

# MOSFET - Complementary, POWERTRENCH®

N-Channel: 20 V, 3.8 A, 66 mΩ

P-Channel: -20 V, -2.6 A, 142 mΩ

## FDME1034CZT

### General Description

This device is designed specifically as a single package solution for a DC/DC 'Switching' MOSFET in cellular handset and other ultra-portable applications. It features an independent N-Channel & P-Channel MOSFET with low on-state resistance for minimum conduction losses. The gate charge of each MOSFET is also minimized to allow high frequency switching directly from the controlling device.

The MicroFET 1.6x1.6 Thin package offers exceptional thermal performance for its physical size and is well suited to switching and linear mode applications.

### Features

#### Q1: N-Channel

- Max  $r_{DS(on)}$  = 66 mΩ at  $V_{GS} = 4.5$  V,  $I_D = 3.4$  A
- Max  $r_{DS(on)}$  = 86 mΩ at  $V_{GS} = 2.5$  V,  $I_D = 2.9$  A
- Max  $r_{DS(on)}$  = 113 mΩ at  $V_{GS} = 1.8$  V,  $I_D = 2.5$  A
- Max  $r_{DS(on)}$  = 160 mΩ at  $V_{GS} = 1.5$  V,  $I_D = 2.1$  A

#### Q2: P-Channel

- Max  $r_{DS(on)}$  = 142 mΩ at  $V_{GS} = -4.5$  V,  $I_D = -2.3$  A
- Max  $r_{DS(on)}$  = 213 mΩ at  $V_{GS} = -2.5$  V,  $I_D = -1.8$  A
- Max  $r_{DS(on)}$  = 331 mΩ at  $V_{GS} = -1.8$  V,  $I_D = -1.5$  A
- Max  $r_{DS(on)}$  = 530 mΩ at  $V_{GS} = -1.5$  V,  $I_D = -1.2$  A
- Low Profile: 0.55 mm Maximum in the New Package MicroFET 1.6x1.6 Thin
- Free from Halogenated Compounds and Antimony Oxides
- HBM ESD Protection Level > 1600 V (Note 3)
- This Device is Pb-Free and is RoHS Compliant

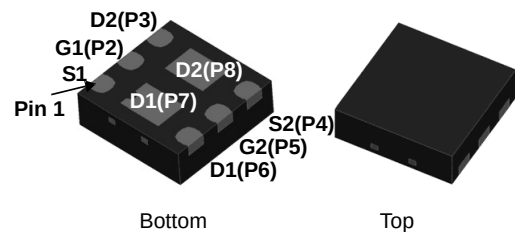
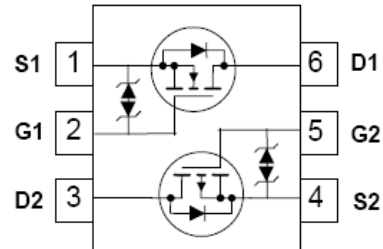
### Applications

- DC-DC Conversion
- Level Shifted Load Switch



ON Semiconductor®

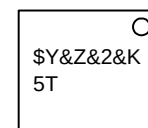
[www.onsemi.com](http://www.onsemi.com)



Note: Center pad of P7 & P8 is a virtual pin number. Actual P7 & P8 is connected to edge pad of P6 & P3 respectively.

UDFN6 1.6x1.6, 0.5P  
CASE 517DW

### MARKING DIAGRAM



|     |                         |
|-----|-------------------------|
| \$Y | = ON Semiconductor Logo |
| &Z  | = Assembly Plant Code   |
| &2  | = Numeric Date Code     |
| &K  | = Lot Code              |
| 5T  | = Specific Device Code  |

### ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

# FDME1034CZT

## MOSFET MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ , Unless otherwise noted)

| Symbol                            | Parameter                                                              |             |                                 | Q1          | Q2   | Units |
|-----------------------------------|------------------------------------------------------------------------|-------------|---------------------------------|-------------|------|-------|
| V <sub>DS</sub>                   | Drain to Source Voltage                                                |             |                                 | 20          | −20  | V     |
| V <sub>GS</sub>                   | Gate to Source Voltage                                                 |             |                                 | ±8          | ±8   | V     |
| I <sub>D</sub>                    | Drain Current                                                          | −Continuous | T <sub>A</sub> = 25°C (Note 1a) | 3.8         | −2.6 | A     |
|                                   | −Pulsed                                                                |             |                                 | 6           | −6   |       |
| P <sub>D</sub>                    | Power Dissipation for Single Operation T <sub>A</sub> = 25°C (Note 1a) |             |                                 | 1.4         |      | W     |
|                                   | Power Dissipation for Single Operation T <sub>A</sub> = 25°C (Note 1b) |             |                                 | 0.6         |      |       |
| T <sub>J</sub> , T <sub>STG</sub> | 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 | Units              |
|-----------------|----------------------------------------------------------------------|-------|--------------------|
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient (Single Operation) (Note 1a) | 90    | $^\circ\text{C/W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient (Single Operation) (Note 1b) | 195   |                    |

## PACKAGE MARKING AND ORDERING INFORMATION

| Device Marking | Device      | Package                       | Shipping <sup>†</sup>    |
|----------------|-------------|-------------------------------|--------------------------|
| 5T             | FDME1034CZT | UDFN6 1.6x1.6, 0.5P (Pb-Free) | 5000 units / Tape & Reel |

<sup>†</sup>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

# FDME1034CZT

## ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C unless otherwise noted)

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

### OFF CHARACTERISTICS

|                                      |                                           |                                                                                                             |          |           |           |          |         |
|--------------------------------------|-------------------------------------------|-------------------------------------------------------------------------------------------------------------|----------|-----------|-----------|----------|---------|
| BV <sub>DSS</sub>                    | Drain to Source Breakdown Voltage         | I <sub>D</sub> = 250 $\mu$ A, V <sub>GS</sub> = 0 V<br>I <sub>D</sub> = -250 $\mu$ A, V <sub>GS</sub> = 0 V | Q1<br>Q2 | 20<br>-20 |           |          | V       |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | I <sub>D</sub> = 250 $\mu$ A, referenced to 25°C<br>I <sub>D</sub> = -250 $\mu$ A, referenced to 25°C       | Q1<br>Q2 |           | 16<br>-12 |          | mV/°C   |
| I <sub>DSS</sub>                     | Zero Gate Voltage Drain Current           | V <sub>DS</sub> = 16 V, V <sub>GS</sub> = 0 V<br>V <sub>DS</sub> = -16 V, V <sub>GS</sub> = 0 V             | Q1<br>Q2 |           |           | 1<br>-1  | $\mu$ A |
| I <sub>GSS</sub>                     | Gate to Source Leakage Current            | V <sub>GS</sub> = $\pm$ 8 V, V <sub>DS</sub> = 0 V                                                          | All      |           |           | $\pm$ 10 | $\mu$ A |

### ON CHARACTERISTICS

|                                        |                                                          |                                                                                                                                                                                                                                                                                               |          |             |                                |                                 |            |
|----------------------------------------|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------------|--------------------------------|---------------------------------|------------|
| V <sub>GS(th)</sub>                    | Gate to Source Threshold Voltage                         | V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 250 $\mu$ A<br>V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = -250 $\mu$ A                                                                                                                                                         | Q1<br>Q2 | 0.4<br>-0.4 | 0.7<br>-0.6                    | 1.0<br>-1.0                     | V          |
| $\frac{\Delta V_{GS(th)}}{\Delta T_J}$ | Gate to Source Threshold Voltage Temperature Coefficient | I <sub>D</sub> = 250 $\mu$ A, referenced to 25°C                                                                                                                                                                                                                                              | Q1<br>Q2 |             | -3<br>2                        |                                 | mV/°C      |
| r <sub>DS(on)</sub>                    | Drain to Source On Resistance                            | V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 3.4 A<br>V <sub>GS</sub> = 2.5 V, I <sub>D</sub> = 2.9 A<br>V <sub>GS</sub> = 1.8 V, I <sub>D</sub> = 2.5 A<br>V <sub>GS</sub> = 1.5 V, I <sub>D</sub> = 2.1 A<br>V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 3.4 A, T <sub>J</sub> = 125°C           | Q1       |             | 55<br>68<br>85<br>106<br>76    | 66<br>86<br>113<br>160<br>112   | m $\Omega$ |
|                                        |                                                          | V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -2.3 A<br>V <sub>GS</sub> = -2.5 V, I <sub>D</sub> = -1.8 A<br>V <sub>GS</sub> = -1.8 V, I <sub>D</sub> = -1.5 A<br>V <sub>GS</sub> = -1.5 V, I <sub>D</sub> = -1.2 A<br>V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -2.3 A, T <sub>J</sub> = 125°C | Q2       |             | 95<br>120<br>150<br>190<br>128 | 142<br>213<br>331<br>530<br>190 |            |
| g <sub>FS</sub>                        | Forward Transconductance                                 | V <sub>DS</sub> = 4.5 V, I <sub>D</sub> = 3.4 A<br>V <sub>DS</sub> = -4.5 V, I <sub>D</sub> = -2.3 A                                                                                                                                                                                          | Q1<br>Q2 |             | 9<br>7                         |                                 | S          |

### DYNAMIC CHARACTERISTICS

|                  |                              |                                                                  |          |  |            |            |    |
|------------------|------------------------------|------------------------------------------------------------------|----------|--|------------|------------|----|
| C <sub>iss</sub> | Input Capacitance            | Q1:<br>V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 0 V, f = 1 MHz  | Q1<br>Q2 |  | 225<br>305 | 300<br>405 | pF |
| C <sub>oss</sub> | Output Capacitance           | Q2:<br>V <sub>DS</sub> = -10 V, V <sub>GS</sub> = 0 V, f = 1 MHz | Q1<br>Q2 |  | 40<br>55   | 55<br>75   | pF |
| C <sub>rss</sub> | Reverse Transfer Capacitance |                                                                  | Q1<br>Q2 |  | 25<br>50   | 40<br>75   | pF |

### SWITCHING CHARACTERISTICS

|                     |                               |                                                                                                                |          |  |            |            |    |
|---------------------|-------------------------------|----------------------------------------------------------------------------------------------------------------|----------|--|------------|------------|----|
| t <sub>d(on)</sub>  | Turn-On Delay Time            | Q1:<br>V <sub>DD</sub> = 10 V, I <sub>D</sub> = 1 A, V <sub>GS</sub> = 4.5V, R <sub>GEN</sub> = 6 $\Omega$     | Q1<br>Q2 |  | 4.5<br>4.7 | 10<br>10   | ns |
| t <sub>r</sub>      | Rise Time                     | Q2:<br>V <sub>DD</sub> = -10 V, I <sub>D</sub> = -1 A, V <sub>GS</sub> = -4.5 V, R <sub>GEN</sub> = 6 $\Omega$ | Q1<br>Q2 |  | 2.0<br>4.8 | 10<br>10   |    |
| t <sub>d(off)</sub> | Turn-Off Delay Time           |                                                                                                                | Q1<br>Q2 |  | 15<br>33   | 27<br>53   |    |
| t <sub>f</sub>      | Fall Time                     |                                                                                                                | Q1<br>Q2 |  | 1.7<br>16  | 10<br>29   |    |
| Q <sub>g</sub>      | Total Gate Charge             | Q1:<br>V <sub>DD</sub> = 10 V, I <sub>D</sub> = 3.4 A, V <sub>GS</sub> = 4.5 V                                 | Q1<br>Q2 |  | 3<br>5.5   | 4.2<br>7.7 | nC |
| Q <sub>gs</sub>     | Gate to Source Gate Charge    | Q2:<br>V <sub>DD</sub> = -10 V, I <sub>D</sub> = -2.3 A, V <sub>GS</sub> = -4.5 V                              | Q1<br>Q2 |  | 0.4<br>0.6 |            |    |
| Q <sub>gd</sub>     | Gate to Drain "Miller" Charge |                                                                                                                | Q1<br>Q2 |  | 0.6<br>1.4 |            |    |

# FDME1034CZT

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

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

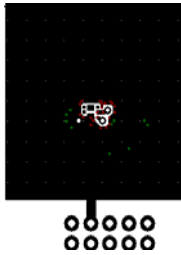
### DRAIN-SOURCE DIODE CHARACTERISTICS $T_J = 25^\circ\text{C}$ unless otherwise noted.

|          |                                       |                                                                                                           |          |  |             |             |    |
|----------|---------------------------------------|-----------------------------------------------------------------------------------------------------------|----------|--|-------------|-------------|----|
| $V_{SD}$ | Source to Drain Diode Forward Voltage | $V_{GS} = 0\text{ V}, I_S = 0.9\text{ A}$ (Note 2)<br>$V_{GS} = 0\text{ V}, I_S = -0.9\text{ A}$ (Note 2) | Q1<br>Q2 |  | 0.7<br>-0.8 | 1.2<br>-1.2 | V  |
| $t_{rr}$ | Reverse Recovery Time                 | Q1:<br>$I_F = 3.4\text{ A}, \Delta i/\Delta t = 100\text{ A}/\mu\text{s}$                                 | Q1<br>Q2 |  | 8.5<br>16   | 17<br>29    | ns |
| $Q_{rr}$ | Reverse Recovery Charge               | Q2:<br>$I_F = -2.3\text{ A}, \Delta i/\Delta t = 100\text{ A}/\mu\text{s}$                                | Q1<br>Q2 |  | 1.4<br>4.4  | 10<br>10    | nC |

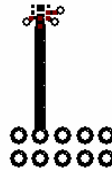
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

#### NOTES:

- $R_{\theta JA}$  is determined with the device mounted on a 1 in<sup>2</sup> 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.  $90^\circ\text{C/W}$  when mounted on a 1 in<sup>2</sup> pad of 2 oz copper



b.  $195^\circ\text{C/W}$  when mounted on a minimum pad of 2 oz copper

- Pulse Test: Pulse Width < 300  $\mu\text{s}$ , Duty cycle < 2.0 %.
- The diode connected between the gate and source serves only as protection ESD. No gate overvoltage rating is implied.

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

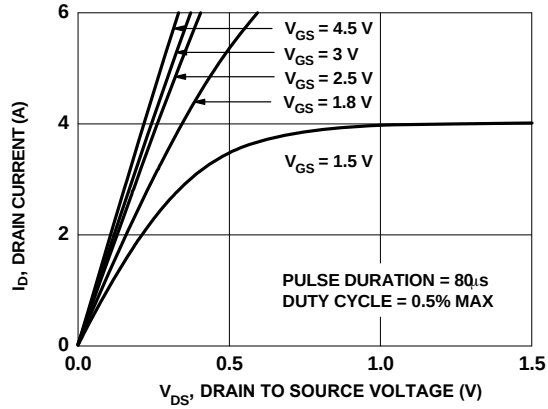


Figure 1. On-Region Characteristics

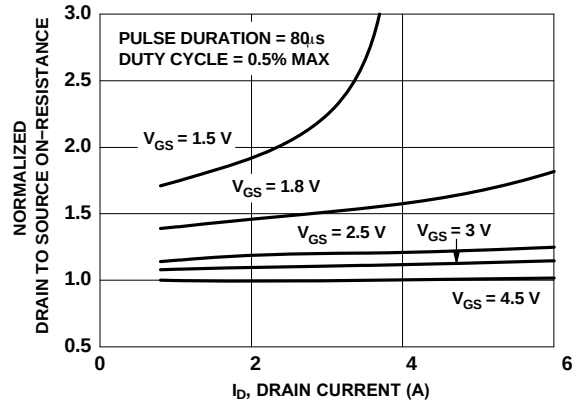


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

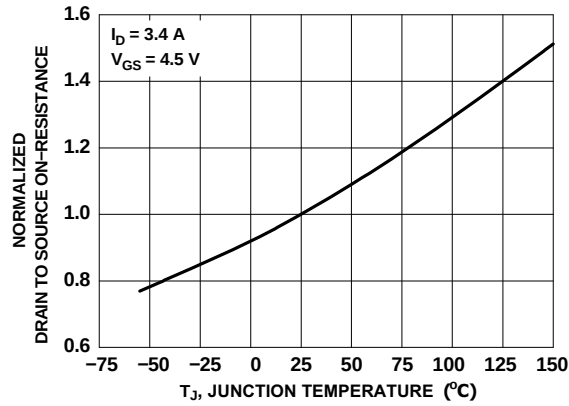


Figure 3. Normalized On Resistance vs. Junction Temperature

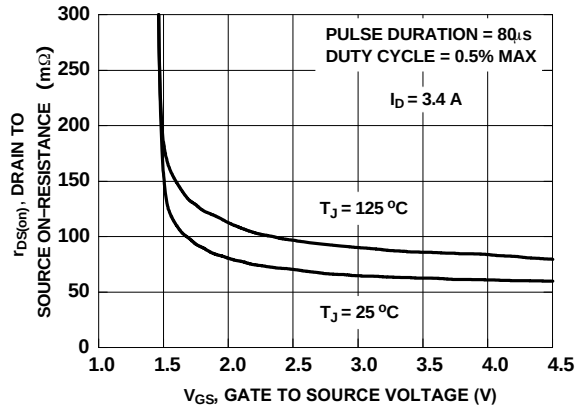


Figure 4. On-Resistance vs. Gate to Source Voltage

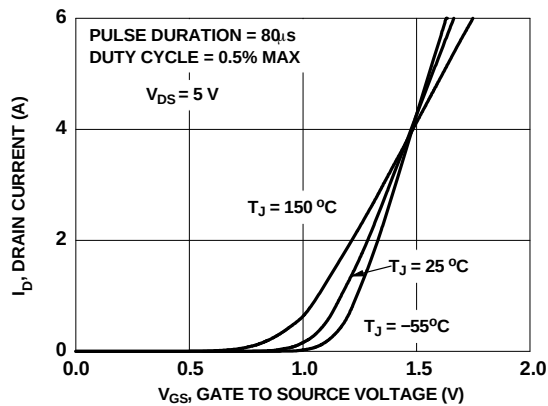


Figure 5. Transfer Characteristics

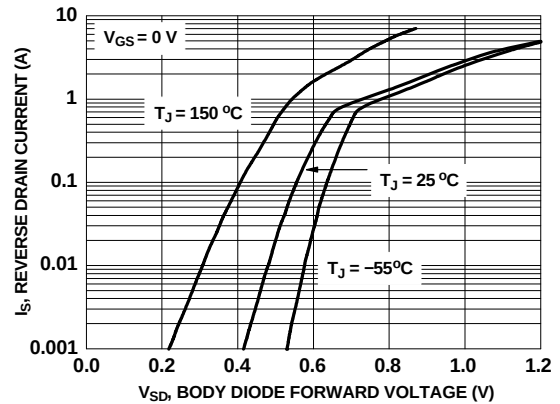


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

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

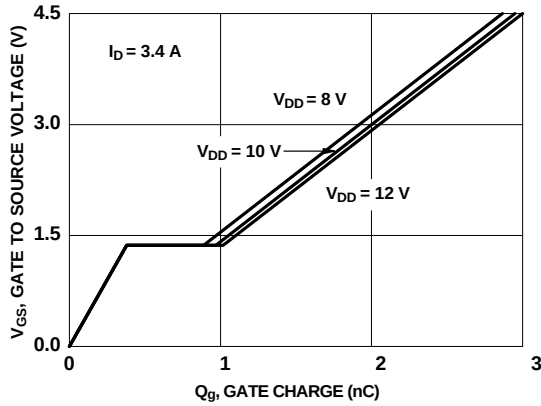


Figure 7. Gate Charge Characteristics

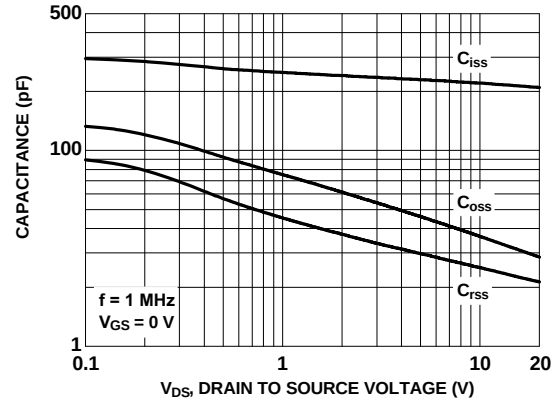


Figure 8. Capacitance vs. Drain to Source Voltage

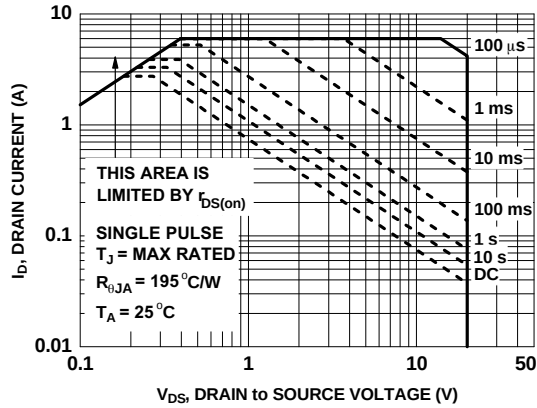


Figure 9. Forward Bias Safe Operating Area

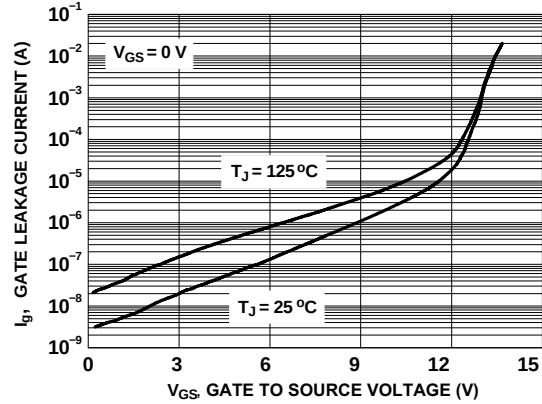


Figure 10. Gate Leakage Current vs. Gate to Source Voltage

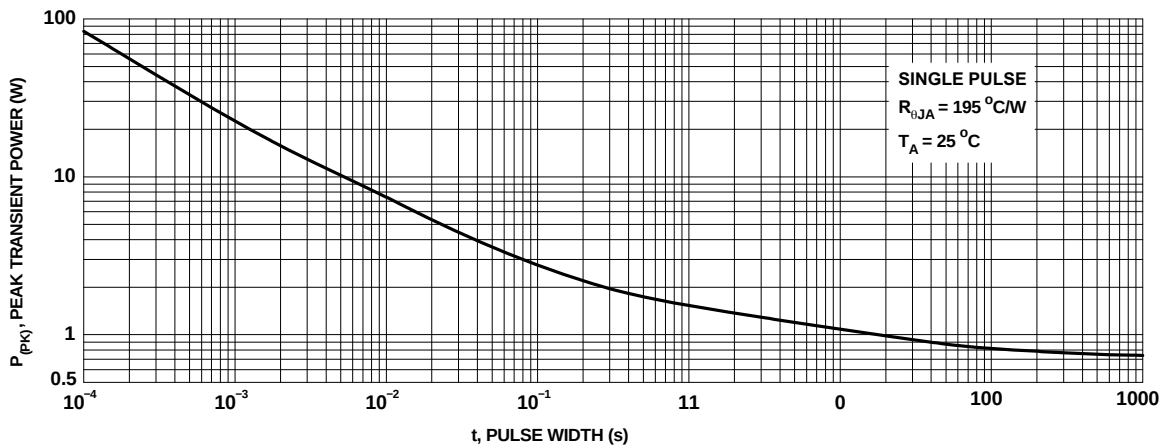


Figure 11. Single Pulse Maximum Power Dissipation

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

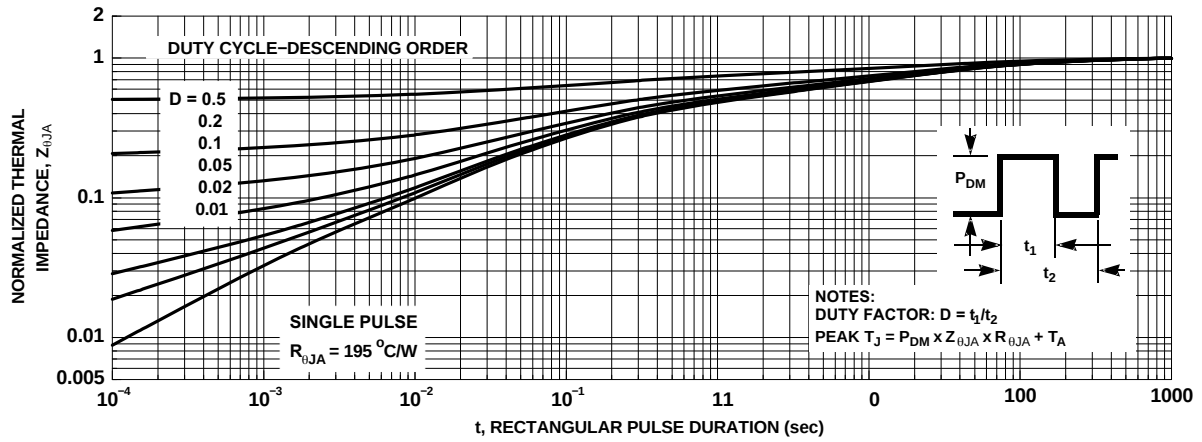


Figure 12. Junction-to-Ambient Transient Thermal Response Curve

TYPICAL CHARACTERISTICS (Q2 P-CHANNEL)  $T_J = 25^\circ\text{C}$  unless otherwise noted.

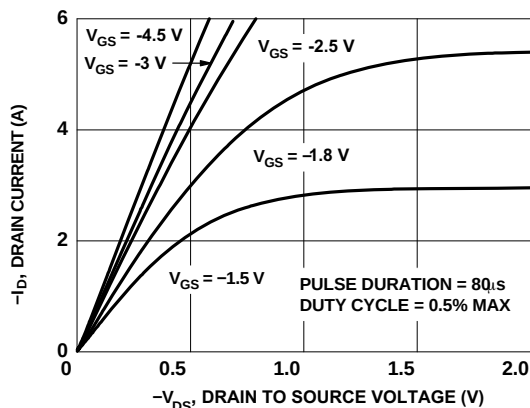


Figure 13. On-Region Characteristics

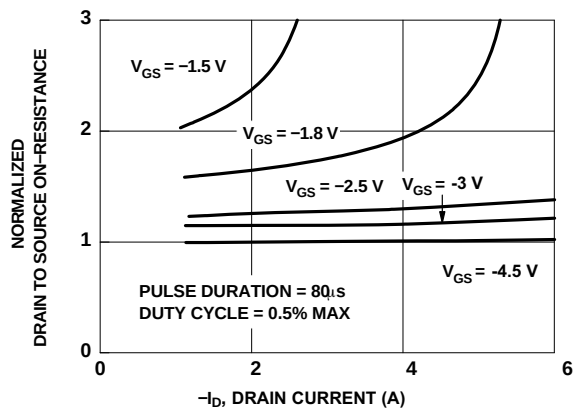


Figure 14. Normalized On-Resistance vs. Drain Current and Gate Voltage

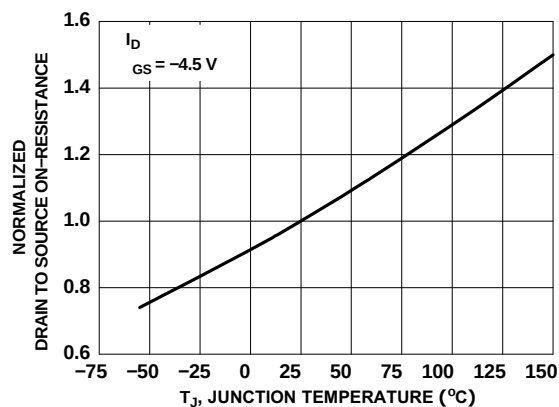


Figure 15. Normalized On-Resistance vs. Junction Temperature

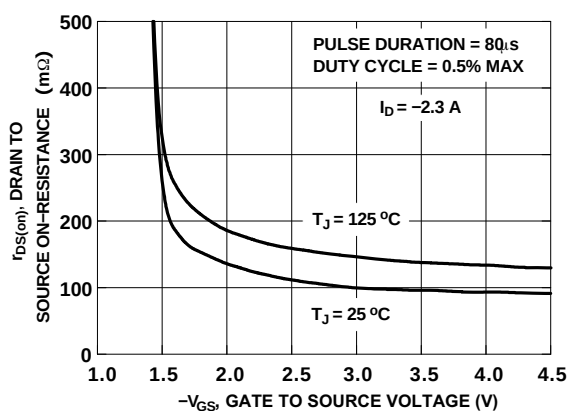


Figure 16. On Resistance vs. Gate to Source Voltage

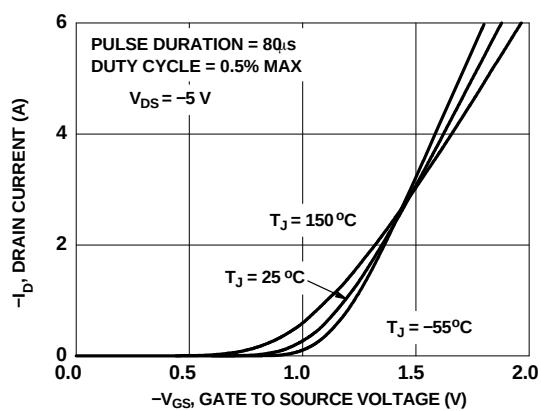


Figure 17. Transfer Characteristics

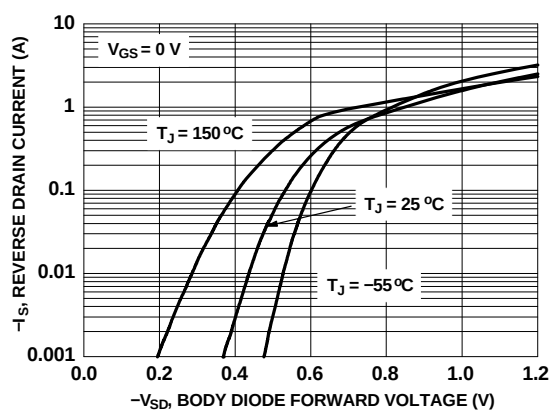


Figure 18. Source to Drain Diode Forward Voltage vs. Source Current

TYPICAL CHARACTERISTICS (Q2 N-CHANNEL)  $T_J = 25^\circ\text{C}$  unless otherwise noted.

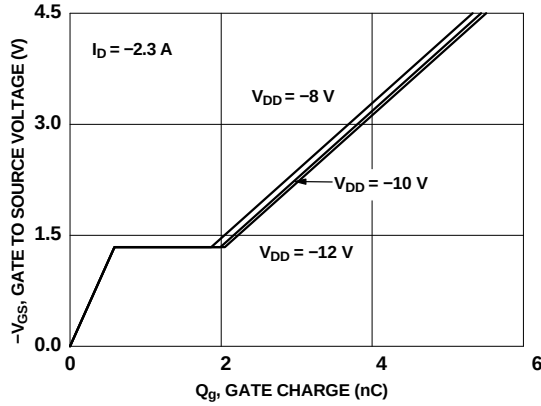


Figure 19. Gate Charge Characteristics

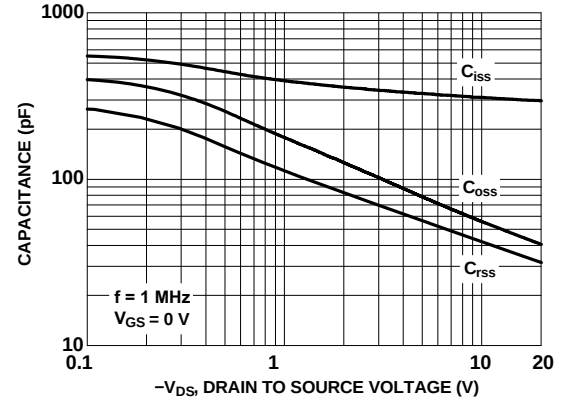


Figure 20. Capacitance vs. Drain to Source Voltage

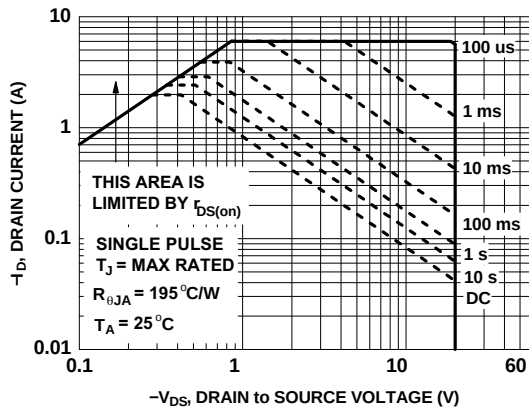


Figure 21. Forward Bias Safe Operating Area

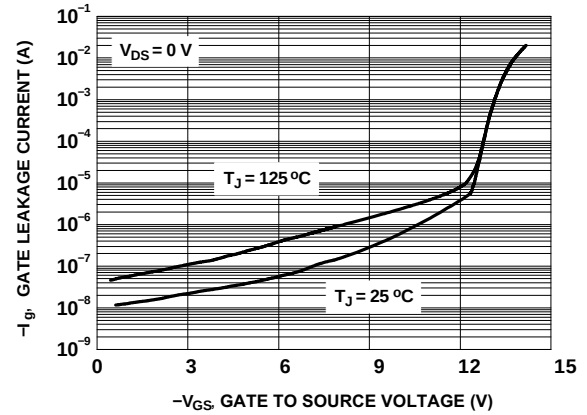


Figure 22. Gate Leakage Current vs. Gate to Source Voltage

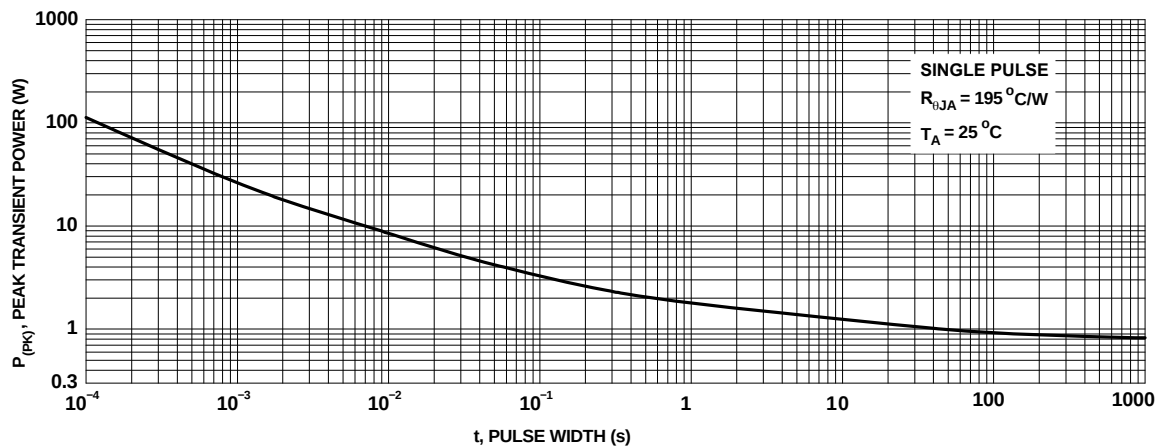


Figure 23. Single Pulse Maximum Power Dissipation

TYPICAL CHARACTERISTICS (Q2 P-CHANNEL)  $T_J = 25^{\circ}\text{C}$  unless otherwise noted.

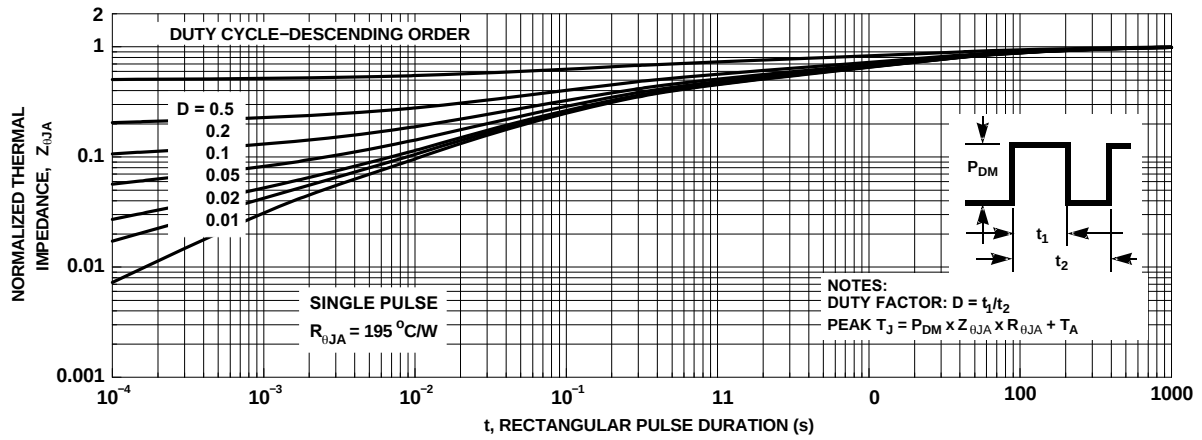
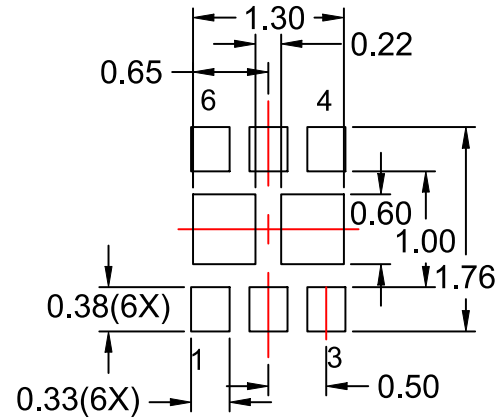
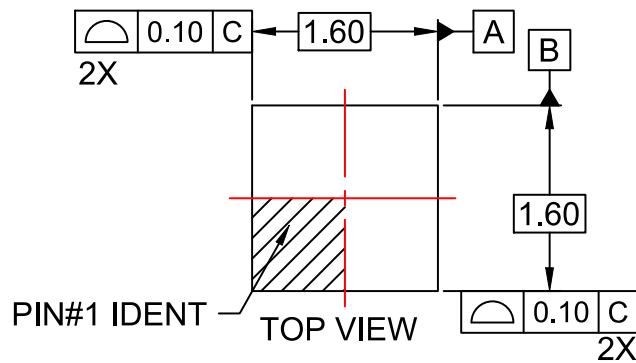


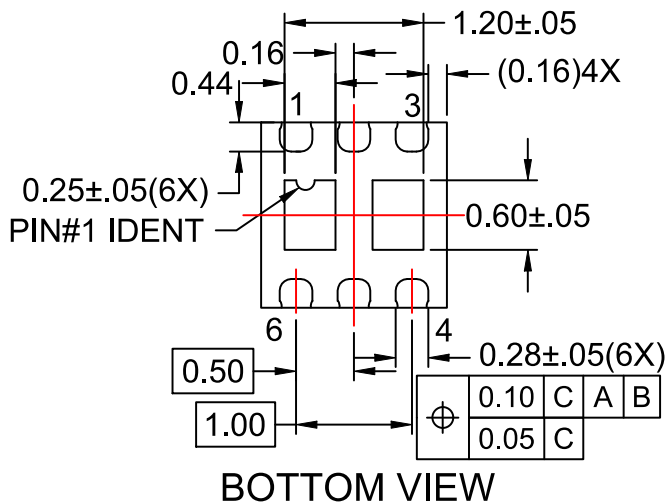
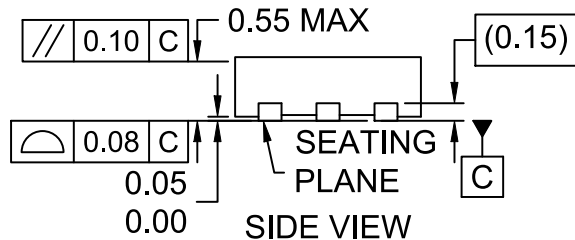
Figure 24. Junction-to-Ambient Transient Thermal Response Curve

**UDFN6 1.6x1.6, 0.5P**  
CASE 517DW  
ISSUE O

DATE 31 OCT 2016



**RECOMMENDED  
LAND PATTERN**



**NOTES:**

- A. PACKAGE DOES NOT CONFORM TO ANY JEDEC STANDARD.
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 2009.
- D. LAND PATTERN RECOMMENDATION IS EXISTING INDUSTRY LAND PATTERN.

|                         |                            |                                                                                                                                                                                     |
|-------------------------|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
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| <b>DESCRIPTION:</b>     | <b>UDFN6 1.6x1.6, 0.5P</b> | <b>PAGE 1 OF 1</b>                                                                                                                                                                  |

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