

N- AND P-Channel Logic Level Enhancement Mode MOSFET

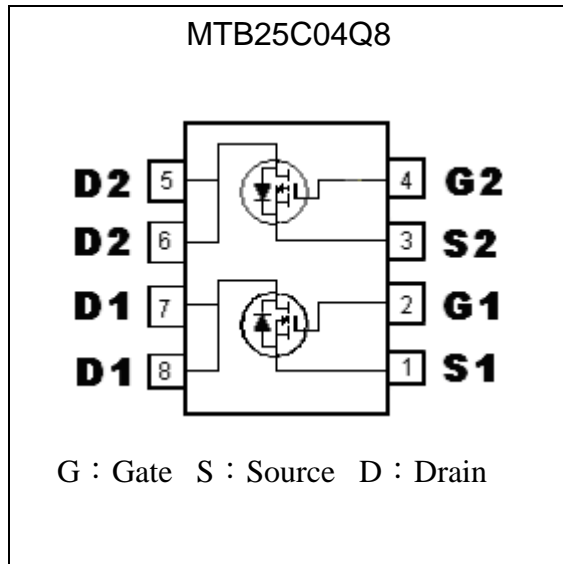
MTB25C04Q8

| | N-CH | P-CH |
|--|-----------------|-----------------|
| BV_{DSS} | 40V | -40V |
| $I_D @ T_A=25^{\circ}C, V_{GS}=10V(-10V)$ | 5.7A | -4.9A |
| $I_D @ T_A=70^{\circ}C, V_{GS}=10V(-10V)$ | 4.8A | -4.1A |
| $I_D @ T_C=25^{\circ}C, V_{GS}=10V(-10V)$ | 10A | -8.6A |
| $I_D @ T_C=100^{\circ}C, V_{GS}=10V(-10V)$ | 7.1A | -6.1A |
| $R_{DSON}(typ.) @ V_{GS}=(-)10V$ | 21.2m Ω | 32.7 m Ω |
| $R_{DSON}(typ.) @ V_{GS}=(-)4.5V$ | 30.1 m Ω | 47.8 m Ω |

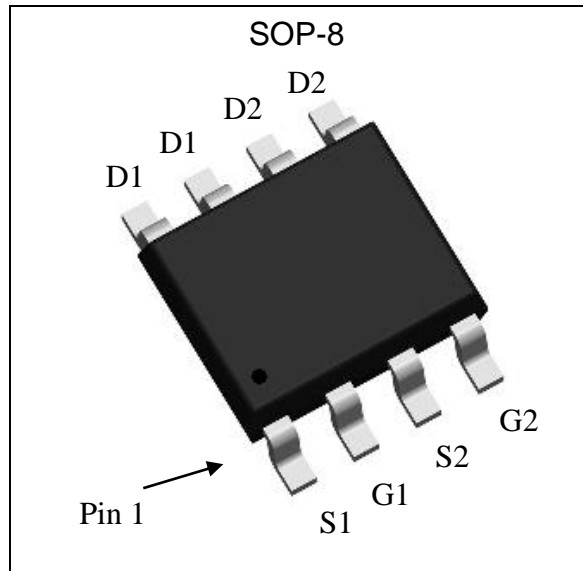
Features

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

Equivalent Circuit

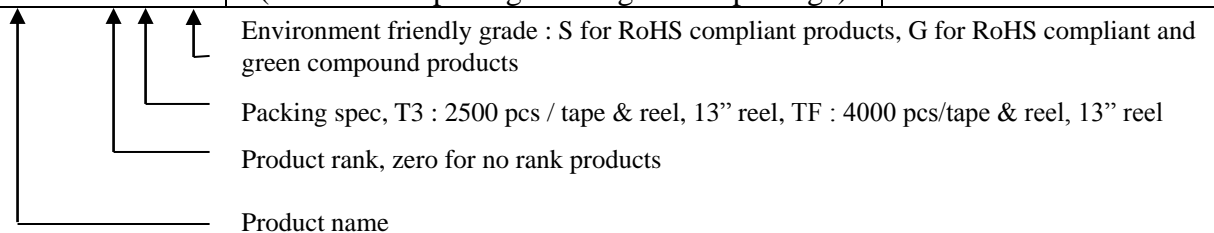


Outline



Ordering Information

| Device | Package | Shipping |
|-------------------|--|------------------------|
| MTB25C04Q8-0-T3-G | SOP-8 (Pb-free lead plating & halogen-free package) | 2500 pcs / Tape & Reel |
| MTB25C04Q8-0-TF-G | SOP-8 (Pb-free lead plating & halogen-free package) | 4000 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_{DSS} | 40 | -40 | V |
| Gate-Source Voltage | V_{GS} | ± 20 | ± 20 | |
| Continuous Drain Current | I_D | $T_C=25^{\circ}\text{C}, V_{GS}=10\text{V} (-10\text{V})$ | 10 | A |
| | | $T_C=100^{\circ}\text{C}, V_{GS}=10\text{V} (-10\text{V})$ | 7.1 | |
| Continuous Drain Current (Note 2) | I_{DSM} | $T_A=25^{\circ}\text{C}, V_{GS}=10\text{V} (-10\text{V})$ | 5.7 | A |
| | | $T_A=70^{\circ}\text{C}, V_{GS}=10\text{V} (-10\text{V})$ | 4.8 | |
| Pulsed Drain Current (Note 1) | I_{DM} | 30 | -30 | |
| Power Dissipation for Dual Operation @ $T_C=25^{\circ}\text{C}$ | P_D | 6 | | W |
| Power Dissipation for Dual Operation @ $T_A=25^{\circ}\text{C}$ | P_{DSM} | 3 | | |
| Power Dissipation for Single Operation @ $T_A=25^{\circ}\text{C}$ | | 1.9 (Note 2) | | |
| | | 1.1 (Note 3) | | |
| Operating Junction and Storage Temperature Range | $T_j; T_{stg}$ | -55~+175 | | $^{\circ}\text{C}$ |

Thermal Data

| Parameter | Symbol | Value | Unit |
|--|--------------|--------------|-----------------------------|
| Thermal Resistance, Junction-to-case, max | $R_{th,j-c}$ | 25 | $^{\circ}\text{C}/\text{W}$ |
| Thermal Resistance, Junction-to-ambient, max | $R_{th,j-a}$ | 50 | |
| | | 78 (Note 2) | |
| | | 135 (Note 3) | |

- Note : 1.Pulse width limited by maximum junction temperature.
 2.Surface mounted on 1 in² copper pad of FR-4 board, pulse width $\leq 10\text{s}$, single operation.
 3.Surface mounted on minimum copper pad, pulse width $\leq 10\text{s}$, single operation.

N-Channel Electrical Characteristics ($T_C=25^{\circ}\text{C}$, unless otherwise specified)

| Symbol | Min. | Typ. | Max. | Unit | Test Conditions |
|------------------------------|------|------|-----------|-----------------------------|--|
| Static | | | | | |
| BV_{DSS} | 40 | - | - | V | $V_{GS}=0\text{V}, I_D=250\mu\text{A}$ |
| $\Delta BV_{DSS}/\Delta T_j$ | - | 0.03 | - | $\text{V}/^{\circ}\text{C}$ | Reference to $25^{\circ}\text{C}, I_D=250\mu\text{A}$ |
| $V_{GS(th)}$ | 1.0 | - | 2.5 | V | $V_{DS}=V_{GS}, I_D=250\mu\text{A}$ |
| I_{GSS} | - | - | ± 100 | nA | $V_{GS}=\pm 20\text{V}, V_{DS}=0\text{V}$ |
| I_{DSS} | - | - | 1 | μA | $V_{DS}=32\text{V}, V_{GS}=0\text{V}$ |
| | - | - | 25 | | $V_{DS}=32\text{V}, V_{GS}=0, T_j=125^{\circ}\text{C}$ |
| * $R_{DS(ON)}$ | - | 21.2 | 27 | m Ω | $I_D=7\text{A}, V_{GS}=10\text{V}$ |
| | - | 30.1 | 40 | | $I_D=6\text{A}, V_{GS}=4.5\text{V}$ |
| * G_{FS} | - | 8.6 | - | S | $V_{DS}=5\text{V}, I_D=7\text{A}$ |
| Dynamic | | | | | |
| C_{iss} | - | 597 | - | pF | $V_{DS}=20\text{V}, V_{GS}=0, f=1\text{MHz}$ |
| C_{oss} | - | 50 | - | | |
| C_{rss} | - | 41 | - | | |



| | | | | | |
|-------------------|---|------|-----|----|--|
| *td(ON) | - | 7.6 | - | ns | V _{DS} =20V, I _D =1A, V _{GS} =10V, R _G =6Ω |
| *tr | - | 16.2 | - | | |
| *td(OFF) | - | 24 | - | | |
| *tf | - | 15.2 | - | | |
| *Qg | - | 11.4 | - | nC | V _{DS} =20V, I _D =5A, V _{GS} =10V |
| *Qgs | - | 2.4 | - | | |
| *Qgd | - | 2.0 | - | | |
| Rg | - | 1.7 | - | Ω | f=1MHz |
| Body Diode | | | | | |
| *I _S | - | - | 5.7 | A | |
| *I _{SM} | - | - | 30 | | |
| *V _{SD} | - | 0.86 | 1.2 | V | V _{GS} =0V, I _S =7A |
| trr * | - | 6.3 | - | ns | I _F =5A, dI _F /dt=100A/μs |
| Qrr * | - | 2.6 | - | nC | |

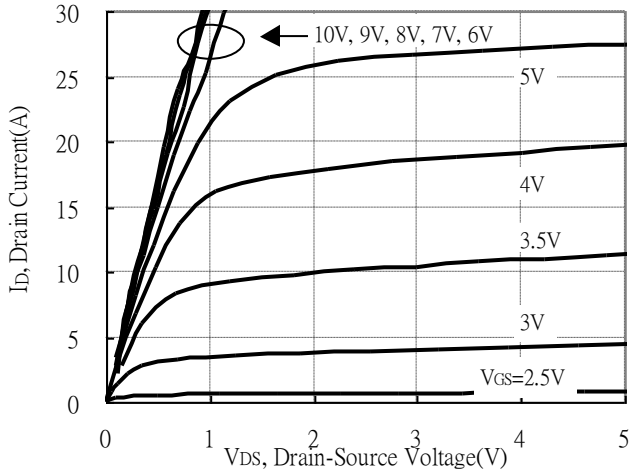
P-Channel Electrical Characteristics (T_c=25°C, unless otherwise specified)

| Symbol | Min. | Typ. | Max. | Unit | Test Conditions |
|-------------------------------------|------|-------|------|------|---|
| Static | | | | | |
| BV _{DSS} | -40 | - | - | V | V _{GS} =0V, I _D =-250μA |
| ΔBV _{DSS} /ΔT _j | - | -0.02 | - | V/°C | Reference to 25°C, I _D =-250μA |
| V _{GS(th)} | -1.0 | - | -2.5 | V | 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 |
| | - | - | -25 | | V _{DS} =-32V, V _{GS} =0, T _j =125°C |
| *R _{Ds(ON)} | - | 32.7 | 45 | mΩ | I _D =-6A, V _{GS} =-10V |
| | - | 47.8 | 65 | | I _D =-5A, V _{GS} =-4.5V |
| *G _{FS} | - | 10.7 | - | S | V _{DS} =-5V, I _D =-6A |
| Dynamic | | | | | |
| C _{iss} | - | 1023 | - | pF | V _{DS} =-20V, V _{GS} =0, f=1MHz |
| C _{oss} | - | 88 | - | | |
| C _{rss} | - | 71 | - | | |
| *td(ON) | - | 7.6 | - | ns | V _{DS} =-20V, I _D =-1A, V _{GS} =-10V, R _G =6Ω |
| *tr | - | 18 | - | | |
| *td(OFF) | - | 54.8 | - | | |
| *tf | - | 17.2 | - | | |
| *Qg | - | 19.4 | - | nC | V _{DS} =-20V, I _D =-5A, V _{GS} =-10V |
| *Qgs | - | 3.4 | - | | |
| *Qgd | - | 3.2 | - | | |
| Rg | - | 17.7 | - | Ω | f=1MHz |
| Body Diode | | | | | |
| *I _S | - | - | -4.9 | A | |
| *I _{SM} | - | - | -30 | | |
| *V _{SD} | - | -0.86 | -1.2 | V | V _{GS} =0V, I _S =-6A |
| trr * | - | 8.8 | - | ns | I _F =6A, dI _F /dt=100A/μs |
| Qrr * | - | 3.8 | - | nC | |

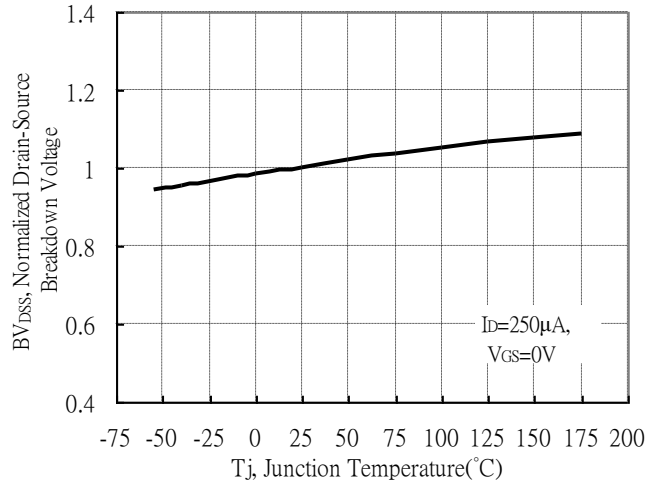
*Pulse Test : Pulse Width ≤300μs, Duty Cycle ≤2%

Typical Characteristics : Q1(N-channel)

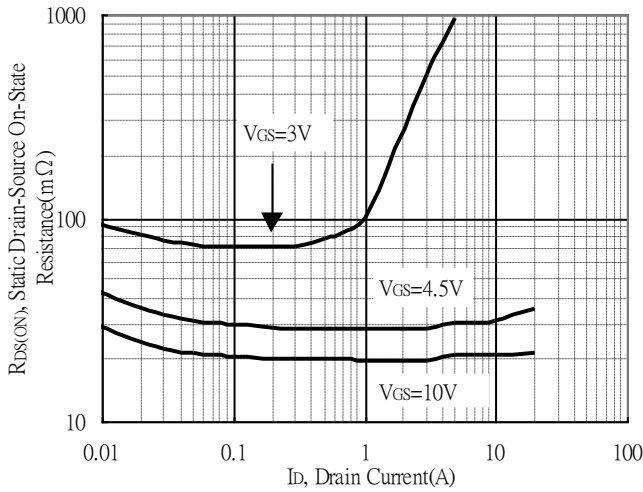
Typical Output Characteristics



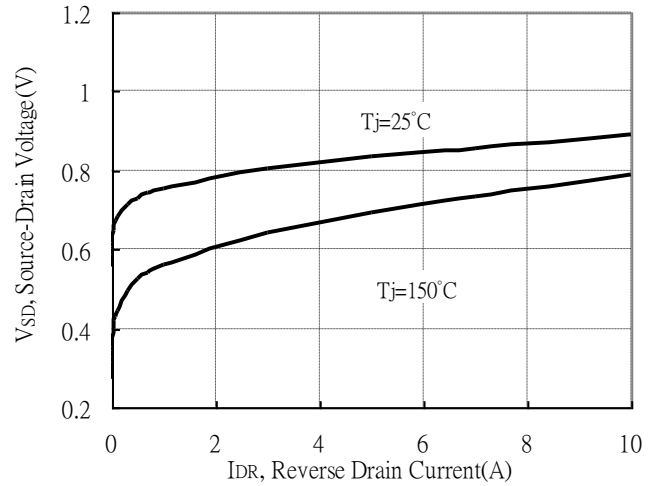
Brekdown Voltage vs Ambient Temperature



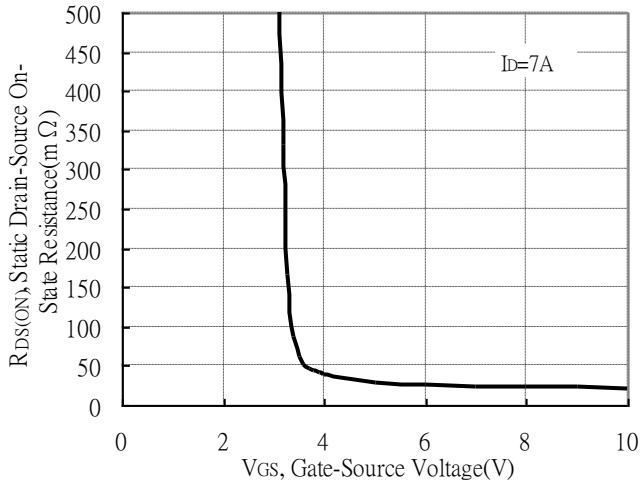
Static Drain-Source On-State resistance vs Drain Current



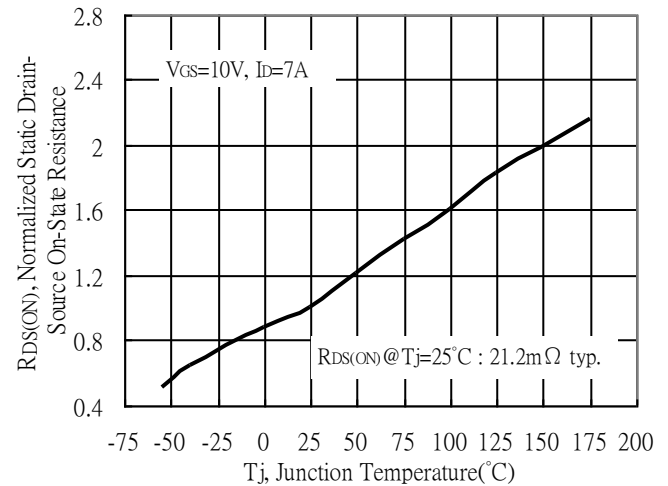
Reverse Drain Current vs Source-Drain Voltage



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

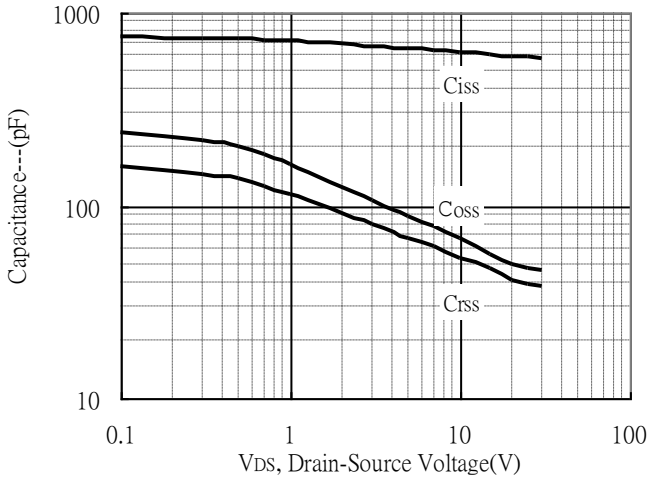


Drain-Source On-State Resistance vs Junction Temperature

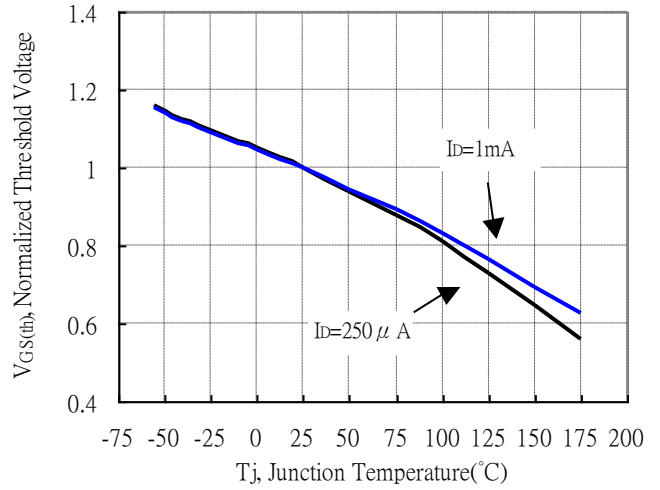


Typical Characteristics(Cont.) : Q1(N-channel)

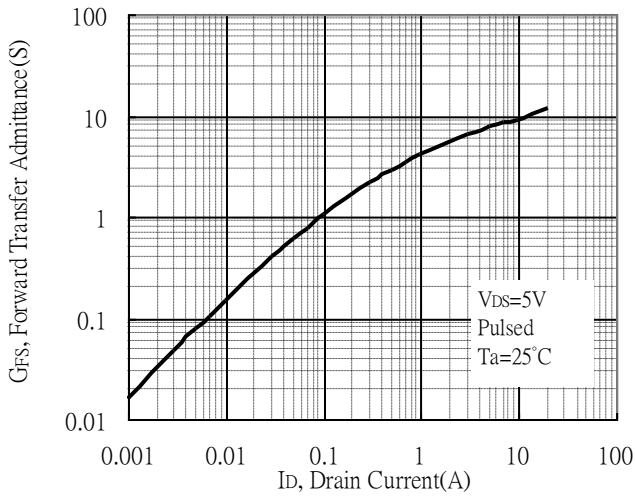
Capacitance vs Drain-to-Source Voltage



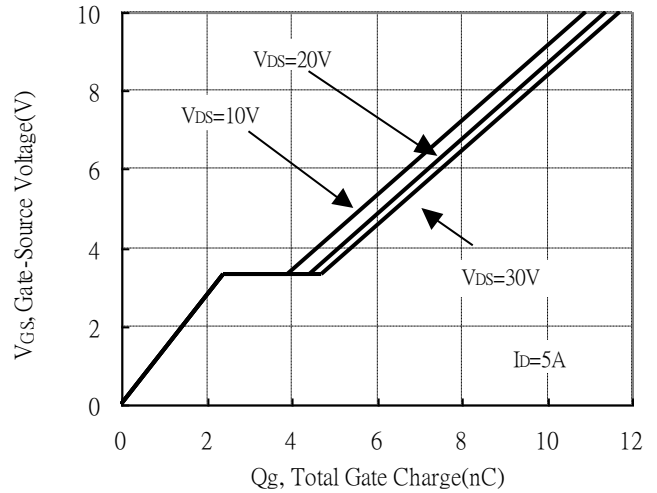
Threshold Voltage vs Junction Temperature



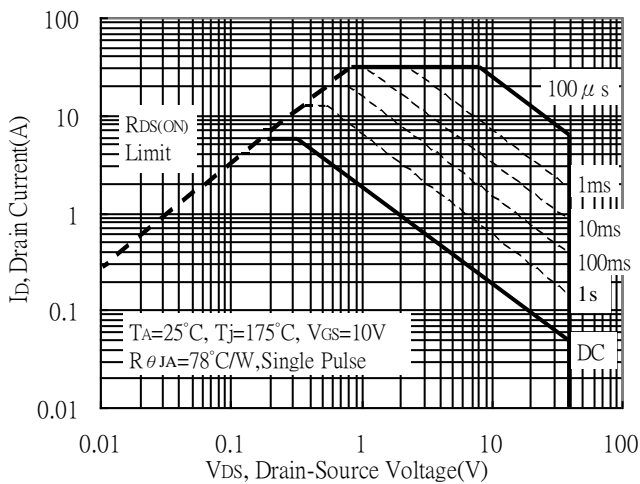
Forward Transfer Admittance vs Drain Current



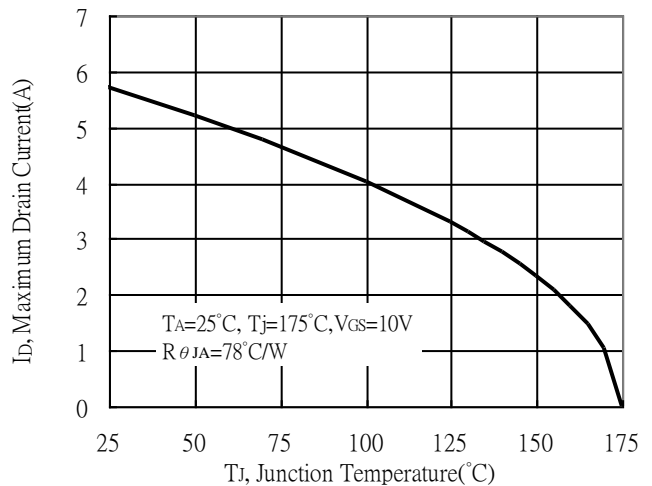
Gate Charge Characteristics



Maximum Safe Operating Area



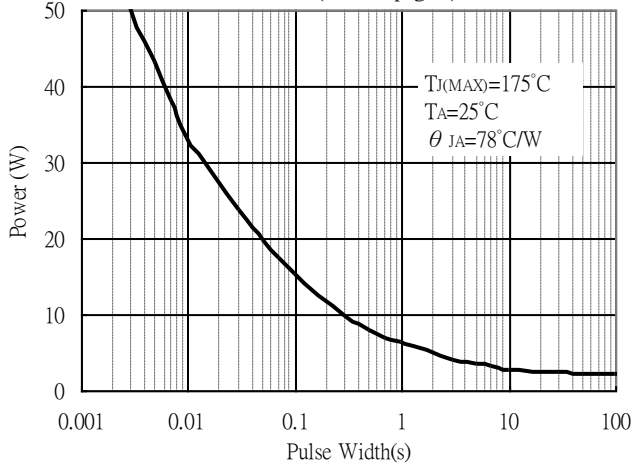
Maximum Drain Current vs Junction Temperature



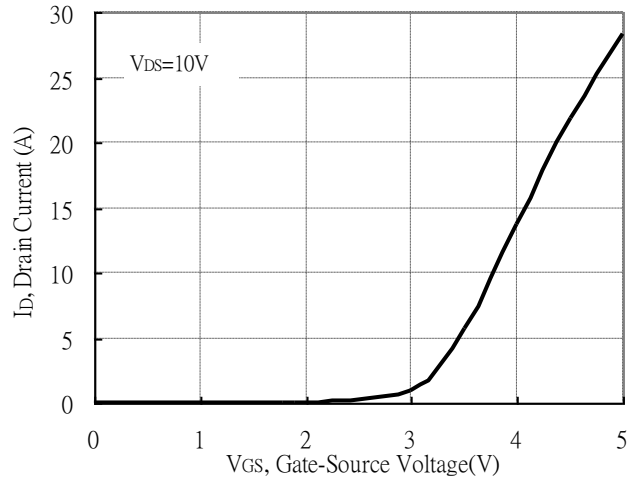


Typical Characteristics(Cont.) : Q1(N-channel)

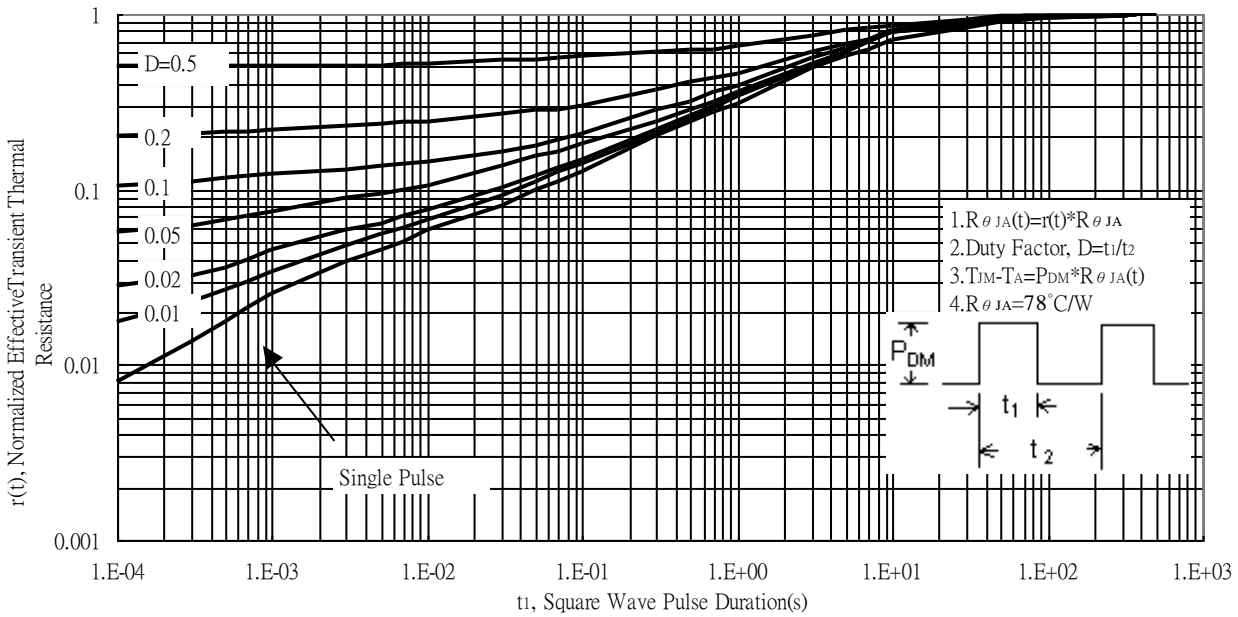
Single Pulse Power Rating, Junction to Ambient
 (Note on page 2)



Typical Transfer Characteristics

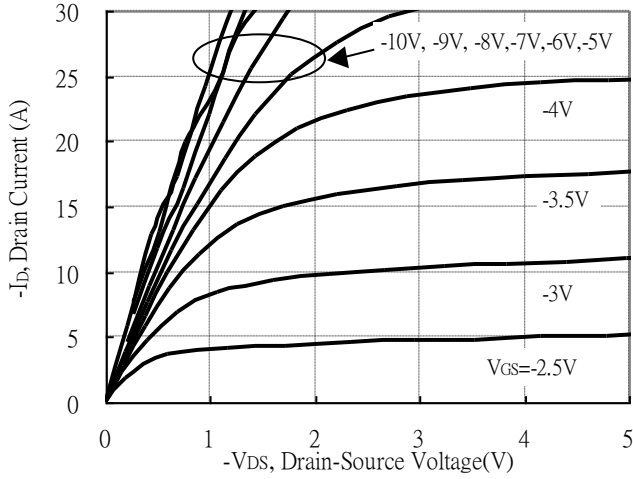


Transient Thermal Response Curves

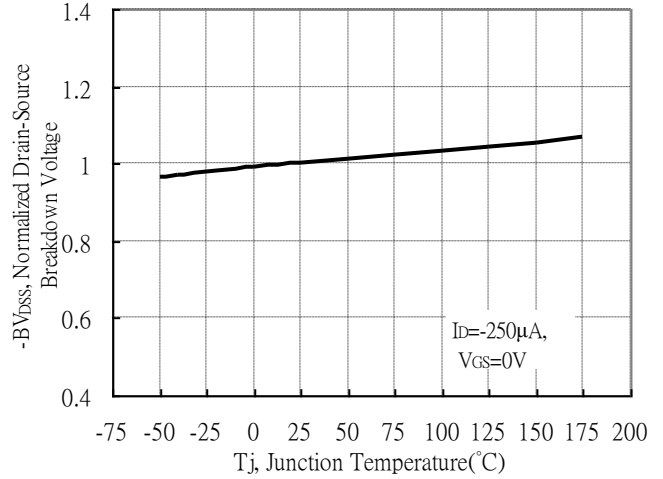


Typical Characteristics : Q2(P-channel)

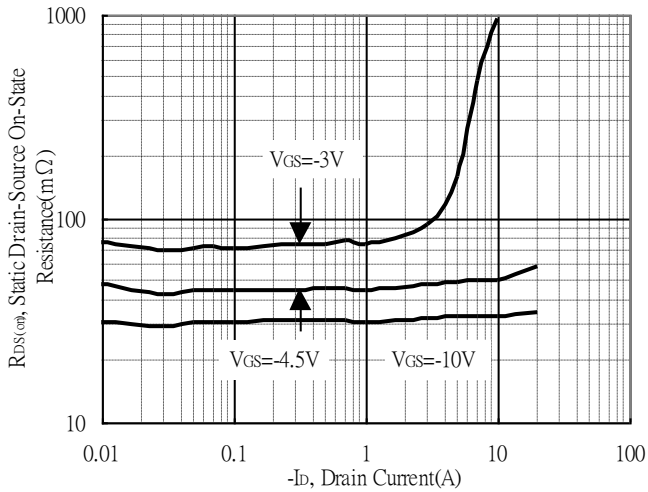
Typical Output Characteristics



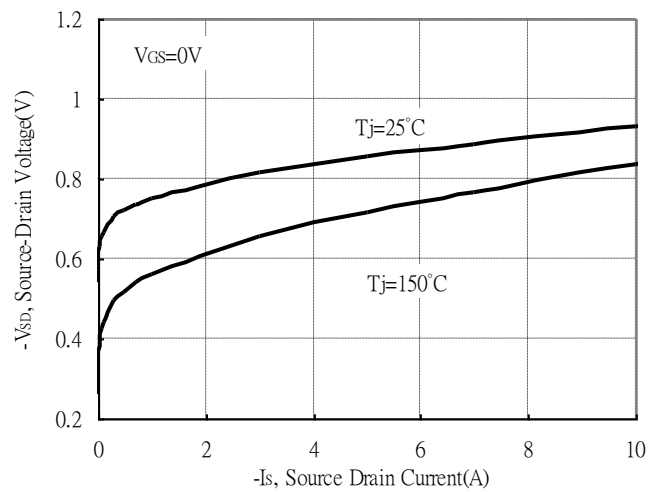
Brekdown Voltage vs Ambient Temperature



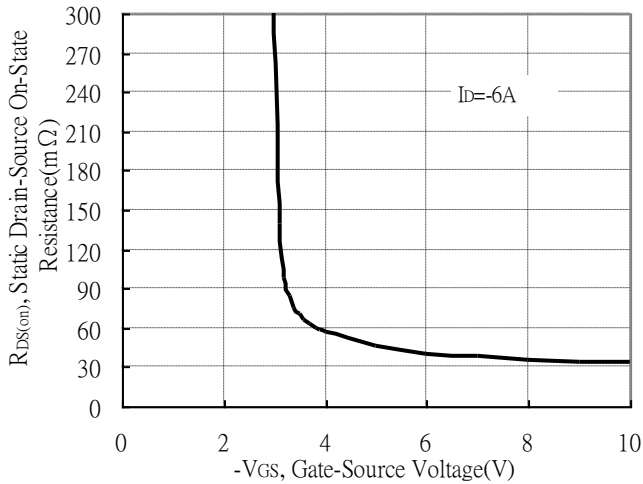
Static Drain-Source On-State resistance vs Drain Current



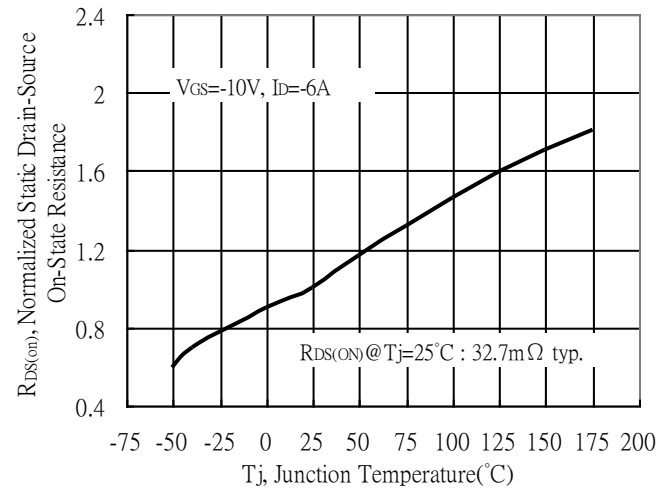
Source Drain Current vs Source-Drain Voltage



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

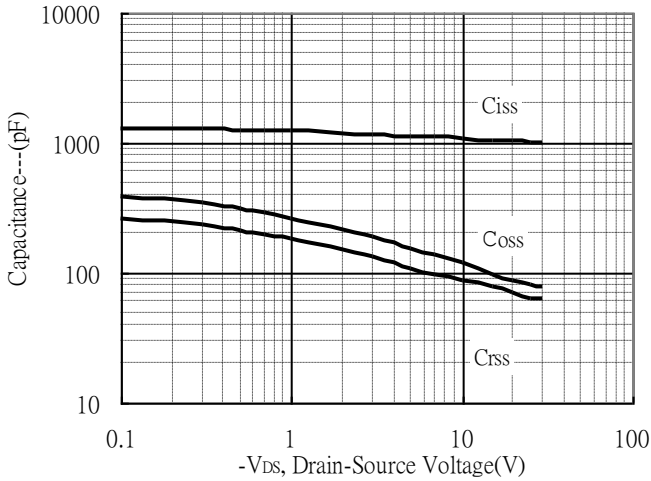


Drain-Source On-State Resistance vs Junction Temperature

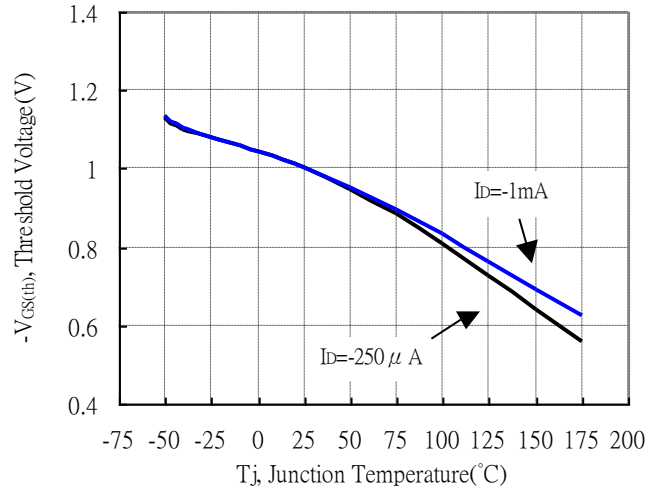


Typical Characteristics(Cont.) : Q2(P-channel)

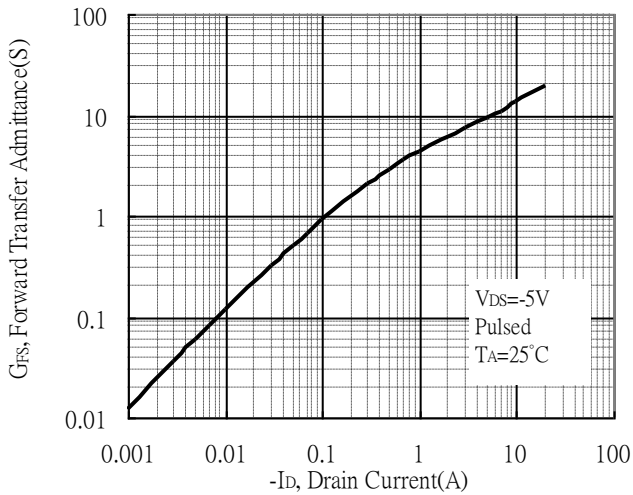
Capacitance vs Drain-to-Source Voltage



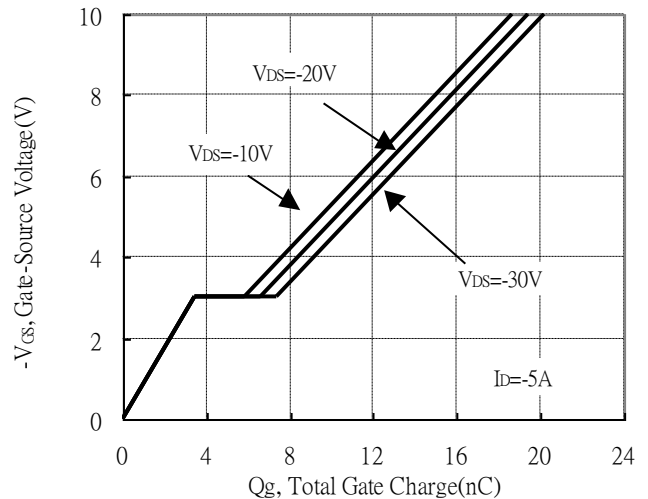
Threshold Voltage vs Junction Temperature



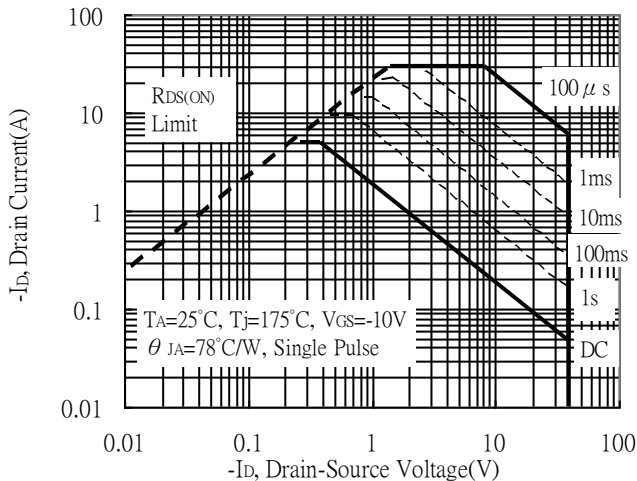
Forward Transfer Admittance vs Drain Current



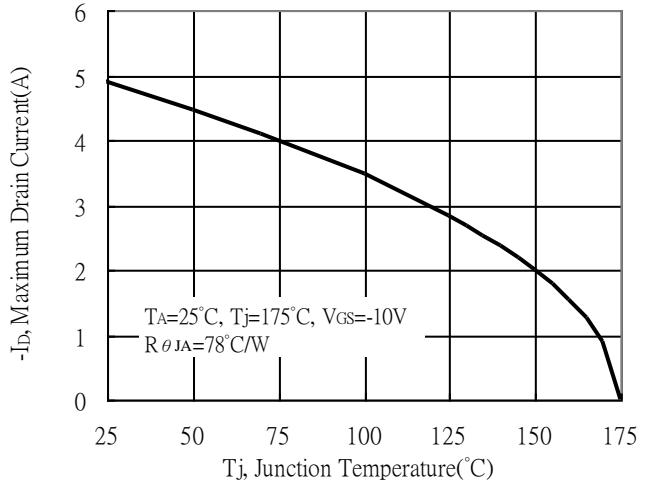
Gate Charge Characteristics



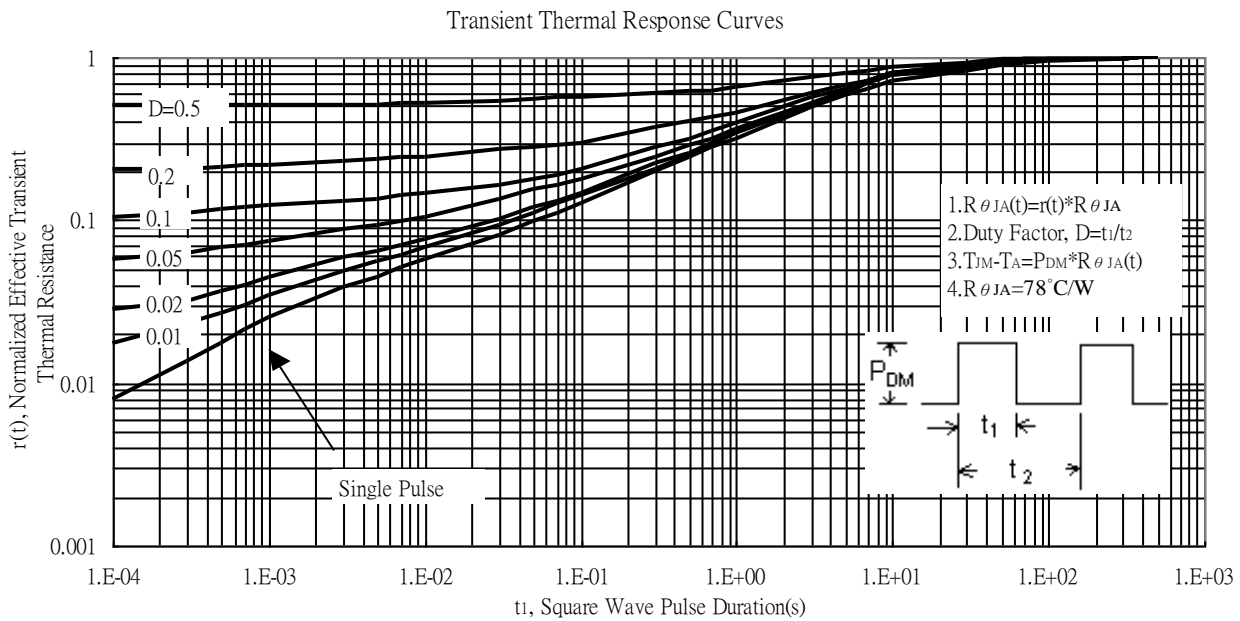
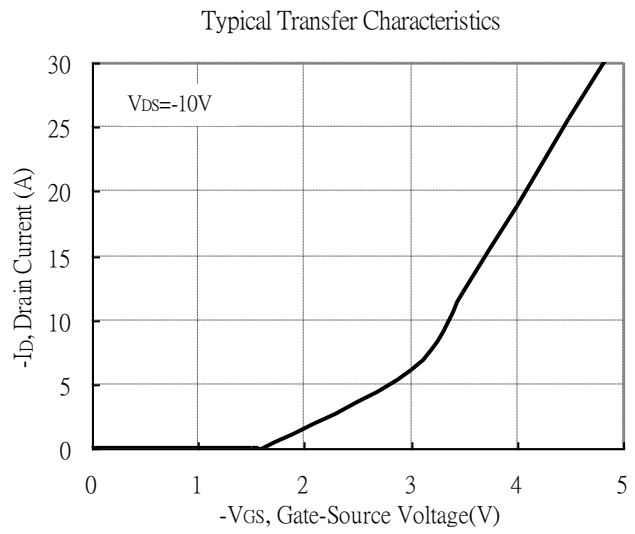
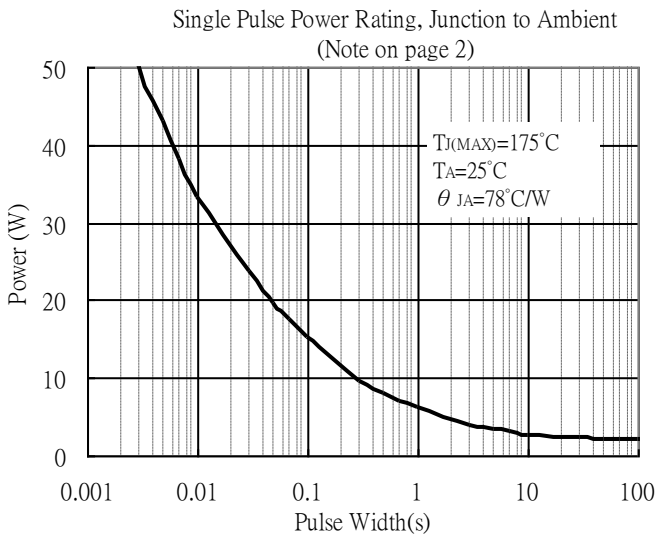
Maximum Safe Operating Area



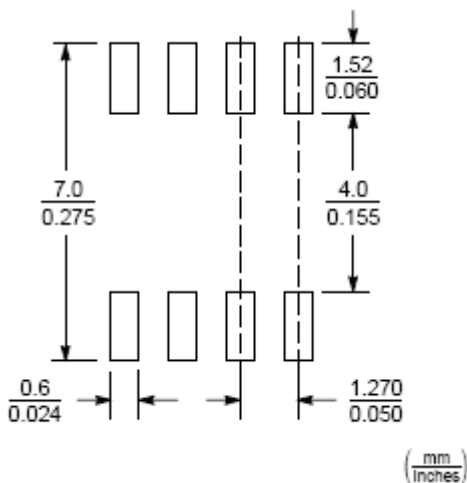
Maximum Drain Current vs Junction Temperature



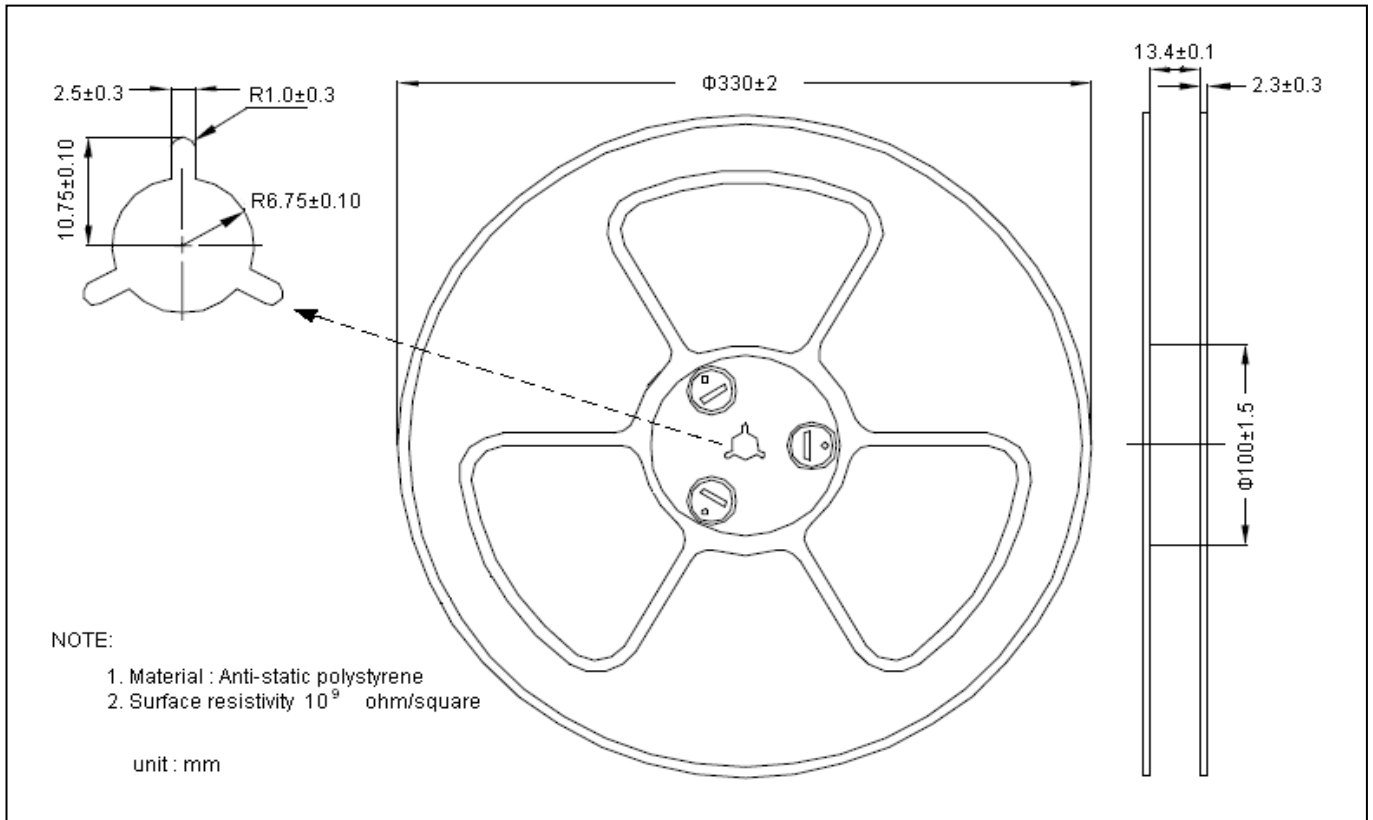
Typical Characteristics(Cont.) : Q2(P-channel)



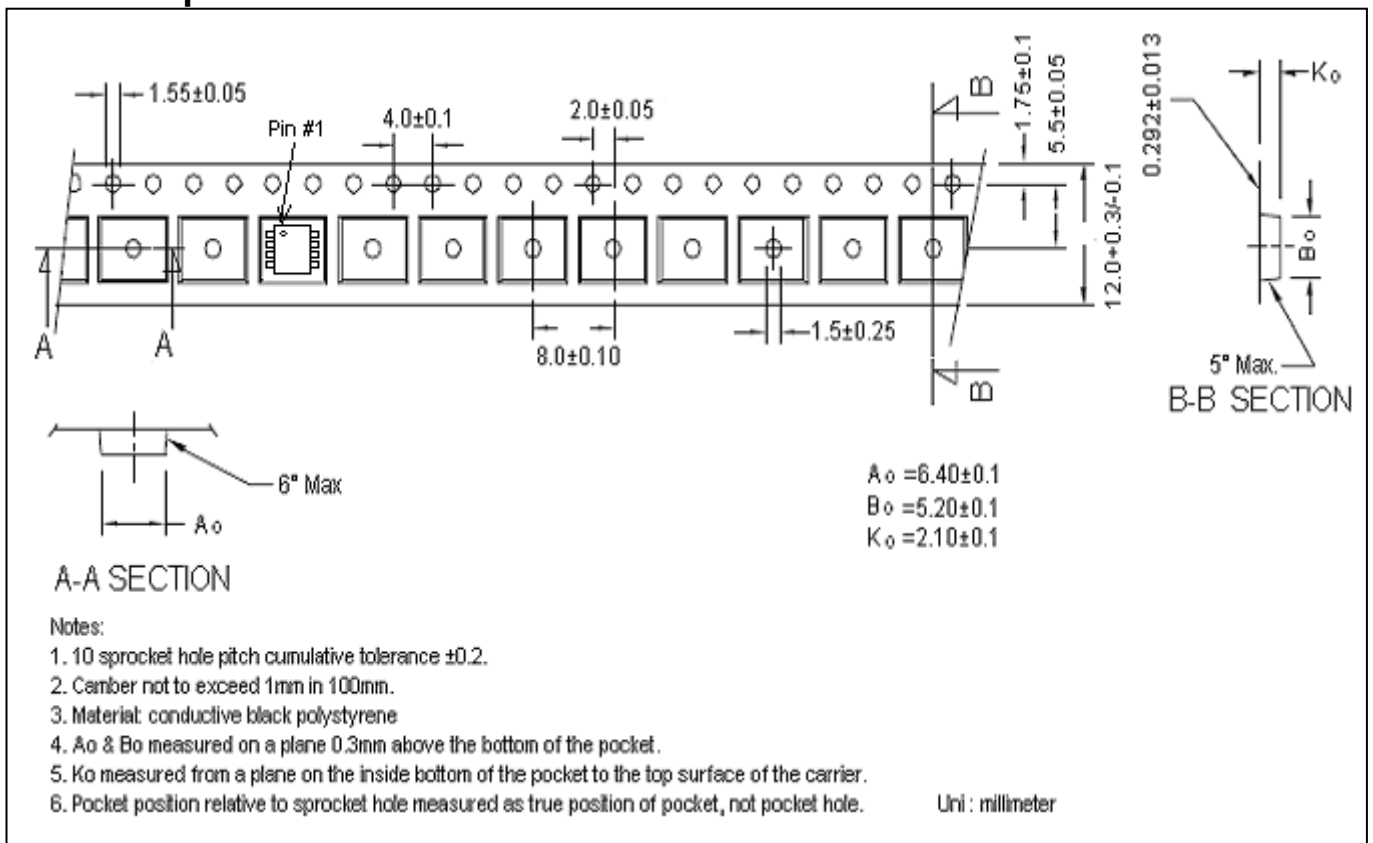
Recommended Soldering Footprint



Reel Dimension



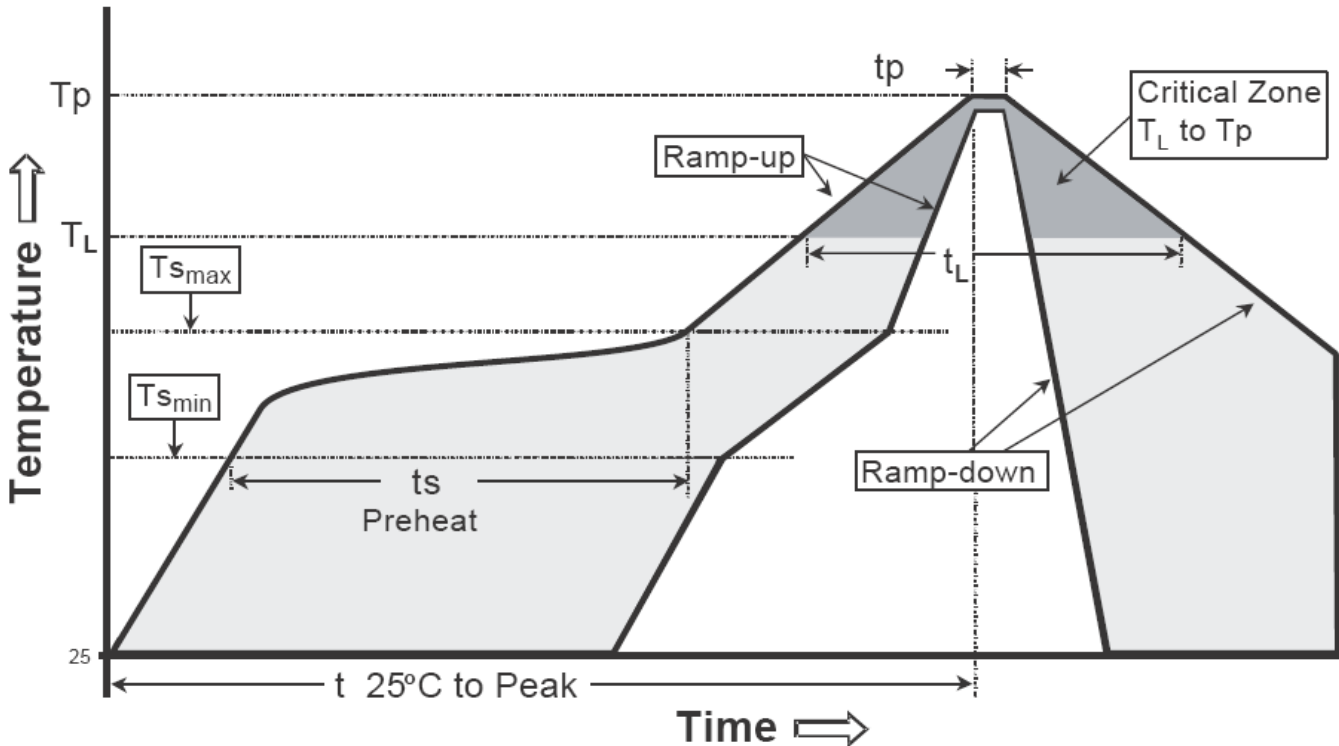
Carrier Tape Dimension



Recommended wave soldering condition

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

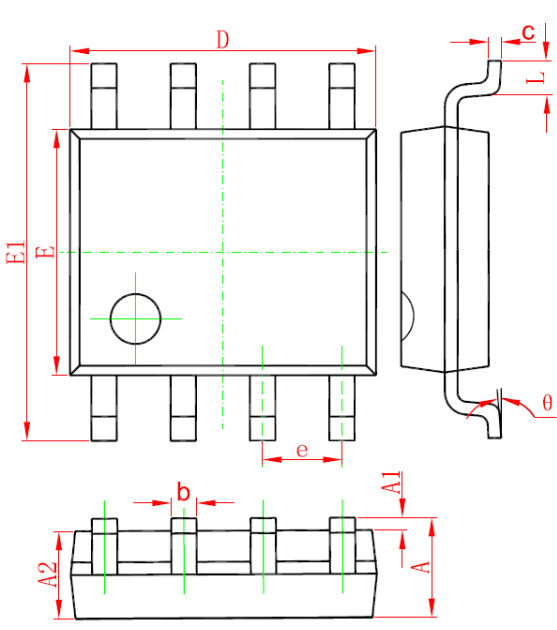
Recommended temperature profile for IR reflow



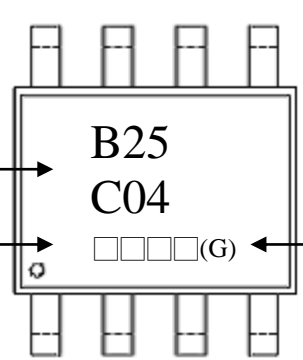
| Profile feature | Sn-Pb eutectic Assembly | Pb-free Assembly |
|---|-------------------------|------------------|
| Average ramp-up rate (T _{smax} to T _p) | 3°C/second max. | 3°C/second max. |
| Preheat | | |
| -Temperature Min(T _{s min}) | 100°C | 150°C |
| -Temperature Max(T _{s max}) | 150°C | 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.

SOP-8 Dimension



Marking:



Device Code → **B25**

Date Code → **C04**

Assembly site code → □□□□(G)

Date Code(counting from left to right) :

1st code: year code, the last digit of Christian year

2nd 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

3rd and 4th codes : production serial number, 01~99

Assembly site code : blank→ JCET, G →GEM

8-Lead SOP-8 Plastic Package
 CYStek Package Code: Q8

*: Typical

| DIM | Millimeters | | Inches | | DIM | Millimeters | | Inches | |
|-----|-------------|-------|--------|-------|-----|-------------|-------|--------|-------|
| | Min. | Max. | Min. | Max. | | Min. | Max. | Min. | Max. |
| A | 1.350 | 1.750 | 0.053 | 0.069 | E | 3.800 | 4.000 | 0.150 | 0.157 |
| A1 | 0.100 | 0.250 | 0.004 | 0.010 | E1 | 5.800 | 6.200 | 0.228 | 0.244 |
| A2 | 1.350 | 1.550 | 0.053 | 0.061 | e | *1.270 | | *0.050 | |
| b | 0.330 | 0.510 | 0.013 | 0.020 | L | 0.400 | 1.270 | 0.016 | 0.050 |
| c | 0.170 | 0.250 | 0.006 | 0.010 | θ | 0° | 8° | 0° | 8° |
| D | 4.700 | 5.100 | 0.185 | 0.200 | | | | | |

- 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.