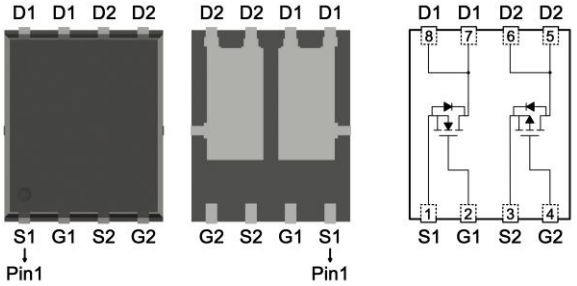
## Product Summary

| | N-CH | P-CH | |
|---|---|---|---|
| $BV_{DSS}$ | 40 | -40 | V |
| $R_{DS(ON)}$ typ. @ $V_{GS}$=(-)10V | 4 | 11 | mΩ |
| $R_{DS(ON)}$ typ. @ $V_{GS}$=(-)4.5V | 5.5 | 21 | |
| $I_D$ @ $V_{GS}$=(-)10V, $T_C$=25°C | 20 | -20 | A |
| $I_D$ @ $V_{GS}$=(-)10V, $T_A$=25°C | 15 | -9.3 | |

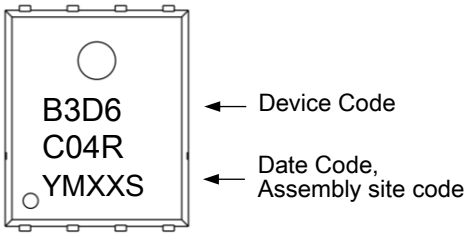
## Features

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

## DFN5×6




## Marking




YM: Date 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

## Ordering Information

| Device | Package | Shipping |
|---|---|---|
| MTB3D6C04RH8-0-T6-G | DFN5×6 | 3000pcs / Tape & Reel |

0: Product rank, zero for no rank products.

T6: Packing spec, T6 : 3000pcs / tape & reel, 13" reel

G: Environment friendly grade: S for RoHS compliant products, G for RoHS compliant and green compound products.

## Absolute Maximum Ratings ($T_A$=25°C)

| Parameter | | Symbol | Value | | Unit |
|---|---|---|---|---|---|
| | | | N-CH | P-CH | |
| Drain-Source Voltage | | $V_{DS}$ | 40 | -40 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±20 | ±20 | |
| Continuous Drain Current @ $V_{GS}$=(-)10V, $T_C$=25°C (silicon limit) | *a | $I_D$ | 56 | -35 | A |
| Continuous Drain Current @ $V_{GS}$=(-)10V, $T_C$=25°C (package limit) | *a | | 20 | -20 | |
| Continuous Drain Current @ $V_{GS}$=(-)10V, $T_C$=100°C | *a | | 20 | -20 | |
| Continuous Drain Current @ $V_{GS}$=(-)10V, $T_A$=25°C | *b | | 15 | -9.3 | |
| Continuous Drain Current @ $V_{GS}$=(-)10V, $T_A$=70°C | *b | | 12 | -7.4 | |
| Pulsed Drain Current | *c | $I_{DM}$ | 80 | -80 | |
| Continuous Body Diode Forward Current @ $T_C$=25°C | | $I_S$ | 20 | -20 | |
| Pulsed Body Diode Forward Current @ $T_C$=25°C | | $I_{SM}$ | 80 | -80 | |
| Avalanche Current @ L=0.1mH | | $I_{AS}$ | 22 | -22 | |
| Avalanche Energy @ L=0.5mH | | $E_{AS}$ | 42 | 42 | mJ |
| Total Power Dissipation | $T_C$=25°C *a | $P_D$ | 36 | | W |
| | $T_C$=100°C *a | | 14 | | |
| | $T_A$=25°C *b | | 2.5 | | |
| | $T_A$=70°C *b | | 1.6 | | |
| Operating Junction and Storage Temperature Range | | $T_J$, $T_{stg}$ | -55~+150 | | °C |
| Steady State Thermal Resistance, Junction-to-Ambient | | $R_{\theta JC}$ | 3.5 | | °C/W |
| Steady State Thermal Resistance, Junction-to-Ambient | *b | $R_{\theta JA}$ | 50 | | |

## N-Channel Electrical Characteristics ($T_A$=25°C, unless otherwise specified)

| Symbol | Min. | Typ. | Max. | Unit | Test Conditions |
|---|---|---|---|---|---|
| **Static** | | | | | |
| $BV_{DSS}$ | 40 | - | - | V | $V_{GS}$=0V, $I_D$=250μA |
| $V_{GS(th)}$ | 1.2 | - | 2.5 | | $V_{DS}$=$V_{GS}$, $I_D$=250μA |
| $G_{FS}$ | - | 14 | - | S | $V_{DS}$=10V, $I_D$=5A |
| $I_{GSS}$ | - | - | ±100 | nA | $V_{GS}$=±20V, $V_{DS}$=0V |
| $I_{DSS}$ | - | - | 1 | μA | $V_{DS}$=32V, $V_{GS}$=0V |
| $R_{DS(ON)}$ | - | 4 | 5.2 | mΩ | $V_{GS}$=10V, $I_D$=10A |
| | - | 5.5 | 7.7 | | $V_{GS}$=4.5V, $I_D$=8A |
| **Dynamic** | | | | | |
| $C_{iss}$ | - | 1600 | - | pF | $V_{DS}$=20V, $V_{GS}$=0V, f=1MHz |
| $C_{oss}$ | - | 550 | - | | |
| $C_{rss}$ | - | 35 | - | | |
| Rg | - | 1 | - | Ω | f=1MHz |
| $Q_g$ *d,e | - | 13 | - | nC | $V_{DS}$=20V, $I_D$=10A, $V_{GS}$=4.5V |
| $Q_g$ *d,e | - | 27 | - | | $V_{DS}$=20V, $I_D$=10A, $V_{GS}$=10V |
| $Q_{gs}$ *d,e | - | 5 | - | | |
| $Q_{gd}$ *d,e | - | 4.5 | - | | |
| $t_{d(ON)}$ *d,e | - | 14 | - | ns | $V_{DS}$=20V, $I_D$=10A, $V_{GS}$=1V, $R_{GS}$=10Ω |
| tr *d,e | - | 13 | - | | |
| $t_{d(OFF)}$ *d,e | - | 40 | - | | |
| $t_f$ *d,e | - | 6.5 | - | | |
| **Source-Drain Diode** | | | | | |
| $V_{SD}$ *d | - | 0.81 | 1.2 | V | $I_S$=10A, $V_{GS}$=0V |
| $t_{rr}$ | - | 26 | - | ns | $I_F$=10A, di/dt=100A/μs |
| $Q_{rr}$ | - | 13 | - | nC | |

Note:

*a. The power dissipation $P_D$ is based on $T_{J(MAX)}$=150°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 1in² FR-4 board with 2oz copper, in a still air environment with $T_A$=25°C. The power dissipation $P_D$ is based on $R_{\theta JA}$ and the maximum allowed junction temperature of 150°C. The value in any given application depends

*c. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}$=150°C. Ratings are based on low frequency and low duty cycles to

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

*e. Independent of operating temperature.

## P-Channel Electrical Characteristics ($T_A$=25°C, unless otherwise specified)

| Symbol | Min. | Typ. | Max. | Unit | Test Conditions |
|---|---|---|---|---|---|
| **Static** | | | | | |
| $BV_{DSS}$ | -40 | - | - | V | $V_{GS}$=0V, $I_D$=-250μA |
| $V_{GS(th)}$ | -1.2 | - | -2.5 | | $V_{DS}$=$V_{GS}$, $I_D$=-250μA |
| $G_{FS}$ | - | 19 | - | S | $V_{DS}$=-10V, $I_D$=-10A |
| $I_{GSS}$ | - | - | ±100 | nA | $V_{GS}$=±20V, $V_{DS}$=0V |
| $I_{DSS}$ | - | - | -1 | μA | $V_{DS}$=-32V, $V_{GS}$=0V |
| $R_{DS(ON)}$ | - | 11 | 15 | mΩ | $V_{GS}$=-10V, $I_D$=-10A |
| | - | 21 | 30 | | $V_{GS}$=-4.5V, $I_D$=-8A |
| **Dynamic** | | | | | |
| $C_{iss}$ | - | 2300 | - | pF | $V_{DS}$=-20V, $V_{GS}$=0V, f=1MHz |
| $C_{oss}$ | - | 220 | - | | |
| $C_{rss}$ | - | 185 | - | | |
| Rg | - | 3.5 | - | Ω | f=1MHz |
| $Q_g$ *d,e | - | 22 | - | nC | $V_{DS}$=-20V, $I_D$=-10A, $V_{GS}$=-4.5V |
| $Q_g$ *d,e | - | 44 | - | | $V_{DS}$=-20V, $I_D$=-10A, $V_{GS}$=-10V |
| $Q_{gs}$ *d,e | - | 7.5 | - | | |
| $Q_{gd}$ *d,e | - | 10 | - | | |
| $t_{d(ON)}$ *d,e | - | 15 | - | ns | $V_{DS}$=-20V, $I_D$=-10A, $V_{GS}$=-10V, $R_{GS}$=1Ω |
| tr *d,e | - | 19 | - | | |
| $t_{d(OFF)}$ *d,e | - | 65 | - | | |
| $t_f$ *d,e | - | 10 | - | | |
| **Source-Drain Diode** | | | | | |
| $V_{SD}$ *d | - | -0.84 | -1.2 | V | $I_S$=-10A, $V_{GS}$=0V |
| $t_{rr}$ | - | 14 | - | ns | $I_F$=-10A, di/dt=100A/μs |
| $Q_{rr}$ | - | 9 | - | nC | |

Note:

*a. The power dissipation $P_D$ is based on $T_{J(MAX)}$=150°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 1in² FR-4 board with 2oz copper, in a still air environment with $T_A$=25°C. The power dissipation $P_D$ is based on $R_{\theta JA}$ and the maximum allowed junction temperature of 150°C. The value in any given application depends

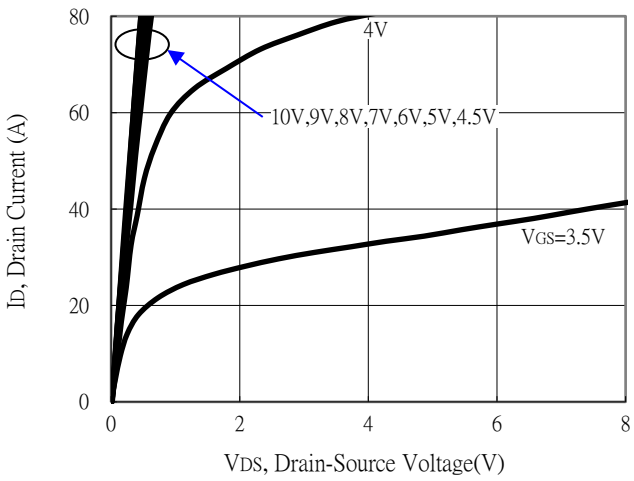
*c. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}$=150°C. Ratings are based on low frequency and low duty cycles to

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

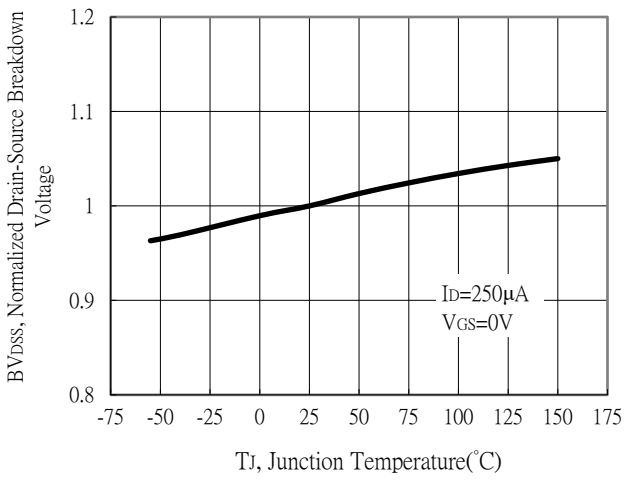
*e. Independent of operating temperature.

## N-Channel Typical Characteristics

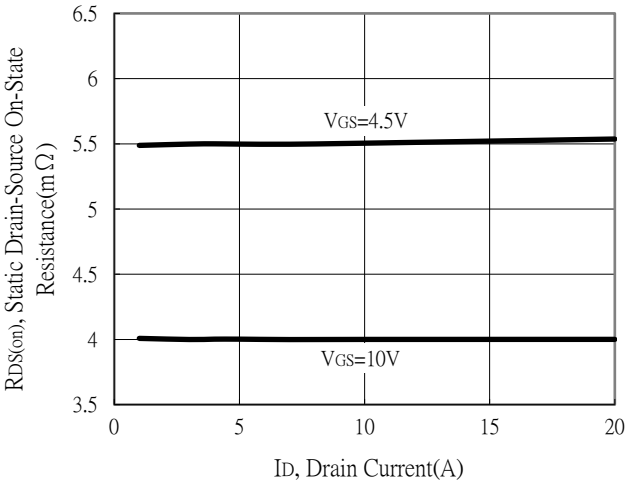
Typical Output Characteristics



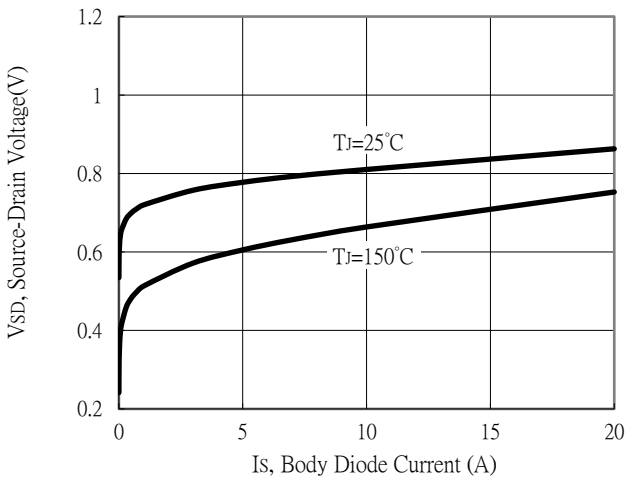

Breakdown Voltage vs Ambient Temperature



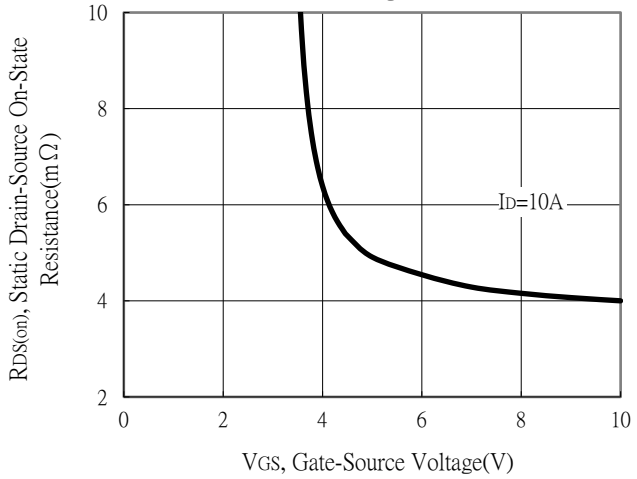

Static Drain-Source On-State resistance vs Drain Current



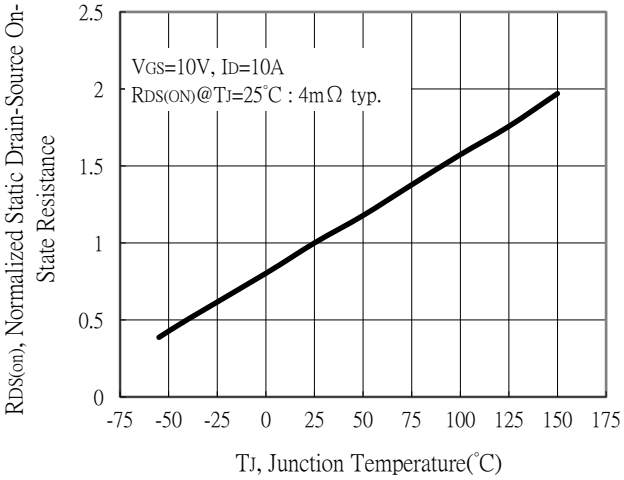

Body Diode Current vs Source-Drain Voltage




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

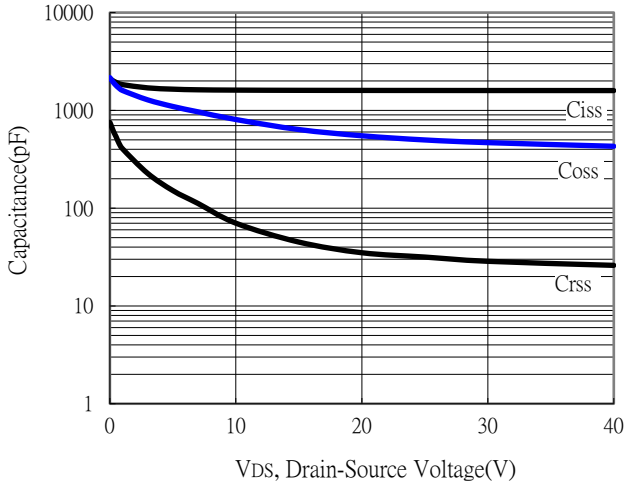



Drain-Source On-State Resistance vs Junction Temperature

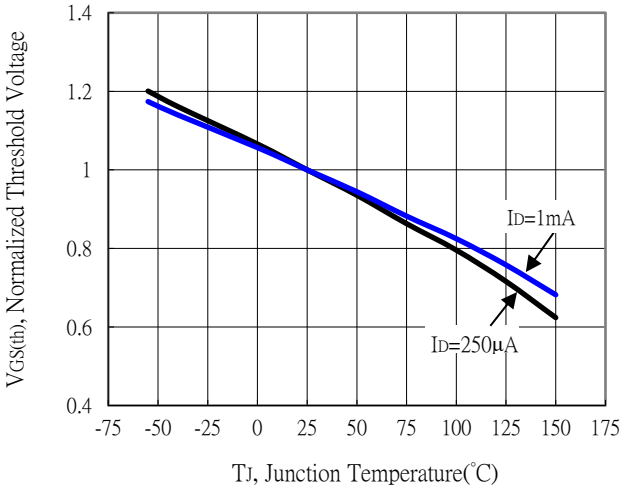


## N-Channel Typical Characteristics

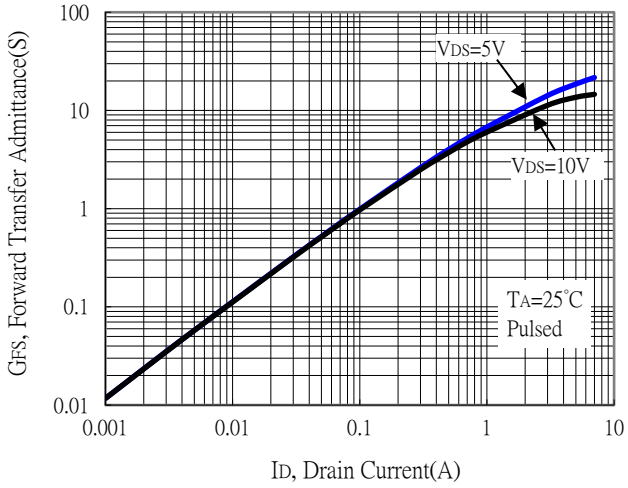
Capacitance vs Drain-to-Source Voltage



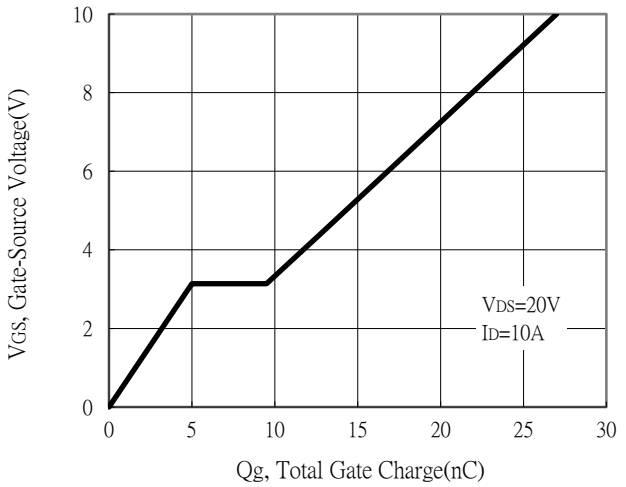

Threshold Voltage vs Junction Temperature



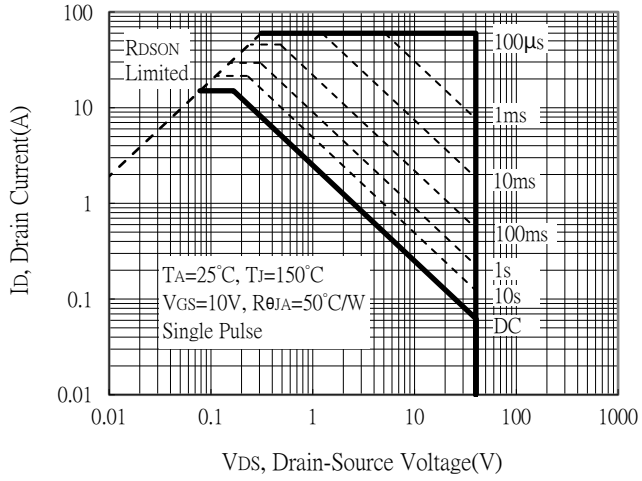

Forward Transfer Admittance vs Drain Current



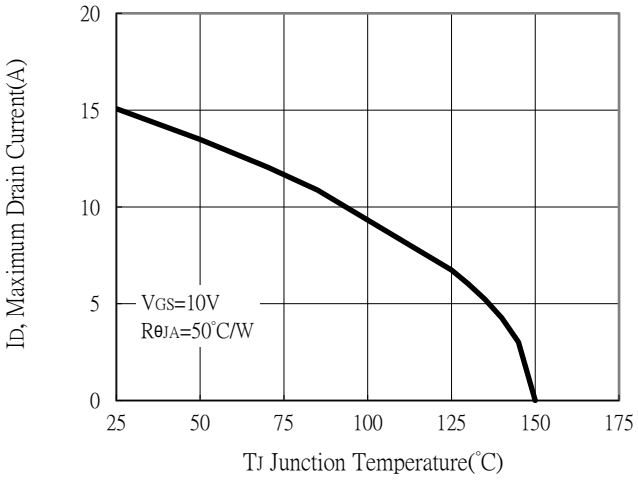

Gate Charge Characteristics




Maximum Safe Operating Area

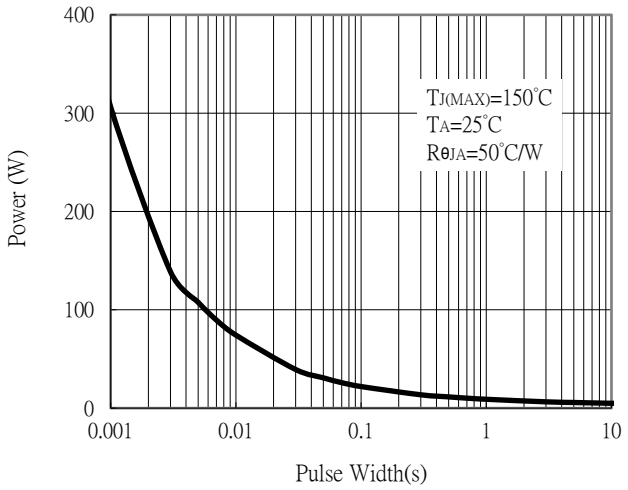



Maximum Drain Current vs Junction Temperature

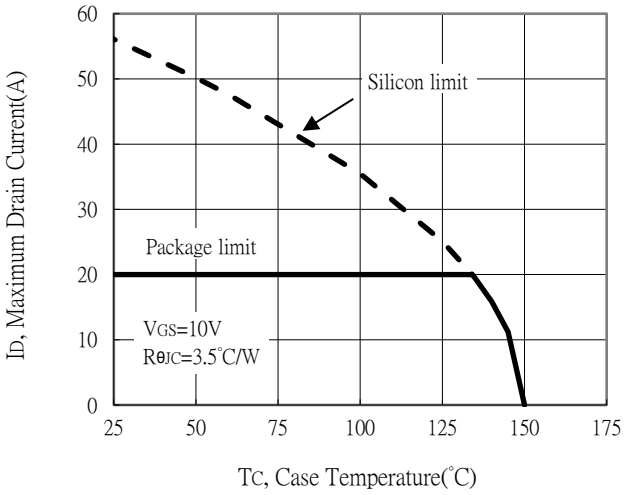


## N-Channel Typical Characteristics

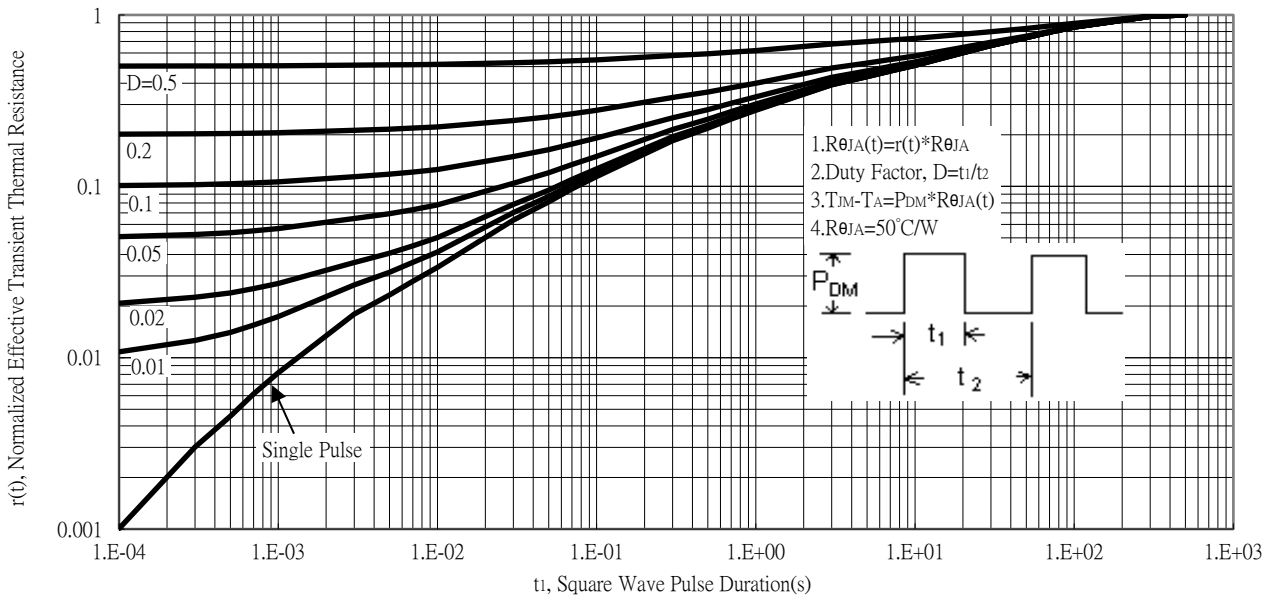
Single Pulse Power Rating, Junction to Ambient




Maximum Drain Current vs Case Temperature

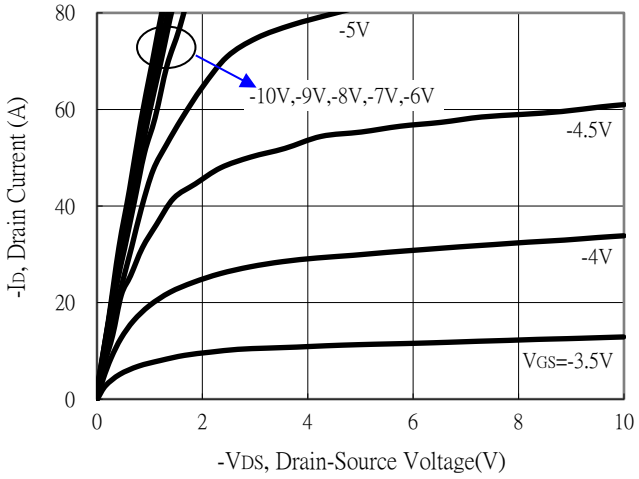



Transient Thermal Response Curves

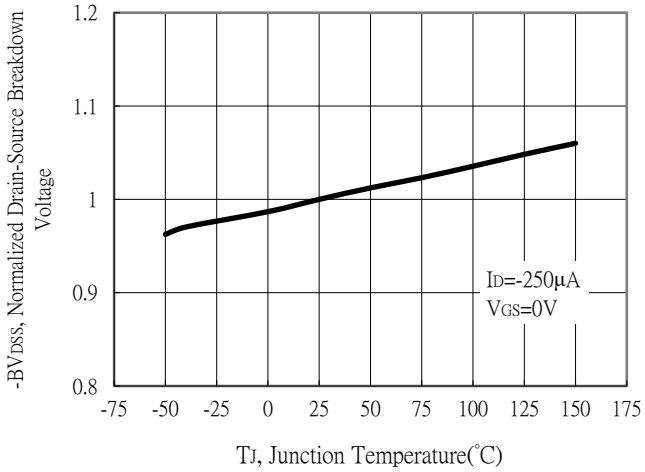


## P-Channel Typical Characteristics

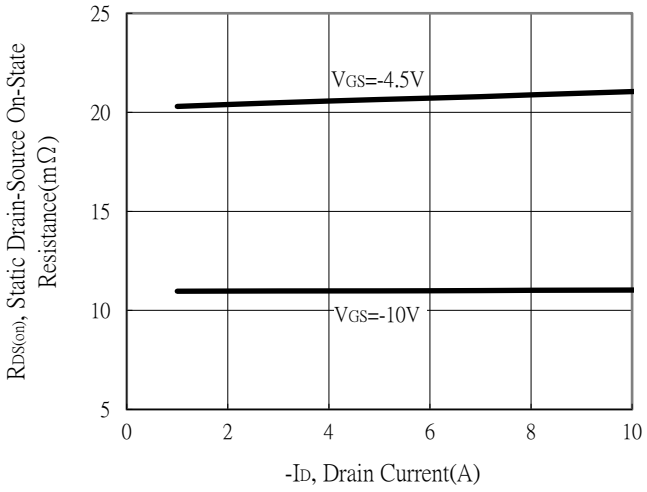
Typical Output Characteristics



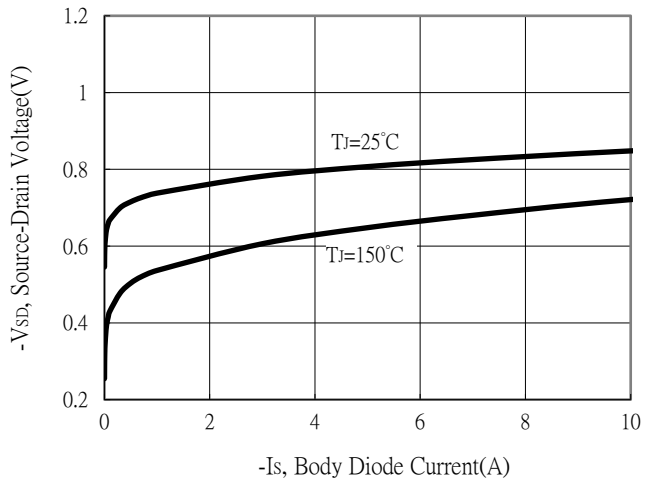

Breakdown Voltage vs Ambient Temperature



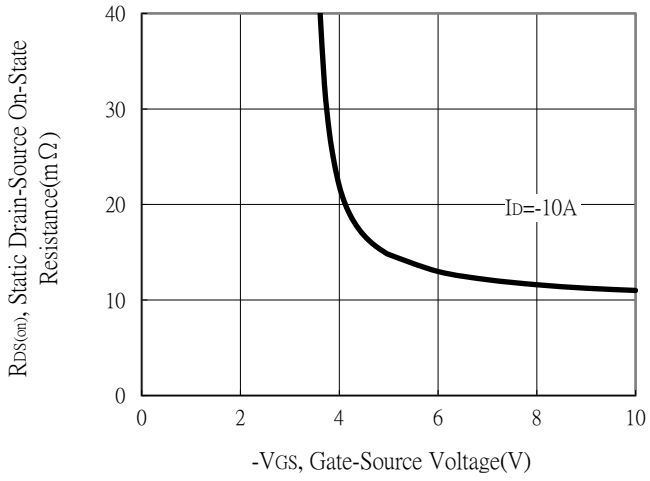

Static Drain-Source On-State resistance vs Drain Current



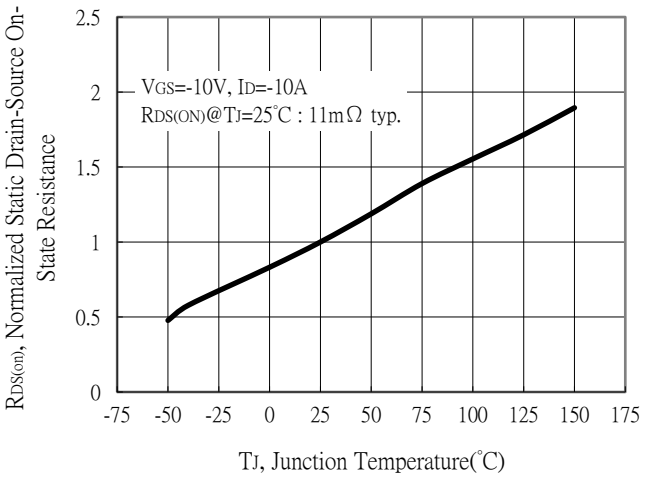

Body Diode Currentvs Source-Drain Voltage




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

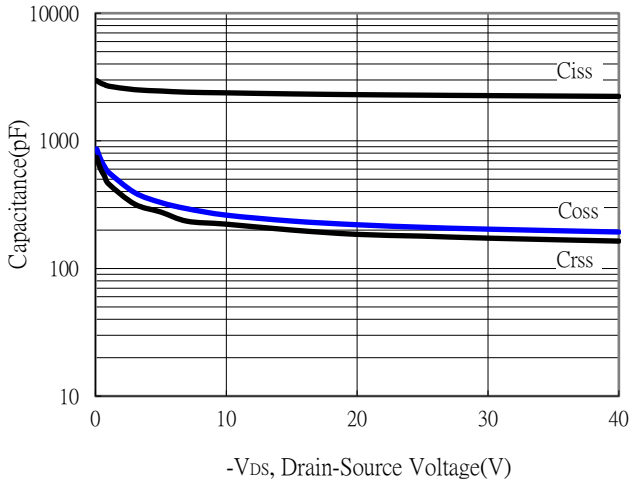



Drain-Source On-State Resistance vs Junction Temperature

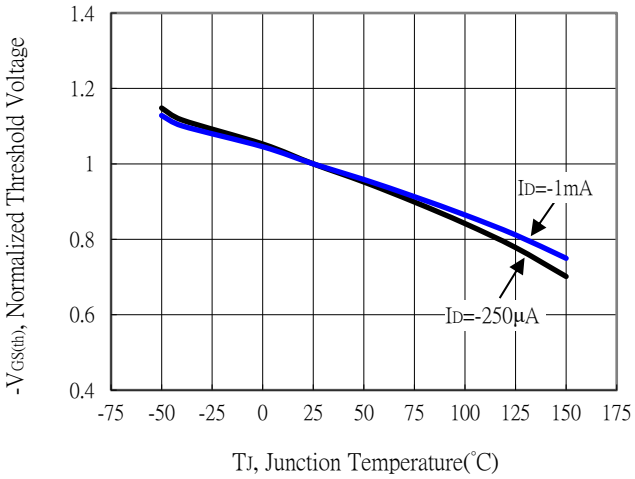


## P-Channel Typical Characteristics

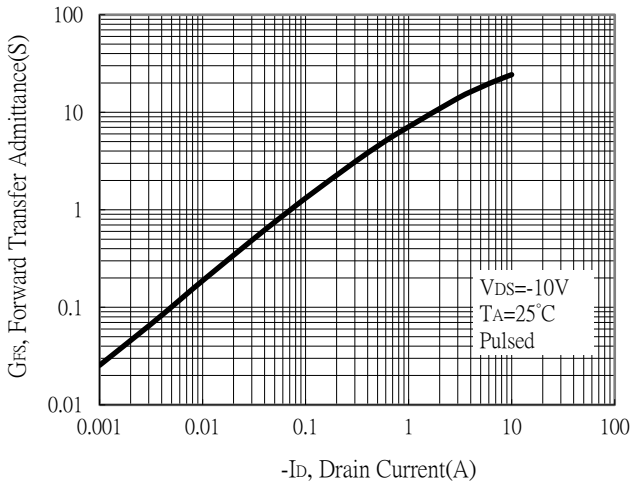
Capacitance vs Drain-to-Source Voltage



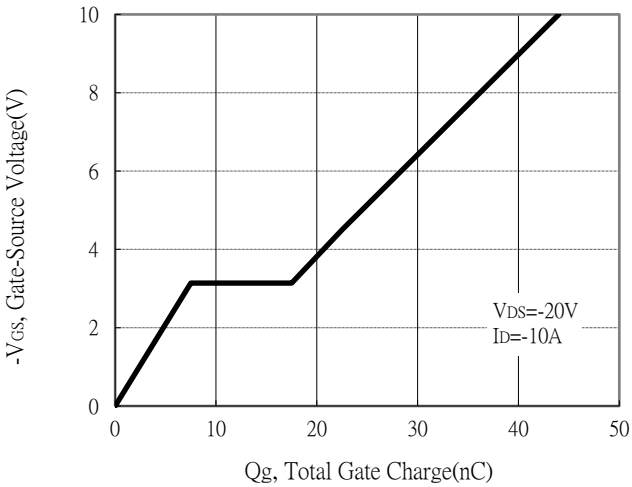

Threshold Voltage vs Junction Temperature



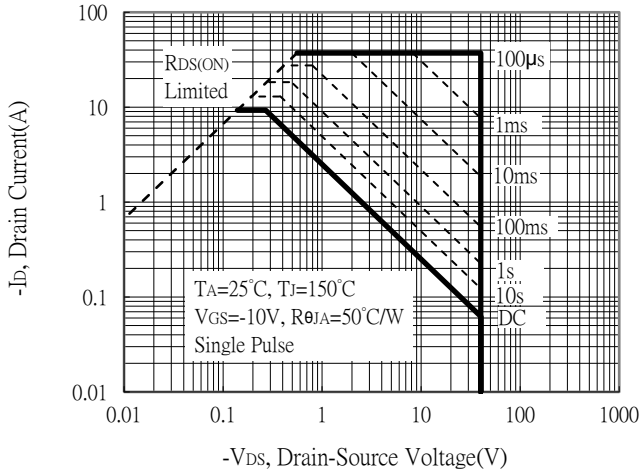

Forward Transfer Admittance vs Drain Current



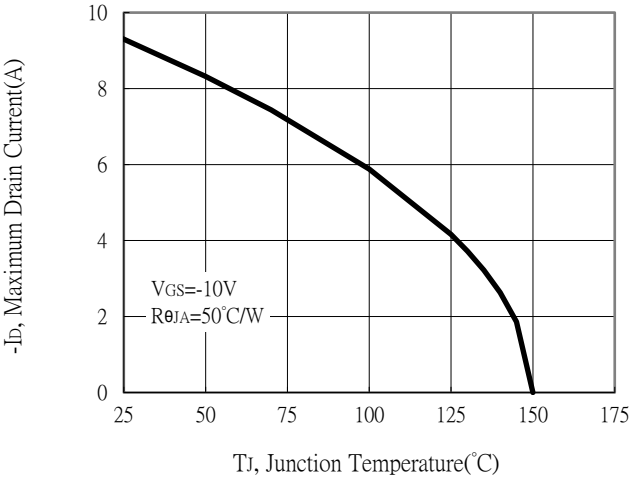

Gate Charge Characteristics




Maximum Safe Operating Area

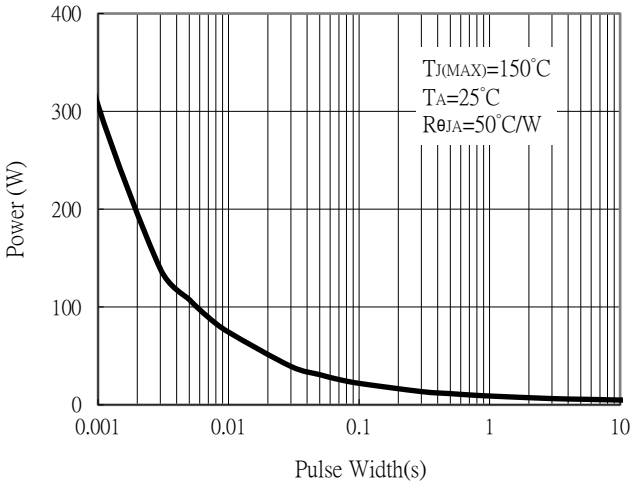



Maximum Drain Current vs Junction Temperature

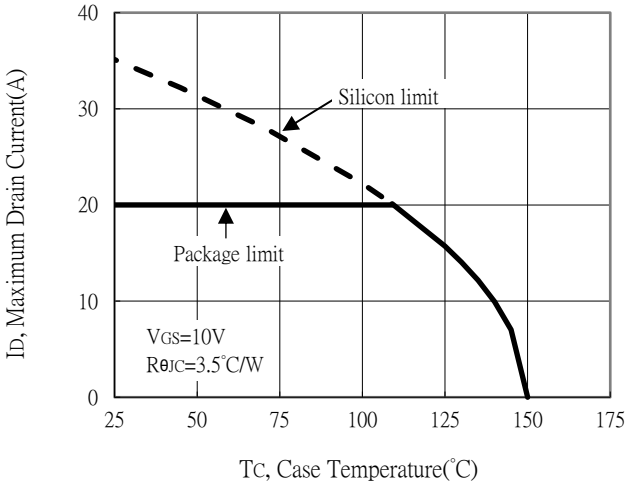


## P-Channel Typical Characteristics

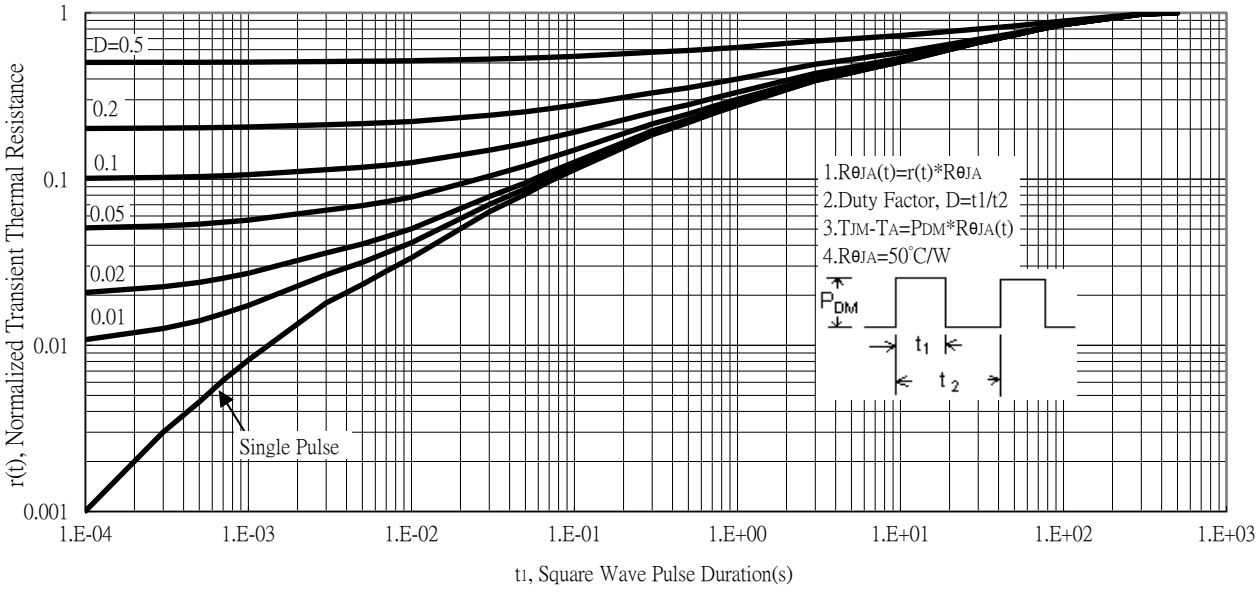
Single Pulse Power Rating, Junction to Ambient



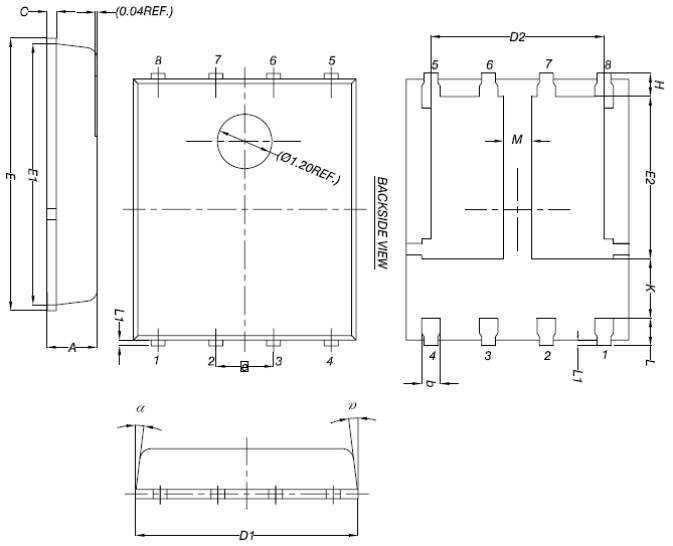

Maximum Drain Current vs Case Temperature



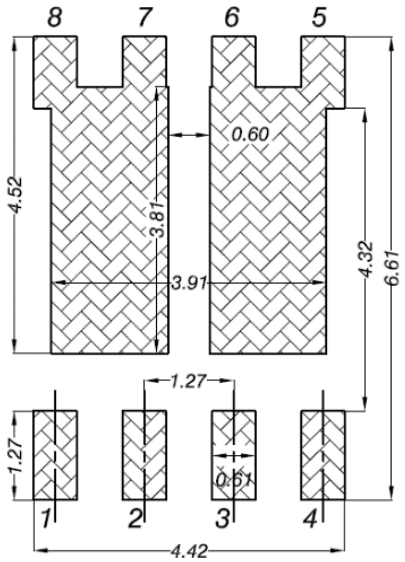

Transient Thermal Response Curves



## DFN5×6 Dimension




8-Lead DFN5×6 Plastic Package
CYS Package Code: H8




Recommended Soldering Footprint

| DIM | Inches | | Millimeters | | DIM | Inches | | Millimeters | |
|---|---|---|---|---|---|---|---|---|---|
| | Min. | Max. | Min. | Max. | | Min. | Max. | Min. | Max. |
| A | 0.035 | 0.043 | 0.90 | 1.10 | e | 0.05 | BSC | 1.27 | BSC |
| b | 0.012 | 0.020 | 0.33 | 0.51 | H | 0.016 | 0.024 | 0.41 | 0.61 |
| C | 0.007 | 0.011 | 0.20 | 0.30 | K | 0.043 | - | 1.10 | - |
| D1 | 0.188 | 0.196 | 4.80 | 5.00 | L | 0.020 | 0.027 | 0.51 | 0.71 |
| D2 | 0.142 | 0.155 | 3.61 | 3.96 | L1 | 0.002 | 0.007 | 0.06 | 0.20 |
| E | 0.232 | 0.240 | 5.90 | 6.10 | M | 0.019 | - | 0.50 | - |
| E1 | 0.224 | 0.228 | 5.70 | 5.80 | α | 0° | 12° | 0° | 12° |
| E2 | 0.133 | 0.148 | 3.38 | 3.78 | | | | | |

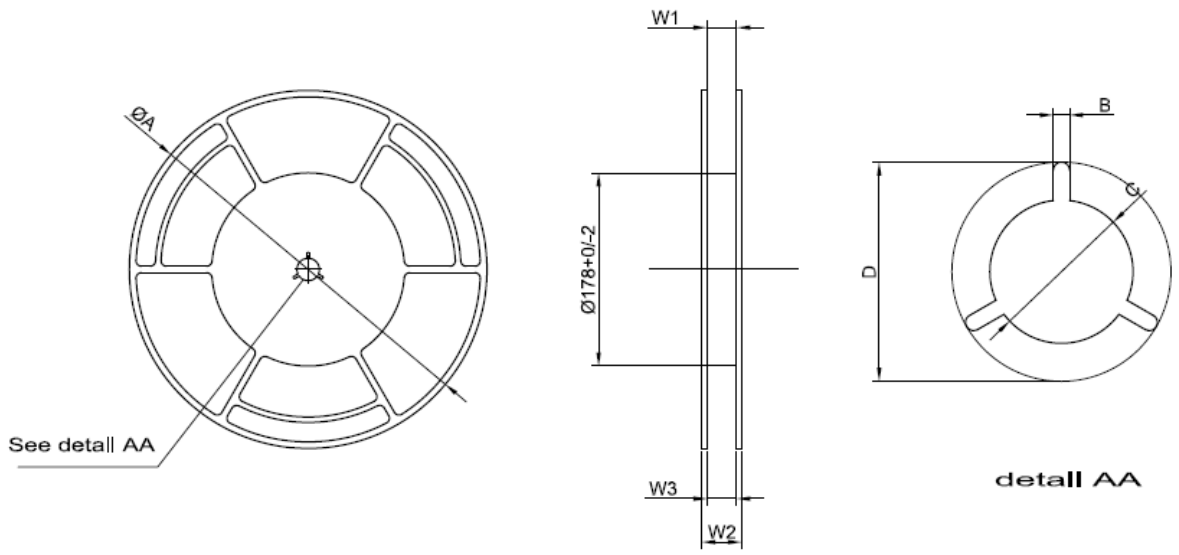
**Note:**

- Controlling dimension: millimeters.
- Maximum lead thickness includes lead finish thickness, and minimum lead thickness is the minimum thickness of base material.
- 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.

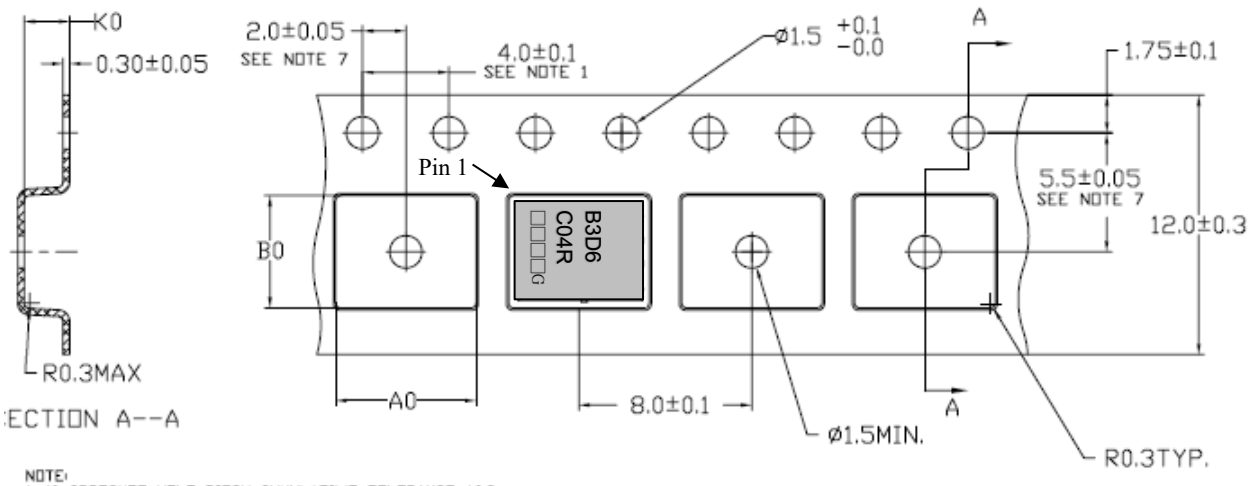
## Reel Dimension




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

Unit:mm

## Carrier Tape Dimension



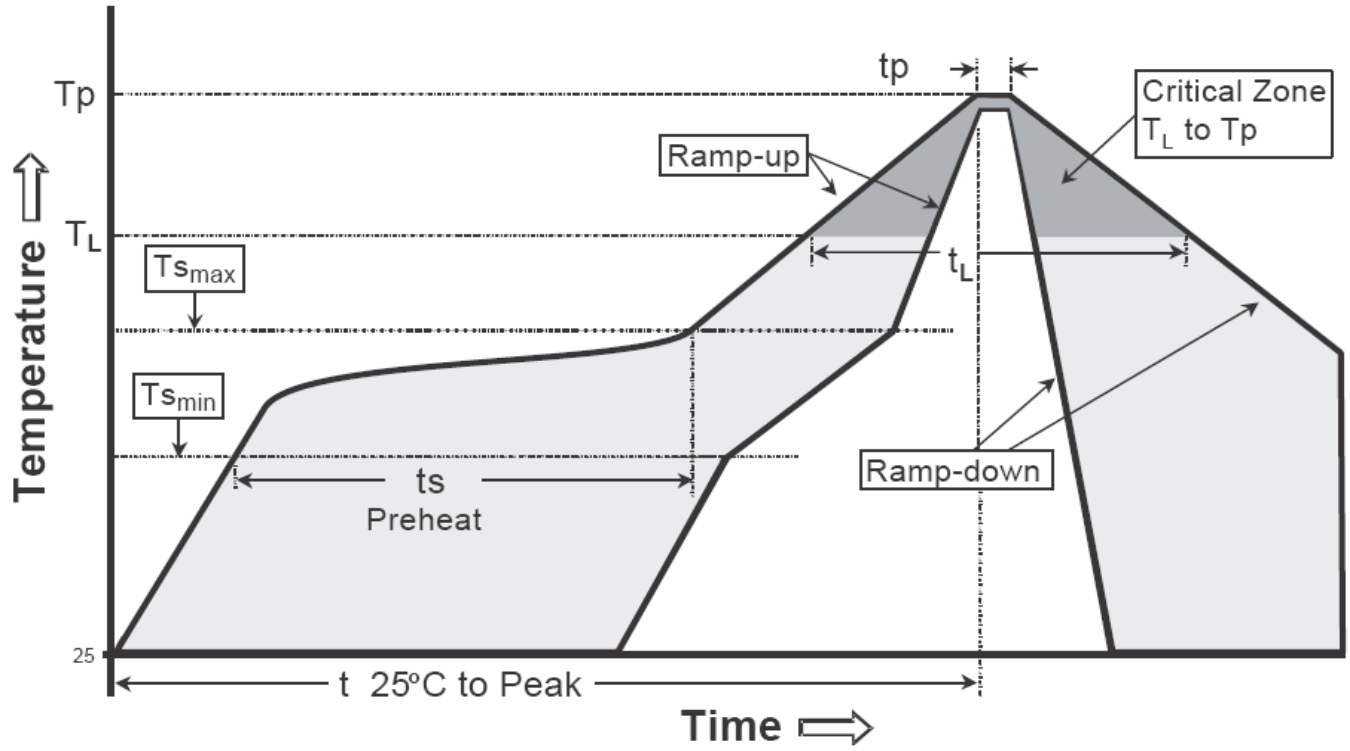

NOTE:
1. 10 SPROCKET HOLE PITCH CUMULATIVE TOLERANCE ±0.2
2. CAMBER NOT TO EXCEED 1mm IN 100mm, NONCUMULATIVE OVER 250mm.
3. MATERIAL: BLACK STATIC DISSIPATIVE PS.(POLYSTYRENE)
4. ALL DIMENSIONS ARE IN MILLIMETERS (UNLESS OTHERWISE SPECIFIED)
5. A0 AND B0 MEASURED ON A PLANE 0.3mm ABOVE THE BOTTOM OF 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
   1X10E4~1X10E11 OHMS/SQ.

A0=6.5±0.1
B0=5.3±0.1
K0=1.4±0.1

## 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 ($T_S$ max to $T_P$) | 3°C/second max. | 3°C/second max. |
| Preheat<br>−Temperature Min ($T_S$ min)<br>−Temperature Max ($T_S$ max)<br>−Time ($t_S$ min to $t_S$ max) | <br>100°C<br>150°C<br>60-120 seconds | <br>150°C<br>200°C<br>60-180 seconds |
| Time maintained above:<br>−Temperature ($T_L$)<br>−Time ($t_L$) | <br>183°C<br>60-150 seconds | <br>217°C<br>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.