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August 2014

# FDPC4044

## Common Drain N-Channel PowerTrench® MOSFET

### 30 V, 27 A, 4.3 mΩ

## Features

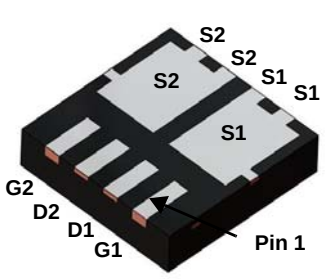
- Max $r_{S1S2(on)}$ = 4.3 mΩ at $V_{GS}$ = 10 V, $I_{S1S2}$ = 27 A
- Max $r_{S1S2(on)}$ = 6.4 mΩ at $V_{GS}$ = 4.5 V, $I_{S1S2}$ = 23 A
- Pakage size/height: 3.3 x 3.3 x 0.8 mm
- Low inductance packaging shortens rise/fall times, resulting in lower switching losses
- MOSFET integration enables optimum layout for lower circuit inductance and reduced switch node ringing
- RoHS Compliant

## General Description

This device is designed specifically as a single package solution for Li-Ion battery pack protection circuit and other ultra-portable applications. It features two common drain N-channel MOSFETs, which enables bidirectional current flow. FDPC4044 combines Fairchild's advanced PowerTrench® process with state of the art packaging process to minimize the on-state resistance.

## Applications

- Battery management
- Load switch
- Battery protection

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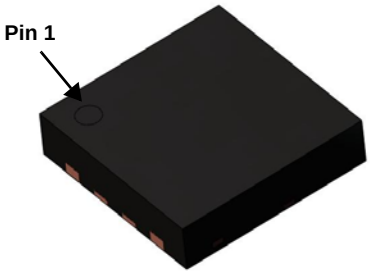


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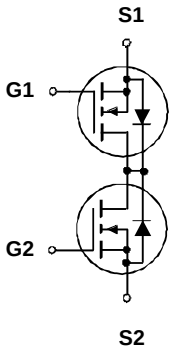



Power Clip 33

## MOSFET Maximum Ratings $T_A$ = 25 °C unless otherwise noted

| Symbol | Parameter | | | Ratings | Units |
|---|---|---|---|---|---|
| $V_{S1S2}$ | Source1 to Source2 Voltage | | | 30 | V |
| $V_{GS}$ | Gate to Source Voltage | | (Note 3) | ±20 | V |
| $I_{S1S2}$ | Source1 to Source2 Current -Continuous | $T_A$ = 25 °C | (Note 1a) | 27 | A |
| | -Pulsed | | (Note 2) | 120 | |
| $P_D$ | Power Dissipation | $T_A$ = 25 °C | (Note 1a) | 2.7 | W |
| | Power Dissipation | $T_A$ = 25 °C | (Note 1b) | 1 | |
| $T_J$, $T_{STG}$ | Operating and Storage Junction Temperature Range | | | -55 to +150 | °C |

### Thermal Characteristics

| | | | | |
|---|---|---|---|---|
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | (Note 1a) | 47 | °C/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | (Note 1b) | 127 | |

### Package Marking and Ordering Information

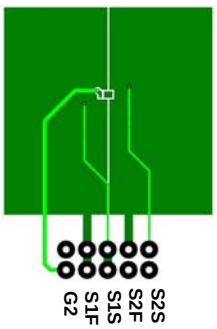
| Device Marking | Device | Package | Reel Size | Tape Width | Quantity |
|---|---|---|---|---|---|
| 40CF | FDPC4044 | Power Clip 33 | 13 ” | 12 mm | 3000 units |

## Electrical Characteristics $T_J$ = 25 °C unless otherwise noted

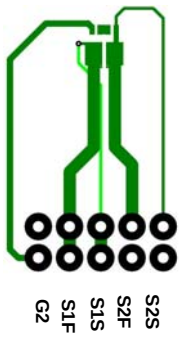
| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| $I_{S1S2}$ | Zero Gate Voltage Source1 to Source2 Current | $V_{S1S2}$ = 24 V, $V_{GS}$ = 0 V | | | 1 | μA |
| $I_{GSS}$ | Gate to Source Leakage Current | $V_{GS}$ = 20 V, $V_{S1S2}$ = 0 V | | | 100 | nA |
| **On Characteristics** | | | | | | |
| $V_{GS(th)}$ | Gate to Source Threshold Voltage | $V_{GS}$ = $V_{S1S2}$, $I_{S1S2}$ = 250 μA | 1.2 | 1.5 | 3 | V |
| $r_{S1S2(on)}$ | Static Source1 to Source2 On Resistance | $V_{GS}$ =10 V, $I_{S1S2}$ = 27 A | | 3.2 | 4.3 | mΩ |
| | | $V_{GS}$ = 4.5 V, $I_{S1S2}$ = 23 A | | 4.6 | 6.4 | |
| | | $V_{GS}$ = 10 V, $I_{S1S2}$ = 27 A, $T_J$ = 125 °C | | 4.5 | 7 | |
| $g_{FS}$ | Forward Transconductance | $V_{S1S2}$ = 10 V, $I_{S1S2}$ = 27 A | | 150 | | S |
| **Dynamic Characteristics** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{S1S2}$ = 15 V, $V_{GS}$ = 0 V, f = 1 MHz | | 2295 | 3215 | pF |
| $C_{oss}$ | Output Capacitance | | | 627 | 880 | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | | 66 | 95 | pF |
| **Switching Characteristics** | | | | | | |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{S1S2}$ = 15 V, $I_{S1S2}$ = 27 A, $V_{GS}$ = 10 V, $R_{GEN}$ = 6 Ω | | 8.5 | 17 | ns |
| $t_r$ | Rise Time | | | 4.8 | 10 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | | 32 | 52 | ns |
| $t_f$ | Fall Time | | | 5.2 | 10 | ns |
| $Q_g$ | Total Gate Charge | $V_{S1S2}$ = 15 V, $I_{S1S2}$ = 27 A, $V_{G1S1}$ = 10 V, $V_{G2S2}$ = 0 V | | 35 | 49 | nC |
| $Q_{gs}$ | Gate to Source1 Gate Charge | | | 5.7 | | nC |
| $Q_{gd}$ | Gate to Source2 “Miller” Charge | | | 4.7 | | nC |
| **Source1 to Source2 Diode Characteristics** | | | | | | |
| $I_{fss}$ | Maximum Continuous Source1 to Source2 Diode Forward Current | | | | 1 | A |
| $V_{fss}$ | Source1 to Source2 Diode Forward Voltage | $V_{G1S1}$ = 0 V, $V_{G2S2}$ = 4.5 V, $I_{fss}$ = 27 A (Note 2) | | 0.8 | 1.2 | V |

**Notes:**

1. $R_{\theta JA}$ is determined with the device mounted on a 1 $in^2$ 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. 47 °C/W when mounted on a 1 $in^2$ pad of 2 oz copper.




b.127 °C/W when mounted on a minimum pad of 2 oz copper.

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

3. As an N-ch device, the negative Vgs rating is for low duty cycle pulse ocurrence only. No continuous rating is implied.

## Typical Characteristics $T_J$ = 25 °C unless otherwise noted

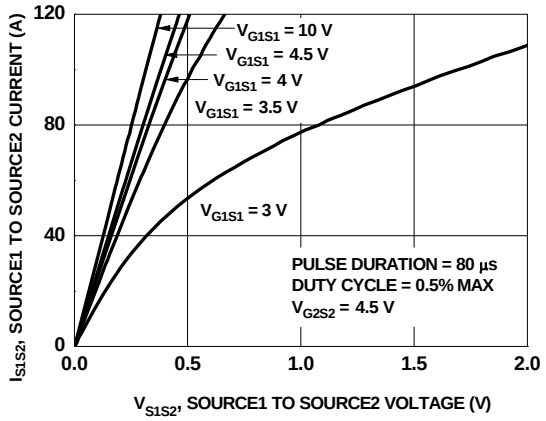



**Figure 1. On-Region Characteristics**

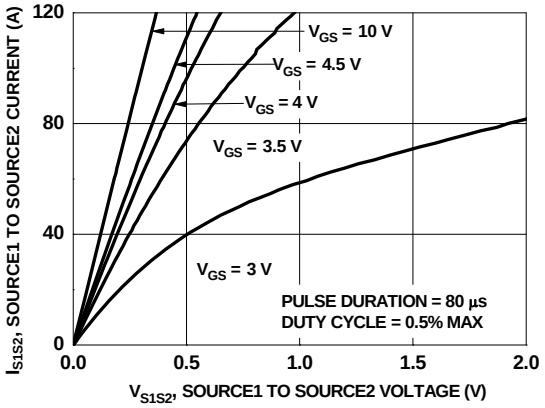



**Figure 2. On-Region Characteristics**

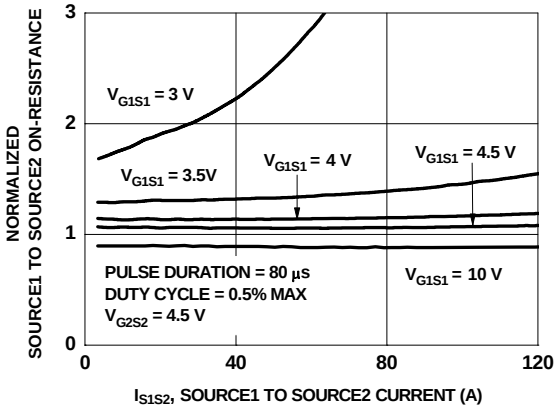



**Figure 3. Normalized On-Resistance vs Source1 to Source2 Current and Gate Voltage**

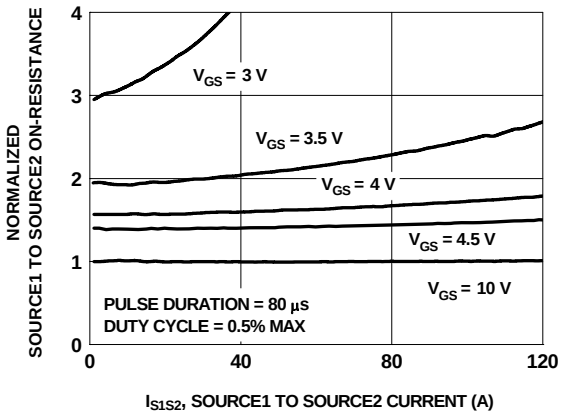



**Figure 4. Normalized On-Resistance vs Source1 to Source2 Current and Gate Voltage**

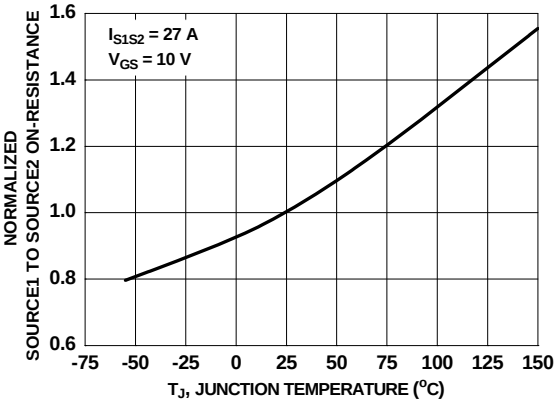



**Figure 5. Normalized On-Resistance vs Junction Temperature**

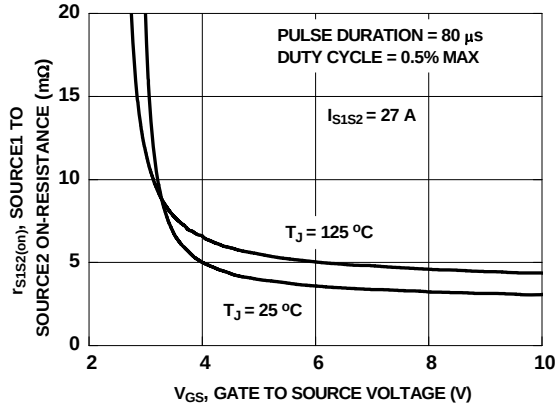



**Figure 6. On-Resistance vs Gate to Source Voltage**

## Typical Characteristics $T_J$ = 25 °C unless otherwise noted

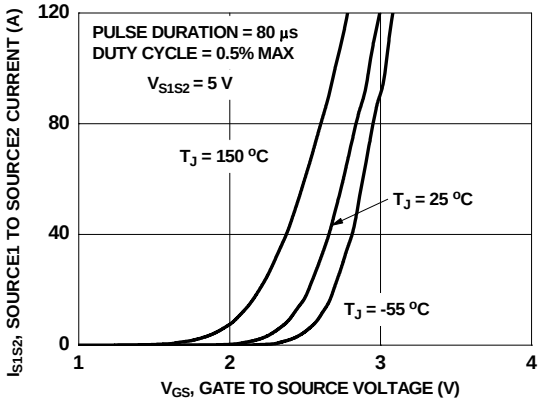



**Figure 7. Transfer Characteristics**

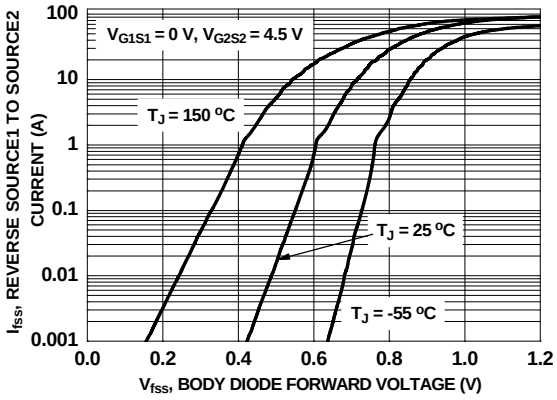



**Figure 8. Source1 to Source2 Diode Forward Voltage vs Source Current**

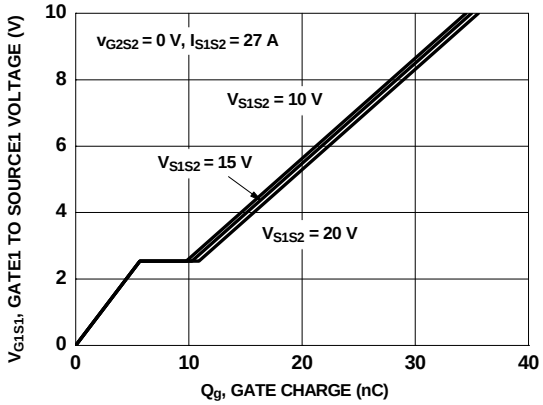



**Figure 9. Gate Charge Characteristics**

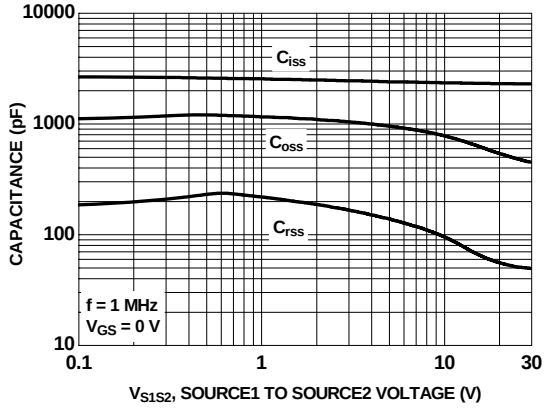



**Figure 10. Capacitance vs Source1 to Source2 Voltage**

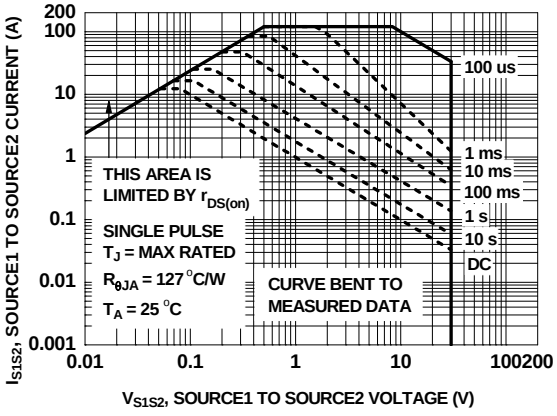



**Figure 11. Forward Bias Safe Operating Area**

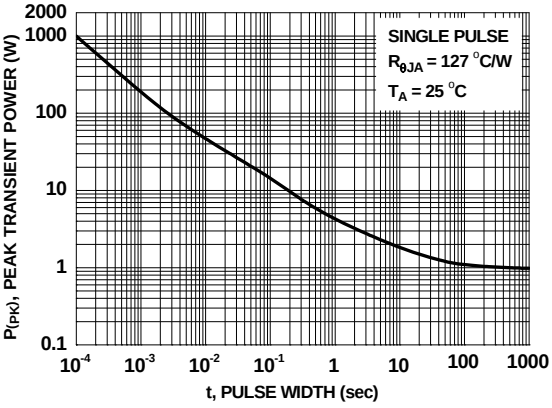



**Figure 12. Single Pulse Maximum Power Dissipation**

## Typical Characteristics $T_J$ = 25 °C unless otherwise noted

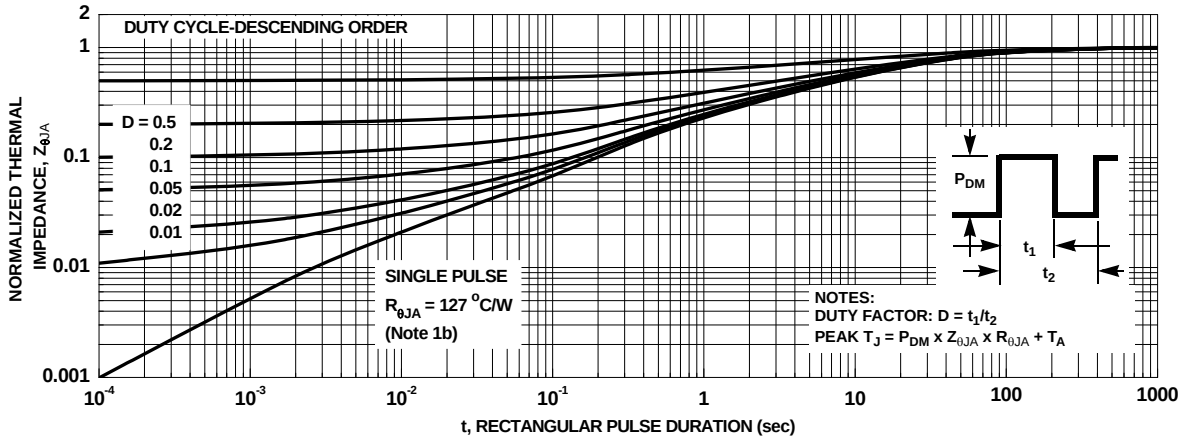
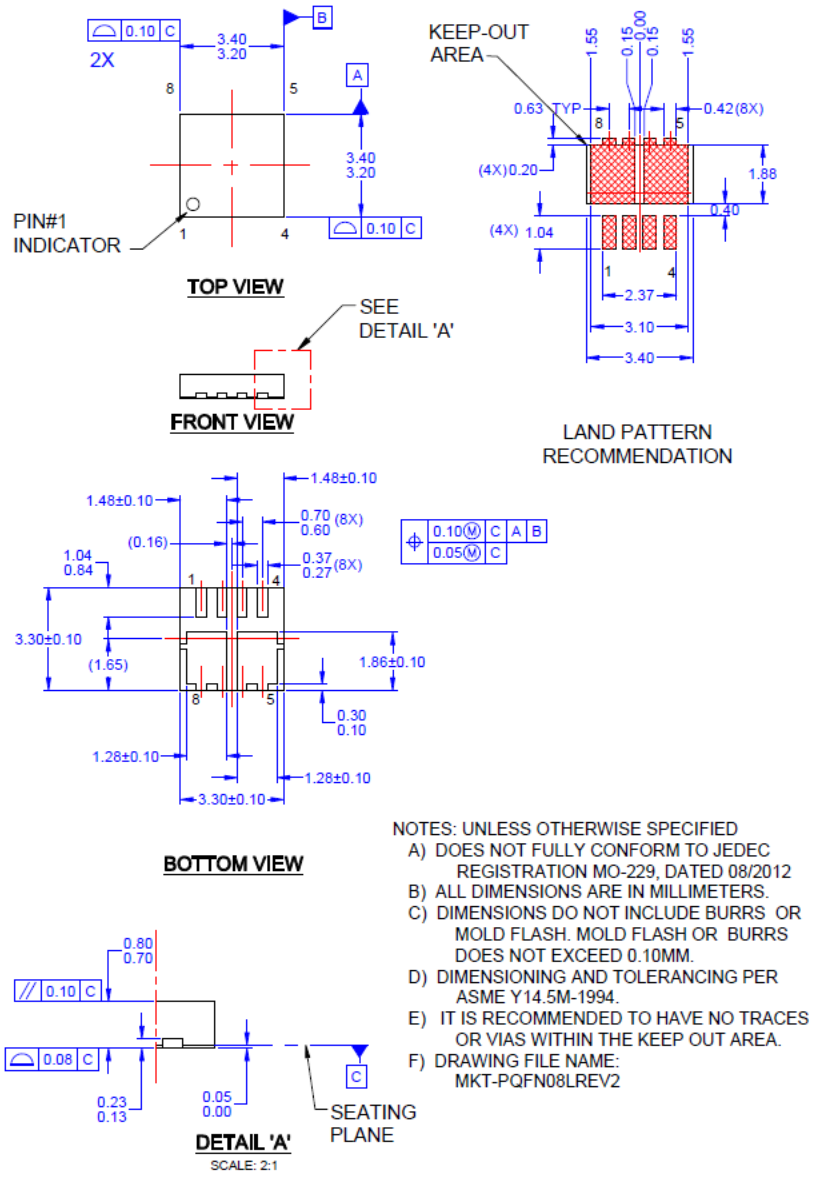



**Figure 13. Junction-to-Ambient Transient Thermal Response Curve**

## Dimensional Outline and Pad Layout

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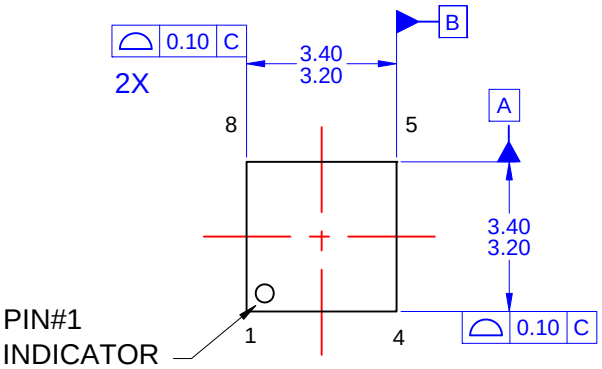
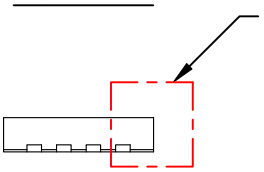



TOP VIEW

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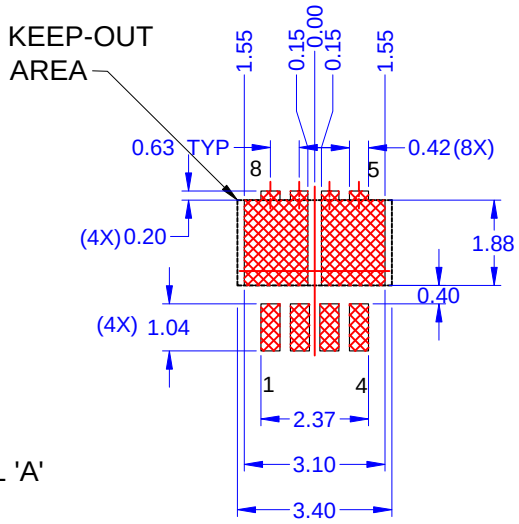
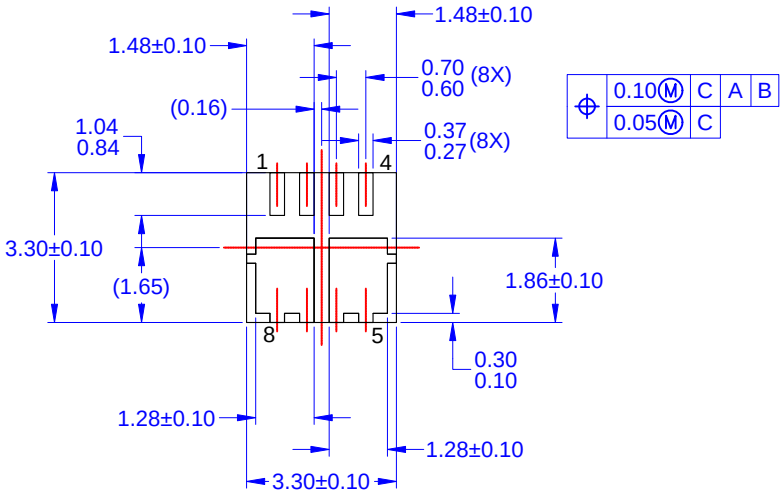
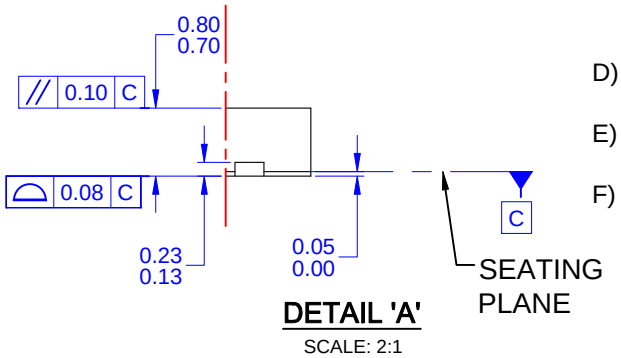



LAND PATTERN
RECOMMENDATION




BOTTOM VIEW




DETAIL 'A'

SCALE: 2:1

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