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FDY2000PZ

Dual P-Channel (– 2.5V) Specified PowerTrench® MOSFET

General Description

This Dual P-Channel MOSFET has been designed using Fairchild Semiconductor's advanced Power Trench process to optimize the $R_{DS(ON)}$ @ $V_{GS} = -2.5V$.

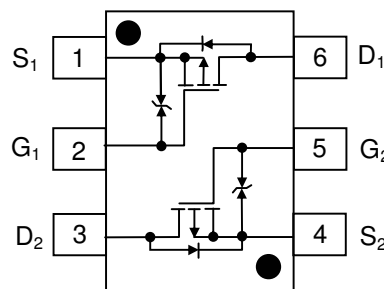
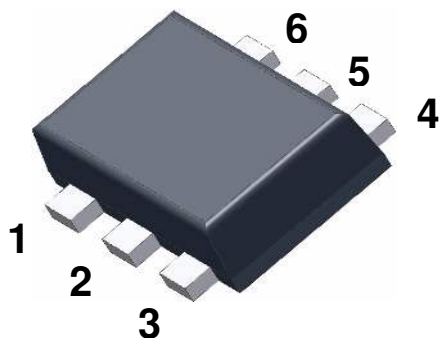
Applications

- Li-Ion Battery Pack



Features

- – 350 mA, – 20 V $R_{DS(ON)} = 1.2 \Omega$ @ $V_{GS} = -4.5 V$
 $R_{DS(ON)} = 1.6 \Omega$ @ $V_{GS} = -2.5 V$
- ESD protection diode (note 3)
- RoHS Compliant



Absolute Maximum Ratings

$T_A = 25^\circ C$ unless otherwise noted

| Symbol | Parameter | Ratings | Units |
|----------------|--|-------------|------------|
| V_{DSS} | Drain-Source Voltage | – 20 | V |
| V_{GSS} | Gate-Source Voltage | ± 8 | V |
| I_D | Drain Current – Continuous (Note 1a) | – 350 | mA |
| | | – 1000 | |
| P_D | Power Dissipation (Steady State) (Note 1a) | 625 | mW |
| | | 446 | |
| T_J, T_{STG} | Operating and Storage Junction Temperature Range | –55 to +150 | $^\circ C$ |

Thermal Characteristics

| | | | |
|-----------------|---|-----|--------------|
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient (Note 1a) | 200 | $^\circ C/W$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient (Note 1b) | 280 | |

Package Marking and Ordering Information

| Device Marking | Device | Reel Size | Tape width | Quantity |
|----------------|-----------|-----------|------------|------------|
| A | FDY2000PZ | 7" | 8 mm | 3000 units |

Electrical Characteristics

$T_A = 25^\circ\text{C}$ unless otherwise noted

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

Off Characteristics

| | | | | | | |
|--------------------------------------|---|--|-----|----|----------|---------------|
| BV_{DSS} | Drain-Source Breakdown Voltage | $V_{GS} = 0\text{ V}, I_D = -250\ \mu\text{A}$ | -20 | | | V |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D = -250\ \mu\text{A}$, Referenced to 25°C | | 14 | | mV/°C |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS} = -16\text{ V}, V_{GS} = 0\text{ V}$ | | | -3 | μA |
| I_{GSS} | Gate-Body Leakage | $V_{GS} = \pm 8\text{ V}, V_{DS} = 0\text{ V}$ | | | ± 10 | μA |

On Characteristics (Note 2)

| | | | | | | |
|--|--|---|-------|--------------------------|--------------------------|----------|
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS} = V_{GS}, I_D = -250\ \mu\text{A}$ | -0.65 | -1.03 | -1.5 | V |
| $\frac{\Delta V_{GS(th)}}{\Delta T_J}$ | Gate Threshold Voltage Temperature Coefficient | $I_D = 250\ \mu\text{A}$, Referenced to 25°C | | -3 | | mV/°C |
| $R_{DS(on)}$ | Static Drain-Source On-Resistance | $V_{GS} = -4.5\text{ V}, I_D = -350\text{ mA}$ $V_{GS} = -2.5\text{ V}, I_D = -300\text{ mA}$ $V_{GS} = -1.8\text{ V}, I_D = -150\text{ mA}$ $V_{GS} = -4.5\text{ V}, I_D = -350\text{ mA}$, $T_J = 125^\circ\text{C}$ | | 0.5 0.8 1.3 0.7 | 1.2 1.6 2.7 1.6 | Ω |
| g_{FS} | Forward Transconductance | $V_{DS} = -5\text{ V}, I_D = -350\text{ mA}$ | | 1.04 | | S |

Dynamic Characteristics

| | | | | | | |
|-----------|------------------------------|--|--|-----|--|----|
| C_{iss} | Input Capacitance | $V_{DS} = -10\text{ V}, V_{GS} = 0\text{ V}$ | | 100 | | pF |
| C_{oss} | Output Capacitance | $f = 1.0\text{ MHz}$ | | 30 | | pF |
| C_{rss} | Reverse Transfer Capacitance | | | 15 | | pF |

Switching Characteristics (Note 2)

| | | | | | | |
|--------------|---------------------|---|--|-----|-----|----|
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DD} = -10\text{ V}, I_D = -0.5\text{ A}$ | | 6 | 12 | ns |
| t_r | Turn-On Rise Time | $V_{GS} = -4.5\text{ V}, R_{GEN} = 6\ \Omega$ | | 13 | 23 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | | 8 | 16 | ns |
| t_f | Turn-Off Fall Time | | | 1 | 2 | ns |
| Q_g | Total Gate Charge | $V_{DS} = -10\text{ V}, I_D = -350\text{ mA}$ | | 1.0 | 1.4 | nC |
| Q_{gs} | Gate-Source Charge | $V_{GS} = -4.5\text{ V}$ | | 0.2 | | nC |
| Q_{gd} | Gate-Drain Charge | | | 0.3 | | nC |

Drain-Source Diode Characteristics and Maximum Ratings

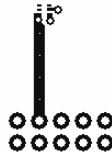
| | | | | | | |
|----------|------------------------------------|--|--|------|------|----|
| V_{SD} | Drain-Source Diode Forward Voltage | $V_{GS} = 0\text{ V}, I_S = -150\text{ mA}$ (Note 2) | | -0.8 | -1.2 | V |
| t_{rr} | Diode Reverse Recovery Time | $I_F = -350\text{ mA}$ | | 10 | | ns |
| Q_{rr} | Diode Reverse Recovery Charge | $di_F/dt = 100\text{ A}/\mu\text{s}$ | | 1.5 | | nC |

Notes:

- $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design



- a) $200^\circ\text{C}/\text{W}$ when mounted on a 1 in^2 pad of 2 oz copper



- b) $280^\circ\text{C}/\text{W}$ when mounted on a minimum pad of 2 oz copper
Scale 1 : 1 on letter size paper

- Pulse Test: Pulse Width < $300\ \mu\text{s}$, Duty Cycle < 2.0%

- The diode connected between the gate and source serves only as protection against ESD. No gate overvoltage rating is implied.

Typical Characteristics

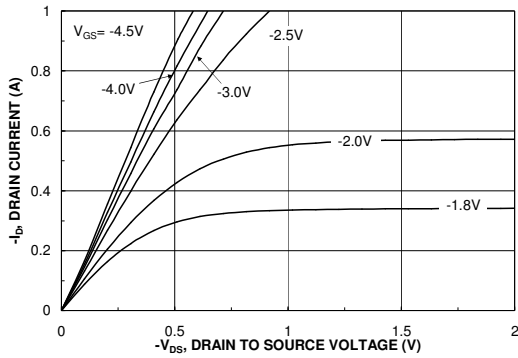


Figure 1. On-Region Characteristics.

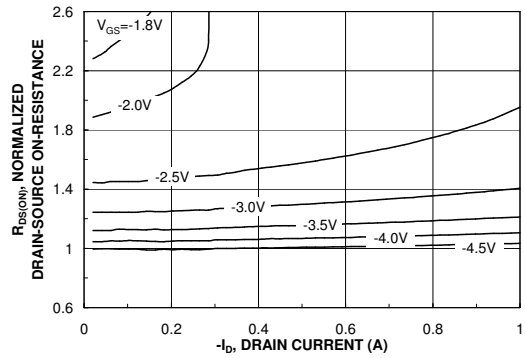


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

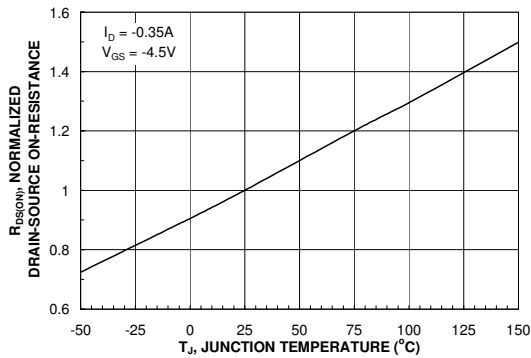


Figure 3. On-Resistance Variation with Temperature.

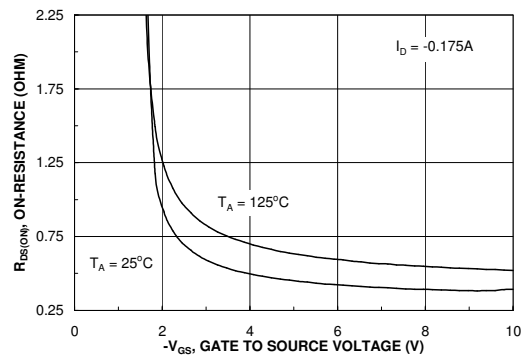


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

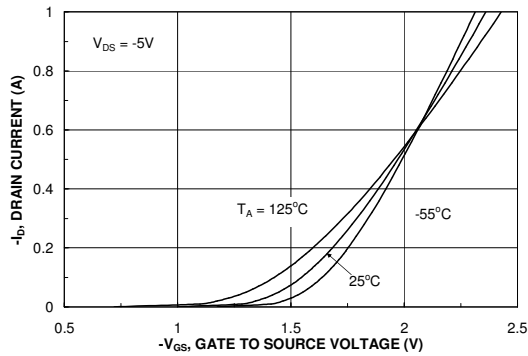


Figure 5. Transfer Characteristics.

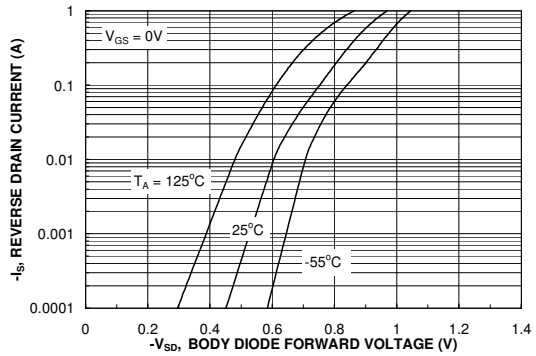


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics

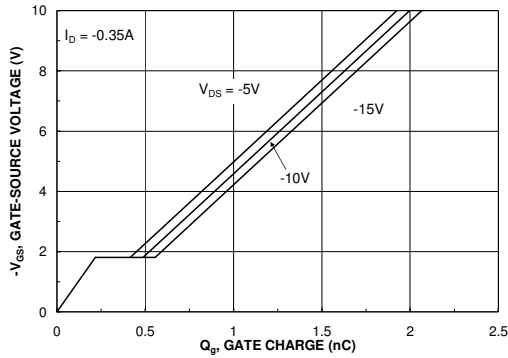


Figure 7. Gate Charge Characteristics.

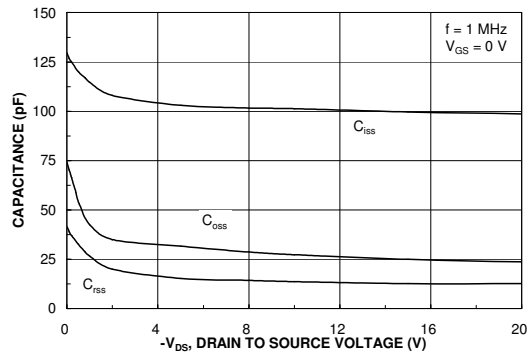


Figure 8. Capacitance Characteristics.

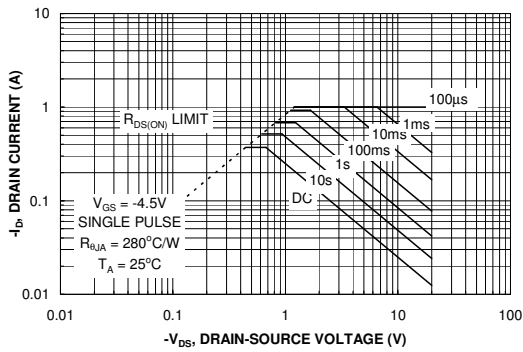


Figure 9. Maximum Safe Operating Area.

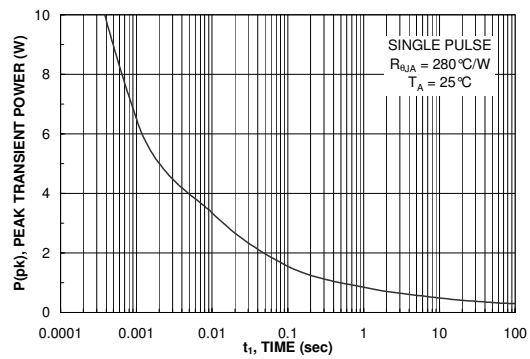


Figure 10. Single Pulse Maximum Power Dissipation.

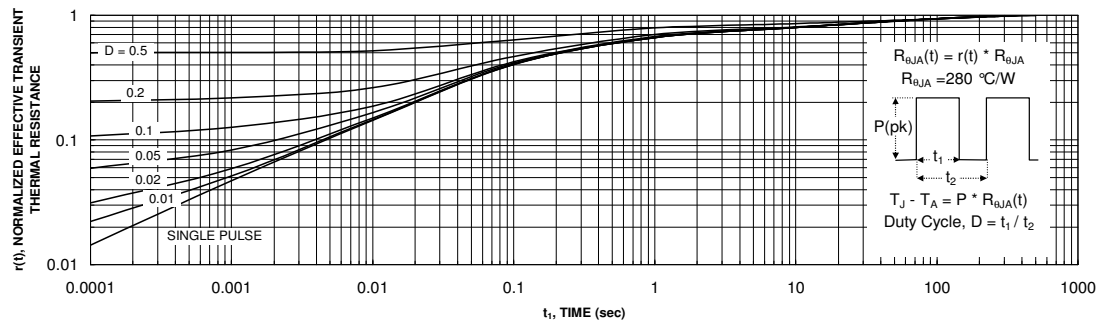
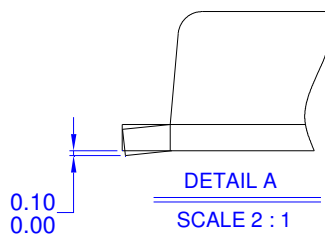
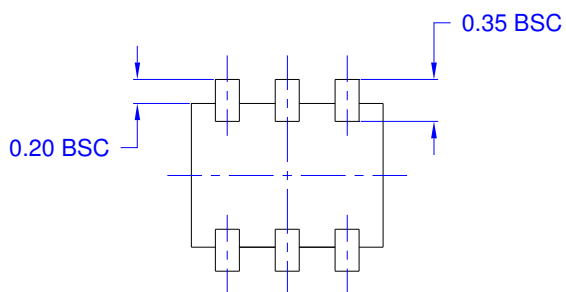
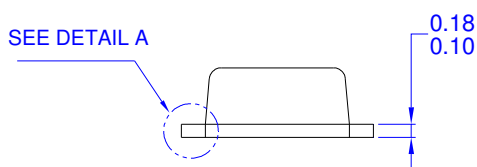
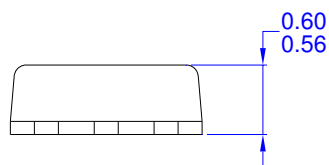
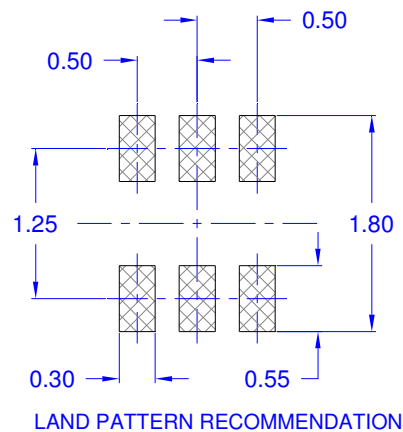
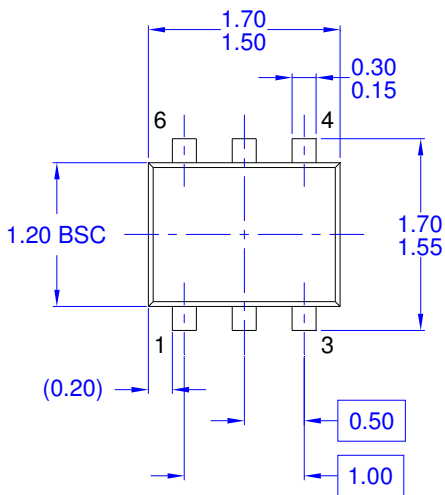


Figure 11. Transient Thermal Response Curve.

Thermal characterization performed using the conditions described in Note 1b. Transient thermal response will change depending on the circuit board design.

Dimensional Outline and Pad Layout



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