

## N- AND P-Channel Enhancement Mode MOSFET

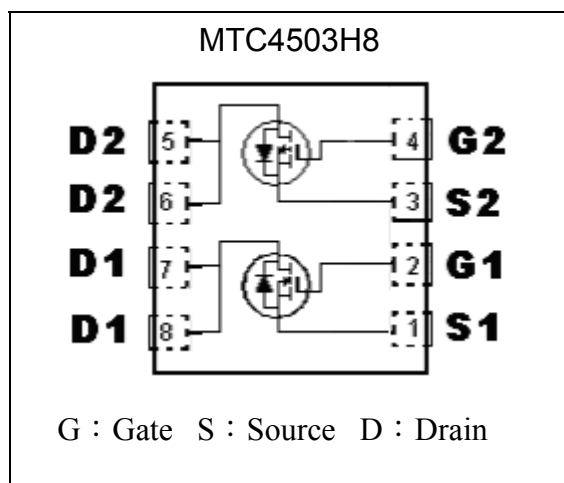
# MTC4503H8

|                                         | N-CH         | P-CH         |
|-----------------------------------------|--------------|--------------|
| $BV_{DSS}$                              | 30V          | -30V         |
| $I_D@V_{GS}=10V(-10V), T_A=25^{\circ}C$ | 9.4A         | -7.8A        |
| $I_D@V_{GS}=10V(-10V), T_C=25^{\circ}C$ | 27A          | -22.5A       |
| $R_{DS(on)(typ)}@V_{GS}=10V(-10V)$      | 13m $\Omega$ | 21m $\Omega$ |
| $R_{DS(on)(typ)}@V_{GS}=4.5V(-4.5V)$    | 17m $\Omega$ | 35m $\Omega$ |

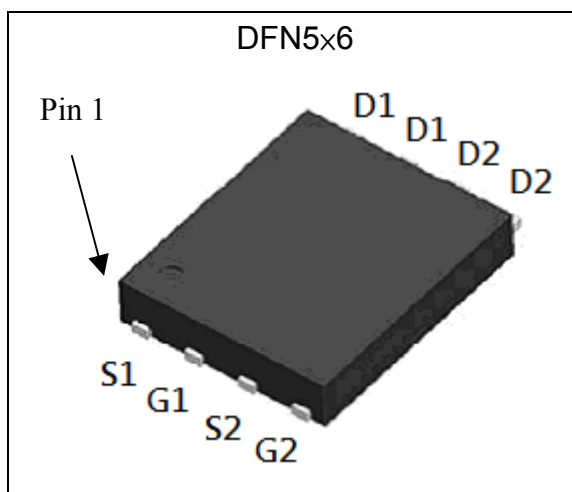
### Features

- Simple drive requirement
- Low on-resistance
- Fast switching speed
- Pb-free lead plating and halogen-free package

### Equivalent Circuit

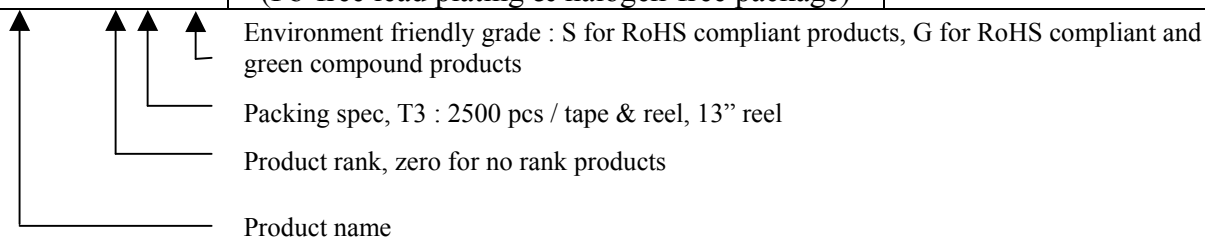


### Outline



### Ordering Information

| Device           | Package                                                   | Shipping               |
|------------------|-----------------------------------------------------------|------------------------|
| MTC4503H8-0-T6-G | DFN 5 ×6<br>(Pb-free lead plating & halogen-free package) | 3000 pcs / Tape & Reel |



**Absolute Maximum Ratings** ( $T_C=25^{\circ}\text{C}$ , unless otherwise noted)

| Parameter                                        |                                                     | Symbol                            | Limits       |           | Unit |
|--------------------------------------------------|-----------------------------------------------------|-----------------------------------|--------------|-----------|------|
|                                                  |                                                     |                                   | N-channel    | P-channel |      |
| Drain-Source Breakdown Voltage                   |                                                     | BV <sub>DSS</sub>                 | 30           | -30       | V    |
| Gate-Source Voltage                              |                                                     | V <sub>GS</sub>                   | ±20          | ±20       |      |
| Continuous Drain Current                         | T <sub>A</sub> =25 °C, V <sub>GS</sub> =10V (-10V)  | I <sub>DSM</sub>                  | 9.4          | -7.8      | A    |
|                                                  | T <sub>A</sub> =70 °C, V <sub>GS</sub> =10V (-10V)  |                                   | 7.5          | -6.2      |      |
|                                                  | T <sub>C</sub> =25 °C, V <sub>GS</sub> =10V (-10V)  | I <sub>D</sub>                    | 27           | -22.5     |      |
|                                                  | T <sub>C</sub> =100 °C, V <sub>GS</sub> =10V (-10V) |                                   | 17           | -14.2     |      |
| Pulsed Drain Current (Note 1 & 2)                |                                                     | I <sub>DM</sub>                   | 40           | -40       |      |
| Power Dissipation                                | T <sub>A</sub> =25 °C                               | P <sub>DSM</sub>                  | 2.5 (Note 3) |           | W    |
|                                                  | T <sub>A</sub> =70 °C                               |                                   | 1.6 (Note 3) |           |      |
|                                                  | T <sub>C</sub> =25 °C                               | P <sub>D</sub>                    | 21           |           |      |
|                                                  | T <sub>C</sub> =100 °C                              |                                   | 8.4          |           |      |
| Operating Junction and Storage Temperature Range |                                                     | T <sub>j</sub> ; T <sub>stg</sub> | -55~+150     |           | °C   |

**Thermal Data**

| Parameter                                    | Symbol       | Value       | Unit                        |
|----------------------------------------------|--------------|-------------|-----------------------------|
| Thermal Resistance, Junction-to-case, max    | $R_{th,j-c}$ | 6           | $^{\circ}\text{C}/\text{W}$ |
| Thermal Resistance, Junction-to-ambient, max | $R_{th,j-a}$ | 50 (Note 3) |                             |

Note : 1. Pulse width limited by maximum junction temperature

2. Duty cycle  $\leq 1\%$ 3. Surface mounted on 1 in<sup>2</sup> copper pad of FR-4 board,  $t \leq 10\text{s}$ ;  $125^{\circ}\text{C}/\text{W}$  when mounted on minimum copper pad.**N-Channel Electrical Characteristics** ( $T_C=25^{\circ}\text{C}$ , unless otherwise specified)

| Symbol         | Min. | Typ. | Max.      | Unit          | Test Conditions                                                               |
|----------------|------|------|-----------|---------------|-------------------------------------------------------------------------------|
| <b>Static</b>  |      |      |           |               |                                                                               |
| $BV_{DSS}$     | 30   | -    | -         | V             | $V_{GS}=0\text{V}$ , $I_D=250\mu\text{A}$                                     |
| $V_{GS(th)}$   | 1.0  | -    | 3.0       |               | $V_{DS}=V_{GS}$ , $I_D=250\mu\text{A}$                                        |
| $I_{GSS}$      | -    | -    | $\pm 100$ | nA            | $V_{GS}=\pm 20\text{V}$ , $V_{DS}=0\text{V}$                                  |
| $I_{DSS}$      | -    | -    | 1         | $\mu\text{A}$ | $V_{DS}=30\text{V}$ , $V_{GS}=0\text{V}$                                      |
|                | -    | -    | 25        |               | $V_{DS}=24\text{V}$ , $V_{GS}=0$ , $T_j=125^{\circ}\text{C}$                  |
| $*R_{DS(ON)}$  | -    | 13   | 17        | m $\Omega$    | $I_D=6\text{A}$ , $V_{GS}=10\text{V}$                                         |
|                | -    | 17   | 23        |               | $I_D=4\text{A}$ , $V_{GS}=4.5\text{V}$                                        |
| $*G_{FS}$      | -    | 6    | -         | S             | $V_{DS}=10\text{V}$ , $I_D=6\text{A}$                                         |
| <b>Dynamic</b> |      |      |           |               |                                                                               |
| $C_{iss}$      | -    | 526  | 790       | pF            | $V_{DS}=25\text{V}$ , $V_{GS}=0\text{V}$ , $f=1\text{MHz}$                    |
| $C_{oss}$      | -    | 62   | -         |               |                                                                               |
| $C_{rss}$      | -    | 53   | -         |               |                                                                               |
| $*t_{d(ON)}$   | -    | 6    | -         | ns            | $V_{DS}=15\text{V}$ , $I_D=1\text{A}$ , $V_{GS}=10\text{V}$ , $R_G=3.3\Omega$ |
| $*t_r$         | -    | 18   | -         |               |                                                                               |
| $*t_{d(OFF)}$  | -    | 29   | -         |               |                                                                               |
| $*t_f$         | -    | 6    | -         |               |                                                                               |



|                  |   |      |     |    |                                                                 |
|------------------|---|------|-----|----|-----------------------------------------------------------------|
| *Qg              | - | 6.8  | 10  | nC | V <sub>DS</sub> =24V, I <sub>D</sub> =6A, V <sub>GS</sub> =4.5V |
| *Qgs             | - | 1    | -   |    |                                                                 |
| *Qgd             | - | 3.8  | -   |    |                                                                 |
| Body Diode       |   |      |     |    |                                                                 |
| *V <sub>SD</sub> | - | 0.85 | 1.2 | V  | V <sub>GS</sub> =0V, I <sub>S</sub> =6.9A                       |
| *trr             | - | 7.5  | -   | ns | I <sub>F</sub> =6.9A dI <sub>F</sub> /dt=100A/μs                |
| *Q <sub>rr</sub> | - | 3.5  | -   | nC |                                                                 |

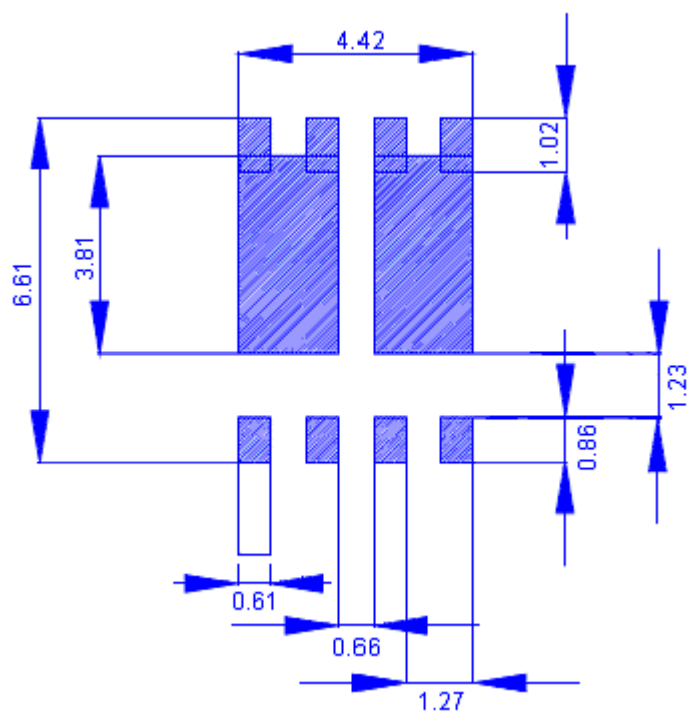
\*Pulse Test : Pulse Width ≤300μs, Duty Cycle ≤2%

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

| Symbol               | Min. | Typ.  | Max. | Unit | Test Conditions                                                                         |
|----------------------|------|-------|------|------|-----------------------------------------------------------------------------------------|
| Static               |      |       |      |      |                                                                                         |
| BV <sub>DSS</sub>    | -30  | -     | -    | V    | V <sub>GS</sub> =0V, I <sub>D</sub> =-250μA                                             |
| V <sub>GS(th)</sub>  | -1.0 | -     | -3.0 |      | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA                               |
| 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> =-30V, V <sub>GS</sub> =0V                                              |
|                      | -    | -     | -25  |      | V <sub>DS</sub> =-24V, V <sub>GS</sub> =0V, T <sub>j</sub> =125°C                       |
| *R <sub>DS(ON)</sub> | -    | 21    | 30   | mΩ   | I <sub>D</sub> =-6A, V <sub>GS</sub> =-10V                                              |
|                      | -    | 35    | 48   |      | I <sub>D</sub> =-4A, V <sub>GS</sub> =-4.5V                                             |
| *G <sub>FS</sub>     | -    | 8     | -    | S    | V <sub>DS</sub> =-10V, I <sub>D</sub> =-6A                                              |
| Dynamic              |      |       |      |      |                                                                                         |
| C <sub>iss</sub>     | -    | 1084  | 1626 | pF   | V <sub>DS</sub> =-25V, V <sub>GS</sub> =0V, f=1MHz                                      |
| C <sub>oss</sub>     | -    | 107   | -    |      |                                                                                         |
| C <sub>rss</sub>     | -    | 77    | -    |      |                                                                                         |
| *t <sub>d(ON)</sub>  | -    | 8     | -    | ns   | V <sub>DS</sub> =-15V, I <sub>D</sub> =-1A, V <sub>GS</sub> =-10V, R <sub>G</sub> =3.3Ω |
| *t <sub>r</sub>      | -    | 19    | -    |      |                                                                                         |
| *t <sub>d(OFF)</sub> | -    | 47    | -    |      |                                                                                         |
| *t <sub>f</sub>      | -    | 15    | -    |      |                                                                                         |
| *Q <sub>g</sub>      | -    | 10    | 15   | nC   | V <sub>DS</sub> =-24V, I <sub>D</sub> =-6A, V <sub>GS</sub> =-4.5V                      |
| *Q <sub>gs</sub>     | -    | 3.3   | -    |      |                                                                                         |
| *Q <sub>gd</sub>     | -    | 4.1   | -    |      |                                                                                         |
| Body Diode           |      |       |      |      |                                                                                         |
| *V <sub>SD</sub>     | -    | -0.85 | -1.2 | V    | V <sub>GS</sub> =0V, I <sub>S</sub> =-6.3A                                              |
| *t <sub>rr</sub>     | -    | 9     | -    | ns   | I <sub>F</sub> =-6.3A dI <sub>F</sub> /dt=100A/μs                                       |
| *Q <sub>rr</sub>     | -    | 3.2   | -    | nC   |                                                                                         |

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

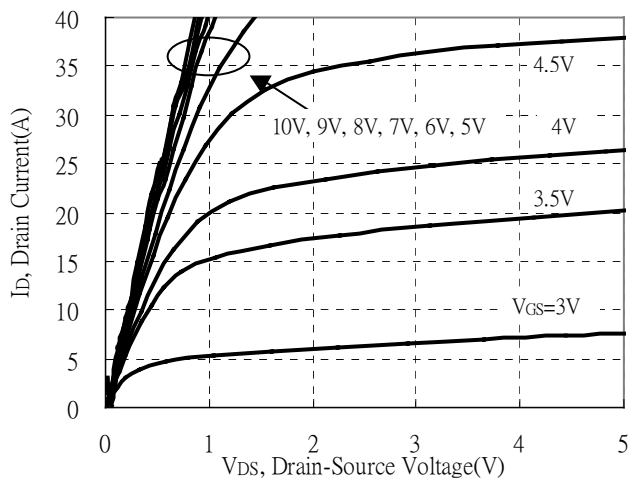
## Recommended Soldering Footprint



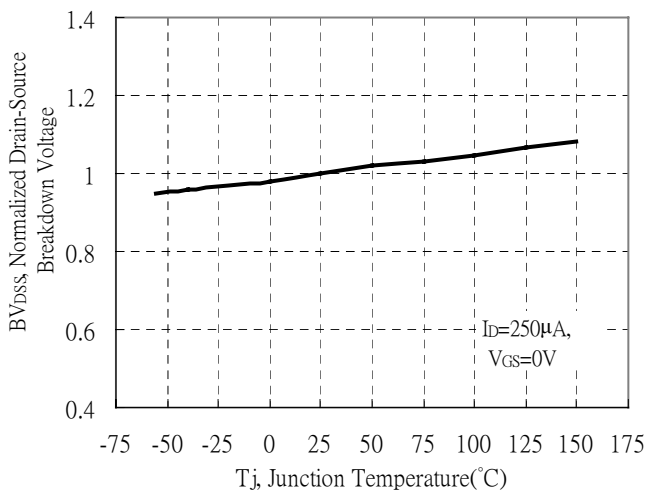
unit : mm

## Typical Characteristics : Q1( N-channel )

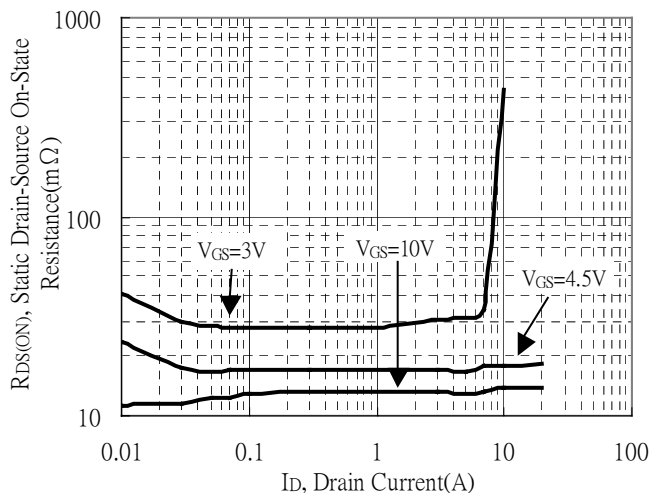
Typical Output Characteristics



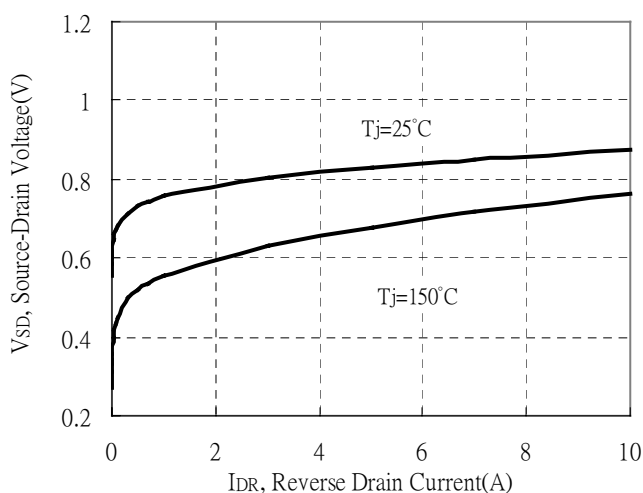
Breakdown Voltage vs Ambient Temperature



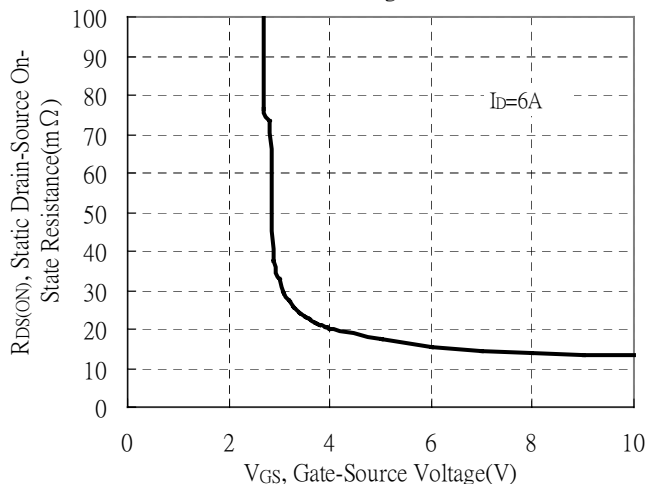
Static Drain-Source On-State resistance vs Drain Current



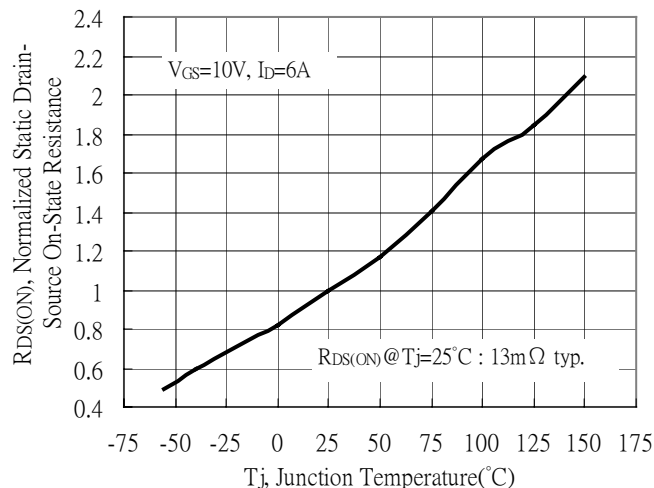
Reverse Drain Current vs Source-Drain Voltage



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

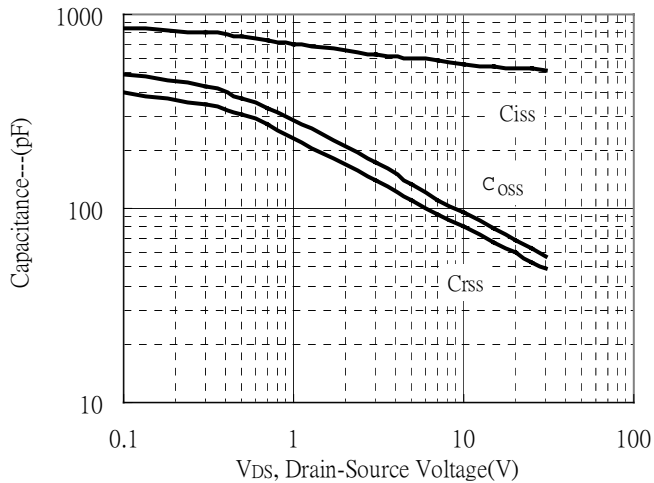


Drain-Source On-State Resistance vs Junction Temperature

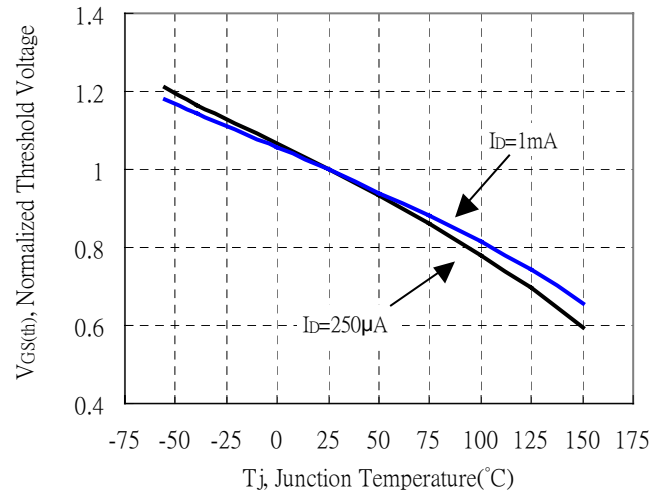


## Typical Characteristics(Cont.) : Q1( N-channel)

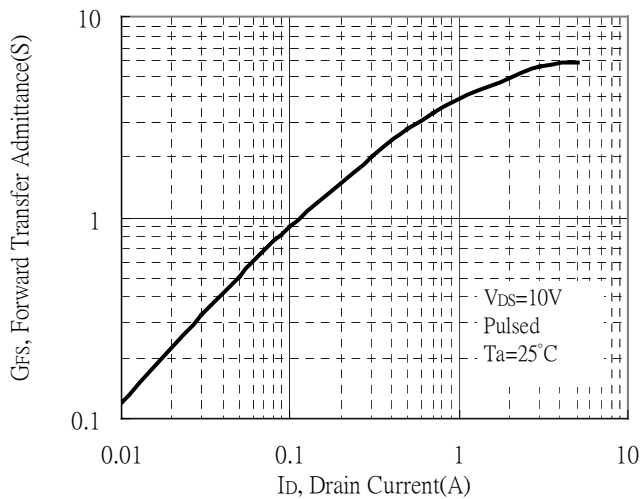
Capacitance vs Drain-to-Source Voltage



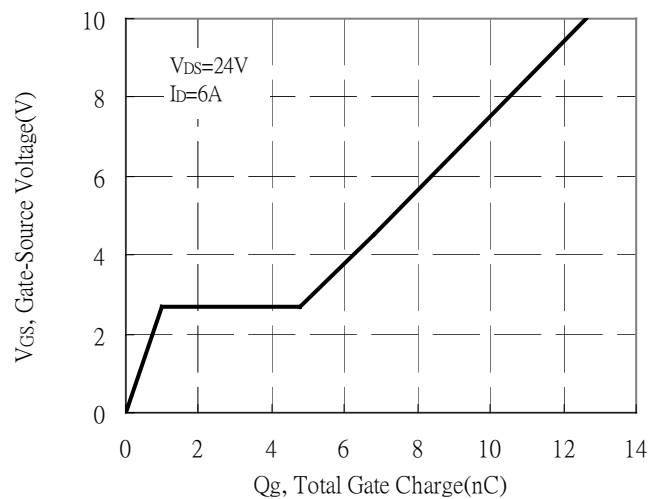
Threshold Voltage vs Junction Temperature



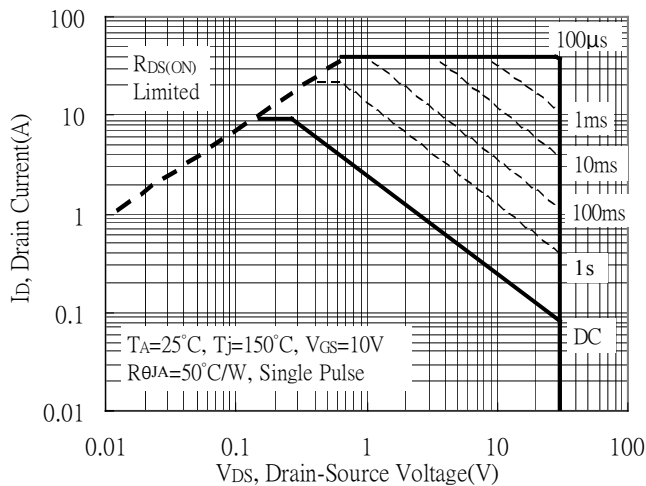
Forward Transfer Admittance vs Drain Current



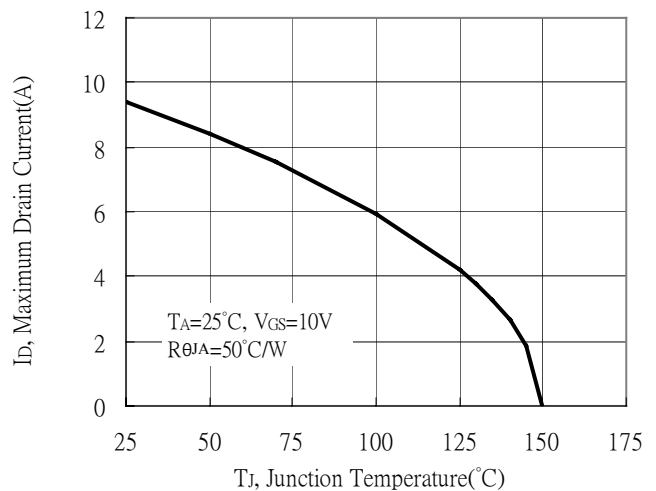
Gate Charge Characteristics



Maximum Safe Operating Area

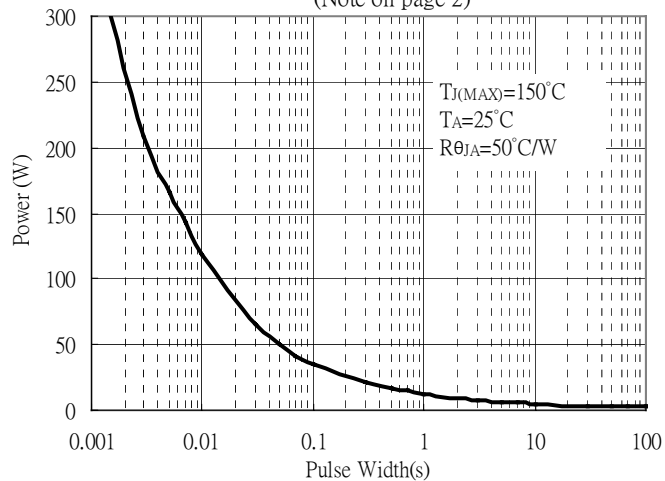


Maximum Drain Current vs Junction Temperature

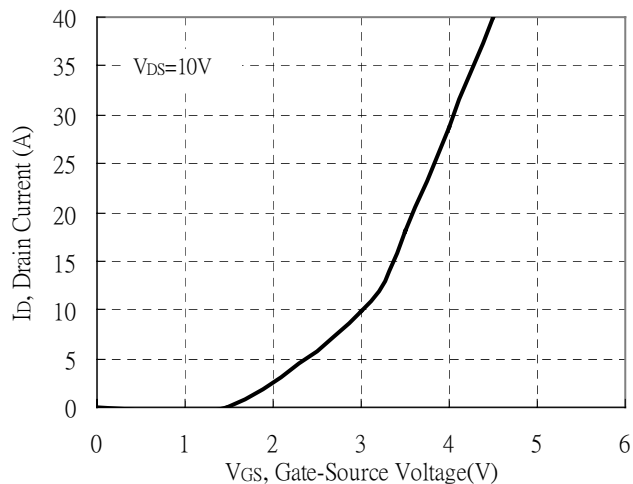


## Typical Characteristics(Cont.) : Q1( N-channel)

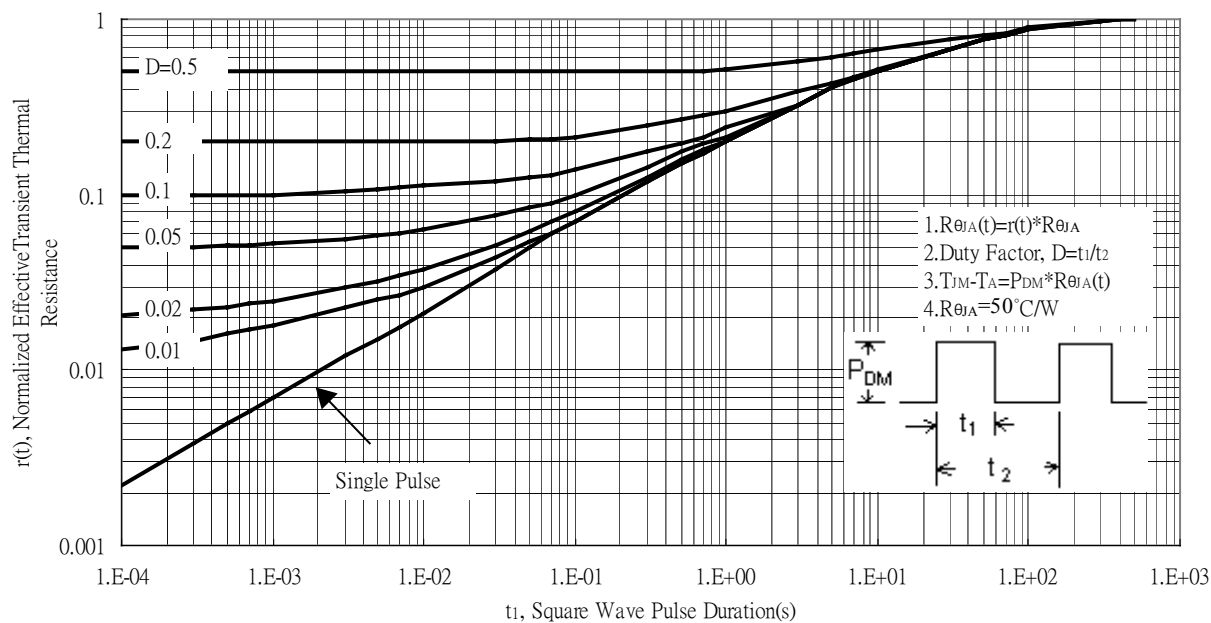
Single Pulse Power Rating, Junction to Ambient  
 (Note on page 2)



Typical Transfer Characteristics

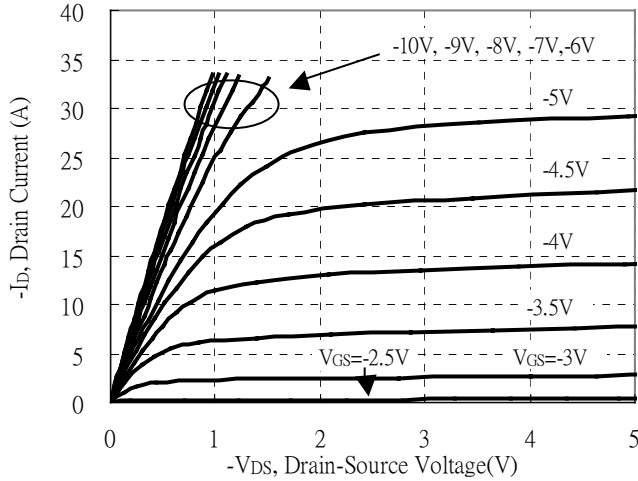


Transient Thermal Response Curves

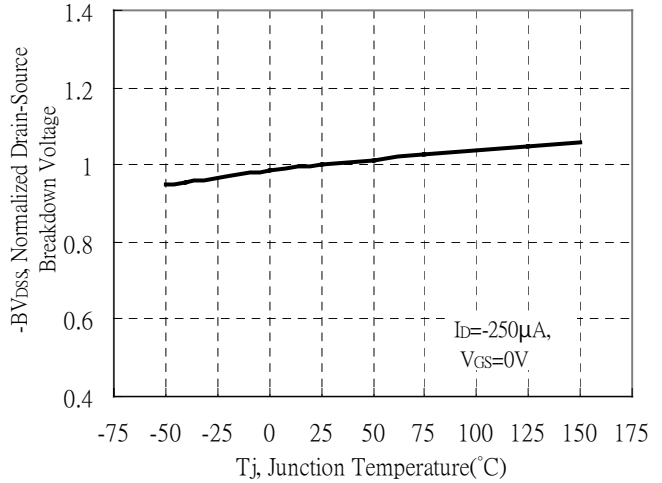


## Typical Characteristics : Q2( P-channel)

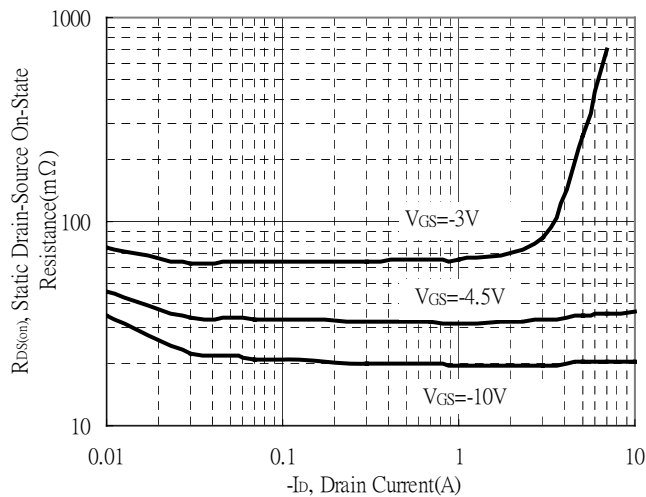
Typical Output Characteristics



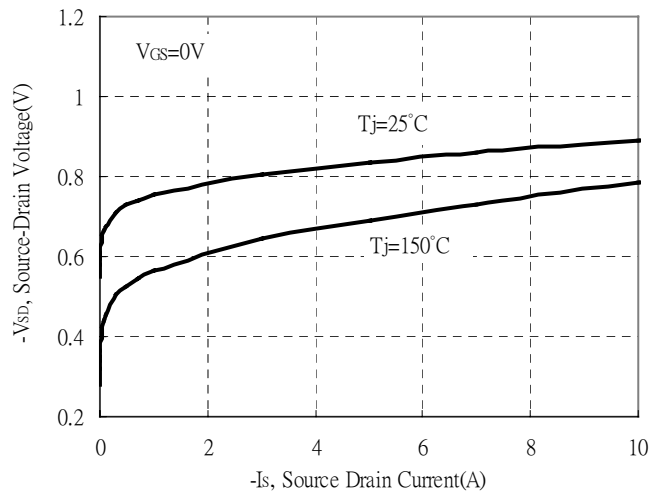
Breakdown Voltage vs Ambient Temperature



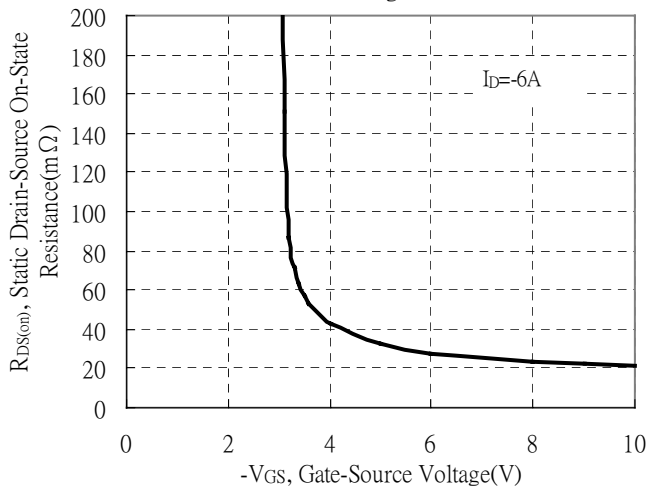
Static Drain-Source On-State resistance vs Drain Current



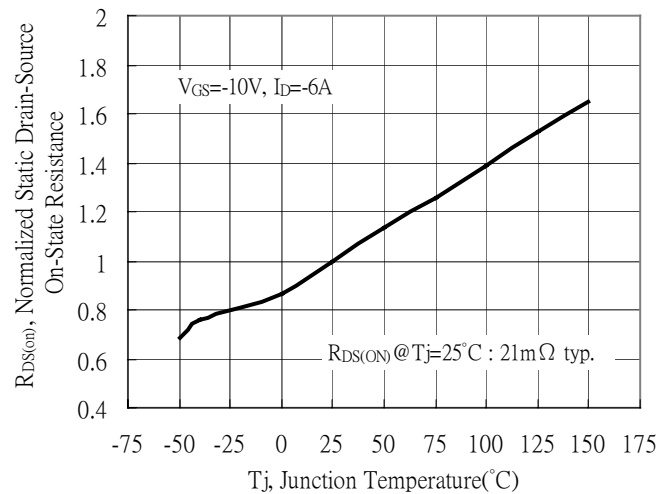
Source Drain Current vs Source-Drain Voltage



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

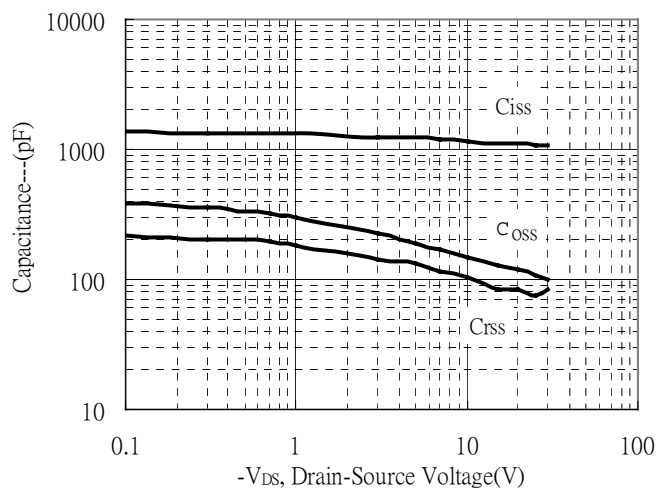


Drain-Source On-State Resistance vs Junction Temperature

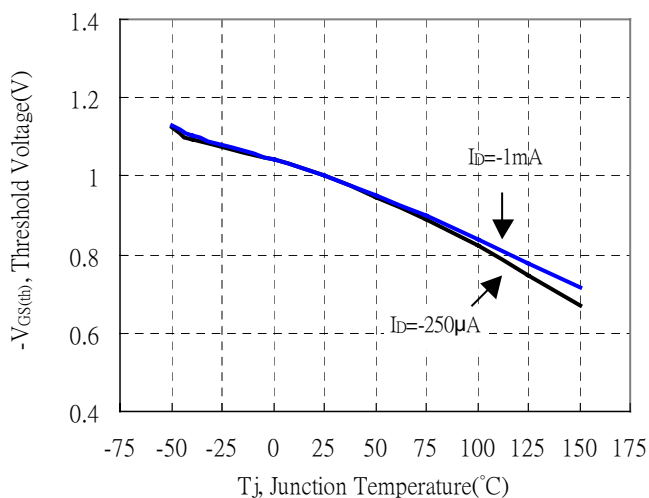


## Typical Characteristics(Cont.) : Q2(P-channel)

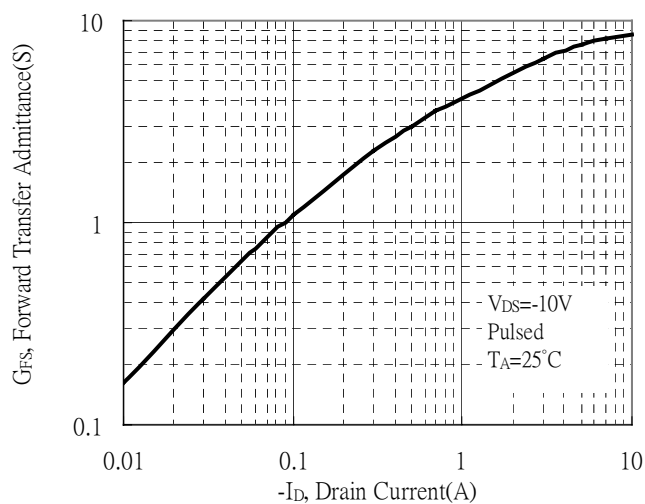
Capacitance vs Drain-to-Source Voltage



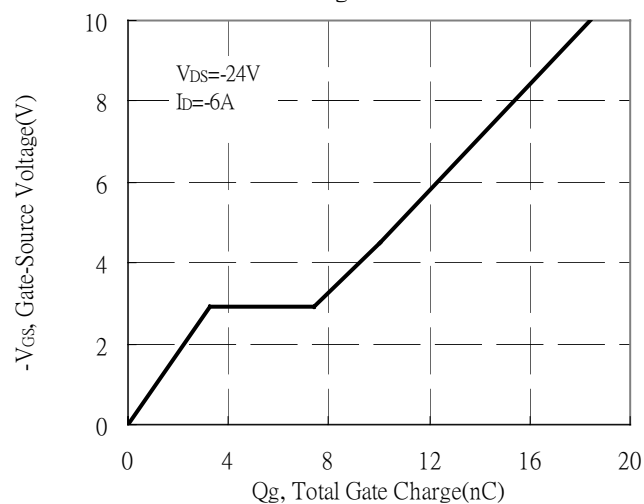
Threshold Voltage vs Junction Temperature



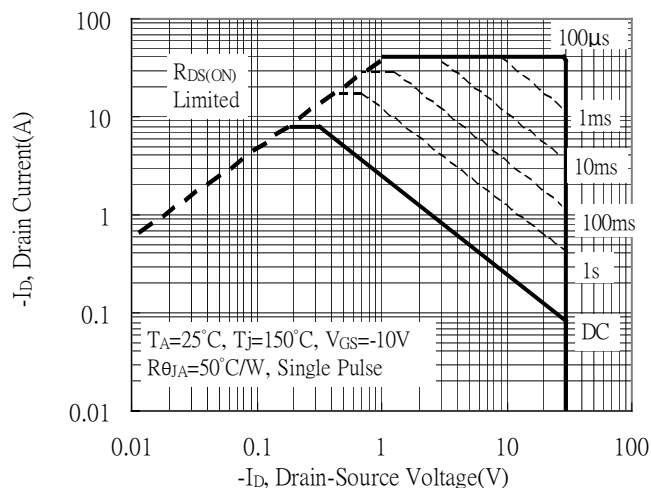
Forward Transfer Admittance vs Drain Current



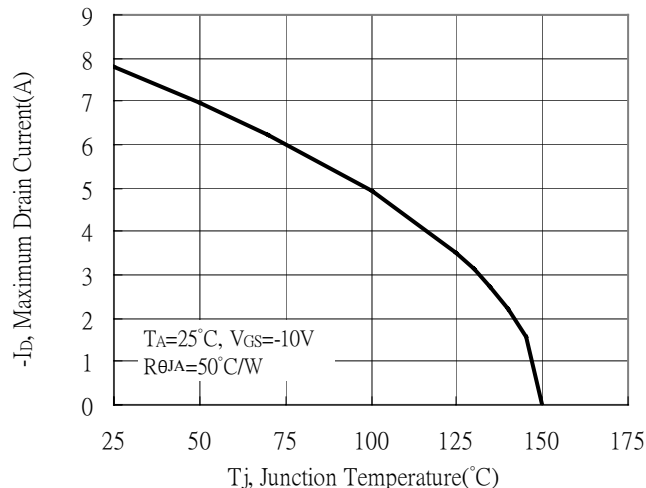
Gate Charge Characteristics



Maximum Safe Operating Area

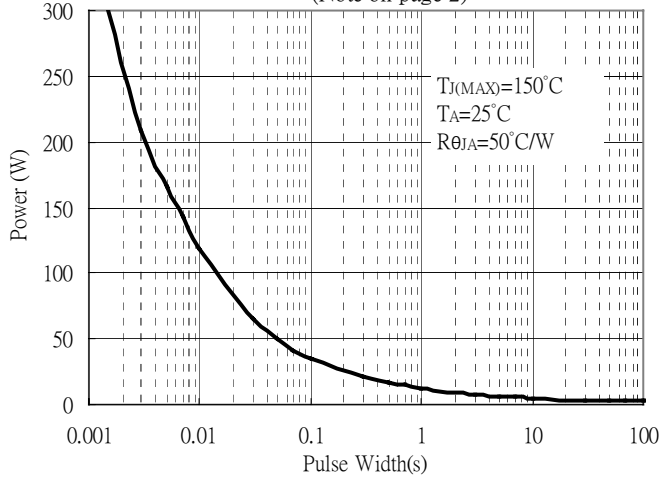


Maximum Drain Current vs Junction Temperature

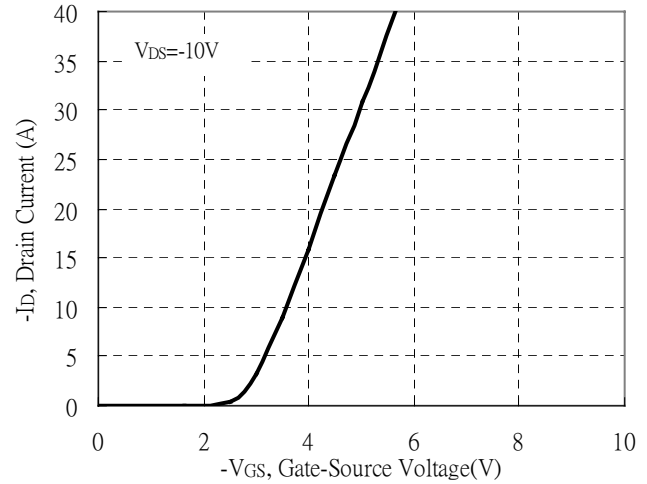


## Typical Characteristics(Cont.) : Q2(P-channel)

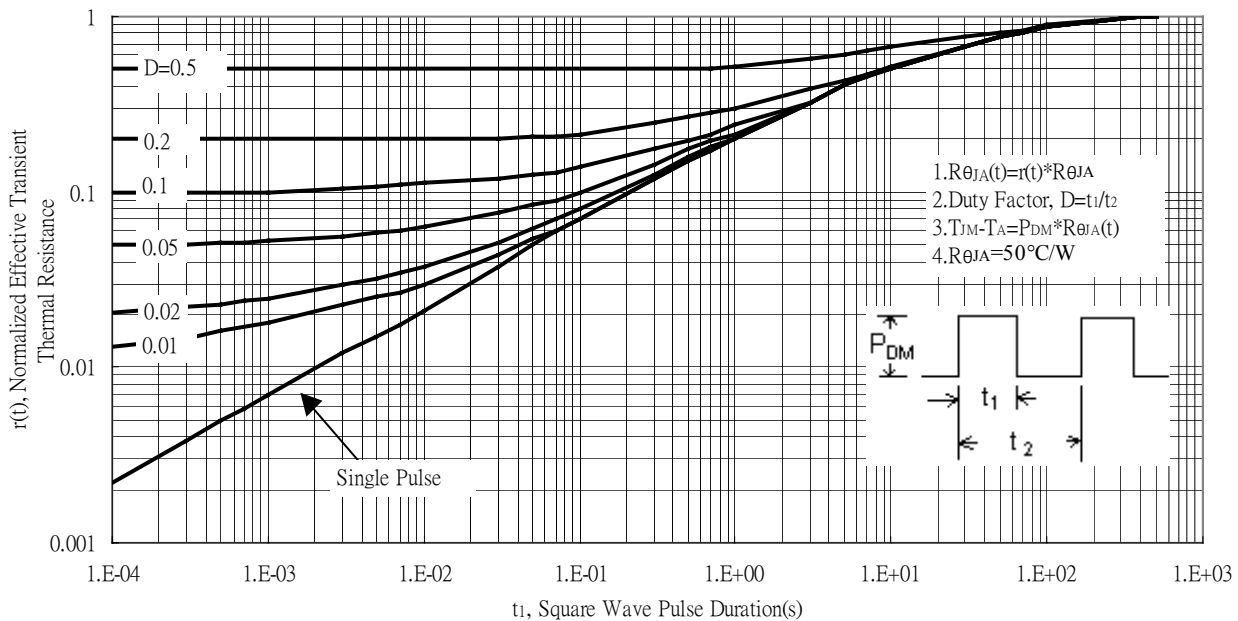
Single Pulse Power Rating, Junction to Ambient  
(Note on page 2)



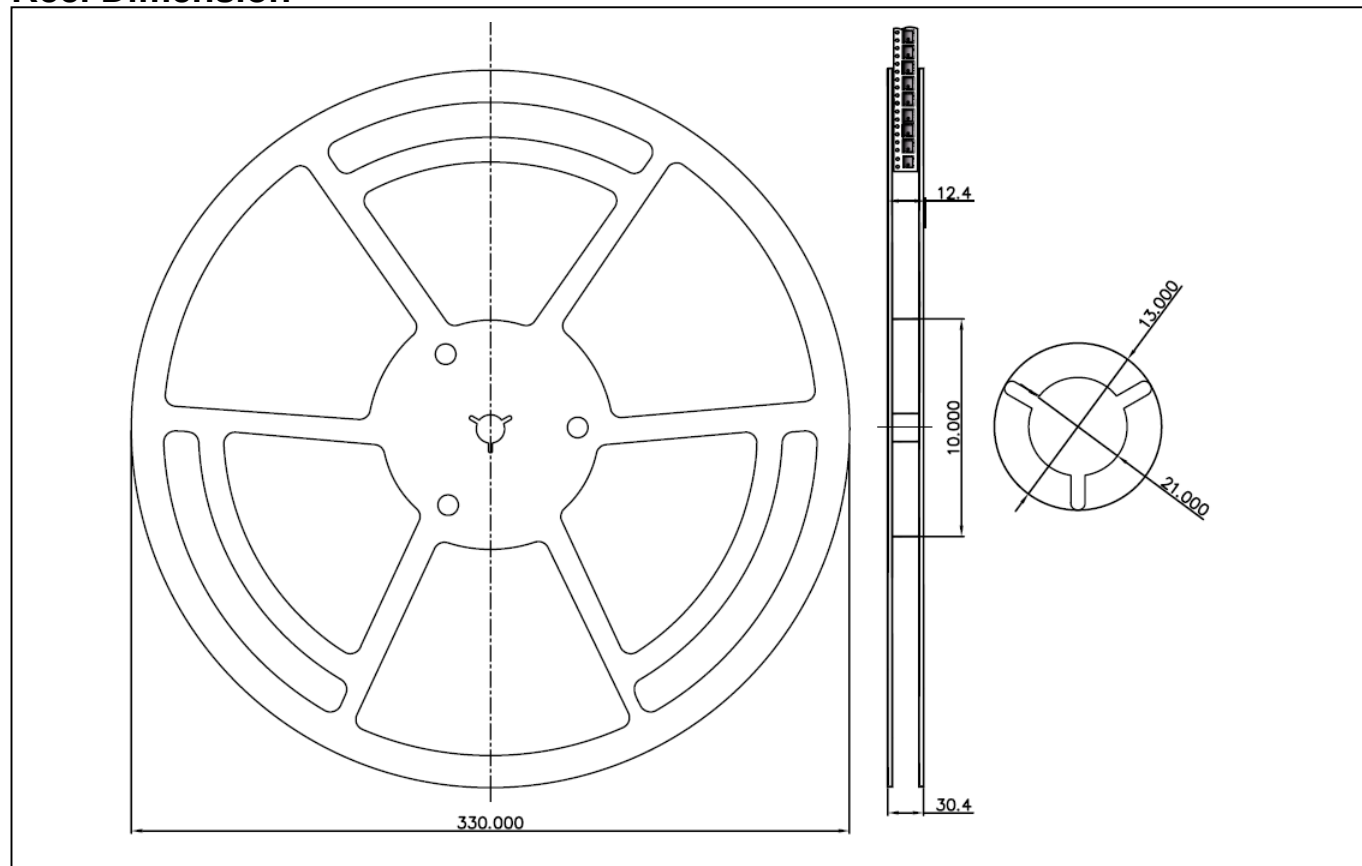
Typical Transfer Characteristics



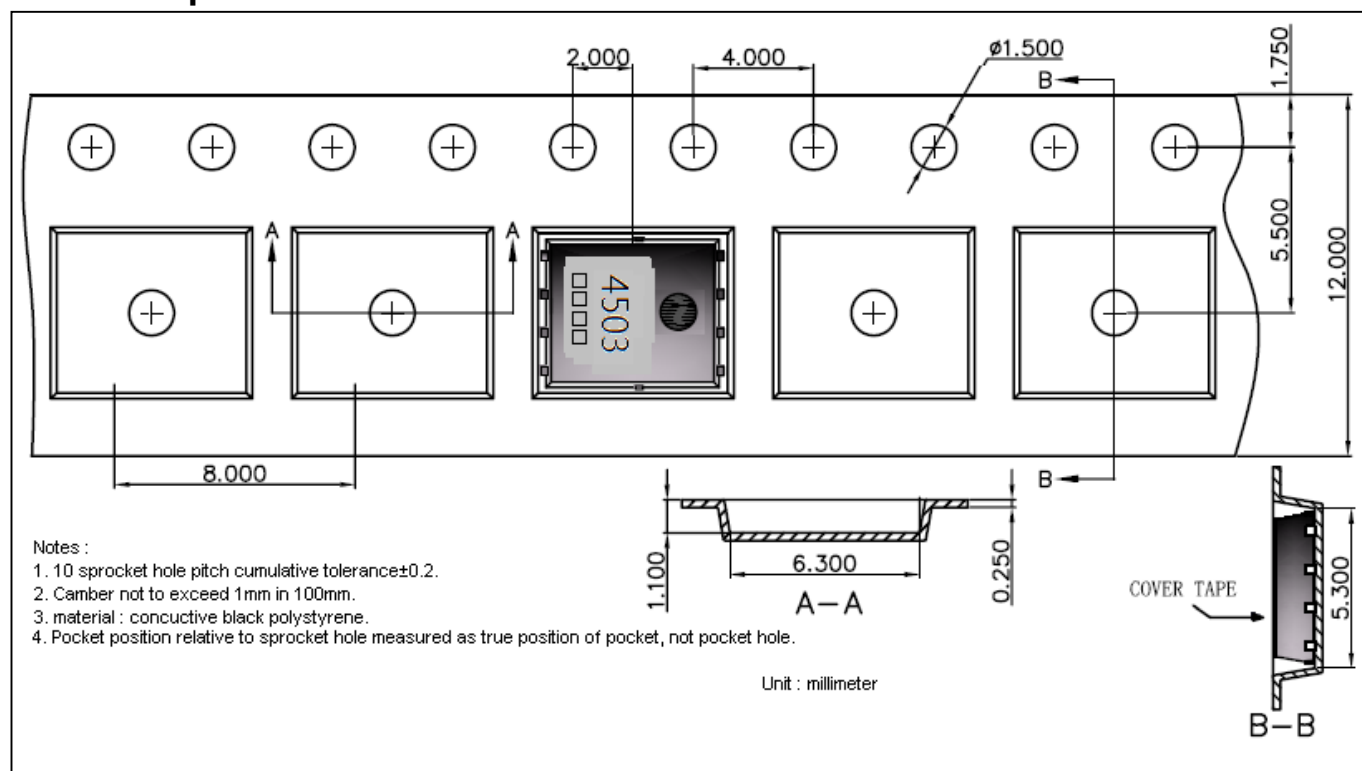
Transient Thermal Response Curves



## Reel Dimension



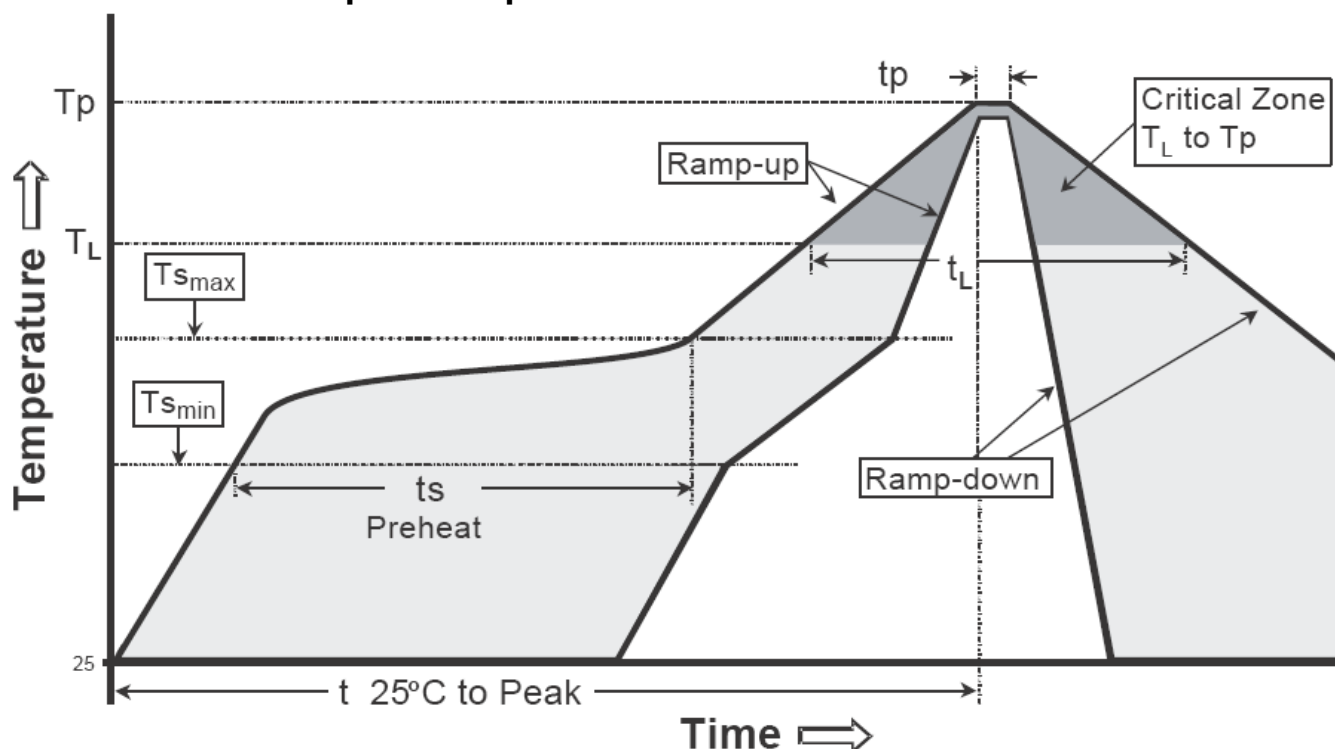
## Carrier Tape Dimension



### Recommended wave soldering condition

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

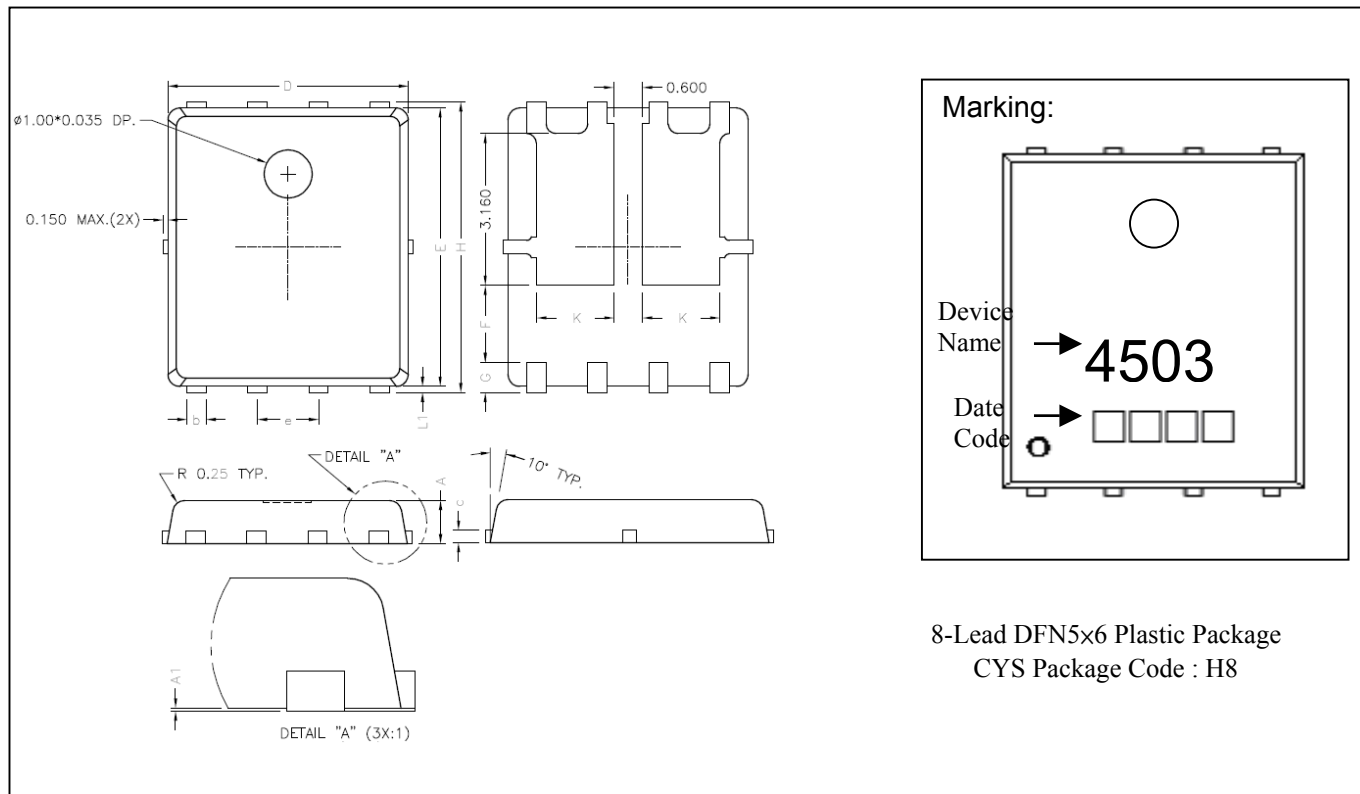
### Recommended temperature profile for IR reflow



| Profile feature                                | Sn-Pb eutectic Assembly | Pb-free Assembly |
|------------------------------------------------|-------------------------|------------------|
| Average ramp-up rate (Tsmax to Tp)             | 3°C/second max.         | 3°C/second max.  |
| Preheat                                        |                         |                  |
| -Temperature Min(Ts min)                       | 100°C                   | 150°C            |
| -Temperature Max(Ts max)                       | 150°C                   | 200°C            |
| -Time(ts min to ts max)                        | 60-120 seconds          | 60-180 seconds   |
| Time maintained above:                         |                         |                  |
| -Temperature (Tl)                              | 183°C                   | 217°C            |
| - Time (tL)                                    | 60-150 seconds          | 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.

## 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   | 1.60        | REF  | 0.063  | REF   | K   | 1.60        | REF  | 0.063  | 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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