



New Product

Si4569DY
Vishay Siliconix

N- and P-Channel 40-V (D-S) MOSFET



RoHS
COMPLIANT

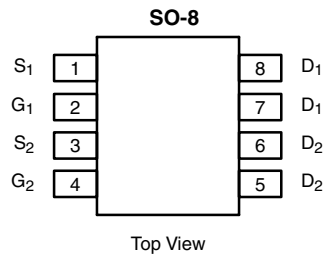
| PRODUCT SUMMARY | | | | |
|-----------------|---------------------|-----------------------------------|---------------------------------|----------------------|
| | V _{DS} (V) | r _{DS(on)} (Ω) | I _D (A) ^a | Q _g (Typ) |
| N-Channel | 40 | 0.027 at V _{GS} = 10 V | 6.0 | 9.6 |
| | | 0.032 at V _{GS} = 4.5 V | 4.8 | |
| P-Channel | -40 | 0.029 at V _{GS} = -10 V | -6.0 | 21 |
| | | 0.039 at V _{GS} = -4.5 V | -4.9 | |

FEATURES

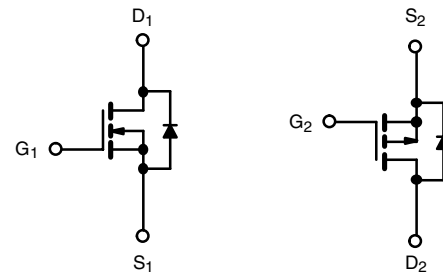
- TrenchFET® Power MOSFET
- 100 % R_g and UIS Tested

APPLICATIONS

- CCFL Inverter



Ordering Information: Si4569DY-T1—E3 (Lead (Pb)-free)



N-Channel MOSFET

P-Channel MOSFET

| ABSOLUTE MAXIMUM RATINGS (T _A = 25 °C UNLESS OTHERWISE NOTED) | | | | | |
|--|------------------------|-----------------------------------|----------------------|----------------------|------|
| Parameter | | Symbol | N-Channel | P-Channel | Unit |
| Drain-Source Voltage | | V _{DS} | 40 | -40 | V |
| Gate-Source Voltage | | V _{GS} | ± 16 | | |
| Continuous Drain Current (T _J = 150 °C) | T _C = 25 °C | I _D | 7.6 | -7.9 | A |
| | T _C = 70 °C | | 6.0 | -6.3 | |
| | T _A = 25 °C | | 6.0 ^{b, c} | -6.1 ^{b, c} | |
| | T _A = 70 °C | | 4.8 ^{b, c} | -4.9 ^{b, c} | |
| Pulsed Drain Current (10 μs Pulse Width) | | I _{DM} | 20 | -20 | A |
| Source-Drain Current Diode Current | T _C = 25 °C | I _S | 2.6 | -2.6 | |
| | T _A = 25 °C | | 1.6 ^{b, c} | -1.6 ^{b, c} | |
| Pulsed Source-Drain Current | | I _{SM} | 20 | -20 | |
| Single Pulse Avalanche Current | L = 0.1 mH | I _{AS} | 10 | 20 | mJ |
| Single Pulse Avalanche Energy | | E _{AS} | 5 | 20 | |
| Maximum Power Dissipation | T _C = 25 °C | P _D | 3.1 | 3.2 | W |
| | T _C = 70 °C | | 2 | 2.1 | |
| | T _A = 25 °C | | 2 ^{b, c} | 2 ^{b, c} | |
| | T _A = 70 °C | | 1.28 ^{b, c} | 1.28 ^{b, c} | |
| Operating Junction and Storage Temperature Range | | T _J , T _{stg} | -55 to 150 | | °C |

| THERMAL RESISTANCE RATINGS | | | | | | | |
|---|--------------|-------------------|-----------|------|-----------|------|------|
| Parameter | | Symbol | N-Channel | | P-Channel | | Unit |
| | | | Typ | Max | Typ | Max | |
| Maximum Junction-to-Ambient ^{b, d} | t ≤ 10 sec | R _{thJA} | 49 | 62.5 | 47 | 62.5 | °C/W |
| Maximum Junction-to-Foot (Drain) | Steady-State | R _{thJF} | 30 | 40 | 29 | 38 | |

Notes

- Based on T_C = 25 °C.
- Surface Mounted on 1" x 1" FR4 Board.
- t = 10 sec.
- Maximum under steady state conditions is 120 °C/W (n-channel) and 110 °C/W (p-channel).

| SPECIFICATIONS (T _J = 25 °C UNLESS OTHERWISE NOTED) | | | | | | | | |
|--|--------------------------------------|---|------|------|------------------|-------|------|---|
| Parameter | Symbol | Test Condition | | Min | Typ ^a | Max | Unit | |
| Static | | | | | | | | |
| Drain-Source Breakdown Voltage | V _{DS} | V _{GS} = 0 V, I _D = 250 μA | N-Ch | 40 | | | V | |
| | | V _{GS} = 0 V, I _D = -250 μA | P-Ch | -40 | | | | |
| V _{DS} Temperature Coefficient | ΔV _{DS} /T _J | I _D = 250 μA | N-Ch | | 37 | | | |
| | | I _D = -250 μA | P-Ch | | -38 | | | |
| V _{GS(th)} Temperature Coefficient | ΔV _{GS(th)} /T _J | I _D = 250 μA | N-Ch | | -5 | | | |
| | | I _D = -250 μA | P-Ch | | 4.0 | | | |
| Gate Threshold Voltage | V _{GS(th)} | V _{DS} = V _{GS} , I _D = 250 μA | N-Ch | 0.6 | | 2.0 | | |
| | | V _{DS} = V _{GS} , I _D = -250 μA | P-Ch | -0.8 | | -2.2 | | |
| Gate-Body Leakage | I _{GSS} | V _{DS} = 0 V, V _{GS} = ± 16 V | N-Ch | | | 100 | nA | |
| | | | P-Ch | | | -100 | | |
| Zero Gate Voltage Drain Current | I _{DSS} | V _{DS} = 40 V, V _{GS} = 0 V | N-Ch | | | 1 | μA | |
| | | V _{DS} = -40 V, V _{GS} = 0 V | P-Ch | | | -1 | | |
| | | V _{DS} = 40 V, V _{GS} = 0 V, T _J = 55 °C | N-Ch | | | 10 | | |
| | | V _{DS} = -40 V, V _{GS} = 0 V, T _J = 55 °C | P-Ch | | | -10 | | |
| On-State Drain Current ^b | I _{D(on)} | V _{DS} = 5 V, V _{GS} = 10 V | N-Ch | 20 | | | A | |
| | | V _{DS} = -5 V, V _{GS} = -10 V | P-Ch | -20 | | | | |
| Drain-Source On-State Resistance ^b | r _{DS(on)} | V _{GS} = 10 V, I _D = 6 A | N-Ch | | 0.022 | 0.027 | Ω | |
| | | V _{GS} = -10 V, I _D = -6 A | P-Ch | | 0.024 | 0.029 | | |
| | | V _{GS} = 4.5 V, I _D = 4.8 A | N-Ch | | 0.026 | 0.032 | | |
| | | V _{GS} = -4.5 V, I _D = -4.9 A | P-Ch | | 0.031 | 0.039 | | |
| Forward Transconductance ^b | g _{fs} | V _{DS} = 15 V, I _D = 6 A | N-Ch | | 20 | | S | |
| | | V _{DS} = -15 V, I _D = -6 A | P-Ch | | 17 | | | |
| Dynamic^a | | | | | | | | |
| Input Capacitance | C _{iss} | N-Channel V _{DS} = 20 V, V _{GS} = 0 V, f = 1 MHz P-Channel V _{DS} = -20 V, V _{GS} = 0 V, f = 1 MHz | N-Ch | | 855 | | pF | |
| | | | P-Ch | | 1505 | | | |
| Output Capacitance | C _{oss} | | N-Ch | | 105 | | | |
| | | | P-Ch | | 230 | | | |
| Reverse Transfer Capacitance | C _{rss} | | N-Ch | | 65 | | | |
| | | | P-Ch | | 175 | | | |
| Total Gate Charge | Q _g | V _{DS} = 20 V, V _{GS} = 10 V, I _D = 5 A | N-Ch | | 21 | 32 | nC | |
| | | V _{DS} = -20 V, V _{GS} = -10 V, I _D = -5 A | P-Ch | | 41 | 62 | | |
| Gate-Source Charge | Q _{gs} | N-Channel V _{DS} = 20 V, V _{GS} = 4.5 V, I _D = 5 A P-Channel V _{DS} = -20 V, V _{GS} = -4.5 V, I _D = -5 A | N-Ch | | 9.6 | 14.5 | | |
| | | | P-Ch | | 21 | 31 | | |
| Gate-Drain Charge | Q _{gd} | | N-Ch | | 2.3 | | | |
| | | | P-Ch | | 4.5 | | | |
| Gate Resistance | R _g | f = 1 MHz | N-Ch | | 2.5 | 3.8 | | Ω |
| | | | P-Ch | | 6.5 | 10 | | |



| SPECIFICATIONS (T _J = 25 °C UNLESS OTHERWISE NOTED) | | | | | | | |
|--|---------------------|---|------|------------------|-------|------|----|
| Parameter | Symbol | Test Condition | Min | Typ ^a | Max | Unit | |
| Dynamic^a | | | | | | | |
| Turn-On Delay Time | t _{d(on)} | N-Channel V _{DD} = 20 V, R _L = 4 Ω I _D ≅ 5 A, V _{GEN} = 10 V, R _g = 1 Ω P-Channel V _{DD} = -20 V, R _L = 4 Ω I _D ≅ -5 A, V _{GEN} = -10 V, R _g = 1 Ω | N-Ch | | 6 | 12 | ns |
| | | | P-Ch | | 7 | 14 | |
| Rise Time | t _r | | N-Ch | | 11 | 20 | |
| | | | P-Ch | | 15 | 25 | |
| Turn-Off Delay Time | t _{d(off)} | | N-Ch | | 24 | 36 | |
| | | | P-Ch | | 51 | 77 | |
| Fall Time | t _f | | N-Ch | | 6 | 12 | |
| | | | P-Ch | | 54 | 81 | |
| Turn-On Delay Time | t _{d(on)} | N-Channel V _{DD} = 20 V, R _L = 4 Ω I _D ≅ 5 A, V _{GEN} = 4.5 V, R _g = 1 Ω P-Channel V _{DD} = -20 V, R _L = 4 Ω I _D ≅ -5 A, V _{GEN} = -4.5 V, R _g = 1 Ω | N-Ch | | 12 | 20 | ns |
| | | | P-Ch | | 26 | 40 | |
| Rise Time | t _r | | N-Ch | | 60 | 90 | |
| | | | P-Ch | | 105 | 160 | |
| Turn-Off Delay Time | t _{d(off)} | | N-Ch | | 22 | 33 | |
| | | | P-Ch | | 60 | 90 | |
| Fall Time | t _f | | N-Ch | | 5 | 10 | |
| | | | P-Ch | | 60 | 90 | |
| Drain-Source Body Diode Characteristics | | | | | | | |
| Continuous Source-Drain Diode Current | I _S | T _C = 25 °C | N-Ch | | | 2.6 | A |
| | | | P-Ch | | | -2.6 | |
| Pulse Diode Forward Current ^a | I _{SM} | | N-Ch | | | 20 | A |
| | | | P-Ch | | | -20 | |
| Body Diode Voltage | V _{SD} | I _S = 1.5 A | N-Ch | | 0.73 | 1.2 | V |
| | | I _S = -1.6 A | P-Ch | | -0.73 | -1.2 | |
| Body Diode Reverse Recovery Time | t _{rr} | N-Channel I _F = 5 A, di/dt = 100 A/μs, T _J = 25 °C P-Channel I _F = -5 A, di/dt = -100 A/μs, T _J = 25 °C | N-Ch | | 26 | 40 | ns |
| | | | P-Ch | | 30 | 45 | |
| Body Diode Reverse Recovery Charge | Q _{rr} | | N-Ch | | 21 | 32 | nC |
| | | | P-Ch | | 24 | 36 | |
| Reverse Recovery Fall Time | t _a | | N-Ch | | 13 | | ns |
| | | | P-Ch | | 15 | | |
| Reverse Recovery Rise Time | t _b | | N-Ch | | 13 | | ns |
| | | | P-Ch | | 15 | | |

Notes

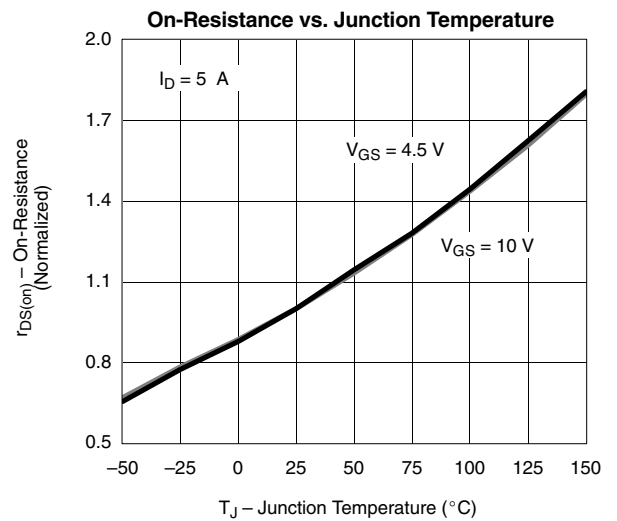
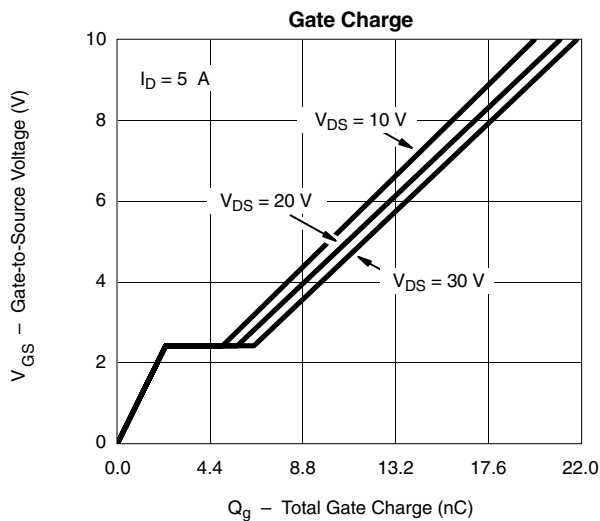
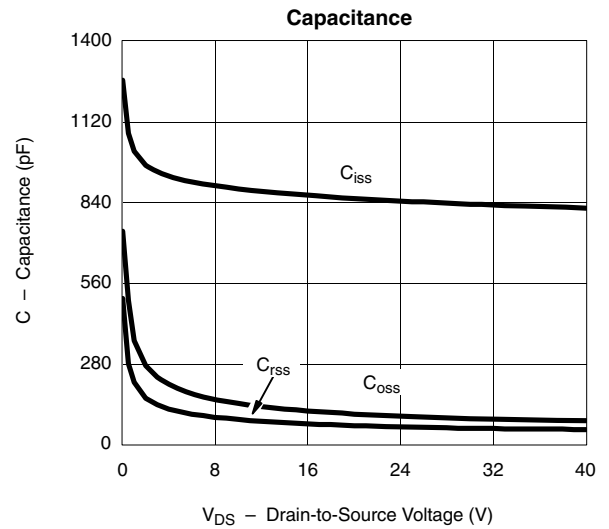
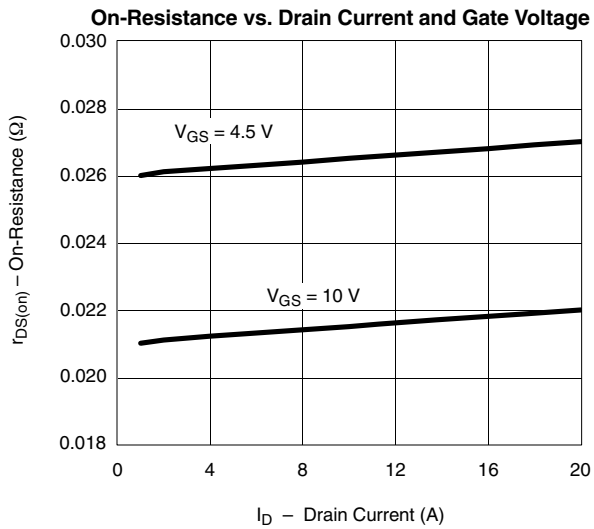
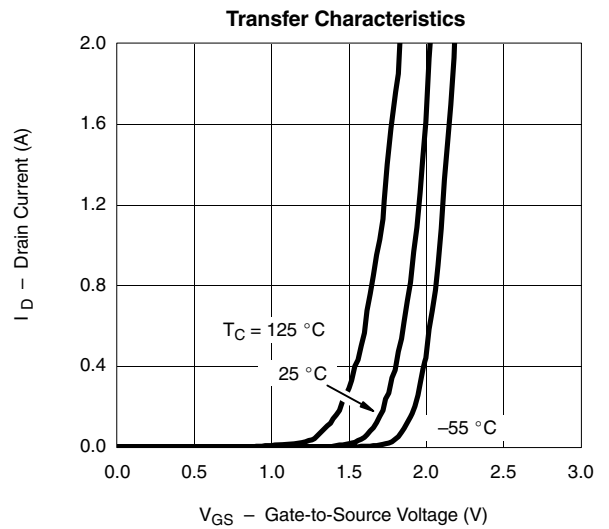
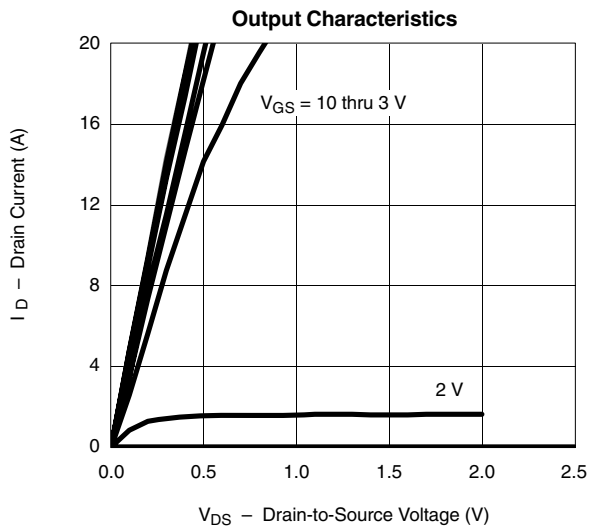
- a. Guaranteed by design, not subject to production testing.
- b. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.



TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)

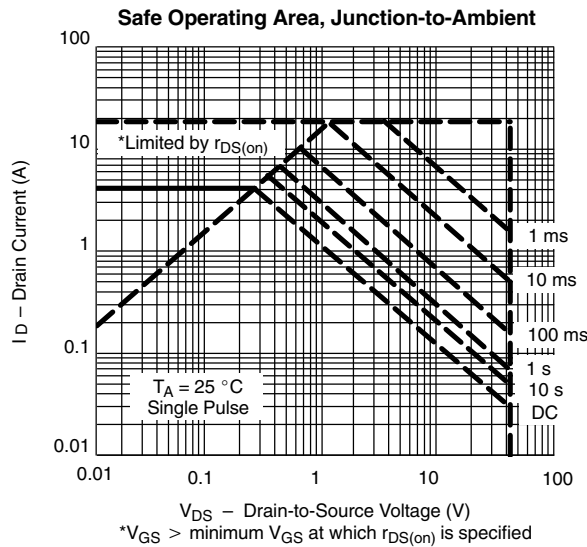
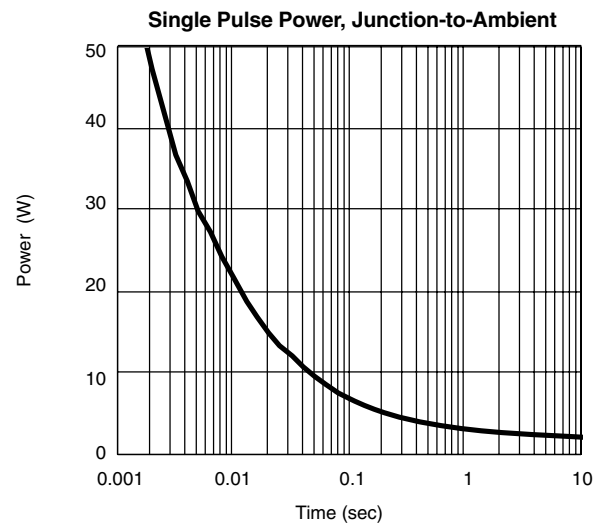
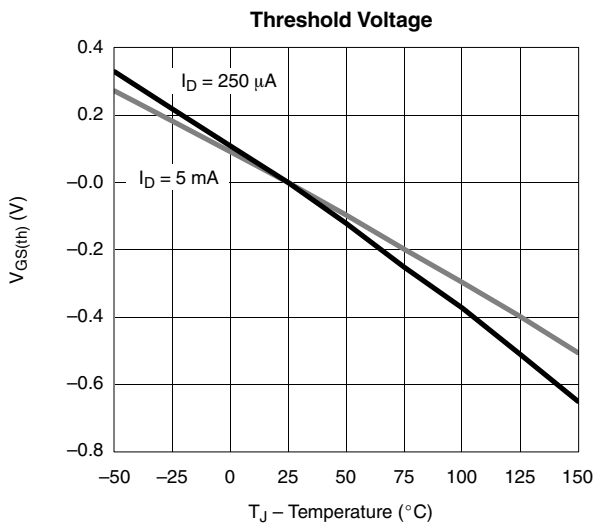
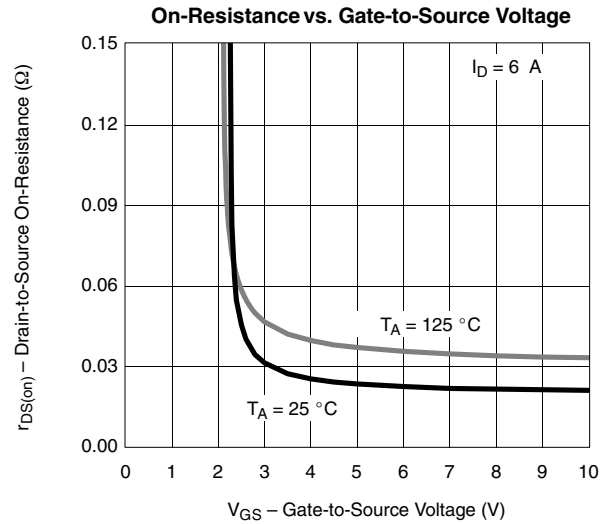
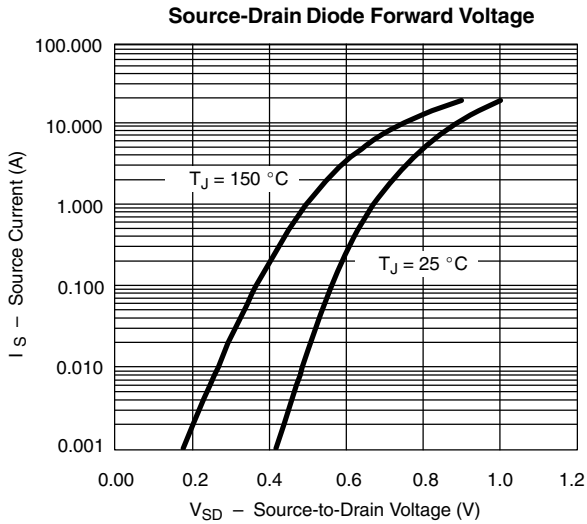
N-CHANNEL





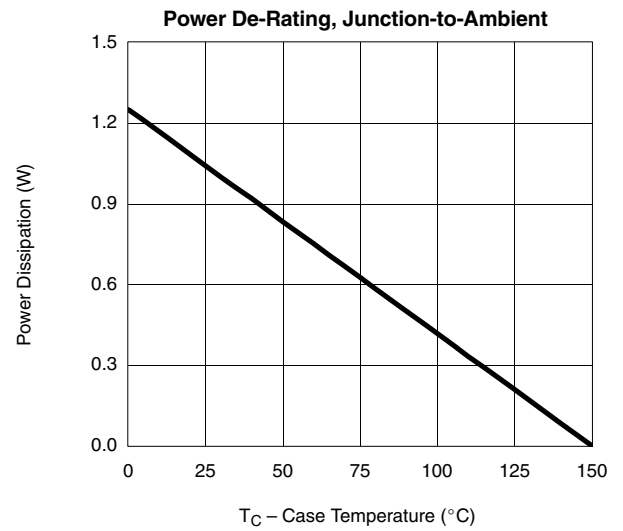
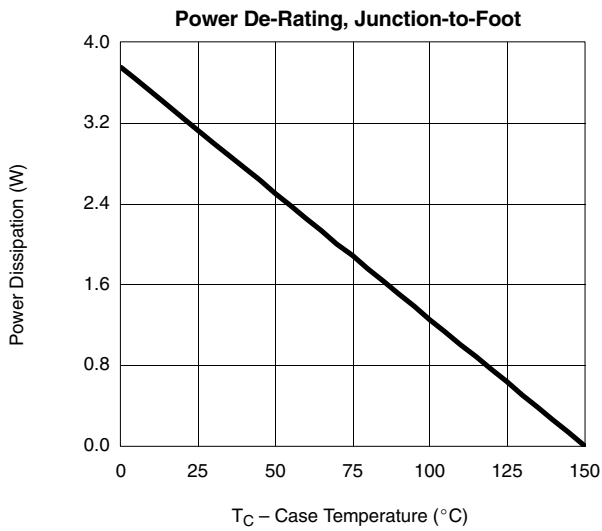
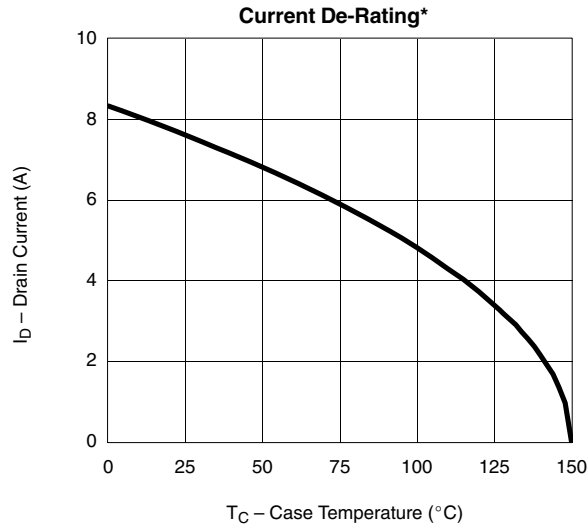
TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)

N-CHANNEL



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N-CHANNEL

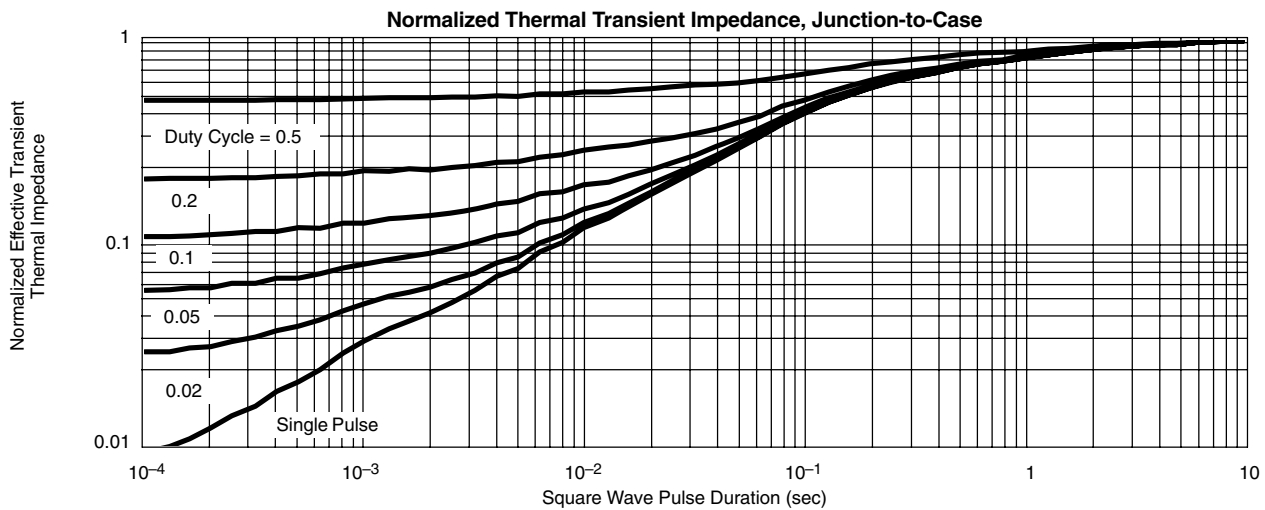
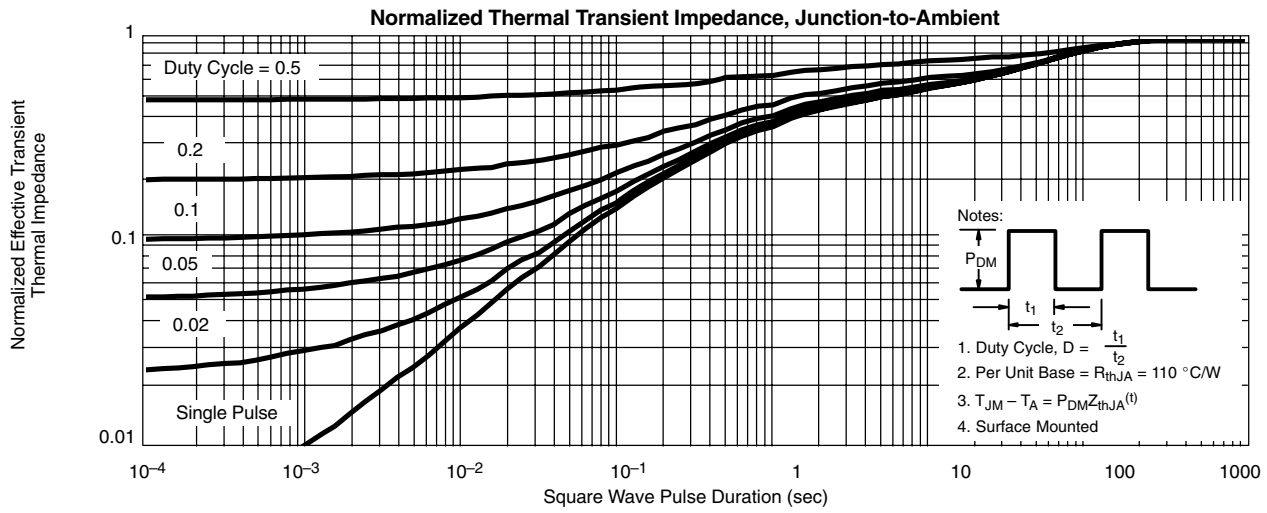


*The power dissipation P_b is based on $T_{J(max)} = 150\text{ °C}$, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.



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N-CHANNEL

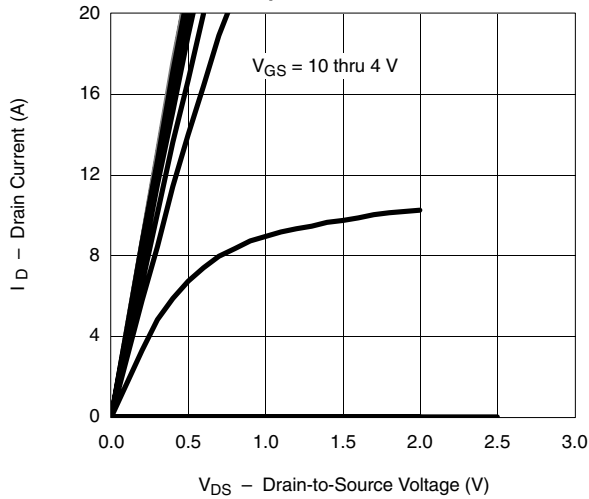




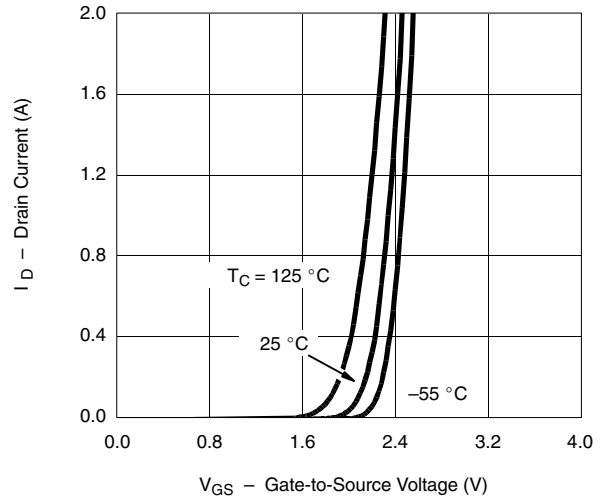
TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)

P-CHANNEL

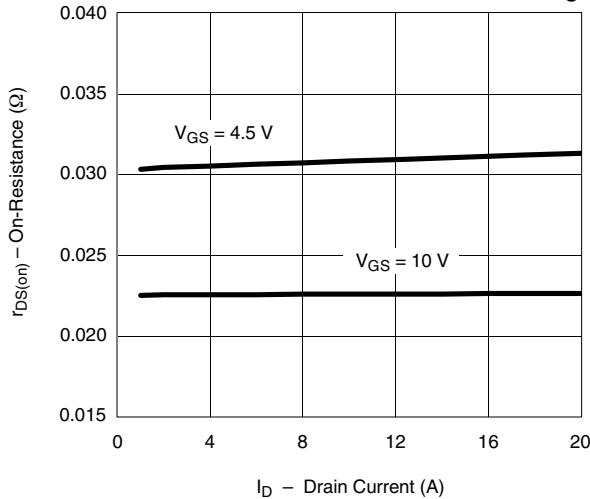
Output Characteristics



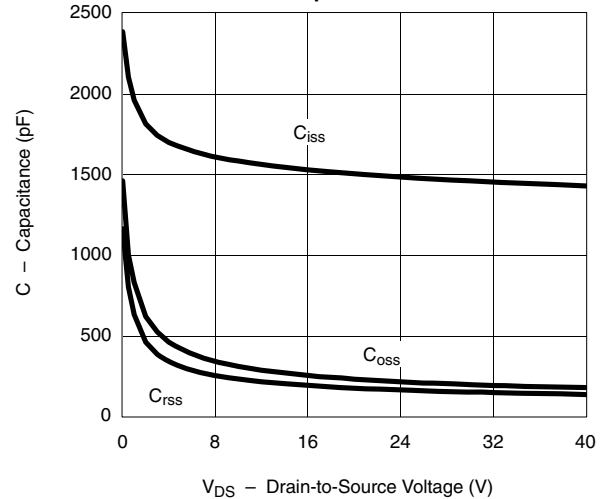
Transfer Characteristics



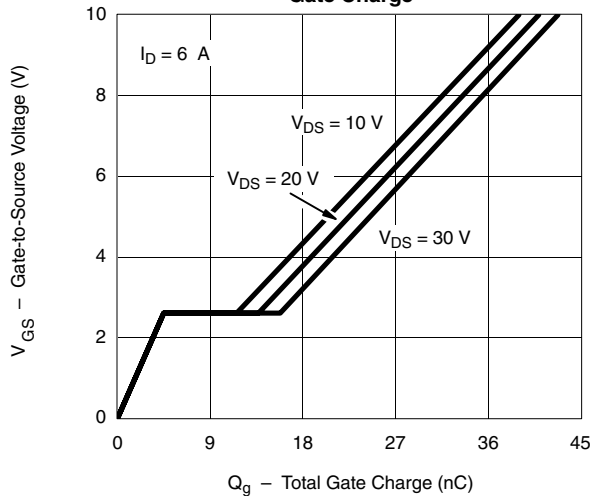
On-Resistance vs. Drain Current and Gate Voltage



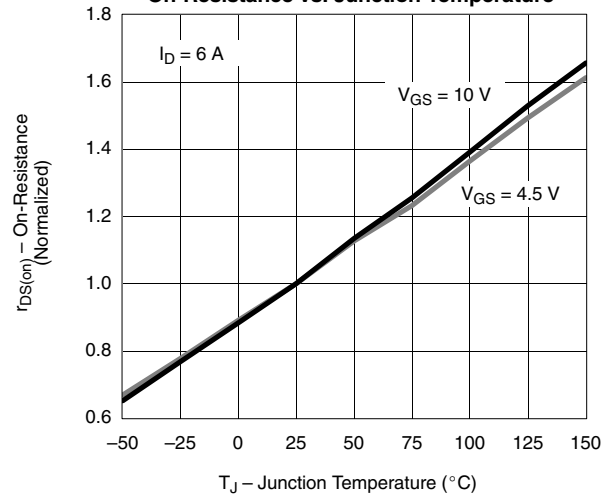
Capacitance



Gate Charge



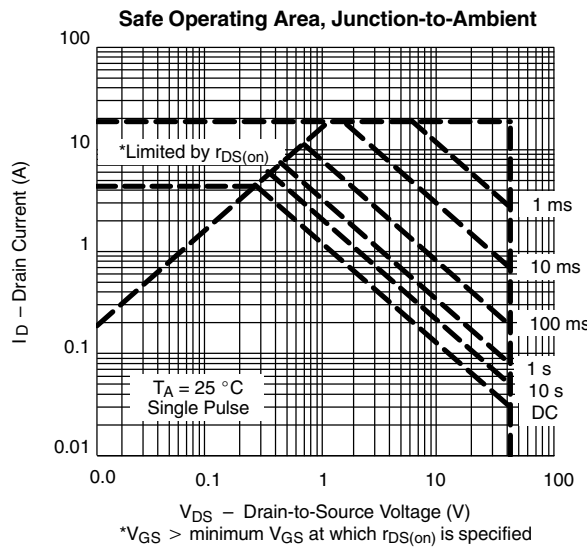
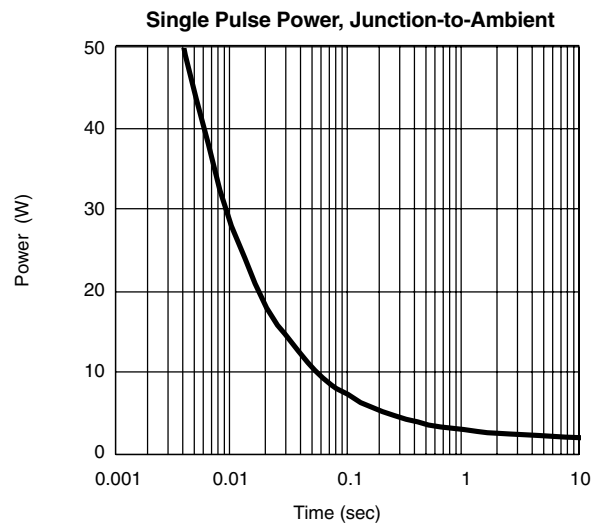
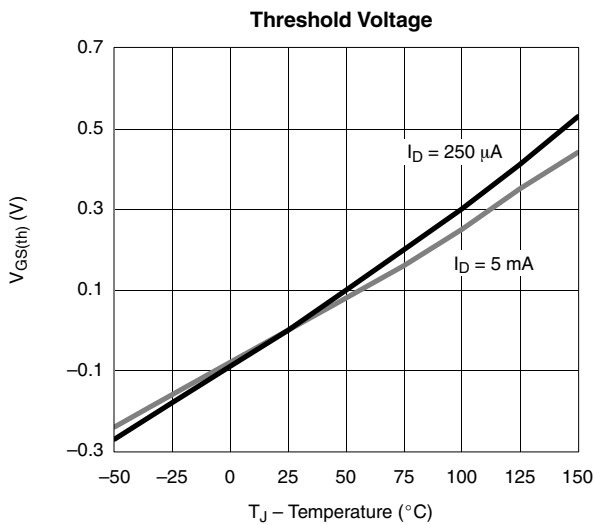
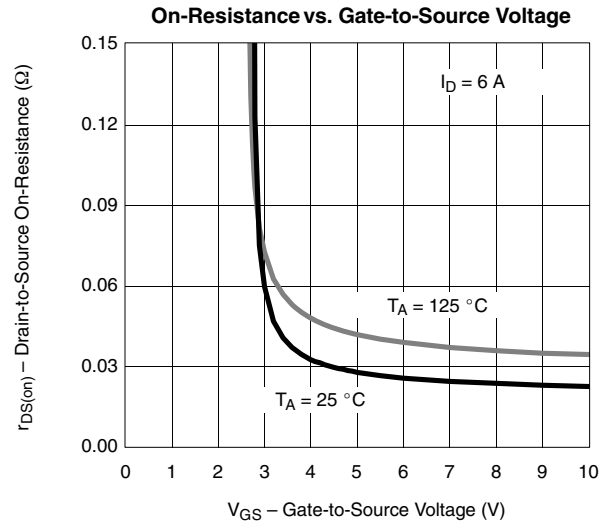
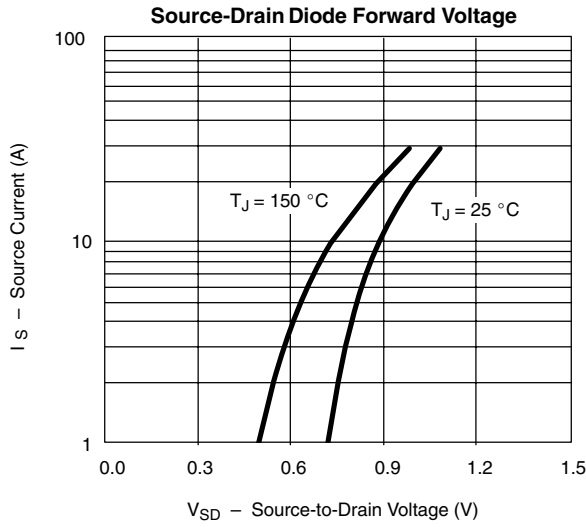
On-Resistance vs. Junction Temperature





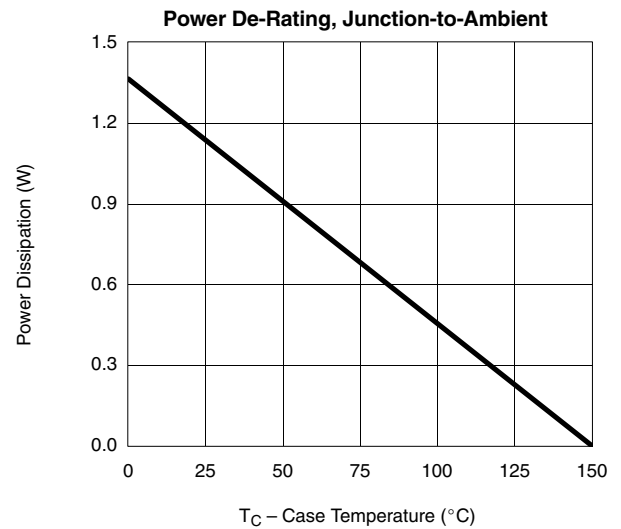
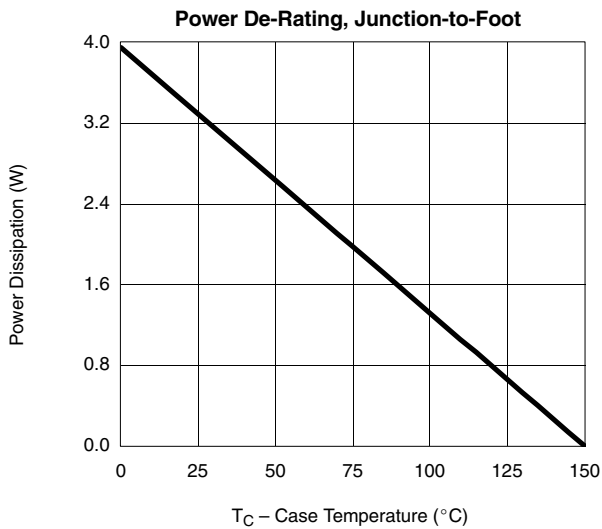
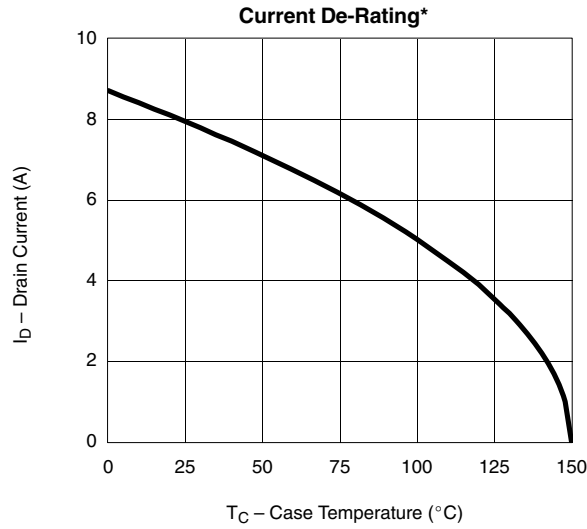
TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)

P-CHANNEL



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P-CHANNEL

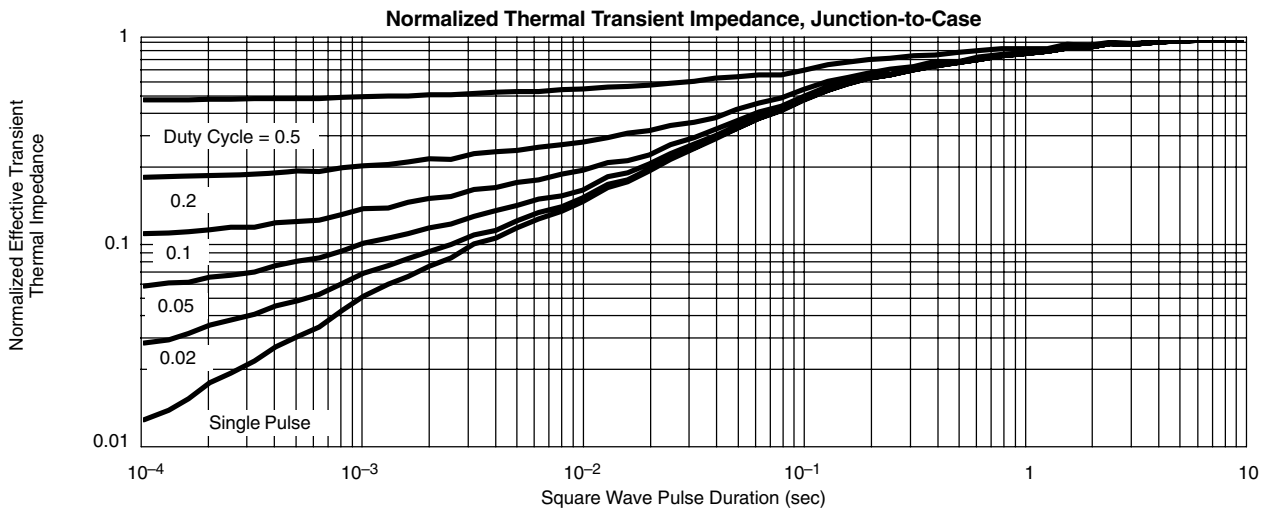
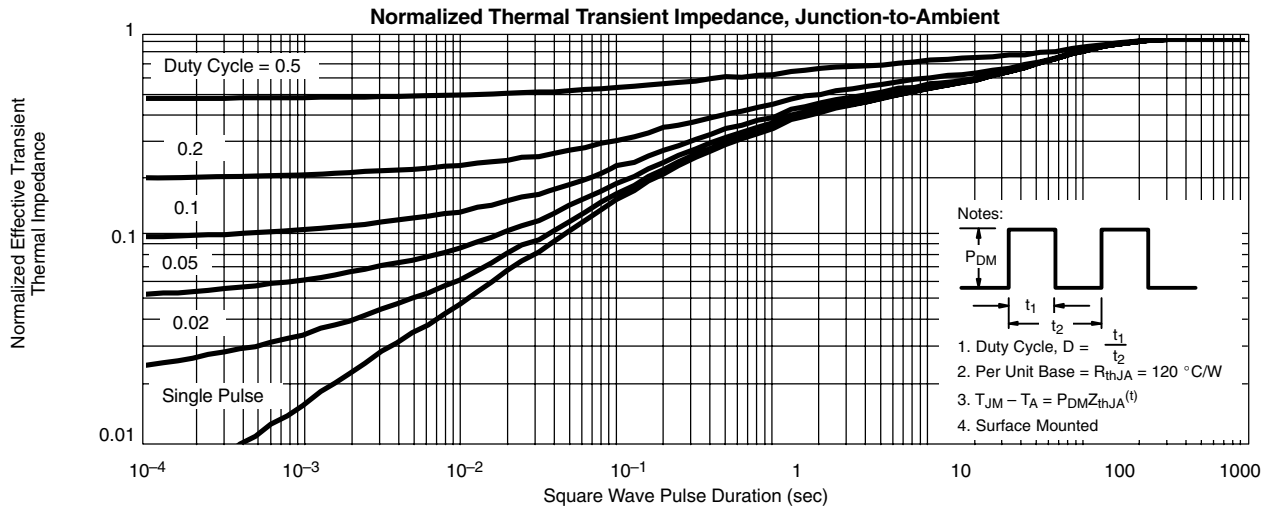


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TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)

P-CHANNEL



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