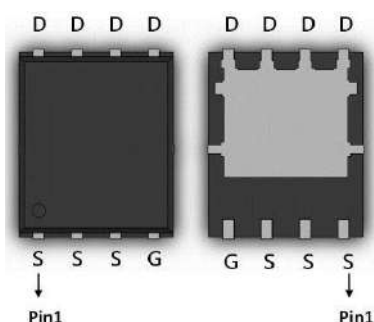


## N-Channel Enhancement Mode Power MOSFET

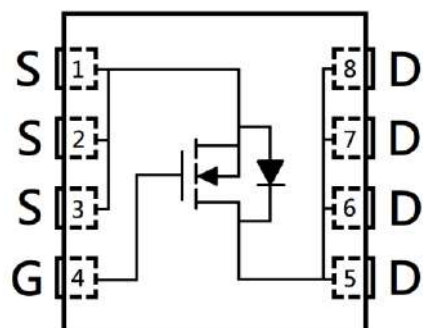
### Features:

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

DFN5x6



|                                            |               |
|--------------------------------------------|---------------|
| $BV_{DSS}$                                 | 40V           |
| $I_D @ V_{GS}=10V, T_C=25^\circ C$         | 84A           |
| $I_D @ V_{GS}=10V, T_A=25^\circ C$         | 21A           |
| $R_{DS(ON)}$ typ. @ $V_{GS}=10V, I_D=20A$  | 2.1m $\Omega$ |
| $R_{DS(ON)}$ typ. @ $V_{GS}=4.5V, I_D=15A$ | 3m $\Omega$   |



G : Gate S : Source D : Drain

### Ordering Information

| Device      | Package                                                   | Shipping               |
|-------------|-----------------------------------------------------------|------------------------|
| KPRB2D4N04R | DFN5x6<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) *a | I <sub>D</sub>                    | 107                      | A    |
| Continuous Drain Current @ V <sub>GS</sub> =10V, T <sub>C</sub> =25°C (package limit) *a |                                   | 84                       |      |
| Continuous Drain Current @ V <sub>GS</sub> =10V, T <sub>C</sub> =100°C *a                |                                   | 68                       |      |
| Continuous Drain Current @ V <sub>GS</sub> =10V, T <sub>A</sub> =25°C *b                 |                                   | 21                       |      |
| Continuous Drain Current @ V <sub>GS</sub> =10V, T <sub>A</sub> =70°C *b                 |                                   | 17                       |      |
| Pulsed Drain Current *c                                                                  | I <sub>DM</sub>                   | 336                      |      |
| Continuous Body Diode Forward Current @ T <sub>C</sub> =25°C *a                          | I <sub>S</sub>                    | 49                       | mJ   |
| Avalanche Current @ L=0.1mH                                                              | I <sub>AS</sub>                   | 40                       |      |
| Avalanche Energy @ L=0.5mH                                                               | E <sub>AS</sub>                   | 156                      |      |
| Total Power Dissipation                                                                  | P <sub>D</sub>                    | T <sub>C</sub> =25°C *a  | W    |
|                                                                                          |                                   | T <sub>C</sub> =100°C *a |      |
|                                                                                          |                                   | T <sub>A</sub> =25°C *b  |      |
|                                                                                          |                                   | T <sub>A</sub> =70°C *b  |      |
| 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> | 2.1          | °C/W |
| Thermal Resistance, Junction-to-ambient *b | R <sub>θJA</sub> | 54           |      |

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>           | -    | 27   | -    | 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> =32V, V <sub>GS</sub> =0V                                            |
| R <sub>DS(ON)</sub>       | -    | 2.1  | 2.7  | mΩ   | V <sub>GS</sub> =10V, I <sub>D</sub> =20A                                            |
|                           | -    | 3    | 4.2  |      | V <sub>GS</sub> =4.5V, I <sub>D</sub> =15A                                           |
| Dynamic                   |      |      |      |      |                                                                                      |
| C <sub>iss</sub>          | -    | 2750 | -    | pF   | V <sub>DS</sub> =20V, V <sub>GS</sub> =0V, f=1MHz                                    |
| C <sub>oss</sub>          | -    | 1050 | -    |      |                                                                                      |
| C <sub>rss</sub>          | -    | 60   | -    |      |                                                                                      |
| R <sub>g</sub>            | -    | 1    | -    | Ω    | f=1MHz                                                                               |
| Q <sub>g</sub> *1, 2      | -    | 47   | -    | nC   | V <sub>DS</sub> =20V, I <sub>D</sub> =20A, V <sub>GS</sub> =10V                      |
| Q <sub>gs</sub> *1, 2     | -    | 8.5  | -    |      |                                                                                      |
| Q <sub>gd</sub> *1, 2     | -    | 8    | -    |      |                                                                                      |
| t <sub>d(ON)</sub> *1, 2  | -    | 18   | -    | ns   | V <sub>DS</sub> =20V, I <sub>D</sub> =20A, V <sub>GS</sub> =10V, R <sub>GS</sub> =1Ω |
| t <sub>r</sub> *1, 2      | -    | 15   | -    |      |                                                                                      |
| t <sub>d(OFF)</sub> *1, 2 | -    | 55   | -    |      |                                                                                      |
| t <sub>f</sub> *1, 2      | -    | 8    | -    |      |                                                                                      |
| 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>           | -    | 38   | -    | ns   | I <sub>F</sub> =20A, dI <sub>F</sub> /dt=100A/μs                                     |
| Q <sub>rr</sub>           | -    | 26   | -    | nC   |                                                                                      |

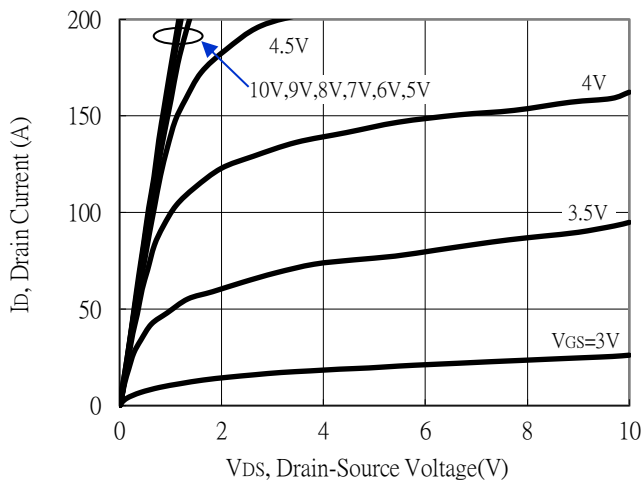
Note:

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

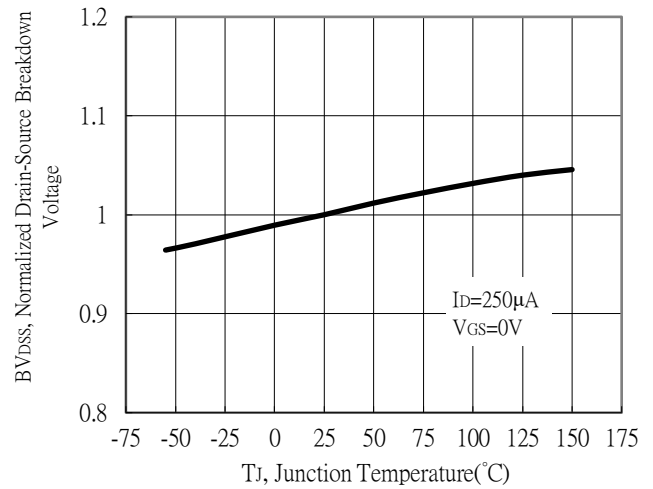
\*2. Independent of operating temperature

## Typical Characteristics

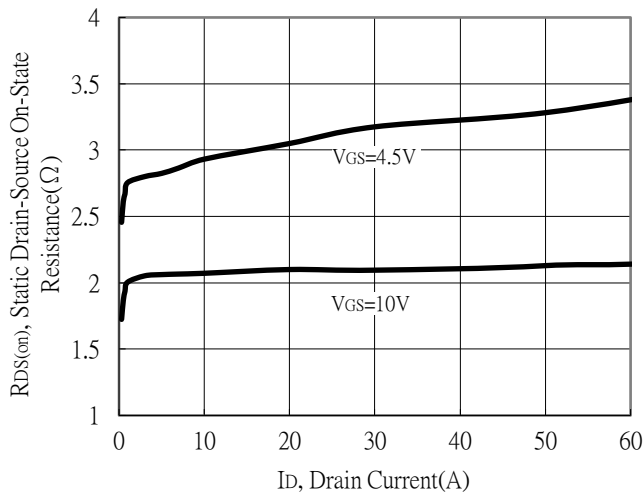
Typical Output Characteristics



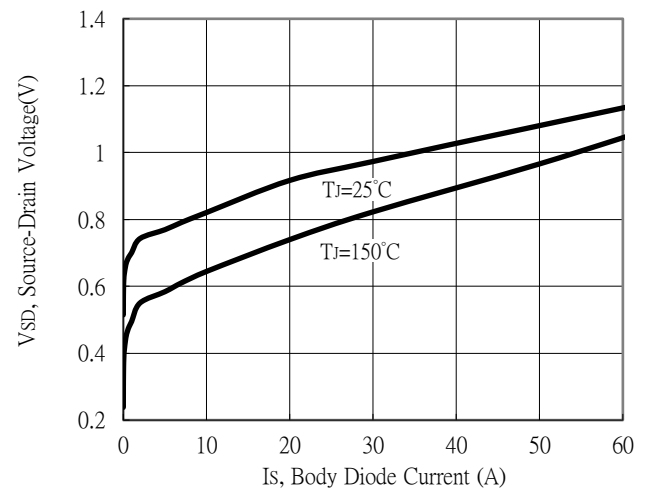
Breakdown Voltage vs Ambient Temperature



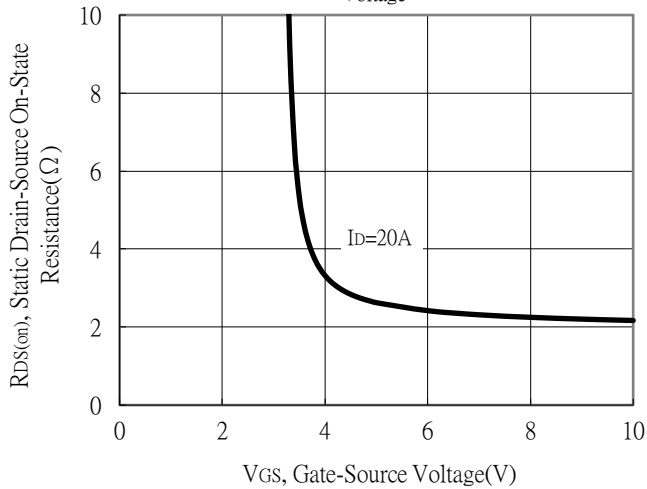
Static Drain-Source On-State resistance vs Drain Current



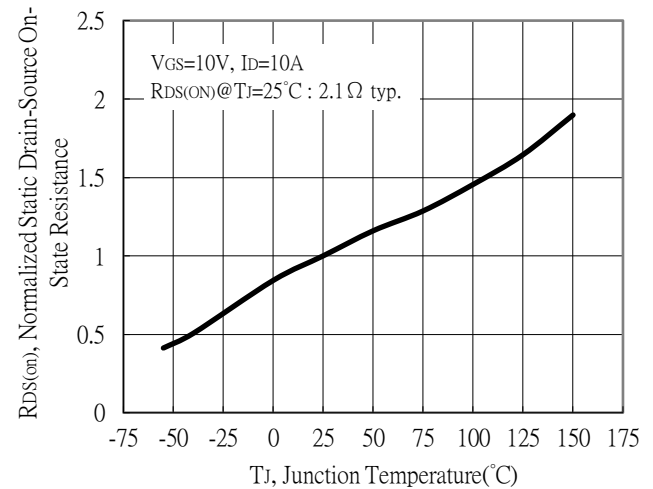
Body Diode Current vs Source-Drain Voltage



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

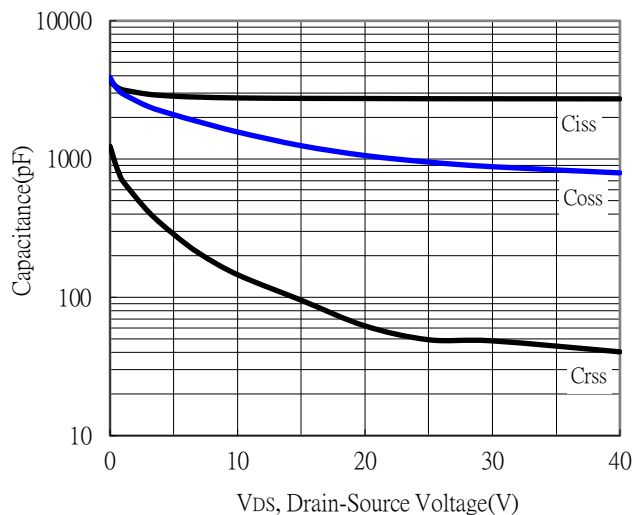


Drain-Source On-State Resistance vs Junction Temperature

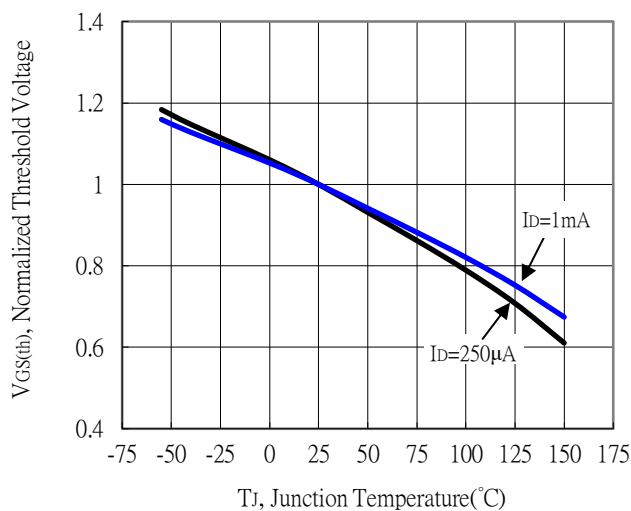


## Typical Characteristics (Cont.)

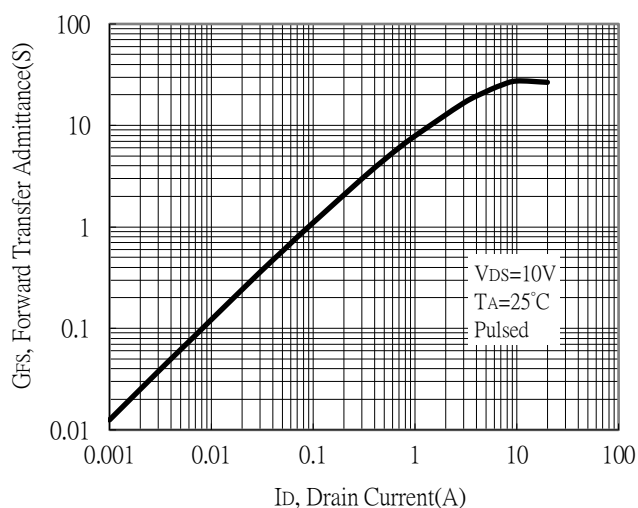
Capacitance vs Drain-to-Source Voltage



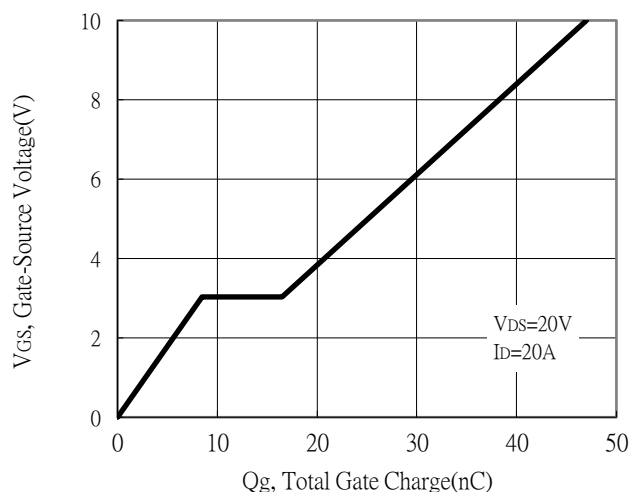
Threshold Voltage vs Junction Temperature



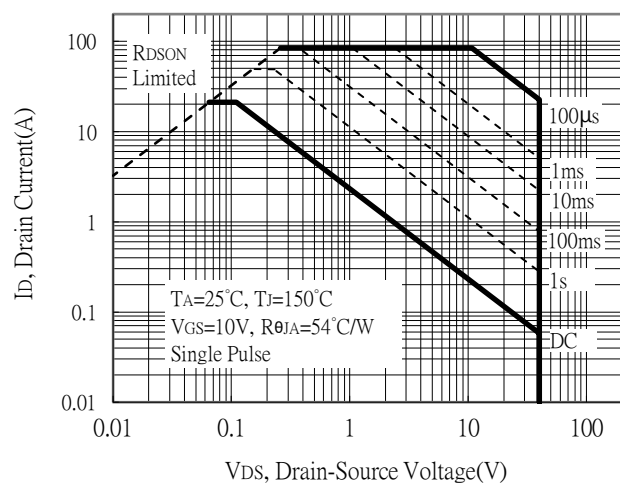
Forward Transfer Admittance vs Drain Current



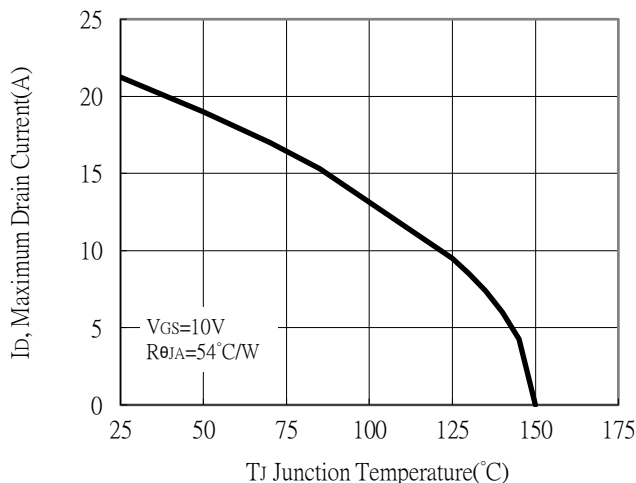
Gate Charge Characteristics



Maximum Safe Operating Area

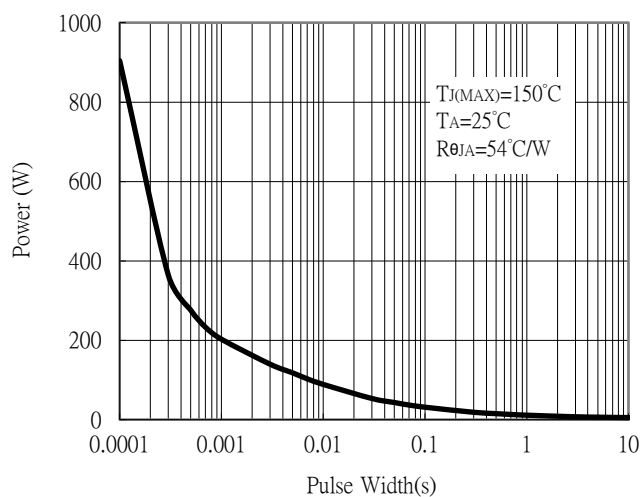


Maximum Drain Current vs Junction Temperature

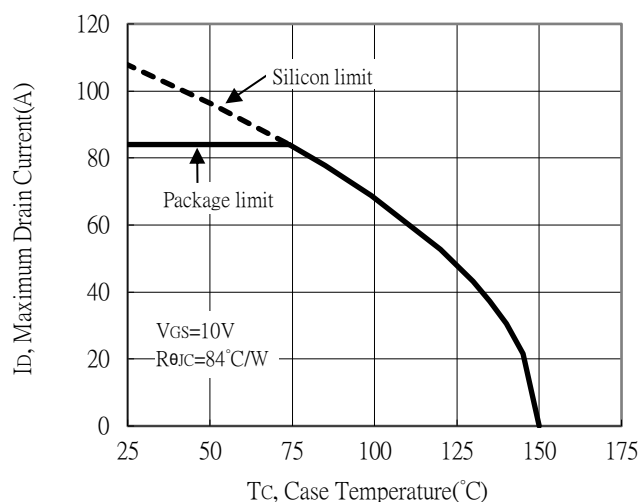


## Typical Characteristics (Cont.)

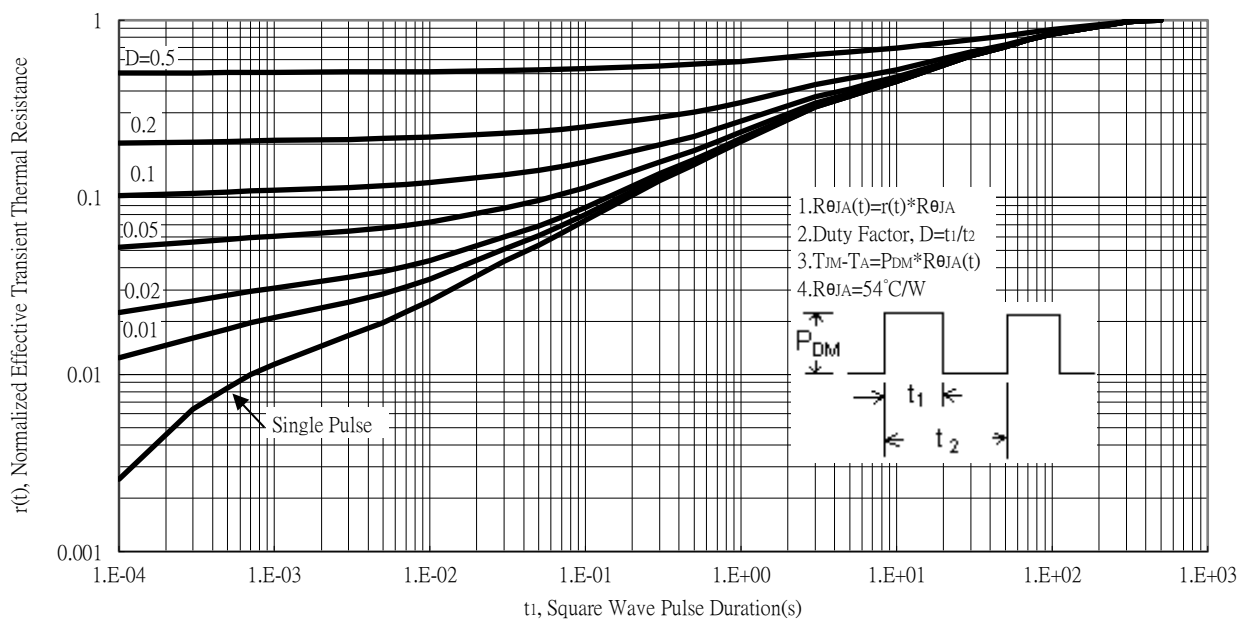
Single Pulse Power Rating, Junction to Ambient



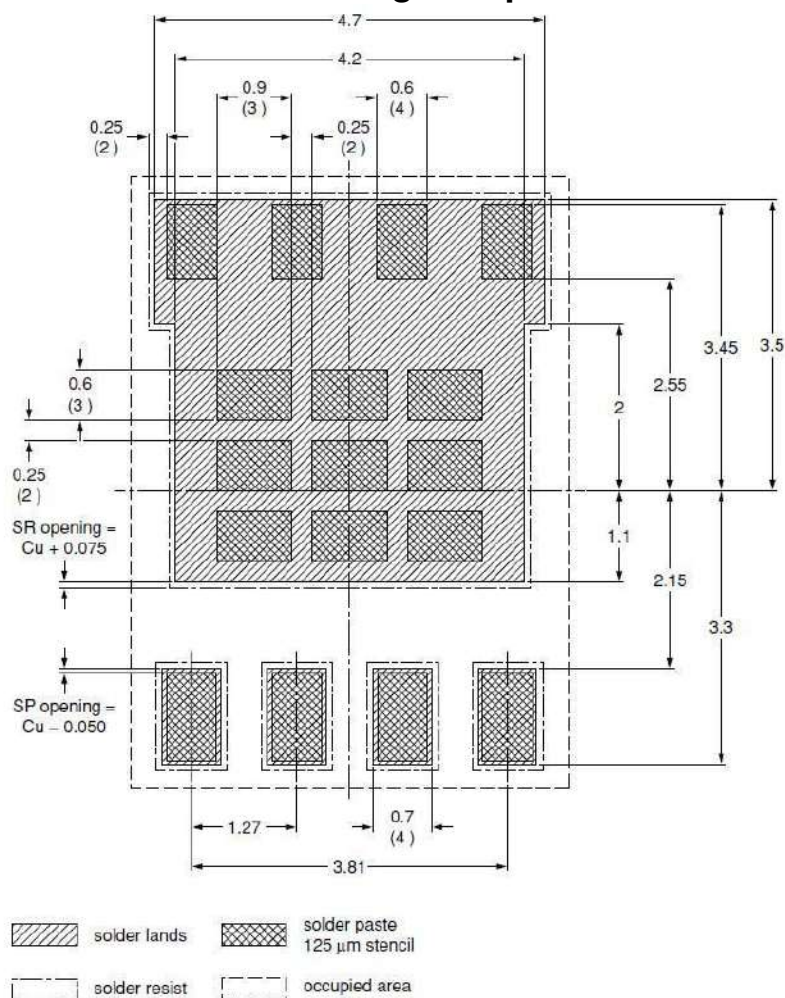
Maximum Drain Current vs Case Temperature



Transient Thermal Response Curves

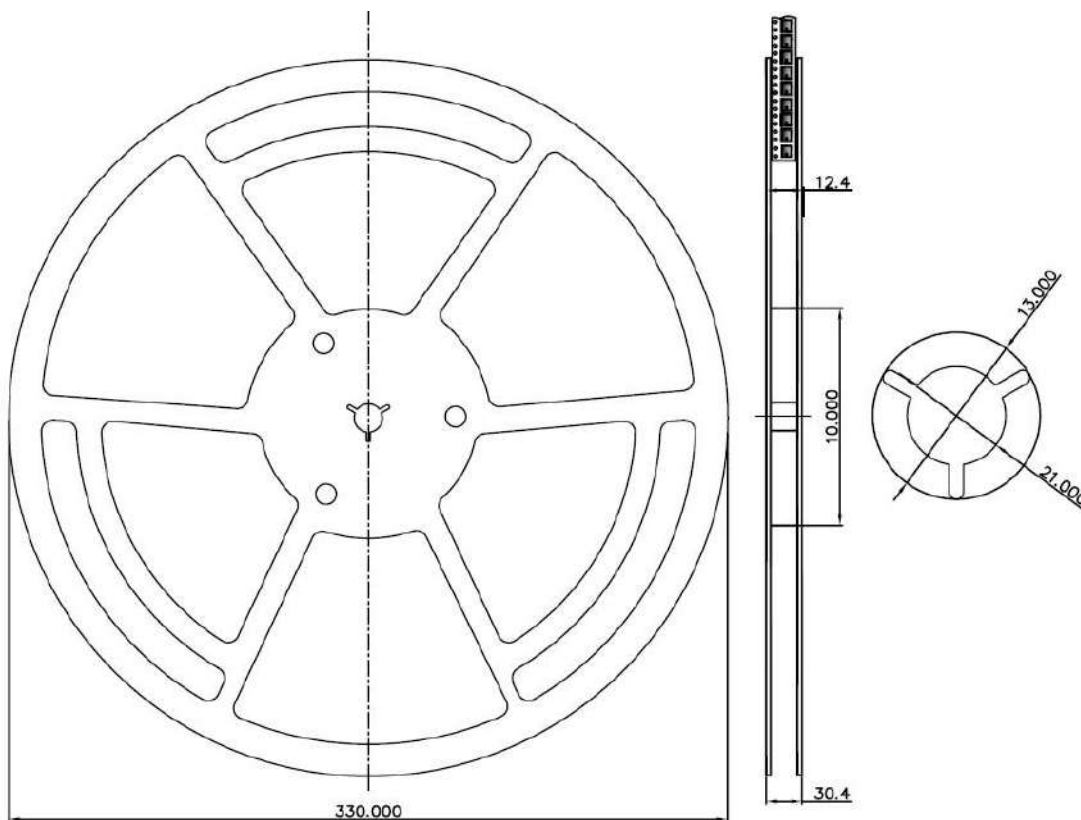


## Recommended Soldering Footprint & Stencil Design

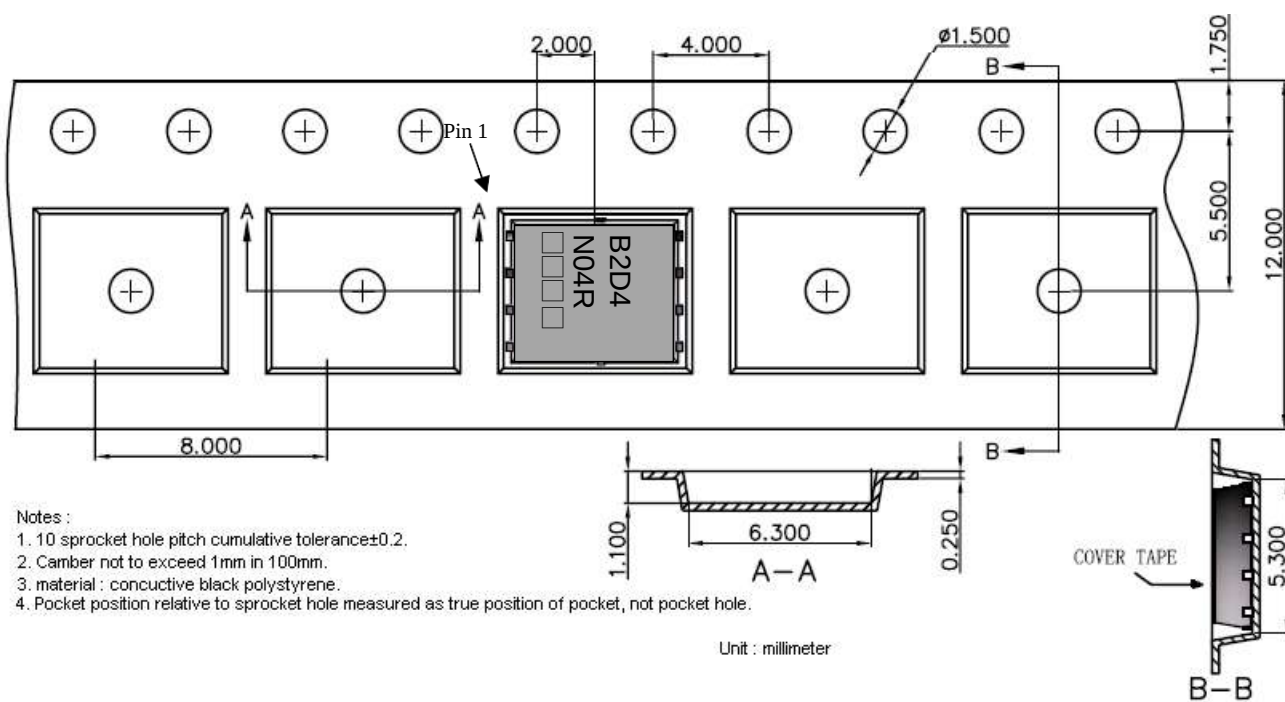


unit : mm

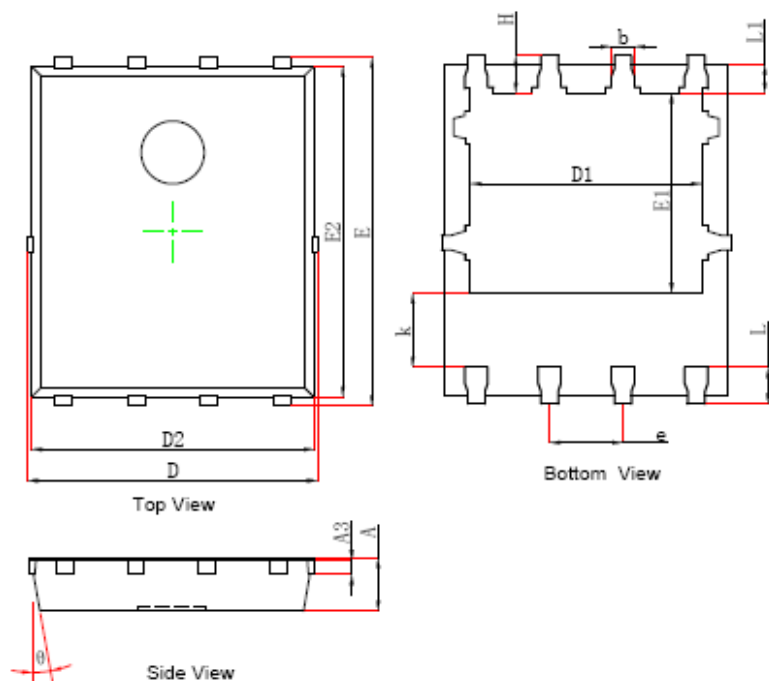
## Reel Dimension



## Carrier Tape Dimension

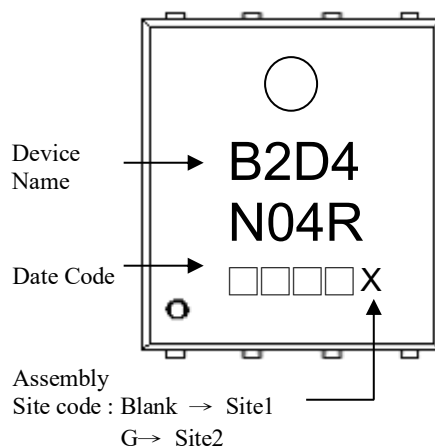


## DFN5x6 Dimension



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   | 0.900       | 1.100 | 0.035  | 0.043 | k   | 1.100       | -     | 0.043  | -     |
| A3  | 0.200       | 0.300 | 0.008  | 0.012 | b   | 0.330       | 0.510 | 0.013  | 0.020 |
| D   | 4.944       | 5.096 | 0.195  | 0.201 | e   | 1.270       | TYP.  | 0.050  | TYP.  |
| E   | 5.900       | 6.126 | 0.232  | 0.241 | L   | 0.510       | 0.711 | 0.020  | 0.028 |
| D1  | 3.670       | 4.110 | 0.144  | 0.162 | L1  | 0.310       | 0.576 | 0.012  | 0.023 |
| E1  | 3.375       | 3.780 | 0.133  | 0.149 | H   | 0.410       | 0.726 | 0.016  | 0.029 |
| D2  | 4.800       | 5.000 | 0.189  | 0.197 | θ   | 8°          | 12°   | 8°     | 12°   |
| E2  | 5.674       | 5.826 | 0.223  | 0.229 |     |             |       |        |       |