



## DESCRIPTION

The AM009NS06HPJ is available in PDFN8(5x6) Package.

| VDSS | RDSON | ID   |
|------|-------|------|
| 60V  | 0.9mΩ | 300A |

## APPLICATIONS

- Battery management
- Synchronous Rectification in SMPS
- Motor driver

## ORDERING INFORMATION

| Package Type                     | Part Number    |                |
|----------------------------------|----------------|----------------|
| PDFN8(5x6)<br>SPQ: 5,000pcs/Reel | PJ8            | AM009NS06HPJ8R |
| Note                             | R: Tape & Reel |                |
| AiT provides all RoHS products   |                |                |

## ABSOLUTE MAXIMUM RATINGS

T<sub>C</sub> = 25°C, unless otherwise specified.

|                                                                               |                        |                |
|-------------------------------------------------------------------------------|------------------------|----------------|
| V <sub>DSS</sub> , Drain-to-Source Voltage <sup>(1)</sup>                     |                        | 60V            |
| V <sub>GSS</sub> , Gate-to-Source Voltage                                     |                        | ±20V           |
| I <sub>D</sub> , Continuous Drain Current                                     | T <sub>C</sub> = 25°C  | 300A           |
|                                                                               | T <sub>C</sub> = 100°C | 205A           |
| I <sub>DM</sub> , Pulsed Drain Current at V <sub>GS</sub> =10V <sup>(2)</sup> |                        | 1160A          |
| E <sub>AS</sub> , Single Pulsed Avalanche Energy, L=1mH                       |                        | 1050mJ         |
| P <sub>D</sub> , Power Dissipation T <sub>C</sub> = 25°C                      |                        | 178W           |
| P <sub>D</sub> , Derating Factor above T <sub>A</sub> =25°C                   |                        | 1.43W          |
| R <sub>θJC</sub> , Thermal Resistance, Junction-to-Case                       |                        | 0.68°C/W       |
| R <sub>θJA</sub> , Thermal Resistance, Junction-to-Ambient                    |                        | 50°C/W         |
| T <sub>STG</sub> , Storage Temperature Range                                  |                        | -55°C ~ +175°C |
| T <sub>J</sub> , Junction Temperature Range                                   |                        | -55°C ~ +175°C |

Stresses above may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated in the Electrical Characteristics are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

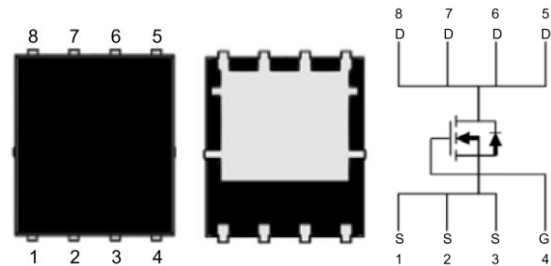
(1) T<sub>J</sub>=+25°C to +175°C .

(2) Repetitive rating; pulse width limited by maximum junction temperature.

## FEATURE

- 60V, 300A
- R<sub>DS(ON)</sub> Typ.=0.9mΩ @ V<sub>GS</sub> =10V
- Proprietary New Trench Technology
- Fast Switching and High Efficiency
- Low On-Resistance

## PIN DESCRIPTION



| Pin #   | Symbol | Function |
|---------|--------|----------|
| 1, 2, 3 | S      | Source   |
| 4       | G      | Gate     |
| 5,6,7,8 | D      | Drain    |



## ELECTRICAL CHARACTERISTICS

T<sub>J</sub> = 25°C, unless otherwise specified.

| Parameter                           | Symbol              | Conditions                                                                              | Min | Typ. | Max  | Unit |
|-------------------------------------|---------------------|-----------------------------------------------------------------------------------------|-----|------|------|------|
| Off Characteristics                 |                     |                                                                                         |     |      |      |      |
| Drain-to-Source Breakdown Voltage   | BV <sub>DSS</sub>   | V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA                                            | 60  | -    | -    | V    |
| Drain-to-Source Leakage Current     | I <sub>DSS</sub>    | V <sub>DS</sub> =60V, V <sub>GS</sub> =0V                                               | -   | -    | 1    | μA   |
|                                     |                     | V <sub>DS</sub> =48V, V <sub>GS</sub> =0V, T <sub>J</sub> =125°C                        |     |      | 100  |      |
| Gate-to-Source Leakage Current      | I <sub>GSS</sub>    | V <sub>GS</sub> = +20V, V <sub>DS</sub> =0V                                             | -   | -    | +100 | nA   |
|                                     |                     | V <sub>GS</sub> = -20V, V <sub>DS</sub> =0V                                             | -   | -    | -100 |      |
| On Characteristics                  |                     |                                                                                         |     |      |      |      |
| Gate Threshold Voltage              | V <sub>GS(TH)</sub> | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA                              | 2.0 | -    | 4.0  | V    |
| Static Drain-Source ON-Resistance * | R <sub>DS(ON)</sub> | V <sub>GS</sub> = 10V, I <sub>D</sub> = 20A                                             | -   | 0.9  | 1.1  | mΩ   |
| Dynamic Characteristics             |                     |                                                                                         |     |      |      |      |
| Input Capacitance                   | C <sub>iss</sub>    | V <sub>DS</sub> = 30V, V <sub>GS</sub> =0V, f=100kHz                                    | -   | 6904 | -    | pF   |
| Output Capacitance                  | C <sub>oss</sub>    |                                                                                         | -   | 2748 | -    |      |
| Reverse Transfer Capacitance        | C <sub>rss</sub>    |                                                                                         | -   | 108  | -    |      |
| Gate Series Resistance              | R <sub>G</sub>      | f=1.0MHz                                                                                | -   | 2.5  | -    | Ω    |
| Total Gate Charge                   | Q <sub>g</sub>      | V <sub>DD</sub> = 30V , I <sub>D</sub> =20A<br>V <sub>GS</sub> =10V                     | -   | 108  | -    | nC   |
| Gate-Source Charge                  | Q <sub>gs</sub>     |                                                                                         | -   | 26   | -    |      |
| Gate-Drain(“Miller”) Charge         | Q <sub>gd</sub>     |                                                                                         | -   | 24   | -    |      |
| Resistive Switching Characteristics |                     |                                                                                         |     |      |      |      |
| Turn-On Delay Time                  | t <sub>d(on)</sub>  | V <sub>DD</sub> =30V, I <sub>D</sub> = 20A<br>R <sub>G</sub> =3Ω, V <sub>GS</sub> = 10V | -   | 30   | -    | ns   |
| Rise Time                           | t <sub>r</sub>      |                                                                                         | -   | 23   | -    |      |
| Turn-Off Delay Time                 | t <sub>d(off)</sub> |                                                                                         | -   | 108  | -    |      |
| Fall Time                           | t <sub>f</sub>      |                                                                                         | -   | 42   | -    |      |
| Source-Drain Diode Characteristics  |                     |                                                                                         |     |      |      |      |
| Continuous Source Current           | I <sub>SD</sub>     | Integral PN-diode in MOSFET                                                             | -   | -    | 300  | A    |
| Pulsed Source Current               | I <sub>SM</sub>     |                                                                                         | -   | -    | 1160 | A    |
| Diode Forward Voltage               | V <sub>SD</sub>     | V <sub>GS</sub> =0V, I <sub>S</sub> = 30A                                               | -   | -    | 1.2  | V    |
| Reverse Recovery Time               | t <sub>rr</sub>     | I <sub>F</sub> = 20A, V <sub>GS</sub> =0V                                               | -   | 100  | -    | ns   |
| Reverse Recovery Charge             | Q <sub>rr</sub>     | di/dt=100A/us                                                                           | -   | 70   | -    | nC   |

\* Pulse Width≤380μs, Duty Cycle≤2%.



## TYPICAL PERFORMANCE CHARACTERISTICS

Fig 1. On-Region Characteristics

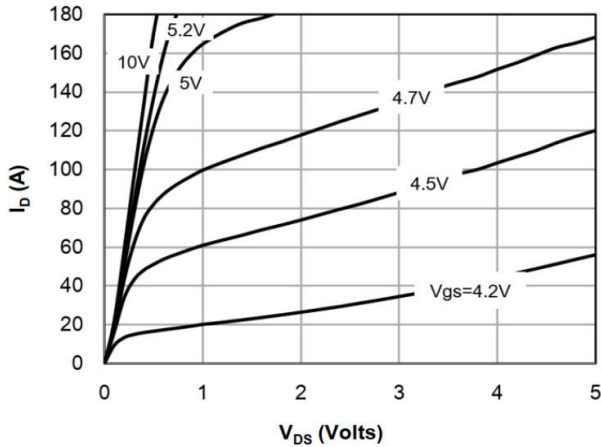


Fig 2. Transfer Characteristics

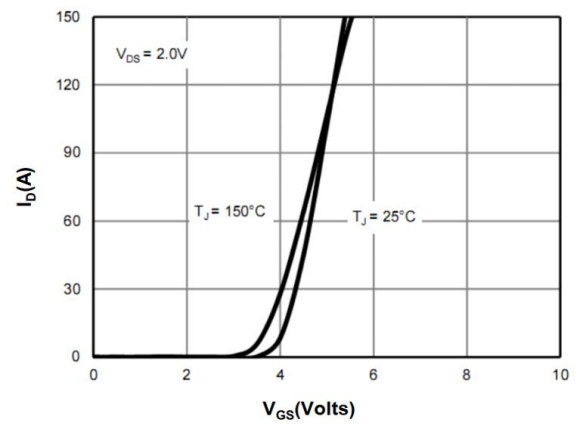


Fig 3. On-Resistance  
vs. Drain Current and Gate Voltage

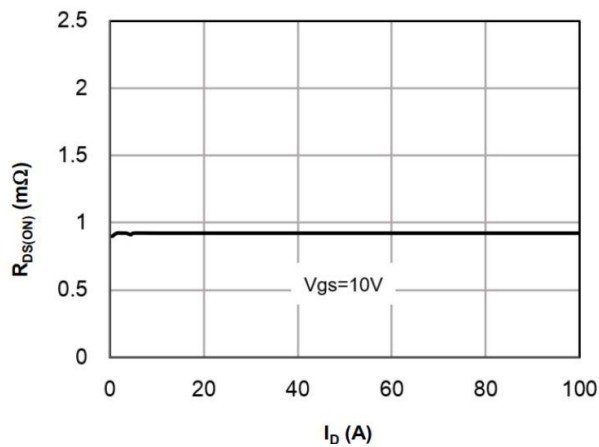


Fig 4. On-Resistance vs. Junction Temperature

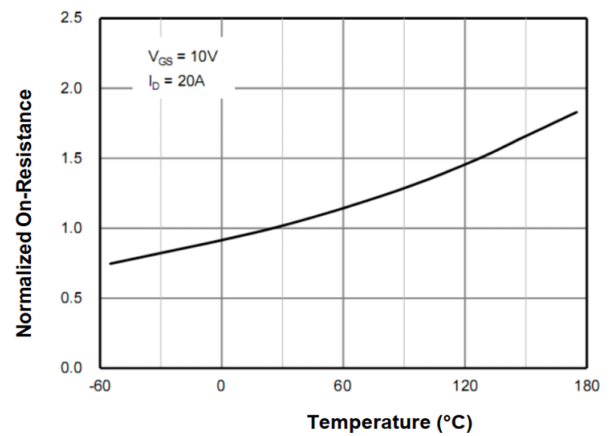


Fig 5. On-Resistance vs. Gate-Source Voltage

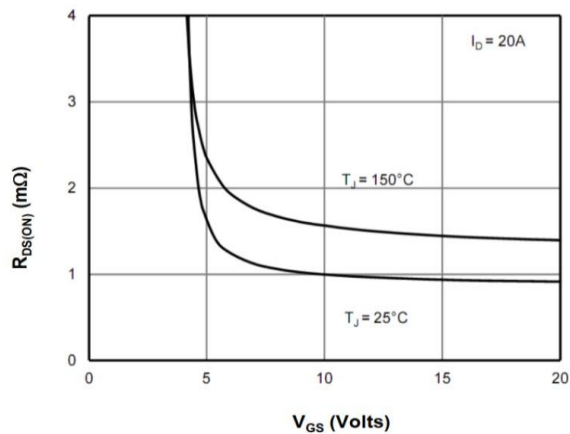


Fig 6. Body-Diode Characteristics

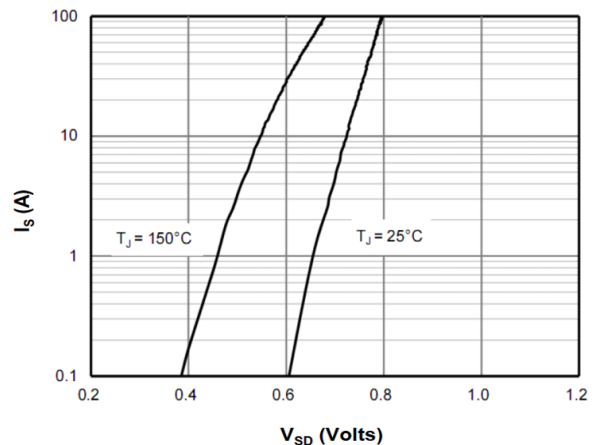




Fig 7. Gate-Charge Characteristics

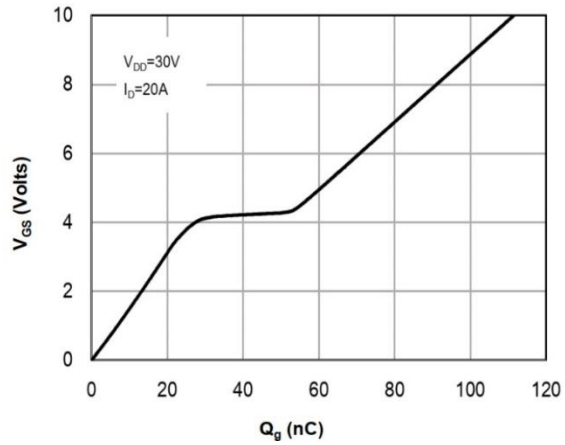


Fig 8. Capacitance Characteristics

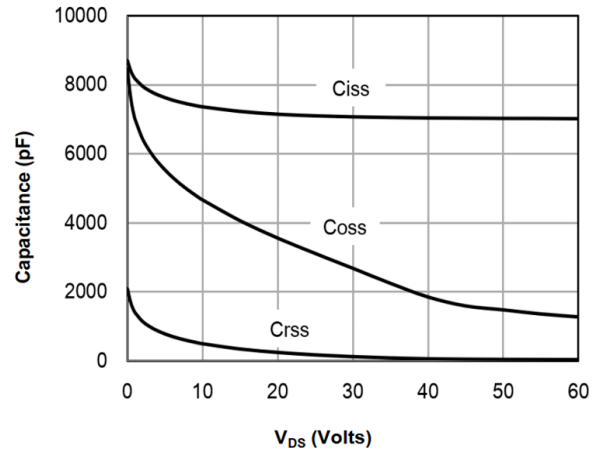
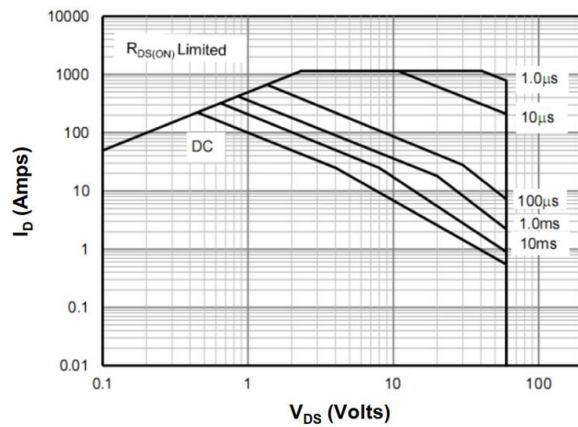


Fig 9. Maximum Forward Biased Safe Operating Area





## TEST CIRCUITS AND WAVEFORMS

Fig 10. Peak Diode Recovery dv/dt Test Circuit

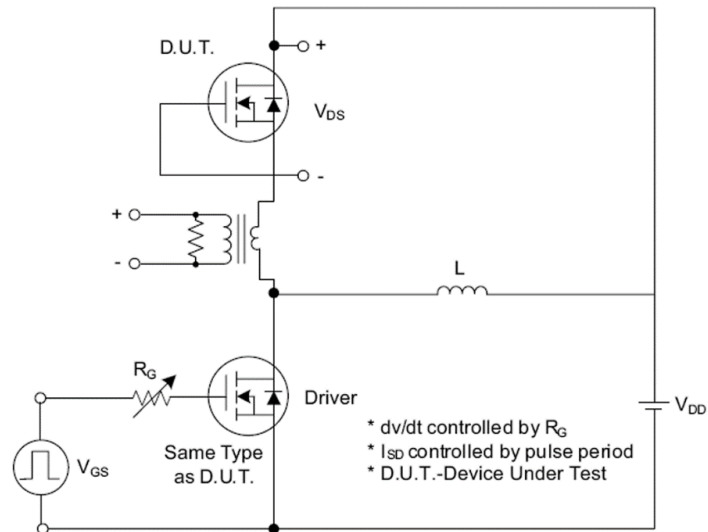


Fig 11. Peak Diode Recovery dv/dt Waveforms

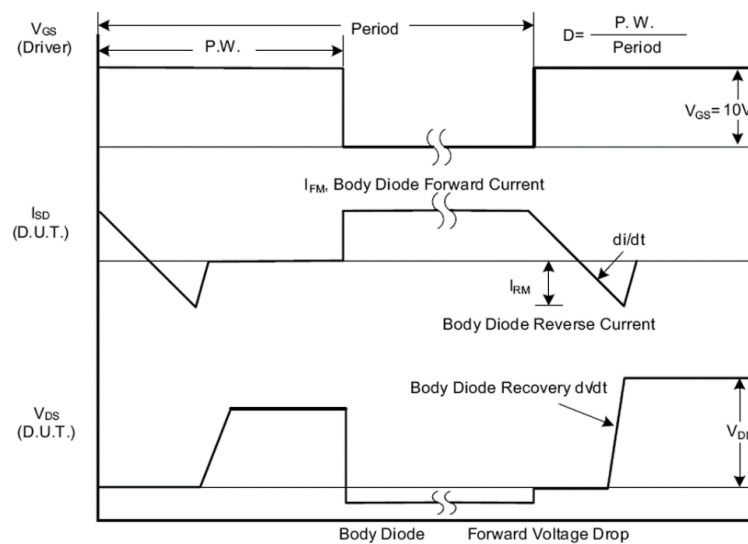




Fig 12. Switching Teat Circuit

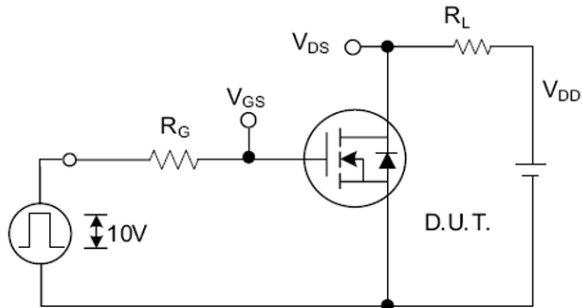


Fig 13. Switching Waveforms

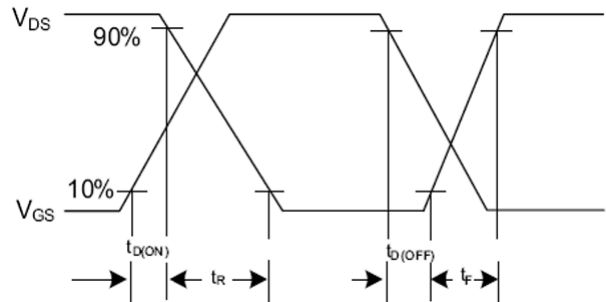


Fig 14. Gate Charge Test Circuit

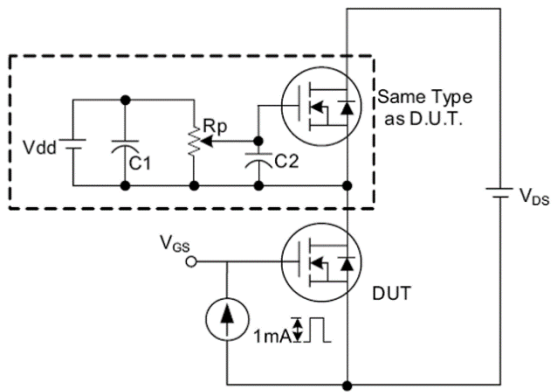


Fig 15. Gate Charge Waveform

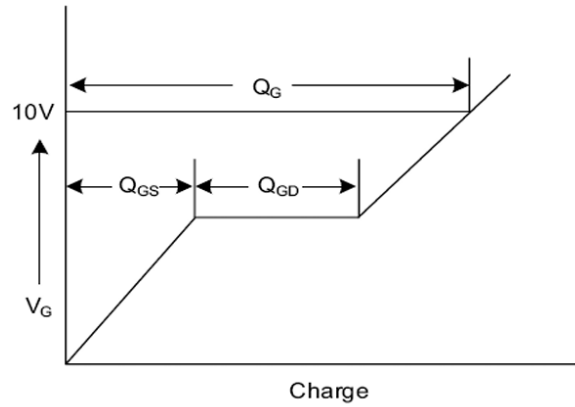


Fig 16. Unclamped Inductive Switching Teat Circuit

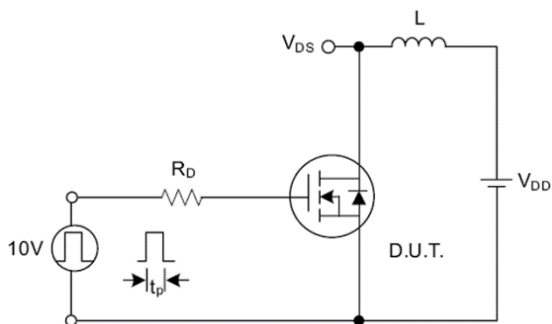
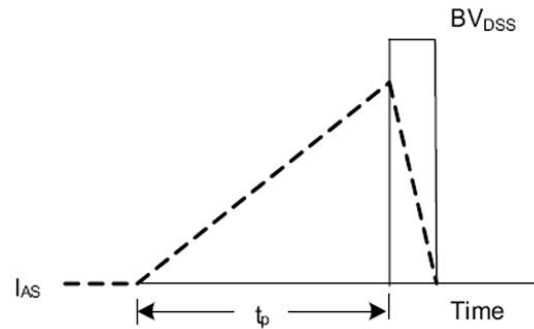


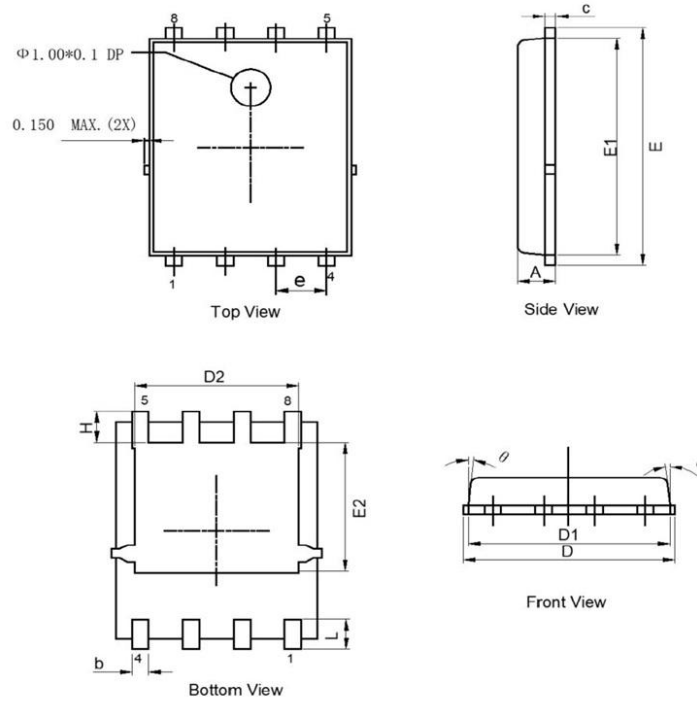
Fig 17. Unclamped Inductive Switching Waveform





## PACKAGE INFORMATION

Dimension in PDFN8 (5x6) (Unit: mm)



| Symbol   | Millimeters |       |
|----------|-------------|-------|
|          | Min.        | Max.  |
| A        | 0.900       | 1.100 |
| b        | 0.310       | 0.510 |
| c        | 0.210       | 0.340 |
| D        | 5.050       | 5.400 |
| D1       | 4.950       | 5.150 |
| D2       | 4.000       | 4.200 |
| E        | 6.300       | 6.500 |
| E1       | 5.750       | 5.950 |
| E2       | 3.430       | 3.630 |
| e        | 1.270 BSC.  |       |
| H        | 0.730       | 0.930 |
| J        | 0.610       | 0.810 |
| $\theta$ | 0°          | 12°   |



## IMPORTANT NOTICE

AiT Semiconductor Inc. (AiT) reserves the right to make changes to any its product, specifications, to discontinue any integrated circuit product or service without notice, and advises its customers to obtain the latest version of relevant information to verify, before placing orders, that the information being relied on is current.

AiT Semiconductor Inc. integrated circuit products are not designed, intended, authorized, or warranted to be suitable for use in life support applications, devices or systems or other critical applications. Use of AiT products in such applications is understood to be fully at the risk of the customer. As used herein may involve potential risks of death, personal injury, or server property, or environmental damage. In order to minimize risks associated with the customer's applications, the customer should provide adequate design and operating safeguards.

AiT Semiconductor Inc. assumes to no liability to customer product design or application support. AiT warrants the performance of its products of the specifications applicable at the time of sale.