| | | N-Ch | | 10 | 15 | | |
| Rise Time | t _r | P-Ch | | 20 | 30 | | |
| | | N-Ch | | 15 | 25 | | |
| Turn-Off Delay Time | t _{d(off)} | P-Ch | | 25 | 40 | | |
| | | N-Ch | | 20 | 30 | | |
| Fall Time | t _f | P-Ch | | 30 | 45 | | |
| | | N-Ch | | 10 | 15 | | |
| Source-Drain Reverse Recovery Time | t _{rr} | I _F = -1.7 A, di/dt = 100 A/μs | P-Ch | | 25 | 50 | |
| | | I _F = 1.7 A, di/dt = 100 A/μs | N-Ch | | 20 | 40 | |

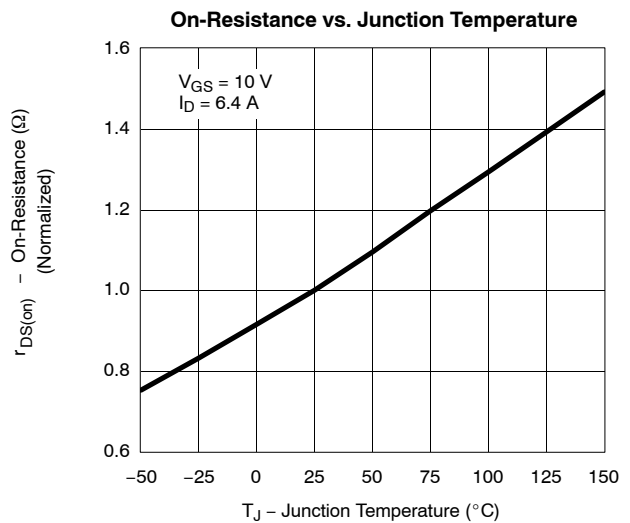
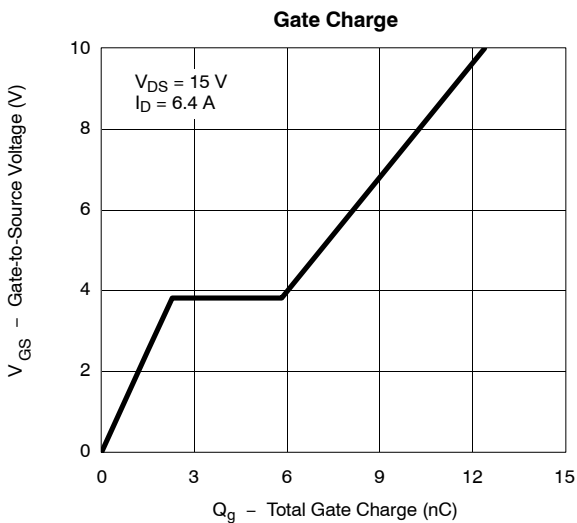
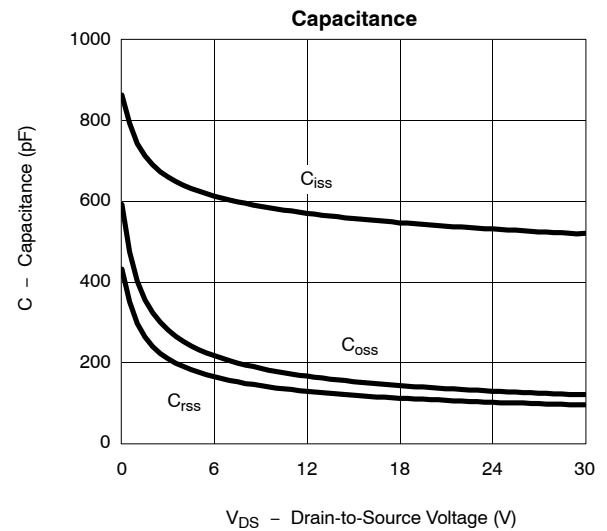
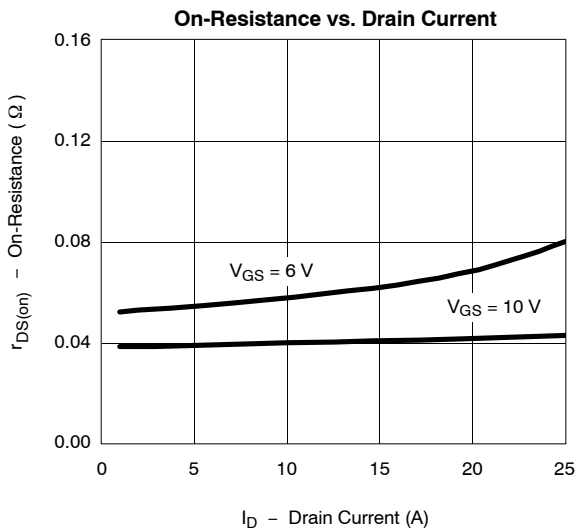
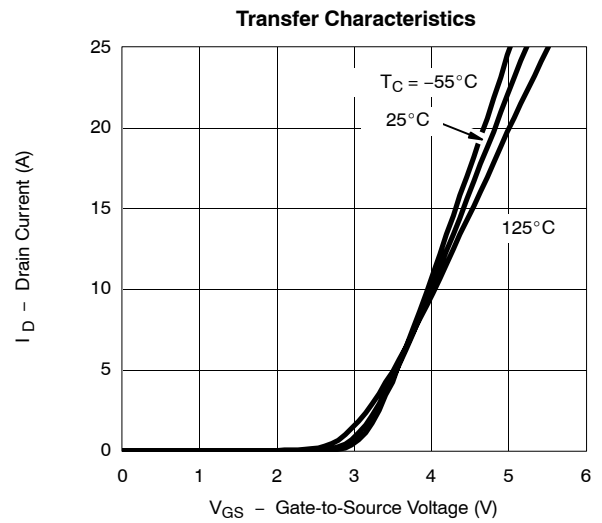
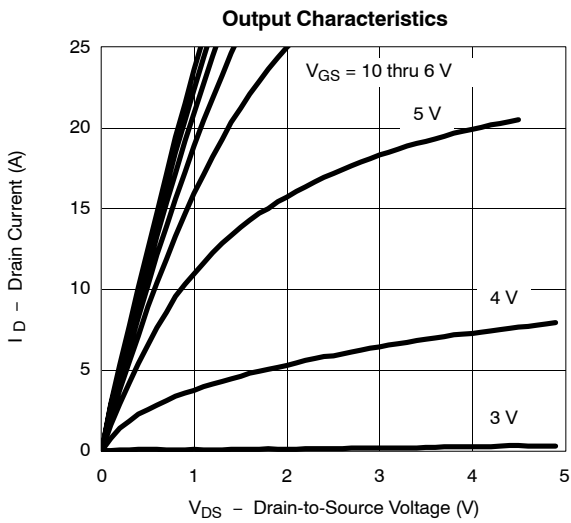
Notes

- a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2%.
 b. Guaranteed by design, not subject to production testing.



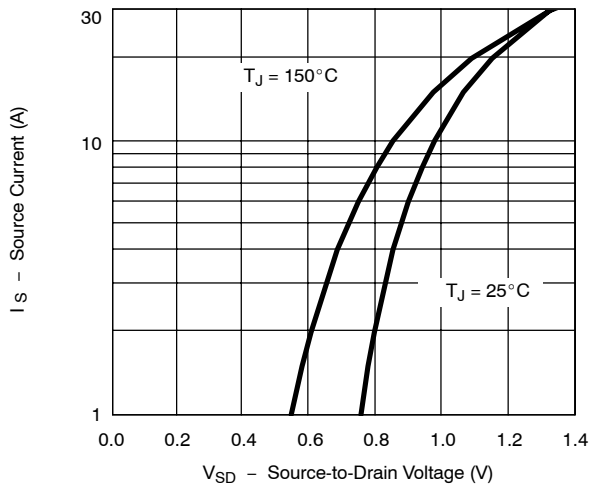
TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

P-CHANNEL

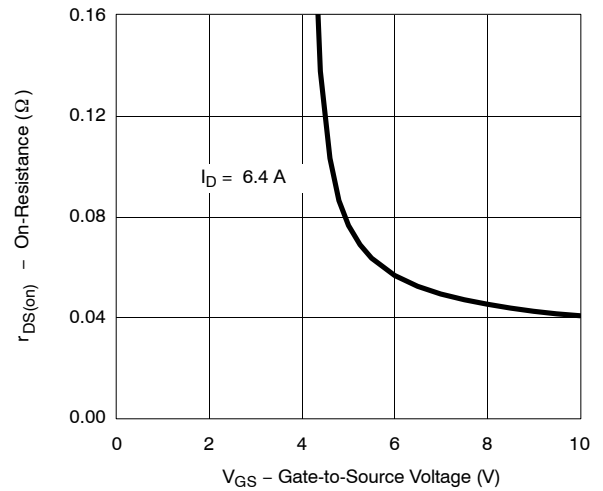


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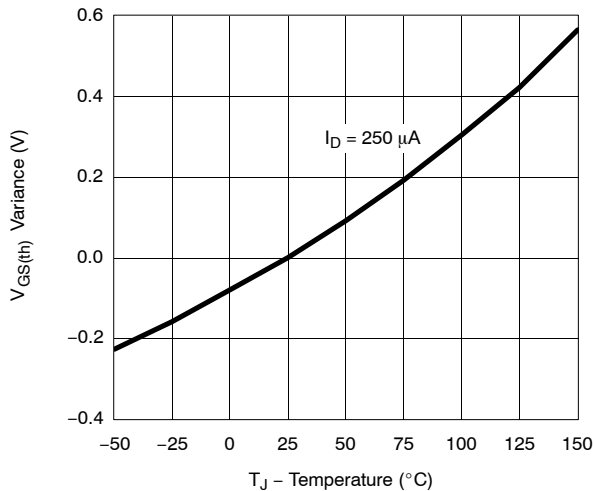
Source-Drain Diode Forward Voltage



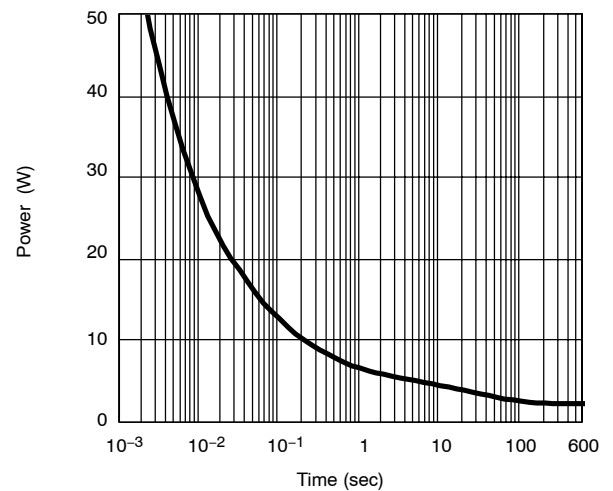
On-Resistance vs. Gate-to-Source Voltage



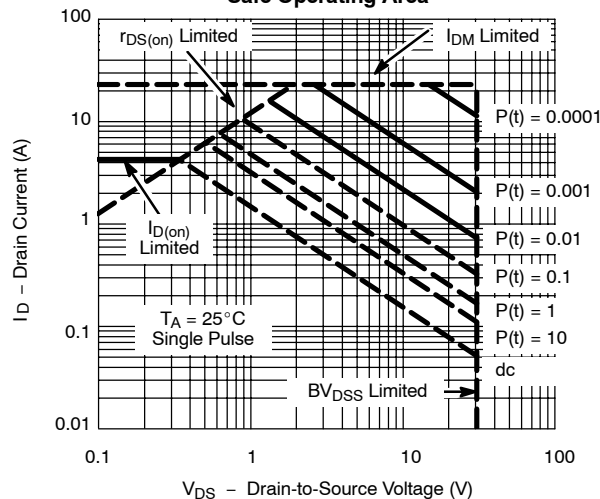
Threshold Voltage



Single Pulse Power



Safe Operating Area

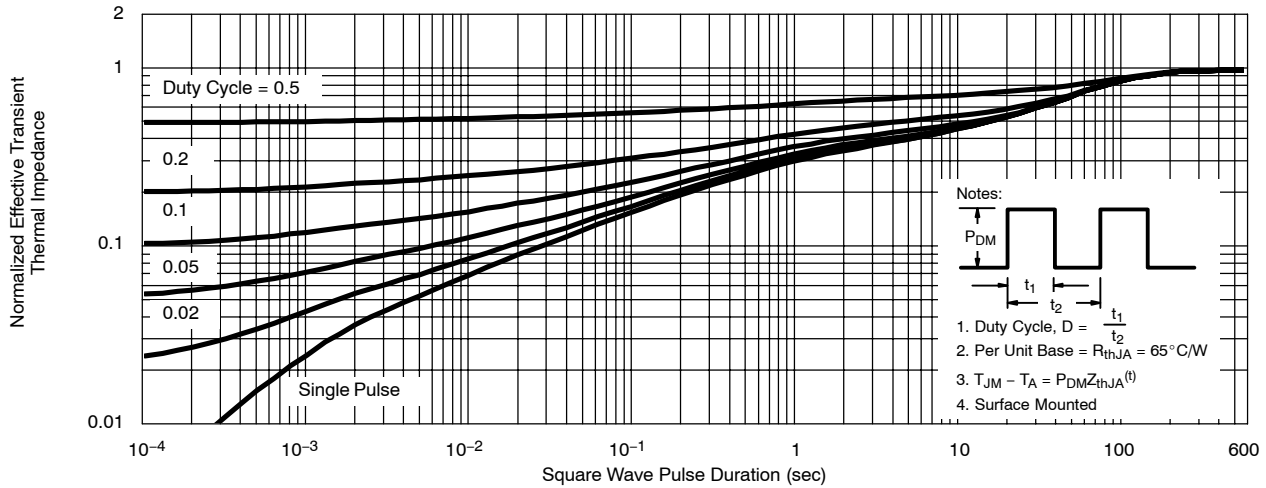




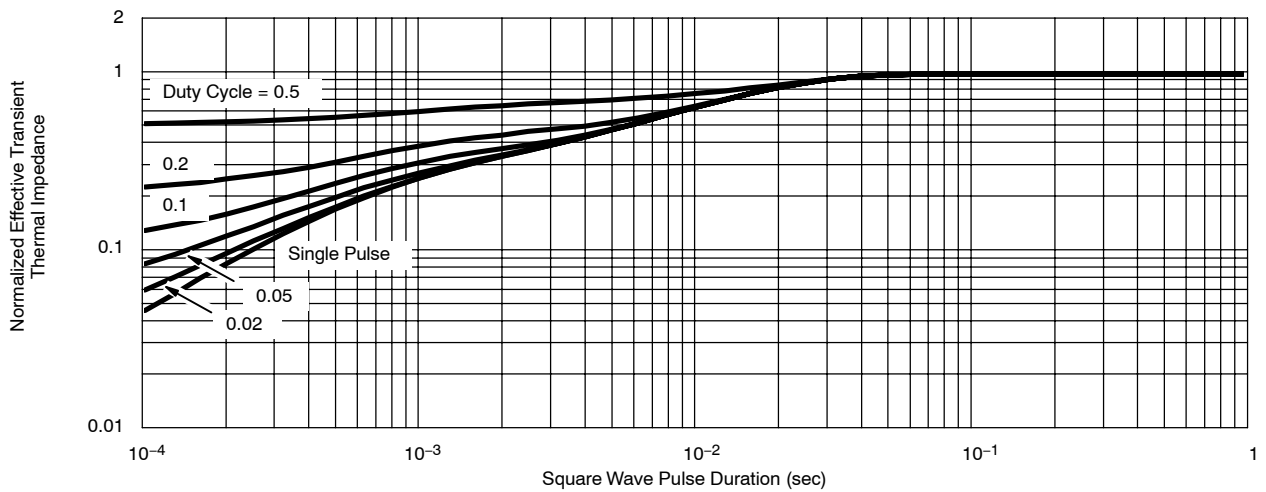
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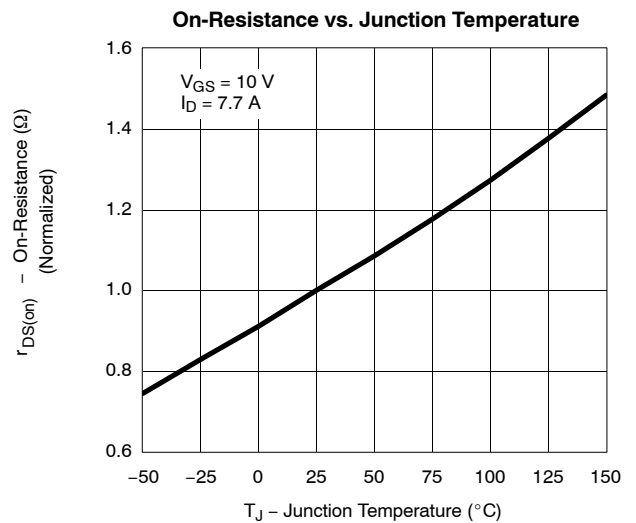
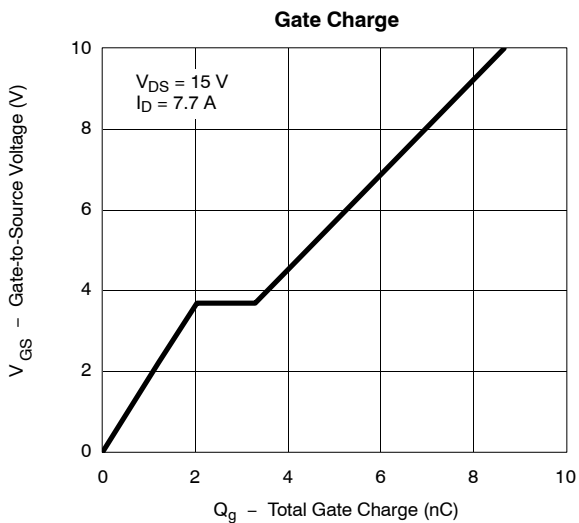
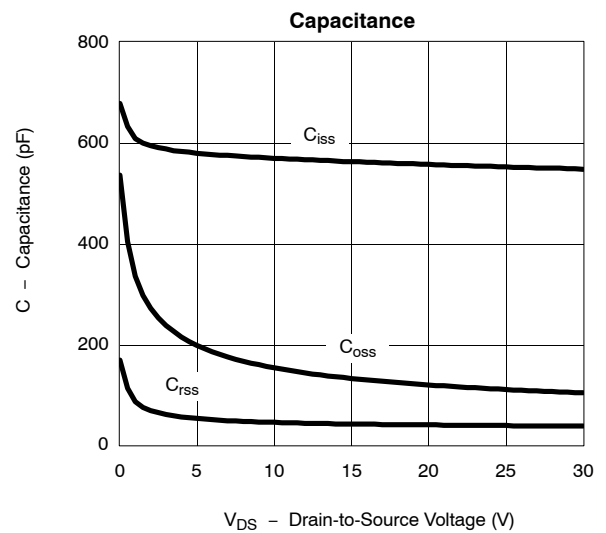
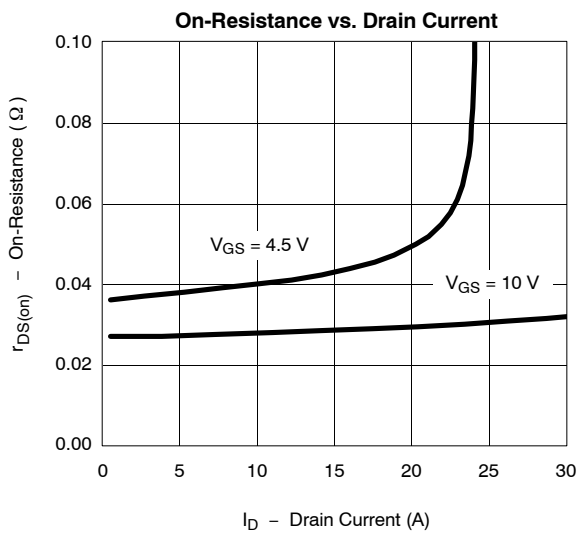
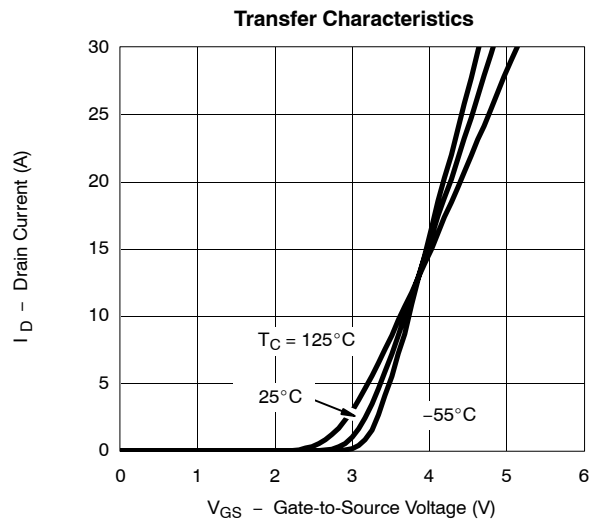
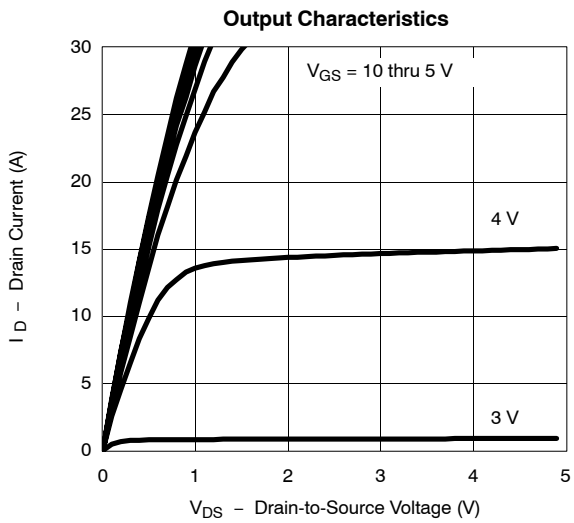
Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case



TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED) N-CHANNEL

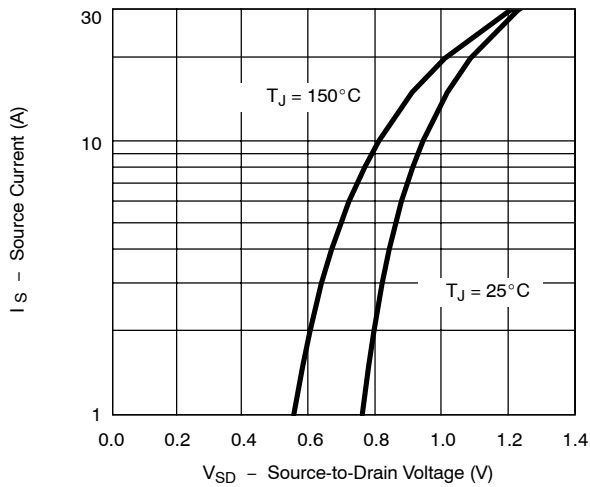




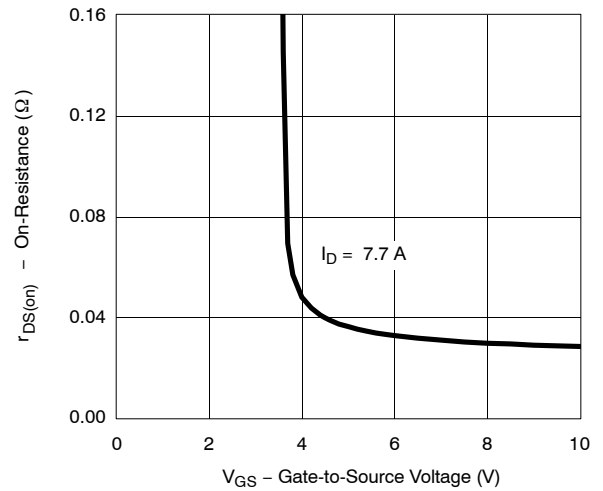
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N-CHANNEL

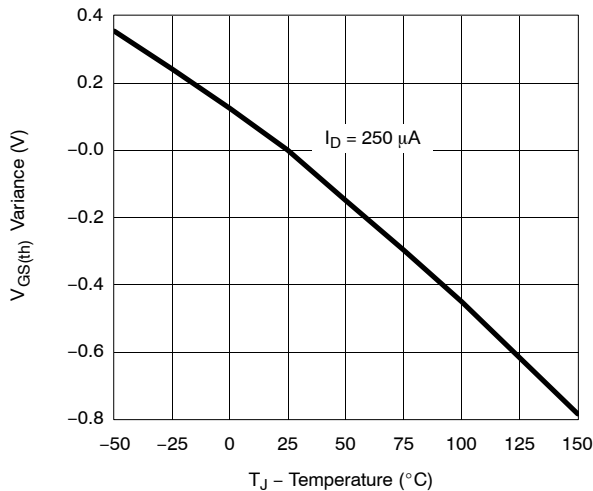
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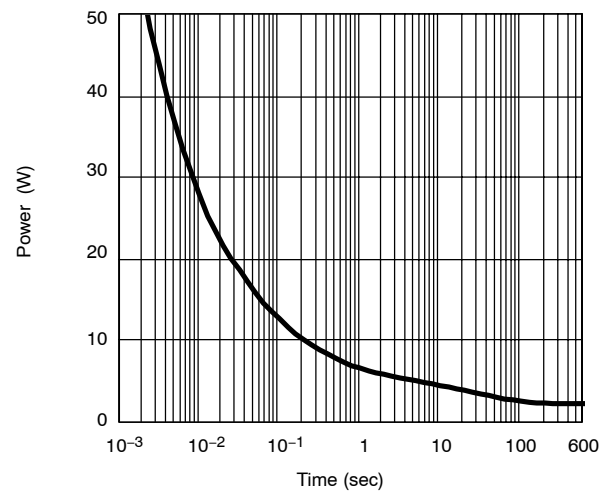
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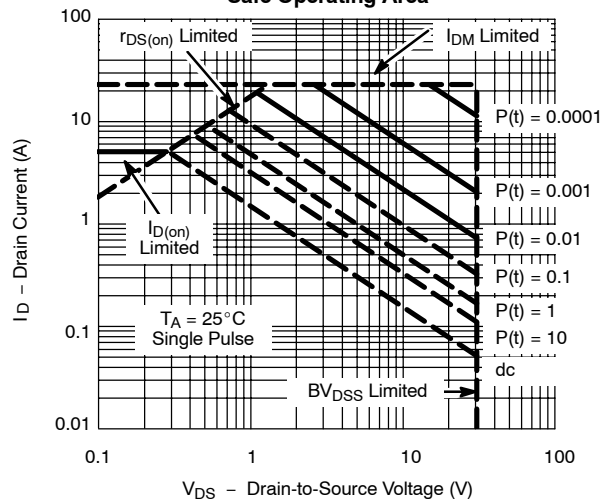
Threshold Voltage



Single Pulse Power



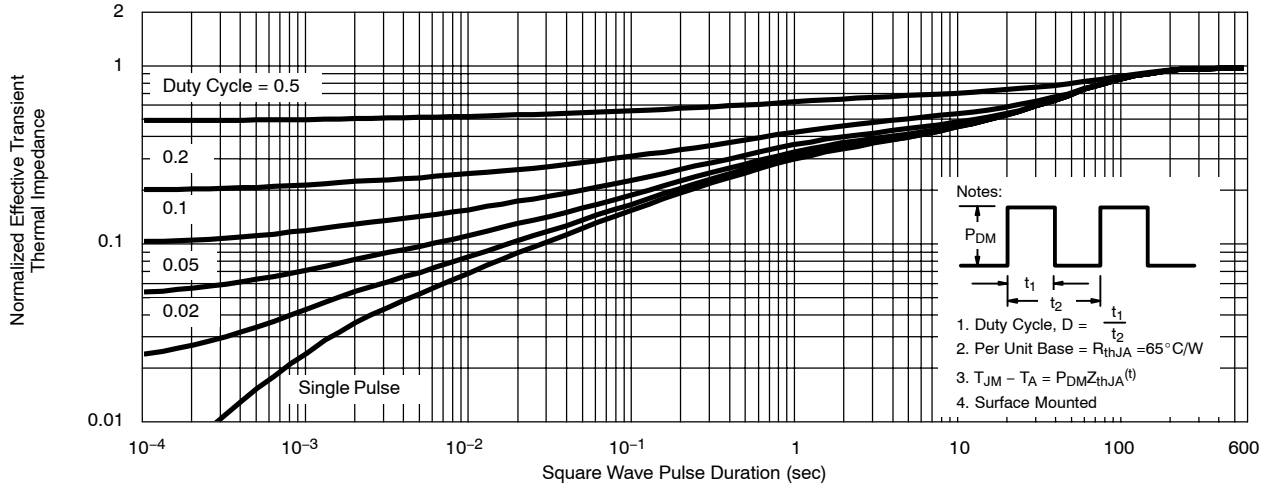
Safe Operating Area



TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)

N-CHANNEL

Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case

