

## N-Channel Logic Level Enhancement Mode Power MOSFET

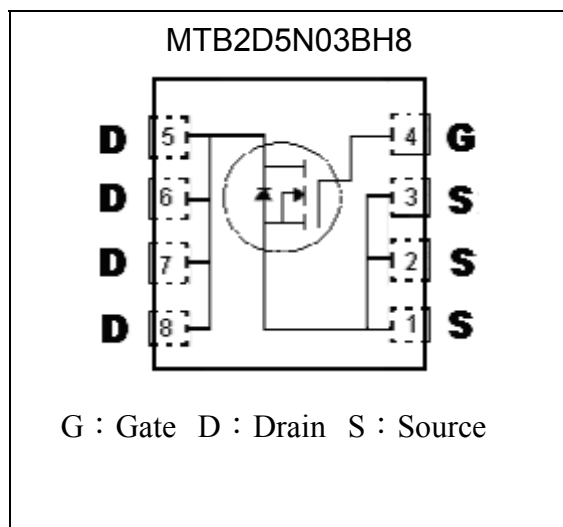
# MTB2D5N03BH8

### Features

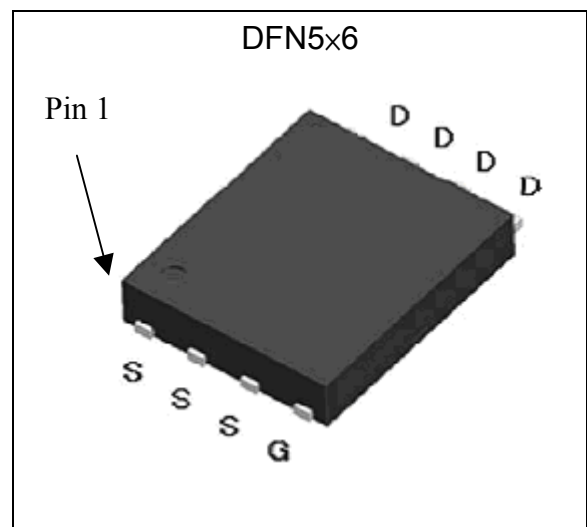
- Single Drive Requirement
- Low On-resistance
- Fast Switching Characteristic
- Dynamic dv/dt rating
- Repetitive Avalanche Rated
- Pb-free lead plating and Halogen-free package

|                                                                  |                     |
|------------------------------------------------------------------|---------------------|
| <b>BV<sub>DSS</sub></b>                                          | <b>30V</b>          |
| <b>I<sub>D</sub>@V<sub>GS</sub>=10V, T<sub>C</sub>=25°C</b>      | <b>60A</b>          |
| <b>I<sub>D</sub>@V<sub>GS</sub>=10V, T<sub>A</sub>=25°C</b>      | <b>20A</b>          |
| <b>R<sub>DS(ON)</sub>@V<sub>GS</sub>=10V, I<sub>D</sub>=30A</b>  | <b>2.1 mΩ (typ)</b> |
| <b>R<sub>DS(ON)</sub>@V<sub>GS</sub>=4.5V, I<sub>D</sub>=24A</b> | <b>2.9 mΩ (typ)</b> |

### Symbol

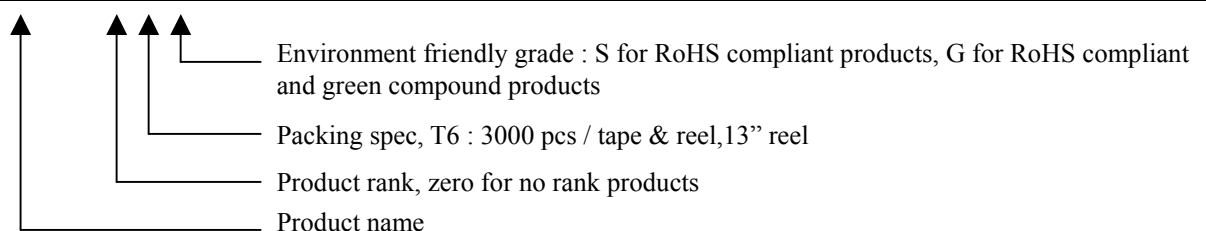


### Outline



### Ordering Information

| Device              | Package                                                     | Shipping               |
|---------------------|-------------------------------------------------------------|------------------------|
| MTB2D5N03BH8-0-T6-G | DFN 5 x6<br>(Pb-free lead plating and halogen-free package) | 3000 pcs / tape & reel |



**Absolute Maximum Ratings** (Ta=25°C)

| Parameter                                                                             |                       | Symbol                            | Limits   | Unit |
|---------------------------------------------------------------------------------------|-----------------------|-----------------------------------|----------|------|
| Drain-Source Voltage                                                                  |                       | V <sub>DS</sub>                   | 30       | V    |
| Gate-Source Voltage                                                                   |                       | V <sub>GS</sub>                   | ±20      |      |
| Continuous Drain Current @ T <sub>C</sub> =25°C, V <sub>GS</sub> =10V(Silicon limit)  |                       | I <sub>D</sub>                    | 90       | A    |
| Continuous Drain Current @ T <sub>C</sub> =100°C, V <sub>GS</sub> =10V(Silicon limit) |                       |                                   | 57       |      |
| Continuous Drain Current @ T <sub>C</sub> =25°C, V <sub>GS</sub> =10V(Package limit)  |                       |                                   | 60       |      |
| Continuous Drain Current @ T <sub>A</sub> =25°C, V <sub>GS</sub> =10V                 |                       | I <sub>DSM</sub>                  | 20   *3  |      |
| Continuous Drain Current @ T <sub>A</sub> =70°C, V <sub>GS</sub> =10V                 |                       |                                   | 16   *3  |      |
| Pulsed Drain Current                                                                  |                       | I <sub>DM</sub>                   | 200   *1 |      |
| Avalanche Current                                                                     |                       | I <sub>AS</sub>                   | 53       |      |
| Avalanche Energy @ L=0.1mH, I <sub>D</sub> =53A, R <sub>G</sub> =25 Ω                 |                       | E <sub>AS</sub>                   | 140      | mJ   |
| Total Power Dissipation                                                               | T <sub>C</sub> =25°C  | P <sub>D</sub>                    | 50       | W    |
|                                                                                       | T <sub>C</sub> =100°C |                                   | 20       |      |
|                                                                                       | T <sub>A</sub> =25°C  | P <sub>DSM</sub>                  | 2.5   *3 |      |
|                                                                                       | T <sub>A</sub> =70°C  |                                   | 1.6   *3 |      |
| Operating Junction and Storage Temperature Range                                      |                       | T <sub>j</sub> , T <sub>stg</sub> | -55~+150 | °C   |

100% UIS testing in condition of V<sub>D</sub>=15V, L=0.1mH, V<sub>G</sub>=10V, I<sub>L</sub>=30A, Rated V<sub>DS</sub>=30V N-CH**Thermal Data**

| Parameter                                    | Symbol              | Value | Unit |
|----------------------------------------------|---------------------|-------|------|
| Thermal Resistance, Junction-to-case, max    | R <sub>th,j-c</sub> | 2.5   | °C/W |
| Thermal Resistance, Junction-to-ambient, max | R <sub>th,j-a</sub> | 50 *3 | °C/W |

Note : 1. Pulse width limited by maximum junction temperature

2. Duty cycle≤1%

3. Surface mounted on 1 in<sup>2</sup> copper pad of FR-4 board, t≤10s; 125°C/W when mounted on minimum copper pad.**Characteristics (T<sub>C</sub>=25°C, unless otherwise specified)**

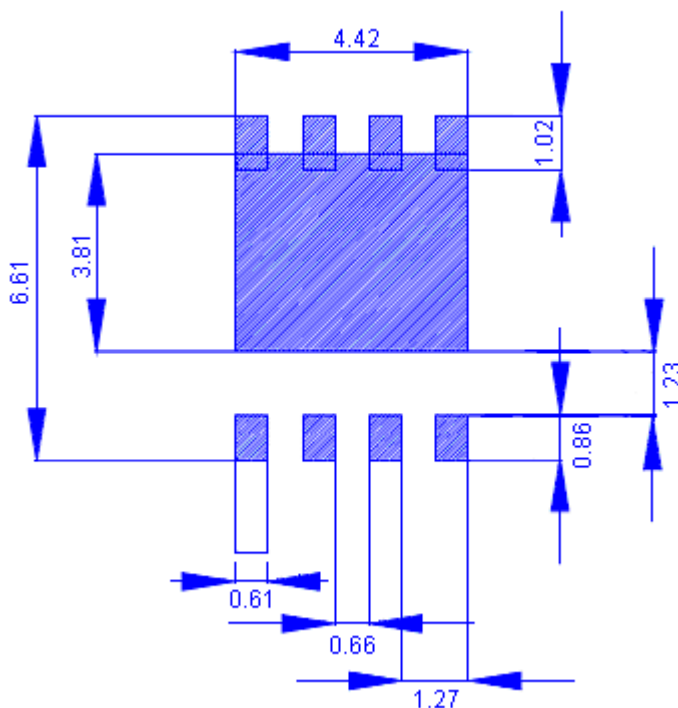
| Symbol                 | Min. | Typ. | Max. | Unit | Test Conditions                                                  |
|------------------------|------|------|------|------|------------------------------------------------------------------|
| <b>Static</b>          |      |      |      |      |                                                                  |
| BV <sub>DSS</sub>      | 30   | -    | -    | V    | V <sub>GS</sub> =0V, I <sub>D</sub> =250μA                       |
| V <sub>GS(th)</sub>    | 1.0  | -    | 2.5  | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> =250μA        |
| G <sub>FS</sub> *1     | -    | 50   | -    | S    | V <sub>DS</sub> =5V, I <sub>D</sub> =20A                         |
| I <sub>GSS</sub>       | -    | -    | ±100 | nA   | V <sub>GS</sub> =±20V                                            |
| I <sub>DSS</sub>       | -    | -    | 1    | μA   | V <sub>DS</sub> =24V, V <sub>GS</sub> =0V                        |
|                        | -    | -    | 25   |      | V <sub>DS</sub> =20V, V <sub>GS</sub> =0V, T <sub>j</sub> =125°C |
| R <sub>DS(ON)</sub> *1 | -    | 2.1  | 2.9  | mΩ   | V <sub>GS</sub> =10V, I <sub>D</sub> =30A                        |
|                        | -    | 2.9  | 4.0  | mΩ   | V <sub>GS</sub> =4.5V, I <sub>D</sub> =24A                       |
| <b>Dynamic</b>         |      |      |      |      |                                                                  |
| C <sub>iss</sub>       | -    | 2743 | -    | pF   | V <sub>GS</sub> =0V, V <sub>DS</sub> =15V, f=1MHz                |
| C <sub>oss</sub>       | -    | 495  | -    |      |                                                                  |
| C <sub>rss</sub>       | -    | 293  | -    |      |                                                                  |

### Characteristics (T<sub>c</sub>=25°C, unless otherwise specified)

| Symbol              | Min. | Typ. | Max. | Unit | Test Conditions                       |
|---------------------|------|------|------|------|---------------------------------------|
| Qg (VGS=10V) *1, 2  | -    | 55.5 | -    | nC   | VDS=15V, VGS=10V, ID=30A              |
| Qg (VGS=4.5V) *1, 2 | -    | 27.6 | -    |      |                                       |
| Qgs *1, 2           | -    | 9.7  | -    |      |                                       |
| Qgd *1, 2           | -    | 11.5 | -    |      |                                       |
| td(ON) *1, 2        | -    | 17.6 | -    | ns   | VDS=15V, ID=24A, VGS=10V,<br>RGS=2.7Ω |
| tr *1, 2            | -    | 20.2 | -    |      |                                       |
| td(OFF) *1, 2       | -    | 59   | -    |      |                                       |
| tf *1, 2            | -    | 13.6 | -    |      |                                       |
| Rg                  | -    | 1.2  | -    | Ω    | f=1MHz                                |
| Source-Drain Diode  |      |      |      |      |                                       |
| IS *1               | -    | -    | 60   | A    |                                       |
| ISM *3              | -    | -    | 200  |      |                                       |
| VSD *1              | -    | 0.8  | 1.2  | V    | IS=20A, VGS=0V                        |
| trr                 | -    | 19   | -    | ns   | IF=24A, dIF/dt=100A/μs                |
| Qrr                 | -    | 10.5 | -    | nC   |                                       |

Note : \*1.Pulse Test : Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$   
 \*2.Independent of operating temperature  
 \*3.Pulse width limited by maximum junction temperature.

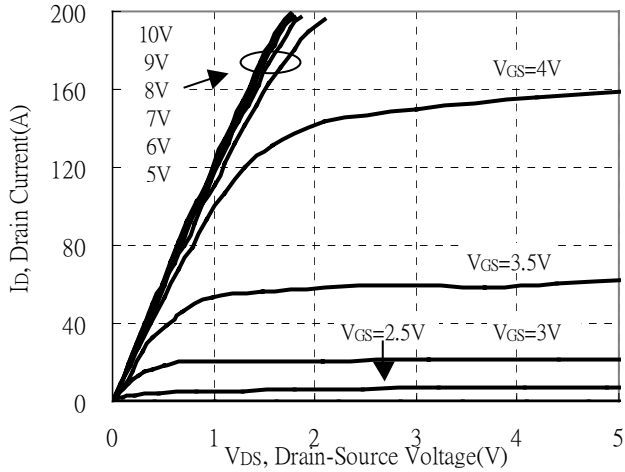
## Recommended Soldering Footprint



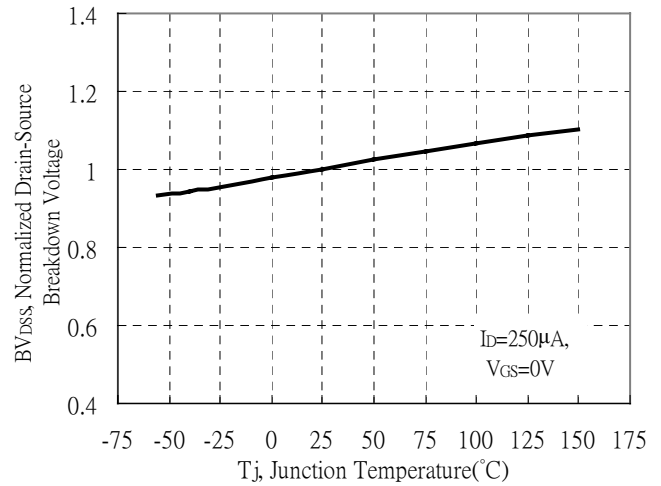
unit : mm

## Typical Characteristics

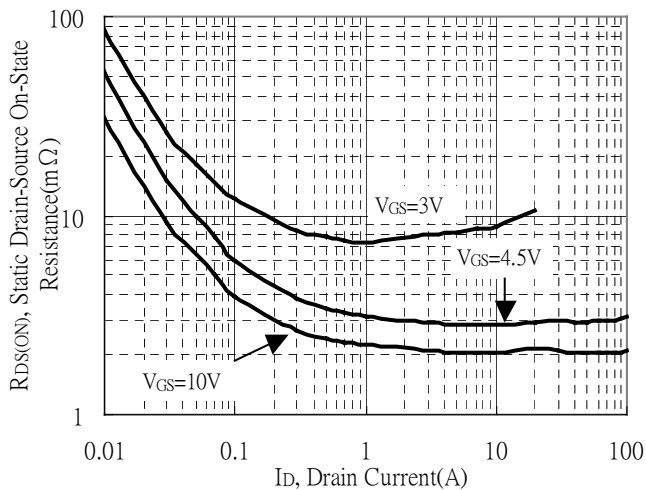
Typical Output Characteristics



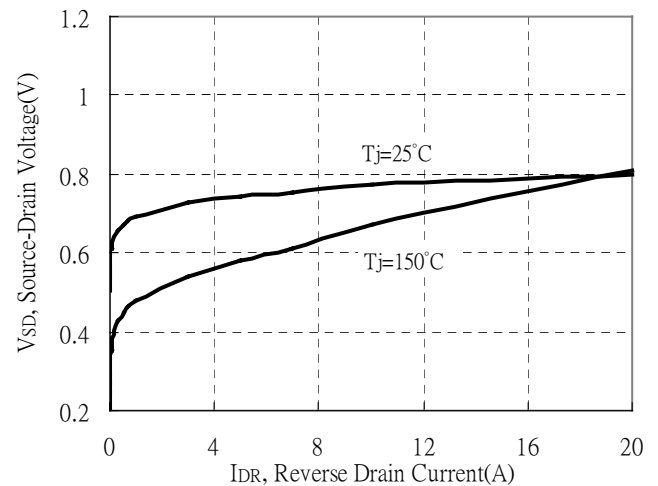
Brekdown Voltage vs Ambient Temperature



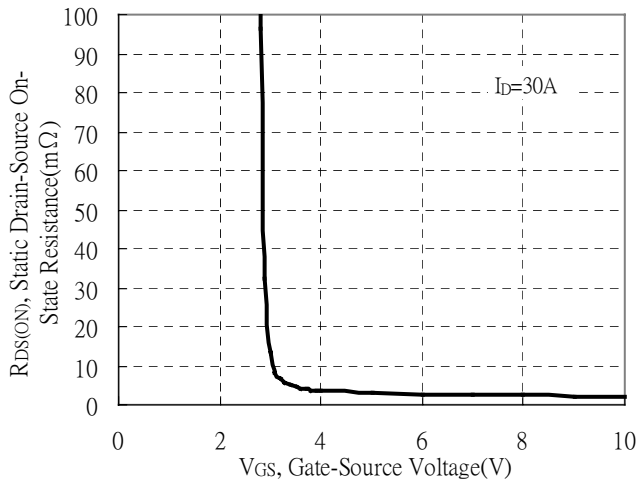
Static Drain-Source On-State resistance vs Drain Current



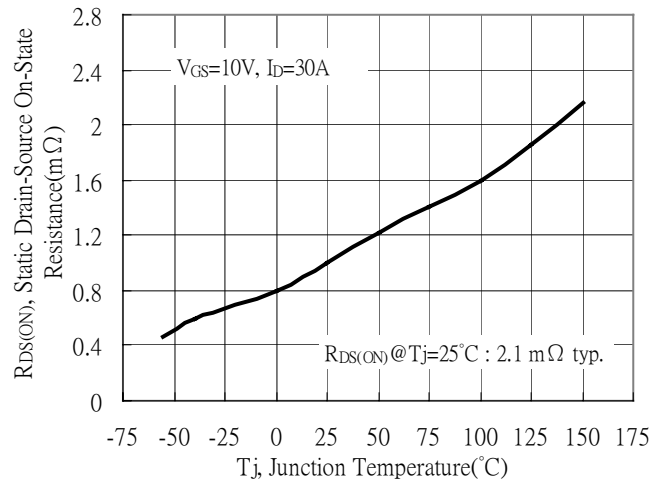
Reverse Drain Current vs Source-Drain Voltage



Static Drain-Source On-State Resistance vs Gate-Source Voltage

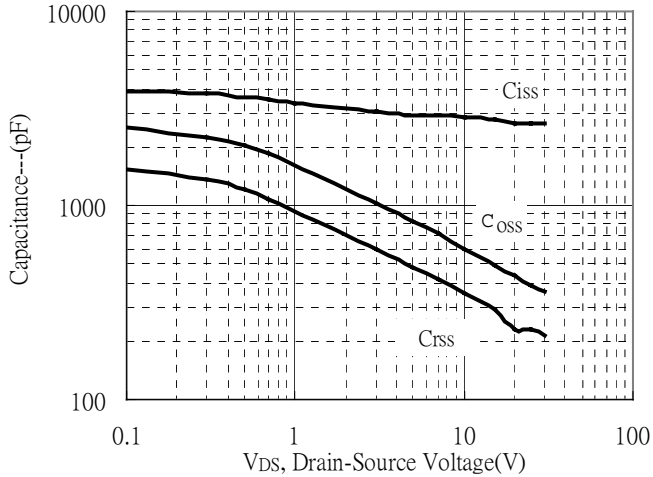


Drain-Source On-State Resistance vs Junction Temperature

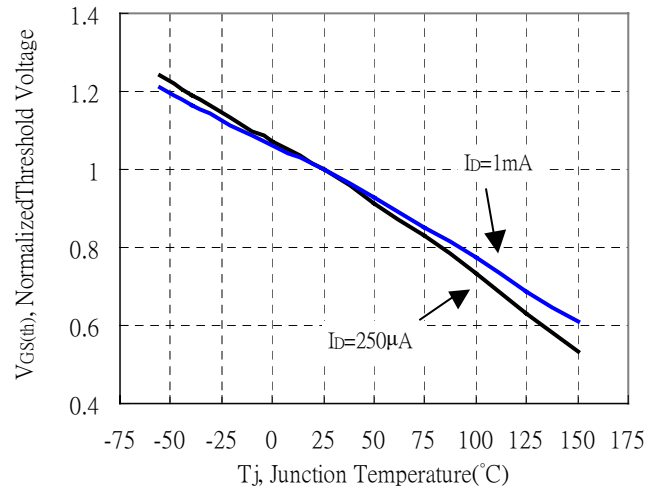


## Typical Characteristics(Cont.)

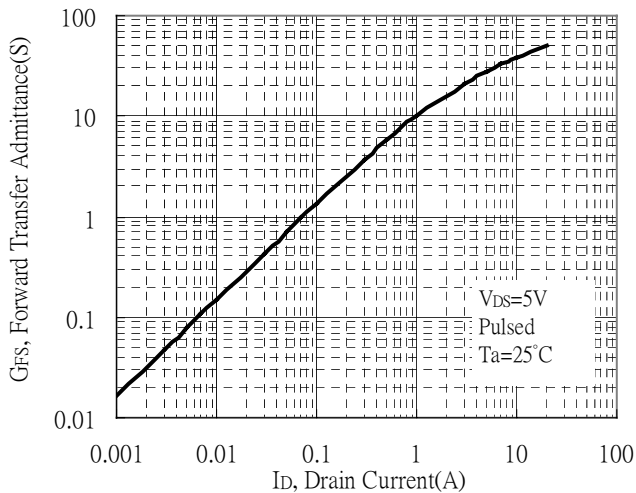
Capacitance vs Drain-to-Source Voltage



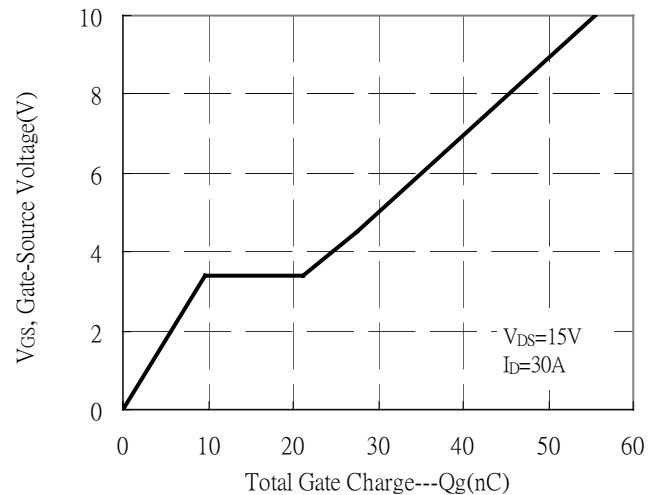
Threshold Voltage vs Junction Temperature



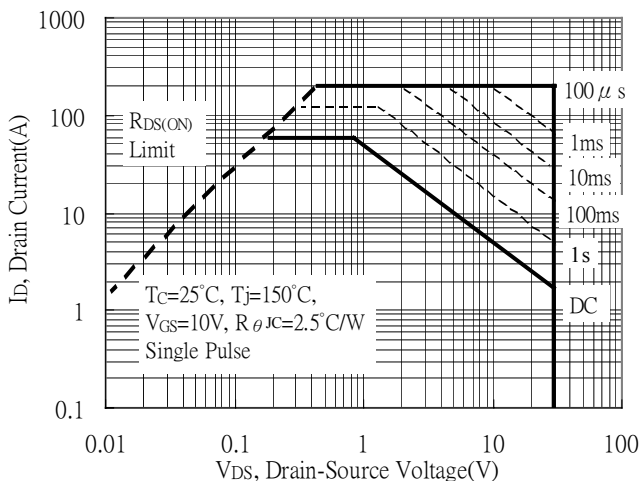
Forward Transfer Admittance vs Drain Current



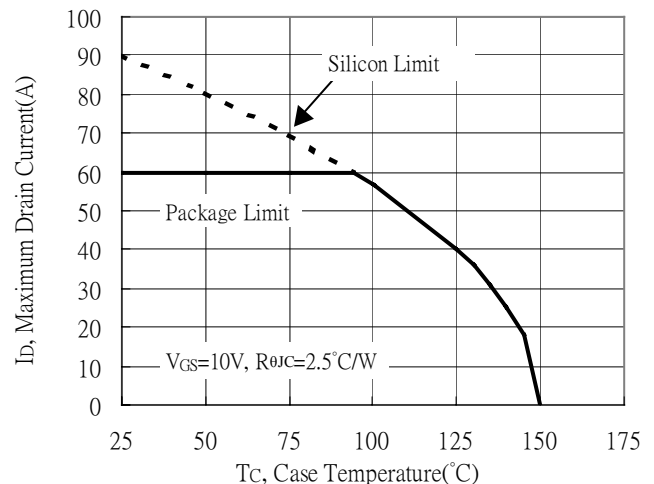
Gate Charge Characteristics



Maximum Safe Operating Area



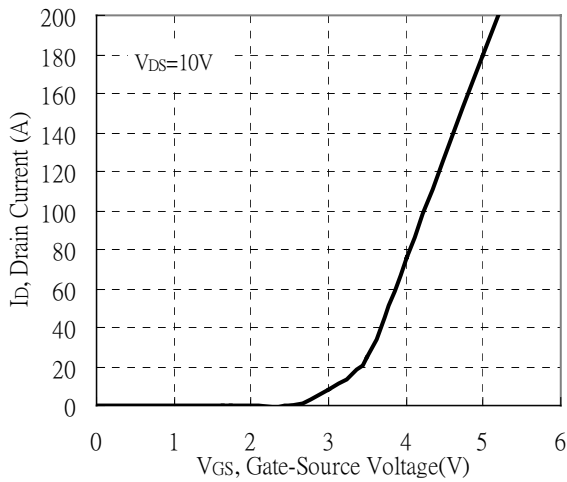
Maximum Drain Current vs Case Temperature



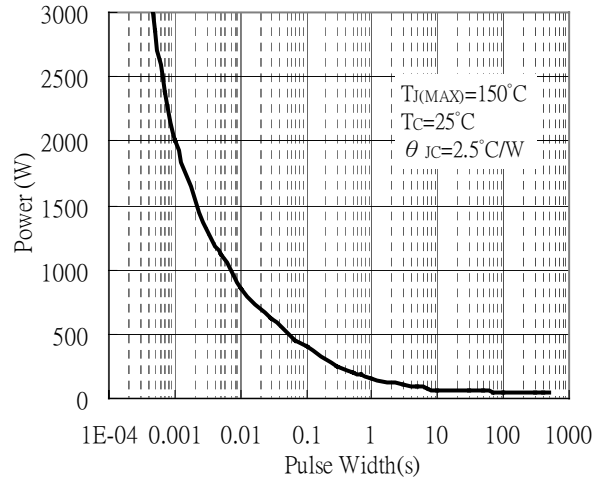


## Typical Characteristics(Cont.)

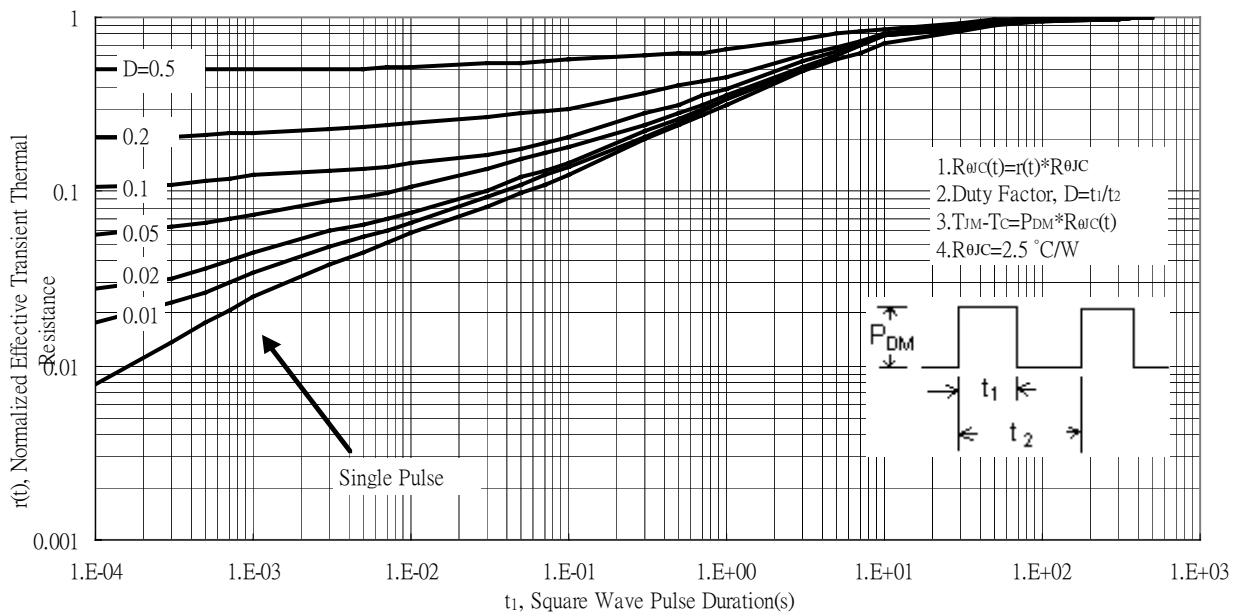
Typical Transfer Characteristics



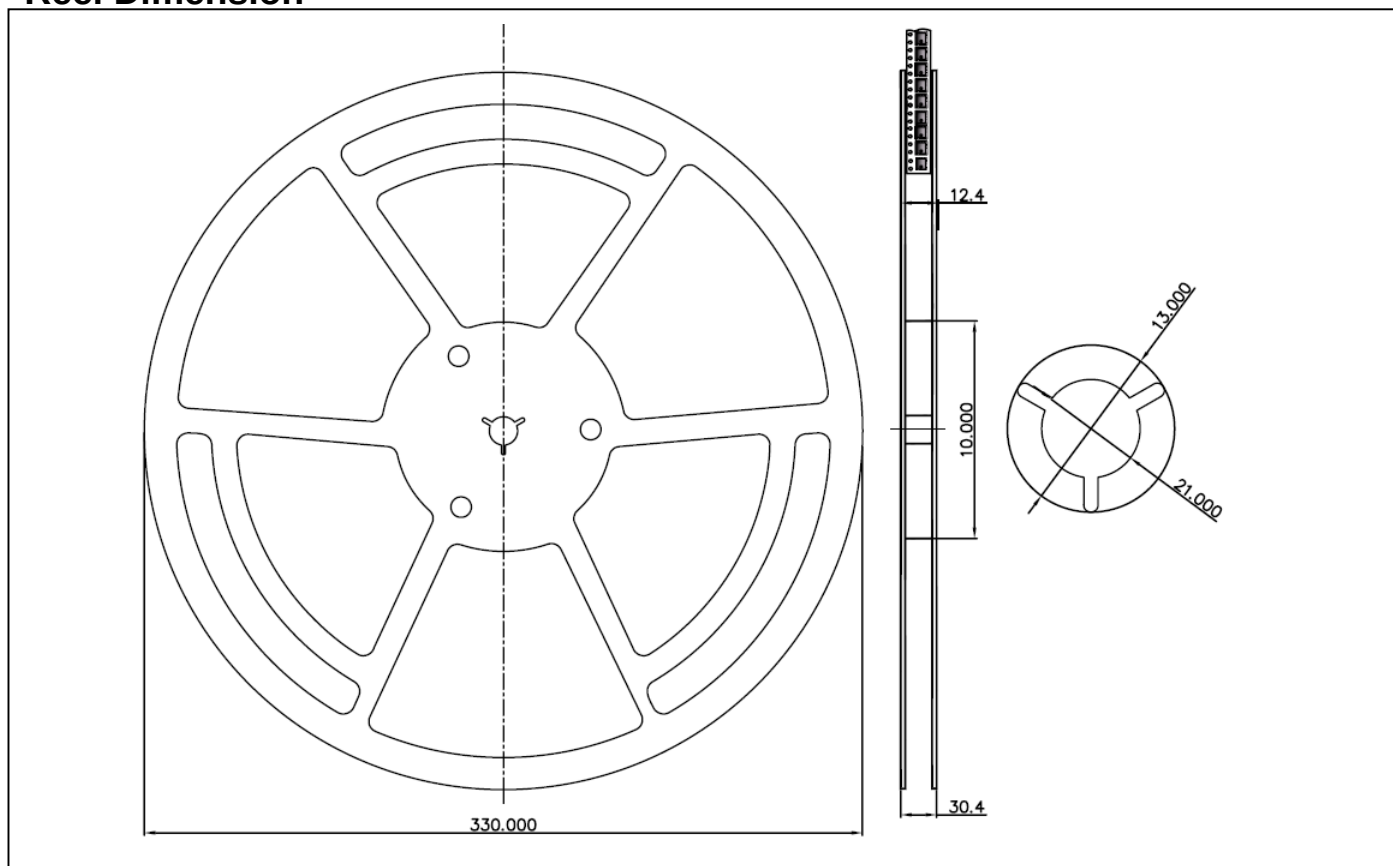
Single Pulse Maximum Power Dissipation



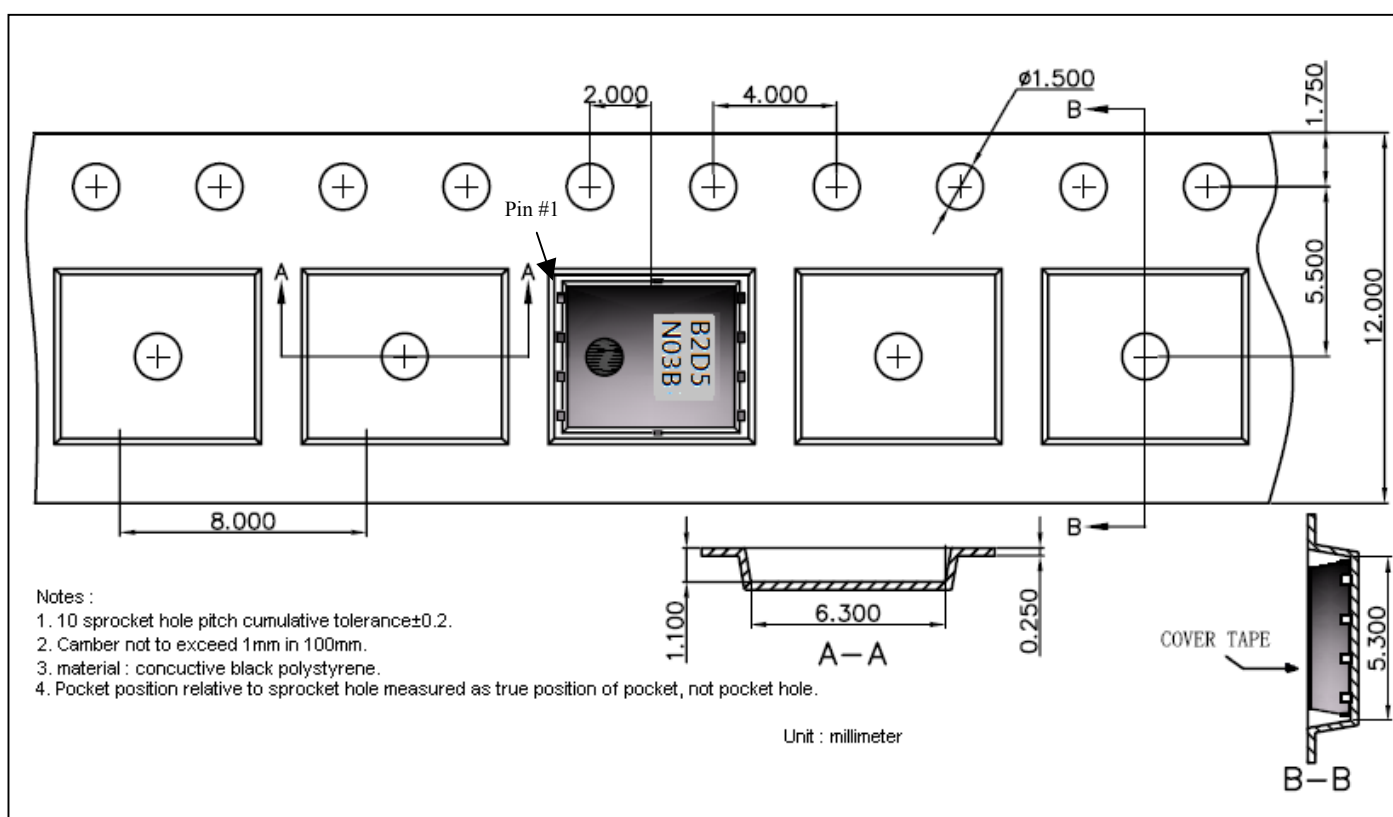
Transient Thermal Response Curves



## Reel Dimension



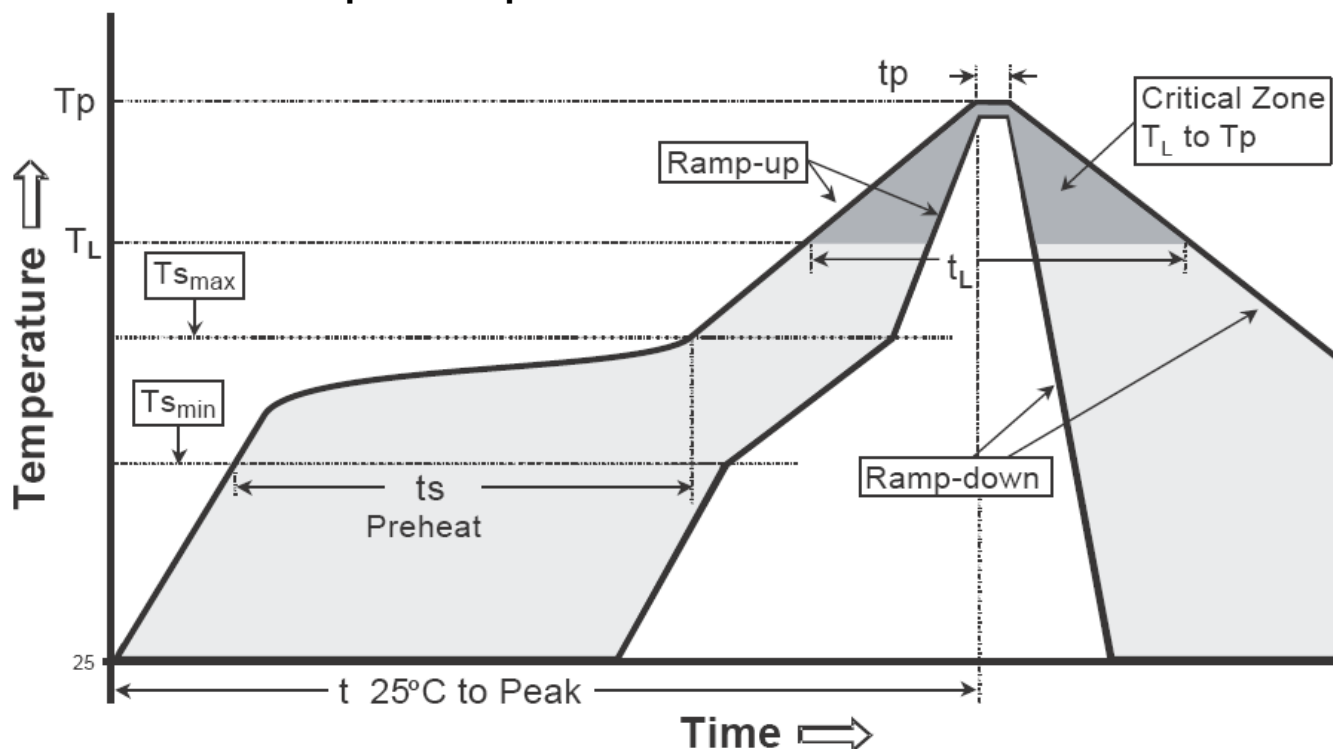
## Carrier Tape Dimension



### Recommended wave soldering condition

| Product         | Peak Temperature | Soldering Time  |
|-----------------|------------------|-----------------|
| Pb-free devices | 260 +0/-5 °C     | 5 +1/-1 seconds |

### Recommended temperature profile for IR reflow

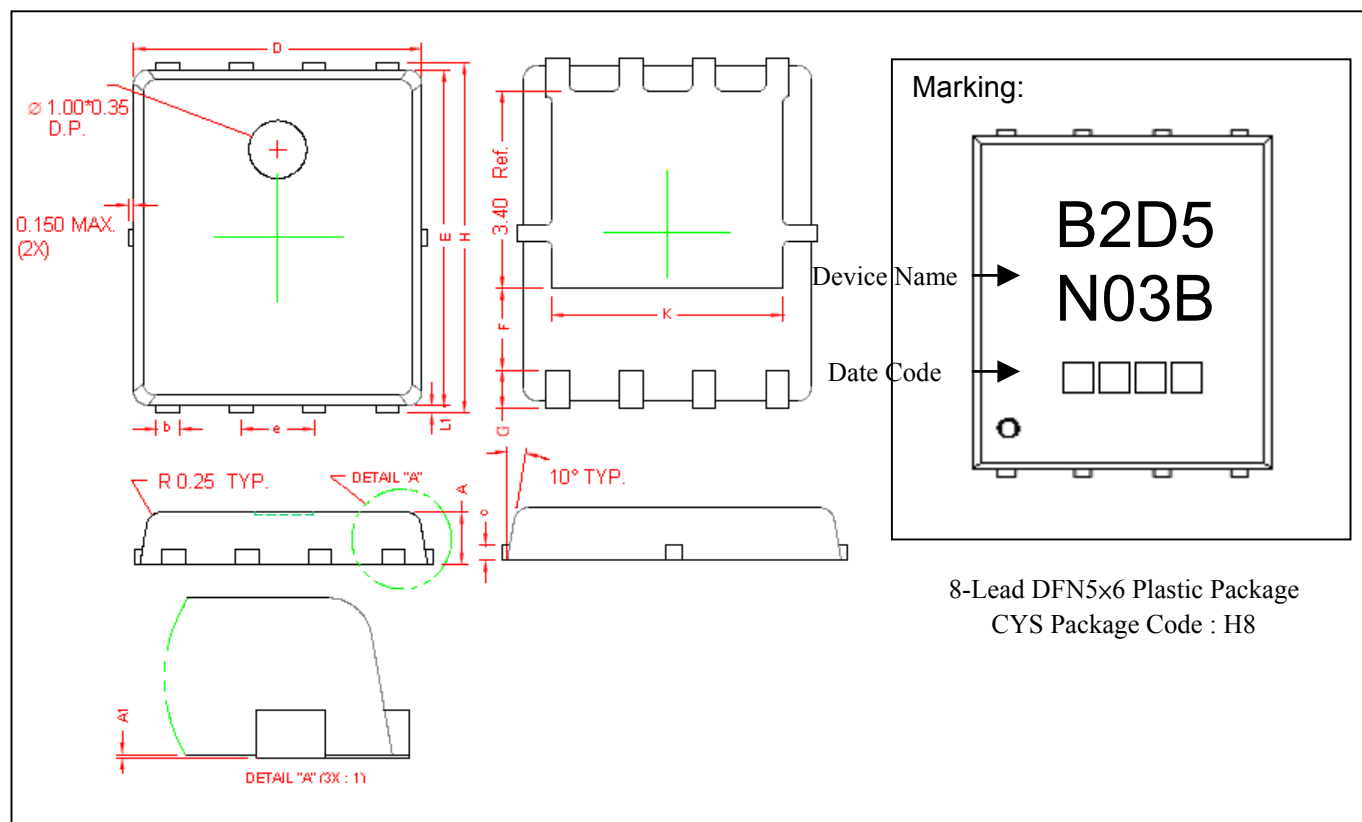


| Profile feature                                     | Sn-Pb eutectic Assembly | Pb-free Assembly |
|-----------------------------------------------------|-------------------------|------------------|
| Average ramp-up rate ( $T_{smax}$ to $T_p$ )        | 3°C/second max.         | 3°C/second max.  |
| Preheat                                             |                         |                  |
| -Temperature Min( $T_{smin}$ )                      | 100°C                   | 150°C            |
| -Temperature Max( $T_{smax}$ )                      | 150°C                   | 200°C            |
| -Time( $t_{smin}$ to $t_{smax}$ )                   | 60-120 seconds          | 60-180 seconds   |
| Time maintained above:                              |                         |                  |
| -Temperature ( $T_L$ )                              | 183°C                   | 217°C            |
| - Time ( $t_L$ )                                    | 60-150 seconds          | 60-150 seconds   |
| Peak Temperature( $T_p$ )                           | 240 +0/-5 °C            | 260 +0/-5 °C     |
| Time within 5°C of actual peak temperature( $t_p$ ) | 10-30 seconds           | 20-40 seconds    |
| Ramp down rate                                      | 6°C/second max.         | 6°C/second max.  |
| Time 25 °C to peak temperature                      | 6 minutes max.          | 8 minutes max.   |

Note : All temperatures refer to topside of the package, measured on the package body surface.



## DFN5x6 Dimension



| DIM | Millimeters |      | Inches |       | DIM | Millimeters |      | Inches |       |
|-----|-------------|------|--------|-------|-----|-------------|------|--------|-------|
|     | Min.        | Max. | Min.   | Max.  |     | Min.        | Max. | Min.   | Max.  |
| A   | 0.80        | 1.00 | 0.031  | 0.039 | E   | 5.70        | 5.90 | 0.224  | 0.232 |
| A1  | 0.00        | 0.05 | 0.000  | 0.002 | e   | 1.27        | BSC  | 0.050  | BSC   |
| b   | 0.35        | 0.49 | 0.014  | 0.019 | H   | 5.95        | 6.20 | 0.234  | 0.244 |
| c   | 0.254       | REF  | 0.010  | REF   | L1  | 0.10        | 0.18 | 0.004  | 0.007 |
| D   | 4.90        | 5.10 | 0.193  | 0.201 | G   | 0.60        | REF  | 0.024  | REF   |
| F   | 1.40        | REF  | 0.055  | REF   | K   | 4.00        | REF  | 0.157  | REF   |

Notes: 1. Controlling dimension: millimeters.

2. Maximum lead thickness includes lead finish thickness, and minimum lead thickness is the minimum thickness of base material.

3. If there is any question with packing specification or packing method, please contact your local CYStek sales office.

### Material:

- Lead: Pure tin plated.
- Mold Compound: Epoxy resin family, flammability solid burning class: UL94V-0.

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