

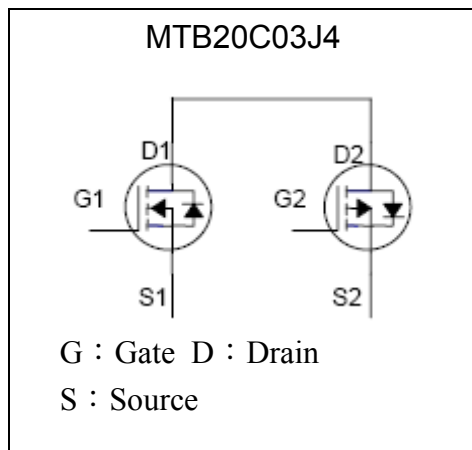
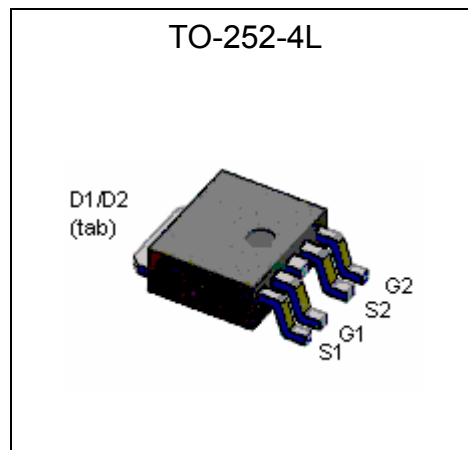
N & P-Channel Enhancement Mode Power MOSFET

MTB20C03J4

| | N-CH | P-CH |
|-------------------|--------------|--------------|
| BV_{DSS} | 30V | -30V |
| I_D | 8A | -7A |
| $R_{DS(on)(MAX)}$ | 18m Ω | 28m Ω |

Features

- Low Gate Charge
- Simple Drive Requirement
- RoHS compliant & Halogen-free package

Equivalent Circuit

Outline

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

| Parameter | Symbol | Limits | | Unit |
|--|----------------|-----------|-----------|------------------|
| | | N-channel | P-channel | |
| Drain-Source Voltage | V_{DS} | 30 | -30 | V |
| Gate-Source Voltage | V_{GS} | ± 20 | ± 20 | |
| Continuous Drain Current @ $T_C=25^\circ\text{C}$ | I_D | 31 | -27 | A |
| Continuous Drain Current @ $T_C=100^\circ\text{C}$ | | 22 | -19 | |
| Continuous Drain Current @ $T_A=25^\circ\text{C}$ | | 8 | -7 | |
| Continuous Drain Current @ $T_A=70^\circ\text{C}$ | | 6.7 | -5.9 | |
| Pulsed Drain Current *1 | I_{DM} | 66 | -45 | |
| Avalanche Current | I_{AS} | 15 | -15 | |
| Avalanche Energy @ $L=0.1\text{mH}$, $I_D=15\text{A}$ (-15A for P-ch), $R_G=25\Omega$ | E_{AS} | 11.3 | 11.3 | mJ |
| Repetitive Avalanche Energy @ $L=0.05\text{mH}$ *2 | E_{AR} | 2.5 | 2.5 | |
| Total Power Dissipation ($T_C=25^\circ\text{C}$) | P_d | 25 | | W |
| Total Power Dissipation ($T_C=100^\circ\text{C}$) | | 18 | | |
| Operating Junction and Storage Temperature Range | T_j, T_{stg} | -55~+175 | | $^\circ\text{C}$ |

Note : *1. Pulse width limited by maximum junction temperature

 *2. Duty cycle $\leq 1\%$



Thermal Data

| Parameter | Symbol | Value | Unit |
|--|--------------|-------|---------------|
| Thermal Resistance, Junction-to-case, max | $R_{th,j-c}$ | 6 | $^{\circ}C/W$ |
| Thermal Resistance, Junction-to-ambient, max * 1 | $R_{th,j-a}$ | 90 | $^{\circ}C/W$ |

Note : *1 62.5 $^{\circ}C/W$ when mounted on a 1 in² pad of 2 oz copper.

N-CH Characteristics (Tc=25 $^{\circ}C$, unless otherwise specified)

| Symbol | Min. | Typ. | Max. | Unit | Test Conditions |
|---------------------------|------|------|-----------|------------|---|
| Static | | | | | |
| BV_{DSS} | 30 | - | - | V | $V_{GS}=0, I_D=250\mu A$ |
| $V_{GS(th)}$ | 1 | 1.7 | 2.5 | | $V_{DS}=V_{GS}, I_D=250\mu A$ |
| G_{FS} *1 | - | 9 | - | S | $V_{DS}=5V, I_D=8A$ |
| I_{GSS} | - | - | ± 100 | nA | $V_{GS}=\pm 20, V_{DS}=0$ |
| I_{DSS} | - | - | 1 | μA | $V_{DS}=24V, V_{GS}=0$ |
| | - | - | 25 | | $V_{DS}=20V, V_{GS}=0, T_j=125^{\circ}C$ |
| $I_{D(ON)}$ *1 | 31 | - | - | A | $V_{DS}=5V, V_{GS}=10V$ |
| $R_{DS(ON)}$ *1 | - | 13 | 18 | m Ω | $V_{GS}=10V, I_D=8A$ |
| | - | 22 | 30 | | $V_{GS}=4.5V, I_D=6A$ |
| Dynamic | | | | | |
| $Q_g(V_{GS}=10V)$ *1 | - | 11 | - | nC | $I_D=8A, V_{DS}=15V, V_{GS}=10V$ |
| $Q_g(V_{GS}=4.5V)$ *1 | - | 6.5 | - | | |
| Q_{gs} *1 | - | 2.5 | - | | |
| Q_{gd} *1 | - | 3.1 | - | | |
| $t_{d(ON)}$ *1 | - | 8 | - | ns | $V_{DS}=15V, I_D=1A, V_{GS}=10V, R_G=6\Omega$ |
| t_r *1 | - | 7 | - | | |
| $t_{d(OFF)}$ *1 | - | 34 | - | | |
| t_f *1 | - | 12 | - | | |
| C_{iss} | - | 715 | - | pF | $V_{GS}=0V, V_{DS}=15V, f=1MHz$ |
| C_{oss} | - | 78 | - | | |
| C_{rss} | - | 69 | - | | |
| Source-Drain Diode | | | | | |
| I_S *1 | - | - | 2.3 | A | |
| I_{SM} *2 | - | - | 9.2 | | |
| V_{SD} *1 | - | - | 1.2 | V | $I_F=I_S, V_{GS}=0V$ |
| t_{rr} *1 | - | 45 | - | ns | $I_F=I_S, V_{GS}=0, dI_F/dt=100A/\mu s$ |
| Q_{rr} *1 | - | 1.8 | - | nC | |

Note : *1.Pulse Test : Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$

*2.Pulse width limited by maximum junction temperature.



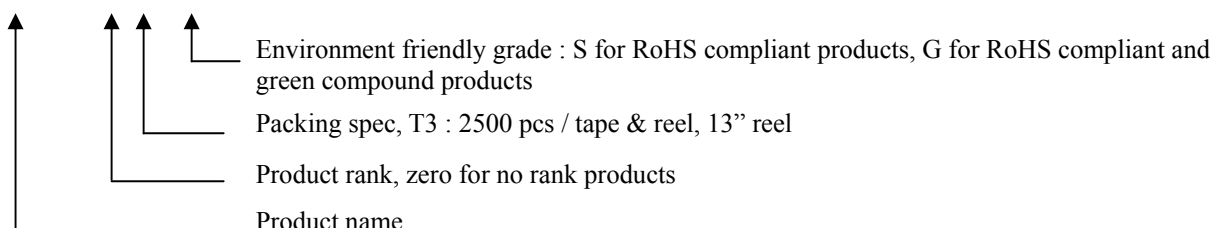
P-CH Characteristics (Tc=25°C, unless otherwise specified)

| Symbol | Min. | Typ. | Max. | Unit | Test Conditions |
|---|------|------|------|------|--|
| Static | | | | | |
| BV _{DSS} | -30 | - | - | V | V _{GS} =0, I _D =-250μA |
| V _{GS(th)} | -1 | -1.2 | -2.5 | | V _{DS} =V _{GS} , I _D =-250μA |
| G _{FS} *1 | - | 12 | - | S | V _{DS} =-5V, I _D =-7A |
| I _{GSS} | - | - | ±100 | nA | V _{GS} =±20, V _{DS} =0 |
| I _{DSS} | - | - | -1 | μA | V _{DS} =-24V, V _{GS} =0 |
| | - | - | -25 | | V _{DS} =-20V, V _{GS} =0, T _j =125°C |
| I _{D(ON)} *1 | -27 | - | - | A | V _{DS} =-5V, V _{GS} =-10V |
| R _{DS(ON)} *1 | - | 21 | 28 | mΩ | V _{GS} =-10V, I _D =-7A |
| | - | 30 | 40 | | V _{GS} =-4.5V, I _D =-5A |
| Dynamic | | | | | |
| Q _g (V _{GS} =-10V)*1 | - | 16 | - | nC | I _D =-7A, V _{DS} =-15V, V _{GS} =-10V |
| Q _g (V _{GS} =-4.5V)*1 | - | 10 | - | | |
| Q _{gs} *1 | - | 3.9 | - | | |
| Q _{gd} *1 | - | 4.9 | - | | |
| t _{d(ON)} *1 | - | 13 | - | ns | V _{DS} =-15V, I _D =-1A, V _{GS} =-10V, R _G =6Ω |
| t _r *1 | - | 10 | - | | |
| t _{d(OFF)} *1 | - | 44 | - | | |
| t _f *1 | - | 17 | - | | |
| C _{iss} | - | 1251 | - | pF | V _{GS} =0V, V _{DS} =-15V, f=1MHz |
| C _{oss} | - | 135 | - | | |
| C _{rss} | - | 110 | - | | |
| Source-Drain Diode | | | | | |
| I _S *1 | - | - | -2.3 | A | |
| I _{SM} *2 | - | - | -9.2 | | |
| V _{SD} *1 | - | - | -1.2 | V | I _F =I _S , V _{GS} =0V |
| t _{rr} *1 | - | 56 | - | ns | I _F =I _S , V _{GS} =0, dI _F /dt=100A/μs |
| Q _{rr} *1 | - | 2.5 | - | nC | |

Note : *1.Pulse Test : Pulse Width ≤300μs, Duty Cycle ≤2%
 *2.Pulse width limited by maximum junction temperature.

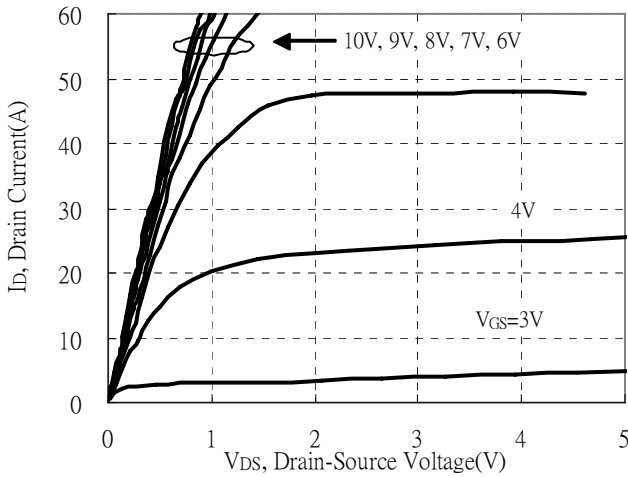
Ordering Information

| Device | Package | Shipping |
|-------------------|---|------------------------|
| MTB20C03J4-0-T3-G | TO-252 (RoHS compliant & Halogen-free package) | 2500 pcs / Tape & Reel |

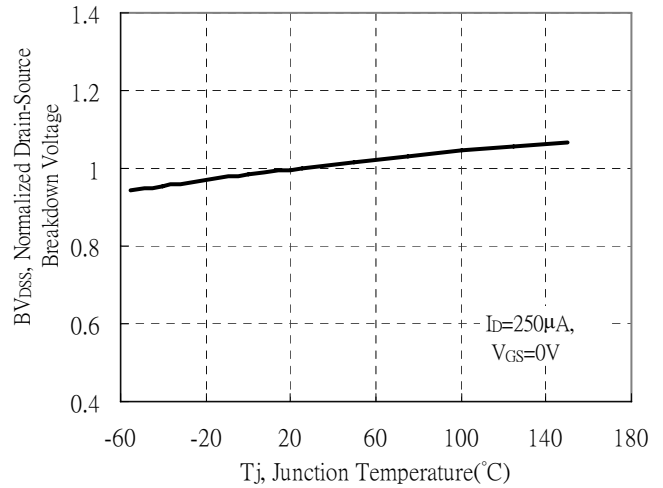


Q1, N-CH Typical Characteristics

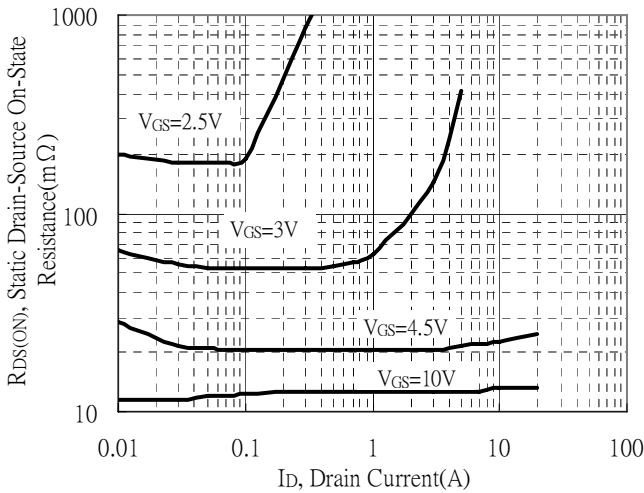
Typical Output Characteristics



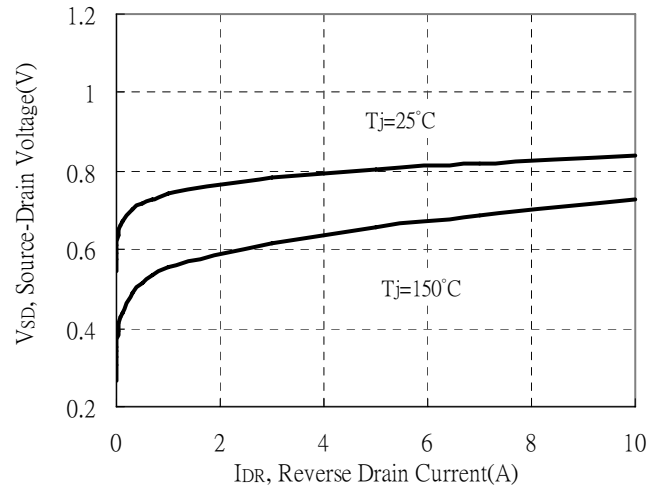
Brekdown Voltage vs Ambient Temperature



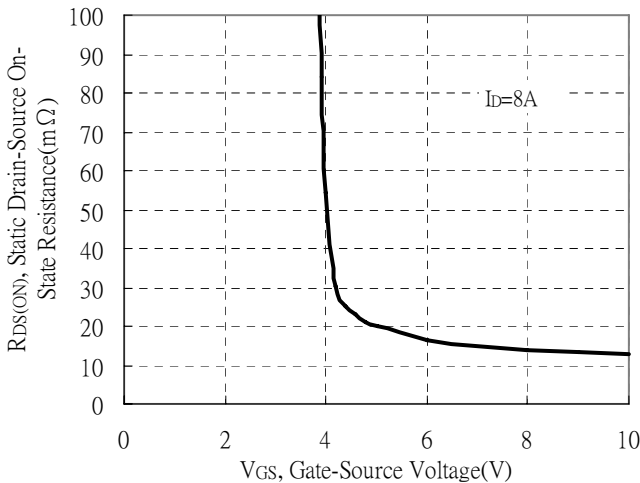
Static Drain-Source On-State resistance vs Drain Current



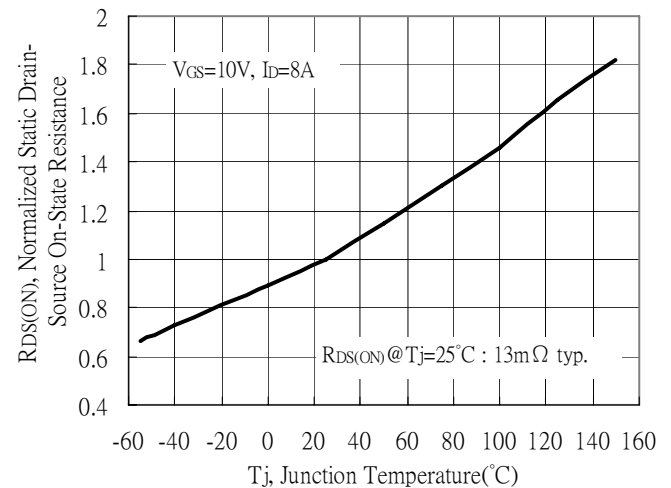
Reverse Drain Current vs Source-Drain Voltage



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

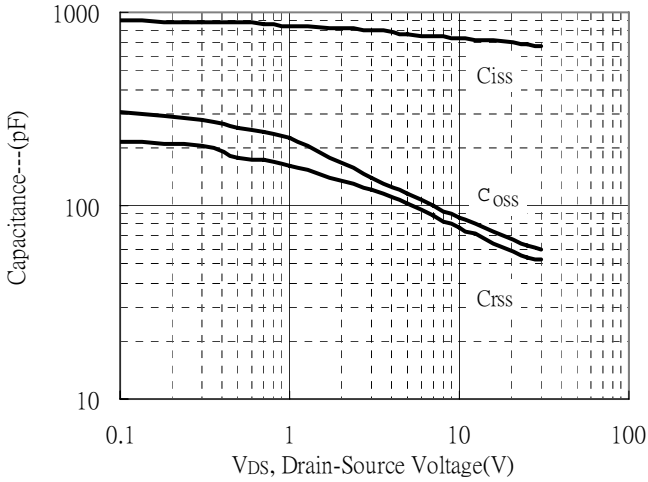


Drain-Source On-State Resistance vs Junction Temperature

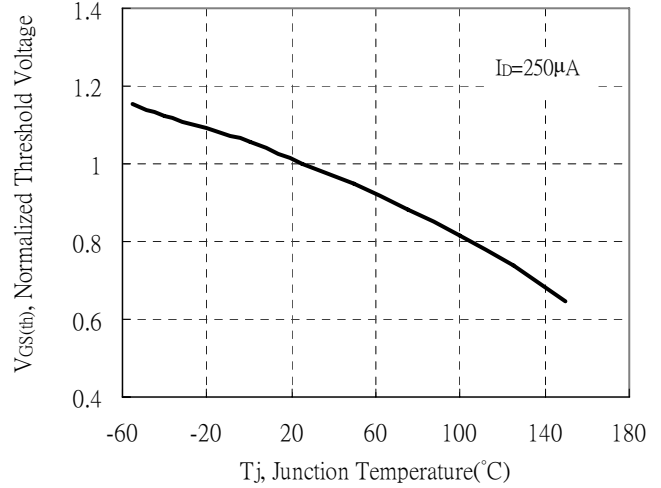


Q1, N-CH Typical Characteristics(Cont.)

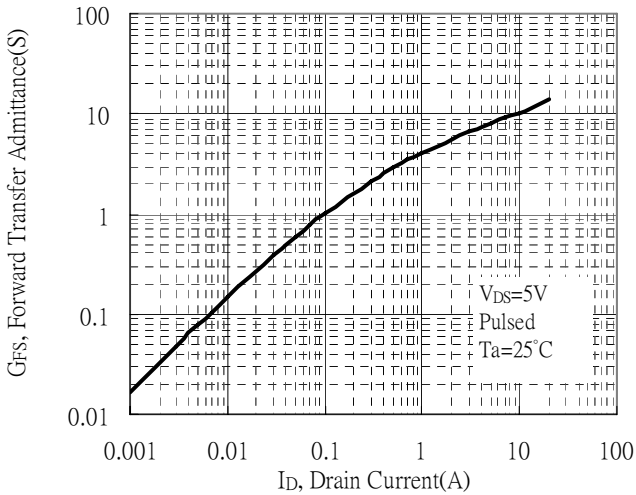
Capacitance vs Drain-to-Source Voltage



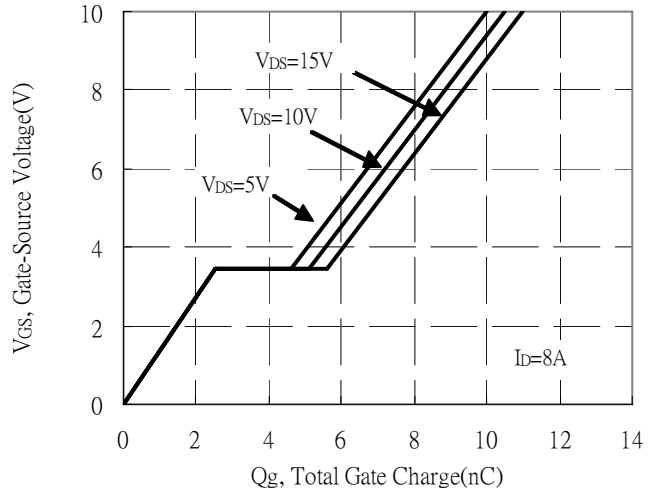
Threshold Voltage vs Junction Temperature



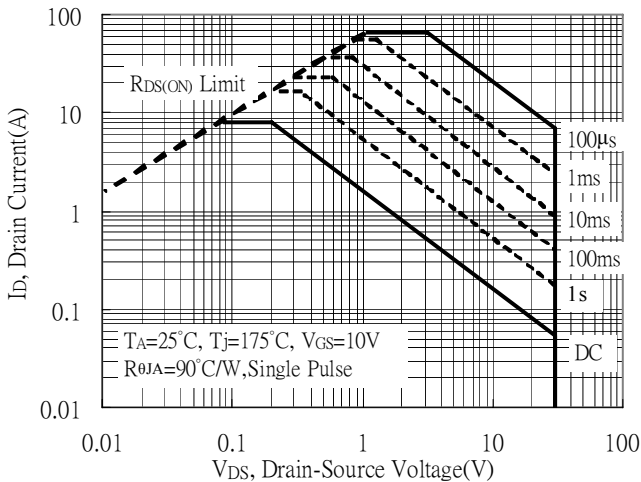
Forward Transfer Admittance vs Drain Current



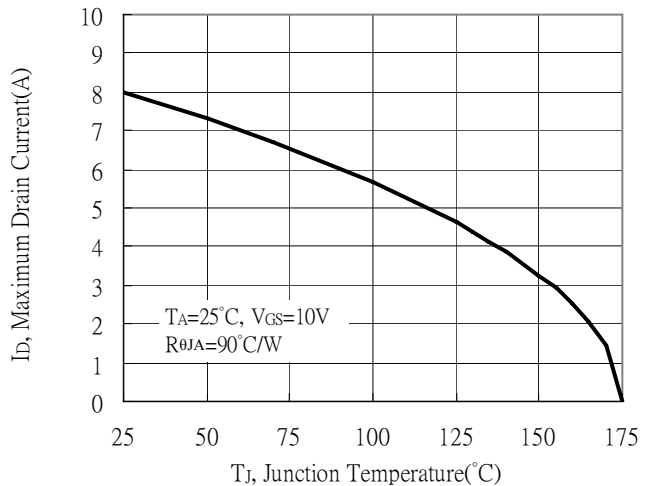
Gate Charge Characteristics



Maximum Safe Operating Area

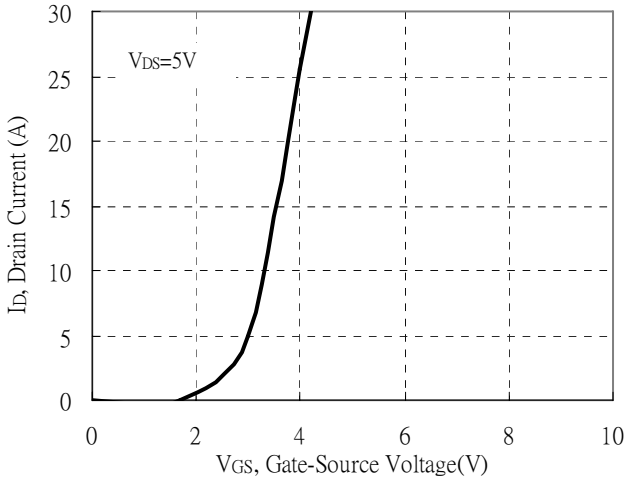


Maximum Drain Current vs Junction Temperature

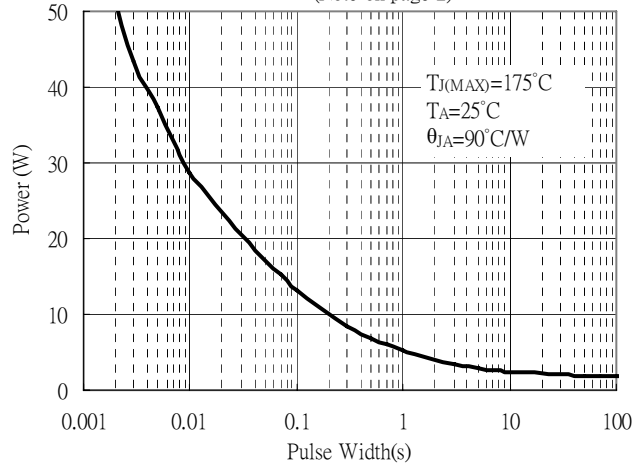


Q1, N-CH Typical Characteristics(Cont.)

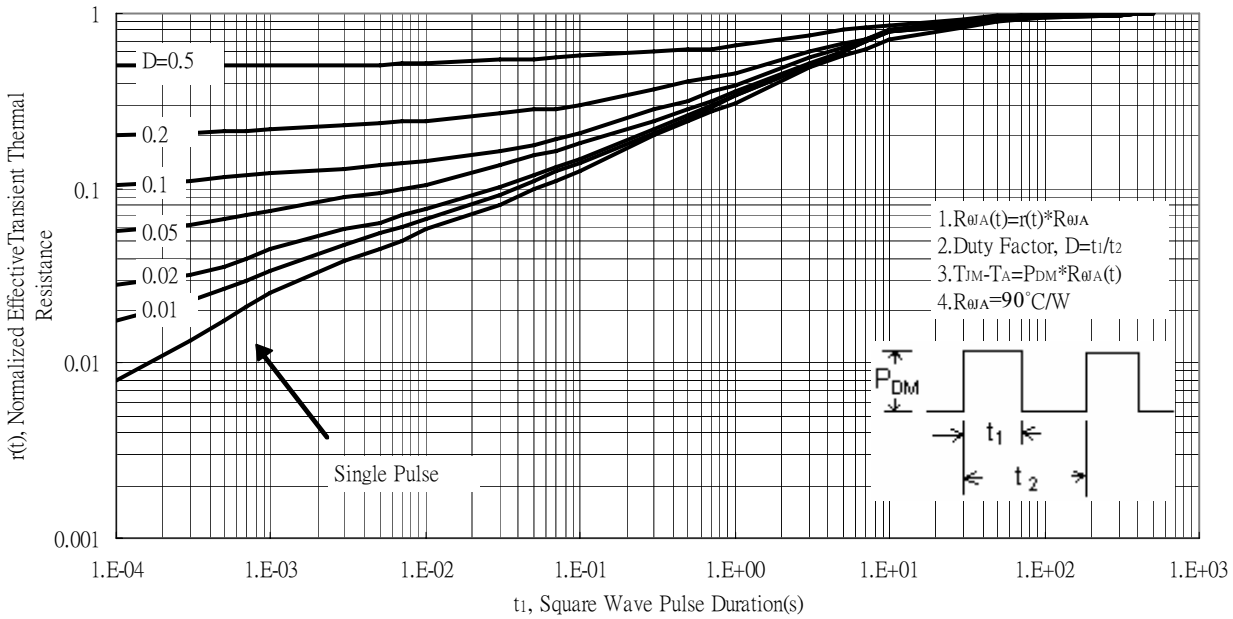
Typical Transfer Characteristics



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

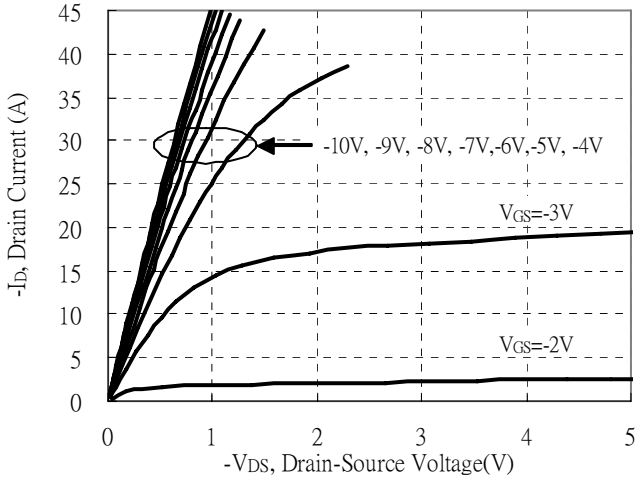


Transient Thermal Response Curves

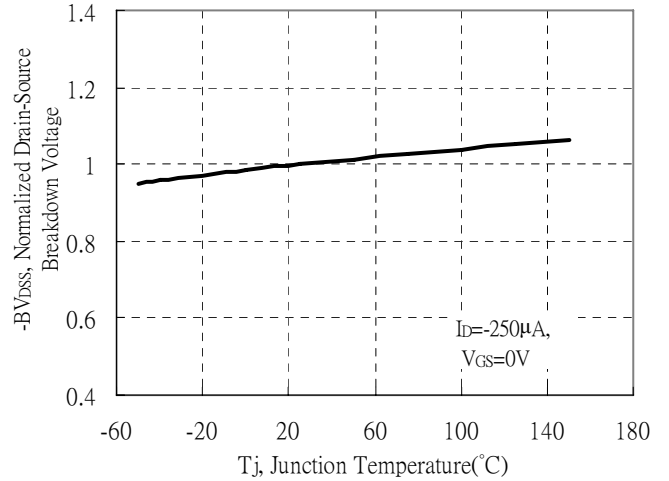


Q2, P-CH Typical Characteristics

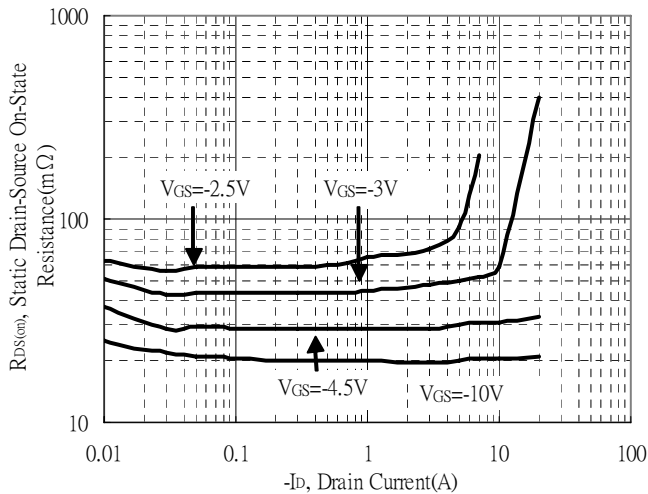
Typical Output Characteristics



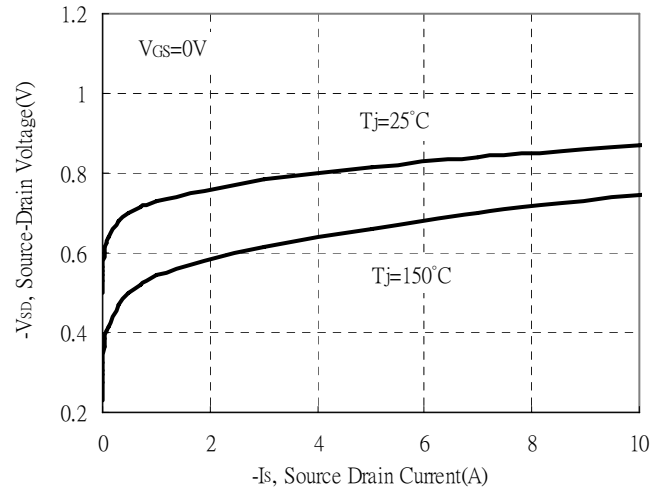
Breakdown Voltage vs Ambient Temperature



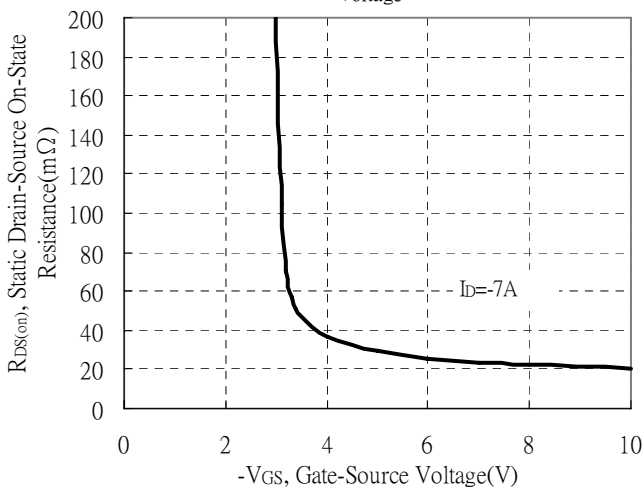
Static Drain-Source On-State resistance vs Drain Current



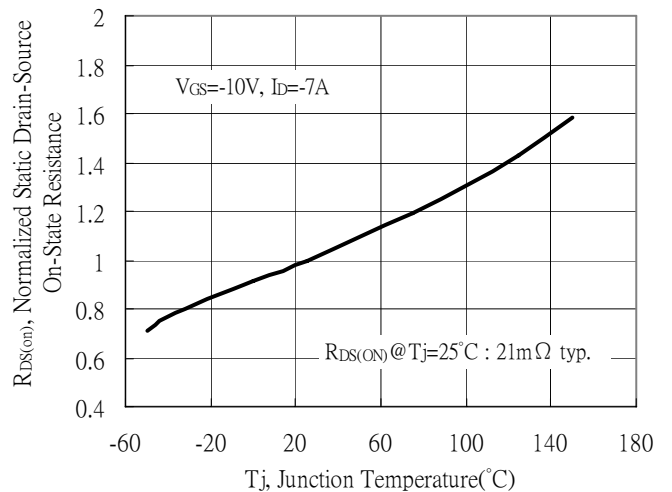
Source Drain Current vs Source-Drain Voltage



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

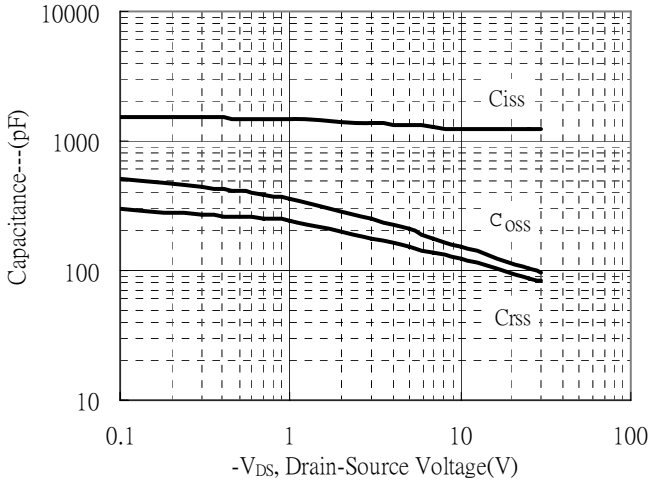


Drain-Source On-State Resistance vs Junction Temperature

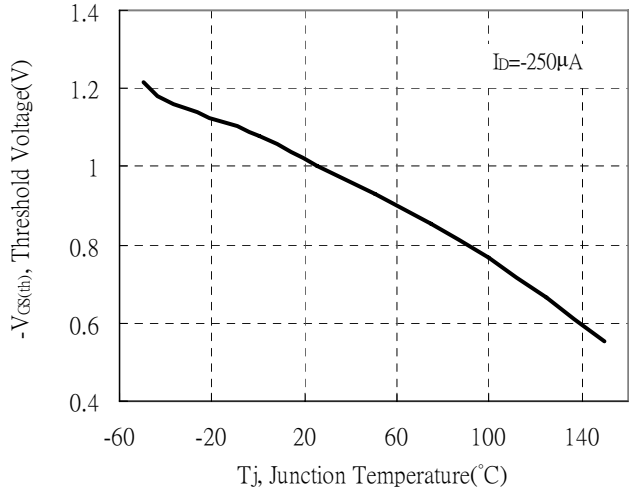


Q2, P-CH Typical Characteristics(Cont.)

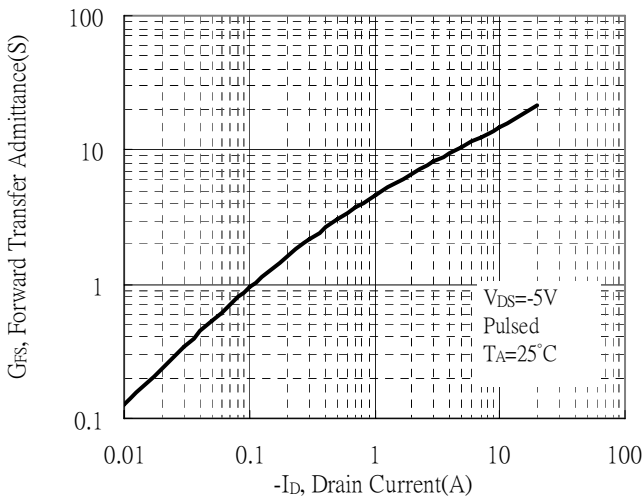
Capacitance vs Drain-to-Source Voltage



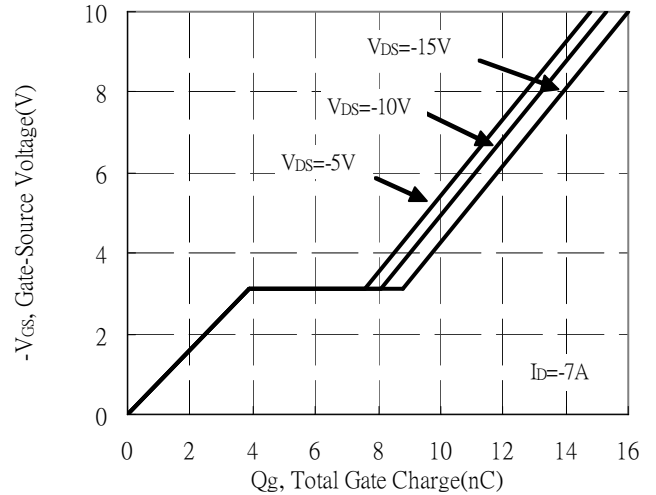
Threshold Voltage vs Junction Temperature



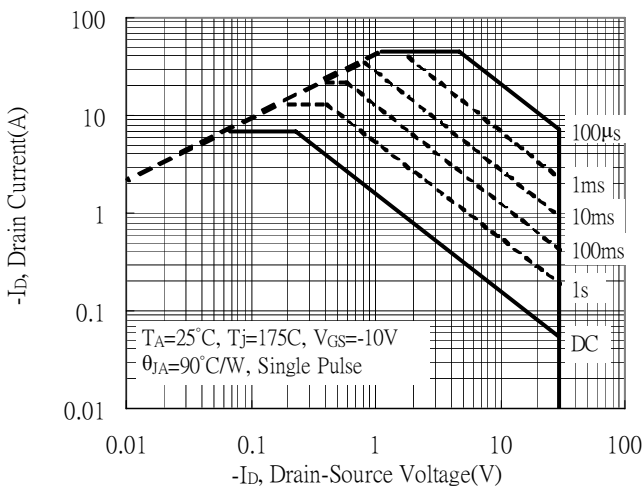
Forward Transfer Admittance vs Drain Current



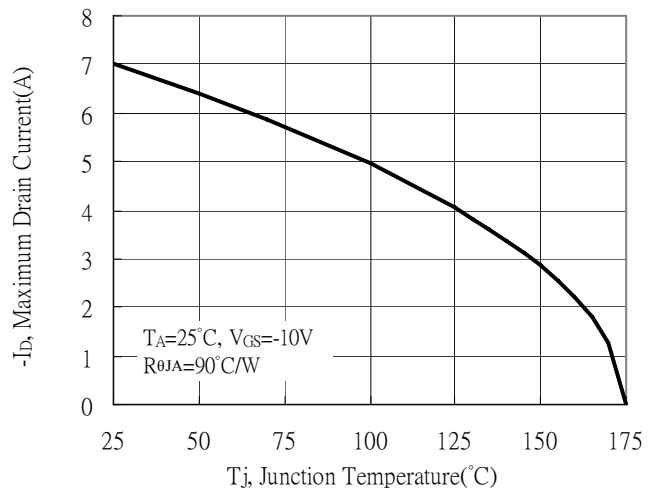
Gate Charge Characteristics



Maximum Safe Operating Area



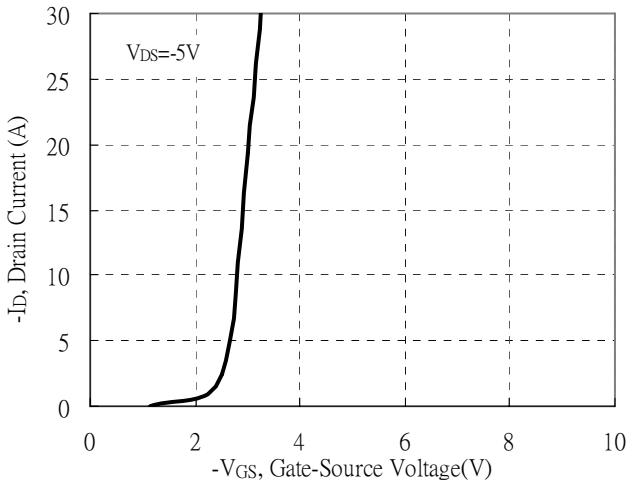
Maximum Drain Current vs Junction Temperature



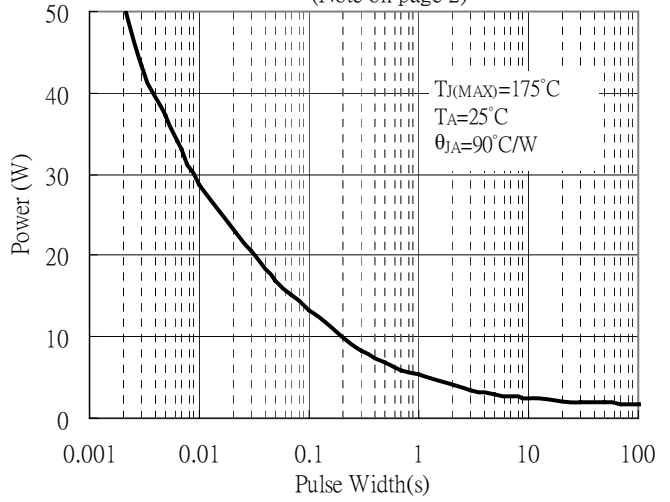


Q2, P-CH Typical Characteristics(Cont.)

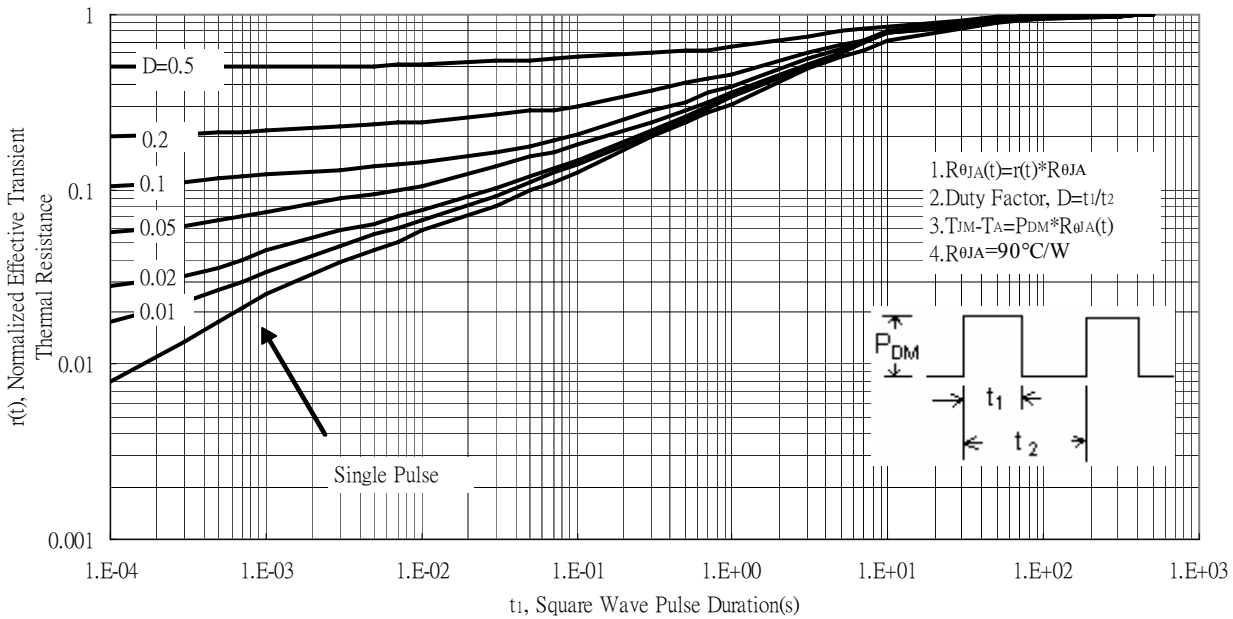
Typical Transfer Characteristics



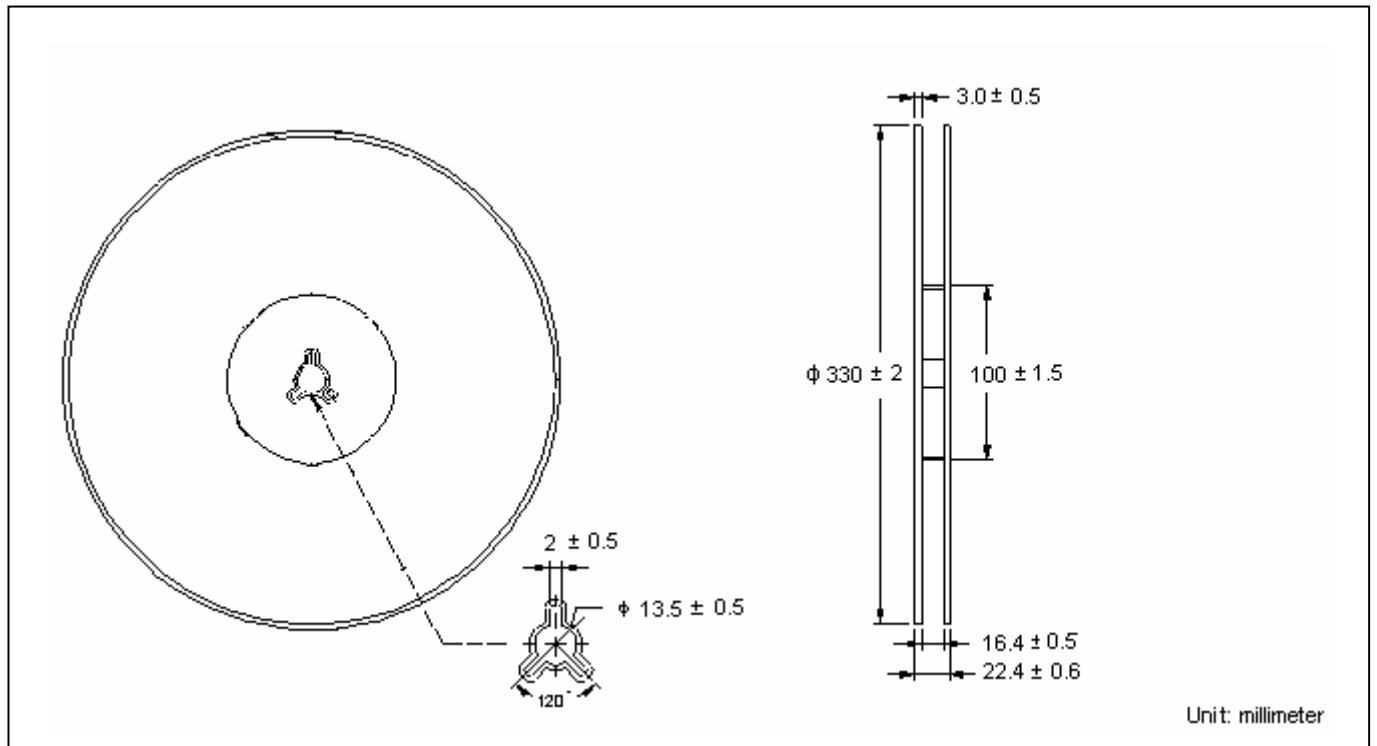
Single Pulse Power Rating, Junction to Ambient
 (Note on page 2)



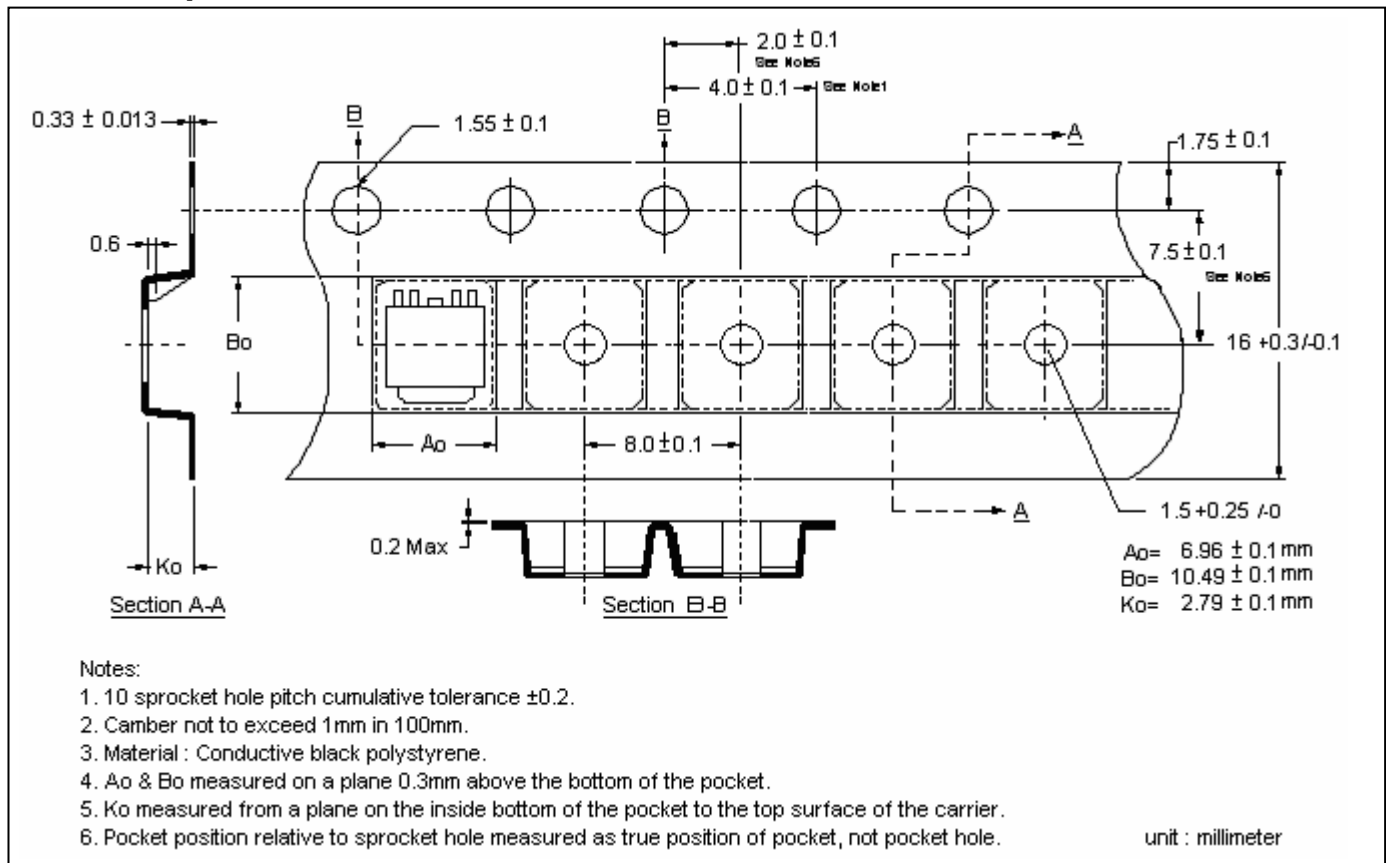
Transient Thermal Response Curves



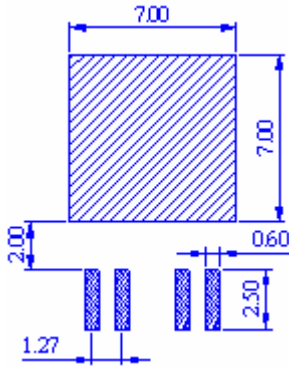
Reel Dimension



Carrier Tape Dimension



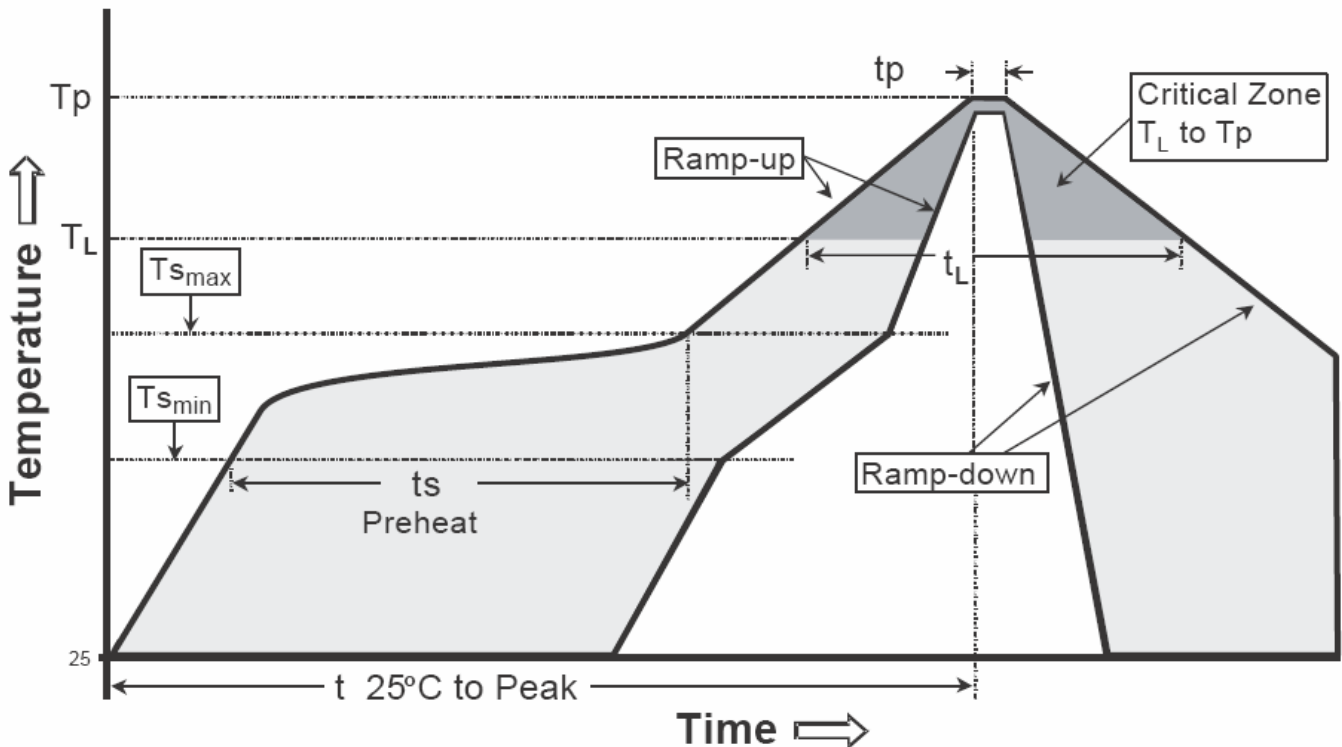
Recommended soldering footprint



Unit : mm

Recommended wave soldering condition

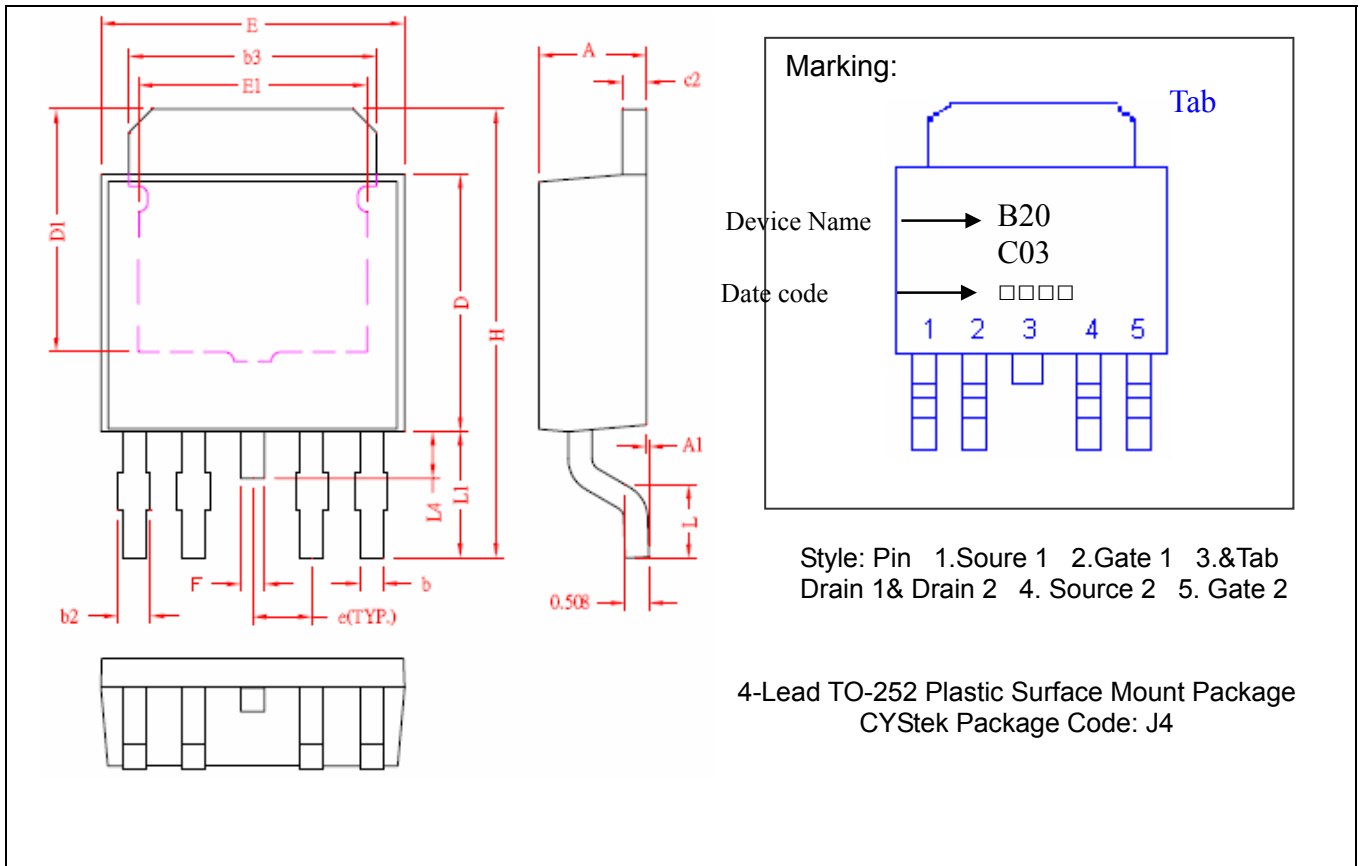
| Product | Peak Temperature | Soldering Time |
|-----------------|------------------|-----------------|
| Pb-free devices | 260 +0/-5 °C | 5 +1/-1 seconds |

Recommended temperature profile for IR reflow


| Profile feature | Sn-Pb eutectic Assembly | Pb-free Assembly |
|--|-------------------------|------------------|
| Average ramp-up rate (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.

TO-252 Dimension



| DIM | Inches | | Millimeters | | DIM | Inches | | Millimeters | |
|-----|--------|--------|-------------|------|-----|--------|--------|-------------|-------|
| | Min. | Max. | Min. | Max. | | Min. | Max. | Min. | Max. |
| A | 0.0866 | 0.0945 | 2.20 | 2.40 | E | 0.2520 | 0.2677 | 6.40 | 6.80 |
| A1 | 0.0000 | 0.0059 | 0.00 | 0.15 | E1 | 0.1500 | - | 3.81 | - |
| b | 0.0157 | 0.0236 | 0.40 | 0.60 | e | 0.0500 | REF | 1.27 | REF |
| b2 | 0.0199 | 0.0315 | 0.50 | 0.80 | F | 0.0157 | 0.0236 | 0.40 | 0.60 |
| b3 | 0.2047 | 0.2165 | 5.20 | 5.50 | H | 0.3701 | 0.4016 | 9.40 | 10.20 |
| c2 | 0.0177 | 0.0217 | 0.45 | 0.55 | L | 0.0551 | 0.0697 | 1.40 | 1.77 |
| D | 0.2126 | 0.2283 | 5.40 | 5.80 | L1 | 0.0945 | 0.1181 | 2.40 | 3.00 |
| D1 | 0.1799 | - | 4.57 | - | L4 | 0.0315 | 0.0472 | 0.80 | 1.20 |

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.

Important Notice:

- All rights are reserved. Reproduction in whole or in part is prohibited without the prior written approval of CYStek.
- CYStek reserves the right to make changes to its products without notice.
- CYStek **semiconductor products are not warranted to be suitable for use in Life-Support Applications, or systems.**
- CYStek assumes no liability for any consequence of customer product design, infringement of patents, or application assistance.