

MOSFET – Dual N-Channel and Dual P-Channel, POWERTRENCH[®], GreenBridge[™] Series of High-Efficiency Bridge Rectifiers

N-Channel: 100 V, 6 A, 110 mΩ
P-Channel: -80 V, -6 A, 190 mΩ

FDMQ8203

General Description

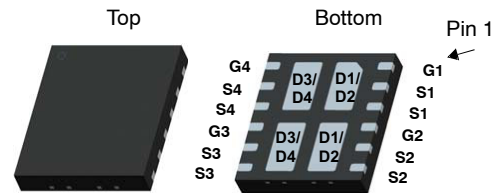
This quad mosfet solution provides ten-fold improvement in power dissipation over diode bridge.

Features

- Q1/Q4: N-Channel
 - ♦ Max $R_{DS(on)}$ = 110 mΩ at $V_{GS} = 10$ V, $I_D = 3$ A
 - ♦ Max $R_{DS(on)}$ = 175 mΩ at $V_{GS} = 6$ V, $I_D = 2.4$ A
- Q2/Q3: P-Channel
 - ♦ Max $R_{DS(on)}$ = 190 mΩ at $V_{GS} = -10$ V, $I_D = -2.3$ A
 - ♦ Max $R_{DS(on)}$ = 235 mΩ at $V_{GS} = -4.5$ V, $I_D = -2.1$ A

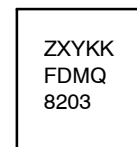
Applications

- High-Efficiency Bridge Rectifiers
- Substantial Efficiency Benefit in PD Solutions
- These Device is Pb-Free, Halide Free and is RoHS Compliant



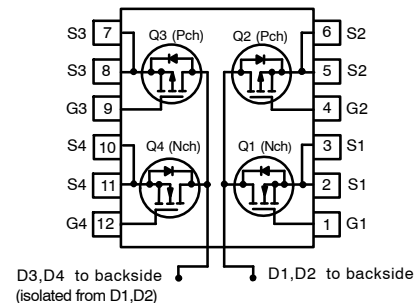
WDFN12 5x4.5, 0.8P
CASE 511CS

MARKING DIAGRAM



FDMQ8203 = Specific Device Code
 Z = Assembly Plant Code
 XY = Date Code
 KK = Lot Run Traceability Code

N-Channel / P-Channel



ORDERING INFORMATION

| Device | Package | Shipping [†] |
|----------|--|-----------------------|
| FDMQ8203 | MLP 4.5x5 (Pb-Free, Halide Free) | 3000 / Tape & Reel |

[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

FDMQ8203

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C unless otherwise noted)

| Symbol | Parameter | | Q1/Q4 | Q2/Q3 | Unit |
|-----------------------------------|--|--|-------------|-------|------|
| V _{DS} | Drain to Source Voltage | | 100 | −80 | V |
| V _{GS} | Gate to Source Voltage | | ±20 | ±20 | V |
| I _D | Drain Current | − Continuous (Package Limited) T _C = 25°C | 6 | −6 | A |
| | | − Continuous (Silicon Limited) T _C = 25°C | 10 | −10 | |
| | | − Continuous T _A = 25°C (Note 1a) | 3.4 | −2.6 | |
| | | − Pulsed | 12 | −10 | |
| P _D | Power Dissipation for Single Operation | T _C = 25°C | 22 | 37 | W |
| | Power Dissipation for Dual Operation | T _A = 25°C (Note 1a) | 2.5 | | |
| T _J , T _{STG} | Operating and Storage Junction Temperature Range | | −55 to +150 | | °C |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

THERMAL CHARACTERISTICS

| Symbol | Parameter | Value | Unit |
|------------------|---|-------|------|
| R _{θJA} | Thermal Resistance, Junction to Ambient (Note 1a) | 50 | °C/W |
| R _{θJA} | Thermal Resistance, Junction to Ambient (Note 1b) | 160 | |

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

| Symbol | Parameter | Test Condition | Type | Min | Typ | Max | Unit |
|--------|-----------|----------------|------|-----|-----|-----|------|
|--------|-----------|----------------|------|-----|-----|-----|------|

OFF CHARACTERISTICS

| | | | | | | | |
|--------------------------------------|---|---|----------------|------------|-----------|--------------|-------|
| BV _{DSS} | Drain to Source Breakdown Voltage | I _D = 250 μA, V _{GS} = 0 I _D = -250 μA, V _{GS} = 0 | Q1/Q4 Q2/Q3 | 100 -80 | - | - | V |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | I _D = 250 μA, Referenced to 25°C I _D = -250 μA, Referenced to 25°C | Q1/Q4 Q2/Q3 | - - | 72 -79 | - | mV/°C |
| I _{DSS} | Zero Gate Voltage Drain Current | V _{DS} = 80 V, V _{GS} = 0 V V _{DS} = -64 V, V _{GS} = 0 V | Q1/Q4 Q2/Q3 | - - | - | 1 -1 | μA |
| I _{GSS} | Gate to Source Leakage Current | V _{GS} = ±20 V, V _{DS} = 0 V | Q1/Q4 Q2/Q3 | - - | - | ±100 ±100 | nA |

ON CHARACTERISTICS (Note 2)

| | | | | | | | |
|--|--|---|----------------|-------------|-------------------|-------------------|-------|
| V _{GS(th)} | Gate to Source Threshold Voltage | V _{GS} = V _{DS} , I _D = 250 μA V _{GS} = V _{DS} , I _D = -250 μA | Q1/Q4 Q2/Q3 | 2 -1 | 3 -1.6 | 4 -3 | V |
| $\frac{\Delta V_{GS(th)}}{\Delta T_J}$ | Gate to Source Threshold Voltage Temperature Coefficient | I _D = 250 μA, Referenced to 25°C I _D = -250 μA, Referenced to 25°C | Q1/Q4 Q2/Q3 | - - | -8 5 | - | mV/°C |
| R _{DS(on)} | Static Drain-Source On-Resistance | V _{GS} = 10 V, I _D = 3 A V _{GS} = 6 V, I _D = 2.4 A V _{GS} = 10 V, I _D = 3 A, T _J = 125°C | Q1/Q4 | - - - | 85 118 147 | 110 175 191 | mΩ |
| | | V _{GS} = -10 V, I _D = -2.3 A V _{GS} = -4.5 V, I _D = -2.1 A V _{GS} = -10 V, I _D = -2.3 A, T _J = 125°C | Q2/Q3 | - - - | 161 188 273 | 190 235 323 | |
| g _{FS} | Forward Transconductance | V _{DS} = 10 V, I _D = 3 A V _{DS} = -10 V, I _D = -2.3 A | Q1/Q4 Q2/Q3 | - - | 6 6 | - - | S |

DYNAMIC CHARACTERISTICS

| | | | | | | | |
|------------------|------------------------------|---|----------------|--------|------------|------------|----|
| C _{iss} | Input Capacitance | Q1/Q4 V _{DD} = 50 V, V _{GS} = 0 V, f = 1.0 MHz Q2/Q3 V _{DS} = -40 V, V _{GS} = 0 V, f = 1.0 MHz Q1/Q4 Q2/Q3 | Q1/Q4 Q2/Q3 | - - | 158 639 | 210 850 | pF |
| C _{oss} | Output Capacitance | | Q1/Q4 Q2/Q3 | - - | 41 46 | 55 65 | pF |
| C _{rss} | Reverse Transfer Capacitance | | Q1/Q4 Q2/Q3 | - - | 2.6 24 | 5 40 | pF |

ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise noted) (continued)

| Symbol | Parameter | Test Condition | | Type | Min | Typ | Max | Unit |
|------------------------------------|-------------------------------|---|---|-------|-----|-----|-----|------|
| SWITCHING CHARACTERISTICS (Note 2) | | | | | | | | |
| t _{d(on)} | Turn-On Delay Time | Q1/Q4 V _{DD} = 50 V, I _D = 3 A, V _{GS} = 10 V, R _{GEN} = 6 Ω Q2/Q3 V _{DD} = -40 V, I _D = -2.3 A, V _{GS} = -10 V, R _{GEN} = 6 Ω | | Q1/Q4 | – | 3.8 | 10 | ns |
| t _r | Rise Time | | | Q2/Q3 | – | 4.7 | 10 | ns |
| t _{d(off)} | Turn-Off Delay Time | | | Q1/Q4 | – | 1.3 | 10 | ns |
| t _f | Fall Time | | | Q2/Q3 | – | 2.8 | 10 | ns |
| Q _g | Total Gate Charge | V _{GS} = 0 V to 10 V V _{GS} = 0 V to -10 V | Q1/Q4: V _{DD} = 50 V, I _D = 3 A Q2/Q3 V _{DD} = -40 V, I _D = -2.3 A | Q1/Q4 | – | 2.9 | 5 | nC |
| Q _g | Total Gate Charge | V _{GS} = 0 V to 5 V V _{GS} = 0 V to -4.5 V | | Q2/Q3 | – | 13 | 19 | nC |
| Q _{gs} | Gate-Source Gate Charge | | | Q1/Q4 | – | 1.6 | 3 | nC |
| Q _{gd} | Gate to Drain “Miller” Charge | | | Q2/Q3 | – | 6.4 | 10 | nC |
| | | | | Q1/Q4 | – | 0.8 | – | nC |
| | | | | Q2/Q3 | – | 1.6 | – | nC |
| | | | | Q1/Q4 | – | 0.8 | – | nC |
| | | | | Q2/Q3 | – | 2.6 | – | nC |

DRAIN-SOURCE DIODE CHARACTERISTICS

| | | | | | | | |
|----------|---------------------------------------|---|----------------|--------|---------------|-------------|----|
| V_{SD} | Source to Drine Diode Forward Voltage | $V_{GS} = 0\text{ V}$, $I_S = 3\text{ A}$ (Note 2) $V_{GS} = 0\text{ V}$, $I_S = -2.3\text{ A}$ (Note 2) | Q1/Q4 Q2/Q3 | – – | 0.86 –0.82 | 1.3 –1.3 | V |
| t_{rr} | Reverse Recovery Time | Q1/Q4: $I_F = 3\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$ Q2/Q3: $I_F = -2.3\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$ | Q1/Q4 Q2/Q3 | – – | 32 26 | 52 42 | ns |
| Q_{rr} | Reverse Recovery Charge | | Q1/Q4 Q2/Q3 | – – | 21 26 | 34 42 | nC |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

- $R_{\theta JA}$ is determined with the device mounted on a 1 in² pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



- 50°C/W when mounted on a 1 in² pad of 2 oz copper, the board designed Q1+Q3 or Q2+Q4.



- 160°C/W when mounted on a minimum pad of 2 oz copper, the board designed Q1+Q3 or Q2+Q4.

- Pulse Test: Pulse Width < 300 μs , Duty Cycle < 2.0%

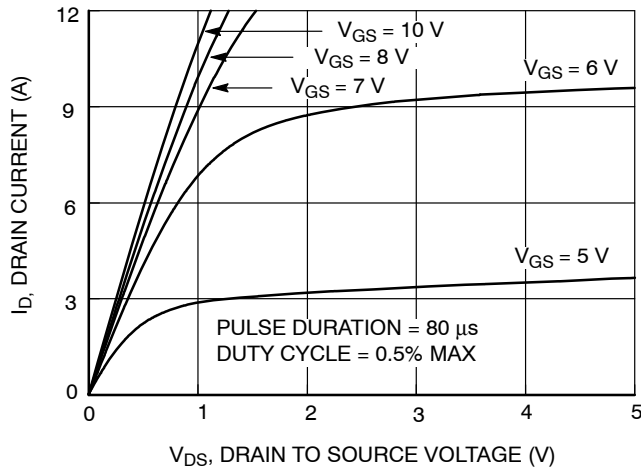
TYPICAL CHARACTERISTICS (N-CHANNEL) ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Figure 1. On Region Characteristics

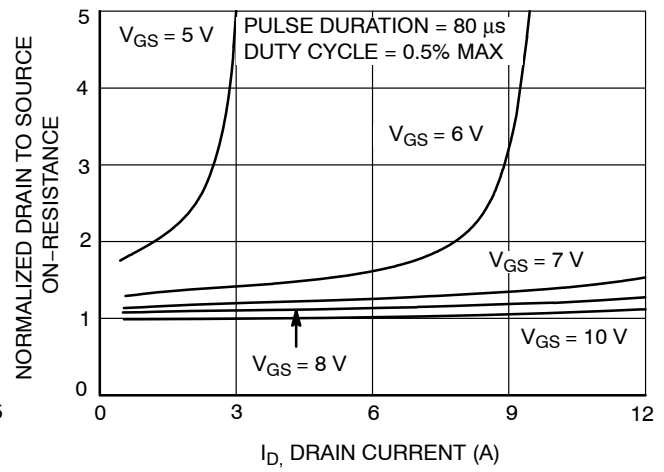


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

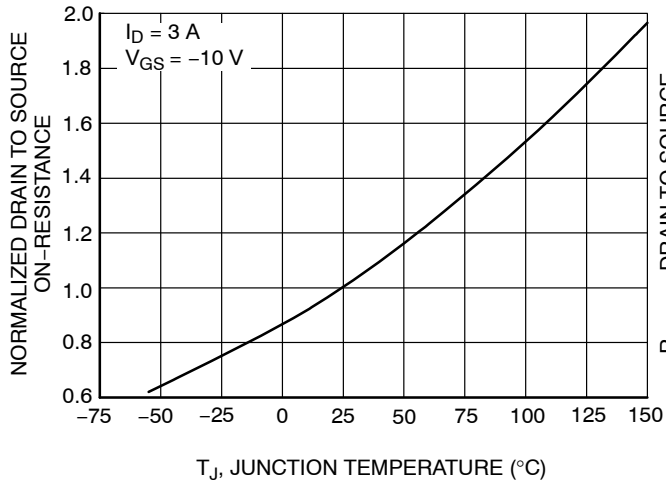


Figure 3. Normalized On Resistance vs Junction Temperature

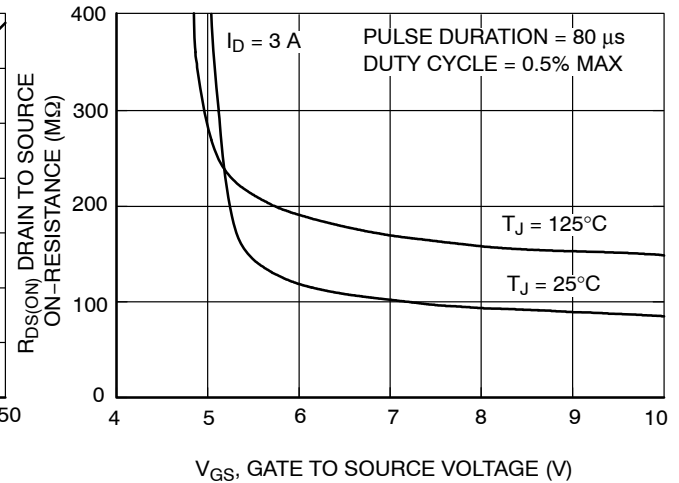


Figure 4. On-Resistance vs Gate to Source Voltage

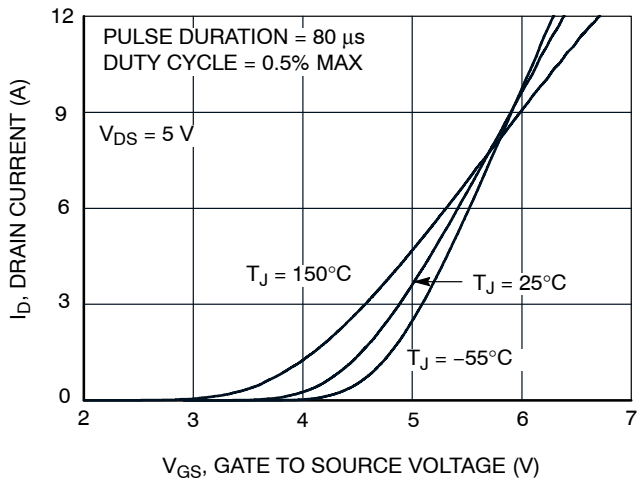


Figure 5. Transfer Characteristics

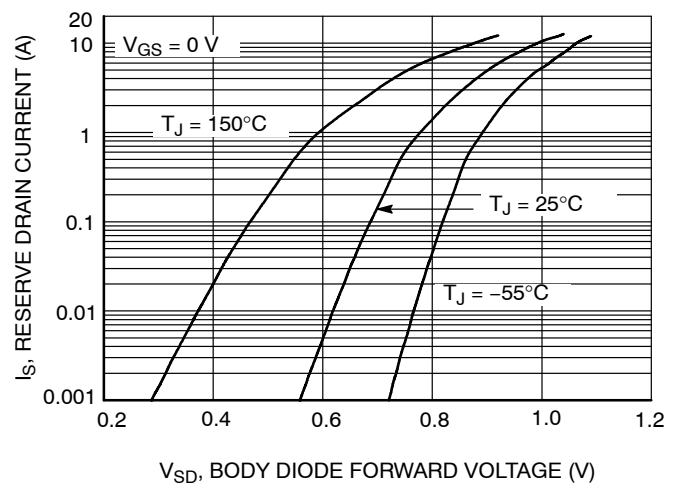


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

TYPICAL CHARACTERISTICS (N-CHANNEL) ($T_J = 25^\circ\text{C}$ unless otherwise noted) (continued)

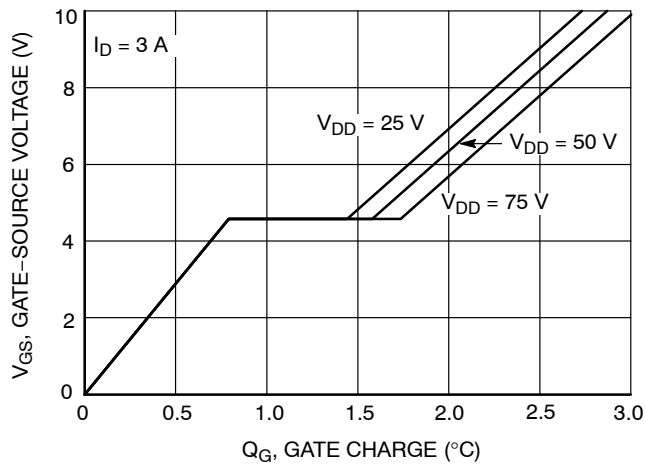


Figure 7. Gate Charge Characteristics

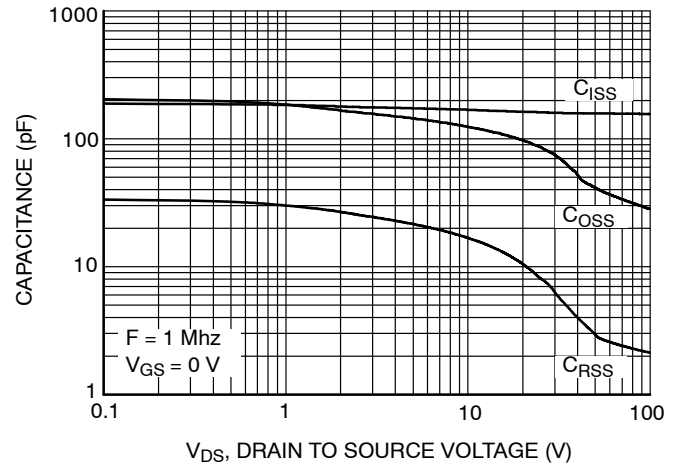


Figure 8. Capacitance vs Drain to Source Voltage

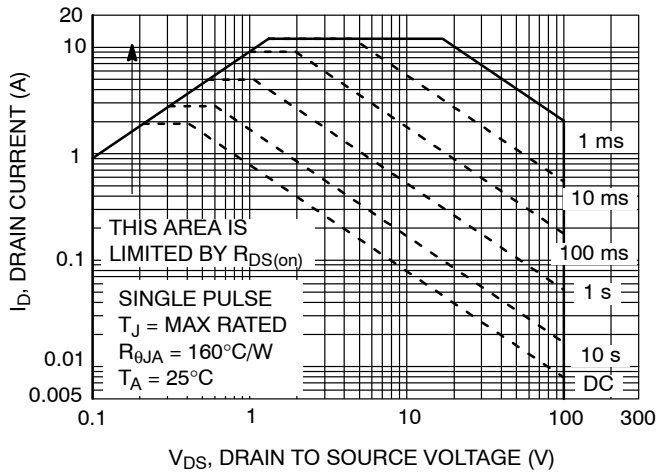


Figure 9. Forward Bias Safe Operating Area

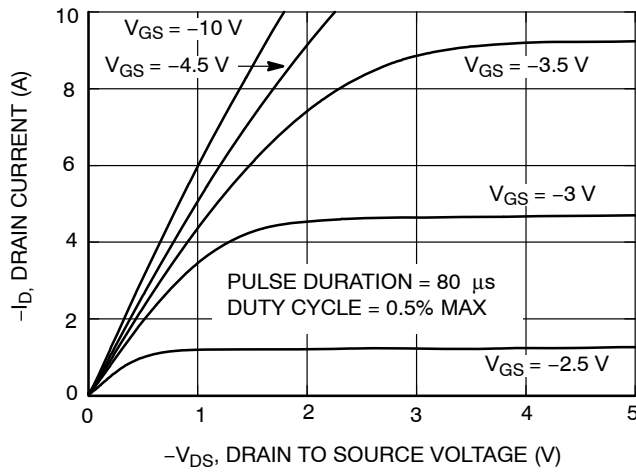
TYPICAL CHARACTERISTICS (P-CHANNEL) ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Figure 10. On-Region Characteristics

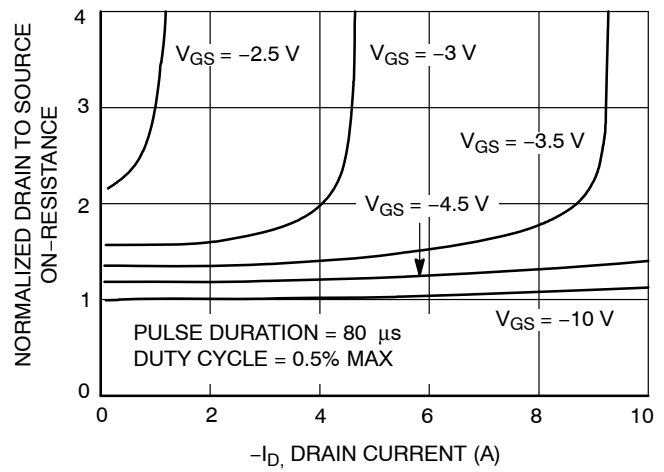


Figure 11. Normalized On-Resistance vs Drain Current and Gate Voltage

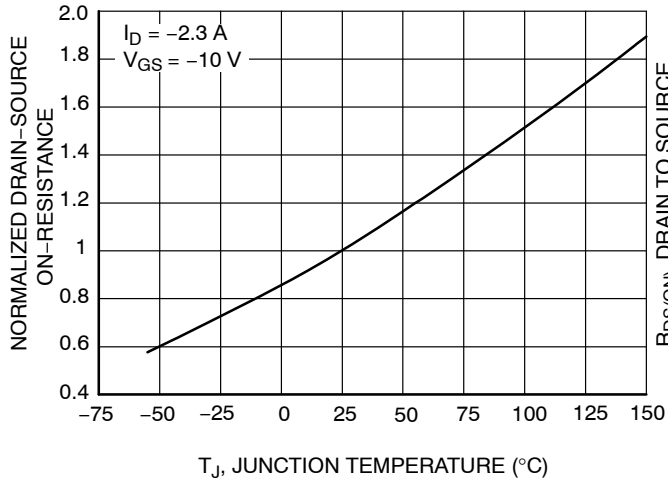


Figure 12. Normalized On-Resistance vs Junction Temperature

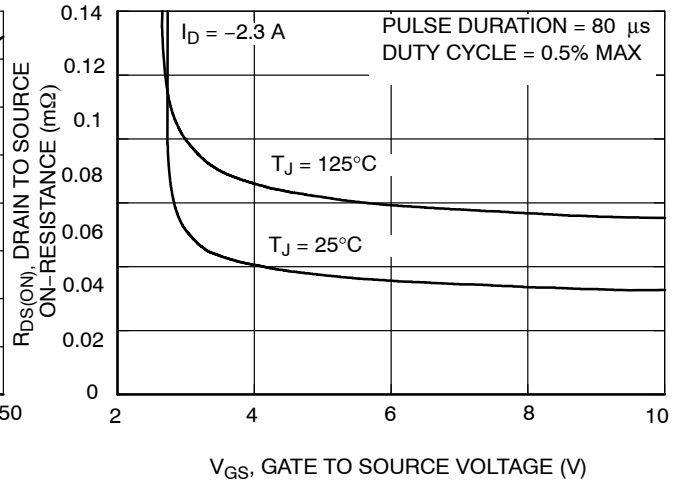


Figure 13. On-Resistance vs Gate to Source Voltage

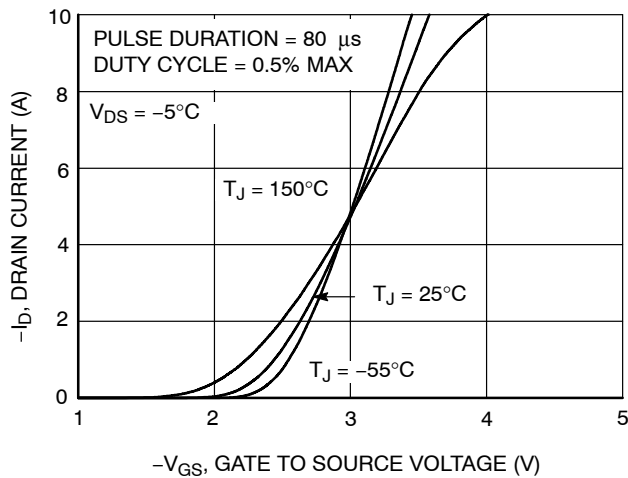


Figure 14. Transfer Characteristics

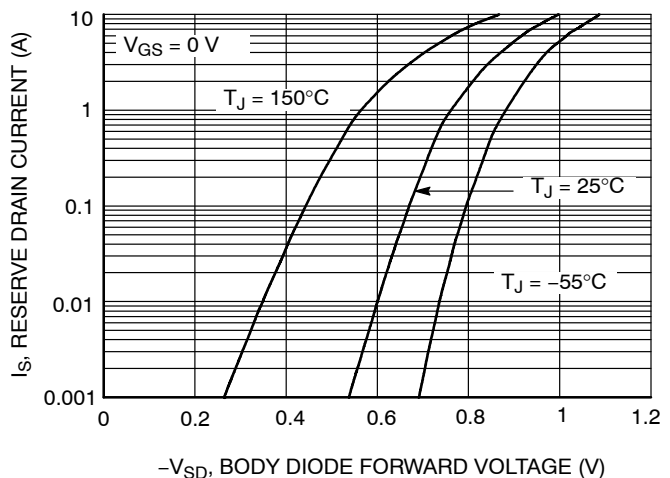


Figure 15. Source to Drain Diode Forward Voltage vs Source Current

TYPICAL CHARACTERISTICS (Q1 P-CHANNEL) ($T_J = 25^\circ\text{C}$ unless otherwise noted) (continued)

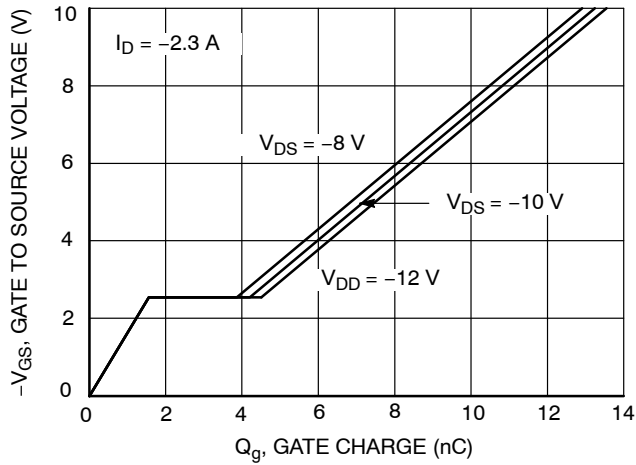


Figure 16. Gate Charge Characteristics

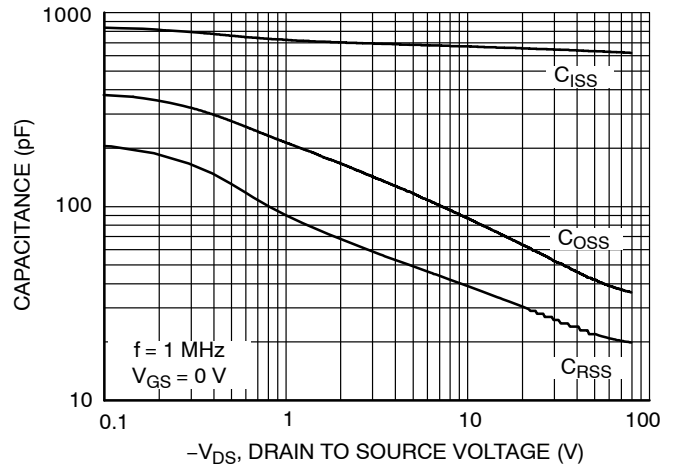


Figure 17. Capacitance vs Drain to Source Voltage

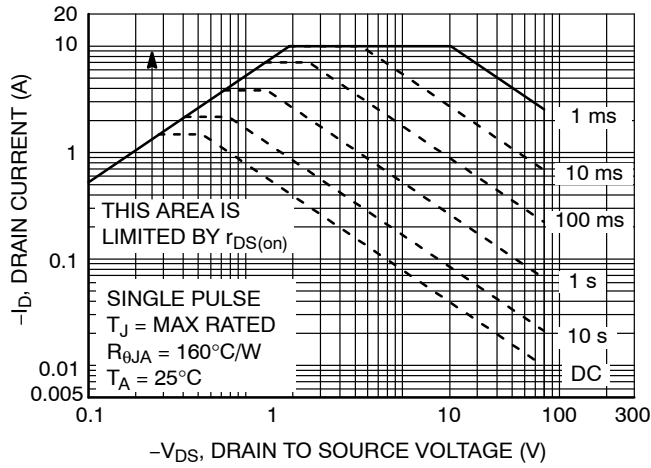


Figure 18. Forward Bias Safe Operating Area

TYPICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

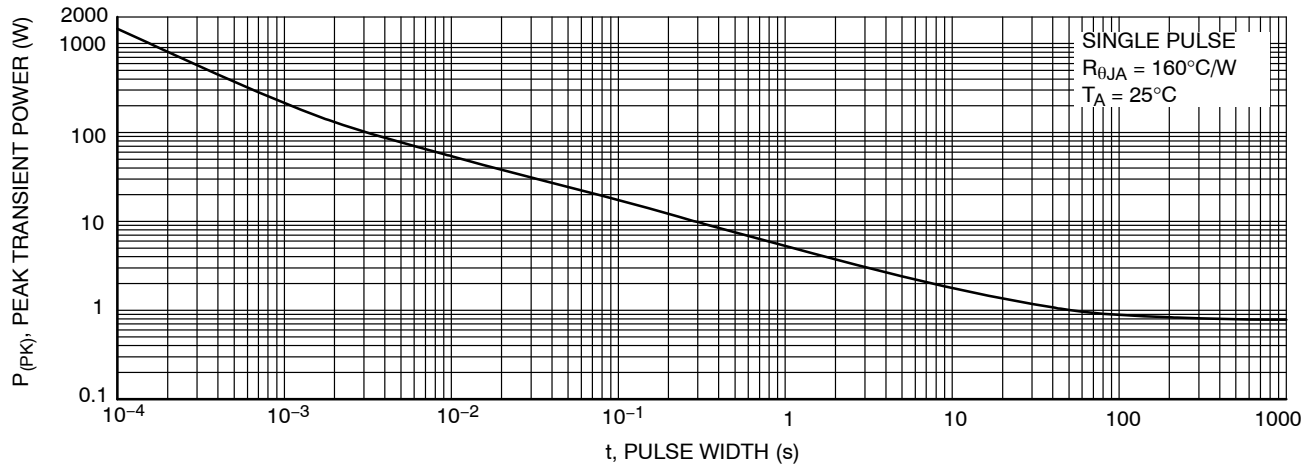


Figure 19. Single Pulse Maximum Power Dissipation

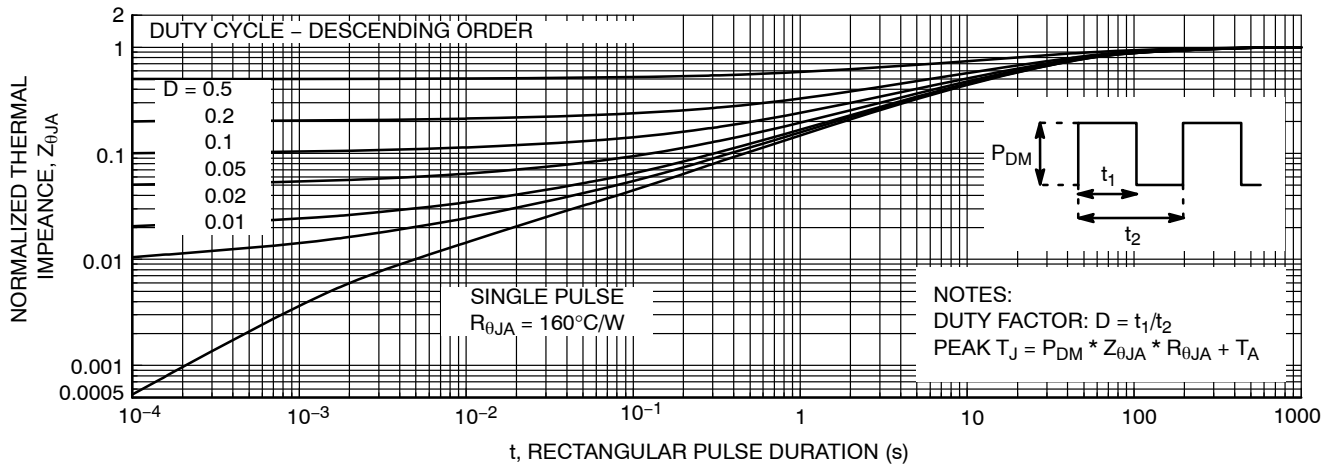
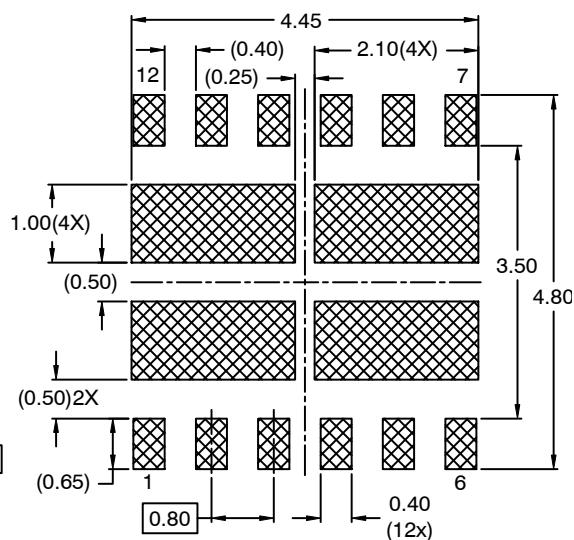


Figure 20. Junction-to-Ambient Transient Thermal Response Curve

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