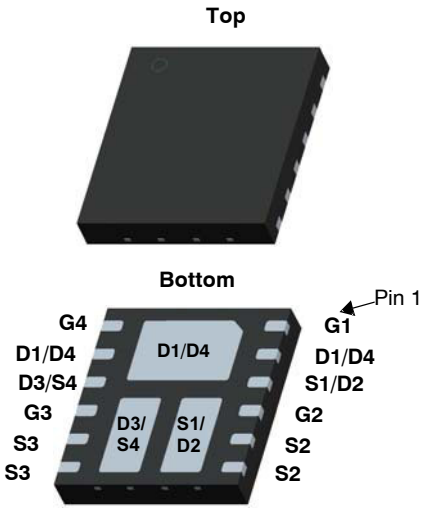
# MOSFET – N-Channel, POWERTRENCH® GreenBridge™ Series of High-Efficiency Bridge Rectifiers

## 60 V, 8 A, 17.5 mΩ

# FDMQ86530L




MLP 4.5x5

### General Description

This Quad MOSFET solution provides ten−fold improvement in power dissipation over diode bridge.

### Features

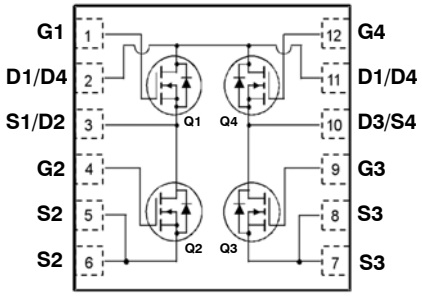
- Max $R_{DS(on)}$ = 17.5 mΩ at $V_{GS}$ = 10 V, $I_D$ = 8 A
- Max $R_{DS(on)}$ = 23 mΩ at $V_{GS}$ = 6 V, $I_D$ = 7 A
- Max $R_{DS(on)}$ = 25 mΩ at $V_{GS}$ = 4.5 V, $I_D$ = 6.5 A
- Substantial Efficiency Benefit in PD Solutions
- This Device is Pb−Free, Halide Free, and RoHS Compliant

### Applications

- Active Bridge
- Diode Bridge Replacement in 24 V & 48 V AC Systems

### MARKING DIAGRAM


Z = Assembly Plant Code
XY = Data Code (Year and Week)
KK = Lot Traceability Code
FDMQ86530L = Specific Device Code




### ORDERING INFORMATION

| Device | Package | Shipping† |
|---|---|---|
| FDMQ86530L | WDFN−12 (Pb-Free, Halide Free) | 3000 / Tape & Reel |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

## MOSFET MAXIMUM RATINGS ($T_A$ = 25°C unless otherwise noted)

| Symbol | Parameter | | | Ratings | Unit |
|---|---|---|---|---|---|
| $V_{DS}$ | Drain to Source Voltage | | | 60 | V |
| $V_{GS}$ | Gate to Source Voltage | | | ±20 | V |
| $I_D$ | Drain Current | Continuous | $T_C$ = 25°C | 8 | A |
| | | Continuous (Note 1a) | $T_A$ = 25°C | 8 | |
| | | Pulsed | | 50 | |
| $P_D$ | Power Dissipation | | $T_C$ = 25°C | 22 | W |
| | Power Dissipation (Note 1a) | | $T_A$ = 25°C | 1.9 | |
| $T_J$, $T_{STG}$ | Operating and Storage Junction Temperature Range | | | −55 to +150 | °C |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

## THERMAL CHARACTERISTICS

| Symbol | Parameter | Ratings | Unit |
|---|---|---|---|
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient (Note 1a) | 65 | °C/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient (Note 1b) | 135 | |

## ELECTRICAL CHARACTERISTICS ($T_J$ = 25°C unless otherwise noted)

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| $BV_{DSS}$ | Drain to Source Breakdown Voltage | $I_D$ = 250 μA, $V_{GS}$ = 0 V | 60 | – | – | V |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D$ = 250 μA, referenced to 25°C | – | 27 | – | mV/°C |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$ = 48 V, $V_{GS}$ = 0 V | – | – | 1 | μA |
| $I_{GSS}$ | Gate to Source Leakage Current | $V_{GS}$ = ±20 V, $V_{DS}$ = 0 V | – | – | ±100 | nA |
| **ON CHARACTERISTICS** | | | | | | |
| $V_{GS(th)}$ | Gate to Source Threshold Voltage | $V_{GS}$ = $V_{DS}$, $I_D$ = 250 μA | 1 | 1.8 | 3 | V |
| $\frac{\Delta V_{GS(th)}}{\Delta T_J}$ | Gate to Source Threshold Voltage Temperature Coefficient | $I_D$ = 250 μA, referenced to 25°C | – | −6 | – | mV/°C |
| $R_{DS(on)}$ | Static Drain to Source On Resistance | $V_{GS}$ = 10 V, $I_D$ = 8 A | – | 12 | 17.5 | mΩ |
| | | $V_{GS}$ = 6 V, $I_D$ = 7 A | – | 15 | 23 | |
| | | $V_{GS}$ = 4.5 V, $I_D$ = 6.5 A | – | 20 | 25 | |
| | | $V_{GS}$ = 10 V, $I_D$ = 8 A, $T_J$ = 125°C | – | 18 | 26 | |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$ = 5 V, $I_D$ = 8 A | – | 28 | – | S |
| **DYNAMIC CHARACTERISTICS** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$ = 30 V, $V_{GS}$ = 0 V, f = 1 MHz | – | 1725 | 2295 | pF |
| $C_{oss}$ | Output Capacitance | | – | 299 | 400 | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | – | 10 | 15 | pF |
| **SWITCHING CHARACTERISTICS** | | | | | | |
| $t_{d(on)}$ | Turn−On Delay Time | $V_{DD}$ = 30 V, $I_D$ = 8 A, $V_{GS}$ = 10 V, $R_{GEN}$ = 6 Ω | – | 8.8 | 18 | ns |
| $t_r$ | Rise Time | | – | 3.8 | 10 | |
| $t_{d(off)}$ | Turn−Off Delay Time | | – | 22 | 35 | |
| $t_f$ | Fall Time | | – | 2.8 | 10 | |

**ELECTRICAL CHARACTERISTICS** ($T_J$ = 25°C unless otherwise noted) (continued)

| | | | | | | |
|---|---|---|---|---|---|---|
| $Q_g$ | Total Gate Charge | $V_{GS}$ = 0 V to 10 V, $V_{DD}$ = 30 V, $I_D$ = 8 A | – | 23 | 33 | nC |
| $Q_g$ | Total Gate Charge | $V_{GS}$ = 0 V to 4.5 V, $V_{DD}$ = 30 V, $I_D$ = 8 A | – | 11 | 16 | |
| $Q_{gs}$ | Gate to Charge | $V_{DD}$ = 30 V, $I_D$ = 8 A | – | 5.1 | – | |
| $Q_{gd}$ | Gate to Drain “Miller” Charge | | – | 2.3 | – | |

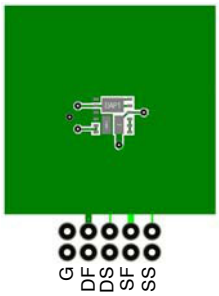
**DRAIN–SOURCE DIODE CHARACTERISTICS**

| | | | | | | |
|---|---|---|---|---|---|---|
| $V_{SD}$ | Source to Drain Diode Forward Voltage | $V_{GS}$ = 0 V, $I_S$ = 8 A (Note 2) | – | 0.8 | 1.3 | V |
| | | $V_{GS}$ = 0 V, $I_S$ = 1.6 A (Note 2) | – | 0.7 | 1.2 | |
| $t_{rr}$ | Reverse Recovery Time | $I_F$ = 8 A, di/dt = 100 A/μs | – | 27 | 43 | ns |
| $Q_{rr}$ | Reverse Recovery Charge | | – | 12 | 22 | nC |

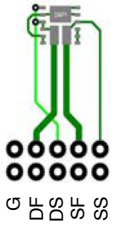
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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. 65°C/W when mounted on a 1 $in^2$ pad of 2 oz copper the board designed Q1 + Q3 or Q2 + Q4.




b. 135°C/W when mounted on a minimum pad of 2 oz copper the board designed Q1 + Q3 or Q2 + Q4.

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

## TYPICAL CHARACTERISTICS

($T_J$ = 25°C unless otherwise noted)

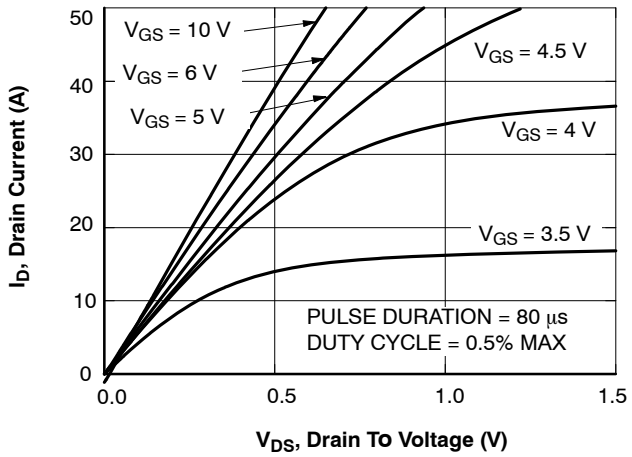



**Figure 1. On−Region Characteristics**

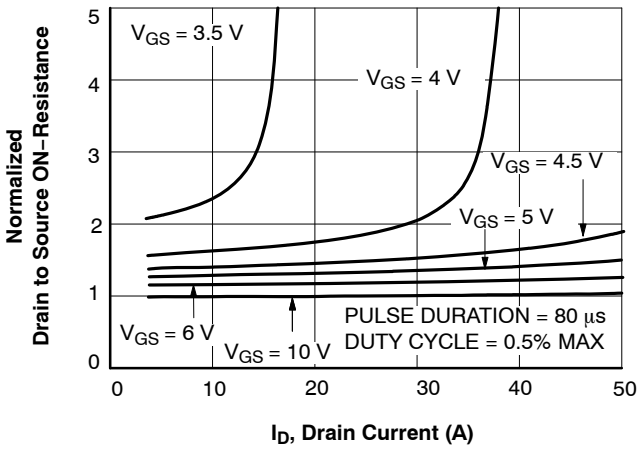



**Figure 2. Normalized On−Resistance vs Drain Current and Gate Voltage**

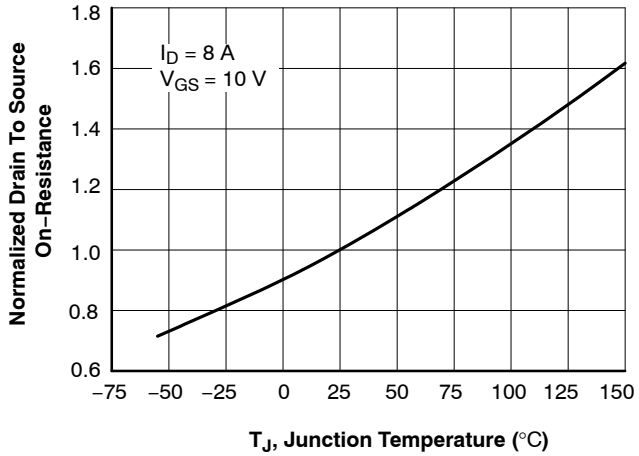



**Figure 3. Normalized On−Resistance vs Junction Temperature**

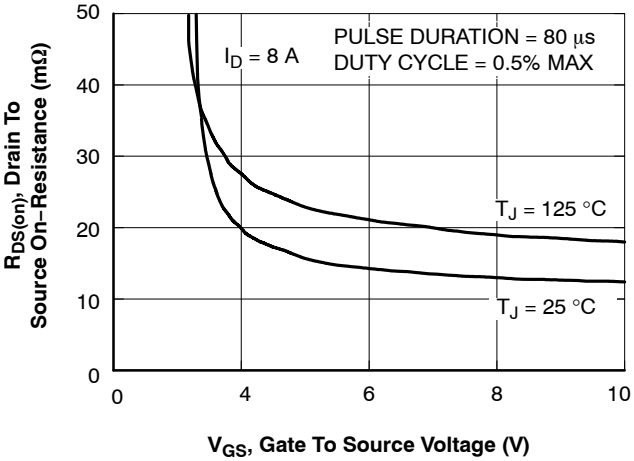



**Figure 4. On−Resistance vs Gate to Source Voltage**

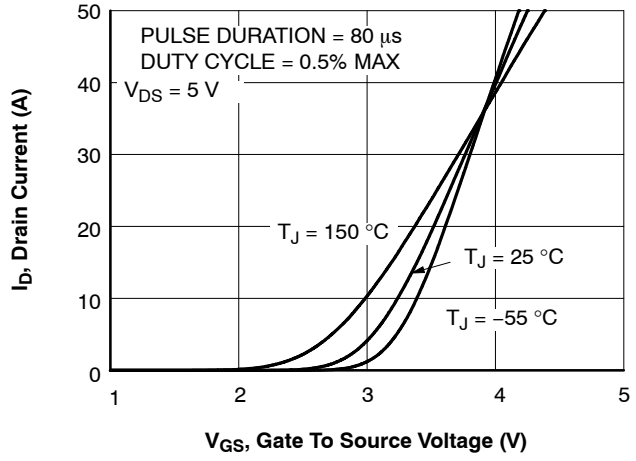



**Figure 5. Transfer Characteristics**

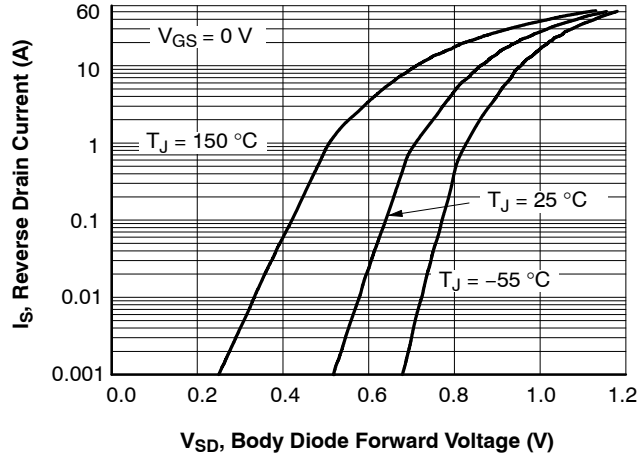



**Figure 6. Source to Drain Diode Forward Voltage vs Source Current**

## TYPICAL CHARACTERISTICS (continued)

($T_J$ = 25°C unless otherwise noted)

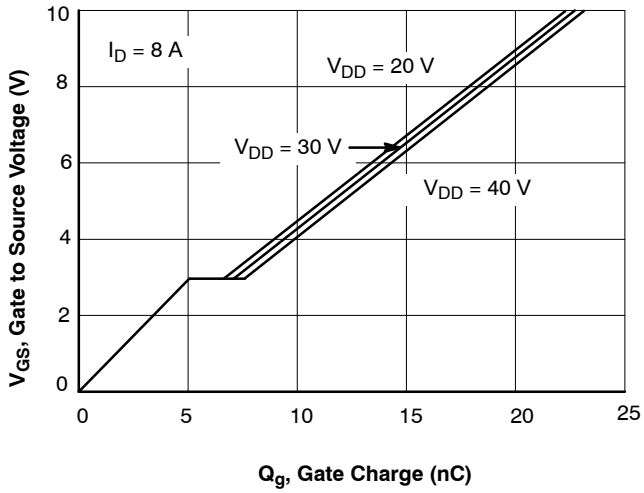



**Figure 7. Gate Charge Characteristics**

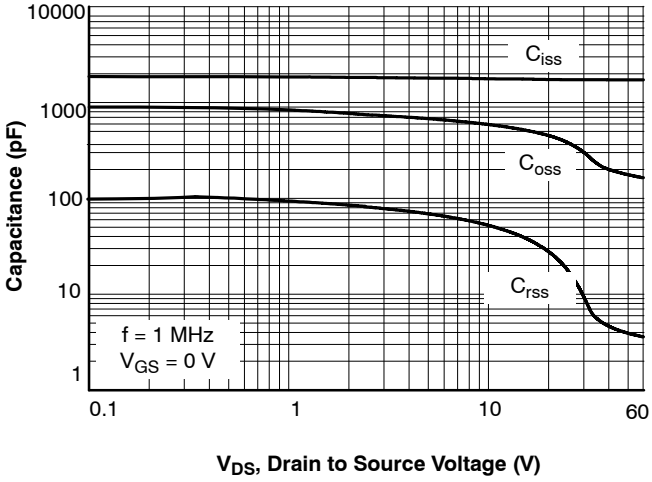



**Figure 8. Capacitance vs Drain to Source Voltage**

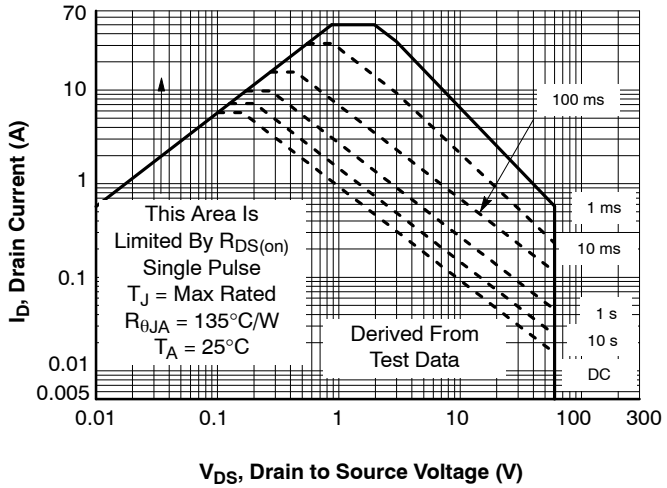



**Figure 9. Forward Bias Safe Operating Area**

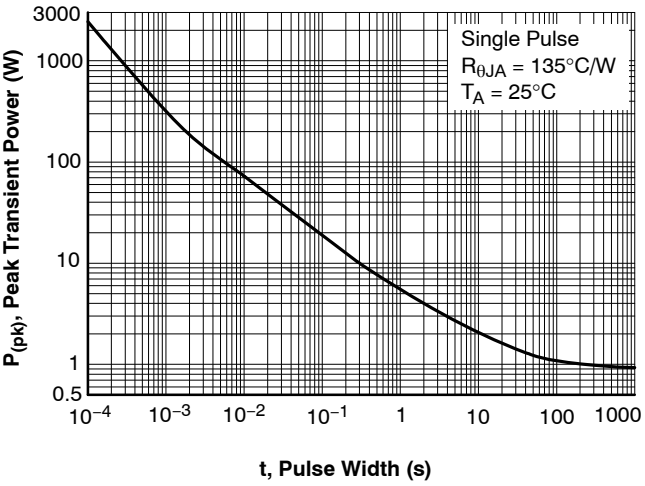



**Figure 10. Single Pulse Maximum Power Dissipation**

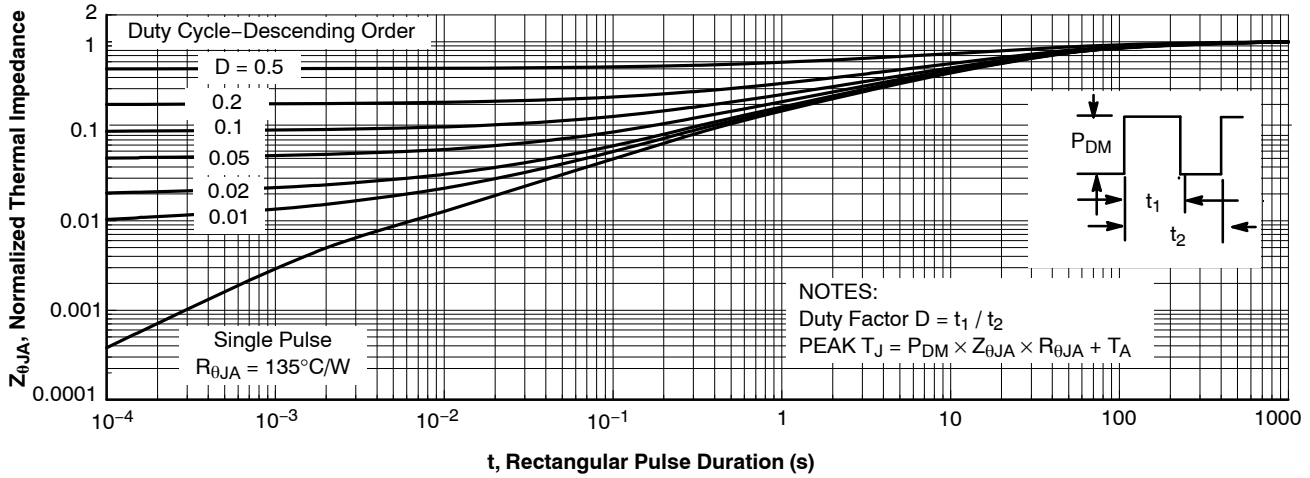
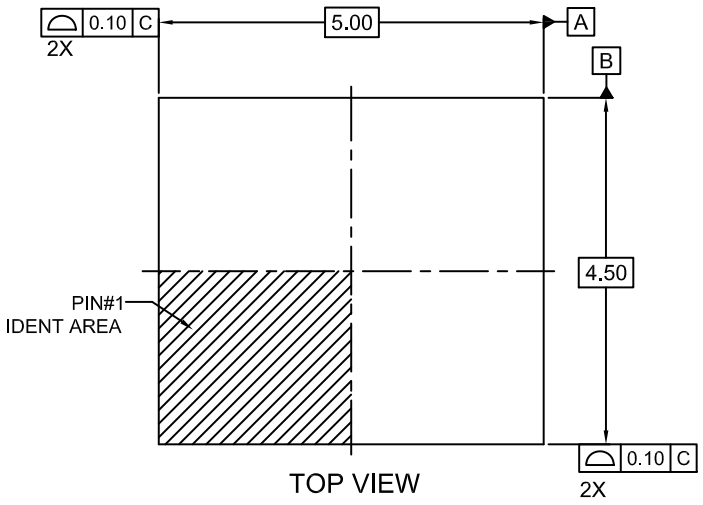


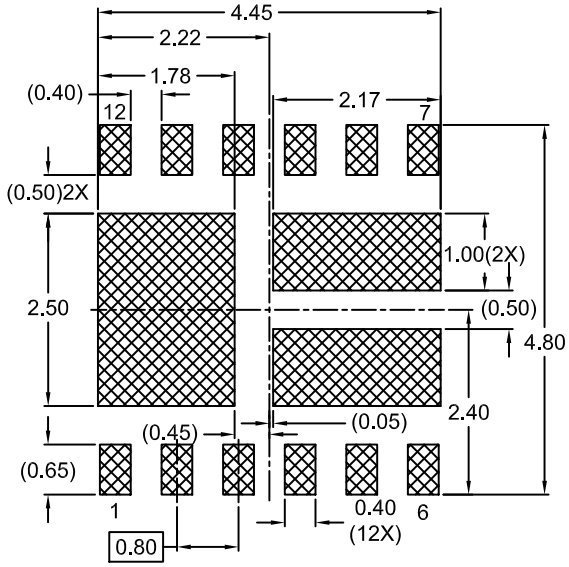

**Figure 11. Junction−to−Ambient Transient Thermal Response Curve**

**WDFN12 5x4.5, 0.8P**
CASE 511CR
ISSUE A

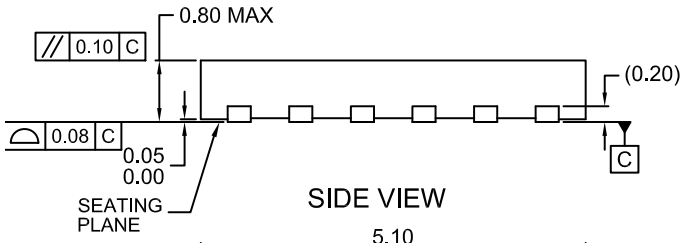
DATE 21 MAR 2017




TOP VIEW



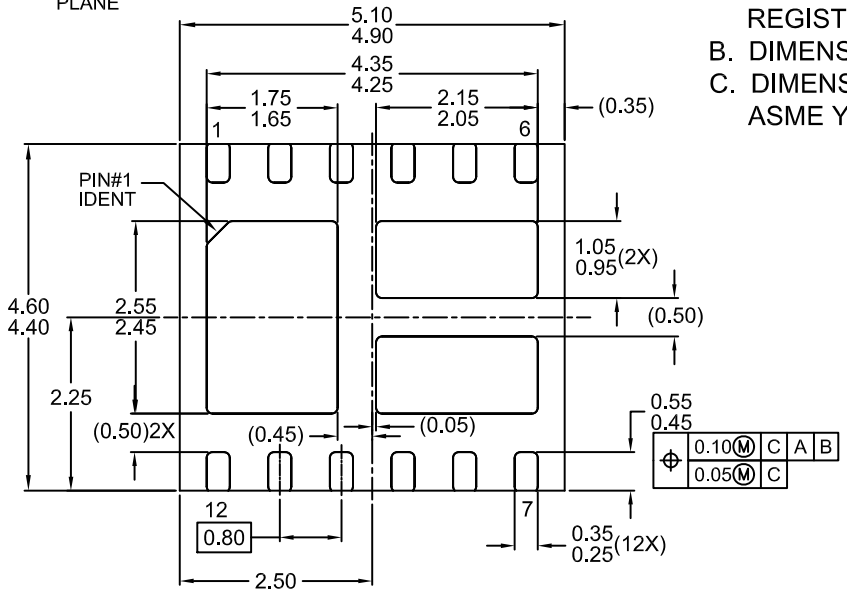

RECOMMENDED LAND PATTERN




SIDE VIEW

NOTES:

A. THIS MKT. DWG. DOES NOT FULLY CONFORM TO JEDEC MO-229 REGISTRATION
B. DIMENSIONS ARE IN MILLIMETERS.
C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.




BOTTOM VIEW

| | | | |
|---|---|---|---|
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