

## N-Channel Enhancement Mode Power MOSFET

DFN5×6

### Features

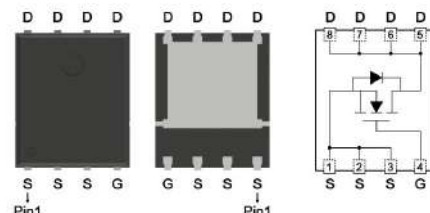
- Low On Resistance
- Low Gate Charge
- Fast Switching Characteristic
- Pb-free lead plating and halogen-free

### Product Summary

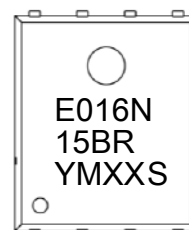
|                                                                      |      |    |
|----------------------------------------------------------------------|------|----|
| BV <sub>DSS</sub>                                                    | 150  | V  |
| R <sub>DS(ON)</sub> typ. @ V <sub>GS</sub> =10V, I <sub>D</sub> =10A | 16.5 | mΩ |
| I <sub>D</sub> @ V <sub>GS</sub> =10V, T <sub>C</sub> =25°C          | 41   | A  |
| I <sub>D</sub> @ V <sub>GS</sub> =10V, T <sub>A</sub> =25°C          | 7.3  |    |

### Ordering Information

| Device       | Package | Shipping              |
|--------------|---------|-----------------------|
| KPRE016N15BR | DFN5×6  | 3000pcs / Tape & Reel |



### Marking



Device Code

Date Code,  
Assembly site code

YMXXS: Date Code & Assembly site code Marking  
Y: Year Code, the last digit of Christian year

M: Month Code

|        |        |        |        |        |        |
|--------|--------|--------|--------|--------|--------|
| A: Jan | B: Feb | C: Mar | D: Apr | E: May | F: Jun |
| G: Jul | H: Aug | J: Sep | K: Oct | L: Nov | M: Dec |

XX: Production Serial Number, 01~99

S: Assembly site code, Site 1: G

### Absolute Maximum Ratings (T<sub>A</sub>=25°C)

| Parameter                                                              |                       | Symbol                            | Value    | Unit |
|------------------------------------------------------------------------|-----------------------|-----------------------------------|----------|------|
| Drain-Source Voltage                                                   |                       | V <sub>DS</sub>                   | 150      | V    |
| Gate-Source Voltage                                                    |                       | V <sub>GS</sub>                   | ±20      |      |
| Continuous Drain Current @ V <sub>GS</sub> =10V, T <sub>C</sub> =25°C  |                       | I <sub>D</sub>                    | 41       | A    |
| Continuous Drain Current @ V <sub>GS</sub> =10V, T <sub>C</sub> =100°C |                       |                                   | 26       |      |
| Continuous Drain Current @ V <sub>GS</sub> =10V, T <sub>A</sub> =25°C  |                       |                                   | 7.3      |      |
| Continuous Drain Current @ V <sub>GS</sub> =10V, T <sub>A</sub> =70°C  |                       |                                   | 5.8      |      |
| Pulsed Drain Current                                                   |                       | I <sub>DM</sub>                   | 164      |      |
| Continuous Body Diode Forward Current @ T <sub>C</sub> =25°C           |                       | I <sub>S</sub>                    | 41       |      |
| Pulsed Body Diode Forward Current @ T <sub>C</sub> =25°C               |                       | I <sub>SM</sub>                   | 164      |      |
| Avalanche Current @ L=0.1mH                                            |                       | I <sub>AS</sub>                   | 20       |      |
| Avalanche Energy @ L=0.5mH                                             |                       | E <sub>AS</sub>                   | 36       | mJ   |
| Total Power Dissipation                                                | T <sub>C</sub> =25°C  | P <sub>D</sub>                    | 89       | W    |
|                                                                        | T <sub>C</sub> =100°C |                                   | 36       |      |
|                                                                        | T <sub>A</sub> =25°C  |                                   | 2.8      |      |
|                                                                        | T <sub>A</sub> =70°C  |                                   | 1.8      |      |
| Operating Junction and Storage Temperature Range                       |                       | T <sub>J</sub> , T <sub>stg</sub> | -55~+150 | °C   |
| Steady State Thermal Resistance, Junction-to-Case                      |                       | R <sub>θJC</sub>                  | 1.4      | °C/W |
| Steady State Thermal Resistance, Junction-to-Ambient                   |                       | R <sub>θJA</sub>                  | 45       |      |

Electrical Characteristics ( $T_A=25^{\circ}\text{C}$ , unless otherwise specified)

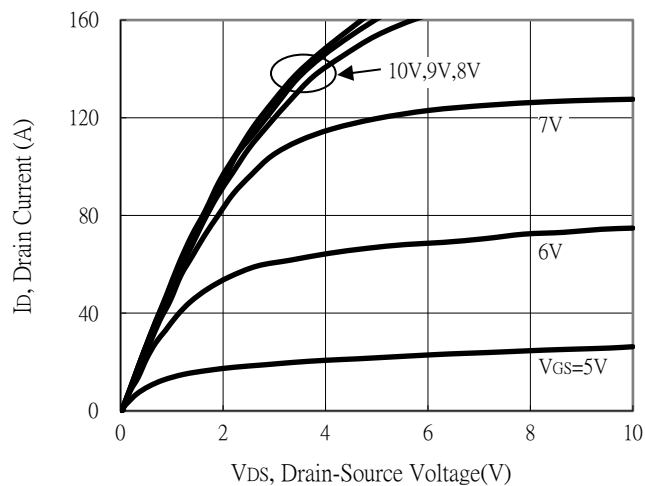
| Symbol                   | Min. | Typ. | Max. | Unit | Test Conditions                                                                      |
|--------------------------|------|------|------|------|--------------------------------------------------------------------------------------|
| Static                   |      |      |      |      |                                                                                      |
| BV <sub>DSS</sub>        | 150  | -    | -    | V    | V <sub>GS</sub> =0V, I <sub>D</sub> =250μA                                           |
| V <sub>GS(th)</sub>      | 2    | -    | 4    |      | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA                             |
| G <sub>FS</sub>          | -    | 14   | -    | S    | V <sub>DS</sub> =10V, I <sub>D</sub> =10A                                            |
| I <sub>GSS</sub>         | -    | -    | ±100 | nA   | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V                                           |
| I <sub>DSS</sub>         | -    | -    | 1    | μA   | V <sub>DS</sub> =120V, V <sub>GS</sub> =0V                                           |
| R <sub>DS(ON)</sub>      | -    | 16.5 | 21.5 | mΩ   | V <sub>GS</sub> =10V, I <sub>D</sub> =10A                                            |
| Dynamic                  |      |      |      |      |                                                                                      |
| C <sub>iss</sub>         | -    | 1740 | -    | pF   | V <sub>DS</sub> =75V, V <sub>GS</sub> =0V, f=1MHz                                    |
| C <sub>oss</sub>         | -    | 175  | -    |      |                                                                                      |
| C <sub>rss</sub>         | -    | 28   | -    |      |                                                                                      |
| R <sub>g</sub>           | -    | 1    | -    | Ω    | f=1MHz                                                                               |
| Q <sub>g</sub> *d,e      | -    | 26   | -    | nC   | V <sub>DS</sub> =75V, I <sub>D</sub> =10A, V <sub>GS</sub> =10V                      |
| Q <sub>gs</sub> *d,e     | -    | 9    | -    |      |                                                                                      |
| Q <sub>gd</sub> *d,e     | -    | 5.7  | -    |      |                                                                                      |
| t <sub>d(ON)</sub> *d,e  | -    | 20   | -    | ns   | V <sub>DS</sub> =75V, I <sub>D</sub> =10A, V <sub>GS</sub> =10V, R <sub>GS</sub> =1Ω |
| tr *d,e                  | -    | 16   | -    |      |                                                                                      |
| t <sub>d(OFF)</sub> *d,e | -    | 33   | -    |      |                                                                                      |
| t <sub>f</sub> *d,e      | -    | 7.6  | -    |      |                                                                                      |
| Source-Drain Diode       |      |      |      |      |                                                                                      |
| V <sub>SD</sub> *d       | -    | 0.82 | 1.2  | V    | I <sub>S</sub> =10A, V <sub>GS</sub> =0V                                             |
| t <sub>rr</sub>          | -    | 62   | -    | ns   | I <sub>F</sub> =10A, di/dt=100A/μs                                                   |
| Q <sub>rr</sub>          | -    | 150  | -    | nC   |                                                                                      |

Note:

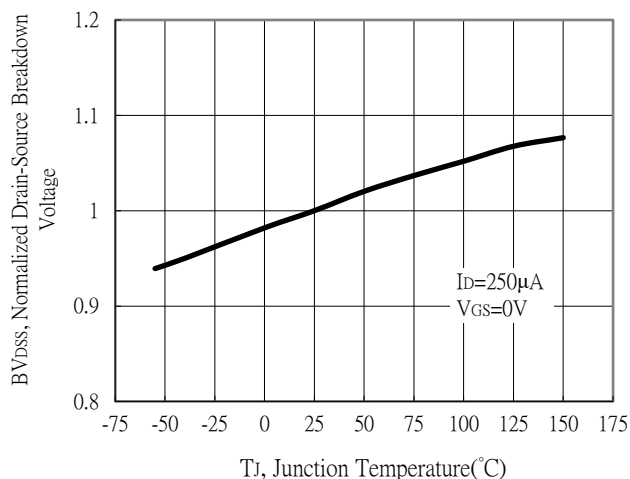
- \*a. The power dissipation  $P_D$  is based on  $T_{J(MAX)}=150^{\circ}\text{C}$ , using junction-to-case thermal resistance, and is more useful in setting the upper Dissipation.
- \*b. The value of  $R_{\theta JA}$  is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz copper, in a still air environment with  $T_A=25^{\circ}\text{C}$ . The power dissipation  $P_D$  is based on  $R_{\theta JA}$  and the maximum allowed junction temperature of  $150^{\circ}\text{C}$ . The value in any given application depends on the user's specific board design.
- \*c. Repetitive rating, pulse width limited by junction temperature  $T_{J(MAX)}=150^{\circ}\text{C}$ . Ratings are based on low frequency and low duty cycles to keep initial  $T_J=25^{\circ}\text{C}$ .
- \*d. Pulse Test : Pulse Width $\leq 300\mu s$ , Duty Cycle $\leq 2\%$ .
- \*e. Independent of operating temperature.

## Typical Characteristics

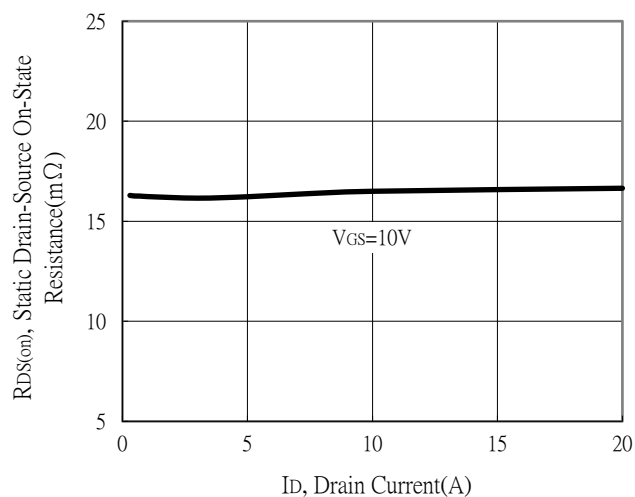
Typical Output Characteristics



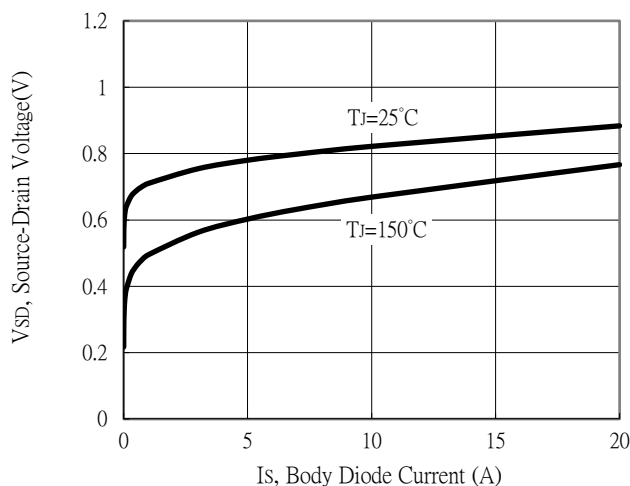
Breakdown Voltage vs Ambient Temperature



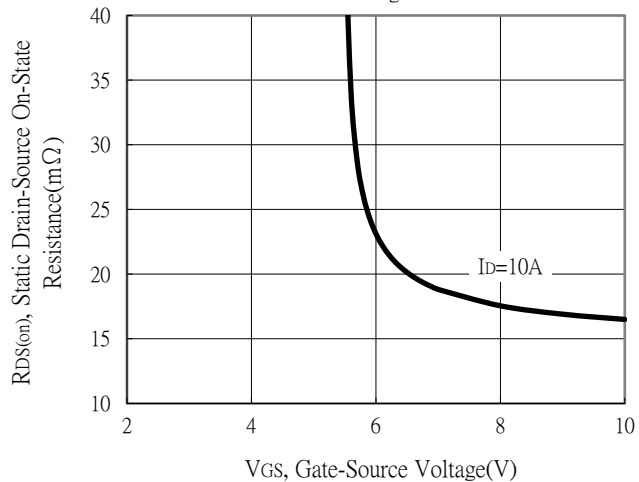
Static Drain-Source On-State resistance vs Drain Current



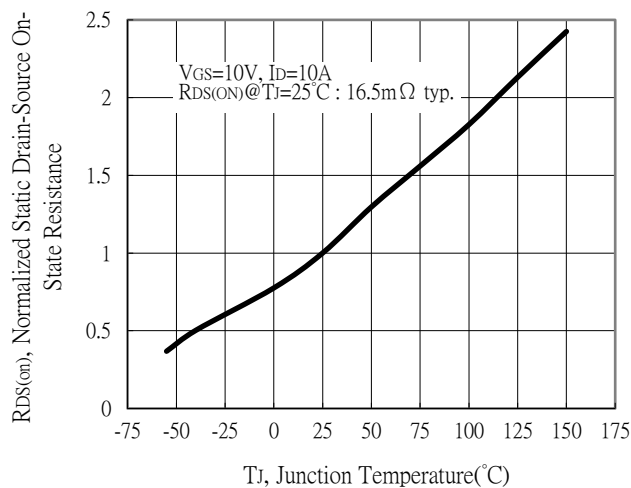
Body Diode Current vs Source-Drain Voltage



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

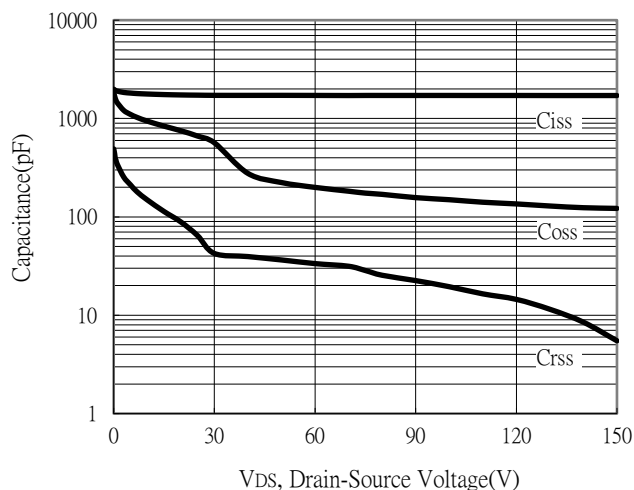


Drain-Source On-State Resistance vs Junction Temperature

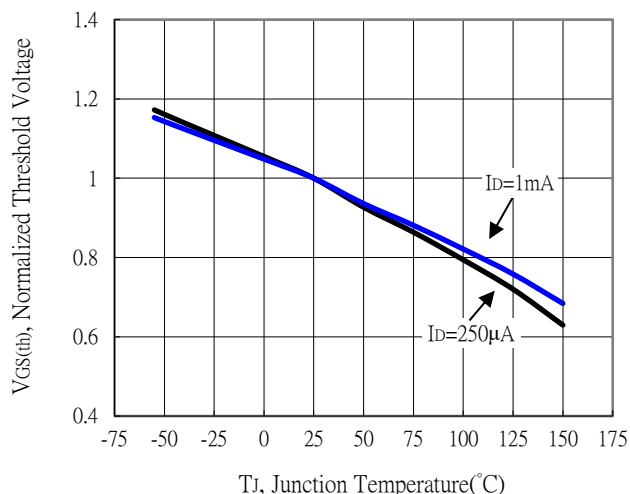


## Typical Characteristics

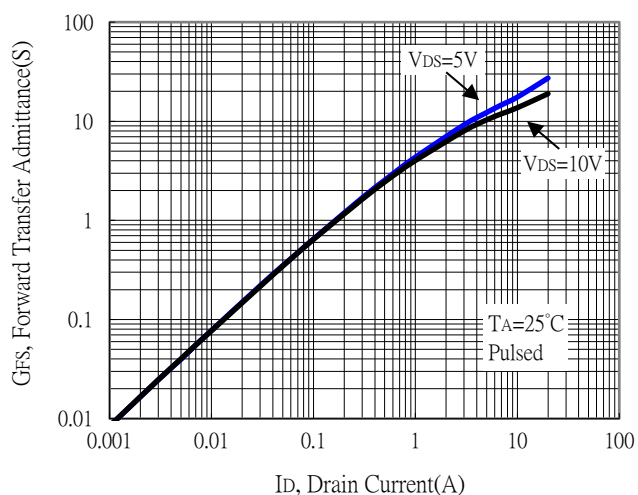
Capacitance vs Drain-to-Source Voltage



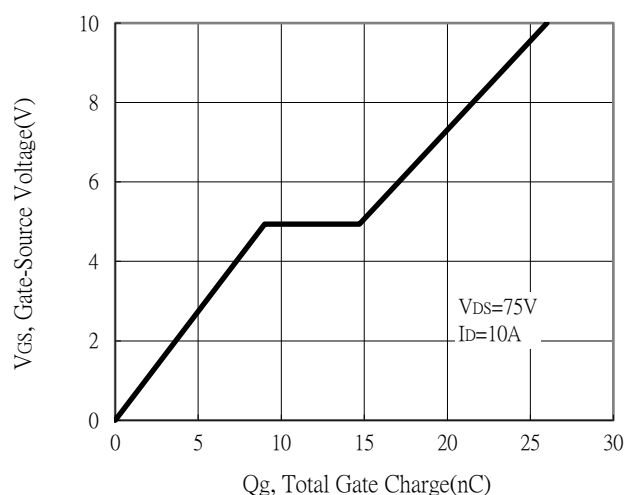
Threshold Voltage vs Junction Temperature



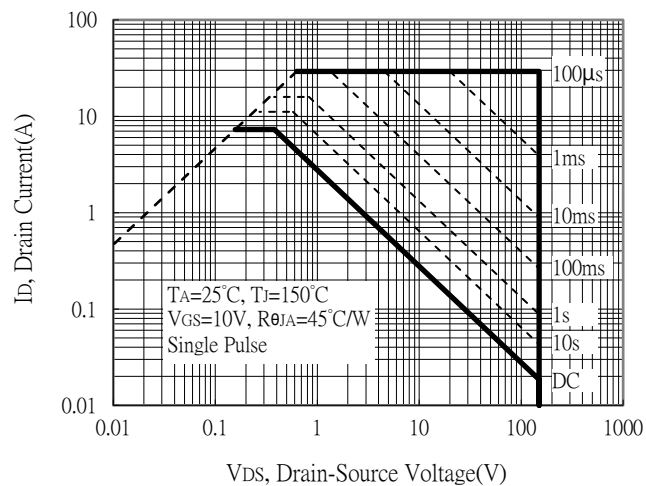
Forward Transfer Admittance vs Drain Current



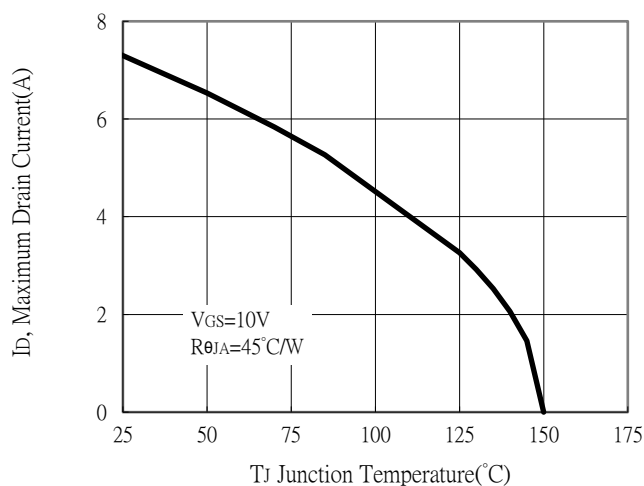
Gate Charge Characteristics



Maximum Safe Operating Area

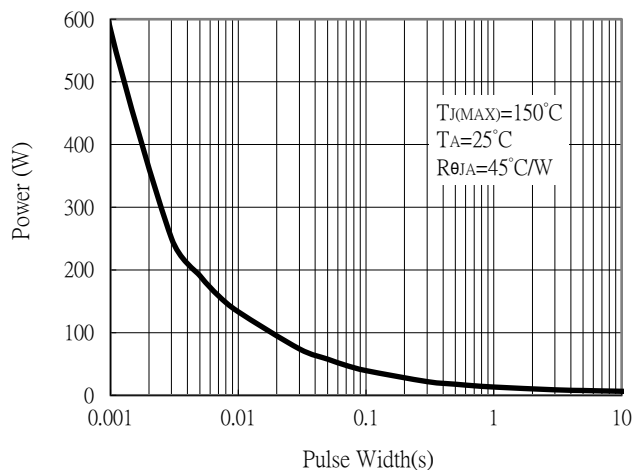


Maximum Drain Current vs Junction Temperature

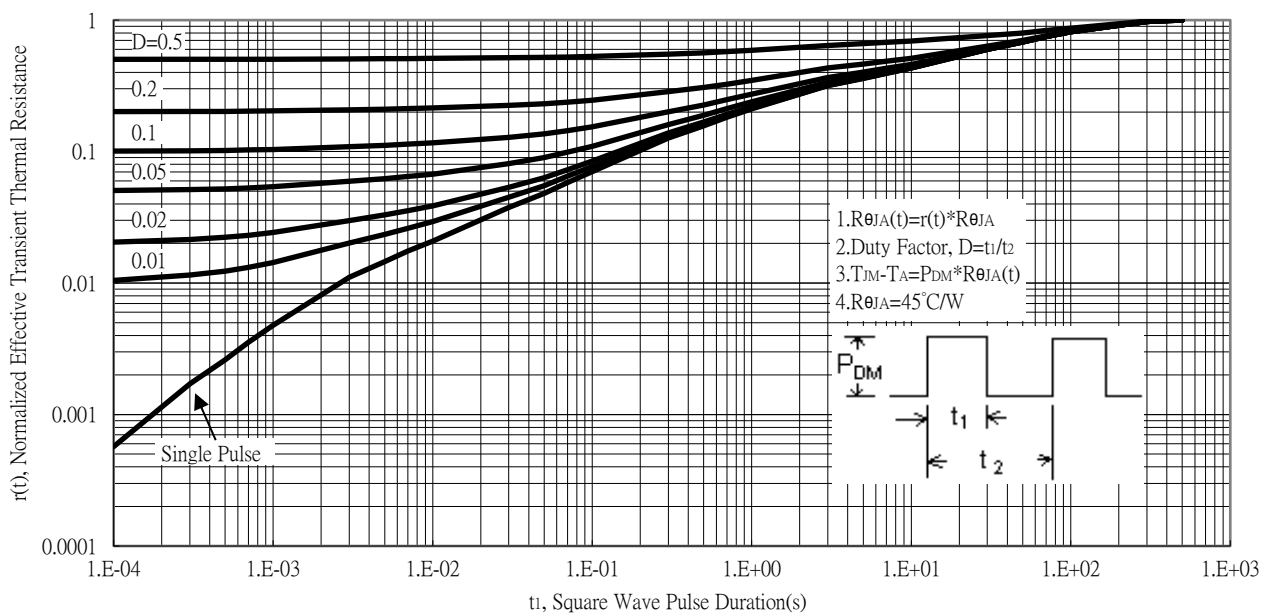


## Typical Characteristics

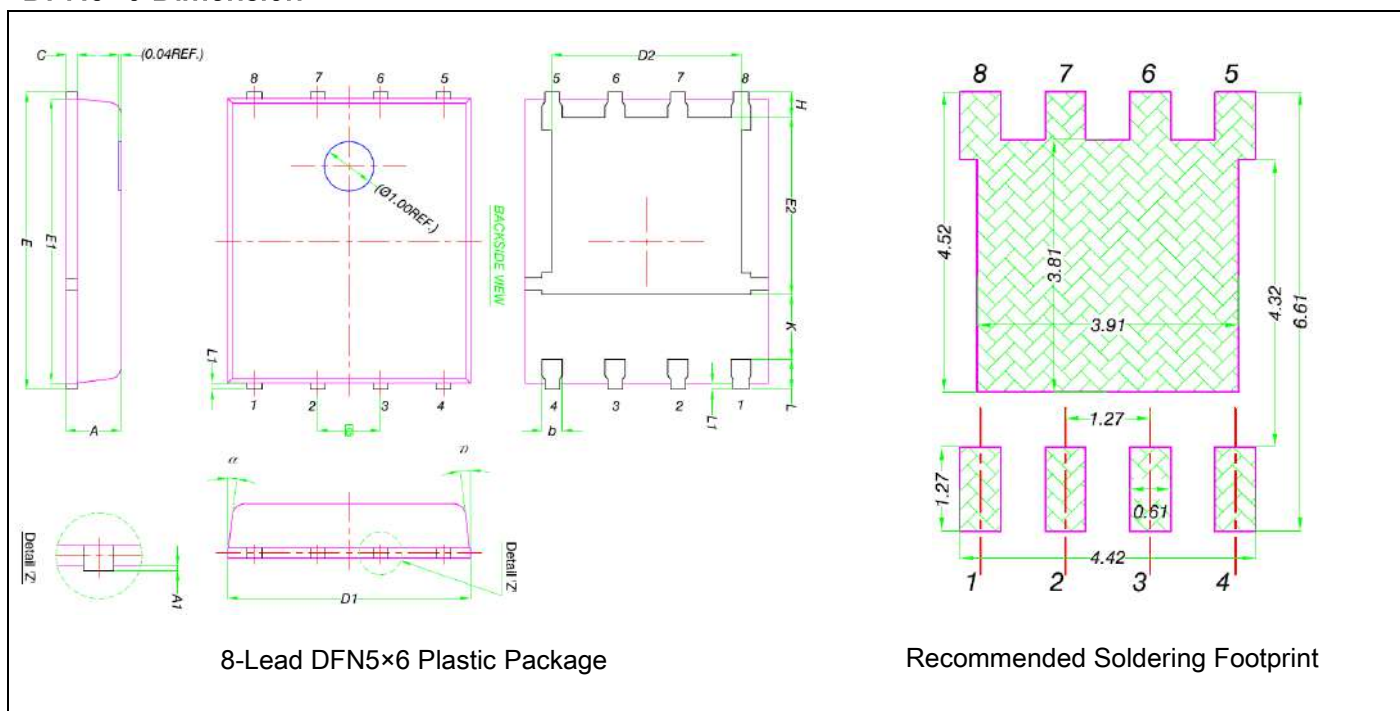
Single Pulse Power Rating, Junction to Ambient



Transient Thermal Response Curves

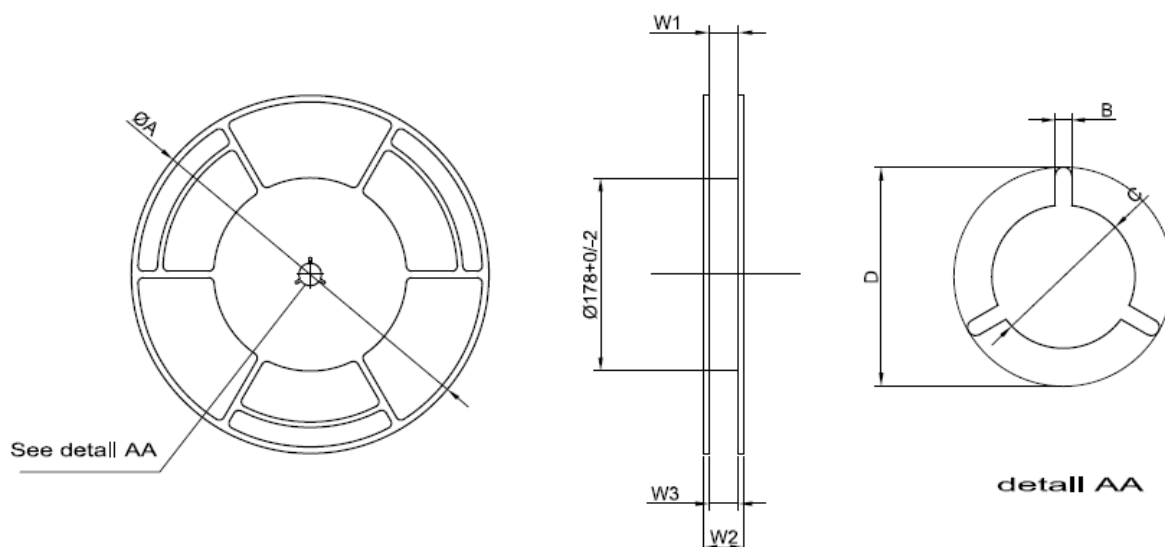


## DFN5×6 Dimension



| DIM | Inches |       | Millimeters |      | DIM | Inches |       | Millimeters |      |
|-----|--------|-------|-------------|------|-----|--------|-------|-------------|------|
|     | Min.   | Max.  | Min.        | Max. |     | Min.   | Max.  | Min.        | Max. |
| A   | 0.035  | 0.043 | 0.90        | 1.10 | E2  | 0.133  | 0.149 | 3.38        | 3.78 |
| A1  | 0.000  | 0.002 | 0.00        | 0.05 | e   | 0.050  | BSC   | 1.27        | BSC  |
| b   | 0.013  | 0.020 | 0.33        | 0.51 | H   | 0.016  | 0.024 | 0.41        | 0.61 |
| C   | 0.008  | 0.012 | 0.20        | 0.30 | K   | 0.043  | -     | 1.10        | -    |
| D1  | 0.189  | 0.197 | 4.80        | 5.00 | L   | 0.020  | 0.028 | 0.51        | 0.71 |
| D2  | 0.142  | 0.156 | 3.61        | 3.96 | L1  | 0.002  | 0.008 | 0.06        | 0.20 |
| E   | 0.232  | 0.240 | 5.90        | 6.10 | α   | 0°     | 12°   | 0°          | 12°  |
| E1  | 0.224  | 0.228 | 5.70        | 5.80 |     |        |       |             |      |

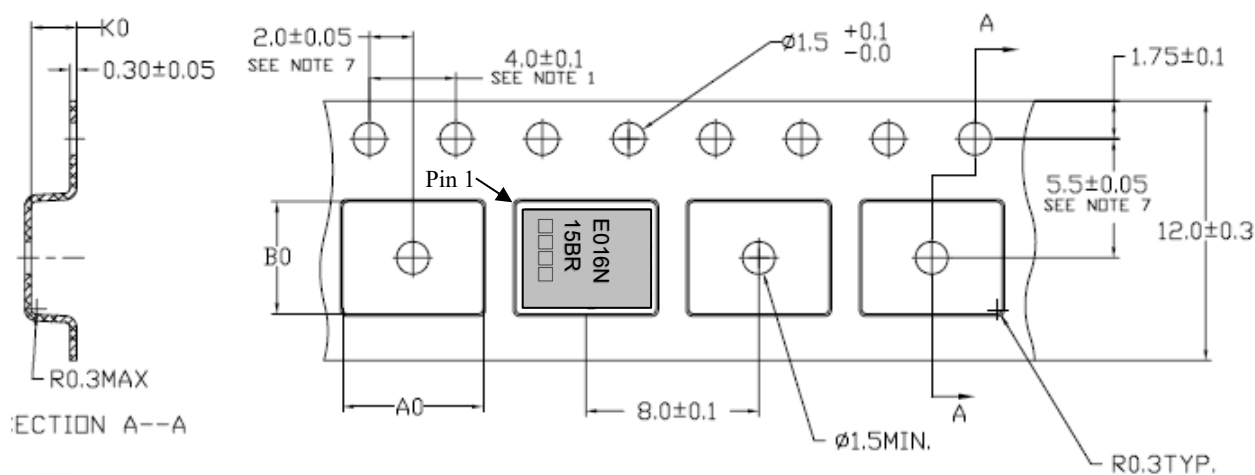
## Reel Dimension



| TAPE SIZE | A             | B             | C                 | D            | W1              | W2             | W3    |
|-----------|---------------|---------------|-------------------|--------------|-----------------|----------------|-------|
| 12mm      | $330 \pm 2.0$ | $2.9 \pm 0.5$ | $13.0 \pm 0.5/-0$ | $23 \pm 1.0$ | $12.4 \pm 2/-0$ | $18.4 \pm 0.5$ | 12~15 |

Unit : mm

## Carrier Tape Dimension



### NOTE:

1. TO SPROCKET HOLE PITCH CUMULATIVE TOLERANCE  $\pm 0.2$
2. CAMBER NOT TO EXCEED 1mm IN 100mm, NONCUMULATIVE OVER 250mm.
3. MATERIAL: BLACK STATIC DISSIPATIVE PS(POLYSTYRENE)
4. ALL DIMENSIONS ARE IN MILLIMETERS (UNLESS OTHERWISE SPECIFIED)
5.  $A0$  AND  $B0$  MEASURED ON A PLANE 0.3mm ABOVE THE BOTTOM OF THE POCKET
6.  $K0$  MEASURED FROM A PLANE ON THE INSIDE BOTTOM OF THE POCKET TO THE TOP SURFACE OF THE CARRIER
7. POCKET POSITION RELATIVE TO SPROCKET HOLE MEASURED AS TRUE POSITION OF POCKET, NOT POCKET HOLE
8. SURFACE RESISTIVITY  $1 \times 10^4 \sim 1 \times 10^6 \Omega/\text{SQ.}$

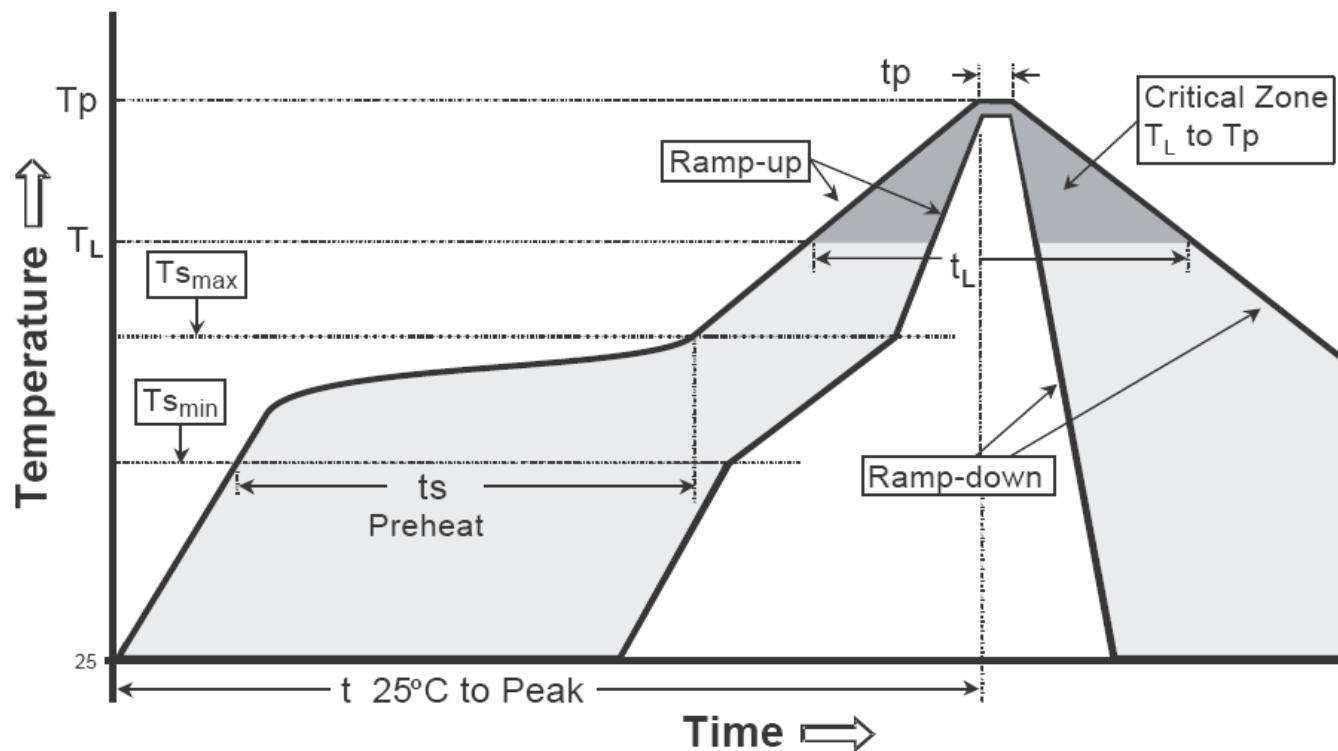
$A0 = 6.5 \pm 0.1$   
 $B0 = 5.3 \pm 0.1$   
 $K0 = 1.4 \pm 0.1$

Unit : mm

**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 (Ts max to TP)                                                           | 3°C/second max.                  | 3°C/second max.                  |
| Preheat<br>-Temperature Min (Ts min)<br>-Temperature Max (Ts max)<br>-Time (ts min to ts max) | 100°C<br>150°C<br>60-120 seconds | 150°C<br>200°C<br>60-180 seconds |
| Time maintained above:<br>-Temperature (Tl)<br>-Time (tl)                                     | 183°C<br>60-150 seconds          | 217°C<br>60-150 seconds          |
| Peak Temperature (TP)                                                                         | 240 +0/-5 °C                     | 260 +0/-5 °C                     |
| Time within 5°C of actual peak temperature (tp)                                               | 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.