



# FDMC8676

## N-Channel PowerTrench® MOSFET

30V, 18A, 5.9mΩ

### Features

- Max  $r_{DS(on)}$  = 5.9mΩ at  $V_{GS} = 10V$ ,  $I_D = 14.7A$
- Max  $r_{DS(on)}$  = 9.3mΩ at  $V_{GS} = 4.5V$ ,  $I_D = 11.5A$
- Low Profile - 1mm max in Power 33
- RoHS Compliant

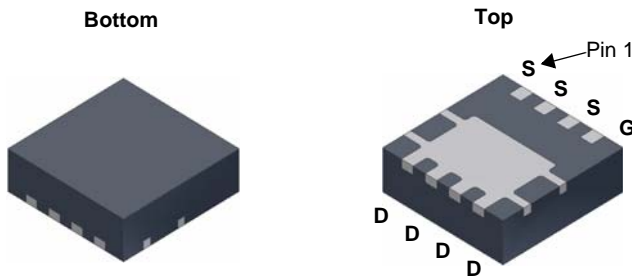


### General Description

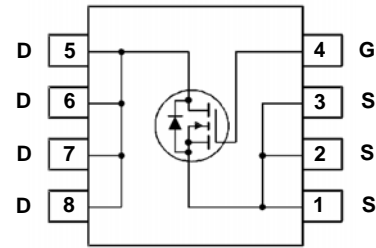
This device has been designed specifically to improve the efficiency of DC/DC converters. Using new techniques in MOSFET construction, the various components of gate charge and capacitance have been optimized to reduce switching losses. Low gate resistance and very low Miller charge enable excellent performance with both adaptive and fixed dead time gate drive circuits. Very low  $r_{DS(on)}$  has been maintained to provide an extremely versatile device.

### Applications

- High efficiency DC-DC converter
- Notebook DC-DC conversion
- Multi purpose point of load



Power 33



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

| Symbol         | Parameter  | Conditions                         | Ratings     | Units            |
|----------------|--|------------------------------------|-------------|------------------|
| $V_{DS}$       | Drain to Source Voltage                          |                                    | 30          | V                |
| $V_{GS}$       | Gate to Source Voltage                           |                                    | $\pm 20$    | V                |
| $I_D$          | Drain Current -Continuous (Package limited)      | $T_C = 25^\circ\text{C}$           | 18          | A                |
|                | -Continuous (Silicon limited)                    | $T_C = 25^\circ\text{C}$           | 66          |                  |
|                | -Continuous                                      | $T_A = 25^\circ\text{C}$ (Note 1a) | 16          |                  |
|                | -Pulsed  |                                    | 60          |                  |
| $P_D$          | Power Dissipation                                | $T_C = 25^\circ\text{C}$           | 41          | W                |
|                | Power Dissipation                                | $T_A = 25^\circ\text{C}$ (Note 1a) | 2.3         |                  |
| $E_{AS}$       | Single Pulse Avalanche Energy                    | (Note 3)                           | 216         | mJ               |
| $T_J, T_{STG}$ | Operating and Storage Junction Temperature Range |                                    | -55 to +150 | $^\circ\text{C}$ |

### Thermal Characteristics

|                 |   |           |    |                    |
|-----------------|---|-----------|----|--------------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case    |           | 3  | $^\circ\text{C/W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | (Note 1a) | 53 |                    |

### Package Marking and Ordering Information

| Device Marking | Device   | Package  | Reel Size | Tape Width | Quantity  |
|----------------|----------|----------|-----------|------------|-----------|
| FDMC8676       | FDMC8676 | Power 33 | 13"       | 12mm       | 3000units |

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

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

### Off Characteristics

|                                      |   |   |    |    |           |                      |
|--------------------------------------|---|---|----|----|-----------|----------------------|
| $BV_{DSS}$                           | Drain to Source Breakdown Voltage         | $I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$                                  | 30 |    |           | V                    |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D = 250\mu\text{A}$ , referenced to $25^\circ\text{C}$                   |    | 32 |           | mV/ $^\circ\text{C}$ |
| $I_{DSS}$                            | Zero Gate Voltage Drain Current           | $V_{DS} = 24\text{V}$ ,<br>$V_{GS} = 0\text{V}$ , $T_J = 125^\circ\text{C}$ |    |    | 1<br>100  | $\mu\text{A}$        |
| $I_{GSS}$                            | Gate to Source Leakage Current            | $V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$                               |    |    | $\pm 100$ | nA                   |

### On Characteristics

|  |  |  |     |     |     |                      |
|--|--|--|-----|-----|-----|----------------------|
| $V_{GS(th)}$                           | Gate to Source Threshold Voltage                         | $V_{GS} = V_{DS}, I_D = 250\mu\text{A}$                            | 1.0 | 1.8 | 3.0 | V                    |
| $\frac{\Delta V_{GS(th)}}{\Delta T_J}$ | Gate to Source Threshold Voltage Temperature Coefficient | $I_D = 250\mu\text{A}$ , referenced to $25^\circ\text{C}$          |     | -5  |     | mV/ $^\circ\text{C}$ |
| $r_{DS(on)}$                           | Static Drain to Source On Resistance                     | $V_{GS} = 10\text{V}, I_D = 14.7\text{A}$                          |     | 4.7 | 5.9 | m $\Omega$           |
|  |  | $V_{GS} = 4.5\text{V}, I_D = 11.5\text{A}$                         |     | 7.1 | 9.3 |                      |
|  |  | $V_{GS} = 10\text{V}, I_D = 14.7\text{A}, T_J = 125^\circ\text{C}$ |     | 6.8 | 9.1 |                      |
| $g_{FS}$                               | Forward Transconductance                                 | $V_{DD} = 5\text{V}, I_D = 14.7\text{A}$                           |     | 56  |     | S                    |

### Dynamic Characteristics

|           |                              |  |                   |      |      |          |
|-----------|------------------------------|--|-------------------|------|------|----------|
| $C_{iss}$ | Input Capacitance            | $V_{DS} = 15\text{V}, V_{GS} = 0\text{V}$ ,<br>$f = 1\text{MHz}$ |                   | 1455 | 1935 | pF       |
| $C_{oss}$ | Output Capacitance           |  |                   | 760  | 1010 | pF       |
| $C_{rss}$ | Reverse Transfer Capacitance |  |                   | 105  | 155  | pF       |
| $R_g$     | Gate Resistance              |  | $f = 1\text{MHz}$ | 0.8  |      | $\Omega$ |

### Switching Characteristics

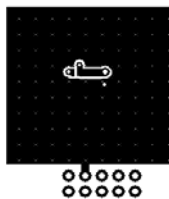
|              |                               |   |                                      |   |    |    |    |
|--------------|-------------------------------|---|--------------------------------------|---|----|----|----|
| $t_{d(on)}$  | Turn-On Delay Time            | $V_{DD} = 15\text{V}, I_D = 14.7\text{A}$ ,<br>$V_{GS} = 10\text{V}, R_{GEN} = 6\Omega$ |                                      | 9   | 19 | ns |    |
| $t_r$        | Rise Time                     |   |                                      | 3   | 10 | ns |    |
| $t_{d(off)}$ | Turn-Off Delay Time           |   |                                      | 22  | 36 | ns |    |
| $t_f$        | Fall Time                     |   |                                      | 2   | 10 | ns |    |
| $Q_g$        | Total Gate Charge             |   | $V_{GS} = 0\text{V to } 10\text{V}$  |   | 21 | 30 | nC |
| $Q_g$        | Total Gate Charge             |   | $V_{GS} = 0\text{V to } 4.5\text{V}$ | $V_{DD} = 15\text{V}$ ,<br>$I_D = 14.7\text{A}$ | 10 | 14 | nC |
| $Q_{gs}$     | Gate to Source Charge         |   | 4                                    |   |    | nC |    |
| $Q_{gd}$     | Gate to Drain "Miller" Charge |   | 3                                    |   |    | nC |    |

### Drain-Source Diode Characteristics

|          |                                       |   |  |     |     |    |
|----------|---------------------------------------|---|--|-----|-----|----|
| $V_{SD}$ | Source to Drain Diode Forward Voltage | $V_{GS} = 0\text{V}, I_S = 14.7\text{A}$ (Note 2)     |  | 0.8 | 1.3 | V  |
|          |                                       | $V_{GS} = 0\text{V}, I_S = 1.7\text{A}$ (Note 2)      |  | 0.7 | 1.2 |    |
| $t_{rr}$ | Reverse Recovery Time                 | $I_F = 14.7\text{A}, di/dt = 100\text{A}/\mu\text{s}$ |  | 33  | 53  | ns |
| $Q_{rr}$ | Reverse Recovery Charge               |   |  | 17  | 31  | nC |

#### NOTES:

1.  $R_{\theta JA}$  is determined with the device mounted on a  $1\text{in}^2$  pad 2 oz copper pad on a  $1.5 \times 1.5\text{in.}$  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.  $53^\circ\text{C}/\text{W}$  when mounted on a  $1\text{in}^2$  pad of 2 oz copper



b.  $125^\circ\text{C}/\text{W}$  when mounted on a minimum pad of 2 oz copper

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

3. Starting  $T_J = 25^\circ\text{C}$ ; N-ch:  $L = 3\text{mH}, I_{AS} = 12\text{A}, V_{DD} = 30\text{V}, V_{GS} = 10\text{V}$

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

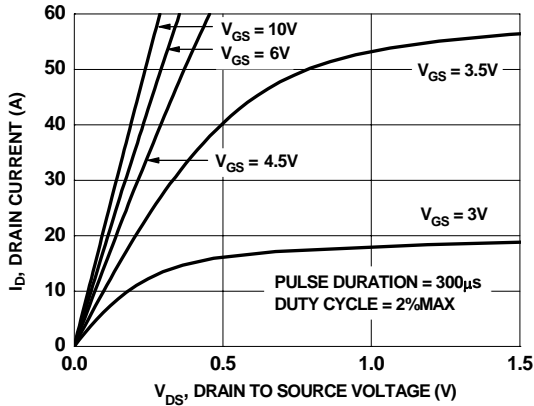


Figure 1. On-Region Characteristics

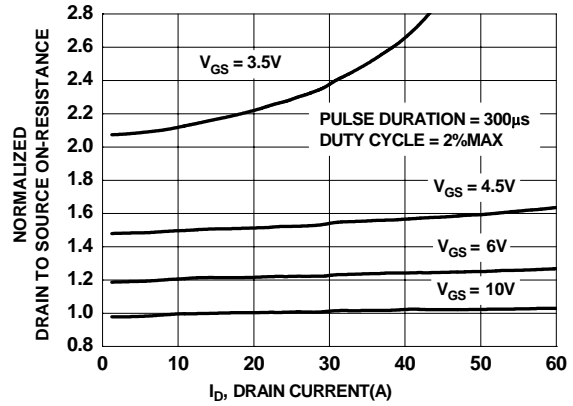


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

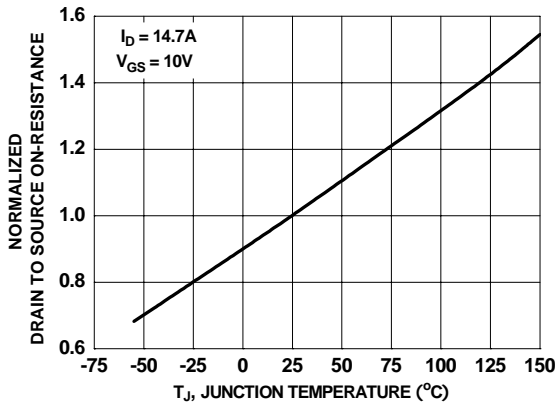


Figure 3. Normalized On-Resistance vs Junction Temperature

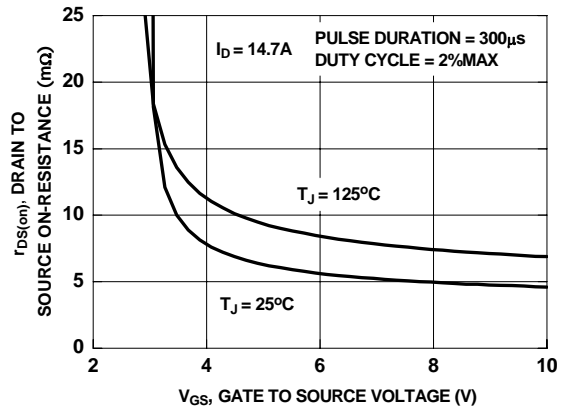


Figure 4. On-Resistance vs Gate to Source Voltage

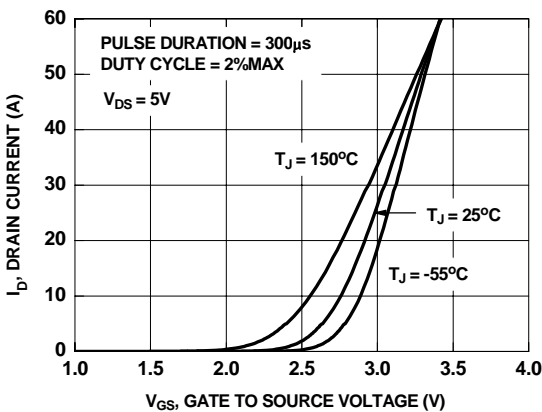


Figure 5. Transfer Characteristics

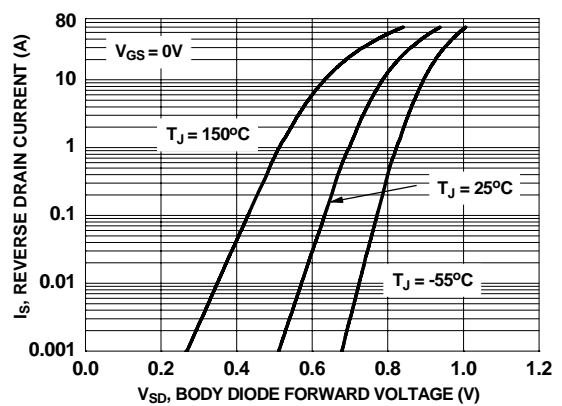
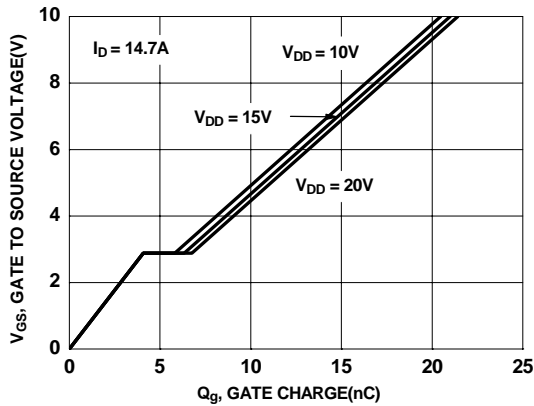
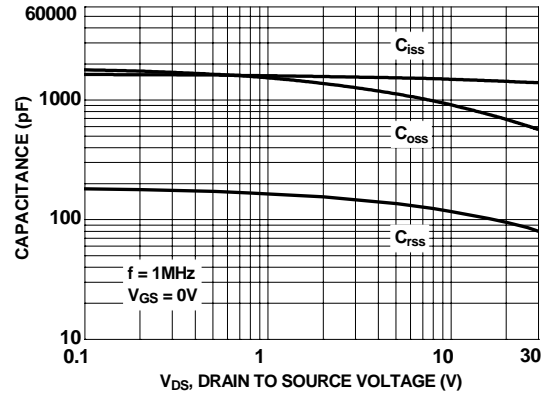


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

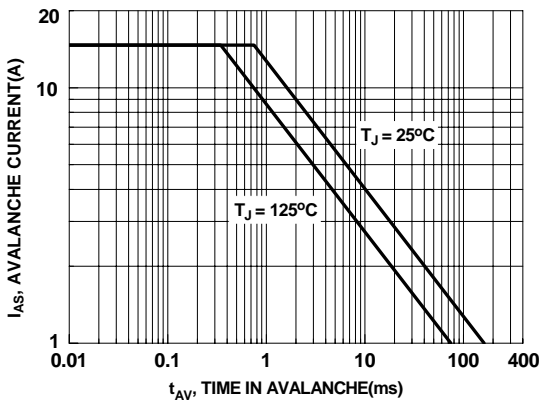
**Typical Characteristics**  $T_J = 25^\circ\text{C}$  unless otherwise noted



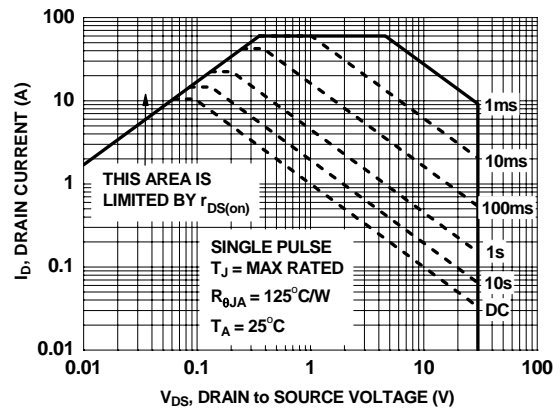
**Figure 7. Gate Charge Characteristics**



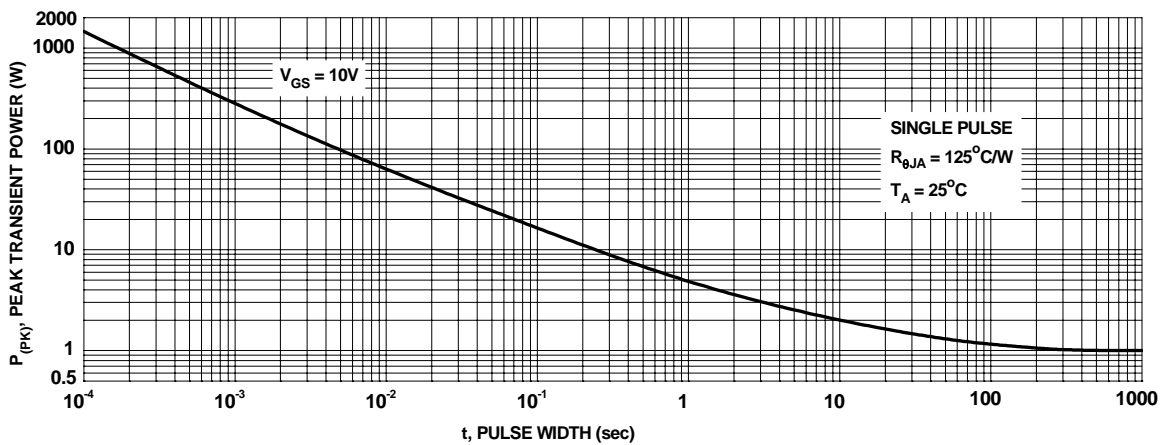
**Figure 8. Capacitance vs Drain to Source Voltage**



**Figure 9. Unclamped Inductive Switching Capability**

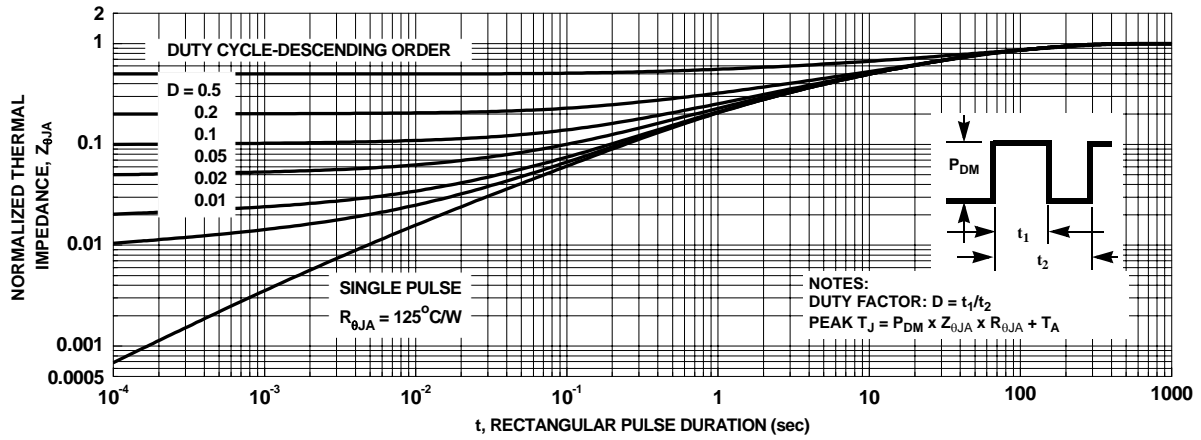


**Figure 10. Forward Bias Safe Operating Area**



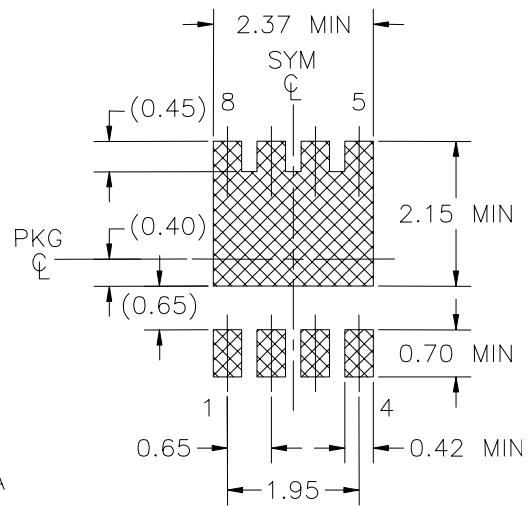
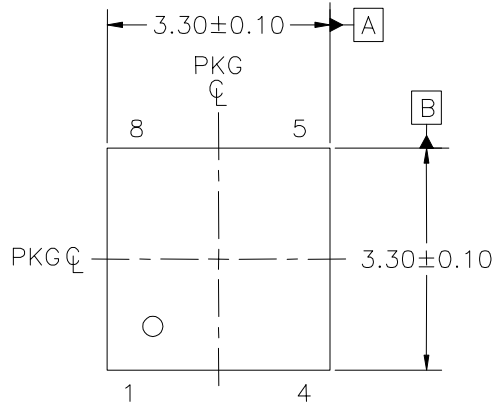
**Figure 11. Single Pulse Maximum Power Dissipation**

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

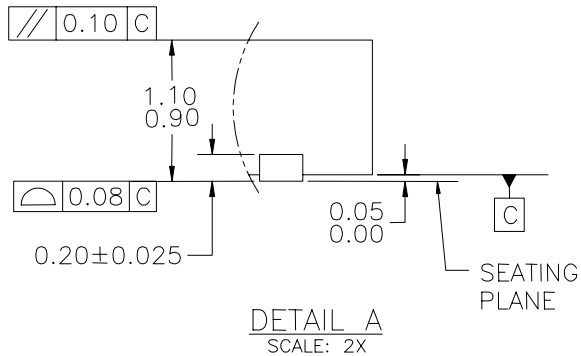
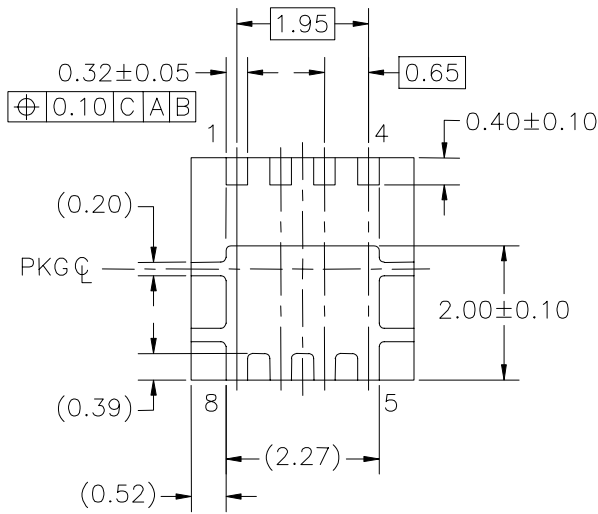
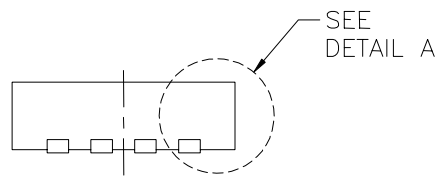


**Figure 12. Transient Thermal Response Curve**

### Dimensional Outline and Pad Layout



LAND PATTERN RECOMMENDATION



DETAIL A  
SCALE: 2X

NOTES: UNLESS OTHERWISE SPECIFIED

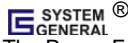


- A) PACKAGE STANDARD REFERENCE: JEDEC MO-240, ISSUE A, VAR. BA, DATED OCTOBER 2002.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH. MOLD FLASH OR BURRS DOES NOT EXCEED 0.10MM.
- D) DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.
- E) DRAWING FILE NAME: PQFN08BREV1

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