

# MOSFET - Power, Single N-Channel, WDFN6

## 25 V, 4.1 mΩ, 19.4 A

### Product Preview

## NTLJS4D7N03H

#### Features

- Small Footprint (4 mm<sup>2</sup>) for Compact Design
- Low R<sub>DS(on)</sub> to Minimize Conduction Losses
- Low Q<sub>G</sub> and Capacitance to Minimize Driver Losses
- These Devices are Pb-Free, Halogen-Free/BFR-Free and are RoHS Compliant

#### Applications

- DC-DC Converters
- Wireless Chargers
- Power Load Switch
- Power Management and Protection
- Battery Management

#### MAXIMUM RATINGS (T<sub>J</sub> = 25°C unless otherwise noted)

| Parameter   | Symbol  | Value                 | Unit                  |
|---|---|-----------------------|-----------------------|
| Drain-to-Source Voltage   | V <sub>DSS</sub>                              | 25                    | V                     |
| Gate-to-Source Voltage  | V <sub>GS</sub>                               | ±20                   | V                     |
| Continuous Drain Current R <sub>θJA</sub> (Notes 1, 3)            | Steady State                                  | T <sub>A</sub> = 25°C | I <sub>D</sub> 19.4 A |
|   |   | T <sub>A</sub> = 85°C | 14                    |
| Power Dissipation R <sub>θJA</sub> (Notes 1, 3)                   |   | T <sub>A</sub> = 25°C | P <sub>D</sub> 2.40 W |
| Continuous Drain Current R <sub>θJA</sub> (Notes 2, 3)            | Steady State                                  | T <sub>A</sub> = 25°C | I <sub>D</sub> 11.6 A |
|   |   | T <sub>A</sub> = 85°C | 8.4                   |
| Power Dissipation R <sub>θJA</sub> (Notes 2, 3)                   |   | T <sub>A</sub> = 25°C | P <sub>D</sub> 0.86 W |
| Pulsed Drain Current  | T <sub>A</sub> = 25°C, t <sub>p</sub> = 10 μs | I <sub>DM</sub>       | 78 A                  |
| Operating Junction and Storage Temperature Range                  | T <sub>J</sub> , T <sub>stg</sub>             | -55 to +150           | °C                    |
| Lead Temperature for Soldering Purposes (1/8" from case for 10 s) | T <sub>L</sub>                                | 260                   | °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 MAXIMUM RATINGS (Note 1)

| Parameter                                   | Symbol           | Value | Unit |
|---|------------------|-------|------|
| Junction-to-Ambient - Steady State (Note 1) | R <sub>θJA</sub> | 52    | °C/W |
| Junction-to-Ambient - Steady State (Note 2) | R <sub>θJA</sub> | 145   |      |

1. Surface-mounted on FR4 board using 1 in<sup>2</sup> pad size, 2 oz. Cu pad.
2. Surface-mounted on FR4 board using minimum pad size, 2 oz. Cu pad.
3. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted. Actual continuous current will be limited by thermal & electro-mechanical application board design. R<sub>θCA</sub> is determined by the user's board design.

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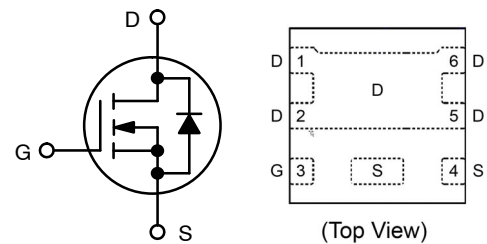


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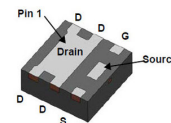
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| V <sub>(BR)DSS</sub> | R <sub>DS(on)</sub> MAX | I <sub>D</sub> MAX |
|----------------------|-------------------------|--------------------|
| 25 V                 | 4.1 mΩ @ 10 V           | 19.4 A             |
|                      | 6.25 mΩ @ 4.5 V         |                    |

#### ELECTRICAL CONNECTION



#### N-CHANNEL MOSFET



WDFN6 (2.05x2.05)  
CASE 483AV

#### MARKING DIAGRAM



YW = Date Code  
ZZ = Assembly Lot Code  
A = Assembly Site Code  
4D7 = Specific Device Code

#### ORDERING INFORMATION

See detailed ordering, marking and shipping information in the package dimensions section on page 4 of this data sheet.

# NTLJS4D7N03H

## ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C unless otherwise noted)

| Parameter   | Symbol                               | Test Condition                                     | Min                    | Typ  | Max  | Unit  |
|---|--------------------------------------|--|------------------------|------|------|-------|
| <b>OFF CHARACTERISTICS</b>                                |                                      |  |                        |      |      |       |
| Drain-to-Source Breakdown Voltage                         | V <sub>(BR)DSS</sub>                 | V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA     | 25                     |      |      | V     |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | V <sub>(BR)DSS</sub> /T <sub>J</sub> | I <sub>D</sub> = 250 μA, ref to 25°C               |                        | 16.2 |      | mV/°C |
| Zero Gate Voltage Drain Current                           | I <sub>DSS</sub>                     | V <sub>GS</sub> = 0 V,<br>V <sub>DS</sub> = 20 V   | T <sub>J</sub> = 25°C  |      | 1    | μA    |
|   |                                      |  | T <sub>J</sub> = 125°C |      | 10   |       |
| Gate-to-Source Leakage Current                            | I <sub>GSS</sub>                     | V <sub>DS</sub> = 0 V, V <sub>GS</sub> = +20/-16 V |                        |      | ±100 | nA    |

## ON CHARACTERISTICS (Note 4)

|                                   |                                 |   |     |       |      |       |
|-----------------------------------|---------------------------------|---|-----|-------|------|-------|
| Gate Threshold Voltage            | V <sub>GS(TH)</sub>             | V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 250 μA | 1.2 |       | 2.1  | V     |
| Threshold Temperature Coefficient | V <sub>GS</sub> /T <sub>J</sub> | I <sub>D</sub> = 250 μA, ref to 25°C                        |     | -4.76 |      | mV/°C |
| Drain-to-Source On Resistance     | R <sub>DS(on)</sub>             | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 10 A               |     | 3.35  | 4.1  | mΩ    |
|                                   |                                 | V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 10 A              |     | 5.02  | 6.25 |       |
| Forward Transconductance          | g <sub>FS</sub>                 | V <sub>DS</sub> = 5 V, I <sub>D</sub> = 10 A                |     | 47    |      | S     |
| Gate Resistance                   | R <sub>G</sub>                  | T <sub>A</sub> = 25°C                                       |     | 1     |      | Ω     |

## CHARGES AND CAPACITANCES

|                              |                     |   |  |     |  |    |
|------------------------------|---------------------|---|--|-----|--|----|
| Input Capacitance            | C <sub>iss</sub>    | V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 15 V,<br>f = 1.0 MHz             |  | 851 |  | pF |
| Output Capacitance           | C <sub>oss</sub>    |   |  | 524 |  |    |
| Reverse Transfer Capacitance | C <sub>rss</sub>    |   |  | 35  |  |    |
| Total Gate Charge            | Q <sub>G(TOT)</sub> | V <sub>GS</sub> = 4.5 V, V <sub>DS</sub> = 15 V,<br>I <sub>D</sub> = 10 A |  | 6.7 |  | nC |
| Threshold Gate Charge        | Q <sub>G(TH)</sub>  |   |  | 1.2 |  |    |
| Gate-to-Source Charge        | Q <sub>GS</sub>     |   |  | 2.3 |  |    |
| Gate-to-Drain Charge         | Q <sub>GD</sub>     |   |  | 2.2 |  |    |
| Total Gate Charge            | Q <sub>G(TOT)</sub> | V <sub>GS</sub> = 10 V, V <sub>DS</sub> = 15 V,<br>I <sub>D</sub> = 10 A  |  | 14  |  | nC |

## SWITCHING CHARACTERISTICS, V<sub>GS</sub> = 4.5 V (Note 5)

|                     |                     |   |  |     |  |    |
|---------------------|---------------------|---|--|-----|--|----|
| Turn-On Delay Time  | t <sub>d(on)</sub>  | V <sub>GS</sub> = 4.5 V, V <sub>DD</sub> = 15 V,<br>I <sub>D</sub> = 10 A, R <sub>G</sub> = 6 Ω |  | 9.3 |  | ns |
| Rise Time           | t <sub>r</sub>      |   |  | 8   |  |    |
| Turn-Off Delay Time | t <sub>d(off)</sub> |   |  | 15  |  |    |
| Fall Time           | t <sub>f</sub>      |   |  | 7.7 |  |    |

## SWITCHING CHARACTERISTICS, V<sub>GS</sub> = 10 V (Note 5)

|                     |                     |  |  |      |  |    |
|---------------------|---------------------|--|--|------|--|----|
| Turn-On Delay Time  | t <sub>d(on)</sub>  | V <sub>GS</sub> = 10 V, V <sub>DD</sub> = 15 V,<br>I <sub>D</sub> = 10 A, R <sub>G</sub> = 6 Ω |  | 6.8  |  | ns |
| Rise Time           | t <sub>r</sub>      |  |  | 2.7  |  |    |
| Turn-Off Delay Time | t <sub>d(off)</sub> |  |  | 19.6 |  |    |
| Fall Time           | t <sub>f</sub>      |  |  | 4.8  |  |    |

## DRAIN-SOURCE DIODE CHARACTERISTICS

|                         |                 |   |                        |  |      |     |    |
|-------------------------|-----------------|---|------------------------|--|------|-----|----|
| Forward Diode Voltage   | V <sub>SD</sub> | V <sub>GS</sub> = 0 V,<br>I <sub>S</sub> = 10 A                                 | T <sub>J</sub> = 25°C  |  | 0.79 | 1.2 | V  |
|                         |                 |   | T <sub>J</sub> = 125°C |  | 0.65 |     |    |
| Reverse Recovery Time   | t <sub>RR</sub> | V <sub>GS</sub> = 0 V, dI <sub>S</sub> /dt = 100 A/μs,<br>I <sub>S</sub> = 10 A |                        |  | 32.6 |     | ns |
| Reverse Recovery Charge | Q <sub>RR</sub> |   |                        |  | 14.3 |     | 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.

4. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.

5. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

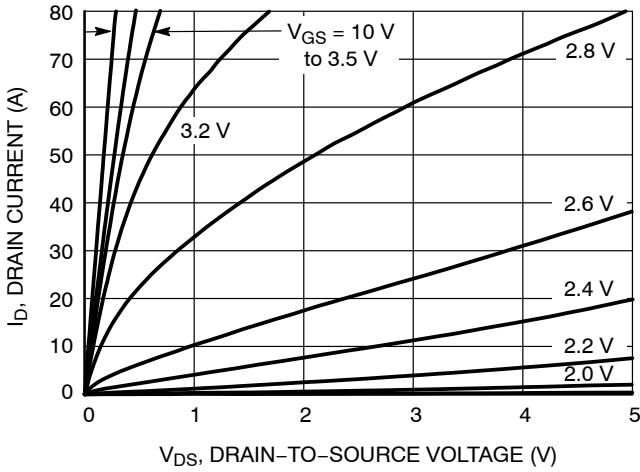


Figure 1. On-Region Characteristics

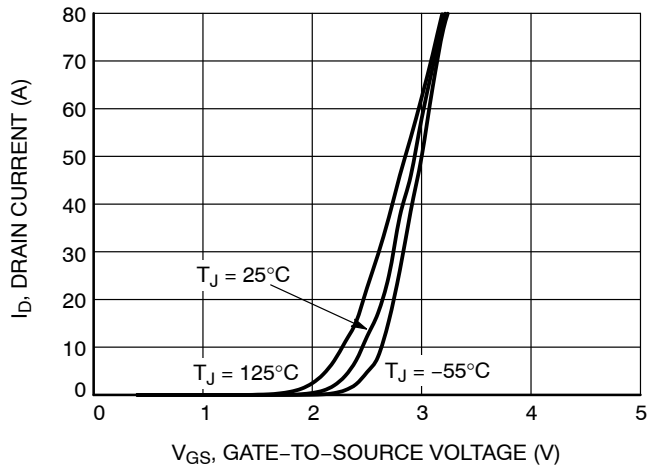


Figure 2. Transfer Characteristics

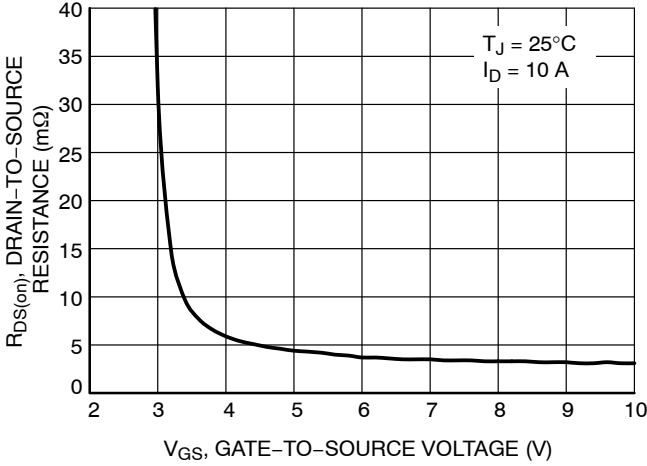


Figure 3. On-Resistance vs. Gate-to-Source Voltage (V)

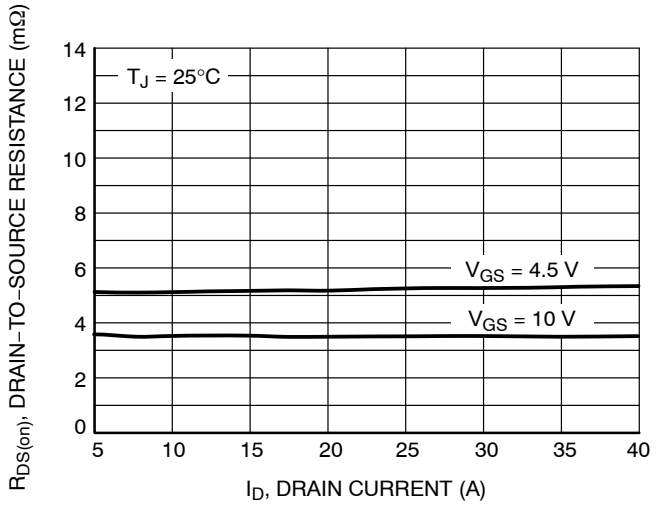


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

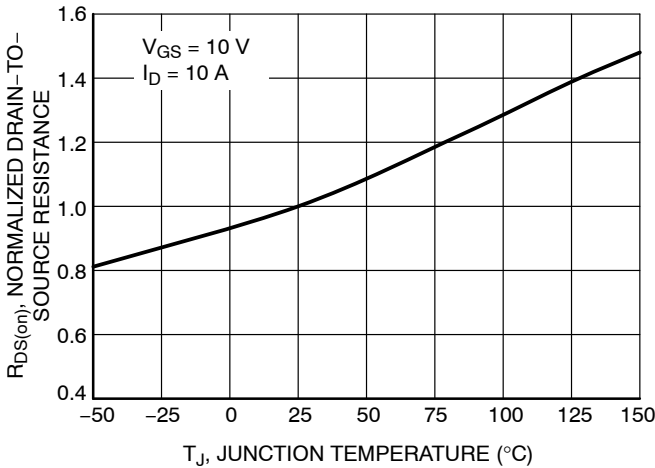


Figure 5. On-Resistance Variation with Temperature

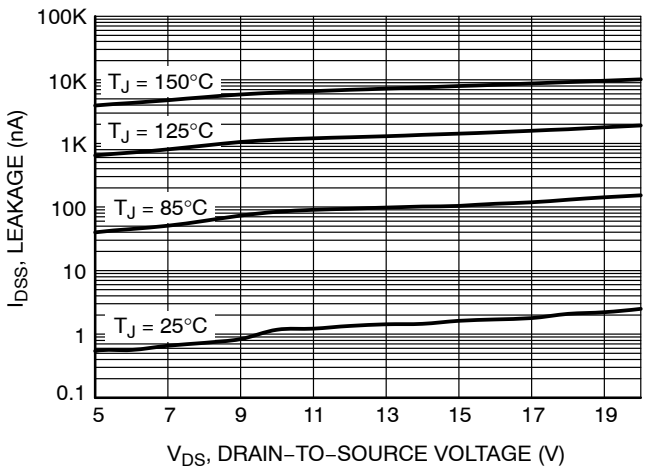


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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## TYPICAL CHARACTERISTICS

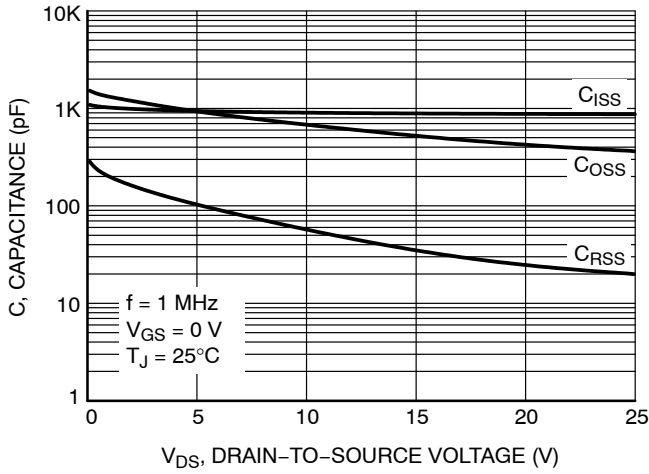


Figure 7. Capacitance Variation

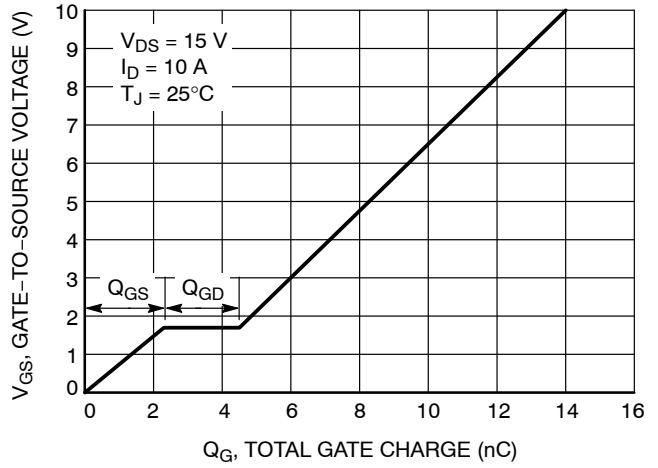


Figure 8. Gate-to-Source vs. Total Charge

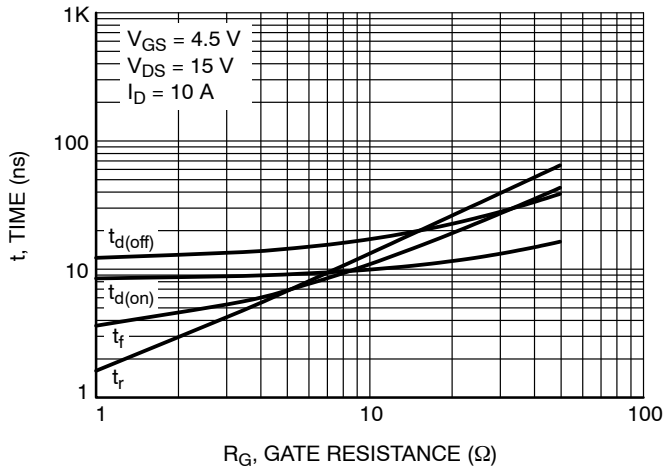


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

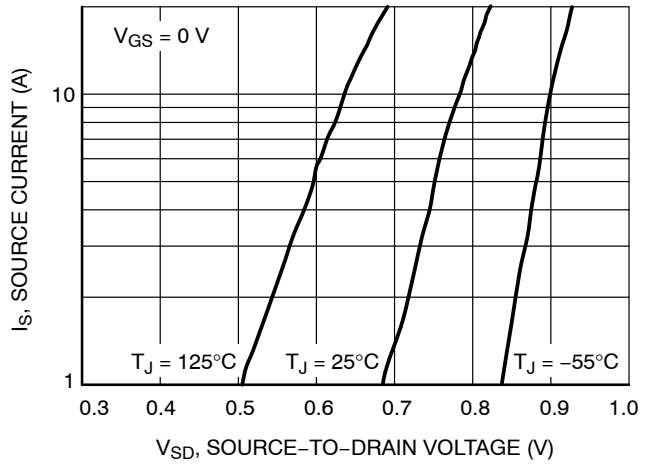


Figure 10. Diode Forward Voltage vs. Current

### DEVICE ORDERING INFORMATION

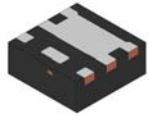
| Device          | Package            | Shipping†          |
|-----------------|--------------------|--------------------|
| NTLJS4D7N03HTAG | WDFN6<br>(Pb-Free) | 3000 / Tape & Reel |

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

# MECHANICAL CASE OUTLINE

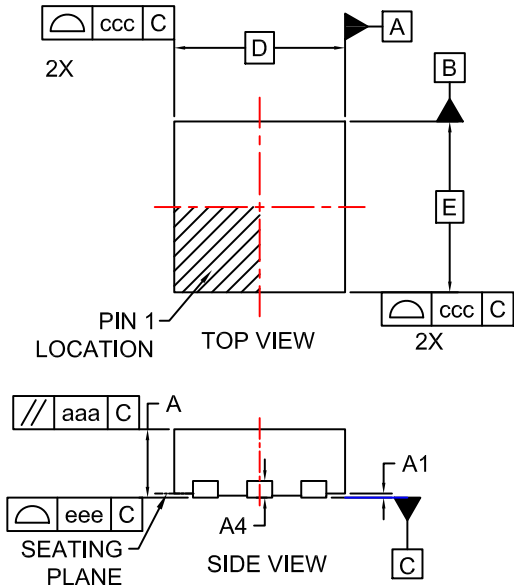
## PACKAGE DIMENSIONS

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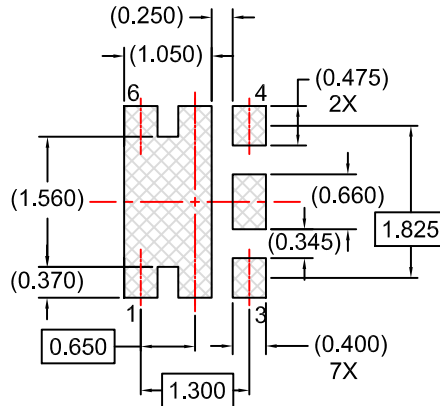


WDFN6 2.05X2.05, 0.65P  
CASE 483AV  
ISSUE A

DATE 02 APR 2019

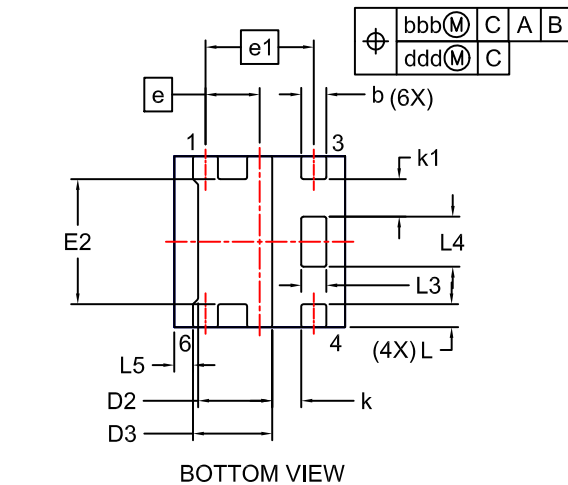


### LAND PATTERN RECOMMENDATION



### NOTES:

1. CONTROLLING DIMENSION: MILLIMETERS.
2. COPLANARITY APPLIES TO THE EXPOSED PADS AS WELL AS THE TERMINALS.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.
4. SEATING PLANE IS DEFINED BY THE TERMINALS. "A1" IS DEFINED AS THE DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT ON THE PACKAGE BODY.



| DIM | MILLIMETERS |      |      |
|-----|-------------|------|------|
|     | MIN.        | NOM. | MAX. |
| A   | 0.60        | 0.70 | 0.80 |
| A1  | 0.00        | -    | 0.05 |
| A4  | (0.20)      |      |      |
| b   | 0.25        | 0.30 | 0.35 |
| D   | 1.95        | 2.05 | 2.15 |
| D2  | 0.84        | 0.89 | 0.94 |
| D3  | (0.95)      |      |      |
| E   | 1.95        | 2.05 | 2.15 |
| E2  | 1.45        | 1.50 | 1.55 |
| e   | 0.65 BSC    |      |      |
| e1  | 1.30 BSC    |      |      |
| k   | (0.35)      |      |      |
| k1  | (0.45)      |      |      |
| L   | 0.18        | 0.28 | 0.38 |
| L3  | 0.25        | 0.30 | 0.35 |
| L4  | 0.55        | 0.60 | 0.65 |
| L5  | (0.23)      |      |      |
| aaa | 0.10        |      |      |
| bbb | 0.10        |      |      |
| ccc | 0.05        |      |      |
| ddd | 0.05        |      |      |
| eee | 0.05        |      |      |

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