

FDMC8200

Dual N-Channel PowerTrench® MOSFET 30 V, 9.5 mΩ and 20 mΩ

Features

Q1: N-Channel

- Max $r_{DS(on)}$ = 20 mΩ at $V_{GS} = 10$ V, $I_D = 6$ A
- Max $r_{DS(on)}$ = 32 mΩ at $V_{GS} = 4.5$ V, $I_D = 5$ A

Q2: N-Channel

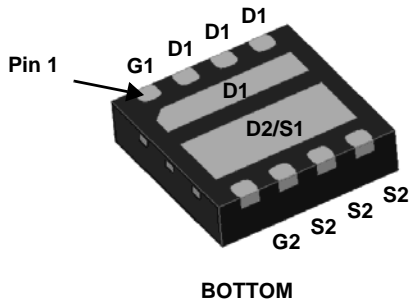
- Max $r_{DS(on)}$ = 9.5 mΩ at $V_{GS} = 10$ V, $I_D = 9$ A
- Max $r_{DS(on)}$ = 13.5 mΩ at $V_{GS} = 4.5$ V, $I_D = 7$ A
- RoHS Compliant

General Description

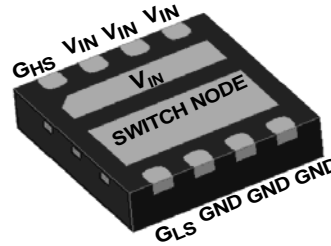
This device includes two specialized N-Channel MOSFETs in a dual Power33 (3mm x 3mm MLP) package. The switch node has been internally connected to enable easy placement and routing of synchronous buck converters. The control MOSFET (Q1) and synchronous MOSFET (Q2) have been designed to provide optimal power efficiency.

Applications

- Mobile Computing
- Mobile Internet Devices
- General Purpose Point of Load

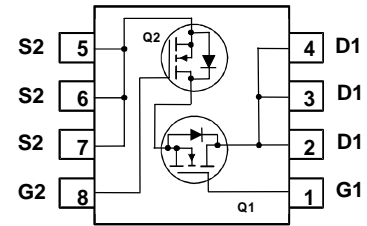


BOTTOM



BOTTOM

Power 33



MOSFET Maximum Ratings $T_C = 25$ °C unless otherwise noted

| Symbol | Parameter | Q1 | Q2 | Units |
|----------------|--|---------------|-------------------|-------------------|
| V_{DS} | Drain to Source Voltage | 30 | 30 | V |
| V_{GS} | Gate to Source Voltage (Note 3) | ±20 | ±20 | V |
| I_D | Drain Current - Continuous (Package limited) | $T_C = 25$ °C | 18 | 18 |
| | - Continuous (Silicon limited) | $T_C = 25$ °C | 23 | 45 |
| | - Continuous | $T_A = 25$ °C | 8 ^{1a} | 12 ^{1b} |
| | - Pulsed | | 40 | 40 |
| P_D | Power Dissipation | $T_A = 25$ °C | 1.9 ^{1a} | 2.2 ^{1b} |
| | Power Dissipation | $T_A = 25$ °C | 0.7 ^{1c} | 0.9 ^{1d} |
| T_J, T_{STG} | Operating and Storage Junction Temperature Range | -55 to +150 | | °C |

Thermal Characteristics

| | | | | |
|-----------------|---|-------------------|-------------------|------|
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | 65 ^{1a} | 55 ^{1b} | °C/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | 180 ^{1c} | 145 ^{1d} | |
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case | 7.5 | 4 | |

Package Marking and Ordering Information

| Device Marking | Device | Package | Reel Size | Tape Width | Quantity |
|----------------|----------|----------|-----------|------------|------------|
| FDMC8200 | FDMC8200 | Power 33 | 13" | 12 mm | 3000 units |

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

| Symbol | Parameter | Test Conditions | Type | Min | Typ | Max | Units |
|--------|-----------|-----------------|------|-----|-----|-----|-------|
|--------|-----------|-----------------|------|-----|-----|-----|-------|

Off Characteristics

| | | | | | | | |
|--------------------------------------|---|--|----------|----------|----------|------------|----------------------|
| BV_{DSS} | Drain to Source Breakdown Voltage | $I_D = 250\text{ }\mu\text{A}, V_{GS} = 0\text{ V}$ $I_D = 250\text{ }\mu\text{A}, V_{GS} = 0\text{ V}$ | Q1 Q2 | 30 30 | | | V |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D = 250\text{ }\mu\text{A}$, referenced to $25\text{ }^\circ\text{C}$ $I_D = 250\text{ }\mu\text{A}$, referenced to $25\text{ }^\circ\text{C}$ | Q1 Q2 | | 14 14 | | mV/ $^\circ\text{C}$ |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS} = 24\text{ V}, V_{GS} = 0\text{ V}$ $V_{DS} = 24\text{ V}, V_{GS} = 0\text{ V}$ | Q1 Q2 | | | 1 1 | μA |
| I_{GSS} | Gate to Source Leakage Current | $V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}$ | Q1 Q2 | | | 100 100 | nA |

On Characteristics

| | | | | | | | |
|--|--|--|----------|------------|------------------|-------------------|----------------------|
| $V_{GS(th)}$ | Gate to Source Threshold Voltage | $V_{GS} = V_{DS}, I_D = 250\text{ }\mu\text{A}$ $V_{GS} = V_{DS}, I_D = 250\text{ }\mu\text{A}$ | Q1 Q2 | 1.0 1.0 | 2.3 2.3 | 3.0 3.0 | V |
| $\frac{\Delta V_{GS(th)}}{\Delta T_J}$ | Gate to Source Threshold Voltage Temperature Coefficient | $I_D = 250\text{ }\mu\text{A}$, referenced to $25\text{ }^\circ\text{C}$ $I_D = 250\text{ }\mu\text{A}$, referenced to $25\text{ }^\circ\text{C}$ | Q1 Q2 | | -5 -6 | | mV/ $^\circ\text{C}$ |
| $r_{DS(on)}$ | Static Drain to Source On Resistance | $V_{GS} = 10\text{ V}, I_D = 6\text{ A}$ $V_{GS} = 4.5\text{ V}, I_D = 5\text{ A}$ $V_{GS} = 10\text{ V}, I_D = 6\text{ A}, T_J = 125\text{ }^\circ\text{C}$ | Q1 | | 16 24 22 | 20 32 28 | m Ω |
| | | $V_{GS} = 10\text{ V}, I_D = 9\text{ A}$ $V_{GS} = 4.5\text{ V}, I_D = 7\text{ A}$ $V_{GS} = 10\text{ V}, I_D = 9\text{ A}, T_J = 125\text{ }^\circ\text{C}$ | Q2 | | 7.3 9.5 10 | 9.5 13.5 13 | |
| g_{FS} | Forward Transconductance | $V_{DD} = 5\text{ V}, I_D = 6\text{ A}$ $V_{DD} = 5\text{ V}, I_D = 9\text{ A}$ | Q1 Q2 | | 29 56 | | S |

Dynamic Characteristics

| | | | | | | | |
|------------|------------------------------|---|----------|--|-------------|-------------|----------|
| C_{iss} | Input Capacitance | | Q1 Q2 | | 495 1180 | 660 1570 | pF |
| C_{oss} | Output Capacitance | $V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$ | Q1 Q2 | | 145 330 | 195 440 | pF |
| C_{riss} | Reverse Transfer Capacitance | | Q1 Q2 | | 20 30 | 30 45 | pF |
| R_g | Gate Resistance | | Q1 Q2 | | 1.4 1.4 | | Ω |

Switching Characteristics

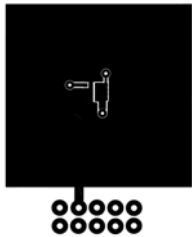
| | | | | | | | |
|--------------|-------------------------------|--|----------|--|------------|-----------|----|
| $t_{d(on)}$ | Turn-On Delay Time | Q1 | Q1 Q2 | | 11 13 | 20 23 | ns |
| t_r | Rise Time | $V_{DD} = 15\text{ V}, I_D = 1\text{ A},$ $V_{GS} = 10\text{ V}, R_{GEN} = 6\text{ }\Omega$ | Q1 Q2 | | 3.1 4 | 10 10 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | Q2 | Q1 Q2 | | 35 38 | 56 60 | ns |
| t_f | Fall Time | $V_{DD} = 15\text{ V}, I_D = 1\text{ A},$ $V_{GS} = 10\text{ V}, R_{GEN} = 6\text{ }\Omega$ | Q1 Q2 | | 1.3 6 | 10 12 | ns |
| $Q_{g(TOT)}$ | Total Gate Charge | $V_{GS} = 0\text{ V to }10\text{ V}$ | Q1 Q2 | | 7.3 16 | 10 22 | nC |
| $Q_{g(TOT)}$ | Total Gate Charge | $V_{GS} = 0\text{ V to }4.5\text{ V}$ | Q1 Q2 | | 3.1 7 | 4.3 10 | nC |
| Q_{gs} | Gate to Source Charge | | Q1 Q2 | | 1.8 4.1 | | nC |
| Q_{gd} | Gate to Drain "Miller" Charge | | Q1 Q2 | | 1 1.5 | | nC |

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

| Symbol | Parameter | Test Conditions | Type | Min | Typ | Max | Units |
|---|---------------------------------------|--|------|-----|-----|-----|-------|
| Drain-Source Diode Characteristics | | | | | | | |
| V_{SD} | Source to Drain Diode Forward Voltage | $V_{GS} = 0\text{ V}, I_S = 6\text{ A}$ (Note 2) | Q1 | | 0.8 | 1.2 | V |
| | | $V_{GS} = 0\text{ V}, I_S = 9\text{ A}$ (Note 2) | Q2 | | 0.8 | 1.2 | |
| t_{rr} | Reverse Recovery Time | Q1 $I_F = 6\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$ | Q1 | | 13 | 24 | ns |
| | | | Q2 | | 21 | 34 | |
| Q_{rr} | Reverse Recovery Charge | Q2 $I_F = 9\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$ | Q1 | | 2.3 | 10 | nC |
| | | | Q2 | | 5.6 | 12 | |

Notes:

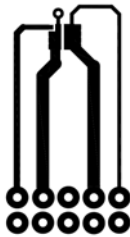
1. $R_{\theta JA}$ is determined with the device mounted on a 1in² pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



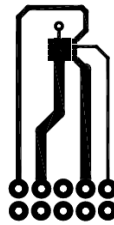
a. 65 °C/W when mounted on a 1 in² pad of 2 oz copper



b. 55 °C/W when mounted on a 1 in² pad of 2 oz copper



c. 180 °C/W when mounted on a minimum pad of 2 oz copper



d. 145 °C/W when mounted on a minimum pad of 2 oz copper

2. Pulse Test: Pulse Width < 300 μs , Duty cycle < 2.0%.

3. As an N-ch device, the negative Vgs rating is for low duty cycle pulse occurrence only. No continuous rating is implied.

Typical Characteristics (Q1 N-Channel) $T_J = 25\text{ }^\circ\text{C}$ unless otherwise noted

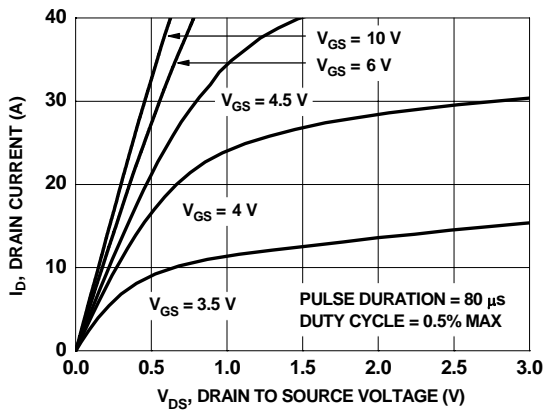


Figure 1. On Region Characteristics

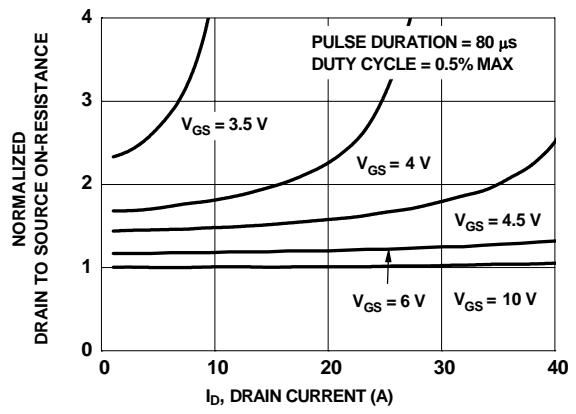


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

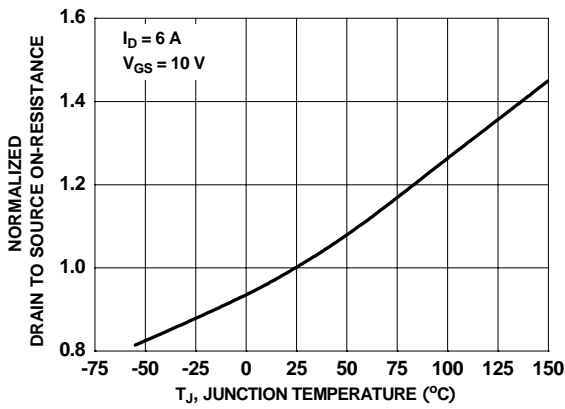


Figure 3. Normalized On Resistance vs Junction Temperature

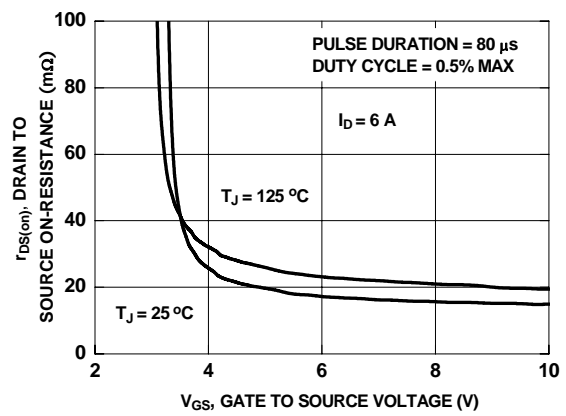


Figure 4. On-Resistance vs Gate to Source Voltage

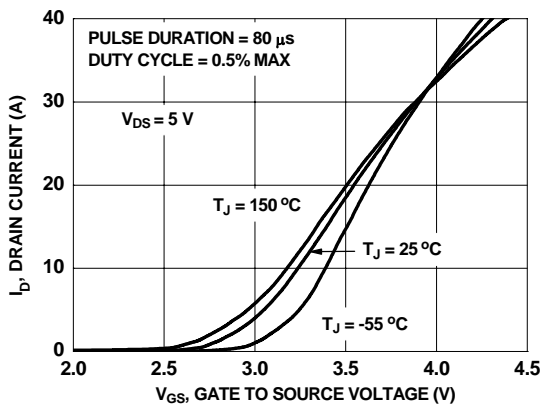


Figure 5. Transfer Characteristics

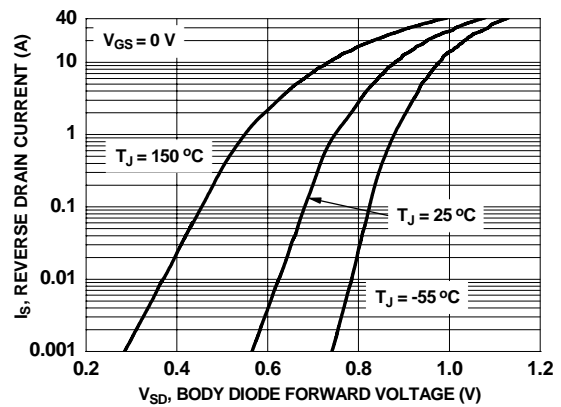


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics (Q1 N-Channel) $T_J = 25\text{ }^\circ\text{C}$ unless otherwise noted

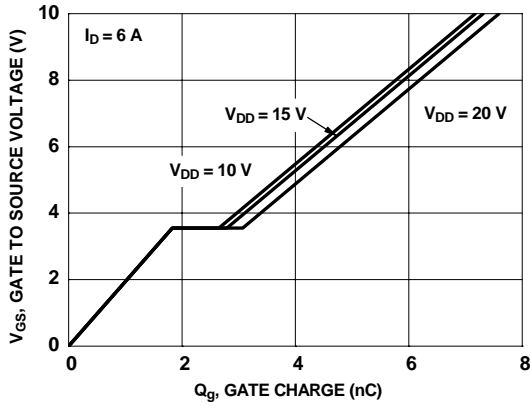


Figure 7. Gate Charge Characteristics

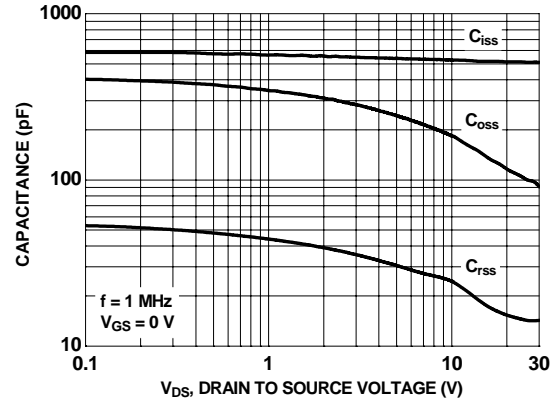


Figure 8. Capacitance vs Drain to Source Voltage

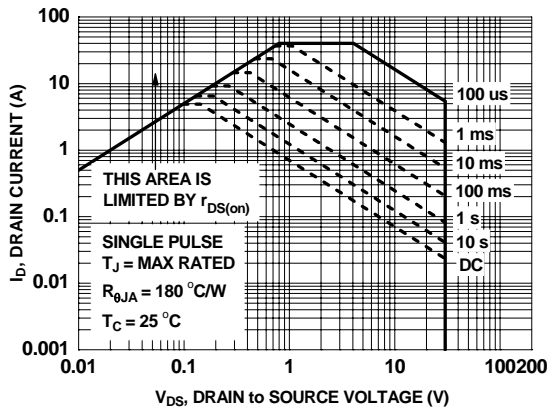


Figure 9. Forward Bias Safe Operating Area

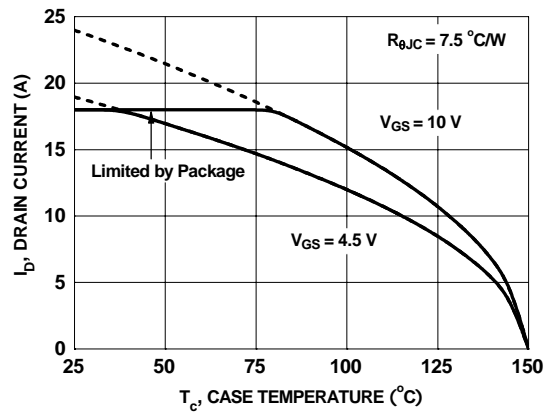


Figure 10. Maximum Continuous Drain Current vs Case Temperature

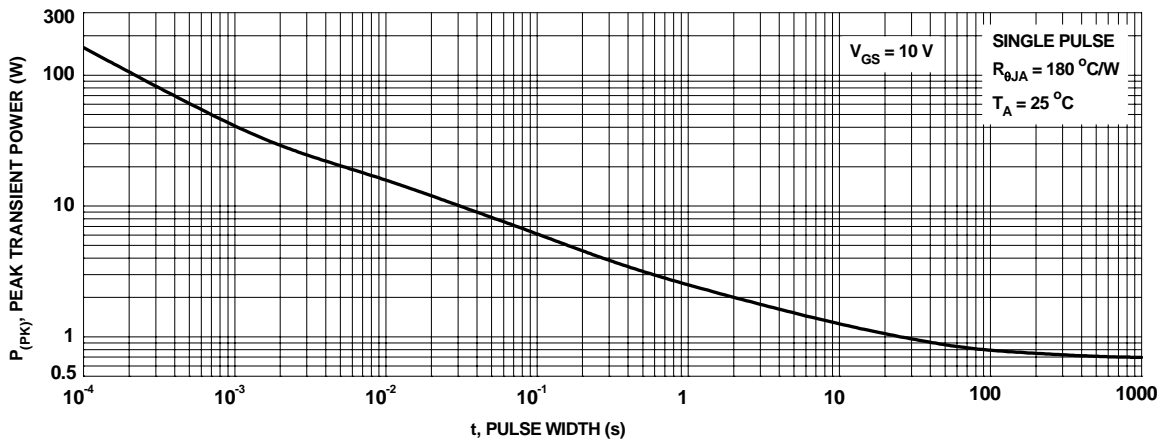


Figure 11. Single Pulse Maximum Power Dissipation

Typical Characteristics (Q1 N-Channel) $T_J = 25\text{ }^\circ\text{C}$ unless otherwise noted

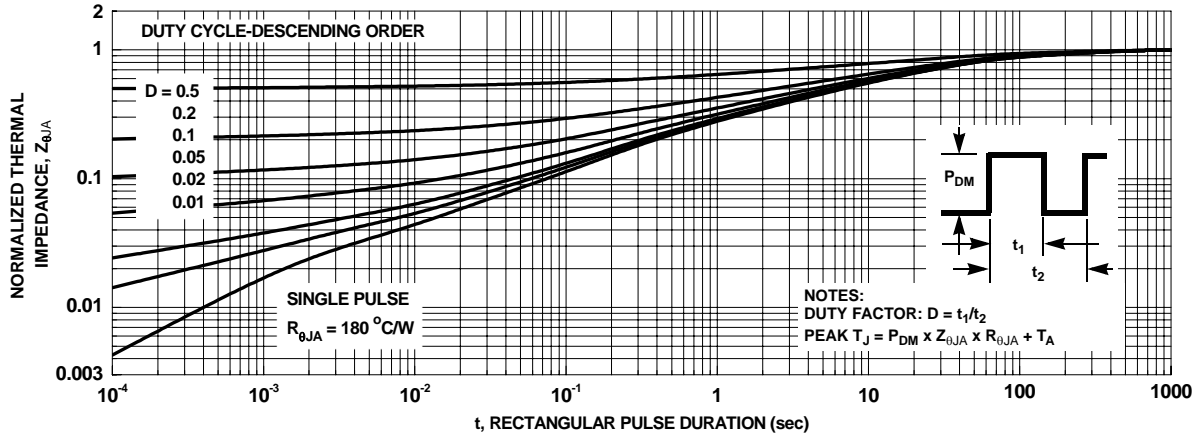


Figure 12. Junction-to-Ambient Transient Thermal Response Curve

Typical Characteristics (Q2 N-Channel) $T_J = 25\text{ }^\circ\text{C}$ unless otherwise noted

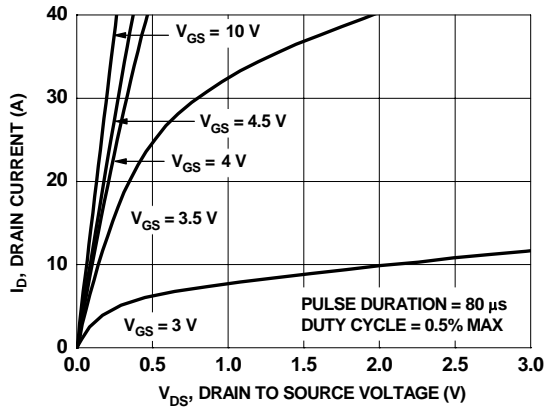


Figure 13. On-Region Characteristics

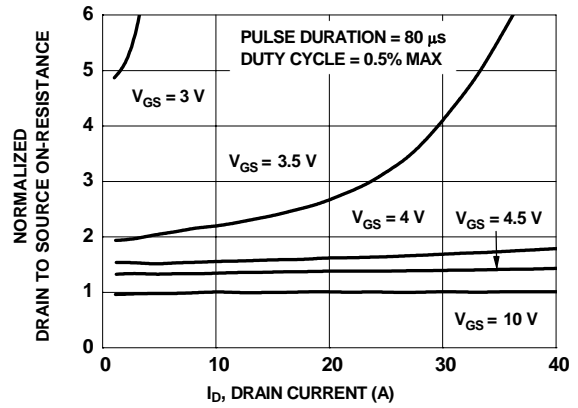


Figure 14. Normalized on-Resistance vs Drain Current and Gate Voltage

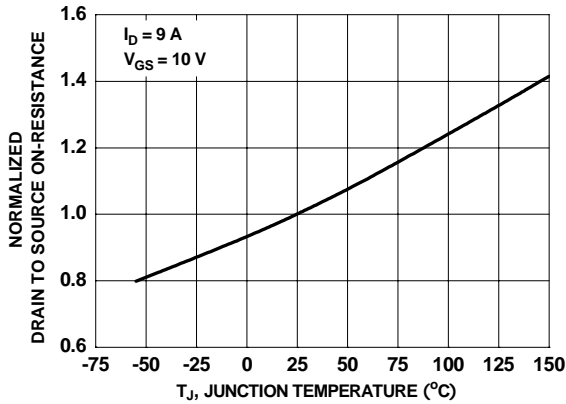


Figure 15. Normalized On-Resistance vs Junction Temperature

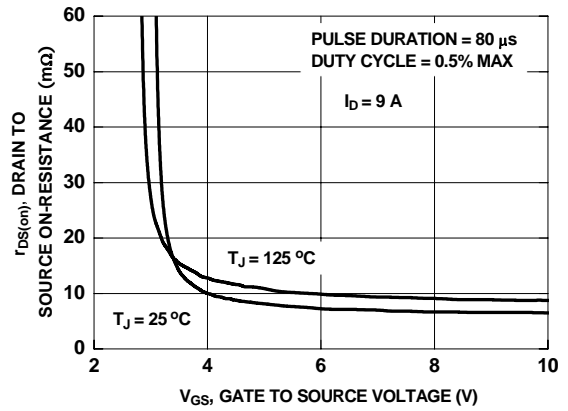


Figure 16. On-Resistance vs Gate to Source Voltage

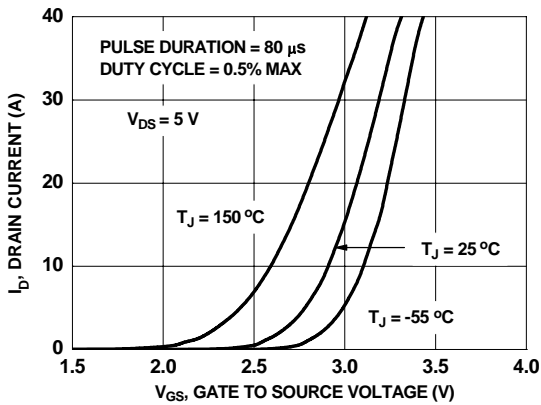


Figure 17. Transfer Characteristics

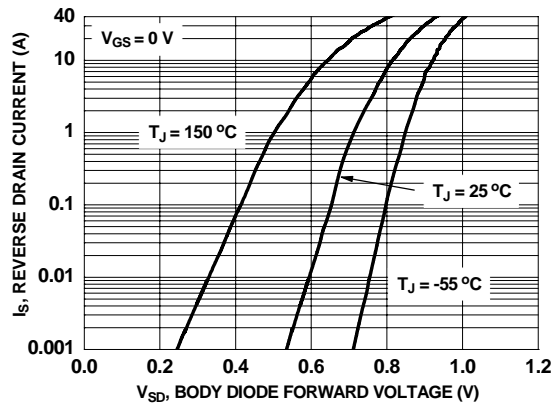


Figure 18. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics (Q2 N-Channel) $T_J = 25\text{ }^\circ\text{C}$ unless otherwise noted

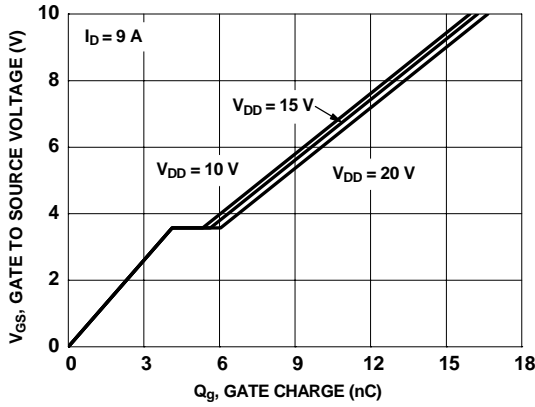


Figure 19. Gate Charge Characteristics

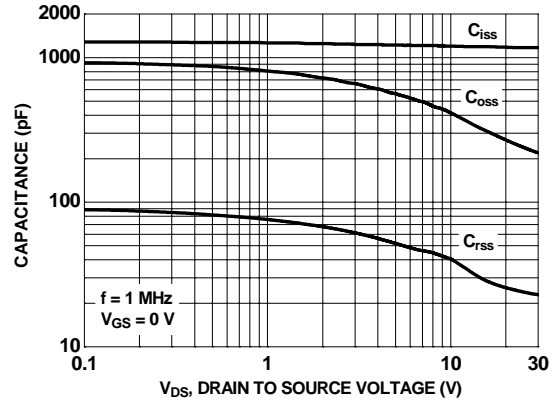


Figure 20. Capacitance vs Drain to Source Voltage

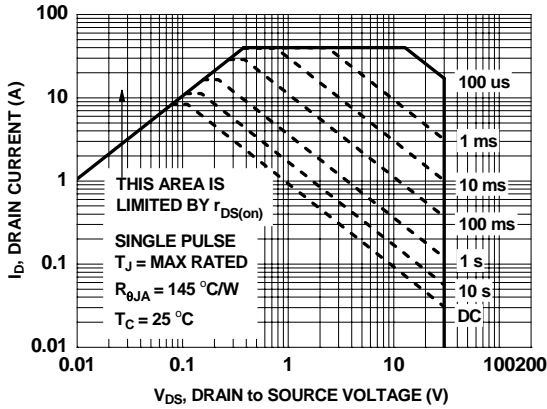


Figure 21. Forward Bias Safe Operating Area

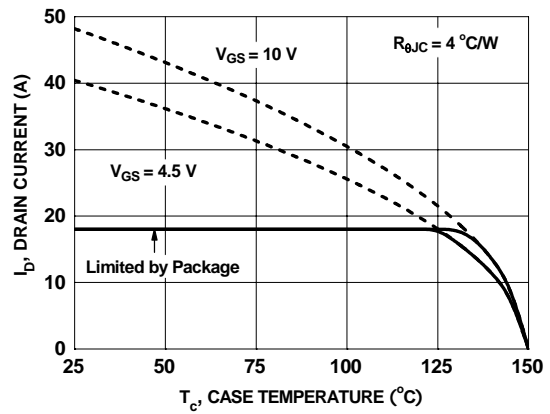


Figure 22. Maximum Continuous Drain Current vs Case Temperature

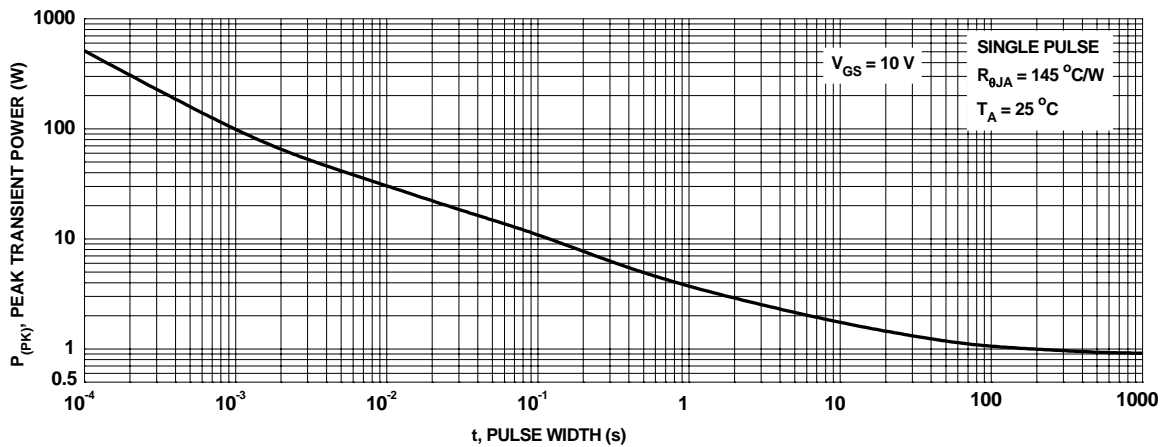


Figure 22. Single Pulse Maximum Power Dissipation

Typical Characteristics (Q2 N-Channel) $T_J = 25\text{ }^\circ\text{C}$ unless otherwise noted

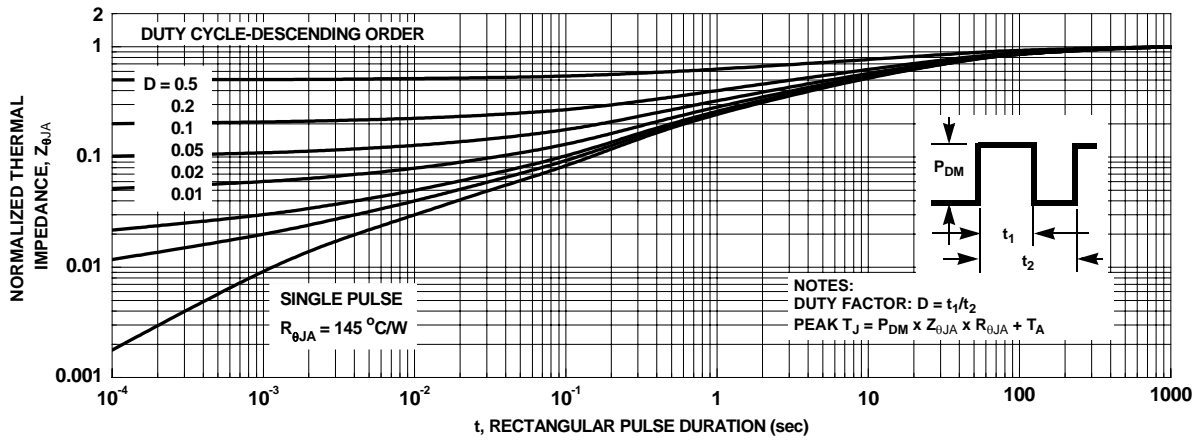
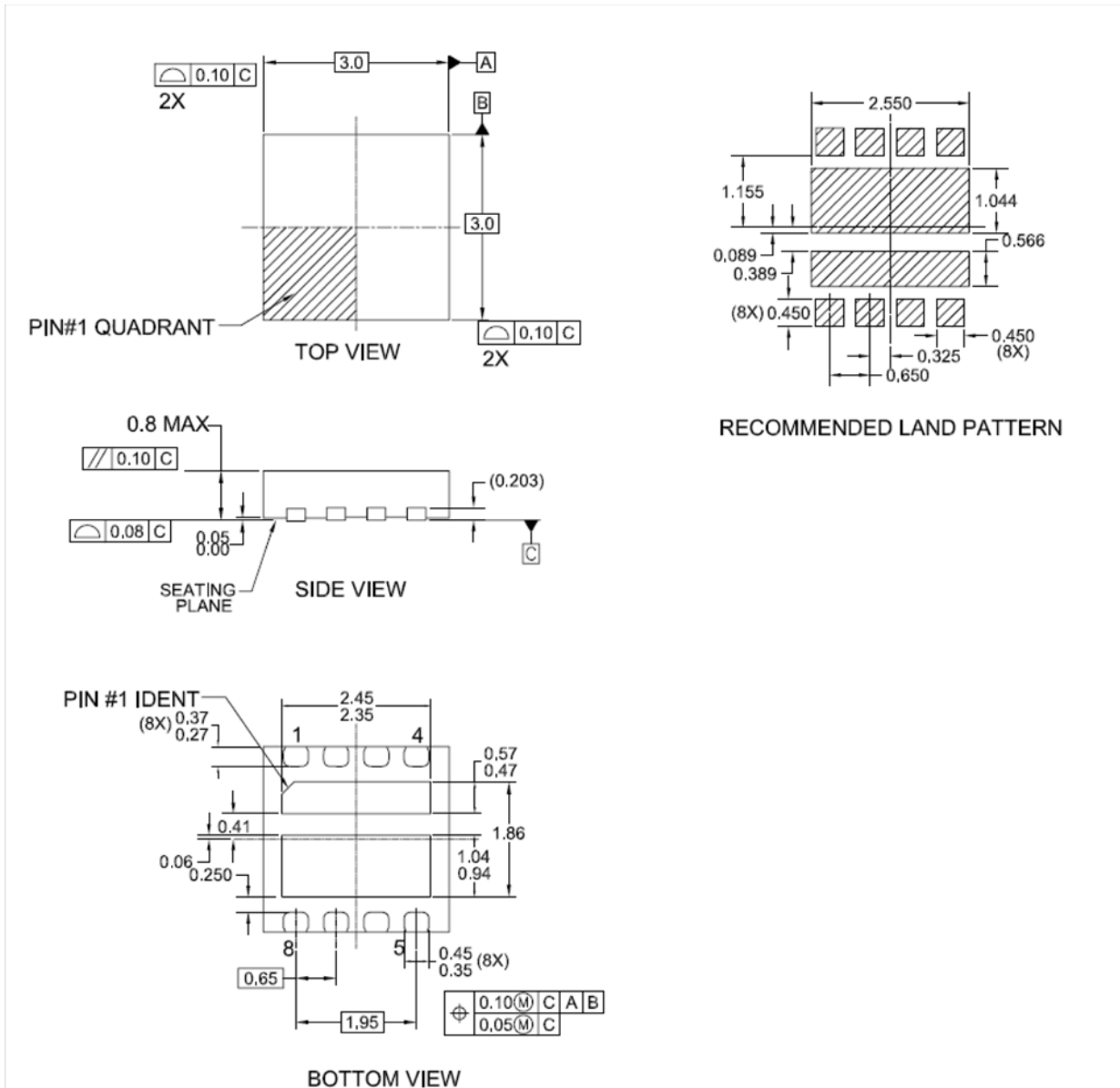


Figure 23. Junction-to-Ambient Transient Thermal Response Curve







Dimensional Outline and Pad Layout





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|--------------------------|-----------------------|---|
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