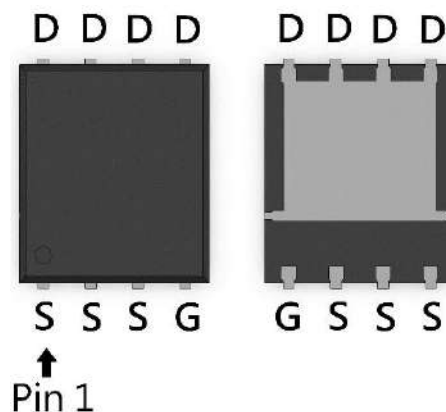


## N-Channel Enhancement Mode Power MOSFET

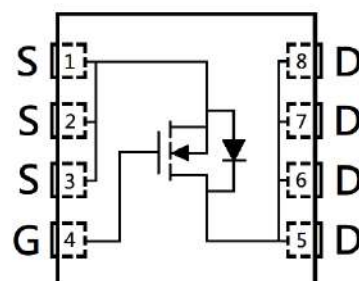
### Features:

- Low On Resistance
- Low Gate Charge
- Fast Switching Characteristic

DFN5×6



|                                                   |               |
|---------------------------------------------------|---------------|
| $BV_{DSS}$                                        | 40V           |
| $I_D @ V_{GS}=10V, T_C=25^\circ C$                | 84A           |
| $I_D @ V_{GS}=10V, T_A=25^\circ C$                | 32A           |
| $R_{DS(ON)} \text{ Typ. } @ V_{GS}=10V, I_D=20A$  | 1.3m $\Omega$ |
| $R_{DS(ON)} \text{ Typ. } @ V_{GS}=4.5V, I_D=20A$ | 2.2m $\Omega$ |



G : Gate S : Source D : Drain

### Ordering Information

| Device      | Package                                                   | Shipping               |
|-------------|-----------------------------------------------------------|------------------------|
| KPRB1D6N04R | DFN5×6<br>(Pb-free lead plating and halogen-free package) | 3000 pcs / Tape & Reel |

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

| Parameter                                                                             | Symbol                            | Limits   | Unit |
|---------------------------------------------------------------------------------------|-----------------------------------|----------|------|
| Drain-Source Voltage                                                                  | V <sub>DS</sub>                   | 40       | V    |
| Gate-Source Voltage                                                                   | V <sub>GS</sub>                   | ±20      |      |
| Continuous Drain Current @ V <sub>GS</sub> =10V, T <sub>C</sub> =25°C (silicon limit) | I <sub>D</sub>                    | 174      | A    |
| Continuous Drain Current @ V <sub>GS</sub> =10V, T <sub>C</sub> =25°C (package limit) |                                   | 84       |      |
| Continuous Drain Current @ V <sub>GS</sub> =10V, T <sub>C</sub> =100°C                |                                   | 84       |      |
| Continuous Drain Current @ V <sub>GS</sub> =10V, T <sub>A</sub> =25°C                 |                                   | 32       |      |
| Continuous Drain Current @ V <sub>GS</sub> =10V, T <sub>A</sub> =70°C                 |                                   | 26       |      |
| Pulsed Drain Current                                                                  |                                   | 336      |      |
| Continuous Body Diode Forward Current @ T <sub>C</sub> =25°C                          | I <sub>S</sub>                    | 84       |      |
| Pulsed Body Diode Forward Current @ T <sub>C</sub> =25°C                              | I <sub>SM</sub>                   | 336      |      |
| Avalanche Current @ L=0.1mH                                                           | I <sub>AS</sub>                   | 35       | mJ   |
| Avalanche Energy @ L=0.5mH                                                            | E <sub>AS</sub>                   | 132      |      |
| Total Power Dissipation                                                               | T <sub>C</sub> =25°C              | 104      | W    |
|                                                                                       | T <sub>C</sub> =100°C             | 42       |      |
|                                                                                       | T <sub>A</sub> =25°C              | 3.6      |      |
|                                                                                       | T <sub>A</sub> =70°C              | 2.3      |      |
| Operating Junction and Storage Temperature Range                                      | T <sub>J</sub> , T <sub>stg</sub> | -55~+150 | °C   |

## Thermal Data

| Parameter                               | Symbol           | Steady State | Unit |
|-----------------------------------------|------------------|--------------|------|
| Thermal Resistance, Junction-to-case    | R <sub>θJC</sub> | 1.2          | °C/W |
| Thermal Resistance, Junction-to-ambient | R <sub>θJA</sub> | 35           |      |

Note:

- \*a. The power dissipation P<sub>D</sub> is based on T<sub>J(MAX)</sub>=150°C, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.
- \*b. The value of R<sub>θJA</sub> is measured with the device mounted on 1 in<sup>2</sup> FR -4 board with 2 oz. copper, in a still air environment with T<sub>A</sub>=25°C. The power dissipation P<sub>D</sub> is based on R<sub>θJA</sub> and the maximum allowed junction temperature of 150°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<sub>J(MAX)</sub>=150°C. Ratings are based on low frequency and low duty cycles to keep initial T<sub>J</sub>=25°C.

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

| Symbol                    | Min. | Typ. | Max. | Unit | Test Conditions                                                                        |
|---------------------------|------|------|------|------|----------------------------------------------------------------------------------------|
| Static                    |      |      |      |      |                                                                                        |
| BV <sub>DSS</sub>         | 40   | -    | -    | V    | V <sub>GS</sub> =0V, I <sub>D</sub> =250μA                                             |
| V <sub>GS(th)</sub>       | 1    | -    | 2.5  |      | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA                               |
| G <sub>FS</sub>           | -    | 49   | -    | S    | V <sub>DS</sub> =10V, I <sub>D</sub> =20A                                              |
| 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> =32V, V <sub>GS</sub> =0V                                              |
| R <sub>DS(ON)</sub>       | -    | 1.3  | 1.8  | mΩ   | V <sub>GS</sub> =10V, I <sub>D</sub> =20A                                              |
|                           | -    | 2.2  | 3.3  |      | V <sub>GS</sub> =4.5V, I <sub>D</sub> =20A                                             |
| Dynamic                   |      |      |      |      |                                                                                        |
| C <sub>iss</sub>          | -    | 3650 | -    | pF   | V <sub>DS</sub> =20V, V <sub>GS</sub> =0V, f=1MHz                                      |
| C <sub>oss</sub>          | -    | 2000 | -    |      |                                                                                        |
| C <sub>rss</sub>          | -    | 140  | -    |      |                                                                                        |
| R <sub>g</sub>            | -    | 0.7  | -    | Ω    | f=1MHz                                                                                 |
| Q <sub>g</sub> *1, 2      | -    | 63   | -    | nC   | V <sub>DS</sub> =20V, I <sub>D</sub> =20A, V <sub>GS</sub> =10V                        |
| Q <sub>gs</sub> *1, 2     | -    | 10   | -    |      |                                                                                        |
| Q <sub>gd</sub> *1, 2     | -    | 11   | -    |      |                                                                                        |
| t <sub>d(ON)</sub> *1, 2  | -    | 22   | -    | ns   | V <sub>DS</sub> =20V, I <sub>D</sub> =20A, V <sub>GS</sub> =10V, R <sub>GS</sub> =2.5Ω |
| t <sub>r</sub> *1, 2      | -    | 17   | -    |      |                                                                                        |
| t <sub>d(OFF)</sub> *1, 2 | -    | 64   | -    |      |                                                                                        |
| t <sub>f</sub> *1, 2      | -    | 12   | -    |      |                                                                                        |
| Source-Drain Diode        |      |      |      |      |                                                                                        |
| V <sub>SD</sub> *1        | -    | 0.8  | 1.2  | V    | I <sub>S</sub> =20A, V <sub>GS</sub> =0V                                               |
| t <sub>rr</sub>           | -    | 52   | -    | ns   | I <sub>F</sub> =20A, dI <sub>F</sub> /dt=100A/μs                                       |
| Q <sub>rr</sub>           | -    | 42   | -    | nC   |                                                                                        |

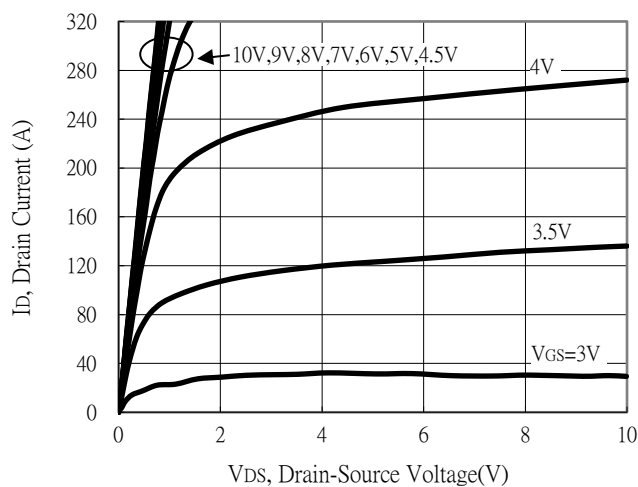
Note:

\*1. Pulse Test : Pulse Width ≤300μs, Duty Cycle≤2%

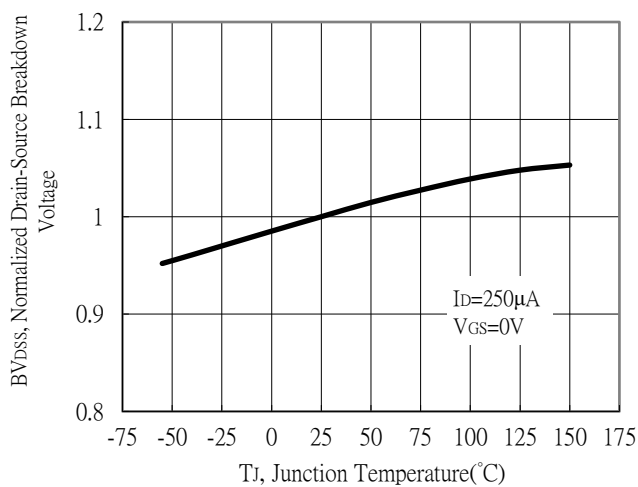
\*2. Independent of operating temperature

## Typical Characteristics

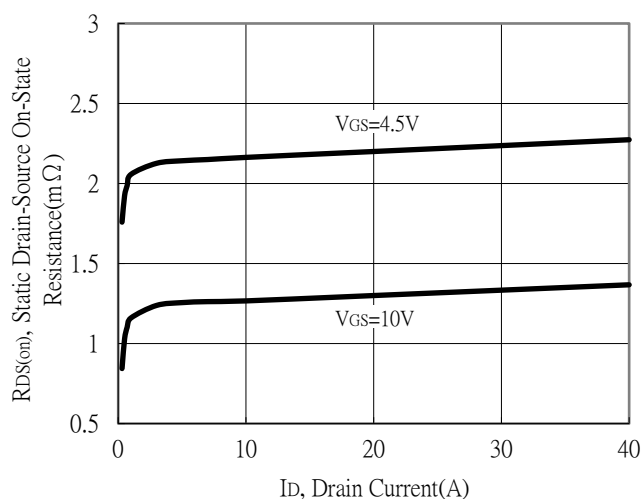
Typical Output Characteristics



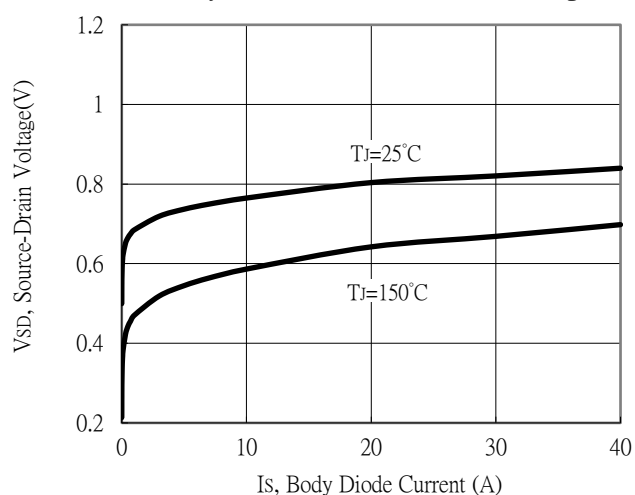
Breakdown Voltage vs Ambient Temperature



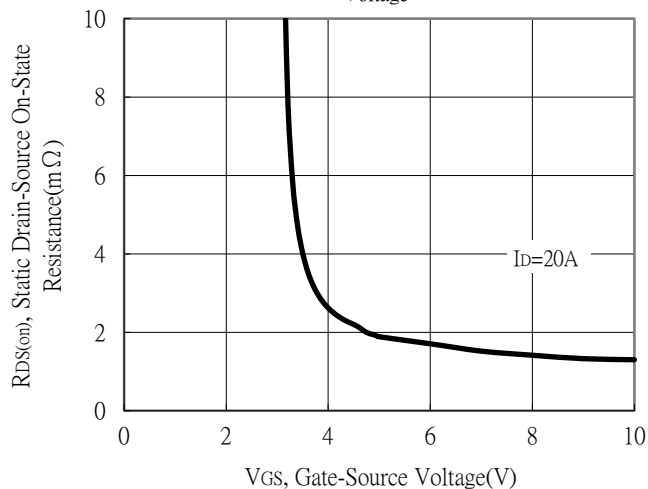
Static Drain-Source On-State resistance vs Drain Current



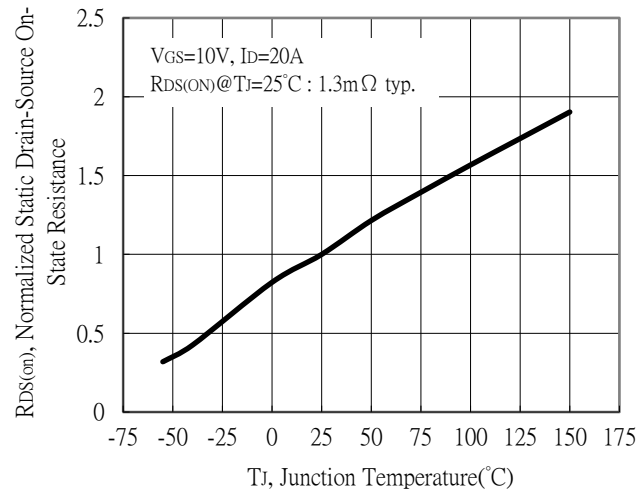
Body Diode Current vs Source-Drain Voltage



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

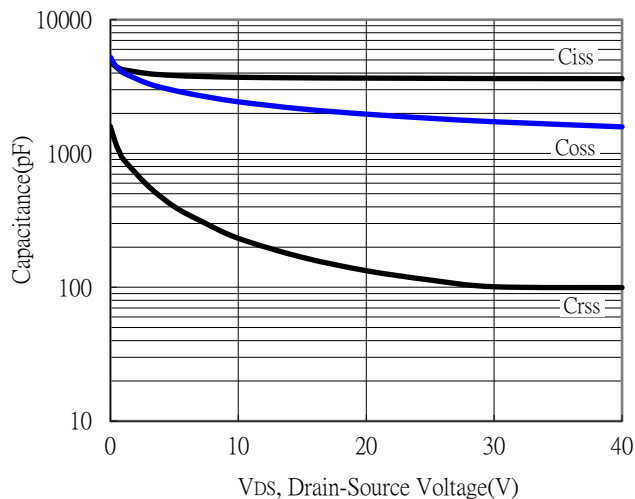


Drain-Source On-State Resistance vs Junction Temperature

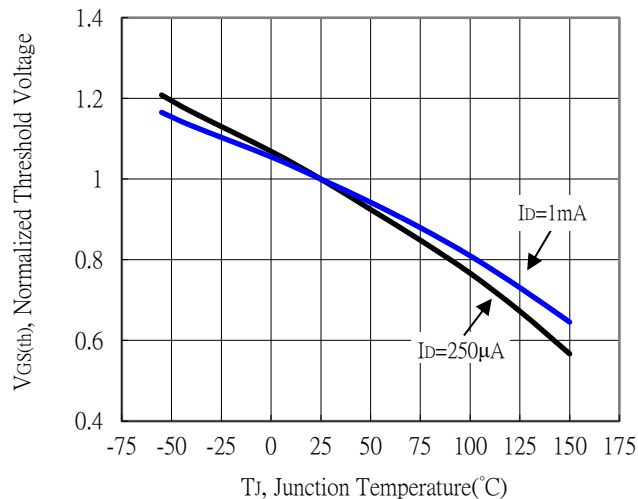


## Typical Characteristics (Cont.)

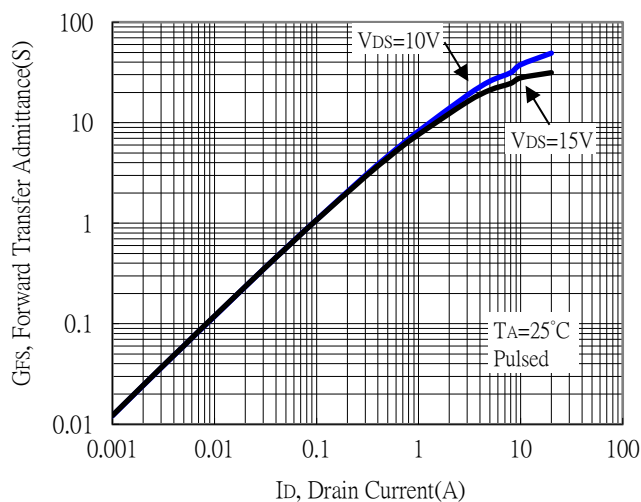
Capacitance vs Drain-to-Source Voltage



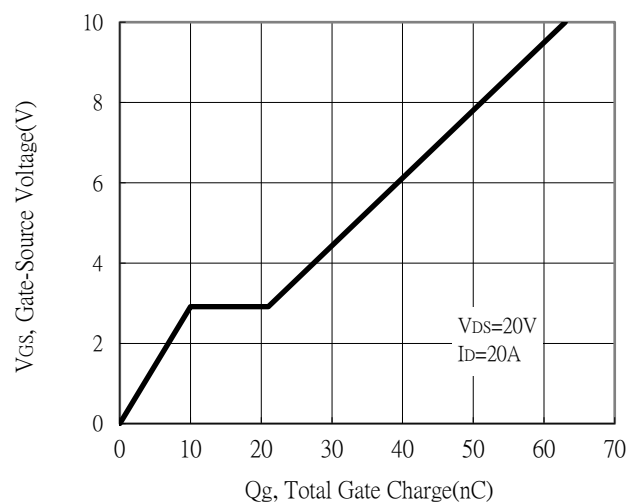
Threshold Voltage vs Junction Temperature



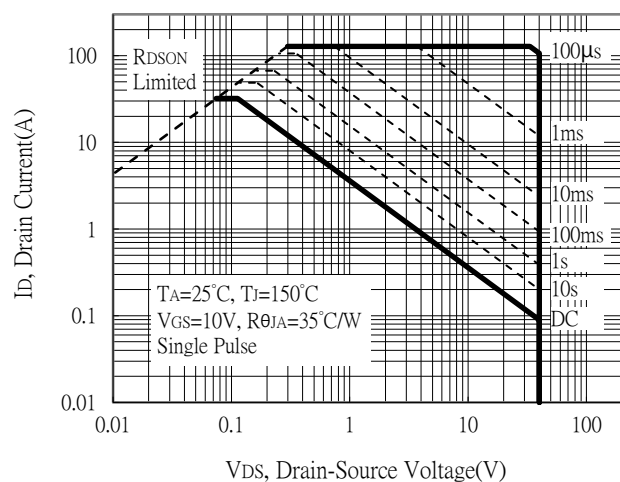
Forward Transfer Admittance vs Drain Current



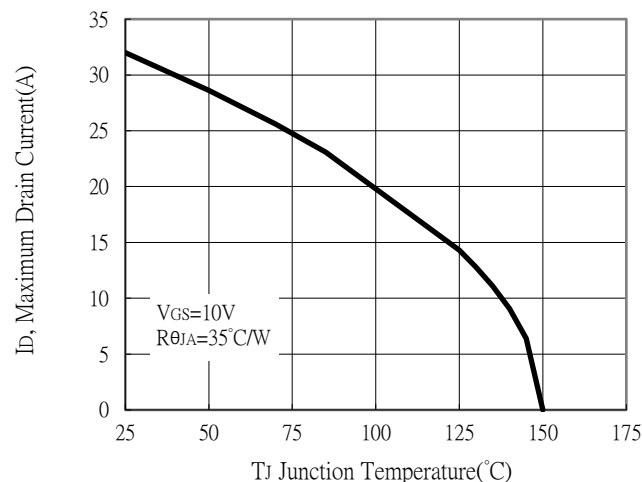
Gate Charge Characteristics



Maximum Safe Operating Area

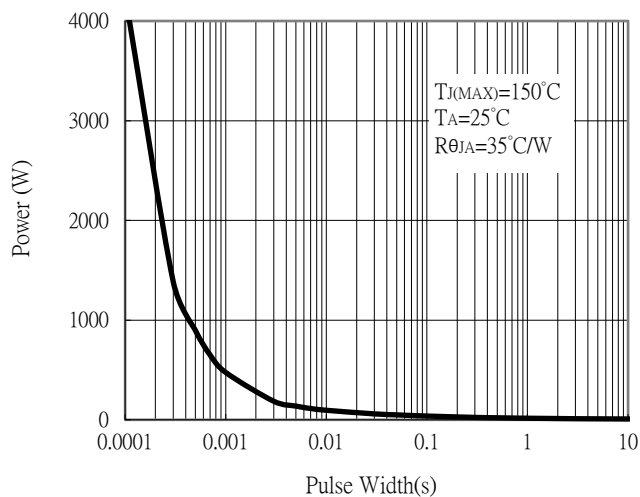


Maximum Drain Current vs Junction Temperature

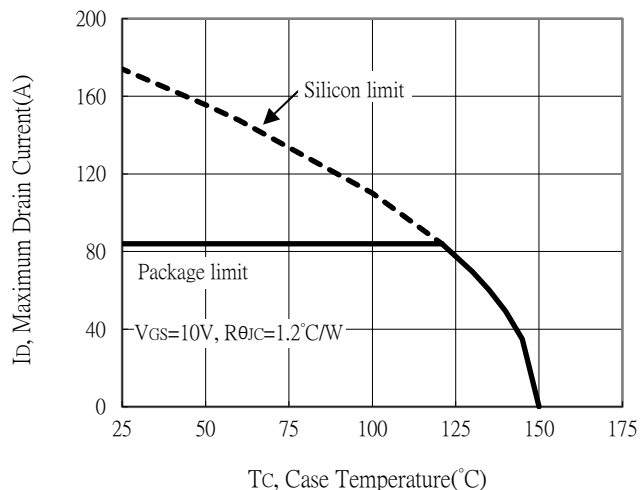


## Typical Characteristics (Cont.)

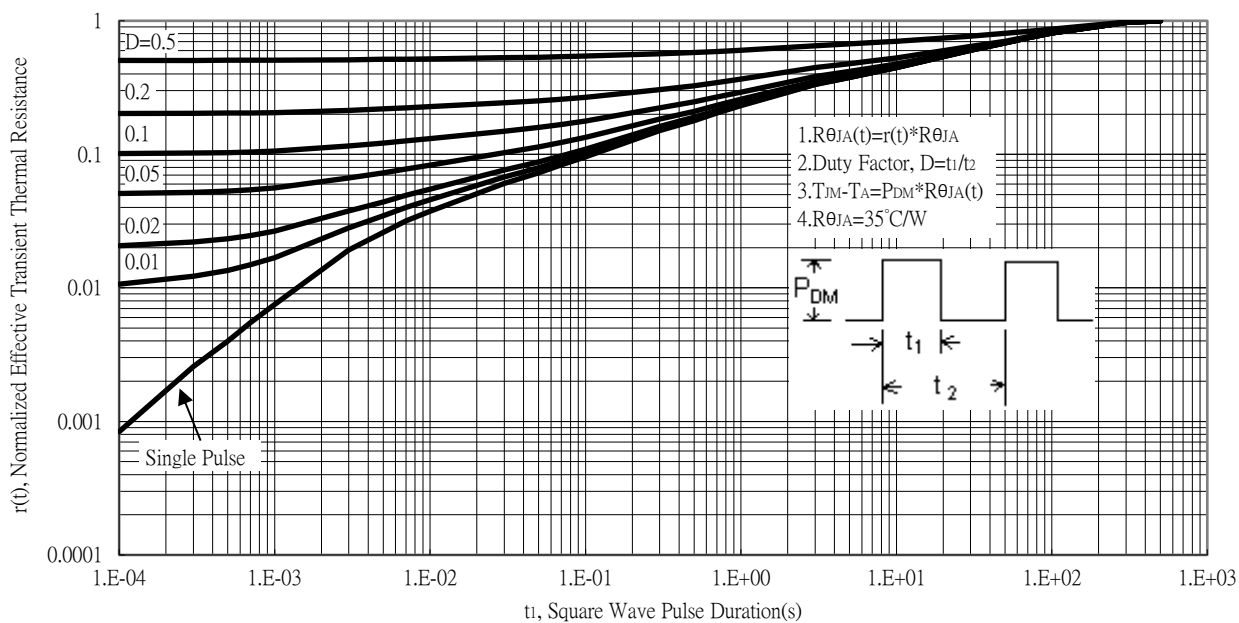
Single Pulse Power Rating, Junction to Ambient



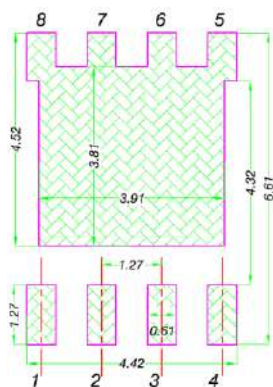
Maximum Drain Current vs Case Temperature



Transient Thermal Response Curves

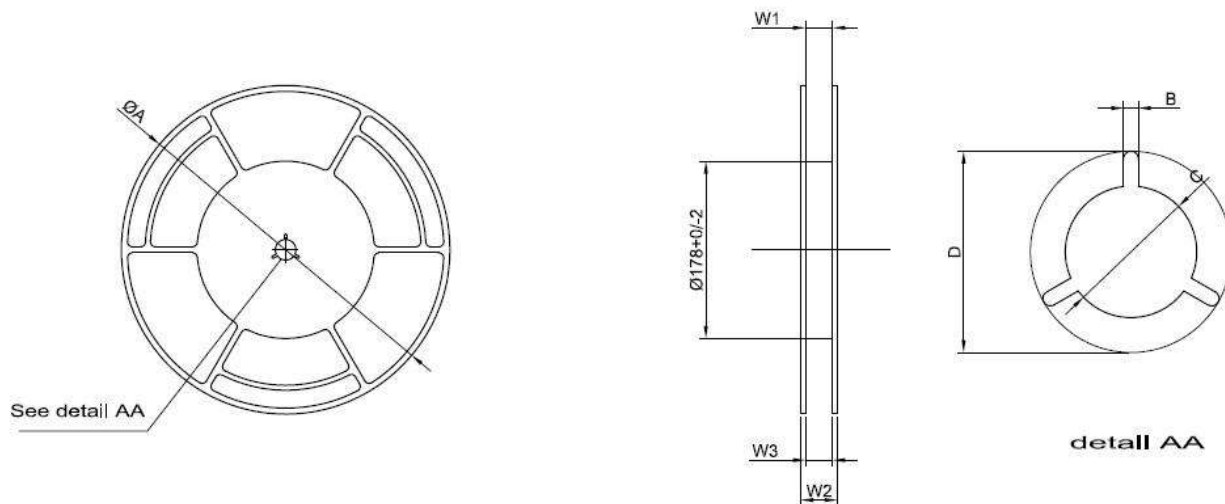


## Recommended Soldering Footprint



Unit : mm

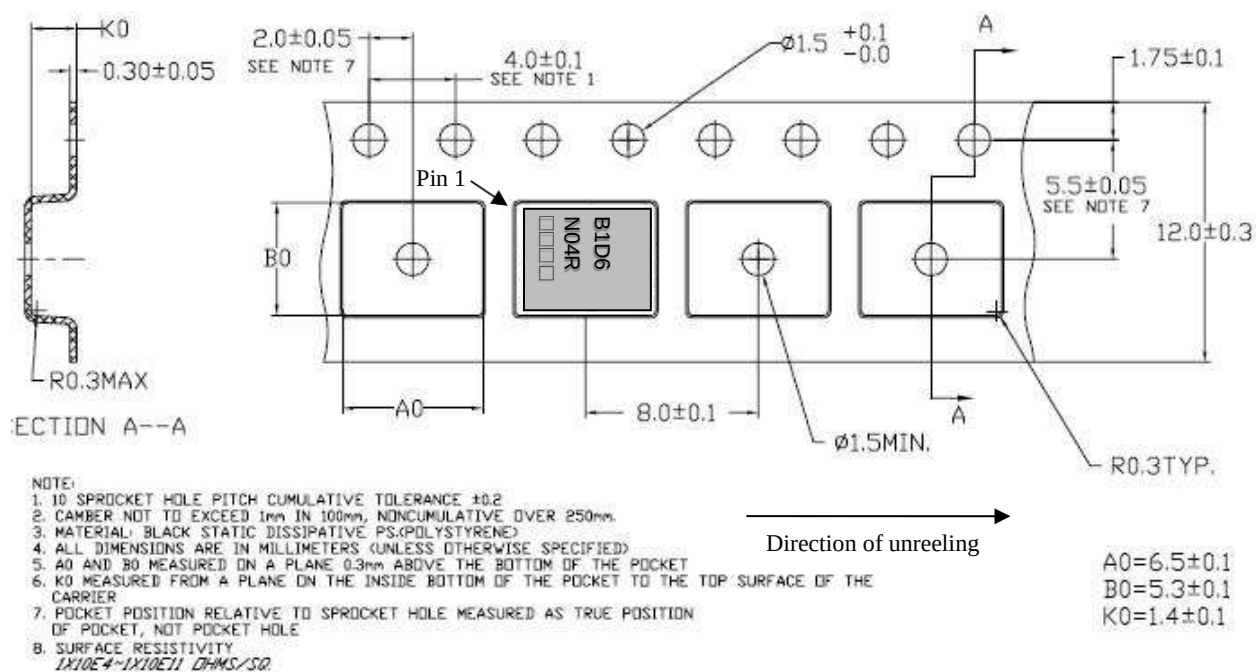
## Reel Dimension



| 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 |

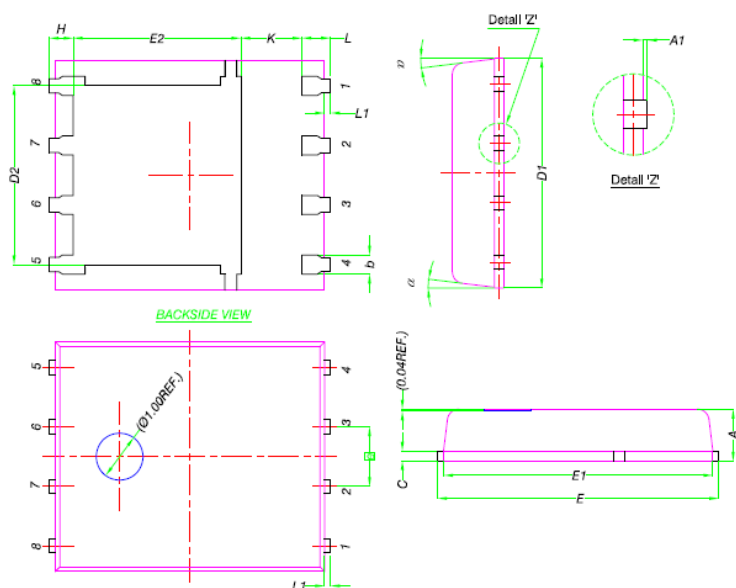
Unit : mm

## Carrier Tape Dimension



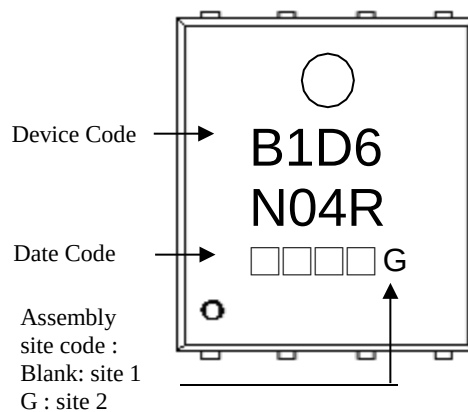
Unit : mm

## DFN5x6 Dimension



8-Lead DFN5x6 Plastic Package

### Marking:



Date Code(counting from left to right) :  
 1<sup>st</sup> code: year code, the last digit of Christian year  
 2<sup>nd</sup> code : month code, Jan→A, Feb→B, Mar→C, Apr→D, May→E, Jun→F, Jul→G, Aug→H, Sep→J, Oct→K, Nov→L, Dec→M  
 3<sup>rd</sup> and 4<sup>th</sup> codes : production serial number, 01~99

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