

Dual N-Channel Enhancement Mode Power MOSFET

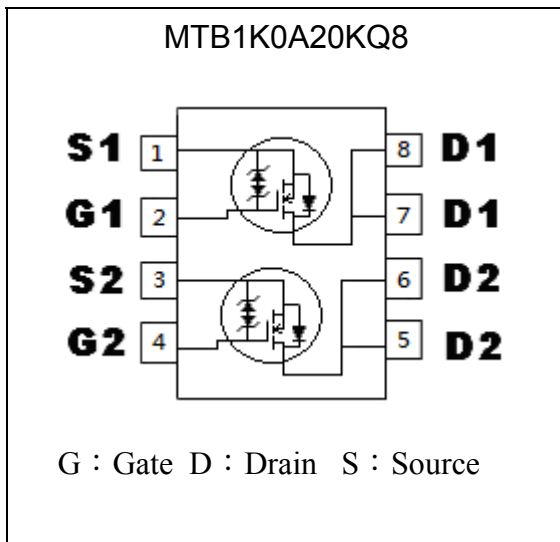
MTB1K0A20KQ8

| | |
|---|--------------------|
| BV_{DSS} | 200V |
| I_D@V_{GS}=10V, T_A=25°C | 0.9A |
| I_D@V_{GS}=10V, T_A=70°C | 0.72A |
| R_{DS(on)}@V_{GS}=10V, I_D=1A | 755mΩ (typ) |
| R_{DS(on)}@V_{GS}=4.5V, I_D=1A | 785mΩ (typ) |

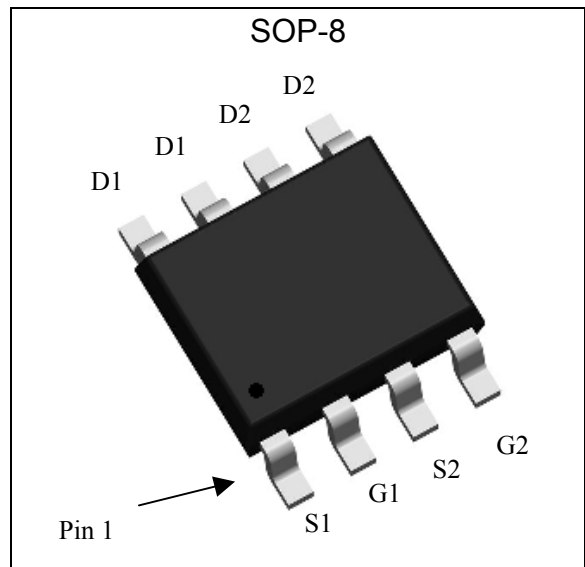
Features

- Simple drive requirement
- Low on-resistance
- Fast switching speed
- Dual N-ch MOSFET package
- ESD protected gate
- Pb-free lead plating & Halogen-free package

Equivalent Circuit

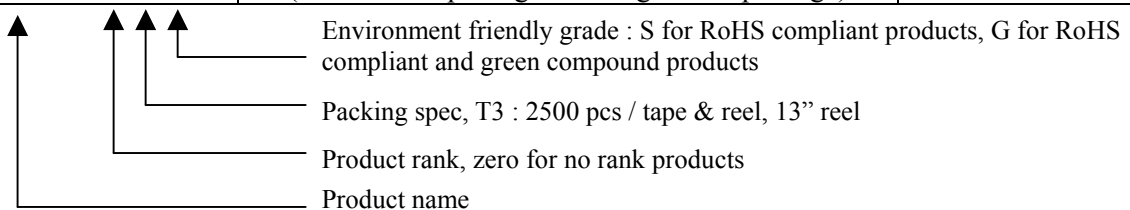


Outline



Ordering Information

| Device | Package | Shipping |
|--------------------|--|------------------------|
| MTB1KA20KQ8-0-T3-G | SOP-8 (Pb-free lead plating and halogen-free package) | 2500 pcs / tape & reel |





Absolute Maximum Ratings (Ta=25°C)

| Parameter | Symbol | Limits | Unit |
|--|-----------------------------------|---------------|------|
| Drain-Source Voltage | V _{DS} | 200 | V |
| Gate-Source Voltage | V _{GS} | ±20 | |
| Continuous Drain Current @ V _{GS} =10V, T _C =25°C | I _D | 1.4 | A |
| Continuous Drain Current @ V _{GS} =10V, T _C =100°C | | 0.89 | |
| Continuous Drain Current @ V _{GS} =10V, T _A =25°C | | 0.9 (Note 2) | |
| Continuous Drain Current @ V _{GS} =10V, T _A =70°C | | 0.72 (Note 2) | |
| Pulsed Drain Current | I _{DM} | 6 (Note 1) | |
| Avalanche Current @ L=0.1mH | I _{AS} | 2 | |
| Avalanche Energy @ L=1mH, I _D =2A, V _{DD} =50V | E _{AS} | 2 (Note 4) | mJ |
| Power Dissipation for Dual Operation | P _D | 2 | W |
| Power Dissipation for Single Operation | | 1.6 (Note 2) | |
| | | 0.9 (Note 3) | |
| Operating Junction and Storage Temperature Range | T _j , T _{stg} | -55~+150 | °C |

Thermal Data

| Parameter | Symbol | Value | Unit |
|---|------------------|--------------|------|
| Thermal Resistance, Junction-to-case, max | R _{θJC} | 25 | °C/W |
| Thermal Resistance, Junction-to-ambient, max, dual | R _{θJA} | 62.5 | |
| Thermal Resistance, Junction-to-ambient, max , single operation | | 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≤10s.
 3. Surface mounted on minimum copper pad, pulse width≤10s.

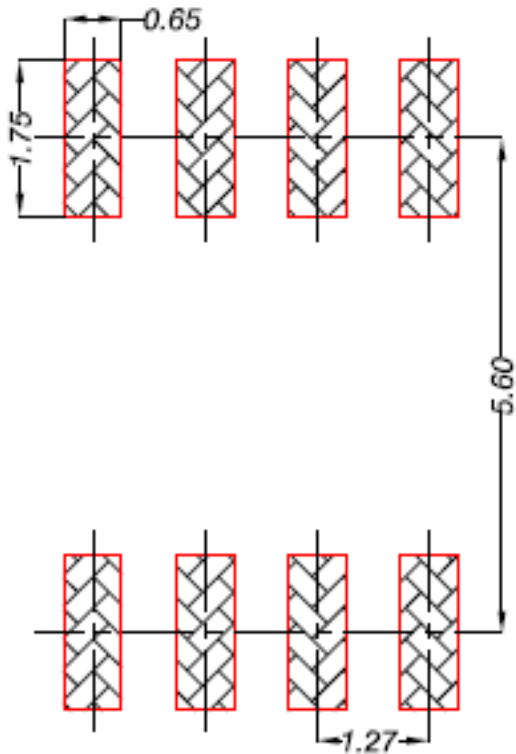
Characteristics (Tj=25°C, unless otherwise specified)

| Symbol | Min. | Typ. | Max. | Unit | Test Conditions |
|------------------------|------|-------|------|------|--|
| Static | | | | | |
| BV _{DSS} | 200 | - | - | V | V _{GS} =0V, I _D =250μA |
| V _{GS(th)} | 1 | - | 2.5 | | V _{DS} =V _{GS} , I _D =250μA |
| G _{FS} *1 | - | 3 | - | S | V _{DS} =10V, I _D =1A |
| I _{GSS} | - | - | ±10 | μA | V _{GS} =±16V, V _{DS} =0V |
| I _{DSS} | - | - | 1 | | V _{DS} =160V, V _{GS} =0V |
| | - | - | 25 | | V _{DS} =160V, V _{GS} =0V, T _j =70°C |
| R _{DS(ON)} *1 | - | 0.755 | 2 | Ω | V _{GS} =10V, I _D =1A |
| | - | 0.785 | 3 | | V _{GS} =4.5V, I _D =1A |
| Dynamic | | | | | |
| Q _g *1, 2 | - | 8.5 | 12.8 | nC | V _{DS} =160V, I _D =1A, V _{GS} =10V |
| Q _{gs} *1, 2 | - | 1.1 | - | | |
| Q _{gd} *1, 2 | - | 2.9 | - | | |

| | | | | | |
|---------------------------|---|------|------|----|--|
| $t_{d(ON)}$ *1, 2 | - | 16.4 | 24.6 | ns | $V_{DS}=100V, I_D=2A, V_{GS}=10V, R_G=1\Omega$ |
| t_r *1, 2 | - | 27 | 40.5 | | |
| $t_{d(OFF)}$ *1, 2 | - | 101 | 152 | | |
| t_f *1, 2 | - | 72 | 108 | | |
| C_{iss} | - | 277 | 415 | pF | $V_{GS}=0V, V_{DS}=100V, f=1MHz$ |
| C_{oss} | - | 15 | 22.5 | | |
| C_{rss} | - | 8.7 | 13.1 | | |
| Source-Drain Diode | | | | | |
| I_S *1 | - | - | 0.9 | A | |
| I_{SM} *3 | - | - | 6 | | |
| V_{SD} *1 | - | 0.79 | 1 | V | $I_S=1A, V_{GS}=0V$ |
| t_{rr} *1 | - | 32 | - | ns | $I_F=1A, dI_F/dt=100A/\mu s$ |
| Q_{rr} *1 | - | 35 | - | nC | |

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

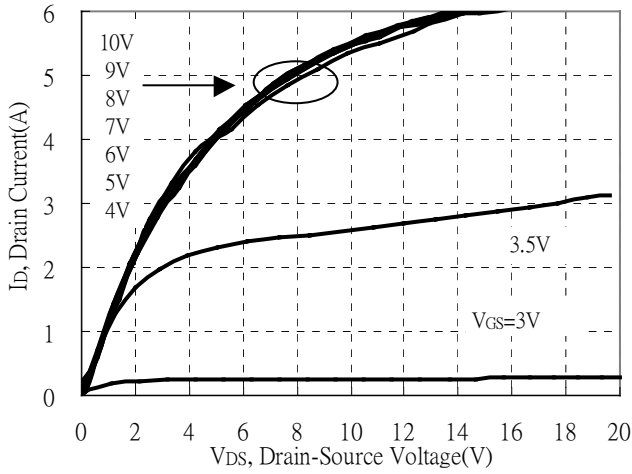
Recommended Soldering Footprint



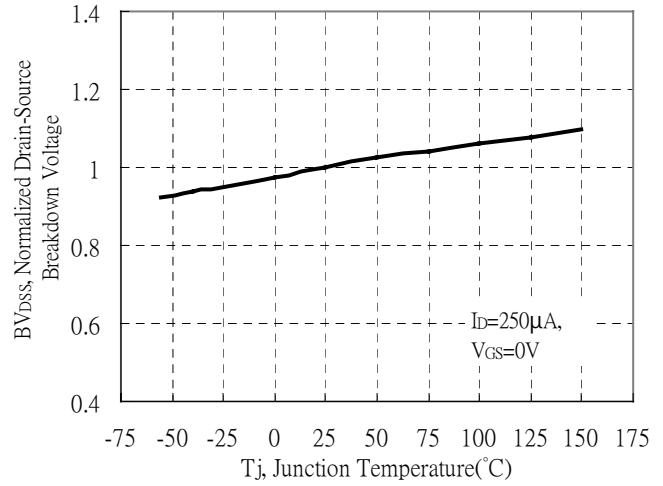


Typical Characteristics

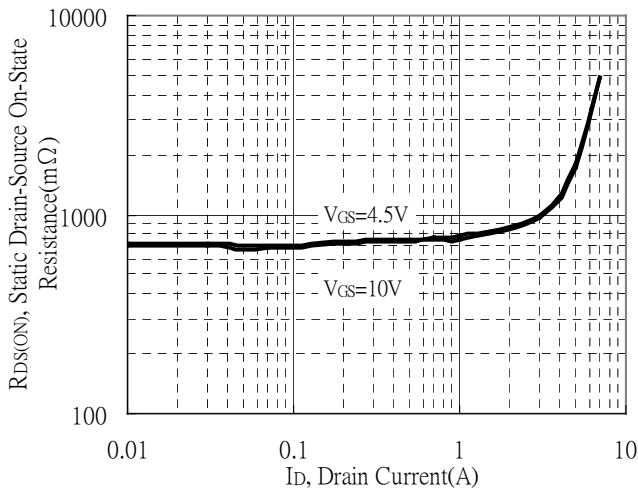
Typical Output Characteristics



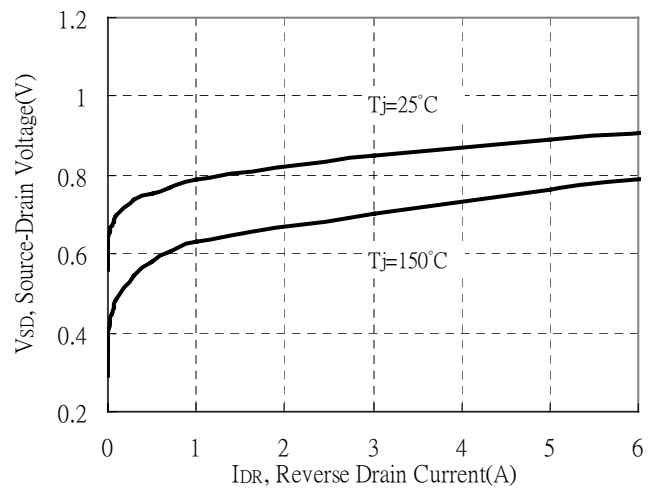
Breakdown Voltage vs Ambient Temperature



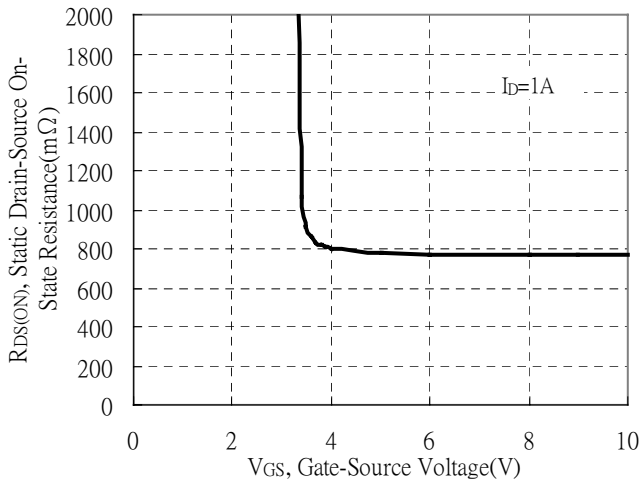
Static Drain-Source On-State resistance vs Drain Current



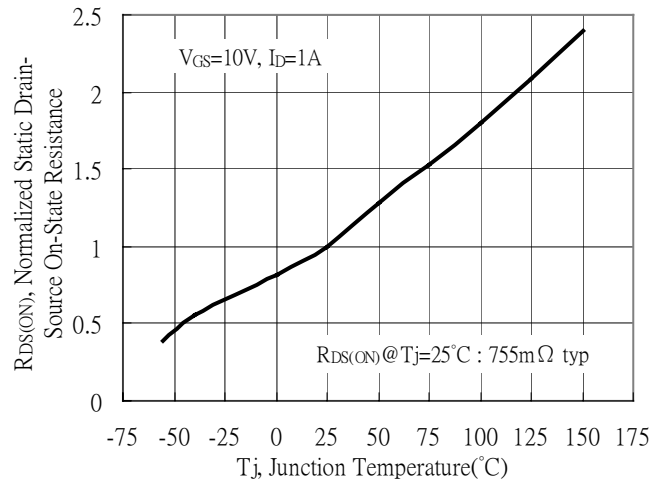
Reverse Drain Current vs Source-Drain Voltage



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

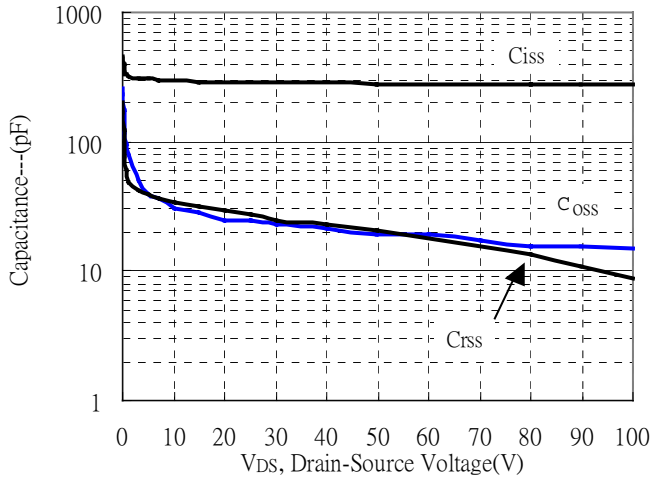


Drain-Source On-State Resistance vs Junction Temperature

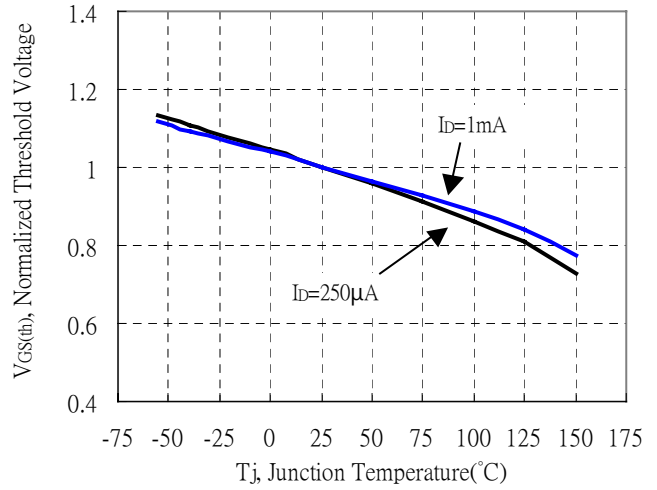


Typical Characteristics(Cont.)

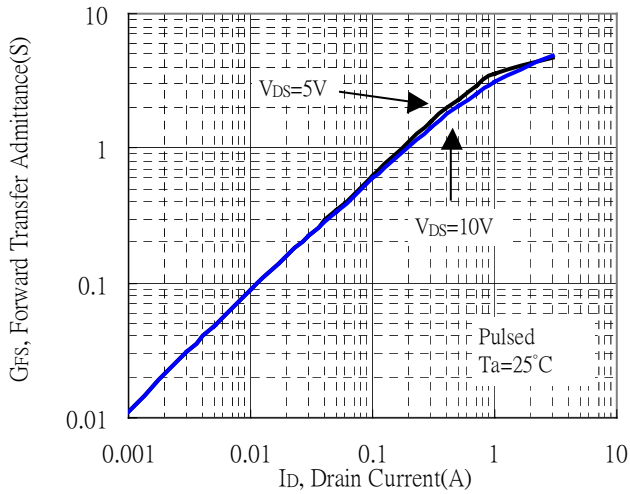
Capacitance vs Drain-to-Source Voltage



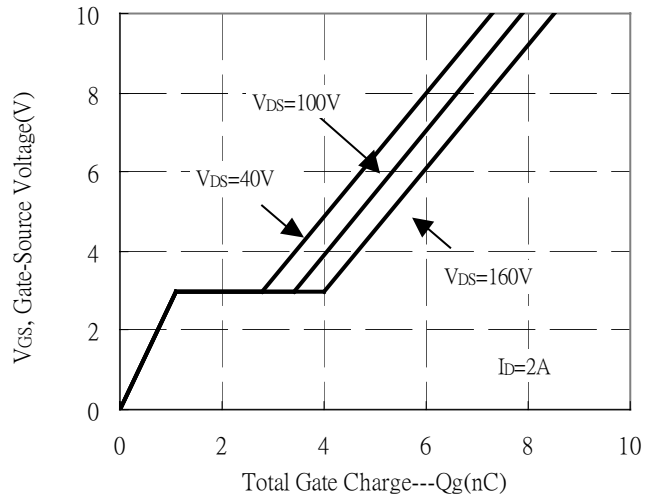
Normalized Threshold Voltage vs Junction Temperature



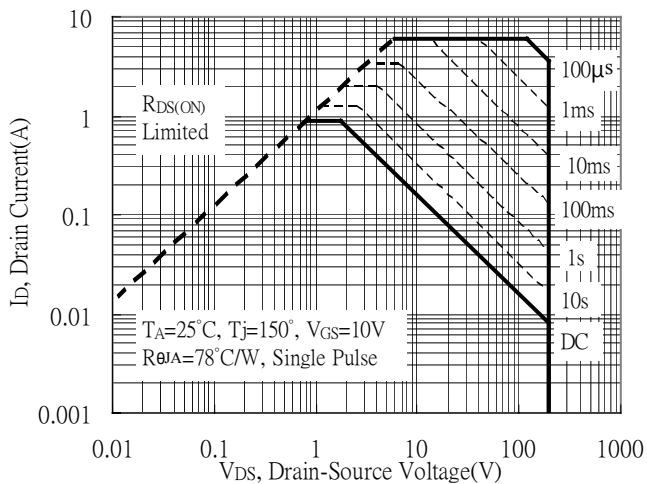
Forward Transfer Admittance vs Drain Current



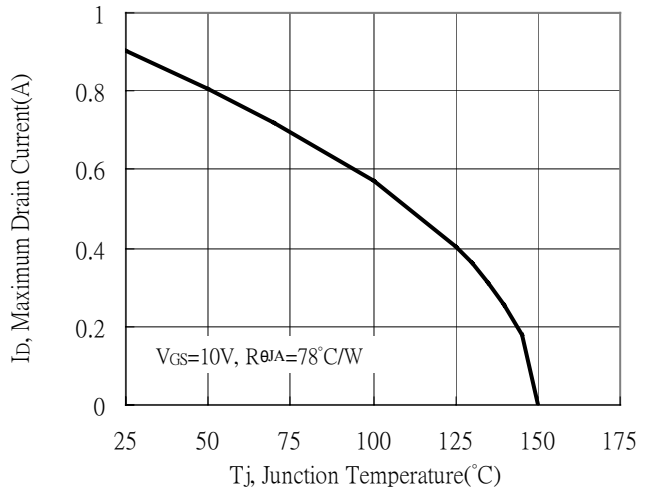
Gate Charge Characteristics



Maximum Safe Operating Area



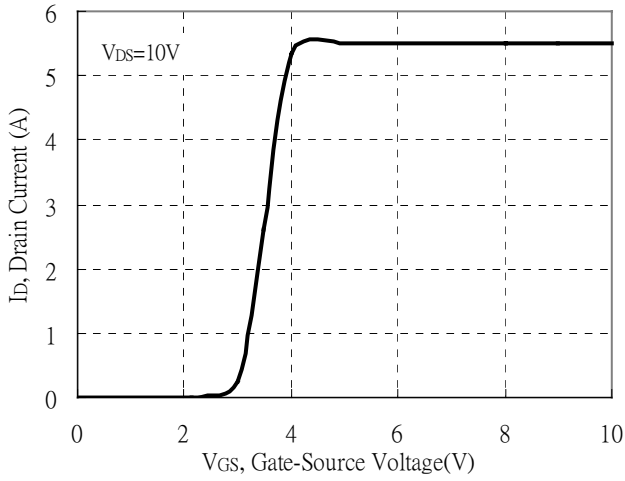
Maximum Drain Current vs Junction Temperature



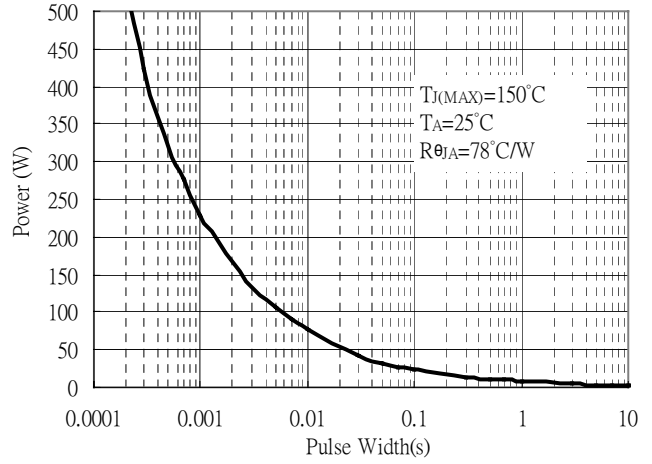


Typical Characteristics(Cont.)

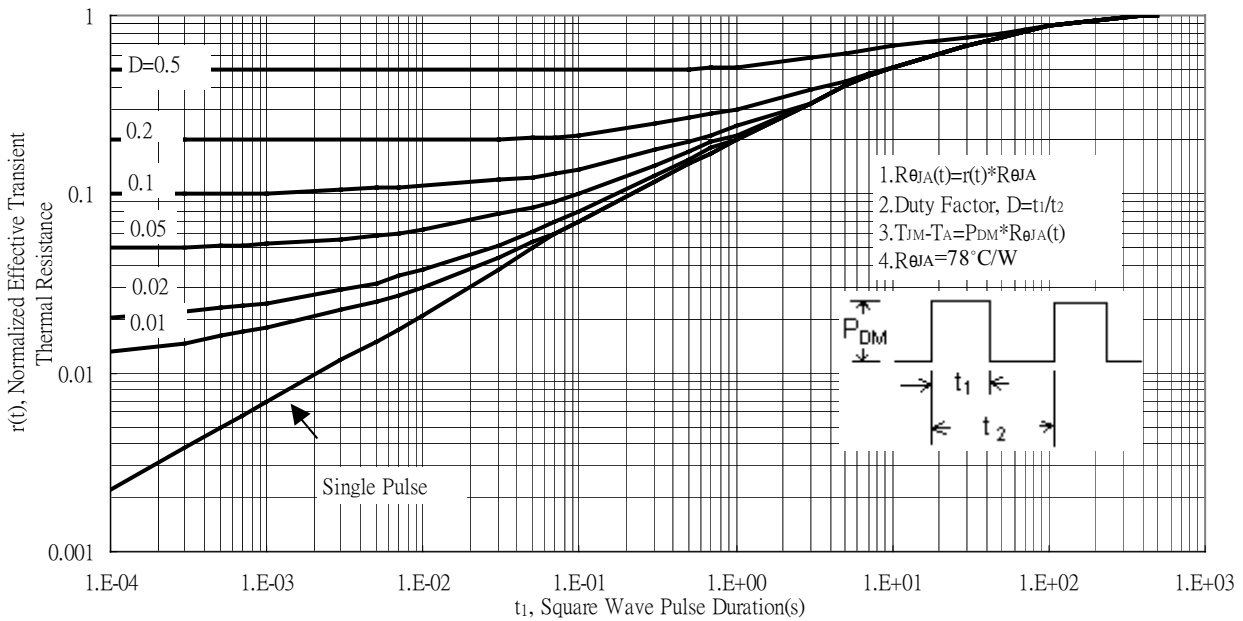
Typical Transfer Characteristics



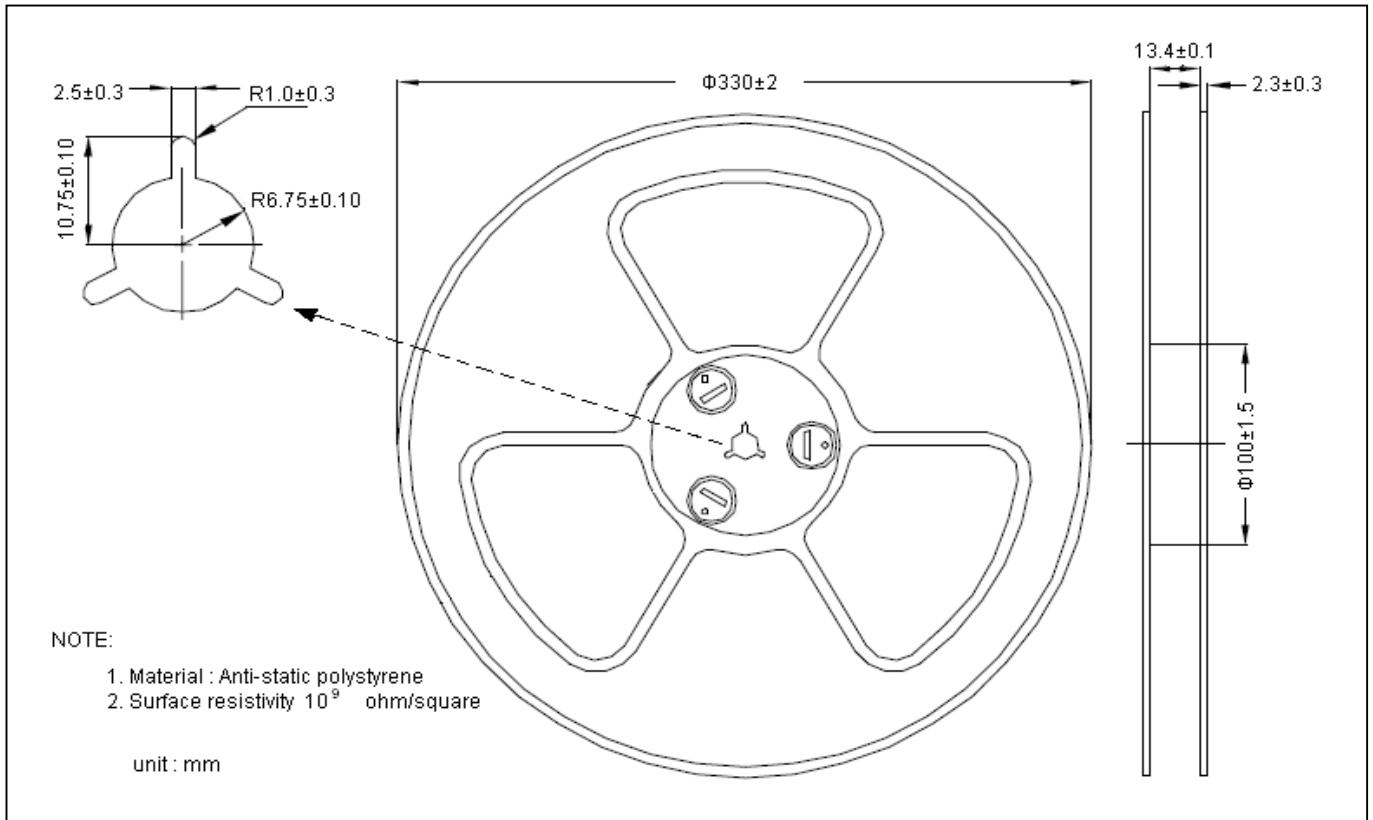
Single Pulse Maximum Power Dissipation
 (Please see Note on page 2)



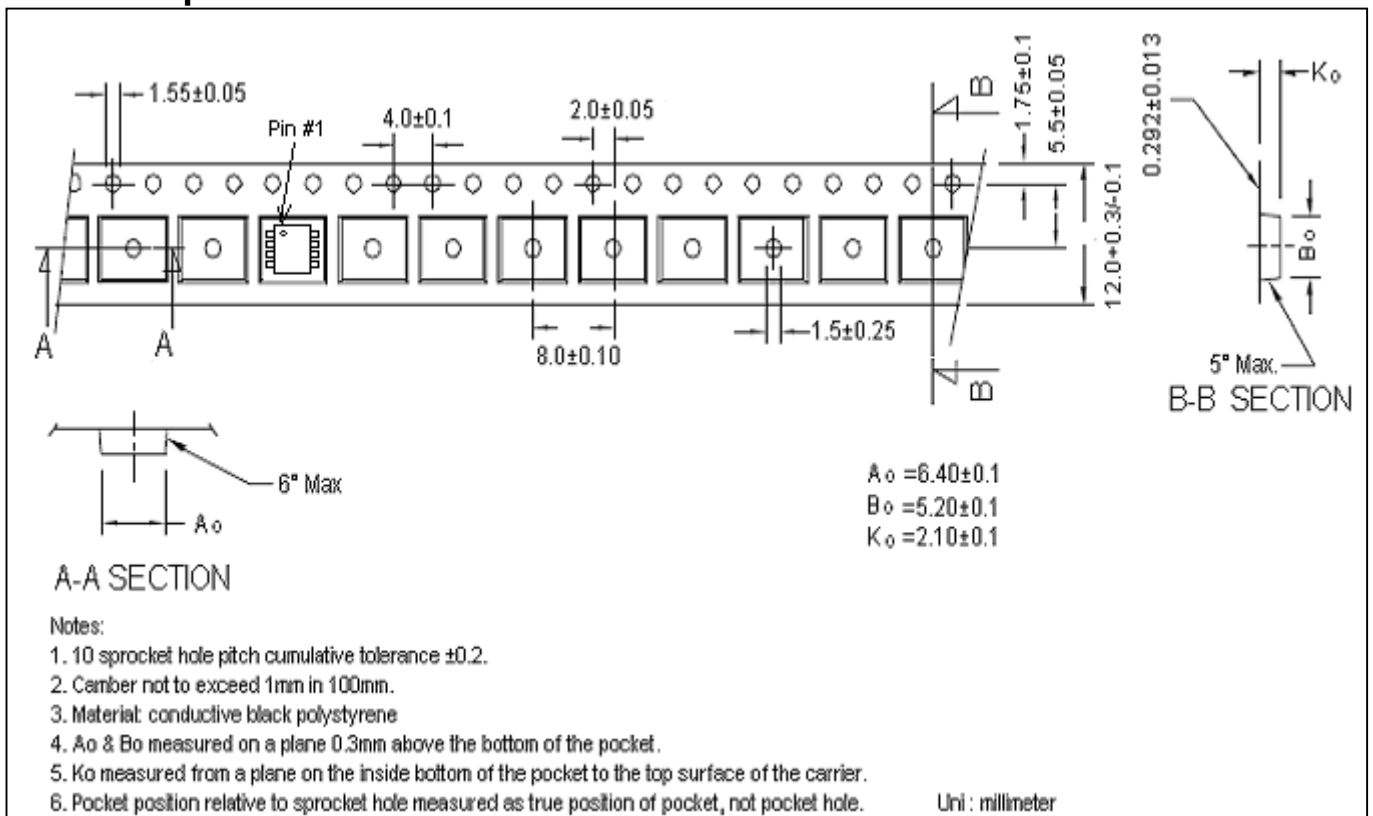
Transient Thermal Response Curves



Reel Dimension



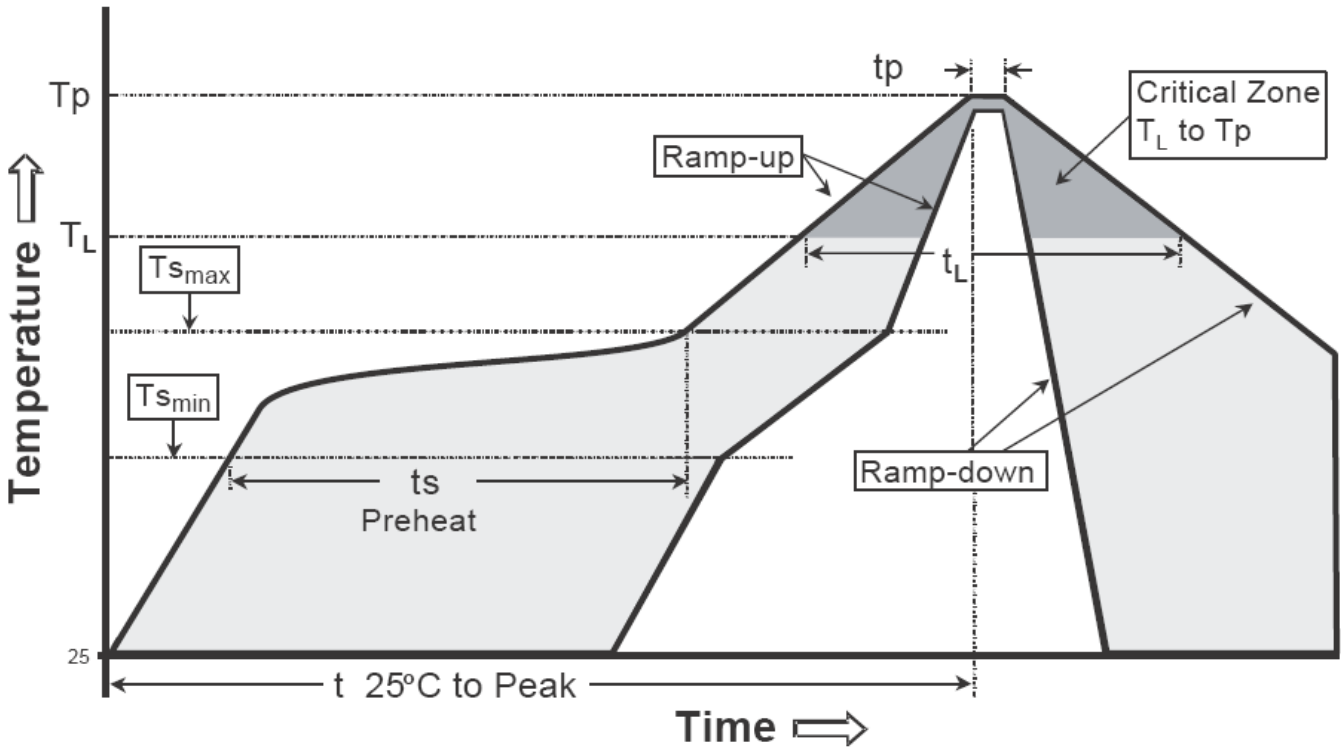
Carrier Tape Dimension



Recommended wave soldering condition

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

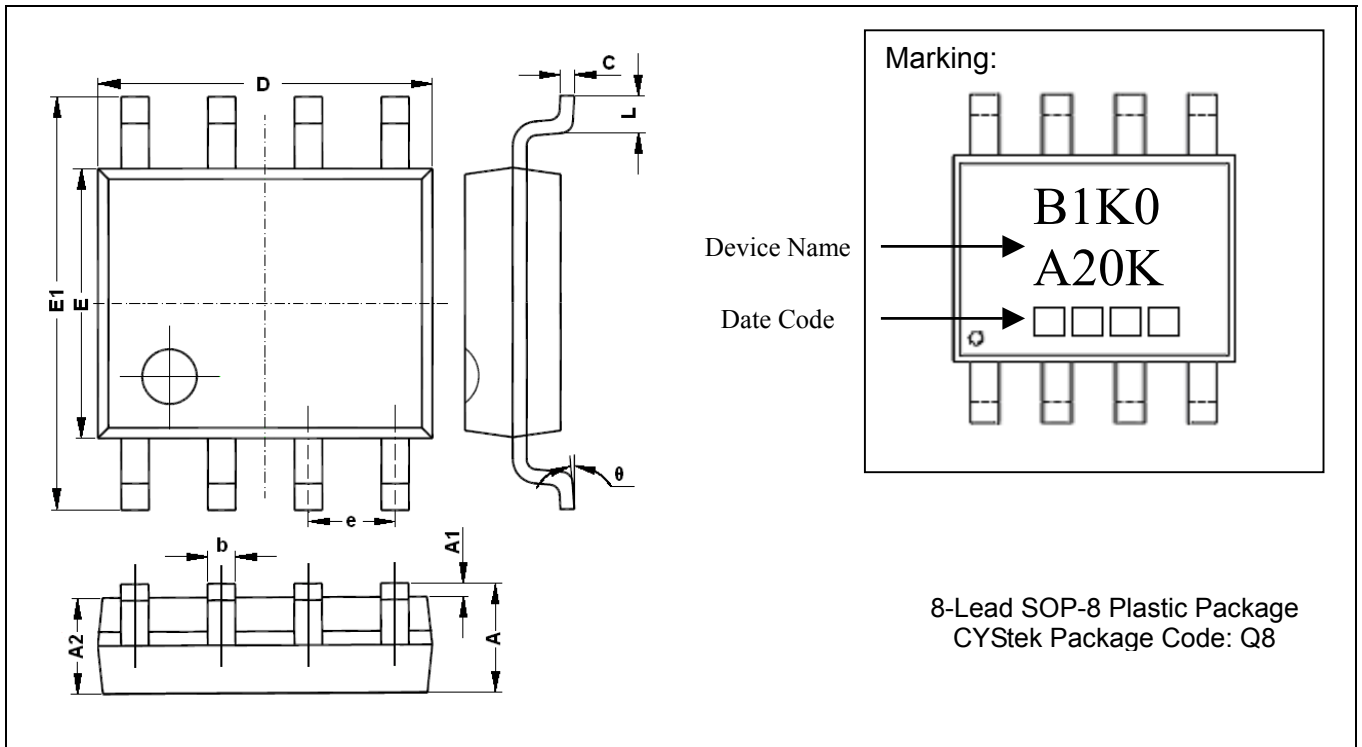
Recommended temperature profile for IR reflow



| 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 :1. All temperatures refer to topside of the package, measured on the package body surface.
 2.For devices mounted on FR-4 PCB of 1.6mm or equivalent grade PCB. If other grade PCB is used, care should be taken to match the coefficients of thermal expansion between components and PCB. If they are not matched well, the solder joints may crack or the bodies of the parts may crack or shatter as the assembly cools.

SOP-8 Dimension



| 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 | 4.200 | 0.150 | 0.165 |
| 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 | (BSC) | 0.050 | (BSC) |
| b | 0.330 | 0.510 | 0.013 | 0.020 | L | 0.300 | 1.270 | 0.012 | 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.

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