

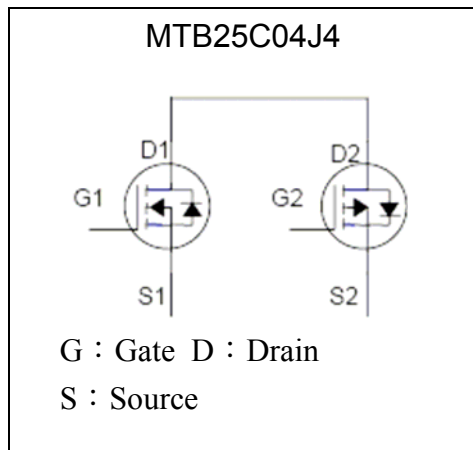
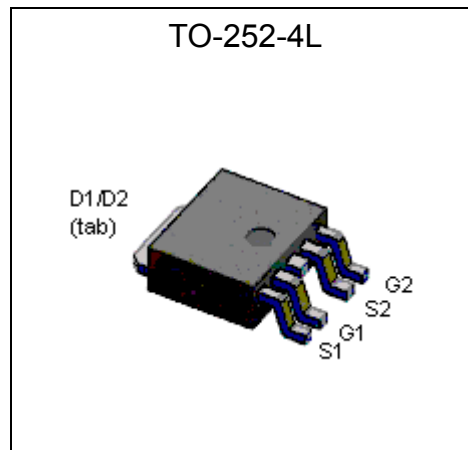
N & P-Channel Enhancement Mode Power MOSFET

MTB25C04J4

| | N-CH | P-CH |
|--|-----------------|-----------------|
| BV_{DSS} | 40V | -40V |
| $I_D @ V_{GS}=10V(-10V), T_A=25^\circ C$ | 5.2A | -4.9A |
| $I_D @ V_{GS}=10V(-10V), T_C=25^\circ C$ | 21A | -20A |
| $R_{DSON}(typ.) @ V_{GS}=(-)10V$ | 20.9 m Ω | 35.8 m Ω |
| $R_{DSON}(typ.) @ V_{GS}=(-)4.5V$ | 30.1 m Ω | 46.2 m Ω |

Features

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

Equivalent Circuit

Outline

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

| Parameter | Symbol | Limits | | Unit |
|--|----------------|-----------|-----------|------------|
| | | N-channel | P-channel | |
| Drain-Source Voltage | V_{DS} | 40 | -40 | V |
| Gate-Source Voltage | V_{GS} | ± 20 | ± 20 | |
| Continuous Drain Current @ $T_C=25^\circ C, V_{GS}=10V(-10V)$ (Note1) | I_D | 21 | -20 | A |
| Continuous Drain Current @ $T_C=100^\circ C, V_{GS}=10V(-10V)$ (Note1) | | 14.9 | -14.1 | |
| Continuous Drain Current @ $T_A=25^\circ C, V_{GS}=10V(-10V)$ (Note4) | | 5.2 | -4.9 | |
| Continuous Drain Current @ $T_A=70^\circ C, V_{GS}=10V(-10V)$ (Note4) | | 4.2 | -3.9 | |
| Pulsed Drain Current *1 (Note3) | I_{DM} | 30 | -30 | |
| Avalanche Current | I_{AS} | 6.5 | -9.3 | |
| Avalanche Energy @ $L=0.5mH, V_{GS}=10V(-10V), I_{AS}=6.5A(-9.3A)$ | E_{AS} | 10.6 | 21.6 | mJ |
| Total Power Dissipation ($T_C=25^\circ C$) (Note1) | P_D | 25 | | W |
| Total Power Dissipation ($T_C=100^\circ C$) (Note1) | | 12.5 | | |
| Total Power Dissipation ($T_A=25^\circ C$) (Note2) | P_{DSM} | 2.4 | | |
| Total Power Dissipation ($T_A=70^\circ C$) (Note2) | | 1.7 | | |
| Operating Junction and Storage Temperature Range | T_j, T_{stg} | -55~+175 | | $^\circ C$ |



Thermal Data

| Parameter | Symbol | Value | Unit |
|--|--------------|-------|------|
| Thermal Resistance, Junction-to-case, max | $R_{th,j-c}$ | 6 | °C/W |
| Thermal Resistance, Junction-to-ambient, max (Note2) | $R_{th,j-a}$ | 62.5 | |
| Thermal Resistance, Junction-to-ambient, max (Note4) | | 90 | |

- Note : 1. The power dissipation P_D is based on $T_{J(MAX)}=175^{\circ}C$, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.
2. The value of $R_{\theta JA}$ is measured with the device mounted on 1 in² FR-4 board with 2 oz. copper, in a still air environment with $T_A=25^{\circ}C$. The power dissipation P_{DSM} is based on $R_{\theta JA}$ and the maximum allowed junction temperature of $150^{\circ}C$. The value in any given application depends on the user's specific board design.
3. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}=175^{\circ}C$. Ratings are based on low frequency and low duty cycles to keep initial $T_J=25^{\circ}C$.
4. When mounted on the minimum pad size recommended (PCB mount), $t \leq 10s$.

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

| Symbol | Min. | Typ. | Max. | Unit | Test Conditions |
|---------------------------|------|------|-----------|---------|---|
| Static | | | | | |
| BV_{DSS} | 40 | - | - | V | $V_{GS}=0V, I_D=250\mu A$ |
| $V_{GS(th)}$ | 1.0 | - | 2.5 | | $V_{DS}=V_{GS}, I_D=250\mu A$ |
| I_{GSS} | - | - | ± 100 | nA | $V_{GS}=\pm 20V, V_{DS}=0V$ |
| I_{DSS} | - | - | 1 | μA | $V_{DS}=32V, V_{GS}=0V$ |
| | - | - | 10 | | $V_{DS}=30V, V_{GS}=0V, T_J=55^{\circ}C$ |
| $R_{DS(ON)} *1$ | - | 20.9 | 28 | mΩ | $V_{GS}=10V, I_D=10A$ |
| | - | 30.1 | 38 | | $V_{GS}=4.5V, I_D=4A$ |
| $G_{FS} *1$ | - | 7.7 | - | S | $V_{DS}=5V, I_D=5A$ |
| Dynamic | | | | | |
| $Q_g *1$ | - | 11.2 | - | nC | $V_{DS}=20V, I_D=5A, V_{GS}=10V$ |
| $Q_{gs} *1$ | - | 2.3 | - | | |
| $Q_{gd} *1$ | - | 2.1 | - | | |
| $t_{d(ON)} *1$ | - | 7 | - | ns | $V_{DS}=20V, I_D=1A, V_{GS}=10V, R_G=6\Omega$ |
| $t_r *1$ | - | 17 | - | | |
| $t_{d(OFF)} *1$ | - | 23.8 | - | | |
| $t_f *1$ | - | 6.6 | - | pF | $V_{DS}=15V, V_{GS}=0V, f=1MHz$ |
| C_{iss} | - | 604 | - | | |
| C_{oss} | - | 56 | - | | |
| C_{rSS} | - | 45 | - | | |
| Source-Drain Diode | | | | | |
| $I_S *1$ | - | - | 5 | A | |
| $I_{SM} *2$ | - | - | 30 | | |
| $V_{SD} *1$ | - | 0.74 | 1 | V | $I_S=1A, V_{GS}=0V$ |
| $t_{rr} *1$ | - | 5.9 | - | ns | $I_F=5A, V_{GS}=0, dI_F/dt=100A/\mu s$ |
| $Q_{rr} *1$ | - | 2.4 | - | nC | |

- Note : *1. Pulse Test : Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$
 *2. Pulse width limited by maximum junction temperature.



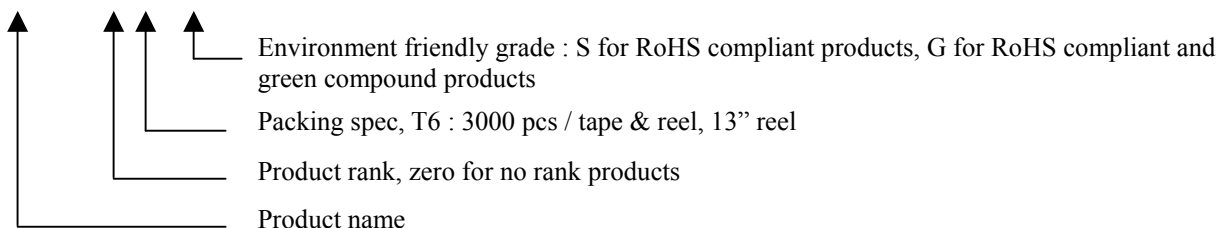
P-CH Characteristics (Tc=25°C, unless otherwise specified)

| Symbol | Min. | Typ. | Max. | Unit | Test Conditions |
|---------------------------|------|-------|------|------|---|
| Static | | | | | |
| BV _{DSS} | -40 | - | - | V | V _{GS} =0V, I _D =-250μA |
| V _{GS(th)} | -1.0 | - | -2.5 | | V _{DS} =V _{GS} , I _D =-250μA |
| I _{GSS} | - | - | ±100 | nA | V _{GS} =±20V, V _{DS} =0V |
| I _{DSS} | - | - | -1 | μA | V _{DS} =-32V, V _{GS} =0V |
| | - | - | -10 | | V _{DS} =-30V, V _{GS} =0V, T _j =55°C |
| R _{DS(ON)} *1 | - | 35.8 | 45 | mΩ | V _{GS} =-10V, I _D =-7A |
| | - | 46.2 | 60 | | V _{GS} =-4.5V, I _D =-4A |
| G _{FS} *1 | - | 10 | - | S | V _{DS} =-5V, I _D =-4.9A |
| Dynamic | | | | | |
| Q _g *1 | - | 19.2 | - | nC | V _{DS} =-20V, I _D =-4.9A, V _{GS} =-10V |
| Q _{gs} *1 | - | 3.2 | - | | |
| Q _{gd} *1 | - | 2.9 | - | | |
| t _{d(ON)} *1 | - | 7 | - | ns | V _{DS} =-20V, I _D =-1A, V _{GS} =-10V, R _G =6Ω |
| t _r *1 | - | 16.6 | - | | |
| t _{d(OFF)} *1 | - | 87 | - | | |
| t _f *1 | - | 64.4 | - | | |
| C _{iss} | - | 1053 | - | pF | V _{DS} =-15V, V _{GS} =0V, f=1MHz |
| C _{oss} | - | 98 | - | | |
| C _{rss} | - | 74 | - | | |
| Source-Drain Diode | | | | | |
| I _s *1 | - | - | -4.9 | A | |
| I _{SM} *2 | - | - | -30 | | |
| V _{SD} *1 | - | -0.74 | -1 | V | I _S =-1A, V _{GS} =0V |
| t _{rr} *1 | - | 8.3 | - | ns | I _F =-5A, V _{GS} =0, dI _F /dt=100A/μs |
| Q _{rr} *1 | - | 3.4 | - | nC | |

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

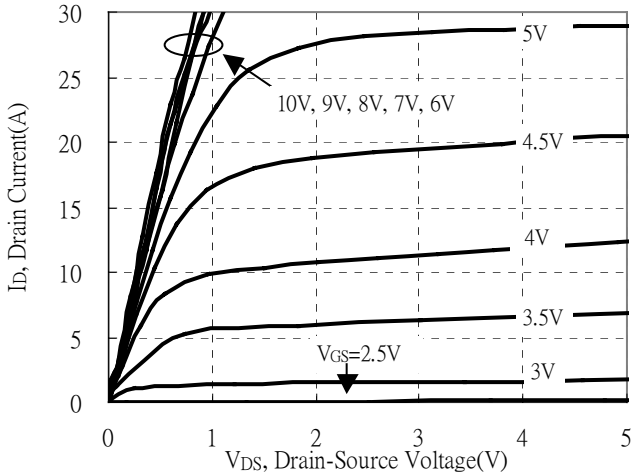
Ordering Information

| Device | Package | Shipping |
|-------------------|---|------------------------|
| MTB25C04J4-0-T6-G | TO-252 (RoHS compliant & Halogen-free package) | 3000 pcs / Tape & Reel |

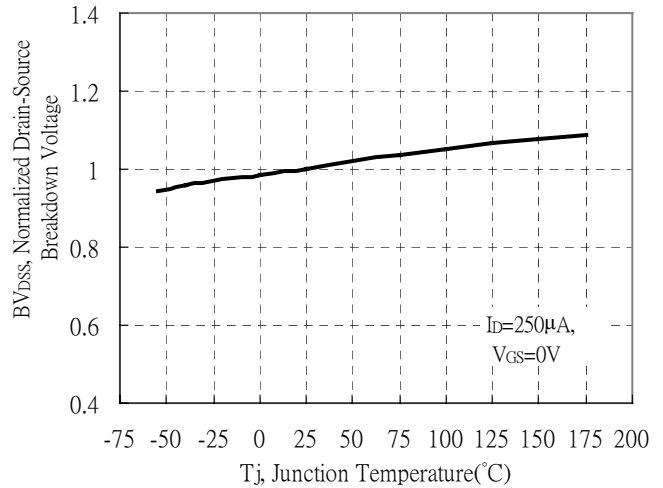


Q1, N-CH Typical Characteristics

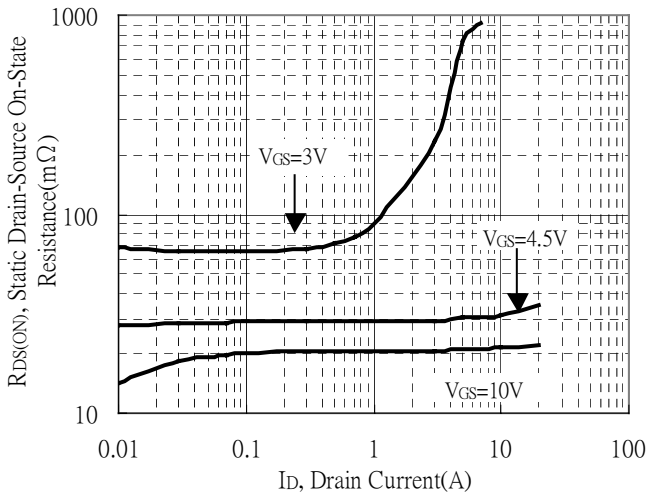
Typical Output Characteristics



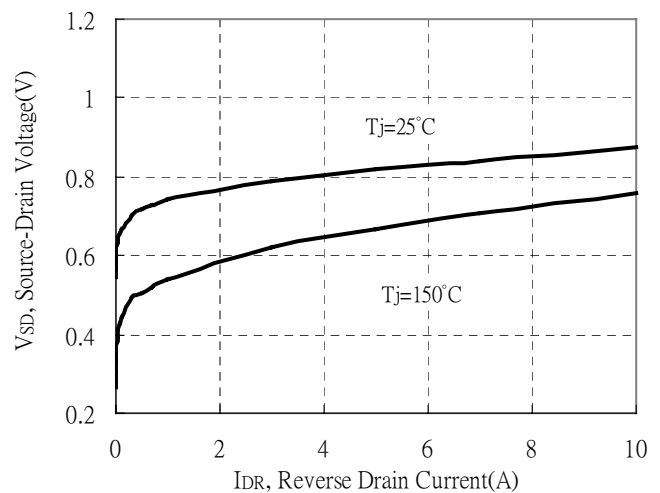
Brekdown Voltage vs Ambient Temperature



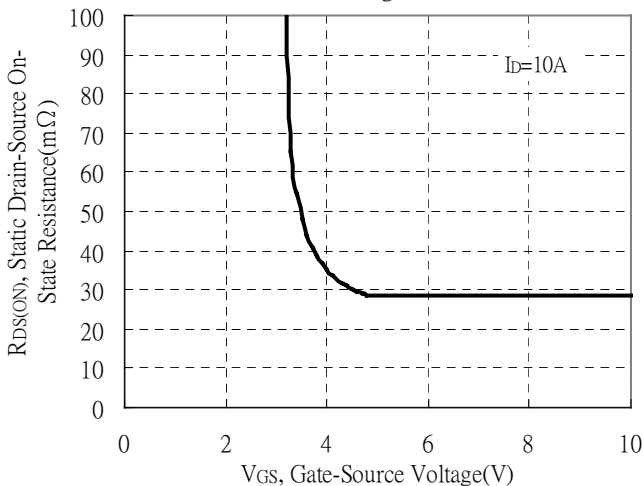
Static Drain-Source On-State resistance vs Drain Current



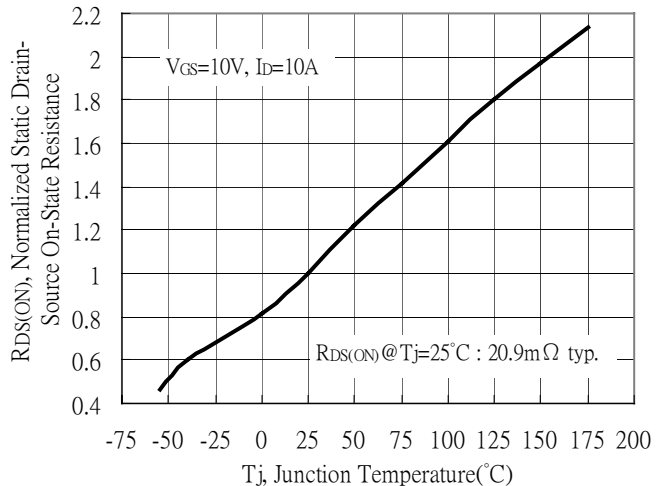
Reverse Drain Current vs Source-Drain Voltage



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



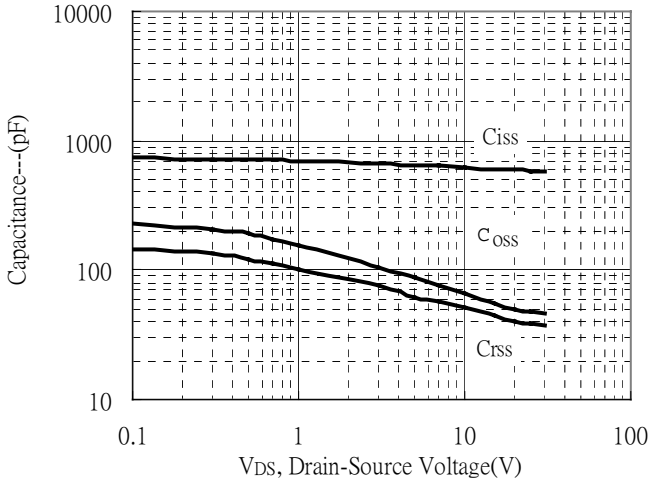
Drain-Source On-State Resistance vs Junction Temperature



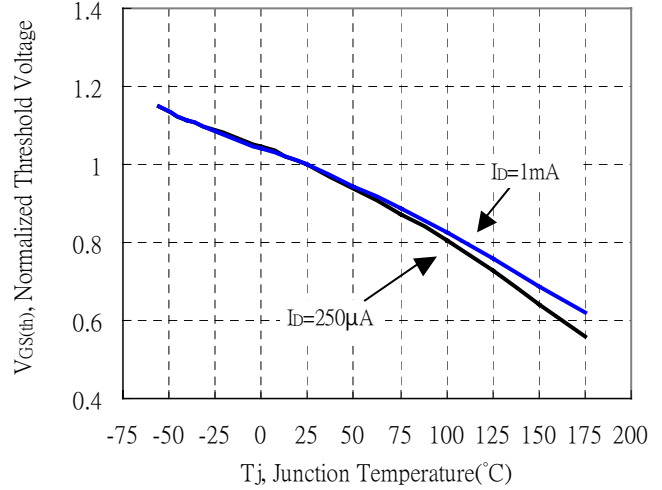


Q1, N-CH Typical Characteristics(Cont.)

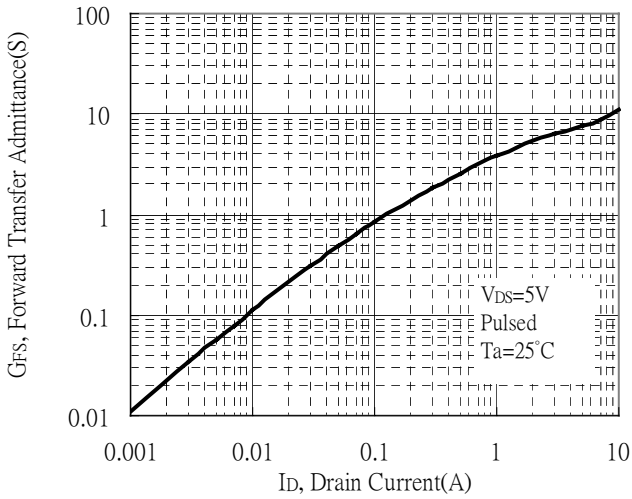
Capacitance vs Drain-to-Source Voltage



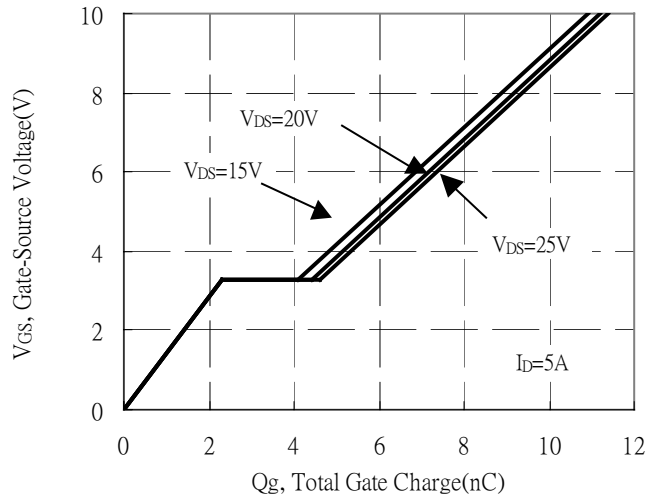
Threshold Voltage vs Junction Temperature



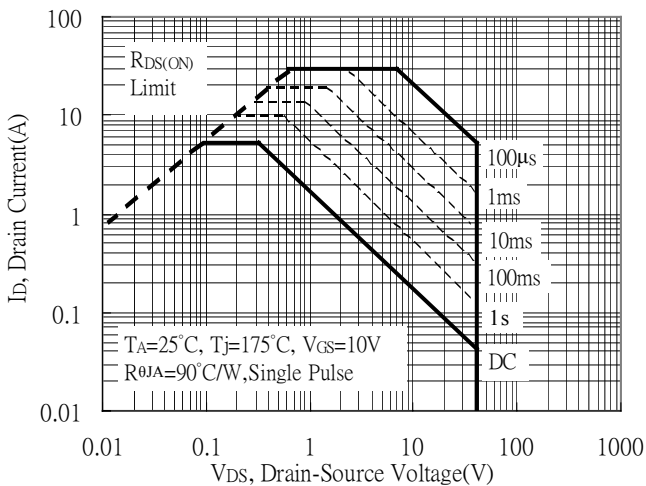
Forward Transfer Admittance vs Drain Current



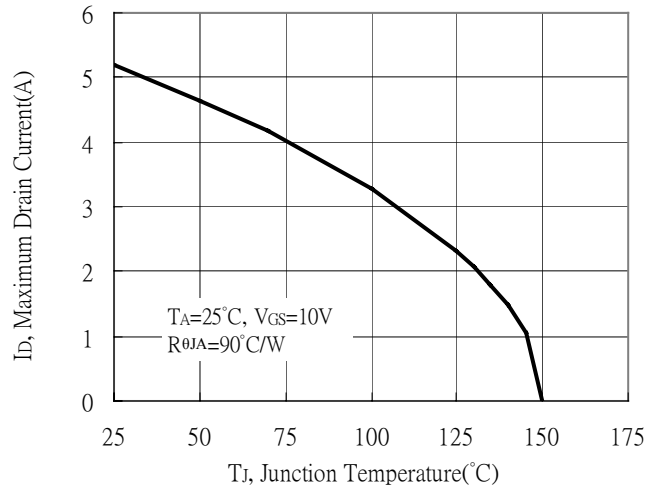
Gate Charge Characteristics



Maximum Safe Operating Area

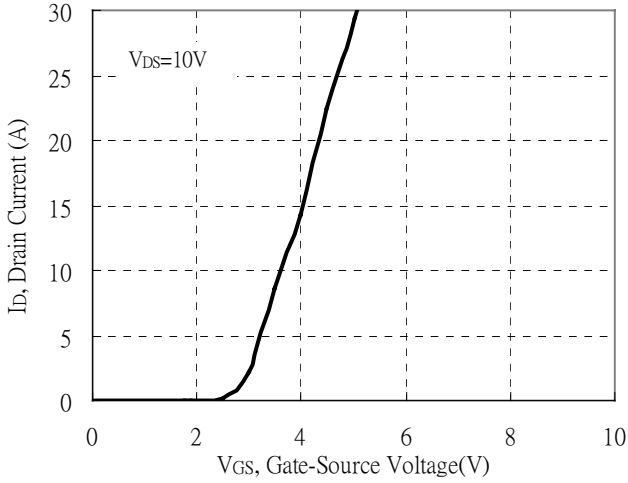


Maximum Drain Current vs Junction Temperature

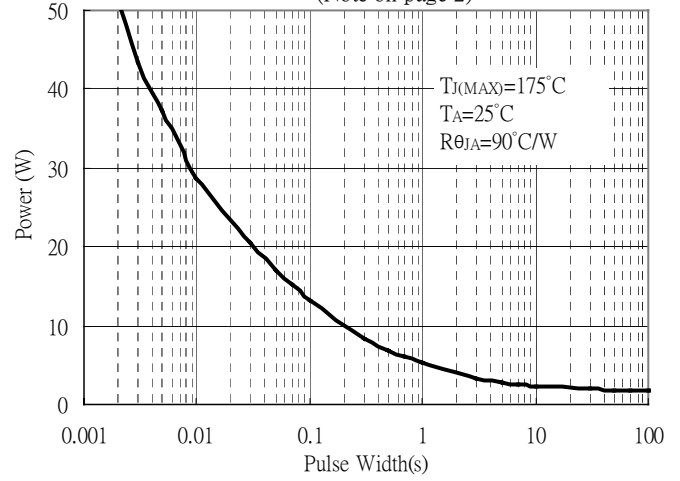


Q1, N-CH Typical Characteristics(Cont.)

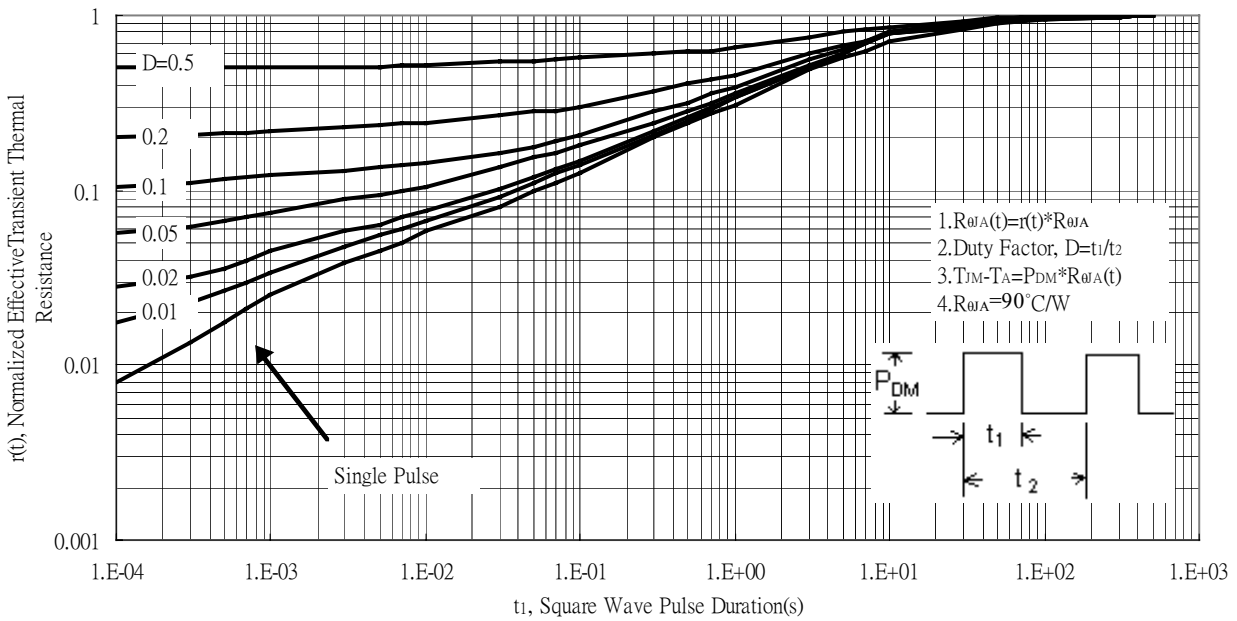
Typical Transfer Characteristics



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

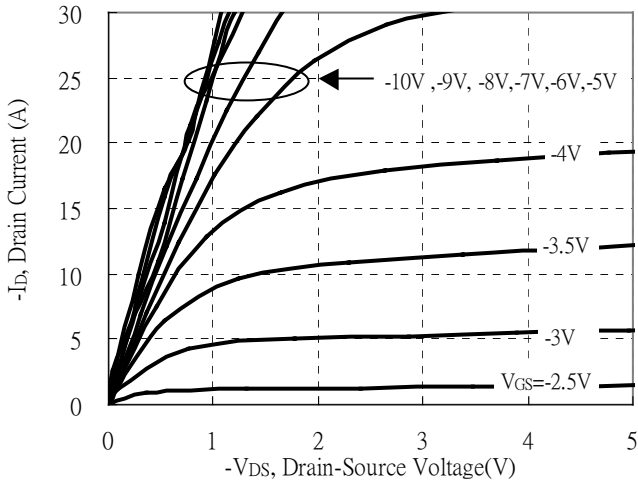


Transient Thermal Response Curves

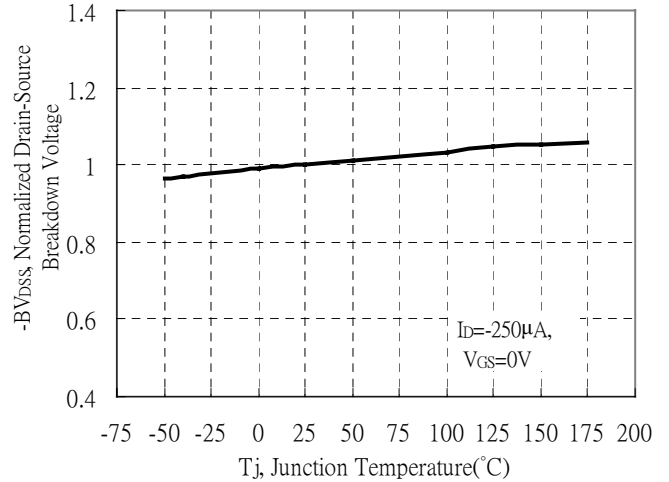


Q2, P-CH Typical Characteristics

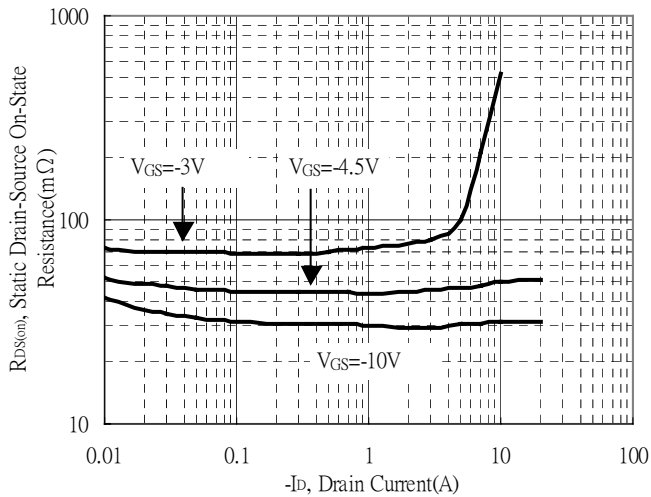
Typical Output Characteristics



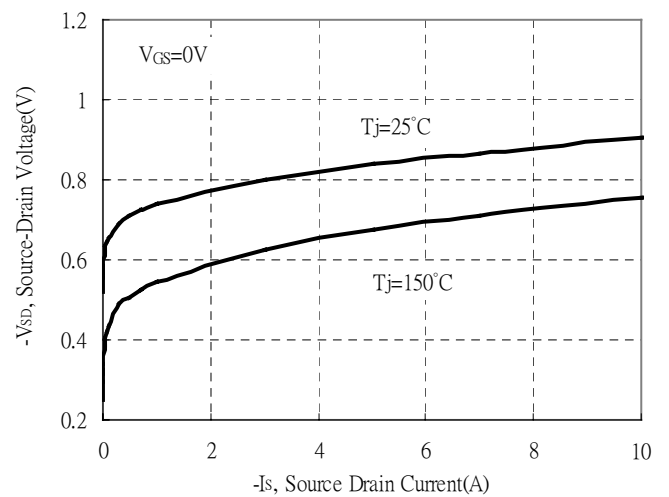
Breakdown Voltage vs Ambient Temperature



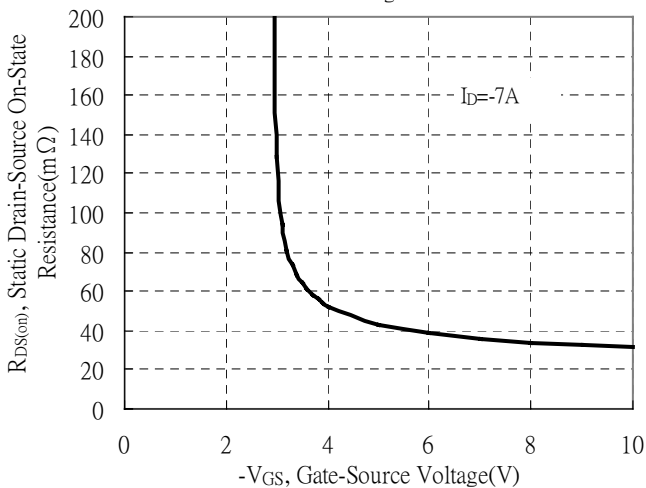
Static Drain-Source On-State resistance vs Drain Current



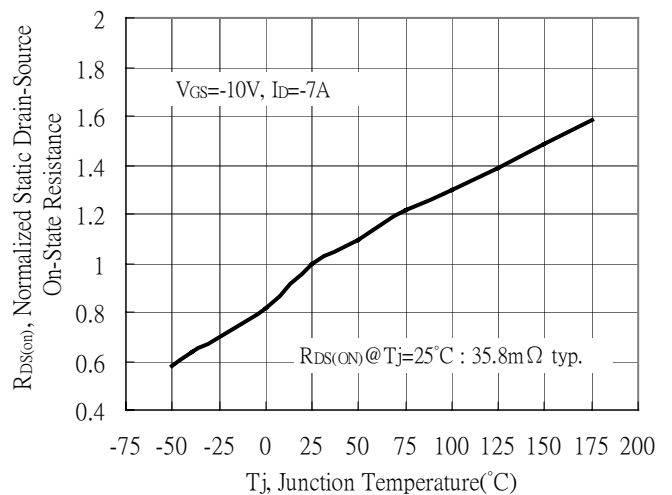
Source Drain Current vs Source-Drain Voltage



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



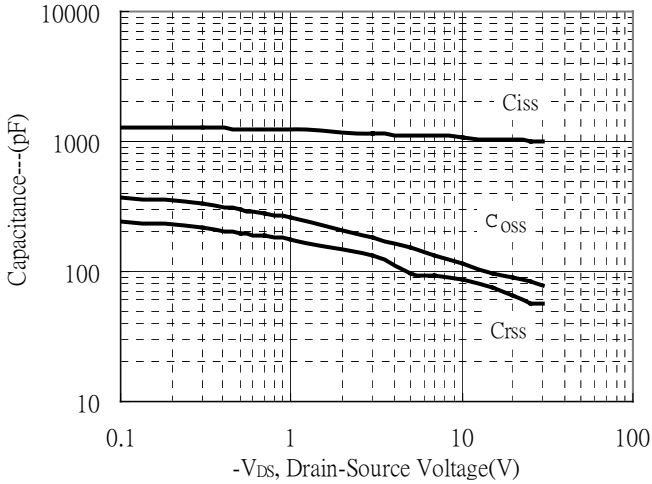
Drain-Source On-State Resistance vs Junction Temperature



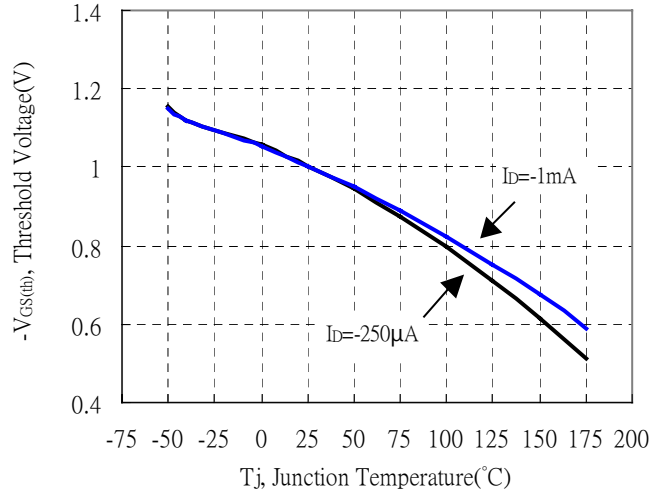


Q2, P-CH Typical Characteristics(Cont.)

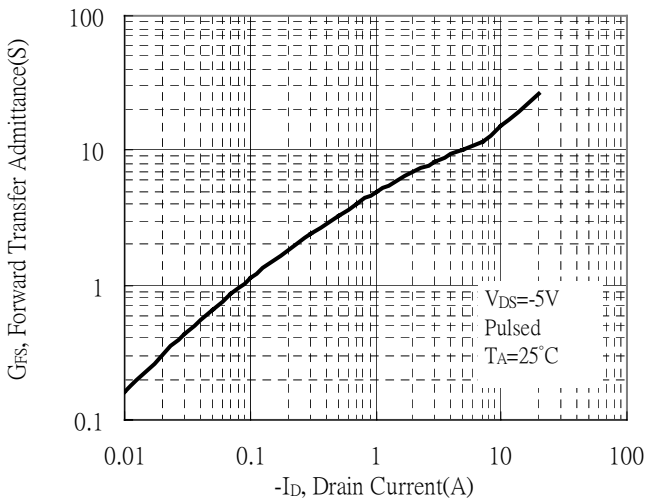
Capacitance vs Drain-to-Source Voltage



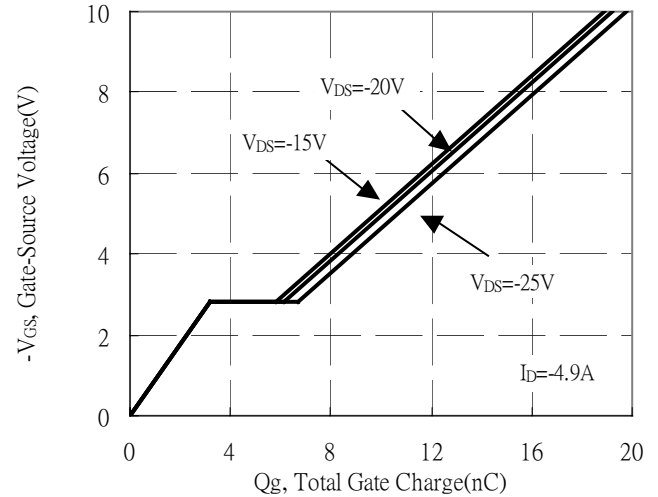
Threshold Voltage vs Junction Temperature



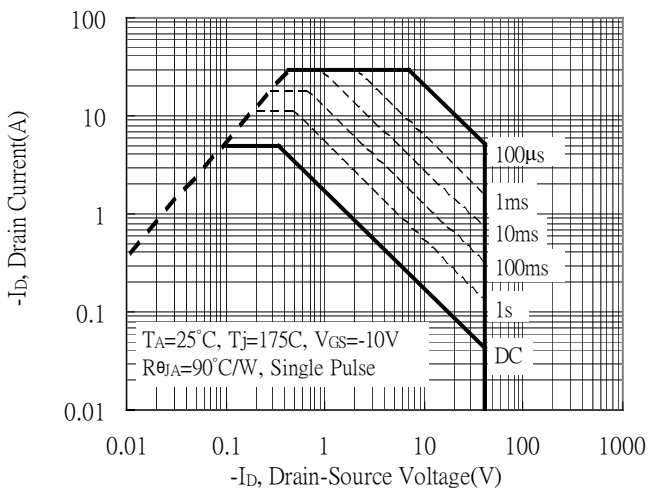
Forward Transfer Admittance vs Drain Current



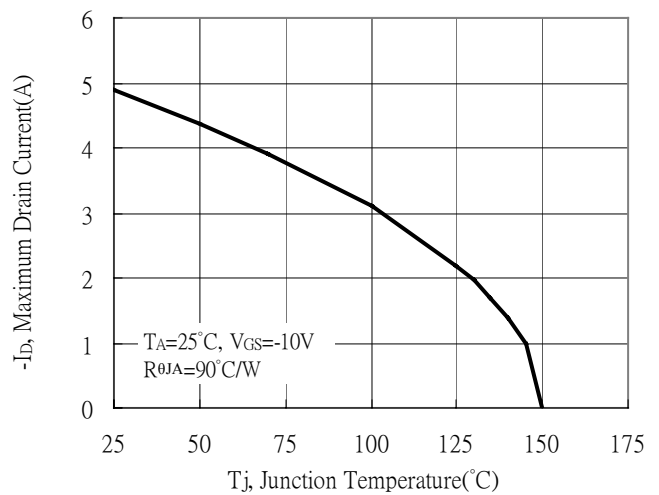
Gate Charge Characteristics



Maximum Safe Operating Area



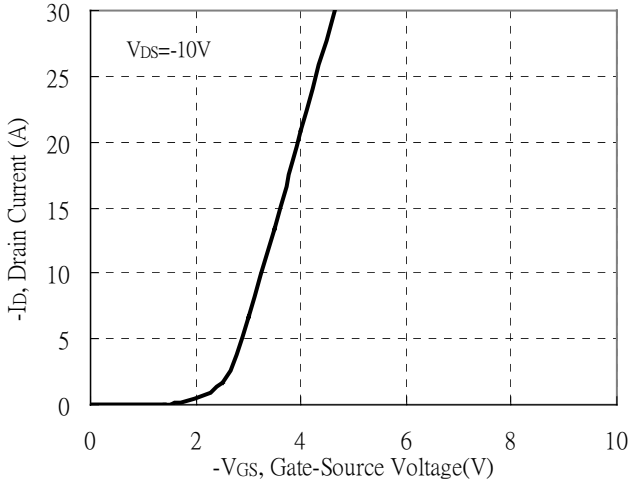
Maximum Drain Current vs Junction Temperature



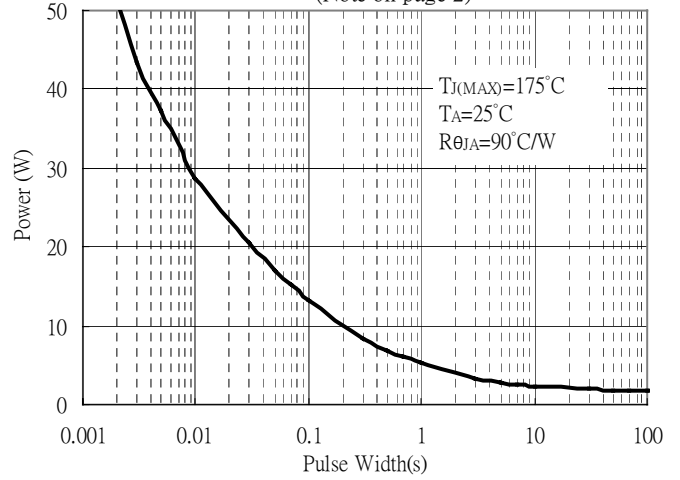


Q2, P-CH Typical Characteristics(Cont.)

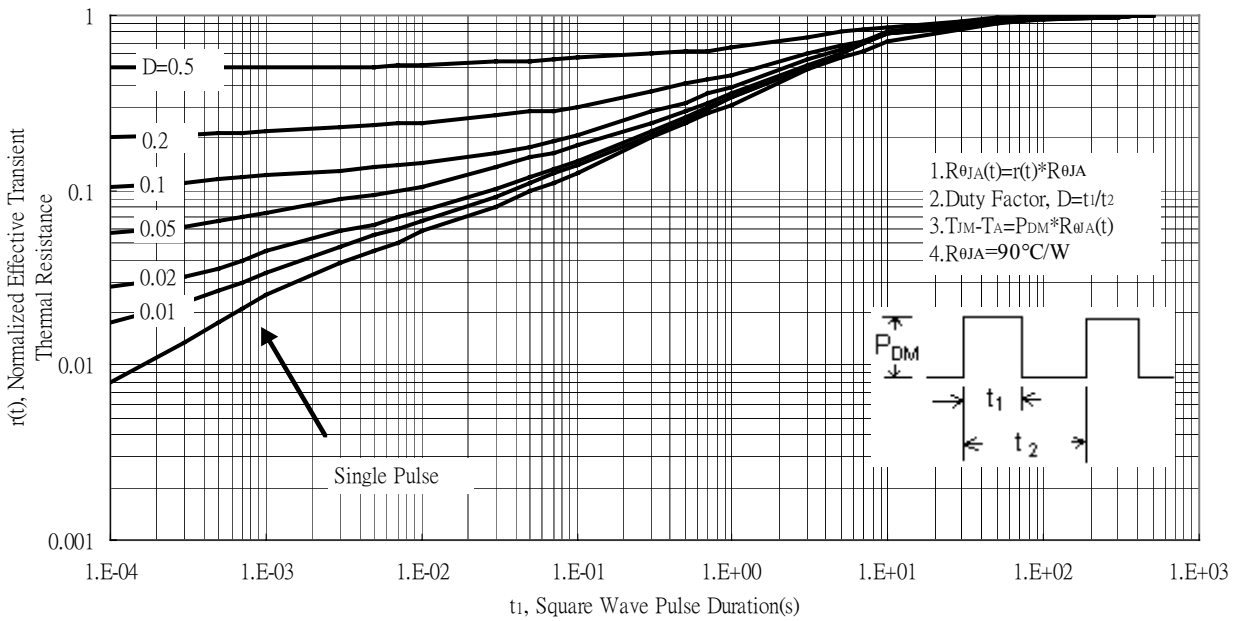
Typical Transfer Characteristics



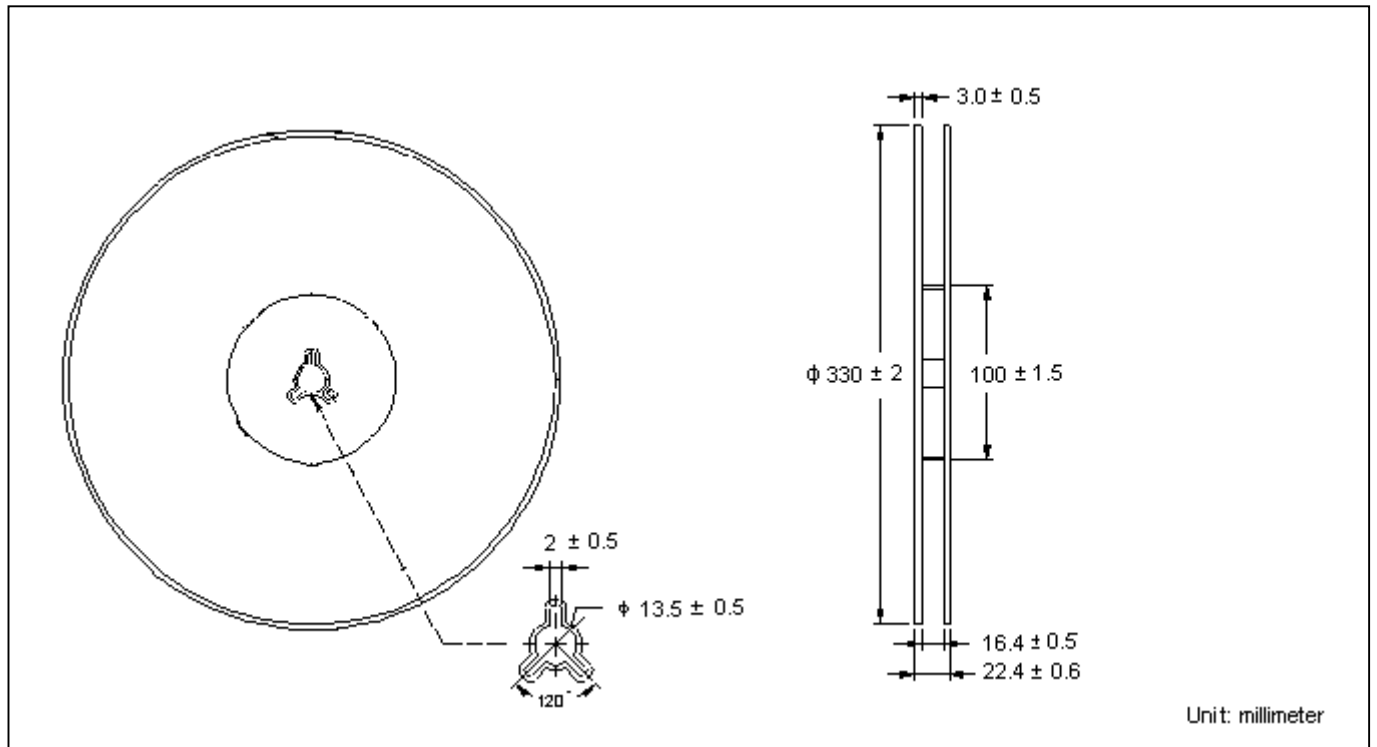
Single Pulse Power Rating, Junction to Ambient
(Note on page 2)



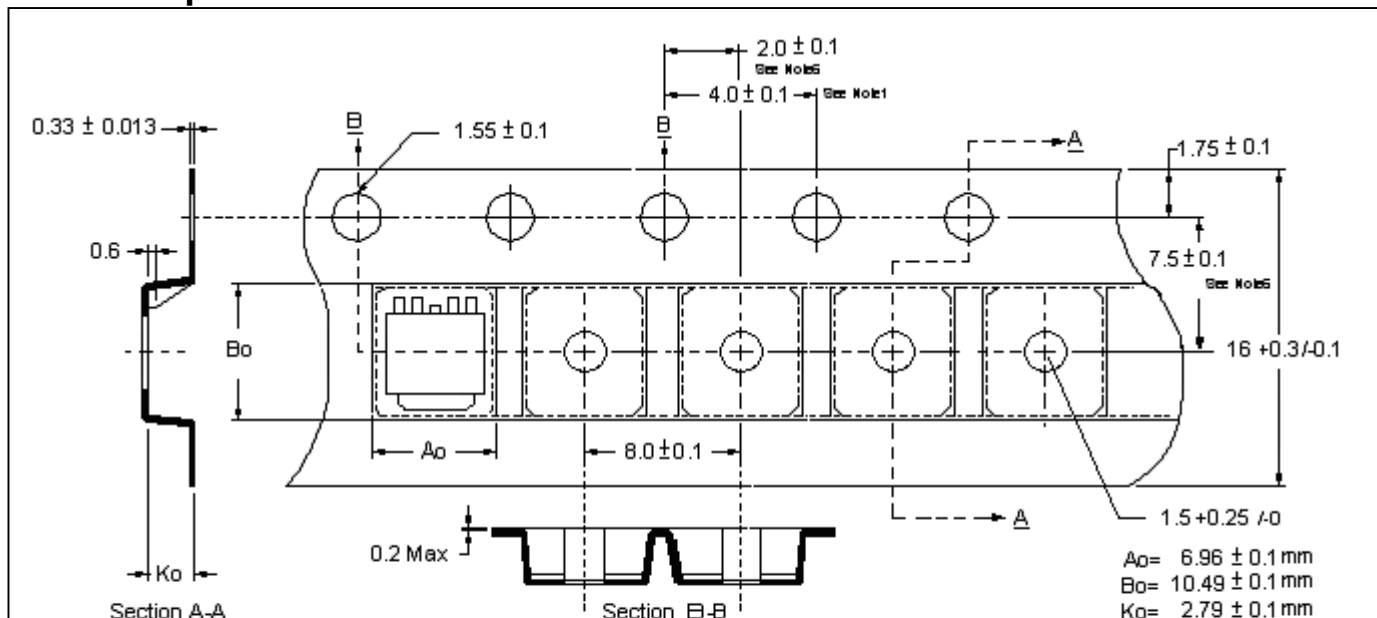
Transient Thermal Response Curves



Reel Dimension



Carrier Tape Dimension



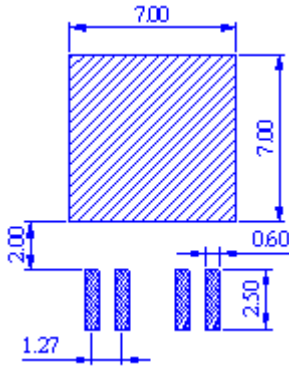
Notes:

1. 10 sprocket hole pitch cumulative tolerance ± 0.2 .
2. Camber not to exceed 1mm in 100mm.
3. Material : Conductive black polystyrene.
4. A_0 & B_0 measured on a plane 0.3mm above the bottom of the pocket.
5. K_0 measured from a plane on the inside bottom of the pocket to the top surface of the carrier.
6. Pocket position relative to sprocket hole measured as true position of pocket, not pocket hole.

unit : millimeter



Recommended soldering footprint

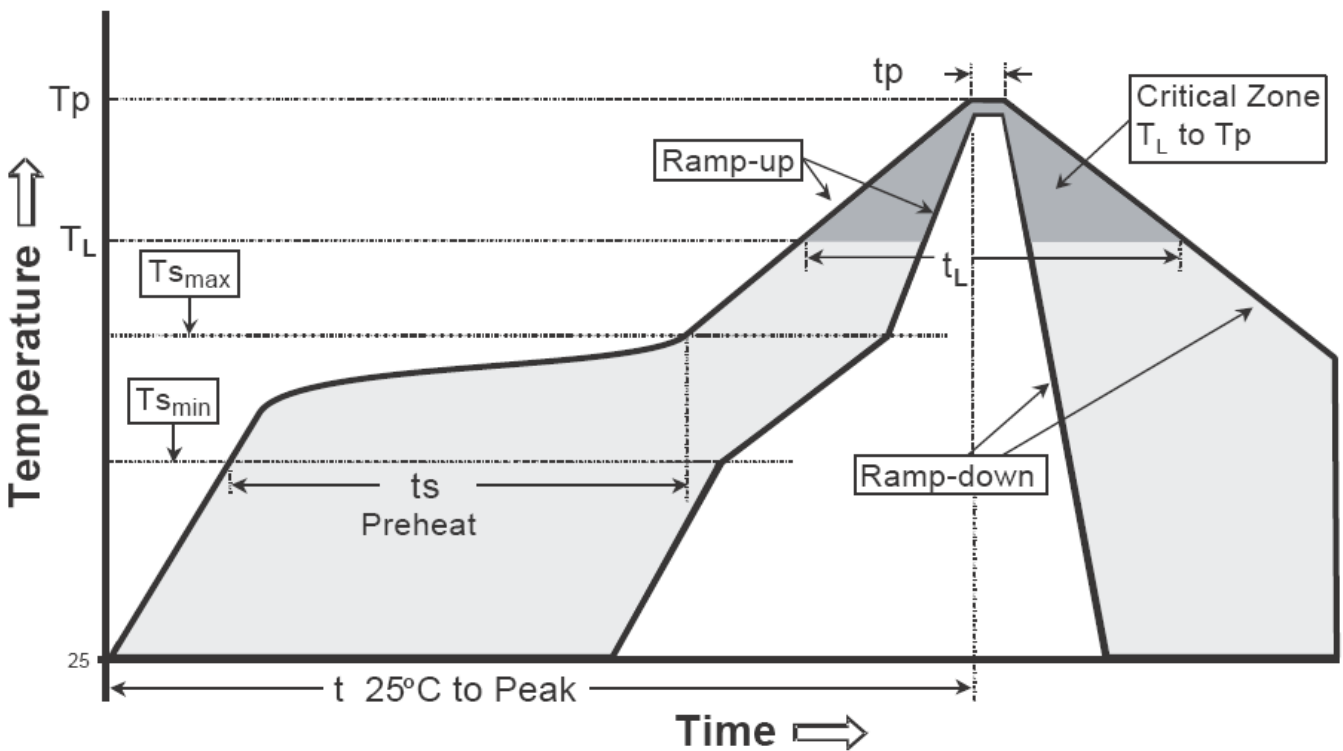


Unit : mm

Recommended wave soldering condition

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

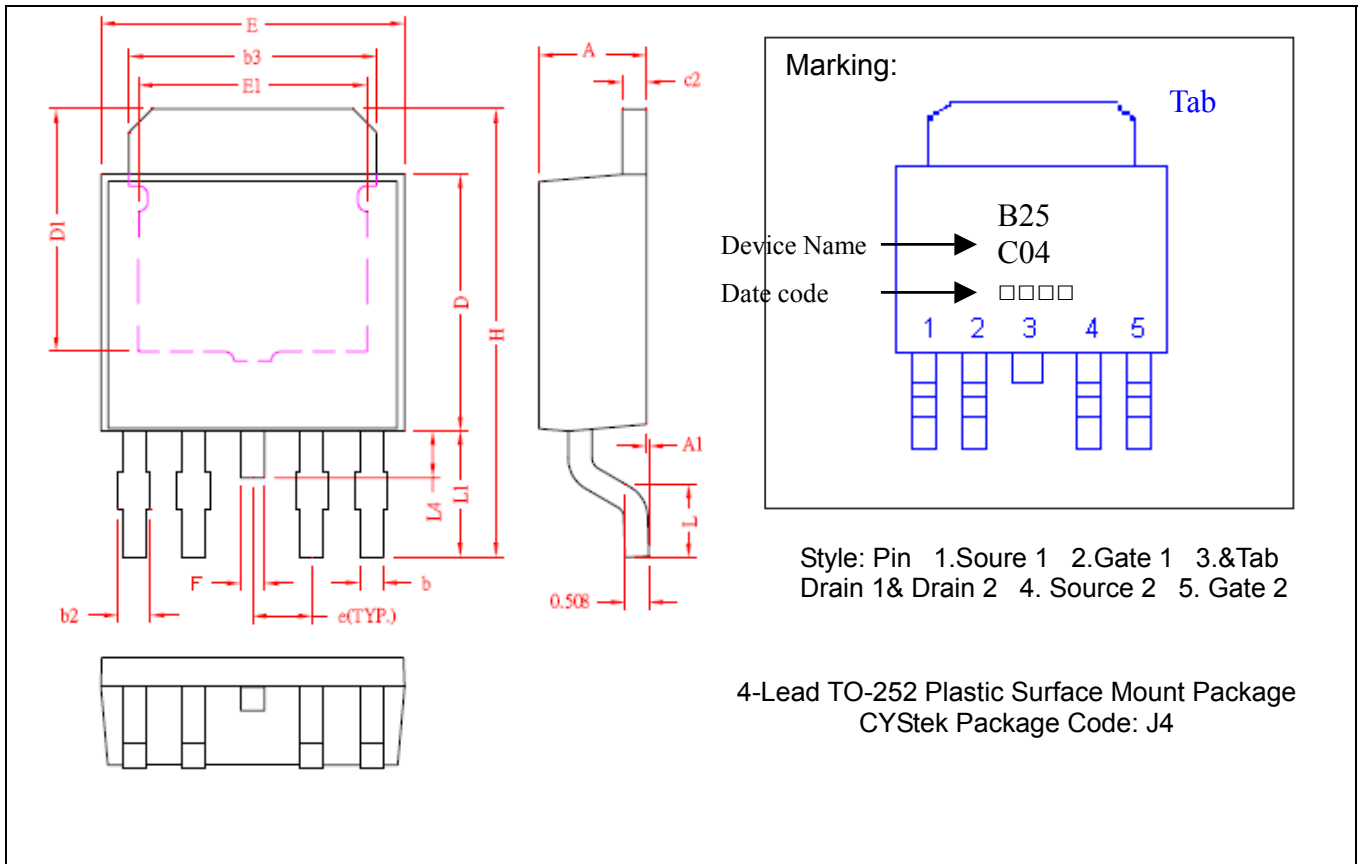
Recommended temperature profile for IR reflow



| Profile feature | Sn-Pb eutectic Assembly | Pb-free Assembly |
|---|-------------------------|------------------|
| Average ramp-up rate (T _{smax} to T _p) | 3°C/second max. | 3°C/second max. |
| Preheat | | |
| -Temperature Min(T _{s min}) | 100°C | 150°C |
| -Temperature Max(T _{s max}) | 150°C | 200°C |
| -Time(t _{s min} to t _{s max}) | 60-120 seconds | 60-180 seconds |
| Time maintained above: | | |
| -Temperature (T _L) | 183°C | 217°C |
| - Time (t _L) | 60-150 seconds | 60-150 seconds |
| Peak Temperature(T _P) | 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.

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