

# FDMJ1028N

## N-Channel 2.5V Specified PowerTrench® MOSFET 20V, 3.2A, 90mΩ

### Features

- Max  $r_{DS(on)}$  = 90mΩ at  $V_{GS} = 4.5V$
- Max  $r_{DS(on)}$  = 130mΩ at  $V_{GS} = 2.5V$
- Low gate charge
- High performance trench technology for extremely low  $r_{DS(on)}$
- RoHS Compliant

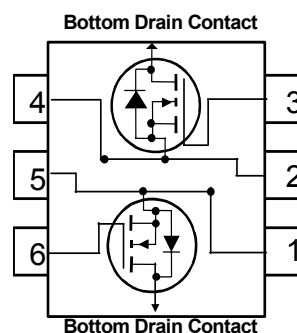
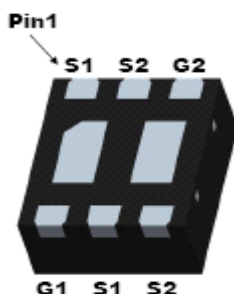


### General Description

This dual N-Channel 2.5V specified MOSFET uses Fairchild's advanced low voltage PowerTrench process. The  $r_{DS(on)}$  and thermal properties of the device are optimized for battery power management applications.

### Applications

- Battery management
- Baseband Switches



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

| Symbol         | Parameter                                                     | Ratings     | Units |
|----------------|---------------------------------------------------------------|-------------|-------|
| $V_{DS}$       | Drain to Source Voltage                                       | 20          | V     |
| $V_{GS}$       | Gate to Source Voltage                                        | ±12         | V     |
| $I_D$          | Drain Current -Continuous                                     | 3.2         | A     |
|                | -Pulsed                                                       | 12          |       |
| $P_D$          | Power Dissipation for Single Operation (Note 1a)<br>(Note 1b) | 1.4         | W     |
|                |                                                               | 0.8         |       |
| $T_J, T_{STG}$ | Operating and Storage Temperature                             | -55 to +150 | °C    |

### Thermal Characteristics

|                 |                                                   |    |      |
|-----------------|---------------------------------------------------|----|------|
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient (Note 1a) | 89 | °C/W |
|-----------------|---------------------------------------------------|----|------|

### Package Marking and Ordering Information

| Device Marking | Device    | Reel Size | Tape Width | Quantity   |
|----------------|-----------|-----------|------------|------------|
| 028            | FDMJ1028N | 7"        | 8mm        | 3000 units |

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

| Symbol                               | Parameter                                 | Test Conditions                                           | Min | Typ | Max       | Units                |
|--------------------------------------|-------------------------------------------|-----------------------------------------------------------|-----|-----|-----------|----------------------|
| <b>Off Characteristics</b>           |                                           |                                                           |     |     |           |                      |
| $BV_{DSS}$                           | Drain to Source Breakdown Voltage         | $I_D = 250\mu\text{A}$ , $V_{GS} = 0\text{V}$             | 20  |     |           | V                    |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D = 250\mu\text{A}$ , referenced to $25^\circ\text{C}$ |     | 13  |           | mV/ $^\circ\text{C}$ |
| $I_{DSS}$                            | Zero Gate Voltage Drain Current           | $V_{DS} = 16$ , $V_{GS} = 0\text{V}$                      |     |     | 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 (Note 2)

|                                        |                                                          |                                                                          |     |     |     |                      |
|----------------------------------------|----------------------------------------------------------|--------------------------------------------------------------------------|-----|-----|-----|----------------------|
| $V_{GS(th)}$                           | Gate to Source Threshold Voltage                         | $V_{GS} = V_{DS}$ , $I_D = 250\mu\text{A}$                               | 0.6 | 1.0 | 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 $25^\circ\text{C}$                |     | -3  |     | mV/ $^\circ\text{C}$ |
| $r_{DS(on)}$                           | Drain to Source On Resistance                            | $V_{GS} = 4.5\text{V}$ , $I_D = 3.2\text{A}$                             |     | 76  | 90  | m $\Omega$           |
|                                        |                                                          | $V_{GS} = 2.5\text{V}$ , $I_D = 2.5\text{A}$                             |     | 106 | 130 |                      |
|                                        |                                                          | $V_{GS} = 4.5\text{V}$ , $I_D = 3.2\text{A}$ , $T_J = 125^\circ\text{C}$ |     | 89  | 132 |                      |
| $g_{FS}$                               | Forward Transconductance                                 | $V_{GS} = 5\text{V}$ , $I_D = 3.2\text{A}$                               |     | 7.5 |     | S                    |

## Dynamic Characteristics

|           |                              |                                                                     |  |     |  |          |
|-----------|------------------------------|---------------------------------------------------------------------|--|-----|--|----------|
| $C_{iss}$ | Input Capacitance            | $V_{DS} = 10\text{V}$ , $V_{GS} = 0\text{V}$ ,<br>$f = 1\text{MHz}$ |  | 200 |  | pF       |
| $C_{oss}$ | Output Capacitance           |                                                                     |  | 50  |  | pF       |
| $C_{rss}$ | Reverse Transfer Capacitance |                                                                     |  | 30  |  | pF       |
| $R_G$     | Gate Resistance              | $f = 1\text{MHz}$                                                   |  | 1   |  | $\Omega$ |

## Switching Characteristics (Note 2)

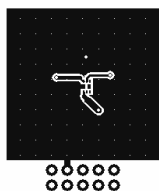
|              |                            |                                                                                          |  |     |    |    |
|--------------|----------------------------|------------------------------------------------------------------------------------------|--|-----|----|----|
| $t_{d(on)}$  | Turn-On Delay Time         | $V_{DD} = 10\text{V}$ , $I_D = 1\text{A}$<br>$V_{GS} = 4.5\text{V}$ , $R_{GS} = 6\Omega$ |  | 7   | 14 | ns |
| $t_r$        | Rise Time                  |                                                                                          |  | 8   | 16 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time        |                                                                                          |  | 11  | 20 | ns |
| $t_f$        | Fall Time                  |                                                                                          |  | 2   | 4  | ns |
| $Q_{g(tot)}$ | Total Gate Charge at 10V   | $V_{DD} = 15\text{V}$ , $V_{GS} = 3.2\text{V}$ ,<br>$V_{GS} = 4.5\text{V}$               |  | 2   | 3  | nC |
| $Q_{gs}$     | Gate to Source Gate Charge |                                                                                          |  | 0.4 |    | nC |
| $Q_{gd}$     | Gate to Drain Charge       |                                                                                          |  | 1.0 |    | nC |

## Drain-Source Diode Characteristics

|          |                                    |                                                           |  |     |     |    |
|----------|------------------------------------|-----------------------------------------------------------|--|-----|-----|----|
| $V_{SD}$ | Drain-Source Diode Forward Voltage | $V_{GS} = 0\text{V}$ , $I_S = 1.16\text{A}$               |  | 0.8 | 1.2 | V  |
| $t_{rr}$ | Diode Reverse Recovery Time        | $I_F = 3.2\text{A}$ , $dI_F/dt = 100\text{A}/\mu\text{s}$ |  | 11  |     | ns |
| $Q_{rr}$ | Diode Reverse Recovery Charge      |                                                           |  | 2.5 |     | nC |

### Notes

1:  $R_{\theta JA}$  is determined with the device mounted on a 1in<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.  $89^\circ\text{C}/\text{W}$  when mounted on a 1 in<sup>2</sup> pad of 2 oz copper



b.  $156^\circ\text{C}/\text{W}$  when mounted on a minimum pad of 2 oz copper

Scale 1 : 1 on letter size paper  
2: Pulse Test: Pulse Width < 300 $\mu\text{s}$ , Duty Cycle < 2.0%

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

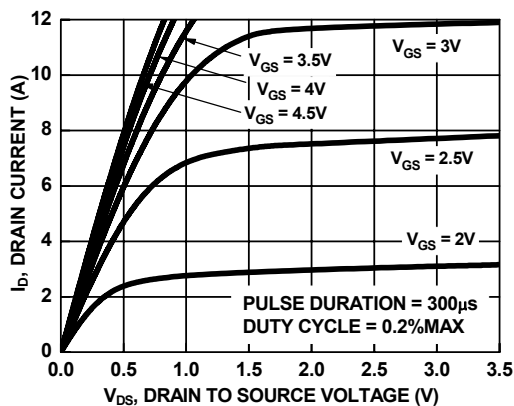


Figure 1. On Region Characteristics

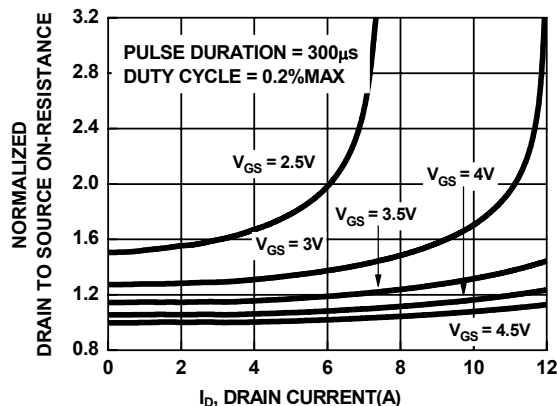


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

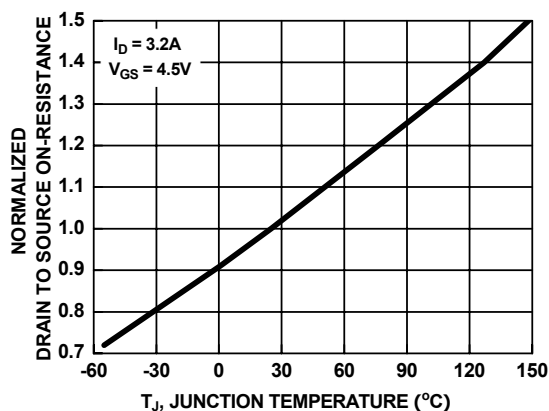


Figure 3. Normalized On Resistance vs Junction Temperature

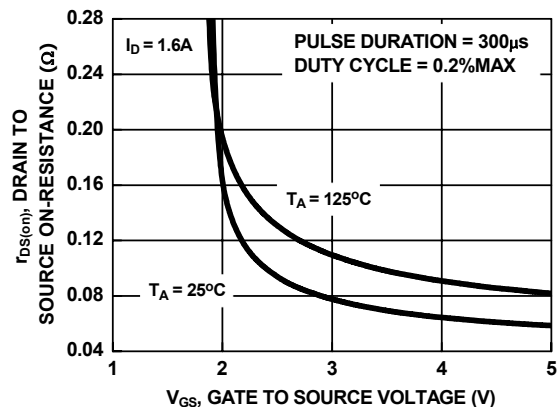


Figure 4. On-Resistance vs Gate to Source Voltage

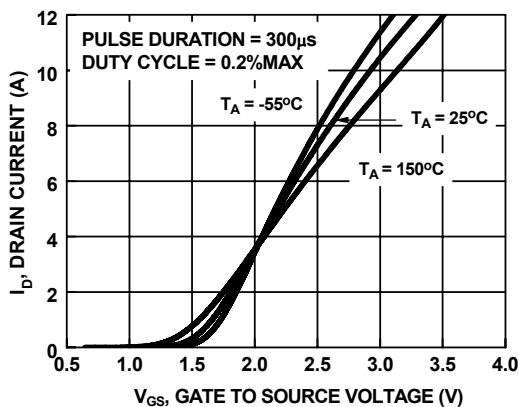


Figure 5. Transfer Characteristics

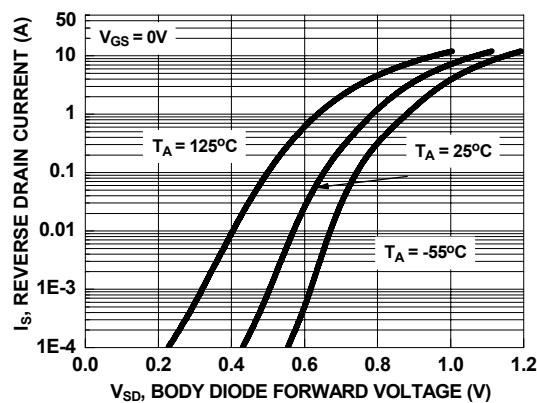
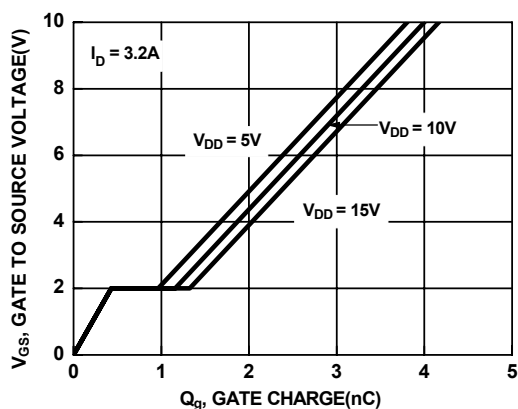
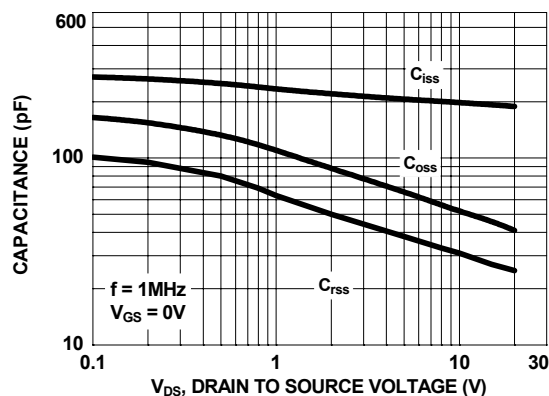


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

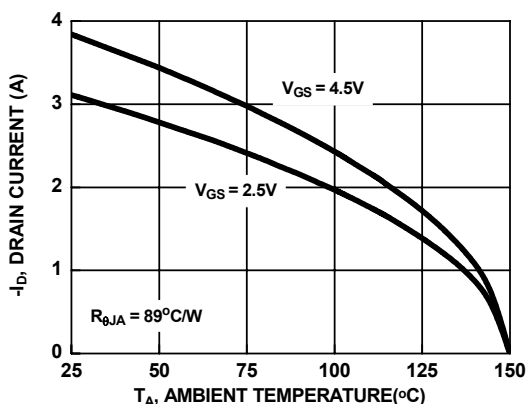
# **Typical Characteristics** $T_J = 25^\circ\text{C}$ unless otherwise noted



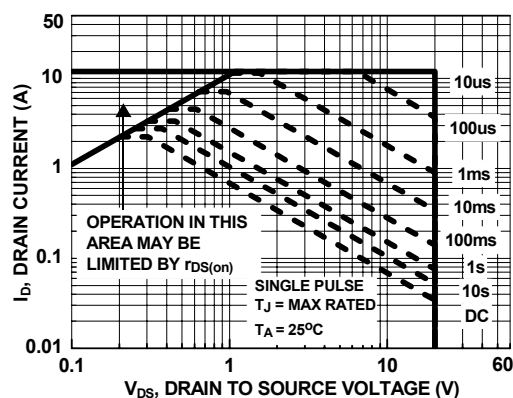
**Figure 7. Gate Charge Characteristics**



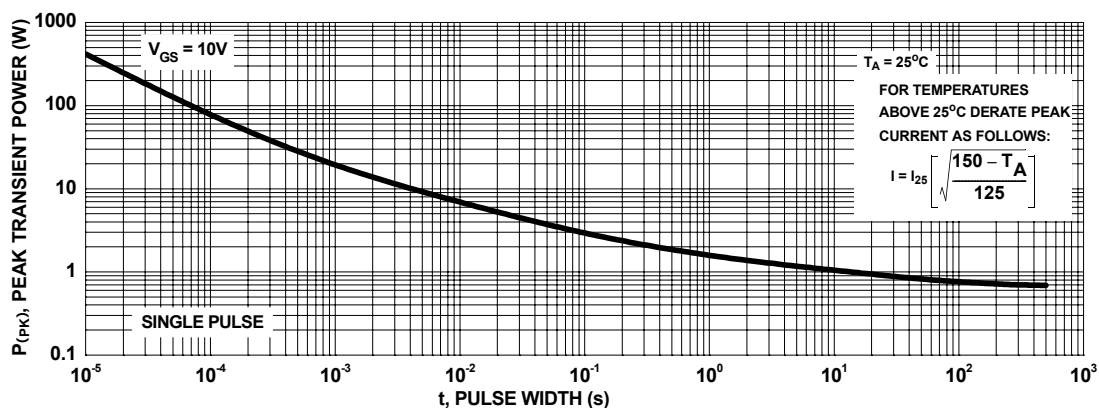
**Figure 8. Capacitance vs Drain to Source Voltage**



**Figure 9. Maximum Continuous Drain Current vs Ambient Temperature**



**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

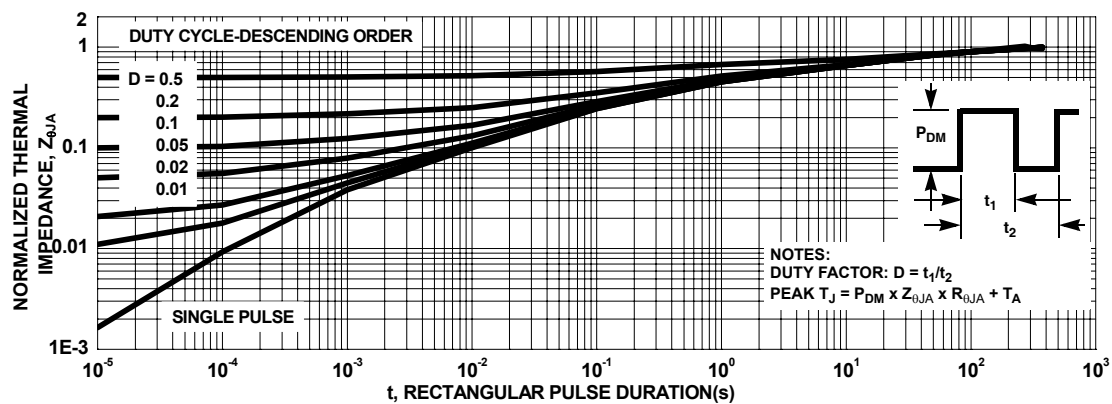
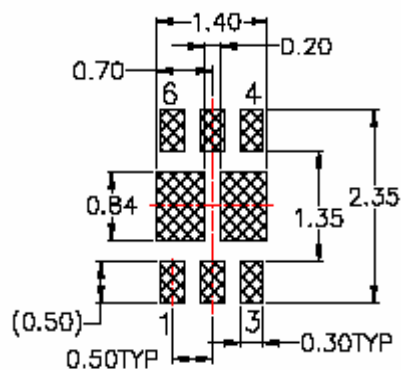
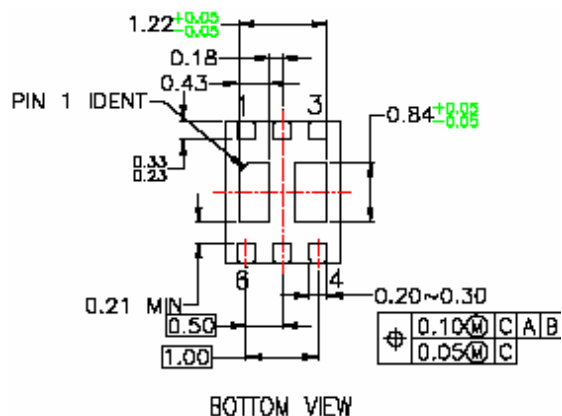
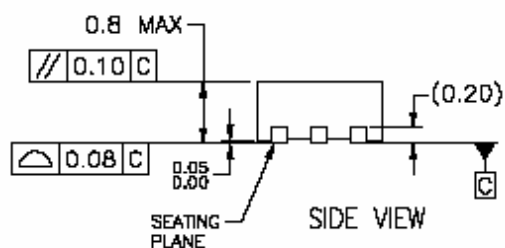
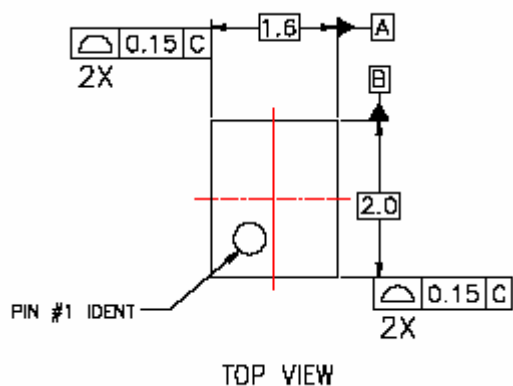


Figure 12. Transient Thermal Response Curve

## Dimensional Outline and Pad Layout



## RECOMMENDED LAND PATTERN

### NOTES:

- A. NON JEDEC REGISTRATION MOLDED PACKAGE OUTLINE,
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES PER  
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| The Power Franchise <sup>®</sup>                 |                                 | POP <sup>™</sup>          | SPM <sup>™</sup>                | Wire <sup>™</sup>           |
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| Datasheet Identification | Product Status         | Definition                                                                                                                                                                                                            |
|--------------------------|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
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