

EFC4K110NUZ

MOSFET – Power, Dual, N-Channel, for 1-2 Cells Lithium-ion Battery Protection 24 V, 2.95 mΩ, 25 A



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Introduction

This Power MOSFET features a low on-state resistance. This device is suitable for applications such as power switches of portable machines. Best suited for 1-2 cells lithium-ion battery applications.

Features

- 2.5 V Drive
- 2 kV ESD HBM
- Common-Drain Type
- ESD Diode-Protected Gate
- This Device is Pb-Free, Halogen Free/BFR Free and is RoHS Compliant

Applications

- 1-2 Cells Lithium-ion Battery Charging and Discharging Switch

Specifications

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C) (Note 1)

| Parameter | Symbol | Value | Unit |
|---|------------------|-------------|------|
| Source to Source Voltage | V _{SSS} | 24 | V |
| Gate to Source Voltage | V _{GSS} | ±12 | V |
| Source Current (DC) | I _S | 25 | A |
| Source Current (Pulse) PW ≤ 10 μs, duty cycle ≤ 1% | I _{SP} | 100 | A |
| Total Dissipation (Note 1) | P _T | 2.5 | W |
| Junction Temperature | T _j | 150 | °C |
| Storage Temperature | T _{stg} | -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.

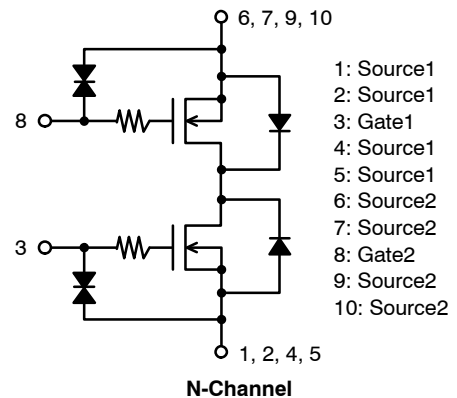
THERMAL RESISTANCE RATINGS

| Parameter | Symbol | Value | Unit |
|------------------------------|------------------|-------|------|
| Junction to Ambient (Note 1) | R _{θJA} | 50 | °C/W |

1. Surface mounted on ceramic substrate (5000 mm² × 0.8 mm).

| V _{SSS} | R _{SS(ON)} MAX | I _S MAX |
|------------------|-------------------------|--------------------|
| 24 V | 2.95 mΩ @ 4.5 V | 25 A |
| | 3.0 mΩ @ 3.8 V | |
| | 4.7 mΩ @ 3.1 V | |
| | 7.4 mΩ @ 2.5 V | |

ELECTRICAL CONNECTION

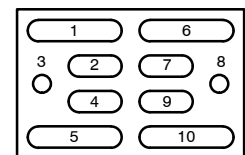


N-Channel

PIN ASSIGNMENT

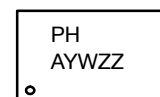


WLCSP10
(3.20 x 2.10 x 0.14)
CASE 567XT



(Bottom View)

MARKING DIAGRAM



- PH = Specific Device Code
- A = Assembly Location
- Y = Year
- W = Work Week
- ZZ = Assembly Lot

ORDERING INFORMATION

See detailed ordering and shipping information on page 5 of this data sheet.

EFC4K110NUZ

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$)

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---------------|--|---|-----|----------|------------------|
| Source to Source Breakdown Voltage | $V_{(BR)SSS}$ | $I_S = 1 \text{ mA}, V_{GS} = 0 \text{ V}$ | 24 | | | V |
| Zero-Gate Voltage Source Current | I_{SSS} | $V_{SS} = 19.2 \text{ V}, V_{GS} = 0 \text{ V}$ | | | 1 | μA |
| Gate to Source Leakage Current | I_{GSS} | $V_{GS} = \pm 8 \text{ V}, V_{SS} = 0 \text{ V}$ | | | ± 10 | μA |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{SS} = 10 \text{ V}, I_S = 1 \text{ mA}$ | 0.4 | | 1.3 | V |
| Static Source to Source On-State Resistance | $R_{SS(on)}$ | $I_S = 5 \text{ A}, V_{GS} = 4.5 \text{ V}$ | 1.6 | 2.4 | 2.95 | $\text{m}\Omega$ |
| | | $I_S = 5 \text{ A}, V_{GS} = 3.8 \text{ V}$ | 1.7 | 2.5 | 3.0 | $\text{m}\Omega$ |
| | | $I_S = 5 \text{ A}, V_{GS} = 3.1 \text{ V}$ | 2.0 | 2.9 | 4.7 | $\text{m}\Omega$ |
| | | $I_S = 5 \text{ A}, V_{GS} = 2.5 \text{ V}$ | 2.2 | 3.6 | 7.4 | $\text{m}\Omega$ |
| Gate Resistance | R_g | $f = 1 \text{ MHz}$ | | 310 | | Ω |
| Total Gate Charge | Q_g | $V_{SS} = 11.5 \text{ V}, V_{GS} = 4.5 \text{ V}, I_S = 5 \text{ A}$ | | 49 | | nC |
| Turn-ON Delay Time | $t_{d(on)}$ | $V_{SS} = 11.5 \text{ V}, V_{GS} = 4.5 \text{ V}, R_L = 2.3 \Omega$ $R_G = 0 \Omega$ Switching Test Circuit | | 0.6 | | μs |
| Rise Time | t_r | | | 1.6 | | μs |
| Turn-OFF Delay Time | $t_{d(off)}$ | | | 7.3 | | μs |
| Fall Time | t_f | | | 3.2 | | μs |
| Forward Source to Source Voltage | $V_{F(S-S)}$ | | $I_S = 3 \text{ A}, V_{GS} = 0 \text{ V}$ | | 0.75 | 1.2 |

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.

SWITCHING TEST CIRCUIT

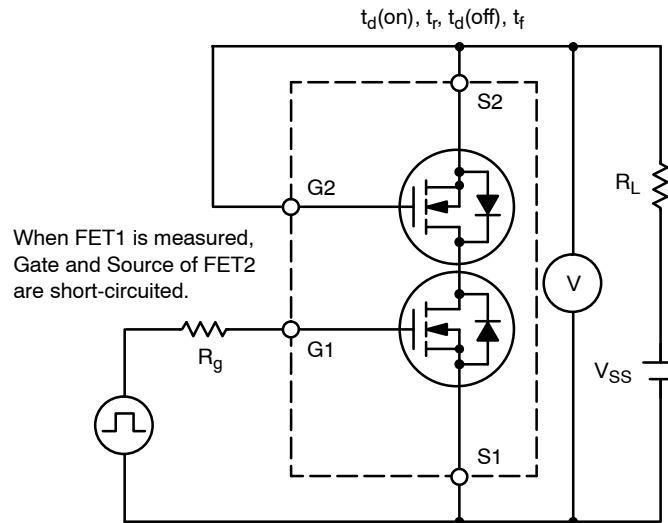


Figure 1. Switching Test Circuit

DEPENDENCY FIGURES

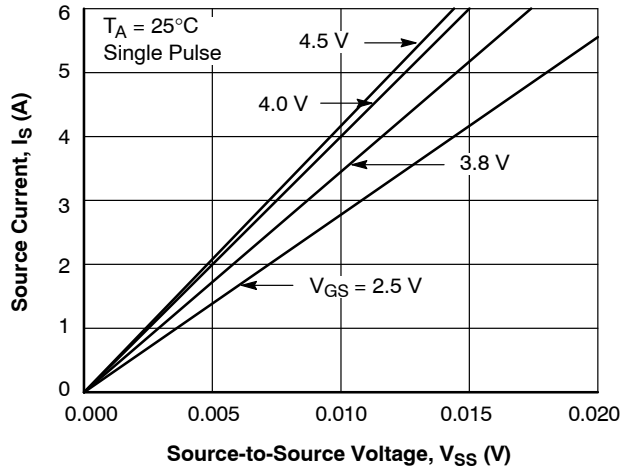


Figure 2. On-Region Characteristics

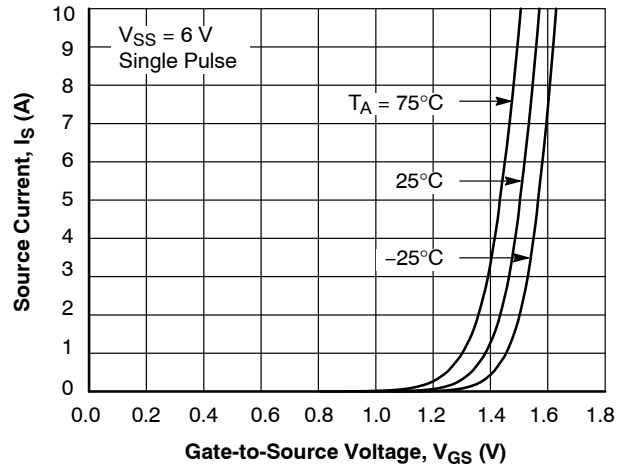


Figure 3. Transfer Characteristics

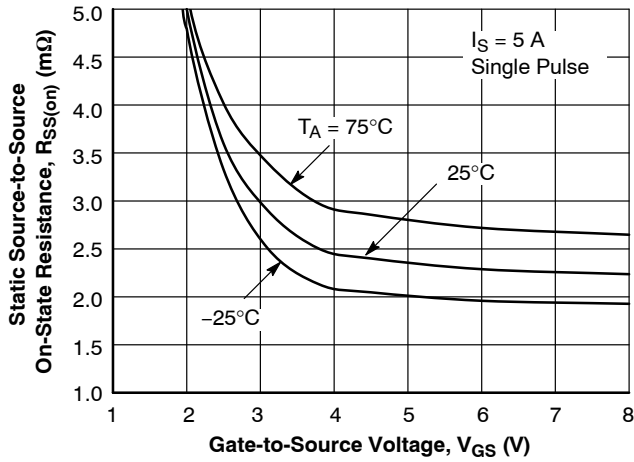


Figure 4. On-Resistance vs. Gate-to-Source Voltage

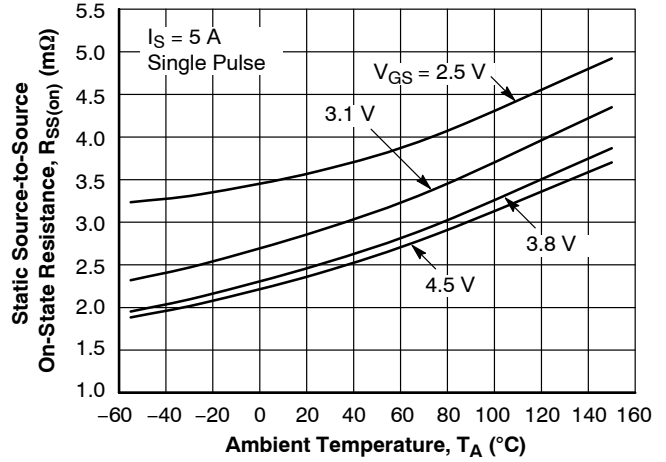


Figure 5. On-Resistance vs. Temperature

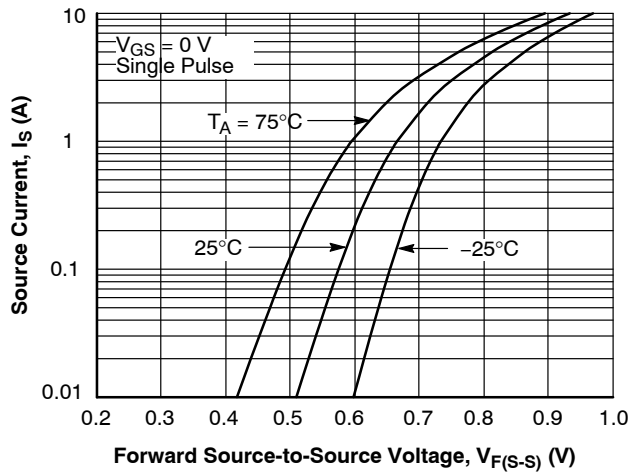


Figure 6. Forward Source-to-Source Voltage vs. Current

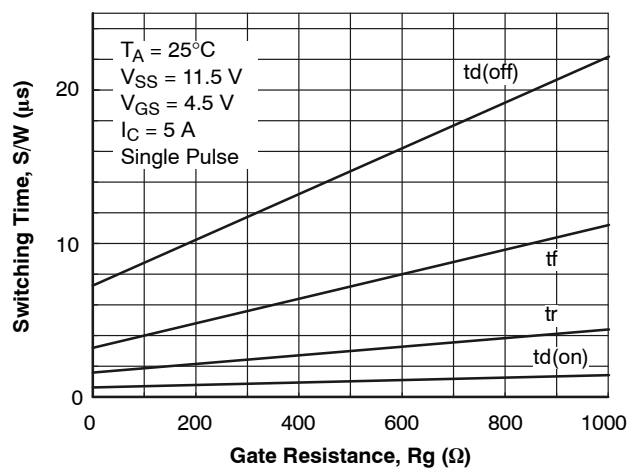


Figure 7. Switching Time vs. Gate Resistance (1)

EFC4K110NUZ

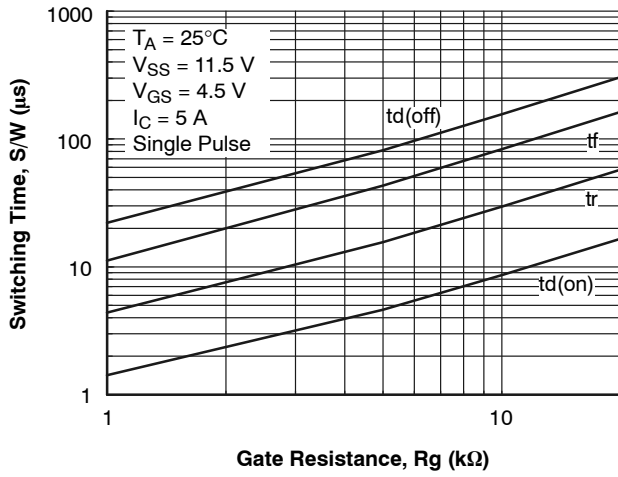


Figure 8. Switching Time vs. Gate Resistance (2)

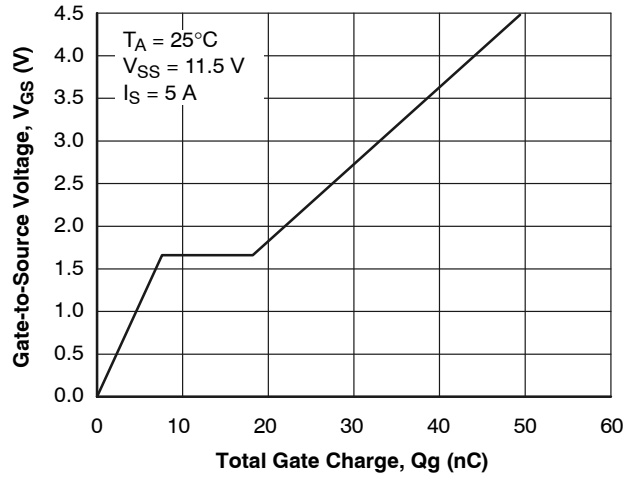


Figure 9. Gate-to-Source Voltage vs. Total Charge

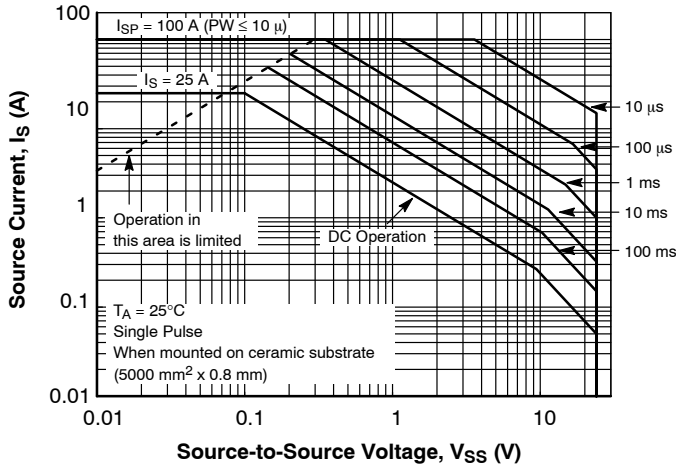


Figure 10. Safe Operating Area

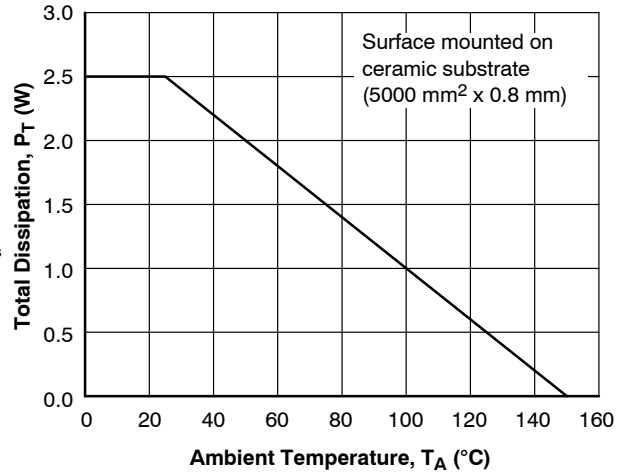


Figure 11. Total Dissipation vs. Temperature

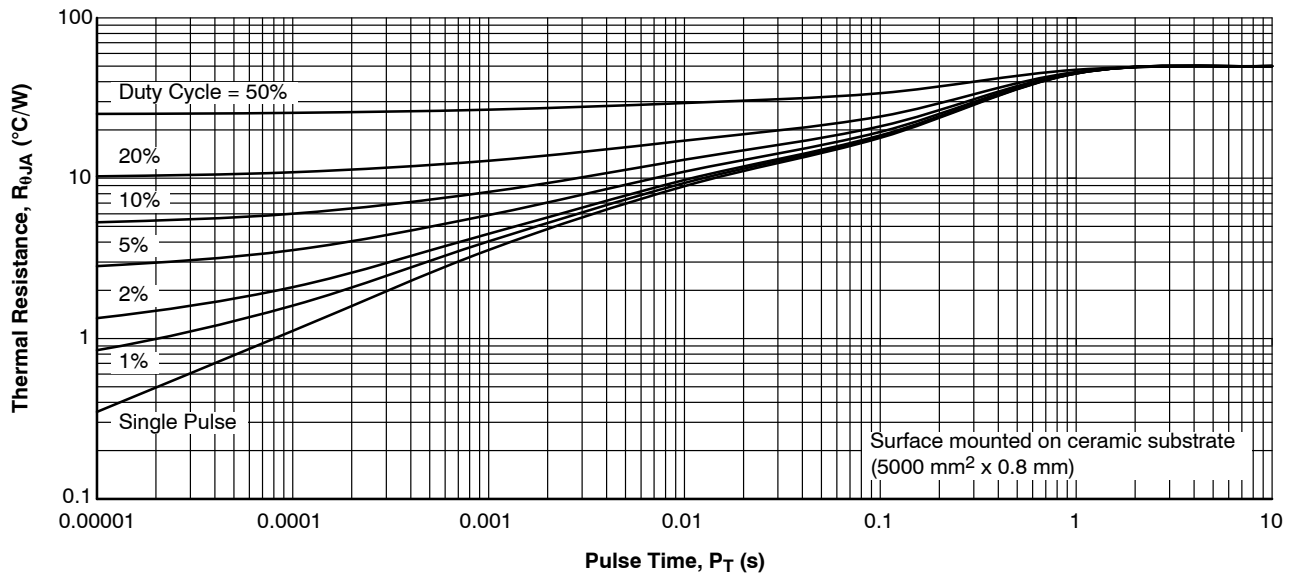


Figure 12. Thermal Response

EFC4K110NUZ

ORDERING INFORMATION

| Device | Marking | Package | Shipping [†] (Qty / Packing) |
|----------------|---------|---|---------------------------------------|
| EFC4K110NUZTDG | PH | WLCSP10, 3.20 x 2.10 x 0.14 (Pb-Free / Halogen Free) | 5000 / Tape & Reel |

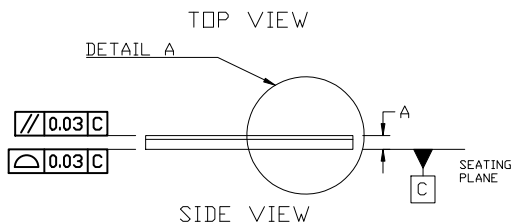
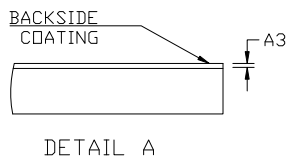
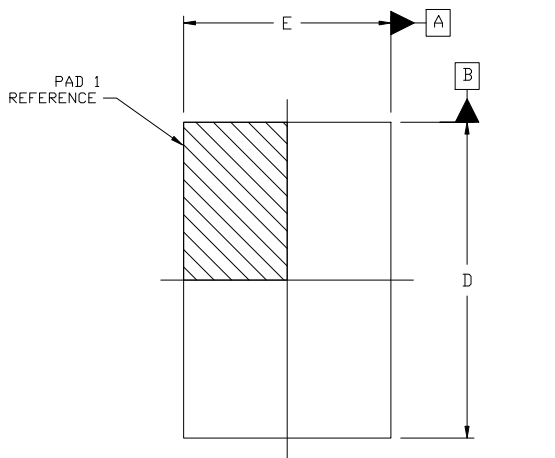
[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

Note on usage: Since the EFC4K110NUZ is a MOSFET product, please avoid using this device in the vicinity of highly charged objects.



WLCSP10 3.2x2.1x0.14
CASE 567XT
ISSUE O

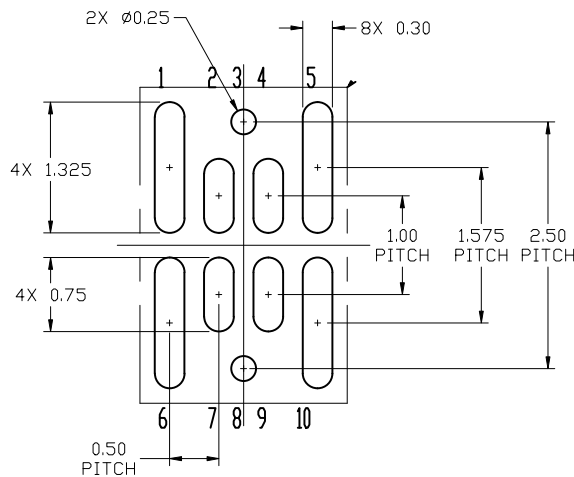
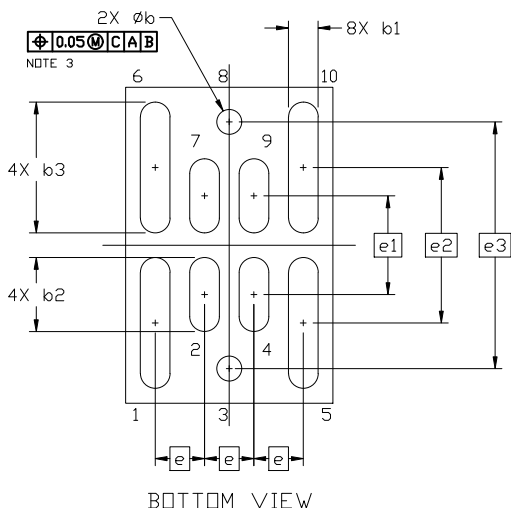
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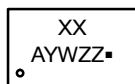
NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. POSITIONAL TOLERANCE APPLIES TO ALL PADS.

| DIM | MILLIMETERS | | |
|-----|-------------|-------|-------|
| | MIN. | NOM. | MAX. |
| A | 0.11 | 0.14 | 0.17 |
| A3 | 0.04 REF | | |
| b | 0.22 | 0.25 | 0.28 |
| b1 | 0.27 | 0.30 | 0.33 |
| b2 | 0.72 | 0.75 | 0.78 |
| b3 | 1.295 | 1.325 | 1.355 |
| D | 3.17 | 3.20 | 3.23 |
| e | 0.50 BSC | | |
| e1 | 1.0 BSC | | |
| e2 | 1.575 BSC | | |
| e3 | 2.50 BSC | | |



GENERIC MARKING DIAGRAM*



- XX = Specific Device Code
- A = Assembly Location
- Y = Year
- W = Work Week
- ZZ = Assembly Lot Code
- = Pb-Free Package

RECOMMENDED MOUNTING FOOTPRINT*

* For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERM/D.

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

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