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August 2015

# FDMS8095AC

## Dual N & P-Channel PowerTrench® MOSFET

N-Channel: 150 V, 27 A, 30 mΩ P-Channel: -150 V, -2.2 A, 1200 mΩ

### Features

Q1: N-Channel

- Max  $r_{DS(on)}$  = 30 mΩ at  $V_{GS} = 10$  V,  $I_D = 6.2$  A
- Max  $r_{DS(on)}$  = 41 mΩ at  $V_{GS} = 6$  V,  $I_D = 5.2$  A

Q2: P-Channel

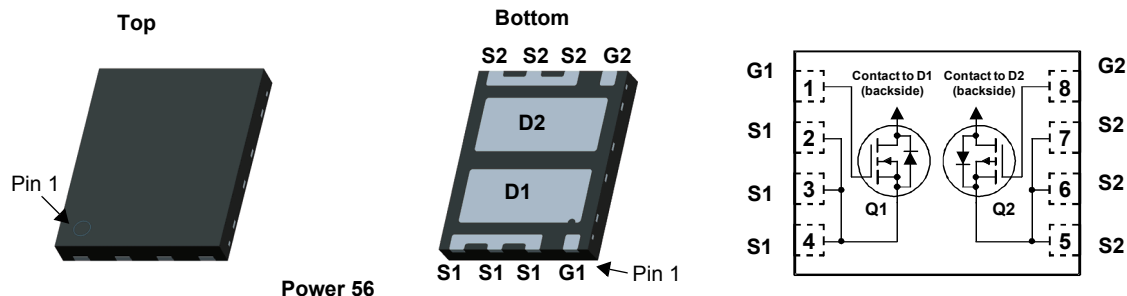
- Max  $r_{DS(on)}$  = 1200 mΩ at  $V_{GS} = -10$  V,  $I_D = -1$  A
- Max  $r_{DS(on)}$  = 1400 mΩ at  $V_{GS} = -6$  V,  $I_D = -0.9$  A
- Optimised for active clamp forward converters
- RoHS Compliant

### General Description

These dual N and P-Channel enhancement mode Power MOSFETs are produced using Fairchild Semiconductor's advanced PowerTrench® process that has been especially tailored to minimize on-state resistance and yet maintain superior switching performance. Shrinking the area needed for implementation of active clamp topology; enabling best in class power density.

### Applications

- DC-DC Converter
- Active Clamp



### MOSFET Maximum Ratings $T_A = 25^\circ\text{C}$ unless otherwise noted

| Symbol         | Parameter                                                       | Q1                | Q2                | Units            |
|----------------|-----------------------------------------------------------------|-------------------|-------------------|------------------|
| $V_{DS}$       | Drain to Source Voltage                                         | 150               | -150              | V                |
| $V_{GS}$       | Gate to Source Voltage                                          | $\pm 20$          | $\pm 25$          | V                |
| $I_D$          | Drain Current -Continuous $T_C = 25^\circ\text{C}$ (Note 5)     | 27                | -2.2              | A                |
|                | Drain Current -Continuous $T_C = 100^\circ\text{C}$ (Note 5)    | 17                | -1.4              |                  |
|                | -Continuous $T_A = 25^\circ\text{C}$                            | 6.2 <sup>1a</sup> | -1 <sup>1b</sup>  |                  |
|                | -Pulsed (Note 4)                                                | 143               | -8.8              |                  |
| $E_{AS}$       | Single Pulse Avalanche Energy (Note 3)                          | 216               | 6                 | mJ               |
| $P_D$          | Power Dissipation for Single Operation $T_A = 25^\circ\text{C}$ | 2.3 <sup>1a</sup> | 2.3 <sup>1b</sup> | W                |
|                | Power Dissipation for Single Operation $T_A = 25^\circ\text{C}$ | 0.9 <sup>1c</sup> | 0.9 <sup>1d</sup> |                  |
|                | Power Dissipation for Single Operation $T_C = 25^\circ\text{C}$ | 50                | 12.5              |                  |
| $T_J, T_{STG}$ | Operating and Storage Junction Temperature Range                | -55 to +150       |                   | $^\circ\text{C}$ |

### Thermal Characteristics

|                 |                                         |                   |                   |                    |
|-----------------|-----------------------------------------|-------------------|-------------------|--------------------|
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | 55 <sup>1a</sup>  | 55 <sup>1b</sup>  | $^\circ\text{C/W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | 138 <sup>1c</sup> | 138 <sup>1d</sup> |                    |
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case    | 2.5               | 10                |                    |

### Package Marking and Ordering Information

| Device Marking | Device     | Package  | Reel Size | Tape Width | Quantity   |
|----------------|------------|----------|-----------|------------|------------|
| FDMS8095AC     | FDMS8095AC | Power 56 | 13"       | 12 mm      | 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         | $I_D = 250\ \mu\text{A}$ , $V_{GS} = 0\ \text{V}$<br>$I_D = -250\ \mu\text{A}$ , $V_{GS} = 0\ \text{V}$                     | Q1<br>Q2 | 150<br>-150 |            |                        | V                    |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D = 250\ \mu\text{A}$ , referenced to $25^\circ\text{C}$<br>$I_D = -250\ \mu\text{A}$ , referenced to $25^\circ\text{C}$ | Q1<br>Q2 |             | 103<br>122 |                        | mV/ $^\circ\text{C}$ |
| $I_{DSS}$                            | Zero Gate Voltage Drain Current           | $V_{DS} = 120\ \text{V}$ , $V_{GS} = 0\ \text{V}$<br>$V_{DS} = -120\ \text{V}$ , $V_{GS} = 0\ \text{V}$                     | Q1<br>Q2 |             |            | 1<br>-1                | $\mu\text{A}$        |
| $I_{GSS}$                            | Gate to Source Leakage Current            | $V_{GS} = \pm 20\ \text{V}$ , $V_{DS} = 0\ \text{V}$<br>$V_{GS} = \pm 25\ \text{V}$ , $V_{DS} = 0\ \text{V}$                | Q1<br>Q2 |             |            | $\pm 100$<br>$\pm 100$ | nA<br>nA             |

**On Characteristics**

|                                        |                                                          |                                                                                                                                                                                    |          |             |                    |                      |                      |
|----------------------------------------|----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------------|--------------------|----------------------|----------------------|
| $V_{GS(th)}$                           | Gate to Source Threshold Voltage                         | $V_{GS} = V_{DS}$ , $I_D = 250\ \mu\text{A}$<br>$V_{GS} = V_{DS}$ , $I_D = -250\ \mu\text{A}$                                                                                      | Q1<br>Q2 | 2.0<br>-2.0 | 3.2<br>-3.2        | 4.0<br>-4.0          | V                    |
| $\frac{\Delta V_{GS(th)}}{\Delta T_J}$ | Gate to Source Threshold Voltage Temperature Coefficient | $I_D = 250\ \mu\text{A}$ , referenced to $25^\circ\text{C}$<br>$I_D = -250\ \mu\text{A}$ , referenced to $25^\circ\text{C}$                                                        | Q1<br>Q2 |             | -11<br>-6          |                      | mV/ $^\circ\text{C}$ |
| $r_{DS(on)}$                           | Static Drain to Source On Resistance                     | $V_{GS} = 10\ \text{V}$ , $I_D = 6.2\ \text{A}$<br>$V_{GS} = 6\ \text{V}$ , $I_D = 5.2\ \text{A}$<br>$V_{GS} = 10\ \text{V}$ , $I_D = 6.2\ \text{A}$ , $T_J = 125^\circ\text{C}$   | Q1       |             | 25<br>33<br>48     | 30<br>41<br>58       | m $\Omega$           |
|                                        |                                                          | $V_{GS} = -10\ \text{V}$ , $I_D = -1\ \text{A}$<br>$V_{GS} = -6\ \text{V}$ , $I_D = -0.9\ \text{A}$<br>$V_{GS} = -10\ \text{V}$ , $I_D = -1\ \text{A}$ , $T_J = 125^\circ\text{C}$ | Q2       |             | 840<br>940<br>1520 | 1200<br>1400<br>2171 |                      |
| $g_{FS}$                               | Forward Transconductance                                 | $V_{DD} = 10\ \text{V}$ , $I_D = 6.2\ \text{A}$<br>$V_{DD} = -10\ \text{V}$ , $I_D = -1\ \text{A}$                                                                                 | Q1<br>Q2 |             | 19<br>0.75         |                      | S                    |

**Dynamic Characteristics**

|           |                              |                                                                              |          |            |             |             |          |
|-----------|------------------------------|------------------------------------------------------------------------------|----------|------------|-------------|-------------|----------|
| $C_{iss}$ | Input Capacitance            | Q1<br>$V_{DS} = 75\ \text{V}$ , $V_{GS} = 0\ \text{V}$ , $f = 1\ \text{MHz}$ | Q1<br>Q2 |            | 1441<br>162 | 2020<br>230 | pF       |
| $C_{oss}$ | Output Capacitance           | Q2                                                                           | Q1<br>Q2 |            | 127<br>13   | 180<br>25   | pF       |
| $C_{rss}$ | Reverse Transfer Capacitance | $V_{DS} = -75\ \text{V}$ , $V_{GS} = 0\ \text{V}$ , $f = 1\ \text{MHz}$      | Q1<br>Q2 |            | 4.4<br>0.6  | 10<br>5     | pF       |
| $R_g$     | Gate Resistance              |                                                                              | Q1<br>Q2 | 0.1<br>0.1 | 1.3<br>3.3  | 3.3<br>8.3  | $\Omega$ |

**Switching Characteristics**

|              |                               |                                                                                                             |          |  |            |           |    |
|--------------|-------------------------------|-------------------------------------------------------------------------------------------------------------|----------|--|------------|-----------|----|
| $t_{d(on)}$  | Turn-On Delay Time            | Q1<br>$V_{DD} = 75\ \text{V}$ , $I_D = 6.2\ \text{A}$ ,<br>$V_{GS} = 10\ \text{V}$ , $R_{GEN} = 6\ \Omega$  | Q1<br>Q2 |  | 12<br>5.2  | 22<br>11  | ns |
| $t_r$        | Rise Time                     |                                                                                                             | Q1<br>Q2 |  | 2.7<br>1.6 | 10<br>10  | ns |
| $t_{d(off)}$ | Turn-Off Delay Time           | Q2<br>$V_{DD} = -75\ \text{V}$ , $I_D = -1\ \text{A}$ ,<br>$V_{GS} = -10\ \text{V}$ , $R_{GEN} = 6\ \Omega$ | Q1<br>Q2 |  | 18<br>7.4  | 33<br>15  | ns |
| $t_f$        | Fall Time                     |                                                                                                             | Q1<br>Q2 |  | 4<br>6.3   | 10<br>13  | ns |
| $Q_{g(TOT)}$ | Total Gate Charge             | $V_{GS} = 0\ \text{V}$ to $10\ \text{V}$<br>$V_{GS} = 0\ \text{V}$ to $-10\ \text{V}$                       | Q1<br>Q2 |  | 21<br>2.8  | 30<br>4   | nC |
| $Q_{g(TOT)}$ | Total Gate Charge             | $V_{GS} = 0\ \text{V}$ to $6\ \text{V}$<br>$V_{GS} = 0\ \text{V}$ to $-6\ \text{V}$                         | Q1<br>Q2 |  | 13<br>1.8  | 19<br>2.6 | nC |
| $Q_{gs}$     | Gate to Source Charge         | Q2<br>$V_{DD} = -75\ \text{V}$                                                                              | Q1<br>Q2 |  | 6.7<br>0.8 |           | nC |
| $Q_{gd}$     | Gate to Drain "Miller" Charge | $I_D = -1\ \text{A}$                                                                                        | Q1<br>Q2 |  | 3.9<br>0.7 |           | nC |



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

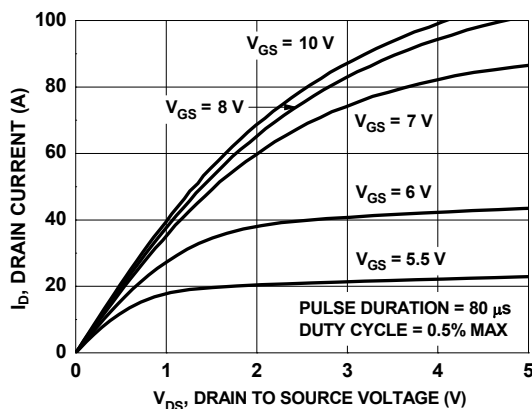


Figure 1. On Region Characteristics

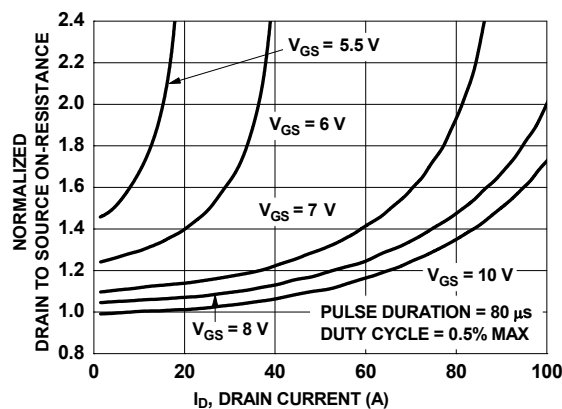


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

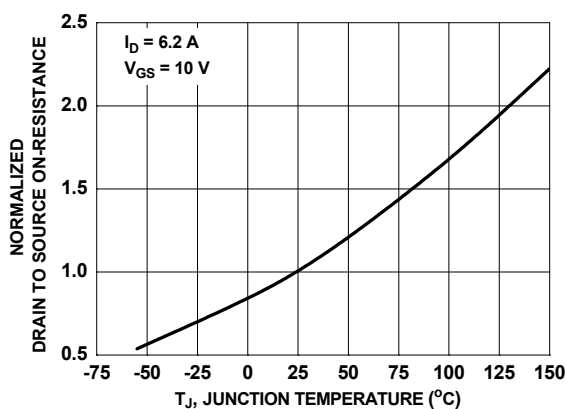


Figure 3. Normalized On Resistance vs Junction Temperature

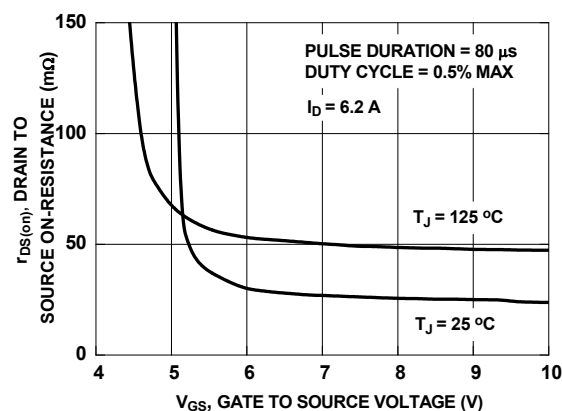


Figure 4. On-Resistance vs Gate to Source Voltage

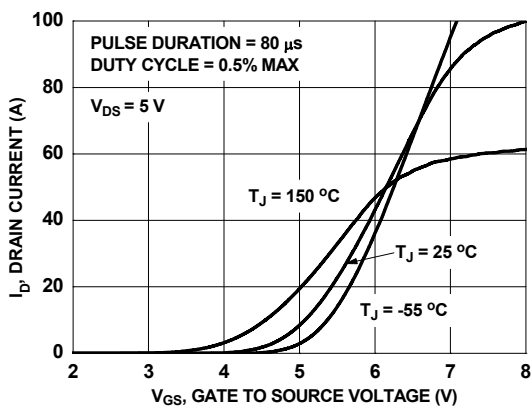


Figure 5. Transfer Characteristics

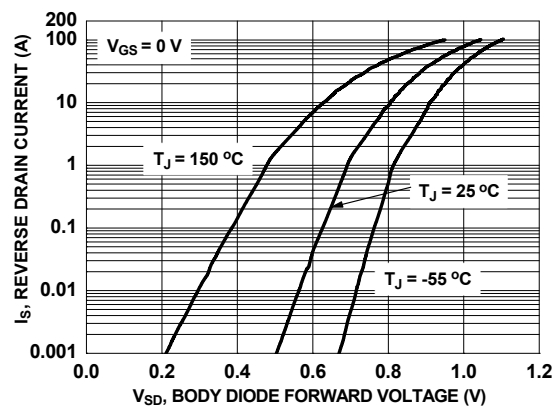


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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

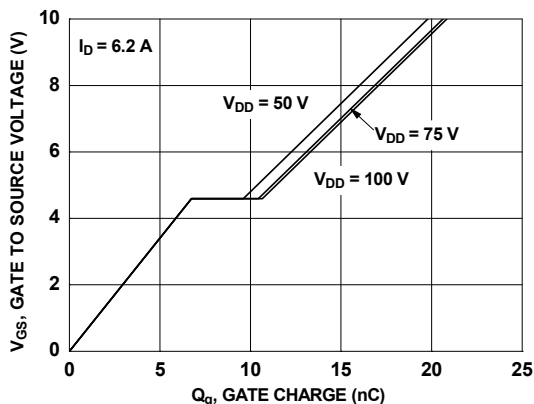


Figure 7. Gate Charge Characteristics

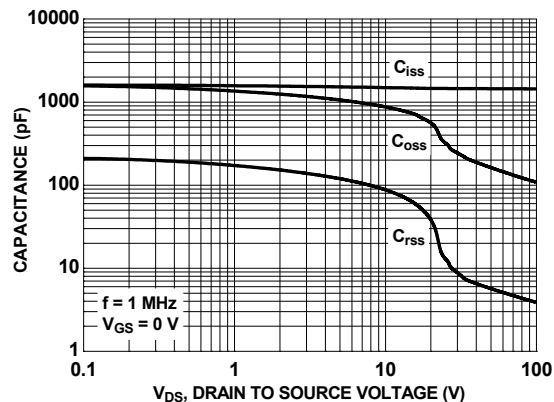


Figure 8. Capacitance vs Drain to Source Voltage

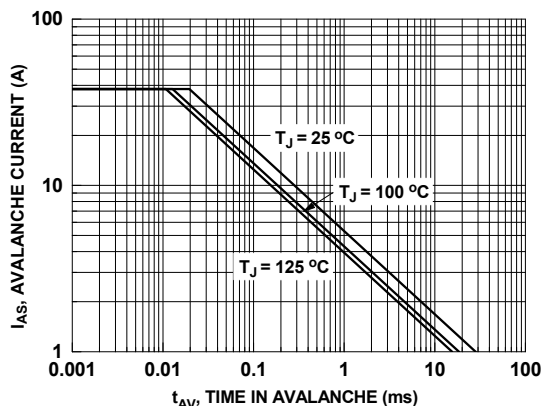


Figure 9. Unclamped Inductive Switching Capability

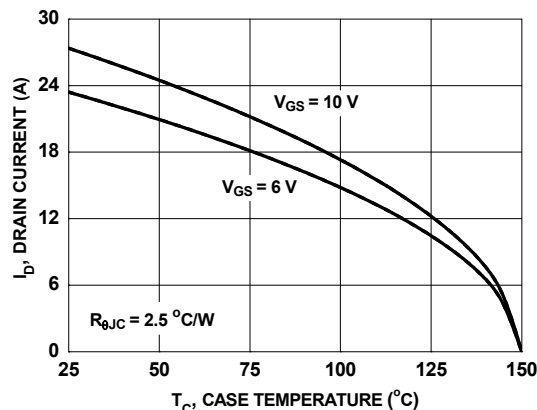


Figure 10. Maximum Continuous Drain Current vs Case Temperature

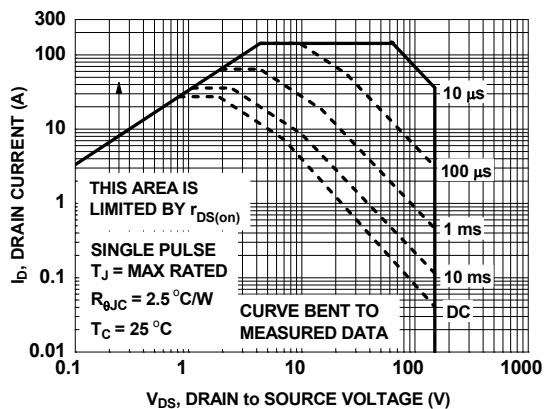


Figure 11. Forward Bias Safe Operating Area

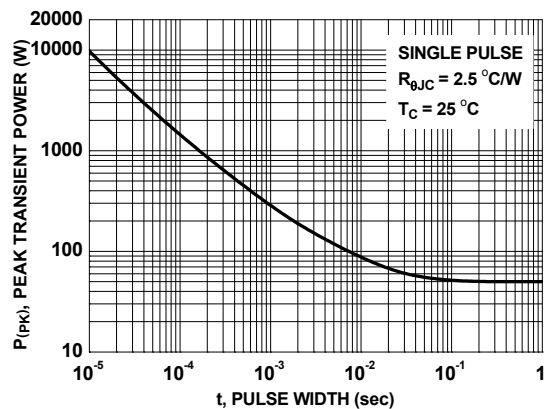
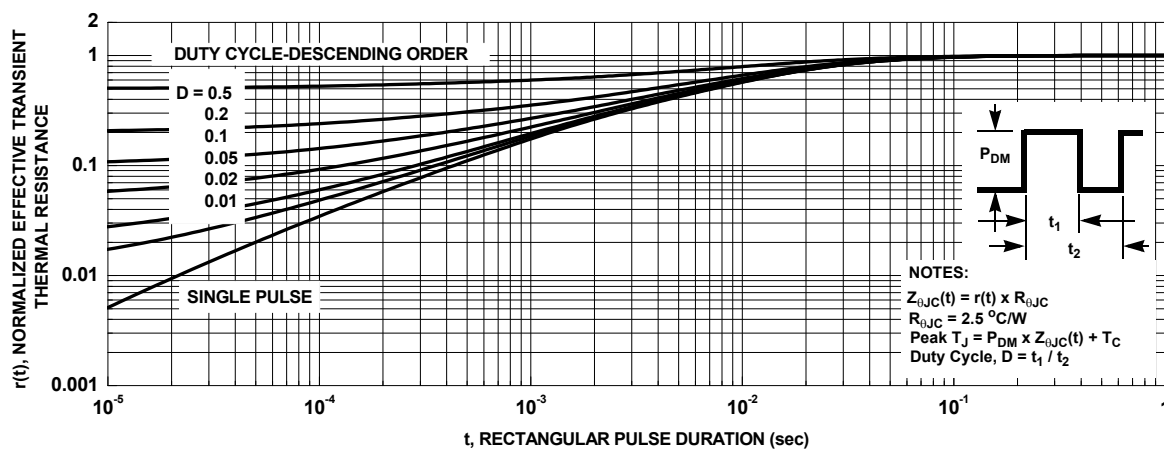


Figure 12. Single Pulse Maximum Power Dissipation

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



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

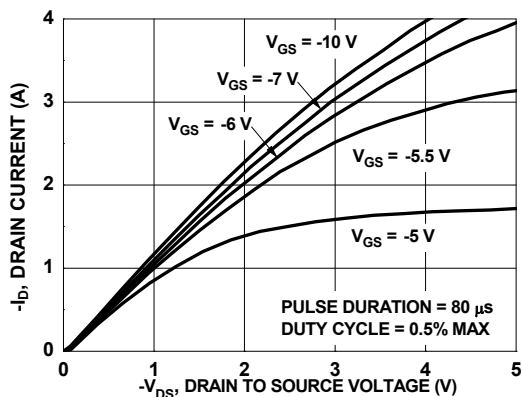


Figure 14. On-Region Characteristics

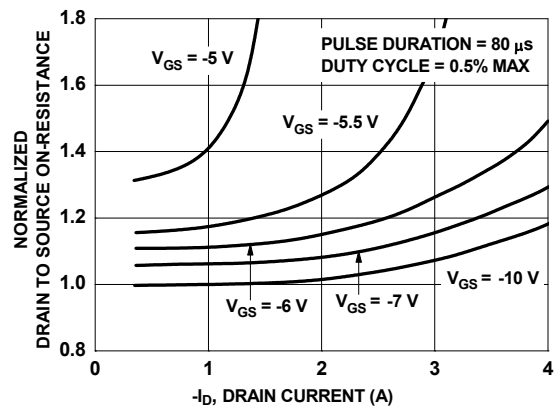


Figure 15. Normalized on-Resistance vs Drain Current and Gate Voltage

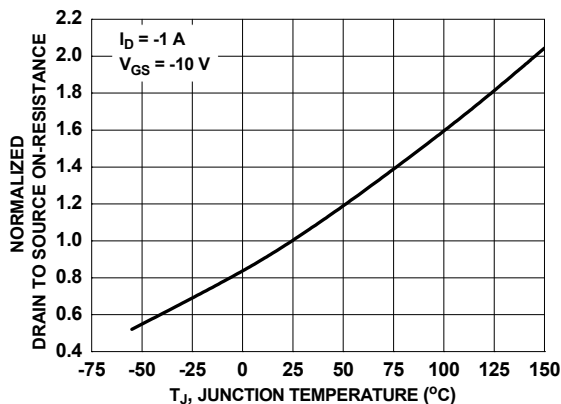


Figure 16. Normalized On-Resistance vs Junction Temperature

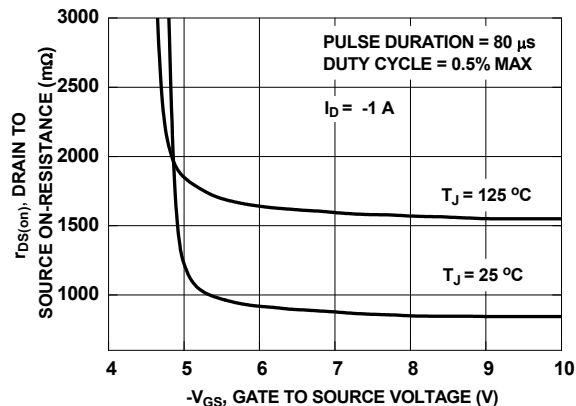


Figure 17. On-Resistance vs Gate to Source Voltage

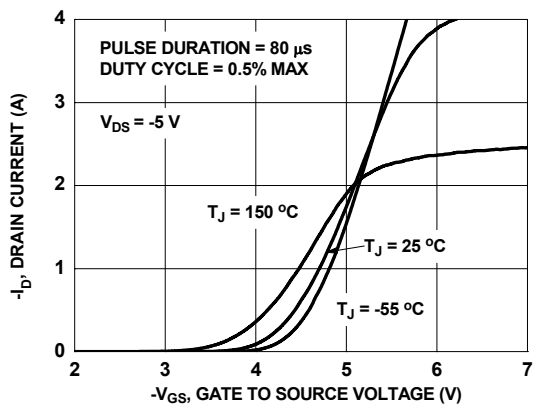


Figure 18. Transfer Characteristics

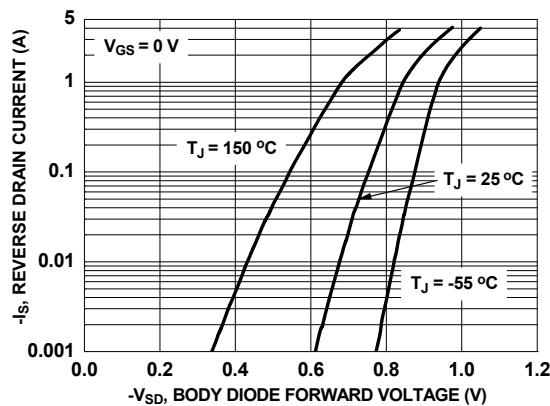


Figure 19. Source to Drain Diode Forward Voltage vs Source Current

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

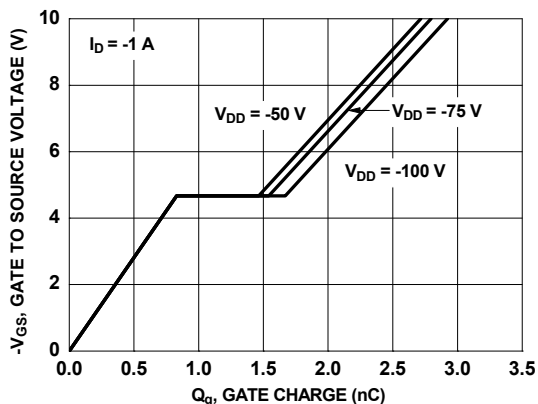


Figure 20. Gate Charge Characteristics

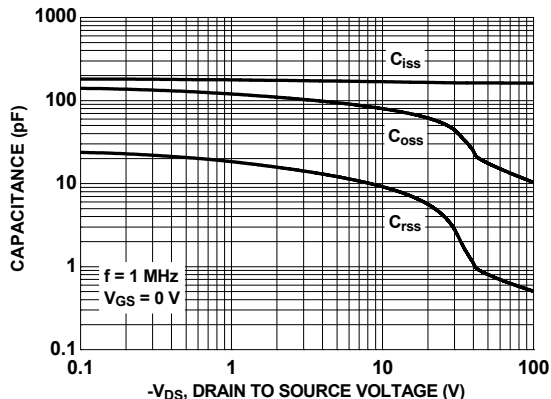


Figure 21. Capacitance vs Drain to Source Voltage

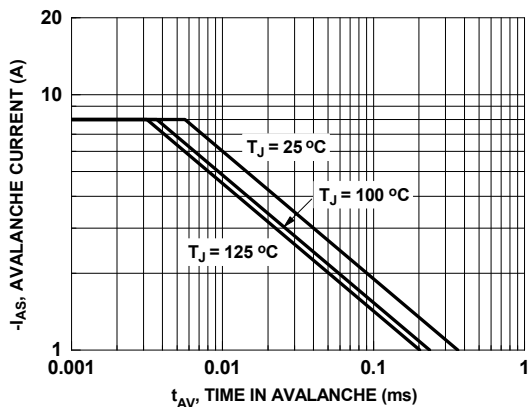


Figure 22. Unclamped Inductive Switching Capability

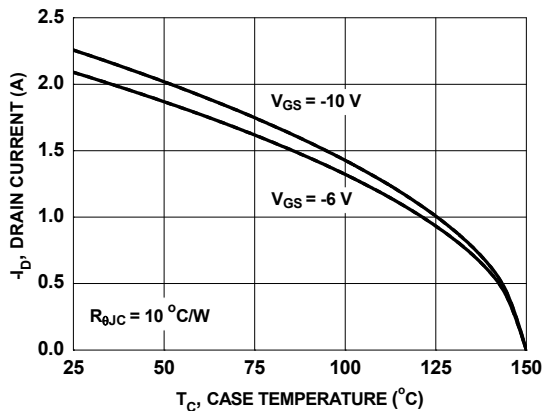


Figure 23. Maximum Continuous Drain Current vs Case Temperature

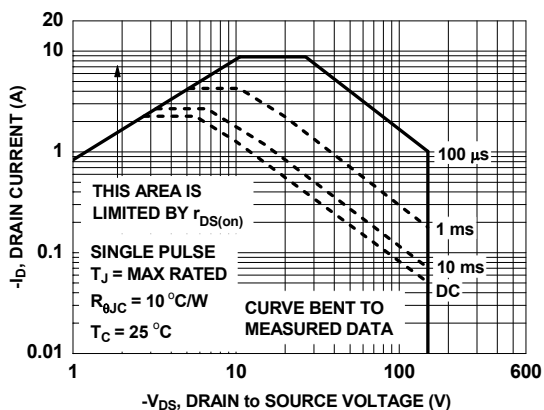


Figure 24. Forward Bias Safe Operating Area

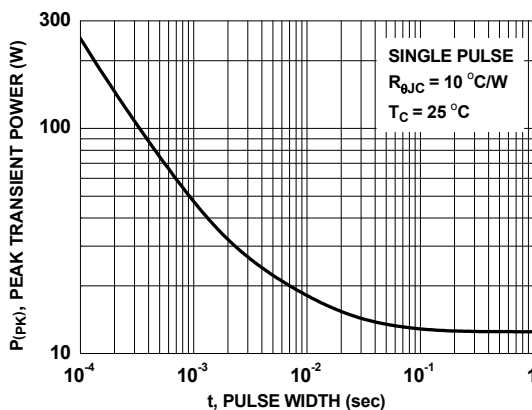
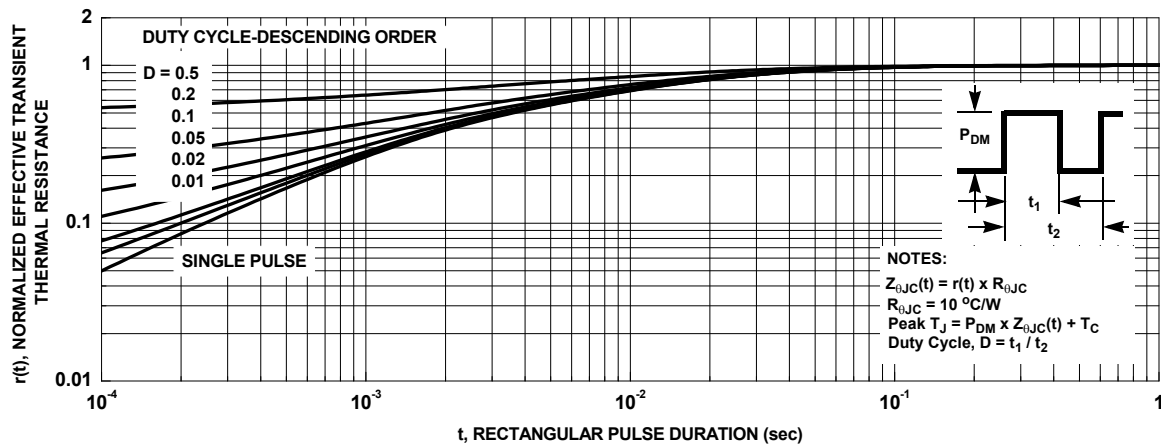
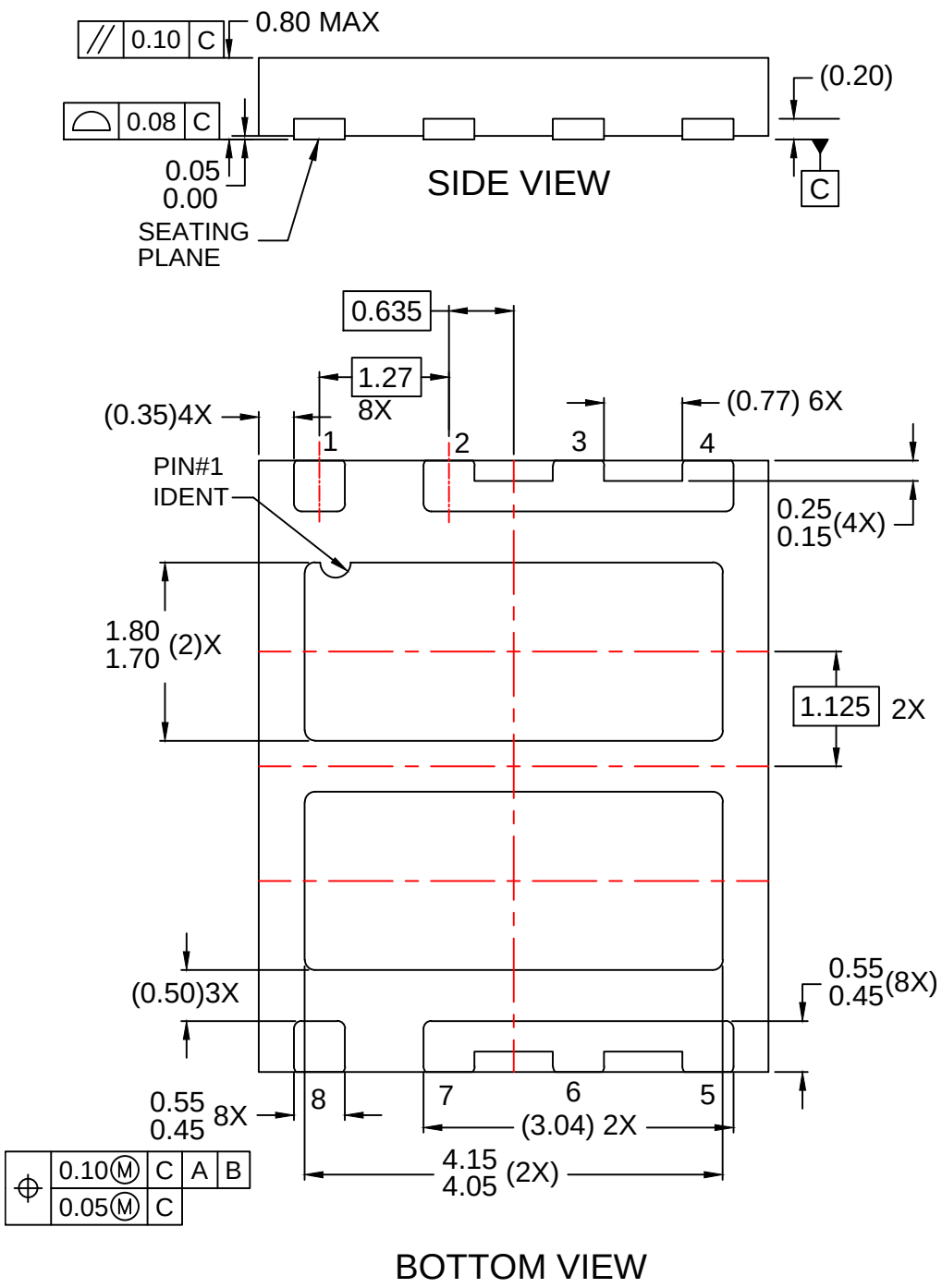
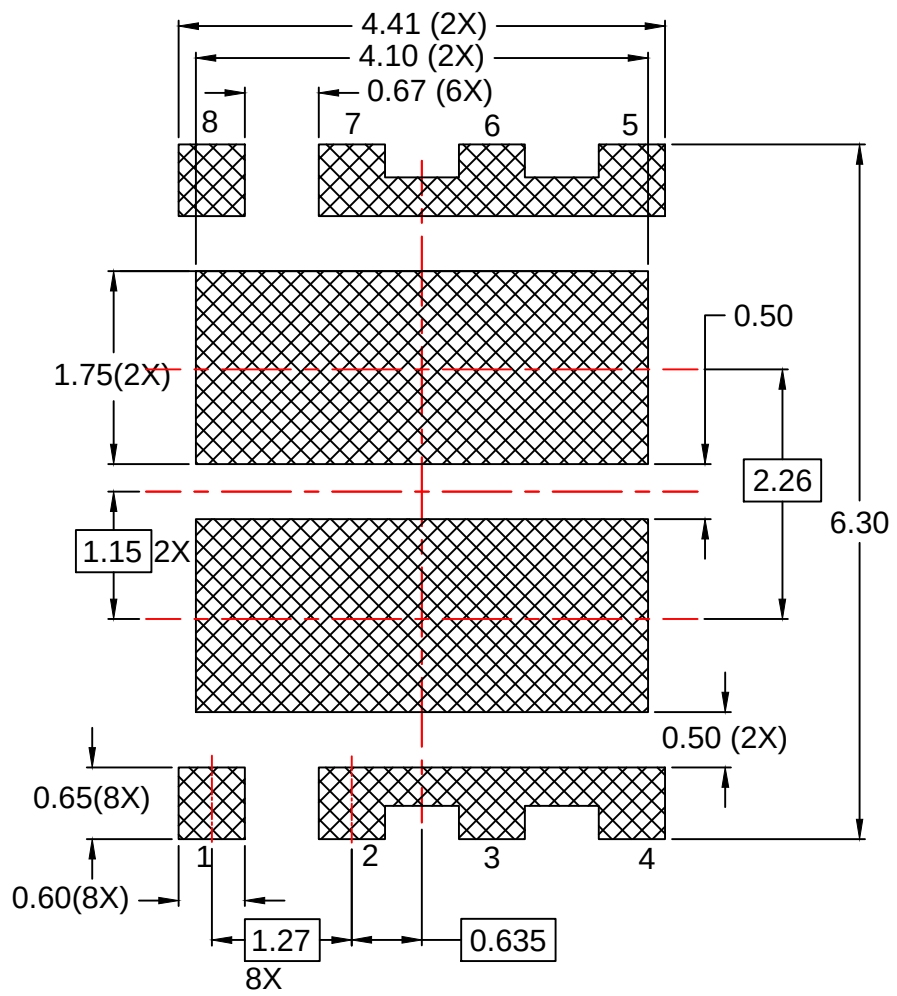
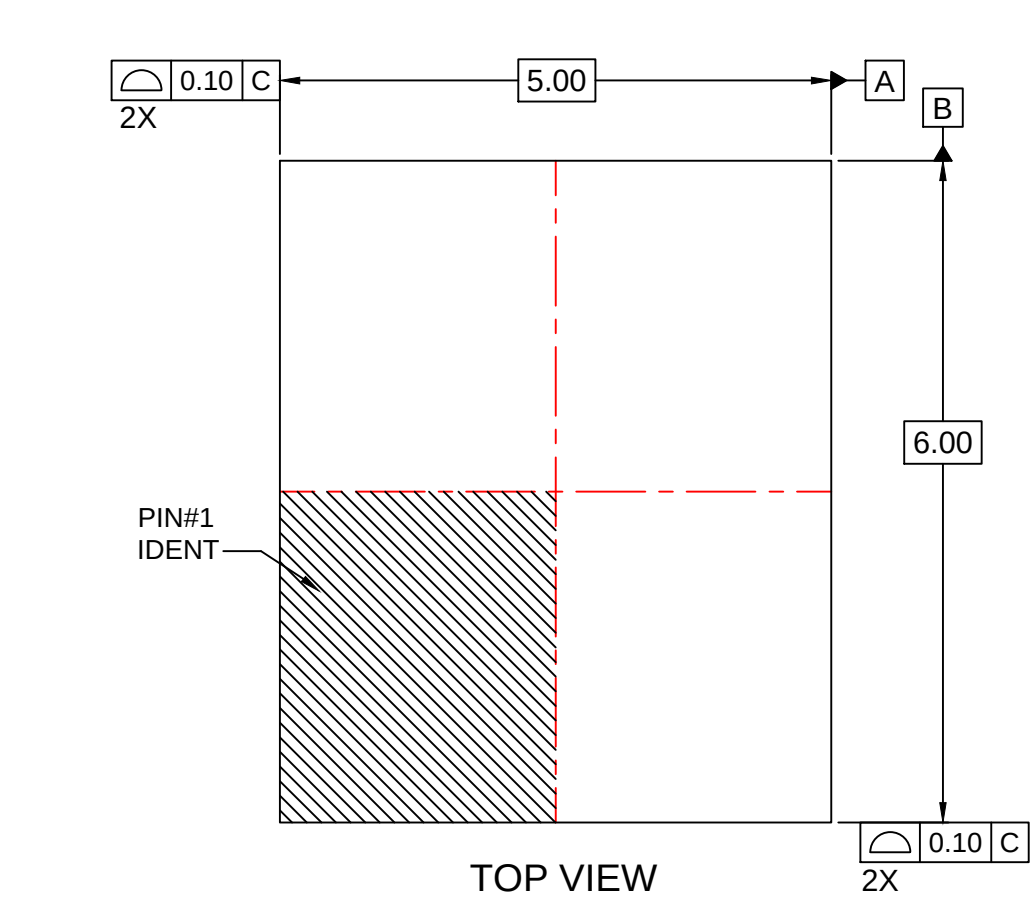


Figure 25. Single Pulse Maximum Power Dissipation

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





- NOTES:
- A. DOES NOT FULLY CONFORM TO JEDEC REGISTRATION, MO-229.
  - B. DIMENSIONS ARE IN MILLIMETERS.
  - C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 2009.
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