



# FDMA3028N

## Dual N-Channel PowerTrench<sup>®</sup> MOSFET

30 V, 3.8 A, 68 mΩ

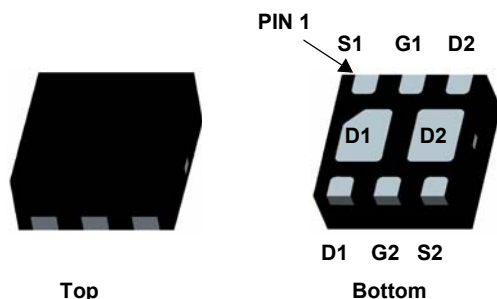


### Features

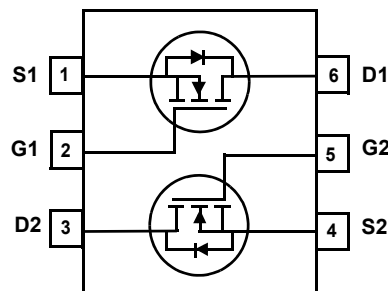
- Max.  $R_{DS(on)}$  = 68 mΩ at  $V_{GS} = 4.5$  V,  $I_D = 3.8$  A
- Max.  $R_{DS(on)}$  = 88 mΩ at  $V_{GS} = 2.5$  V,  $I_D = 3.4$  A
- Max.  $R_{DS(on)}$  = 123 mΩ at  $V_{GS} = 1.8$  V,  $I_D = 2.9$  A
- Low profile - 0.8 mm maximum - in the new package MicroFET 2x2 mm
- RoHS Compliant

### General Description

This device is designed specifically as a single package solution for dual switching requirements in cellular handset and other ultra-portable applications. It features two independent N-Channel MOSFETs with low on-state resistance for minimum conduction losses. The MicroFET 2x2 package offers exceptional thermal performance for its physical size and is well suited to linear mode applications.



MicroFET 2x2



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

| Symbol         | Parameter  | Ratings     | Units            |
|----------------|--|-------------|------------------|
| $V_{DS}$       | Drain to Source Voltage                          | 30          | V                |
| $V_{GS}$       | Gate to Source Voltage                           | $\pm 12$    | V                |
| $I_D$          | Drain Current -Continuous (Note 1a)              | 3.8         | A                |
|                | -Pulsed  | 16          |                  |
| $P_D$          | Power Dissipation (Note 1a)                      | 1.5         | W                |
|                | Power Dissipation (Note 1b)                      | 0.7         |                  |
| $T_J, T_{STG}$ | Operating and Storage Junction Temperature Range | -55 to +150 | $^\circ\text{C}$ |

### Thermal Characteristics

|                 |  |     |                    |
|-----------------|--|-----|--------------------|
| $R_{\theta JA}$ | Thermal Resistance for Single Operation, Junction to Ambient (Note 1a) | 86  | $^\circ\text{C/W}$ |
|                 | Thermal Resistance for Single Operation, Junction to Ambient (Note 1b) | 173 |                    |
|                 | Thermal Resistance for Dual Operation, Junction to Ambient (Note 1c)   | 69  |                    |
|                 | Thermal Resistance for Dual Operation, Junction to Ambient (Note 1d)   | 151 |                    |
|                 | Thermal Resistance for Single Operation, Junction to Ambient (Note 1e) | 160 |                    |
|                 | Thermal Resistance for Dual Operation, Junction to Ambient (Note 1f)   | 133 |                    |

### Package Marking and Ordering Information

| Device Marking | Device    | Package      | Reel Size | Tape Width | Quantity   |
|----------------|-----------|--------------|-----------|------------|------------|
| 328            | FDMA3028N | MicroFET 2X2 | 7"        | 8 mm       | 3000 units |

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

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

**Off Characteristics**

|                                      |   |   |    |    |           |                        |
|--------------------------------------|---|---|----|----|-----------|------------------------|
| $BV_{DSS}$                           | Drain to Source Breakdown Voltage         | $I_D = 250\text{ }\mu\text{A}$ , $V_{GS} = 0\text{ V}$                      | 30 |    |           | V                      |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D = 250\text{ }\mu\text{A}$ , referenced to $25\text{ }^{\circ}\text{C}$ |    | 23 |           | mV/ $^{\circ}\text{C}$ |
| $I_{DSS}$                            | Zero Gate Voltage Drain Current           | $V_{DS} = 24\text{ V}$ , $V_{GS} = 0\text{ V}$                              |    |    | 1         | $\mu\text{A}$          |
| $I_{GSS}$                            | Gate to Source Leakage Current            | $V_{GS} = \pm 12\text{ V}$ , $V_{DS} = 0\text{ V}$                          |    |    | $\pm 100$ | nA                     |

**On Characteristics**

|  |  |  |     |     |     |                        |
|--|--|--|-----|-----|-----|------------------------|
| $V_{GS(th)}$                           | Gate to Source Threshold Voltage                         | $V_{GS} = V_{DS}$ , $I_D = 250\text{ }\mu\text{A}$                                   | 0.6 | 0.9 | 1.5 | 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 $25\text{ }^{\circ}\text{C}$          |     | -3  |     | mV/ $^{\circ}\text{C}$ |
| $r_{DS(on)}$                           | Static Drain to Source On Resistance                     | $V_{GS} = 4.5\text{ V}$ , $I_D = 3.8\text{ A}$                                       |     | 46  | 68  | m $\Omega$             |
|  |  | $V_{GS} = 2.5\text{ V}$ , $I_D = 3.4\text{ A}$                                       |     | 56  | 88  |                        |
|  |  | $V_{GS} = 1.8\text{ V}$ , $I_D = 2.9\text{ A}$                                       |     | 80  | 123 |                        |
|  |  | $V_{GS} = 4.5\text{ V}$ , $I_D = 3.8\text{ A}$ , $T_J = 125\text{ }^{\circ}\text{C}$ |     | 72  | 108 |                        |
| $g_{FS}$                               | Forward Transconductance                                 | $V_{DS} = 5\text{ V}$ , $I_D = 3.8\text{ A}$   |     | 15  |     | S                      |

**Dynamic Characteristics**

|           |                              |  |  |     |     |          |
|-----------|------------------------------|--|--|-----|-----|----------|
| $C_{iss}$ | Input Capacitance            | $V_{DS} = 15\text{ V}$ , $V_{GS} = 0\text{ V}$ ,<br>$f = 1\text{ MHz}$ |  | 282 | 375 | pF       |
| $C_{oss}$ | Output Capacitance           |  |  | 40  | 55  | pF       |
| $C_{rss}$ | Reverse Transfer Capacitance |  |  | 29  | 45  | pF       |
| $R_g$     | Gate Resistance              |  |  | 2.4 |     | $\Omega$ |

**Switching Characteristics**

|              |                               |  |  |     |     |    |
|--------------|-------------------------------|--|--|-----|-----|----|
| $t_{d(on)}$  | Turn-On Delay                 | $V_{DD} = 15\text{ V}$ , $I_D = 3.8\text{ A}$ ,<br>$V_{GS} = 4.5\text{ V}$ , $R_{GEN} = 6\text{ }\Omega$ |  | 5.3 | 11  | ns |
| $t_r$        | Rise Time                     |  |  | 3   | 10  | ns |
| $t_{d(off)}$ | Turn-Off Delay                |  |  | 15  | 27  | ns |
| $t_f$        | Fall Time                     |  |  | 2.5 | 10  | ns |
| $Q_{g(TOT)}$ | Total Gate Charge             | $V_{DD} = 15\text{ V}$ , $I_D = 3.8\text{ A}$ ,<br>$V_{GS} = 5\text{ V}$                                 |  | 3.7 | 5.2 | nC |
| $Q_{gs}$     | Gate to Source Charge         |  |  | 0.4 |     | nC |
| $Q_{gd}$     | Gate to Drain "Miller" Charge |  |  | 1   |     | nC |

**Drain-Source Diode Characteristics**

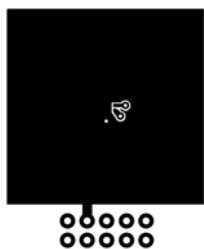
|          |                                       |   |  |     |     |    |
|----------|---------------------------------------|---|--|-----|-----|----|
| $V_{SD}$ | Source to Drain Diode Forward Voltage | $V_{GS} = 0\text{ V}$ , $I_S = 1.3\text{ A}$ (Note 2)     |  | 0.7 | 1.2 | V  |
| $t_{rr}$ | Reverse Recovery Time                 | $I_F = 3.8\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ |  | 12  | 22  | ns |
| $Q_{rr}$ | Reverse Recovery Charge               |   |  | 3.3 | 10  | nC |

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

### Notes:

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

- (a)  $R_{\theta JA} = 86\text{ }^{\circ}\text{C/W}$  when mounted on a 1 in<sup>2</sup> pad of 2 oz copper, 1.5 " x 1.5 " x 0.062 " thick PCB. For single operation.
- (b)  $R_{\theta JA} = 173\text{ }^{\circ}\text{C/W}$  when mounted on a minimum pad of 2 oz copper. For single operation.
- (c)  $R_{\theta JA} = 69\text{ }^{\circ}\text{C/W}$  when mounted on a 1 in<sup>2</sup> pad of 2 oz copper, 1.5 " x 1.5 " x 0.062 " thick PCB. For dual operation.
- (d)  $R_{\theta JA} = 151\text{ }^{\circ}\text{C/W}$  when mounted on a minimum pad of 2 oz copper. For dual operation.
- (e)  $R_{\theta JA} = 160\text{ }^{\circ}\text{C/W}$  when mounted on a 30mm<sup>2</sup> pad of 2 oz copper. For single operation.
- (f)  $R_{\theta JA} = 133\text{ }^{\circ}\text{C/W}$  when mounted on a 30mm<sup>2</sup> pad of 2 oz copper. For dual operation.



a.  $86\text{ }^{\circ}\text{C/W}$  when mounted on a 1 in<sup>2</sup> pad of 2 oz copper



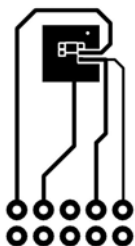
b.  $173\text{ }^{\circ}\text{C/W}$  when mounted on a minimum pad of 2 oz copper



c.  $69\text{ }^{\circ}\text{C/W}$  when mounted on a 1 in<sup>2</sup> pad of 2 oz copper



d.  $151\text{ }^{\circ}\text{C/W}$  when mounted on a minimum pad of 2 oz copper



e.  $160\text{ }^{\circ}\text{C/W}$  when mounted on 30mm<sup>2</sup> pad of 2 oz copper



f.  $133\text{ }^{\circ}\text{C/W}$  when mounted on 30mm<sup>2</sup> of 2 oz copper

2. Pulse Test : Pulse Width < 300 us, Duty Cycle < 2.0%

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

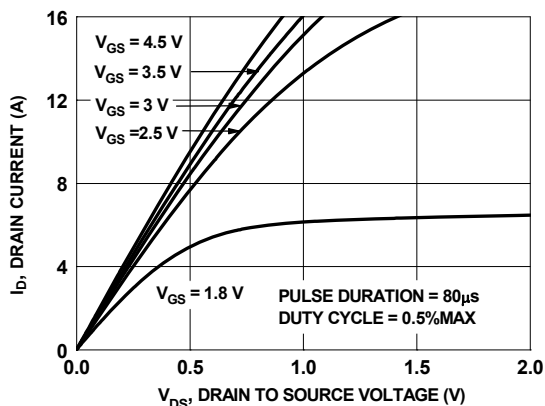


Figure 1. On Region Characteristics

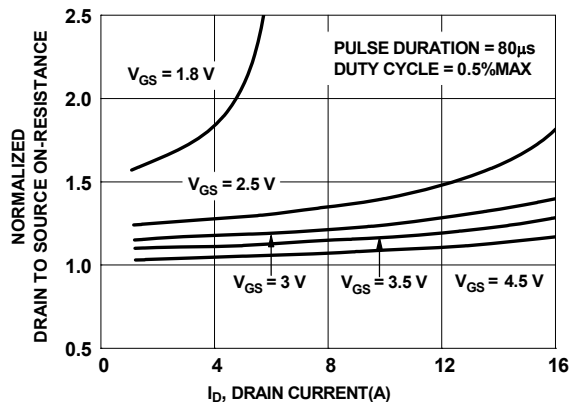


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

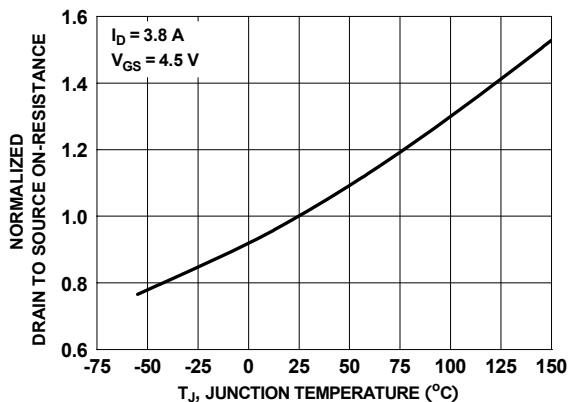


Figure 3. Normalized On Resistance vs. Junction Temperature

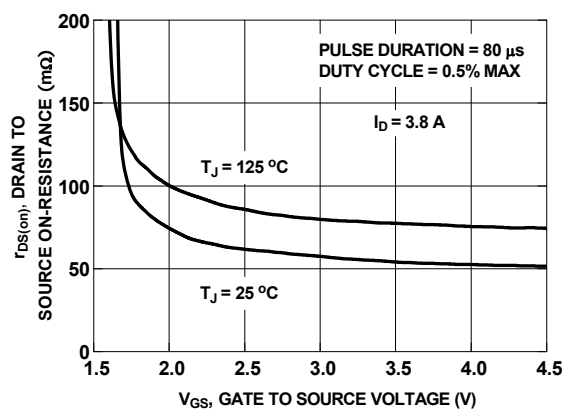


Figure 4. On-Resistance vs Gate to Source Voltage

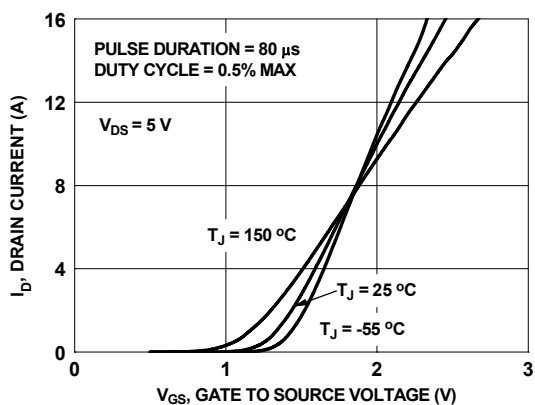


Figure 5. Transfer Characteristics

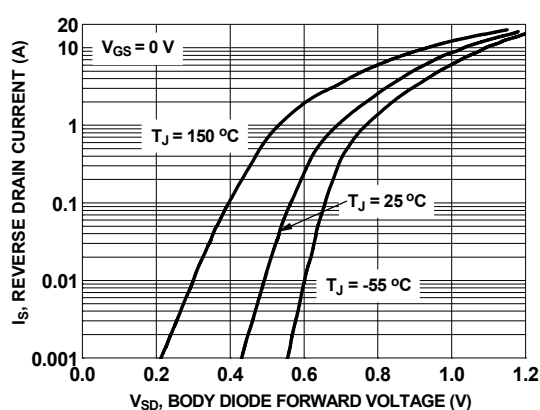


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

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

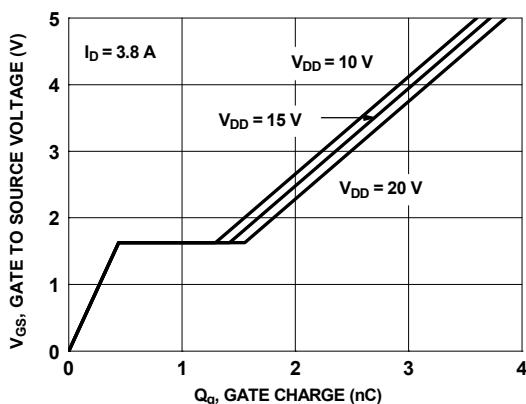


Figure 7. Gate Charge Characteristics

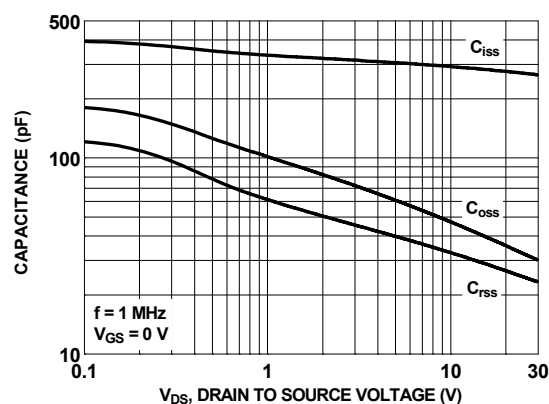


Figure 8. Capacitance vs. Drain to Source Voltage

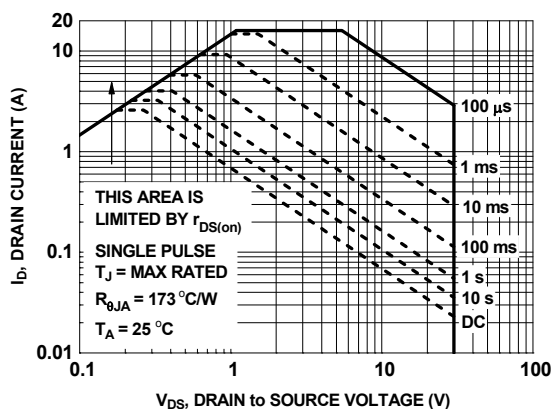


Figure 9. Forward Bias Safe Operating Area

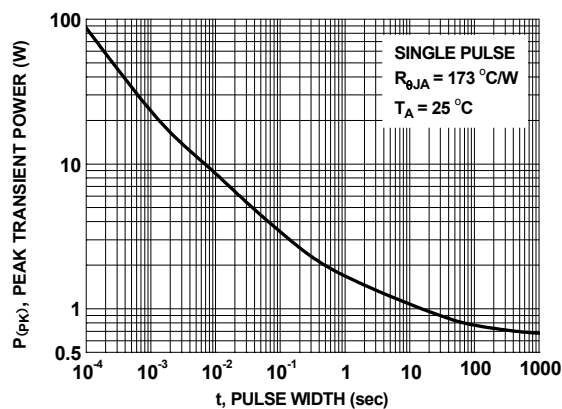


Figure 10. Single-Pulse Maximum Power Dissipation

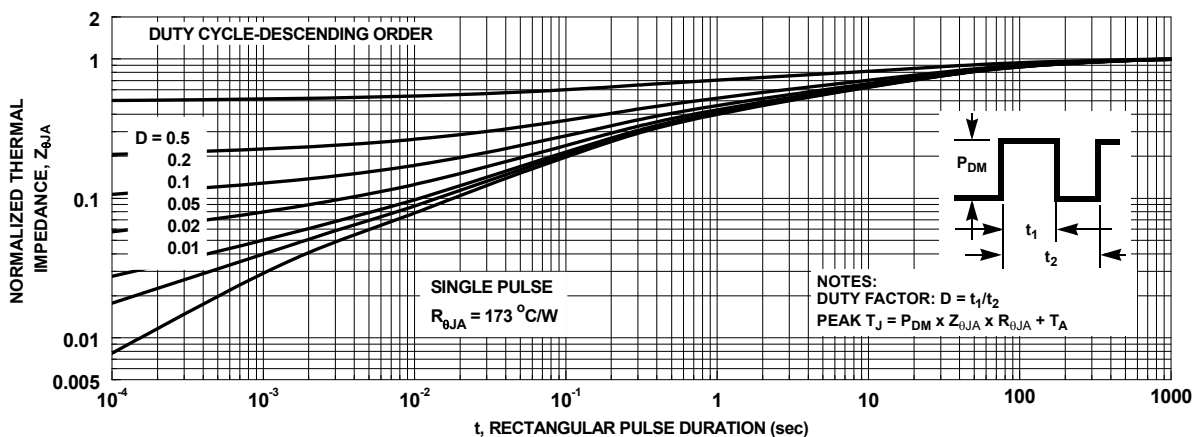
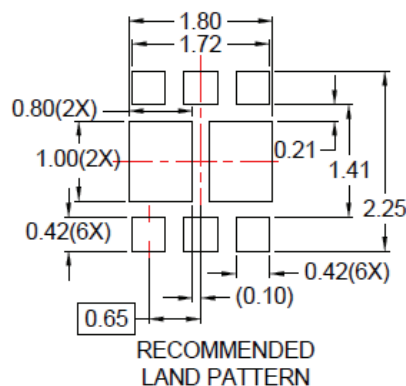
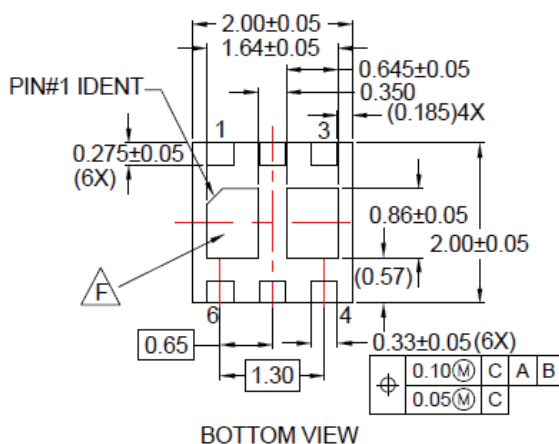
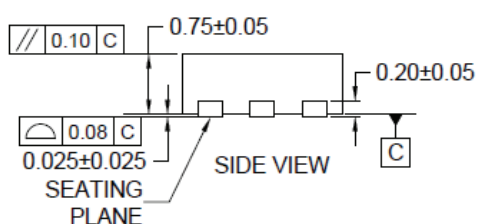
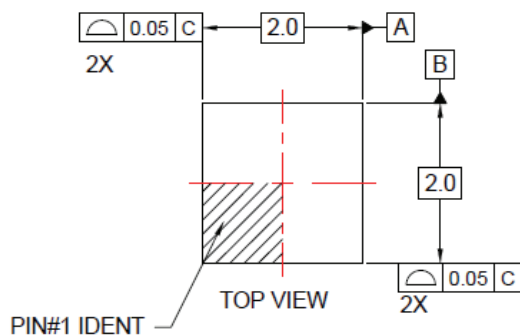


Figure 11. Junction-to-Ambient Transient Thermal Response Curve

## Dimensional Outline and Pad Layout



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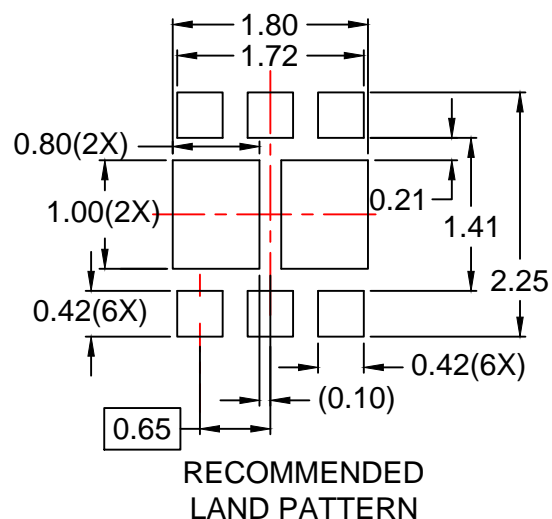
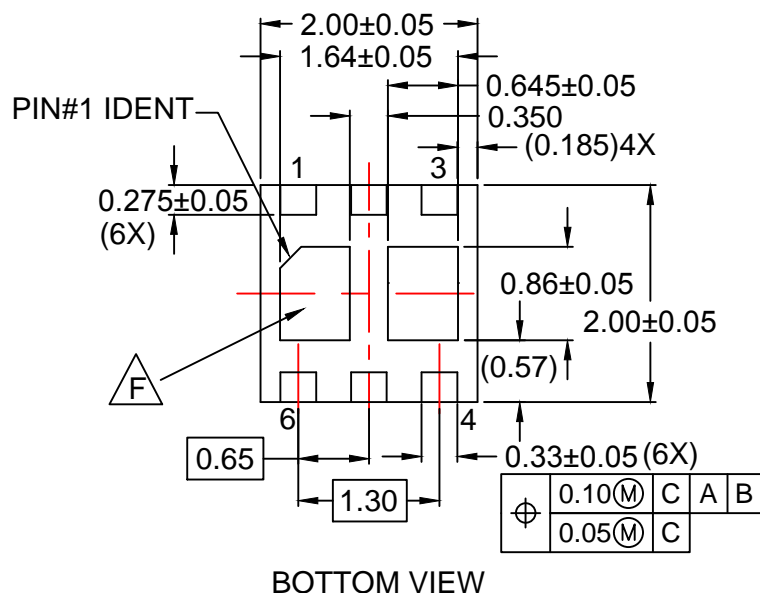
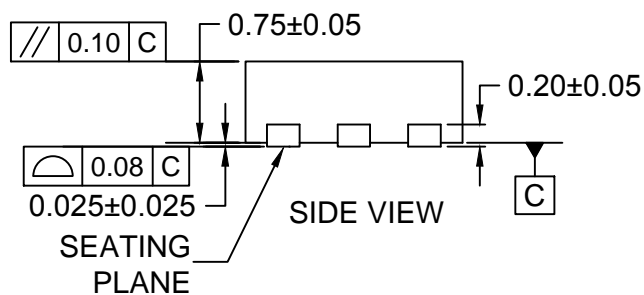
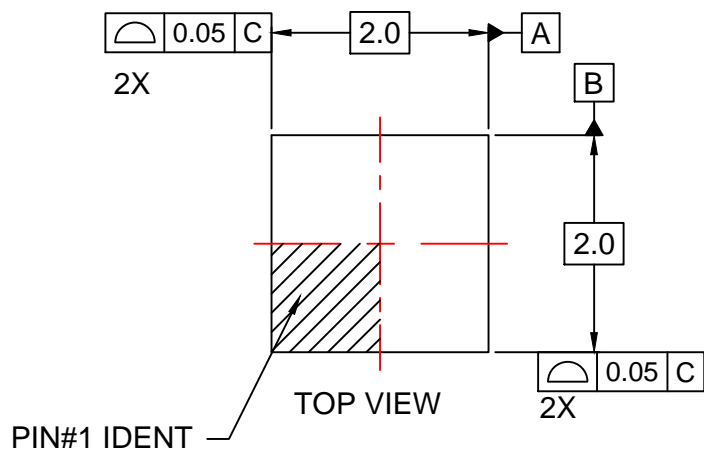
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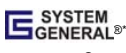









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### Definition of Terms

| Datasheet Identification | Product Status        | Definition  |
|--------------------------|-----------------------|---|
| Advance Information      | Formative / In Design | Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.   |
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Contact Us :

➤ Address :

401 Building No.5, JiuGe Business Center, Lane 2301, Yishan Rd  
Minhang District, Shanghai , China

➤ Sales :

Direct     +86 (21) 6401-6692  
  
Email       amall@ameya360.com  
  
QQ         800077892  
  
Skype      ameyasales1 ameyasales2

➤ Customer Service :

Email       service@ameya360.com

➤ Partnership :

Tel         +86 (21) 64016692-8333  
  
Email      mkt@ameya360.com