

MOSFET – N-Channel, POWERTRENCH®

100 V, 11.2 A, 9.8 mΩ

FDS86140

General Description

This N-Channel MOSFET is produced using onsemi's advanced POWERTRENCH process that has been optimized for $R_{DS(on)}$, switching performance and ruggedness.

Features

- Max $R_{DS(on)}$ = 9.8 mΩ at $V_{GS} = 10\text{ V}$, $I_D = 11.2\text{ A}$
- Max $R_{DS(on)}$ = 16 mΩ at $V_{GS} = 6\text{ V}$, $I_D = 9\text{ A}$
- High Performance Trench Technology for extremely Low $R_{DS(on)}$
- High Power and Current Handling Capability in a Widely Used Surface Mount Package
- 100% UIL Tested
- This Device is Pb-Free, Halide Free and is RoHS Compliant

Applications

- DC/DC Converters and Off-Line UPS
- Distributed Power Architectures and VRMs
- Primary Switch for 24 V and 48 V Systems
- High Voltage Synchronous Rectifier

MOSFET MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

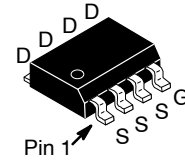
| Symbol | Parameter | Value | Unit |
|----------------|--|------------------------------------|------------------|
| V_{DS} | Drain to Source Voltage | 100 | V |
| V_{GS} | Gate to Source Voltage | ± 20 | V |
| I_D | Drain Current | Continuous | 11.2 |
| | | Pulsed | 50 |
| E_{AS} | Single Pulse Avalanche Energy (Note 3) | 264 | mJ |
| P_D | Power Dissipation | $T_C = 25^\circ\text{C}$ (Note 1) | 5.0 |
| | | $T_A = 25^\circ\text{C}$ (Note 1a) | 2.5 |
| T_J, T_{STG} | Operating and Storage Junction Temperature Range | -55 to 150 | $^\circ\text{C}$ |

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

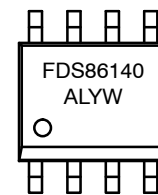
| Symbol | Parameter | Value | Unit |
|-----------------|---|-------|---------------------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case (Note 1) | 25 | $^\circ\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient (Note 1a) | 50 | |

| V_{DS} | $R_{DS(ON)}$ Max | I_D MAX |
|----------|------------------|-----------|
| 100 V | 9.8 mΩ @ 10 V | 11.2 A |



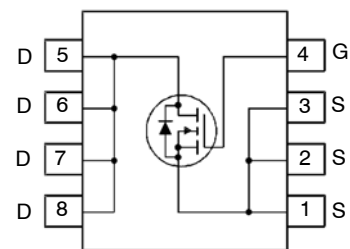
SOIC8
 CASE 751EB

MARKING DIAGRAM



FDS86140 = Device Code
 A = Assembly Site
 L = Wafer Lot Number
 YW = Assembly Start Week

PIN CONNECTIONS



ORDERING INFORMATION

| Device | Package | Shipping† |
|----------|---------|--------------------|
| FDS86140 | SOIC8 | 2500 / 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](#).

FDS86140

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 | 100 | – | – | V |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | I _D = 250 μA, Referenced to 25°C | – | 70 | – | mV/°C |
| I _{DSS} | Zero Gate Voltage Drain Current | V _{DS} = 80 V, V _{GS} = 0 V | – | – | 1 | μA |
| I _{GSS} | Gate to Body Leakage, Forward | 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 | 2 | 2.7 | 4 | V |
| $\frac{\Delta V_{GS(th)}}{\Delta T_J}$ | Gate to Source Threshold Voltage Temperature Coefficient | I _D = 250 μA, Referenced to 25°C | – | –11 | – | mV/°C |
| R _{DS(on)} | Static Drain to Source On-Resistance | V _{GS} = 10 V, I _D = 11.2 A | – | 8.1 | 9.8 | mΩ |
| | | V _{GS} = 6 V, I _D = 9 A | – | 10.8 | 16 | |
| | | V _{GS} = 10 V, I _D = 11.2 A, T _J = 125°C | – | 13.1 | 17 | |
| g _{FS} | Forward Transconductance | V _{DS} = 10 V, I _D = 11.2 A | – | 35 | – | S |

DYNAMIC CHARACTERISTICS

| | | | | | | |
|------------------|------------------------------|--|---|------|------|----|
| C _{iss} | Input Capacitance | V _{DS} = 50 V, V _{GS} = 0 V, f = 1 MHz | – | 1940 | 2580 | pF |
| C _{oss} | Output Capacitance | | – | 440 | 585 | pF |
| C _{rss} | Reverse Transfer Capacitance | | – | 20 | 30 | pF |
| R _g | Gate Resistance | | – | 0.9 | – | Ω |

SWITCHING CHARACTERISTICS

| | | | | | | |
|---------------------|-------------------------------|---|---|------|----|----|
| t _{d(on)} | Turn-On Delay Time | V _{DD} = 50 V, I _D = 11.2 A, V _{GS} = 10 V, R _{GEN} = 6 Ω | – | 13.7 | 25 | ns |
| t _r | Rise Time | | – | 5.6 | 11 | ns |
| t _{d(off)} | Turn-Off Delay Time | | – | 23 | 38 | ns |
| t _f | Fall Time | | – | 4.8 | 10 | ns |
| Q _g | Total Gate Charge | V _{GS} = 0 V to 10 V, V _{DD} = 50 V, I _D = 11.2 A | – | 29 | 41 | nC |
| | | V _{GS} = 0 V to 5 V, V _{DD} = 50 V, I _D = 11.2 A | – | 16.5 | 23 | nC |
| Q _{gs} | Gate to Source Charge | V _{DD} = 50 V, I _D = 11.2 A | – | 8.0 | – | nC |
| Q _{gd} | Gate to Drain "Miller" Charge | | – | 6.5 | – | nC |

DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS

| | | | | | | |
|-----------------|------------------------------------|---|---|-----|-----|----|
| V _{SD} | Source-Drain Diode Forward Voltage | V _{GS} = 0 V, I _S = 11.2 A (Note 2) | – | 0.8 | 1.3 | V |
| | | V _{GS} = 0 V, I _S = 2 A (Note 2) | – | 0.7 | 1.2 | |
| t _{rr} | Reverse Recovery Time | I _F = 11.2 A, di/dt = 100 A/μs | – | 53 | 85 | ns |
| Q _{rr} | Reverse Recovery Charge | | – | 59 | 94 | 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.

1. R_{θJA} is determined with the device mounted on a 1 in² pad 2 oz copper pad on a 1.5 × 1.5 in. board of FR-4 material. R_{θJC} is guaranteed by design while R_{θCA} is determined by the user's board design.



a) 50°C/W when mounted on a 1 in² pad of 2 oz. copper.



b) 125°C/W when mounted on a minimum pad.

2. Pulse Test: Pulse Width < 300 μs, Duty Cycle < 2.0%.
3. Starting T_J = 25°C, L = 1 mH, I_{AS} = 23 A, V_{DD} = 90 V, V_{GS} = 10 V.

TYPICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

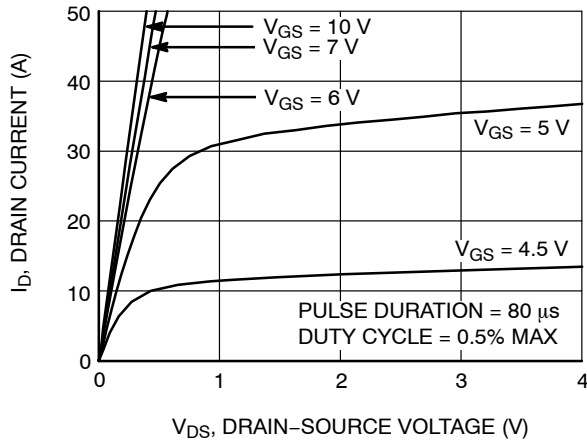


Figure 1. On Region Characteristics

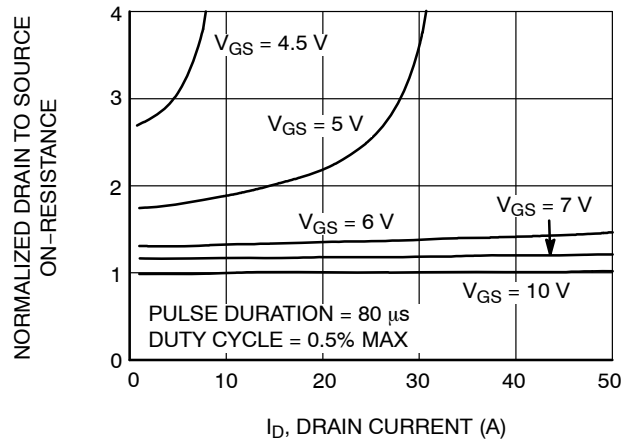


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

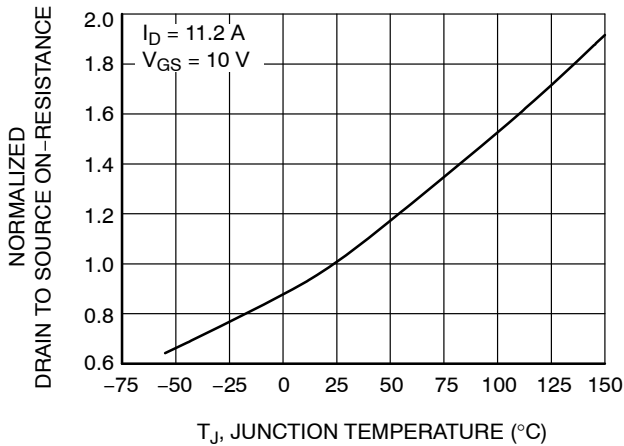


Figure 3. Normalized On-Resistance vs. Junction Temperature

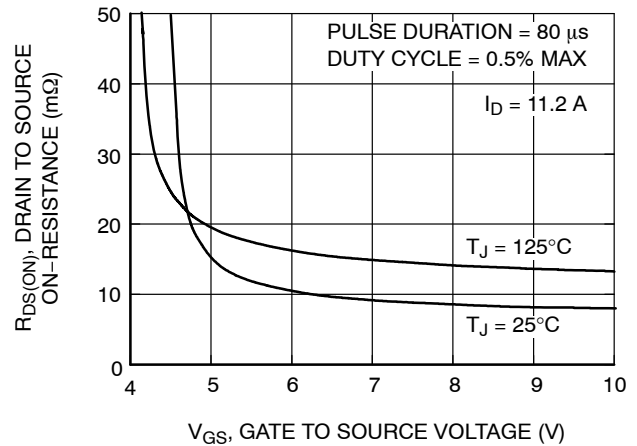


Figure 4. On-Resistance vs. Gate to Source Voltage

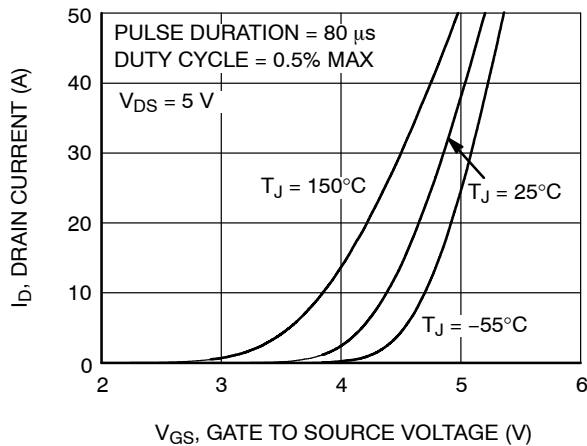


Figure 5. Transfer Characteristics

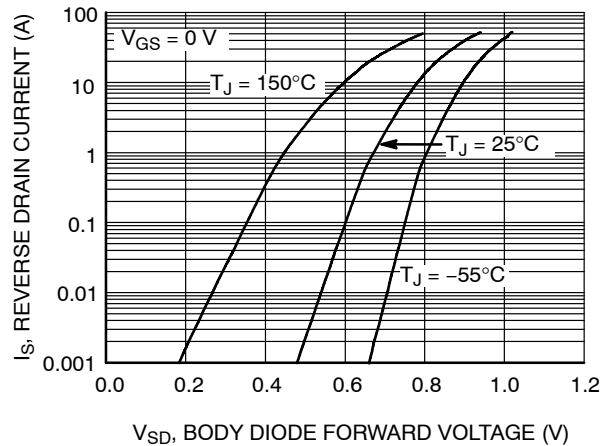


Figure 6. Body to Drain Diode Forward Voltage vs. Source Current

TYPICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise noted) (continued)

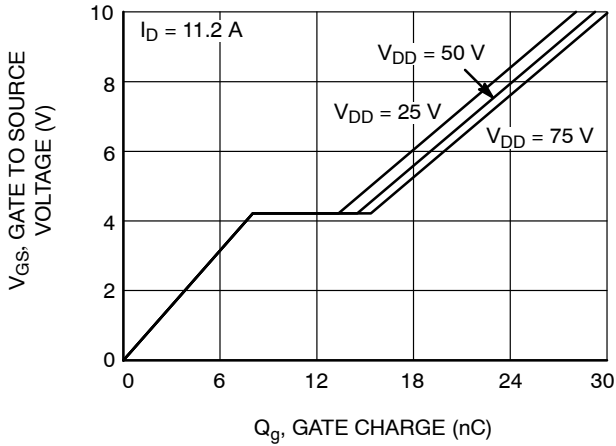


Figure 7. Gate Charge Characteristics

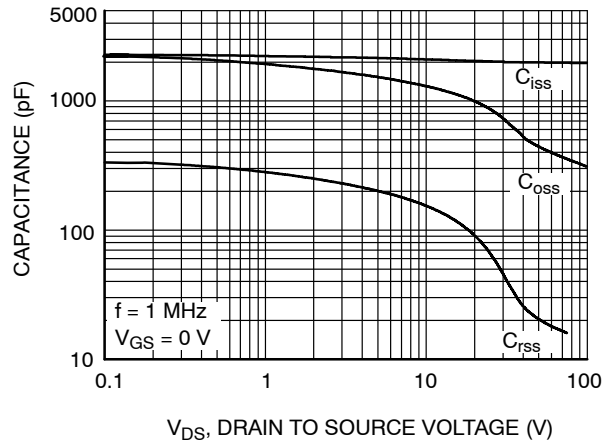


Figure 8. Capacitance vs. Drain to Source Voltage

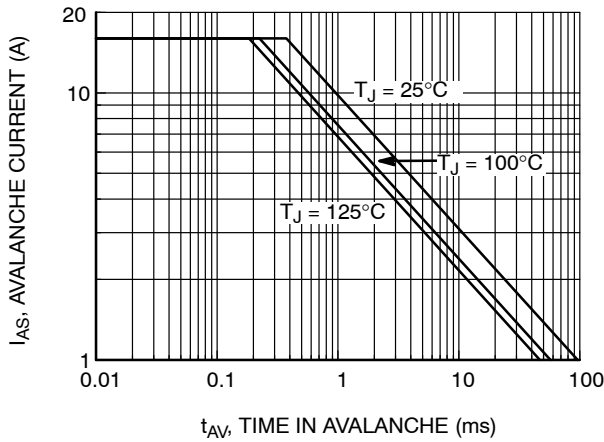


Figure 9. Unclamped Inductive Switching Capability

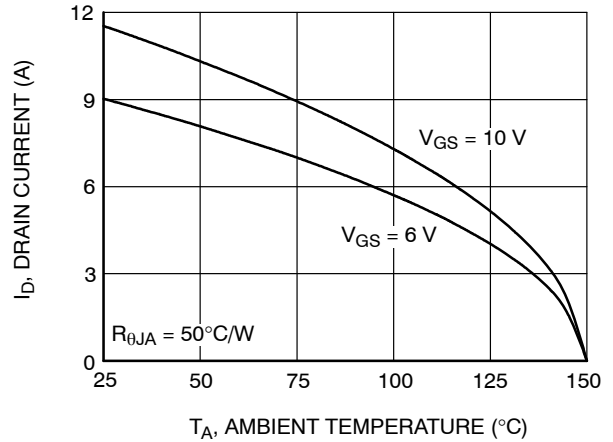


Figure 10. Maximum Continuous Drain Current vs. Ambient Temperature

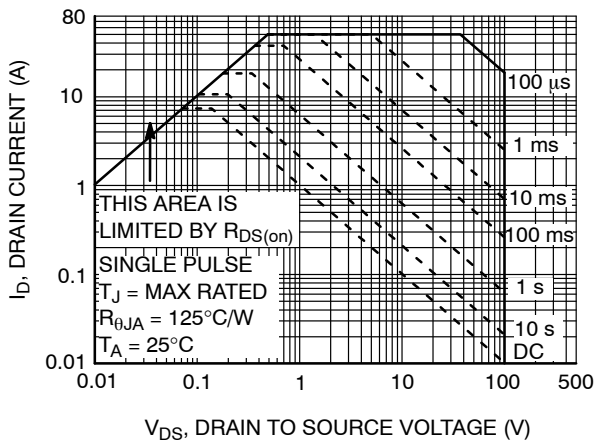


Figure 11. Forward Bias Safe Operating Area

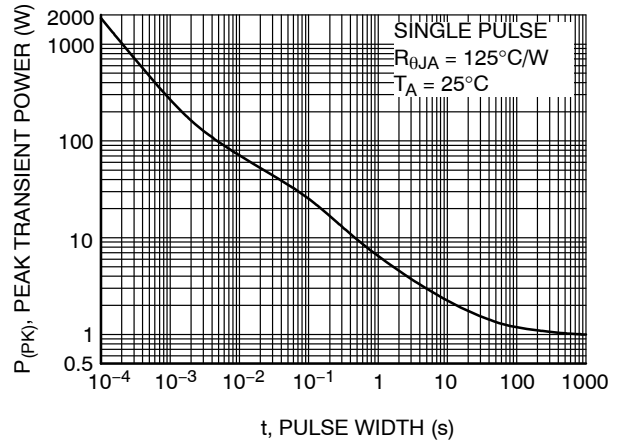


Figure 12. Single Pulse Maximum Power Dissipation

TYPICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise noted) (continued)

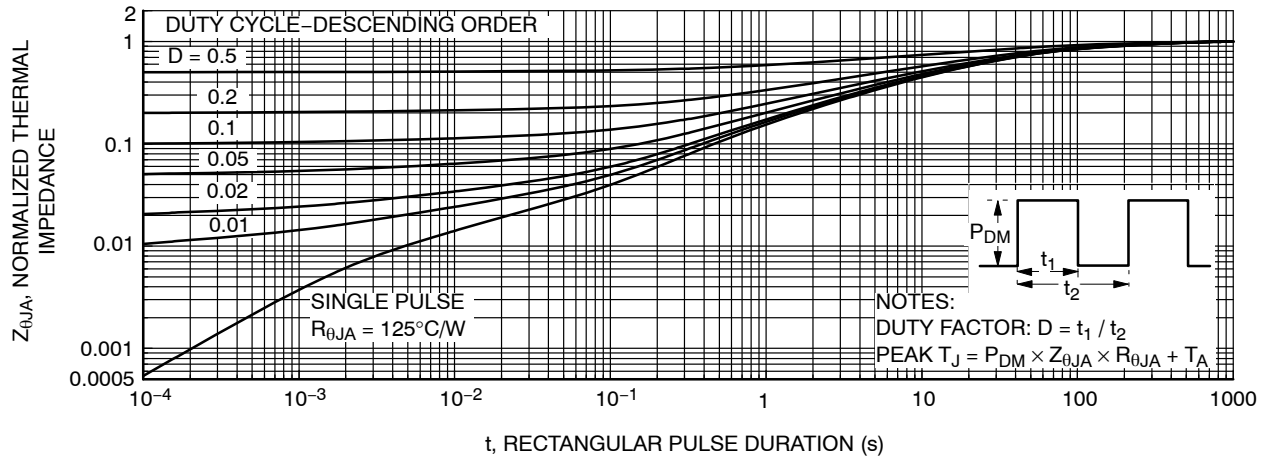


Figure 13. Junction-to-Ambient Thermal Response Curve

MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

ON Semiconductor®

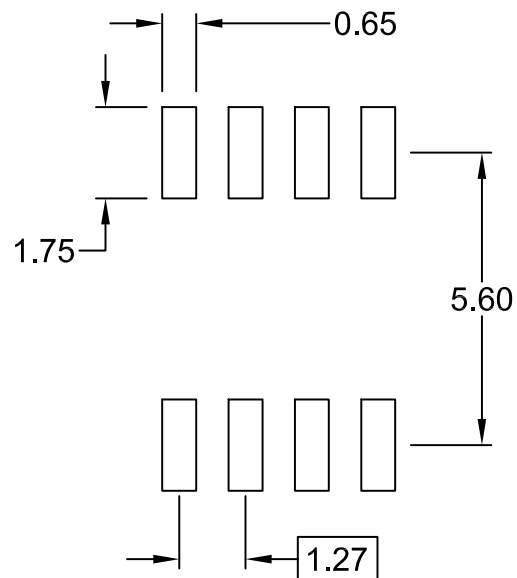


SOIC8
CASE 751EB
ISSUE A

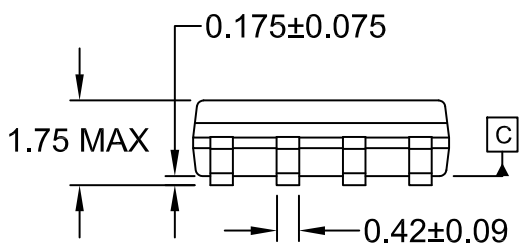
DATE 24 AUG 2017



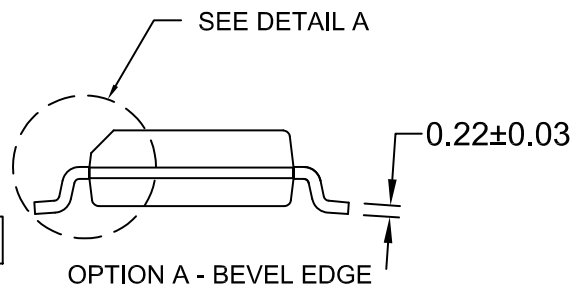
\varnothing 0.25 (M) C B A



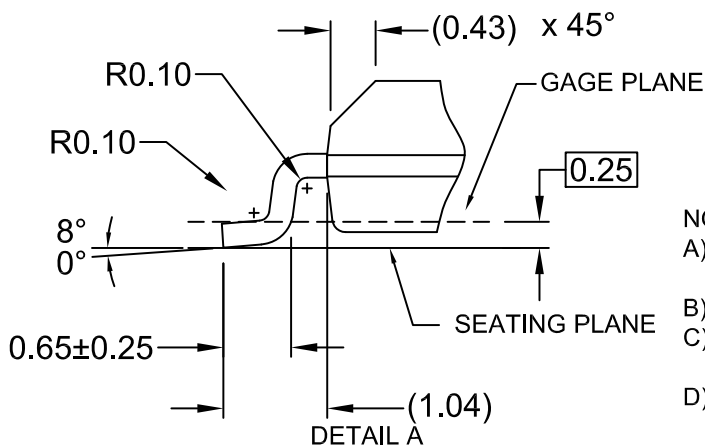
LAND PATTERN RECOMMENDATION



$\frac{1}{2}$ 0.10



OPTION B - NO BEVEL EDGE



SCALE: 2:1

NOTES:

- A) THIS PACKAGE CONFORMS TO JEDEC MS-012, VARIATION AA.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONS DO NOT INCLUDE MOLD FLASH OR BURRS.
- D) LANDPATTERN STANDARD: SOIC127P600X175-8M

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