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FDG8842CZ

Complementary PowerTrench® MOSFET

Q1: 30V, 0.75A, 0.4Ω; Q2: -25V, -0.41A, 1.1Ω

Features

Q1: N-Channel

- Max $r_{DS(on)}$ = 0.4Ω at $V_{GS} = 4.5V$, $I_D = 0.75A$
- Max $r_{DS(on)}$ = 0.5Ω at $V_{GS} = 2.7V$, $I_D = 0.67A$

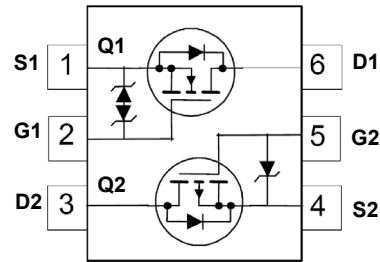
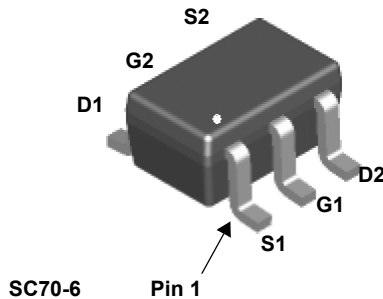
Q2: P-Channel

- Max $r_{DS(on)}$ = 1.1Ω at $V_{GS} = -4.5V$, $I_D = -0.41A$
- Max $r_{DS(on)}$ = 1.5Ω at $V_{GS} = -2.7V$, $I_D = -0.25A$
- Very low level gate drive requirements allowing direct operation in 3V circuits ($V_{GS(th)} < 1.5V$)
- Very small package outline SC70-6
- RoHS Compliant



General Description

These N & P-Channel logic level enhancement mode field effect transistors are produced using Fairchild's proprietary, high cell density, DMOS technology. This very high density process is especially tailored to minimize on-state resistance. This device has been designed especially for low voltage applications as a replacement for bipolar digital transistors and small signal MOSFETs. Since bias resistors are not required, this dual digital FET can replace several different digital transistors, with different bias resistor values.



MOSFET Maximum Ratings $T_A = 25^\circ C$ unless otherwise noted

| Symbol | Parameter | Q1 | Q2 | Units |
|----------------|--|-------------|-------|-------|
| V_{DS} | Drain to Source Voltage | 30 | -25 | V |
| V_{GS} | Gate to Source Voltage | ±12 | -8 | V |
| I_D | Drain Current -Continuous | 0.75 | -0.41 | A |
| | -Pulsed | 2.2 | -1.2 | |
| P_D | Power Dissipation for Single Operation | (Note 1a) | 0.36 | W |
| | | (Note 1b) | 0.30 | |
| T_J, T_{STG} | Operating and Storage Junction Temperature Range | -55 to +150 | | °C |

Thermal Characteristics

| | | | | |
|-----------------|--|-----------|-----|------|
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient Single operation | (Note 1a) | 350 | °C/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient Single operation | (Note 1b) | 415 | |

Package Marking and Ordering Information

| Device Marking | Device | Reel Size | Tape Width | Quantity |
|----------------|-----------|-----------|------------|------------|
| .42 | FDG8842CZ | 7" | 8mm | 3000 units |

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

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

Off Characteristics

| | | | | | | | |
|--------------------------------------|---|---|----------|-----------|-----------|------------------|----------------------|
| BV_{DSS} | Drain to Source Breakdown Voltage | $I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$ $I_D = -250\mu\text{A}, V_{GS} = 0\text{V}$ | Q1 Q2 | 30 -25 | | | V |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D = 250\mu\text{A}$, referenced to 25°C $I_D = -250\mu\text{A}$, referenced to 25°C | Q1 Q2 | | 25 -21 | | mV/ $^\circ\text{C}$ |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS} = 24\text{V}, V_{GS} = 0\text{V}$ $V_{DS} = -20\text{V}, V_{GS} = 0\text{V}$ | Q1 Q2 | | | 1 -1 | μA |
| I_{GSS} | Gate to Source Leakage Current | $V_{GS} = \pm 12\text{V}, V_{DS} = 0\text{V}$ $V_{GS} = -8\text{V}, V_{DS} = 0\text{V}$ | Q1 Q2 | | | ± 10 -100 | μA nA |

On Characteristics

| | | | | | | | |
|--|--|---|----------|---------------|----------------------|-------------------|----------------------|
| $V_{GS(th)}$ | Gate to Source Threshold Voltage | $V_{GS} = V_{DS}, I_D = 250\mu\text{A}$ $V_{GS} = V_{DS}, I_D = -250\mu\text{A}$ | Q1 Q2 | 0.65 -0.65 | 1.0 -0.8 | 1.5 -1.5 | V |
| $\frac{\Delta V_{GS(th)}}{\Delta T_J}$ | Gate to Source Threshold Voltage Temperature Coefficient | $I_D = 250\mu\text{A}$, referenced to 25°C $I_D = -250\mu\text{A}$, referenced to 25°C | Q1 Q2 | | -3.0 1.8 | | mV/ $^\circ\text{C}$ |
| $r_{DS(on)}$ | Static Drain to Source On Resistance | $V_{GS} = 4.5\text{V}, I_D = 0.75\text{A}$ $V_{GS} = 2.7\text{V}, I_D = 0.67\text{A}$ $V_{GS} = 4.5\text{V}, I_D = 0.75\text{A}, T_J = 125^\circ\text{C}$ | Q1 | | 0.25 0.29 0.36 | 0.4 0.5 0.6 | Ω |
| | | $V_{GS} = -4.5\text{V}, I_D = -0.41\text{A}$ $V_{GS} = -2.7\text{V}, I_D = -0.25\text{A}$ $V_{GS} = -4.5\text{V}, I_D = -0.41\text{A}, T_J = 125^\circ\text{C}$ | Q2 | | 0.87 1.20 1.22 | 1.1 1.5 1.9 | |
| g_{FS} | Forward Transconductance | $V_{DS} = 5\text{V}, I_D = 0.75\text{A}$ $V_{DS} = -5\text{V}, I_D = -0.41\text{A}$ | Q1 Q2 | | 3 8 | | S |

Dynamic Characteristics

| | | | | | | | |
|-----------|------------------------------|---|----|--|----|-----|----|
| C_{iss} | Input Capacitance | Q1 $V_{DS} = 10\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$ Q2 | Q1 | | 90 | 120 | pF |
| | | | Q2 | | 70 | 100 | |
| C_{oss} | Output Capacitance | Q1 $V_{DS} = -10\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$ Q2 | Q1 | | 20 | 30 | pF |
| | | | Q2 | | 30 | 40 | |
| C_{rss} | Reverse Transfer Capacitance | Q1 Q2 | Q1 | | 15 | 25 | pF |
| | | | Q2 | | 15 | 25 | |

Switching Characteristics (note 2)

| | | | | | | | |
|--------------|-------------------------------|--|----|--|------|------|----|
| $t_{d(on)}$ | Turn-On Delay Time | Q1 $V_{DD} = 5\text{V}, I_D = 0.5\text{A},$ $V_{GS} = 4.5\text{V}, R_{GEN} = 6\Omega$ Q2 | Q1 | | 4 | 10 | ns |
| | | | Q2 | | 6 | 12 | |
| t_r | Rise Time | Q1 $V_{DD} = 5\text{V}, I_D = 0.5\text{A},$ $V_{GS} = 4.5\text{V}, R_{GEN} = 6\Omega$ Q2 | Q1 | | 1 | 10 | ns |
| | | | Q2 | | 16 | 29 | |
| $t_{d(off)}$ | Turn-Off Delay Time | Q1 $V_{DD} = -5\text{V}, I_D = -0.5\text{A},$ $V_{GS} = -4.5\text{V}, R_{GEN} = 6\Omega$ Q2 | Q1 | | 9 | 18 | ns |
| | | | Q2 | | 35 | 56 | |
| t_f | Fall Time | Q1 $V_{DD} = -5\text{V}, I_D = -0.5\text{A},$ $V_{GS} = -4.5\text{V}, R_{GEN} = 6\Omega$ Q2 | Q1 | | 1 | 10 | ns |
| | | | Q2 | | 40 | 64 | |
| Q_g | Total Gate Charge | Q1 $V_{GS} = 4.5\text{V}, V_{DD} = 5\text{V}, I_D = 0.75\text{A}$ Q2 | Q1 | | 1.03 | 1.44 | nC |
| | | | Q2 | | 1.20 | 1.68 | |
| Q_{gs} | Gate to Source Charge | Q1 $V_{GS} = 4.5\text{V}, V_{DD} = 5\text{V}, I_D = 0.75\text{A}$ Q2 | Q1 | | 0.29 | | nC |
| | | | Q2 | | 0.31 | | |
| Q_{gd} | Gate to Drain "Miller" Charge | Q1 $V_{GS} = -4.5\text{V}, V_{DD} = -5\text{V}, I_D = -0.41\text{A}$ Q2 | Q1 | | 0.17 | | nC |
| | | | Q2 | | 0.22 | | |

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

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

Drain-Source Diode Characteristics and Maximum Ratings

| | | | | | | | |
|----------|---|---|----------|--|---------------|-------------|---|
| I_S | Maximum Continuous Drain-Source Diode Forward Current | | Q1 Q2 | | | 0.3 -0.3 | A |
| V_{SD} | Source to Drain Diode Forward Voltage | $V_{GS} = 0V, I_S = 0.3A$ (Note 2) $V_{GS} = 0V, I_S = -0.3A$ (Note 2) | Q1 Q2 | | 0.76 -0.84 | 1.2 -1.2 | V |

Notes:

- $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta JA}$ is determined by the user's board design.



a. 350°C/W when mounted on a 1 in^2 pad of 2 oz copper.



b. 415°C/W when mounted on a minimum pad of 2 oz copper.

Scale 1:1 on letter size paper.

- Pulse Test: Pulse Width $< 300\mu\text{s}$, Duty cycle $< 2.0\%$.

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

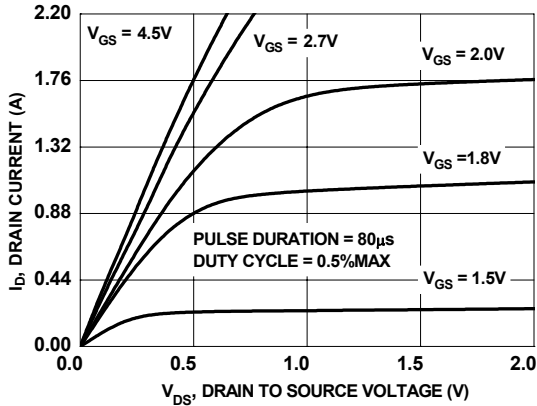


Figure 1. On-Region Characteristics

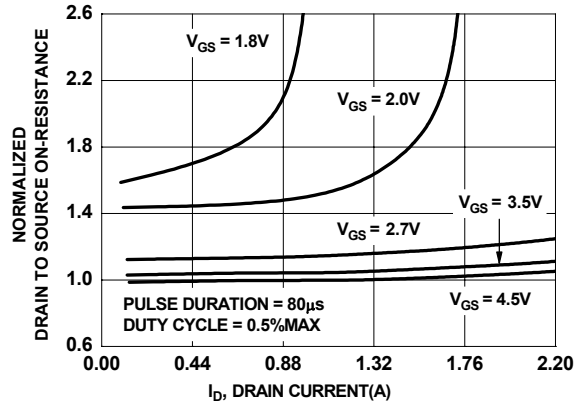


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

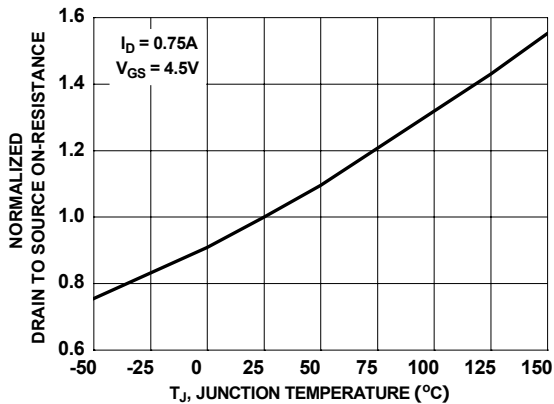


Figure 3. Normalized On-Resistance vs Junction Temperature

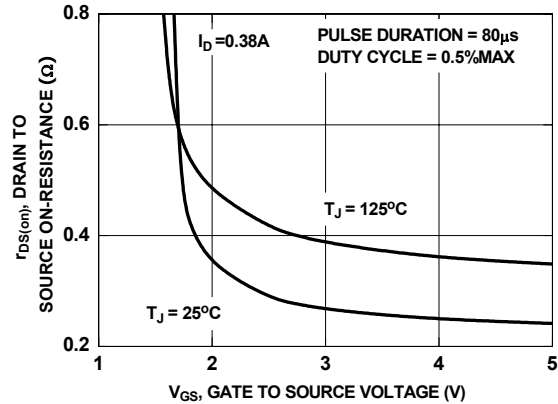


Figure 4. On-Resistance vs Gate to Source Voltage

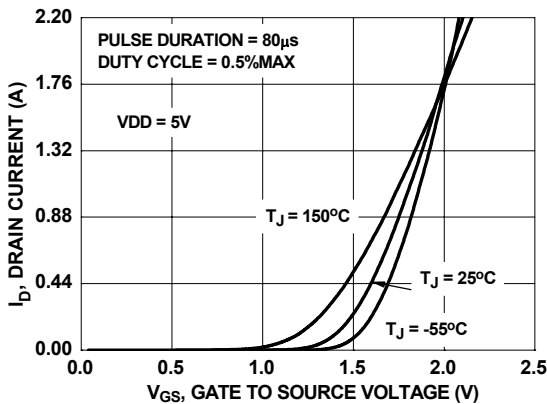


Figure 5. Transfer Characteristics

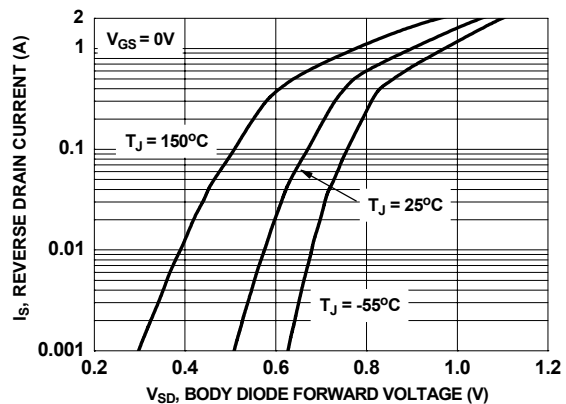


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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

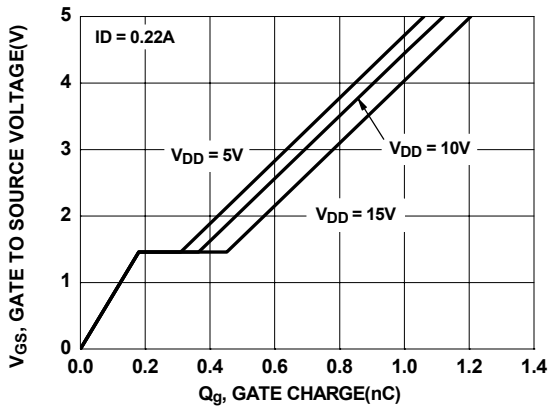


Figure 7. Gate Charge Characteristics

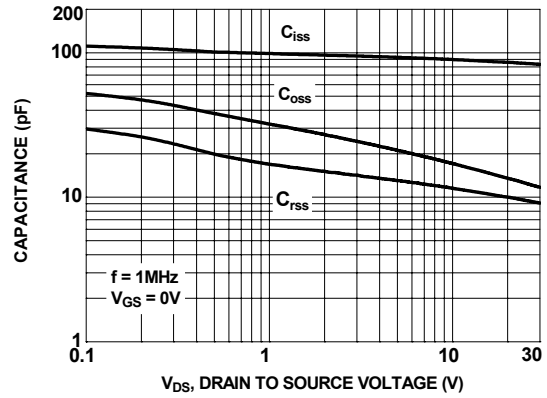


Figure 8. Capacitance vs Drain to Source Voltage

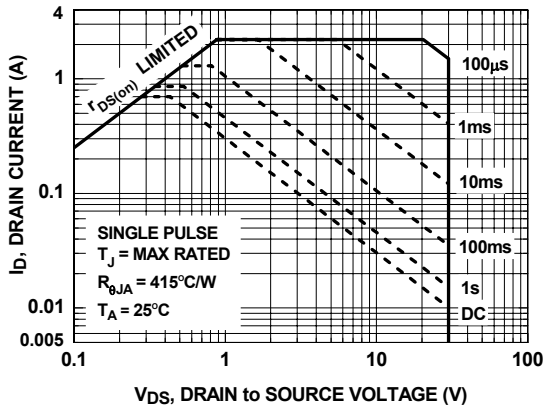


Figure 9. Forward Bias Safe Operating Area

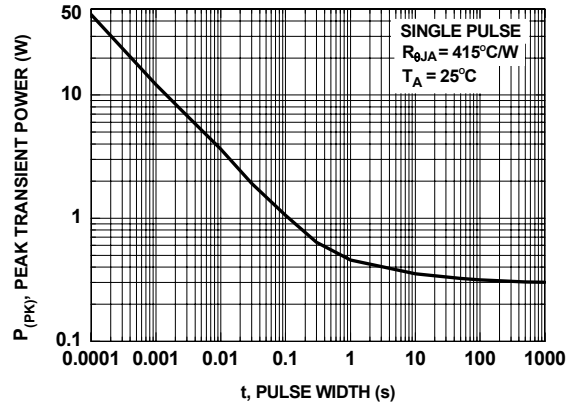


Figure 10. Single Pulse Maximum Power Dissipation

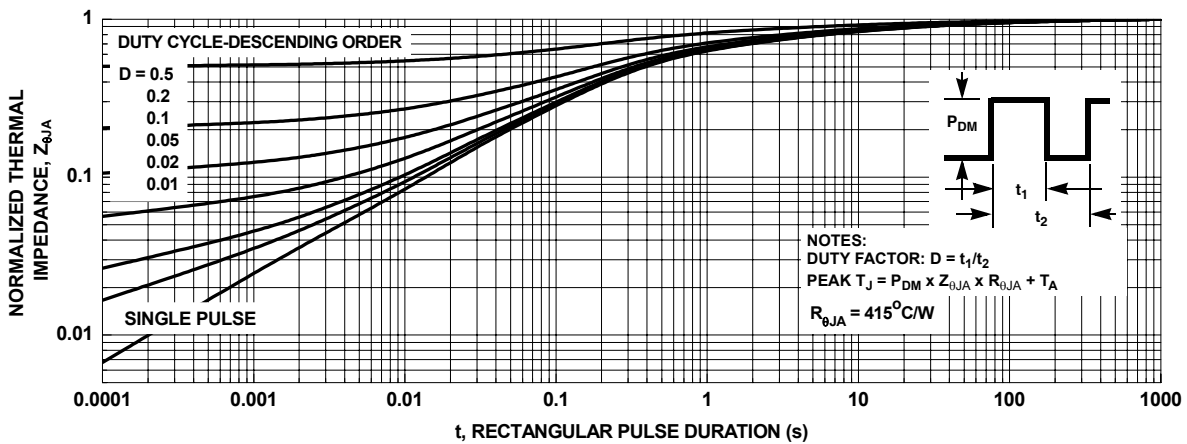


Figure 11. Transient Thermal Response Curve

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

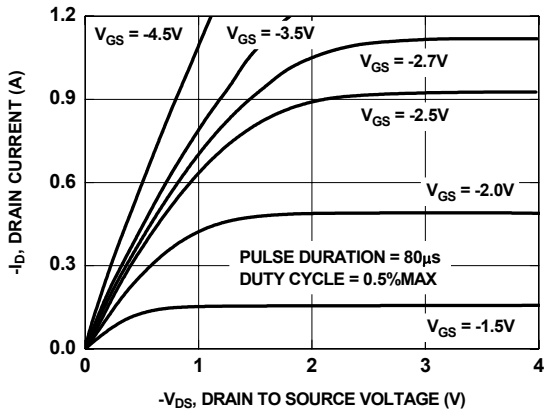


Figure 13. On Region Characteristics

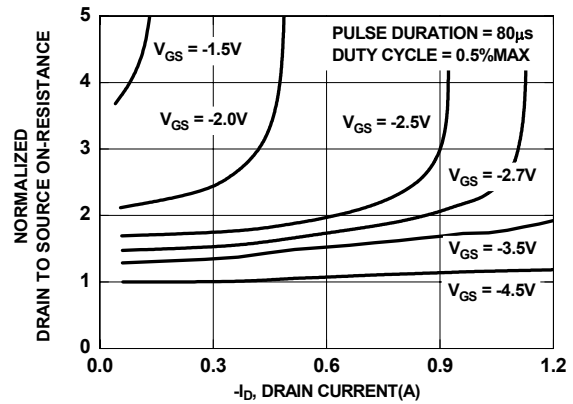


Figure 14. Normalized on-Resistance vs Drain Current and Gate Voltage

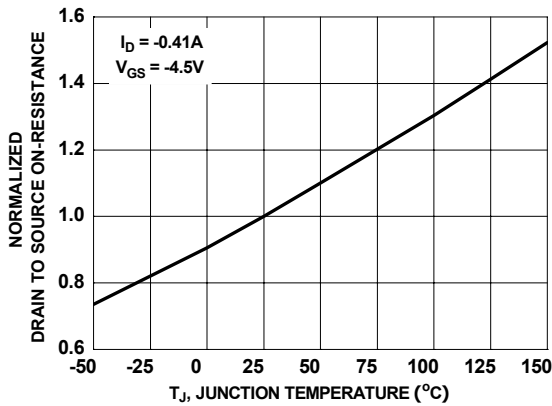


Figure 15. Normalized On Resistance vs Junction Temperature

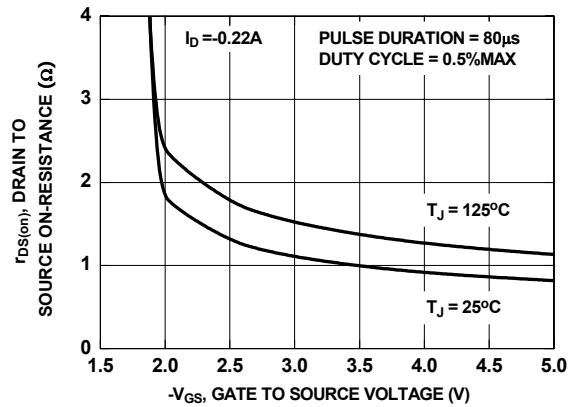


Figure 16. On-Resistance vs Gate to Source Voltage

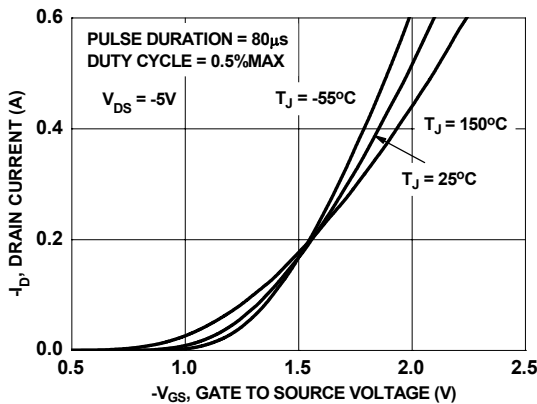


Figure 17. Transfer Characteristics

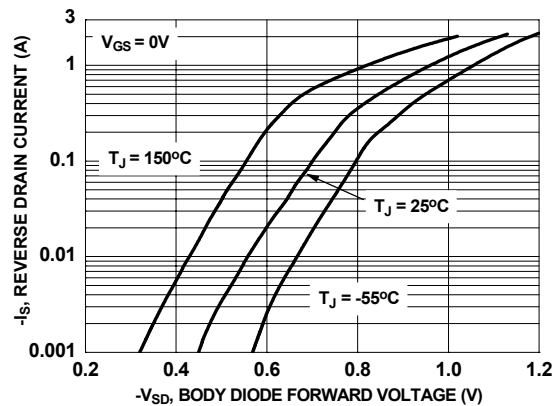


Figure 18. Source to Drain Diode Forward Voltage vs Source Current

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

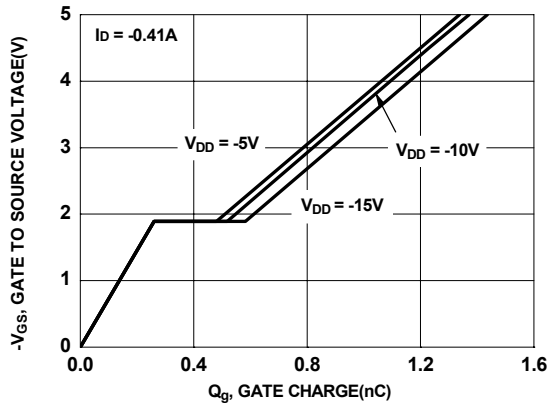


Figure 19. Gate Charge Characteristics

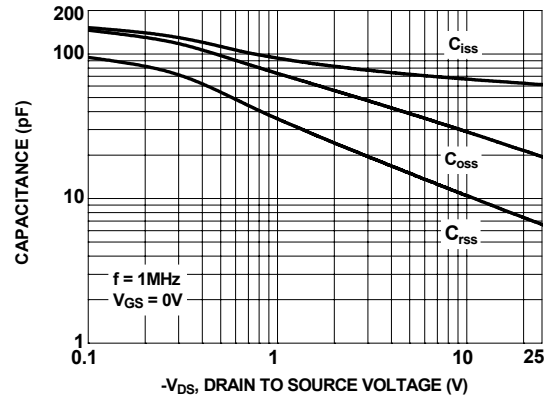


Figure 20. Capacitance vs Drain to Source Voltage

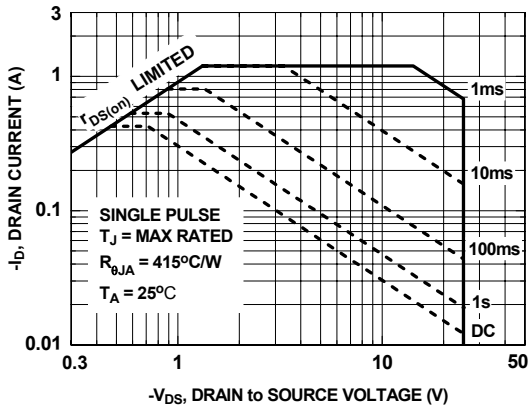


Figure 21. Forward Bias Safe Operating Area

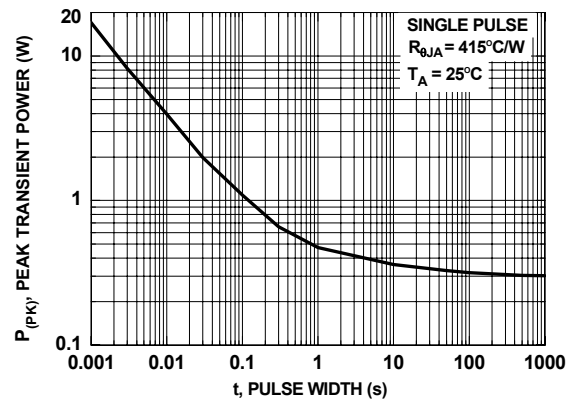


Figure 22. Single Pulse Maximum Power Dissipation

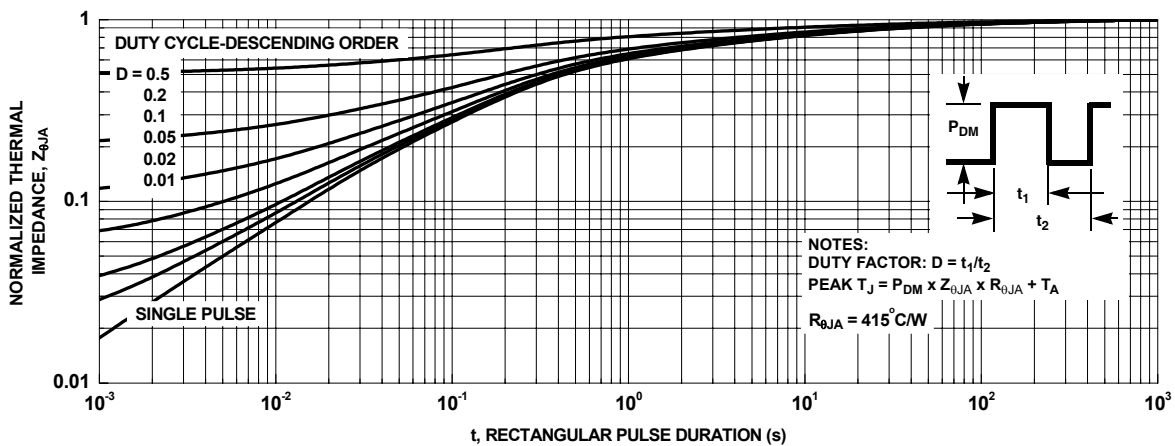


Figure 23. Transient Thermal Response Curve



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