## Dual N-Channel Enhancement Mode Power MOSFET

# MTB1K0A20KQ8

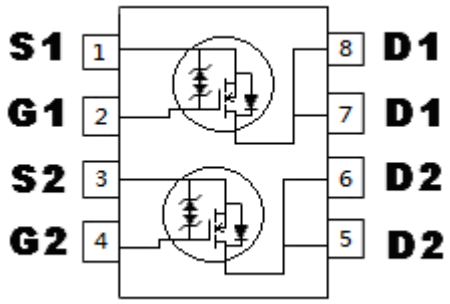
| | |
|---|---|
| **$BV_{DSS}$** | **200V** |
| **$I_D$@$V_{GS}$=10V, $T_A$=25°C** | **0.9A** |
| **$I_D$@$V_{GS}$=10V, $T_A$=70°C** | **0.72A** |
| **$R_{DSON}$@$V_{GS}$=10V, $I_D$=1A** | **755mΩ(typ)** |
| **$R_{DSON}$@$V_{GS}$=4.5V, $I_D$=1A** | **785mΩ(typ)** |

## 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

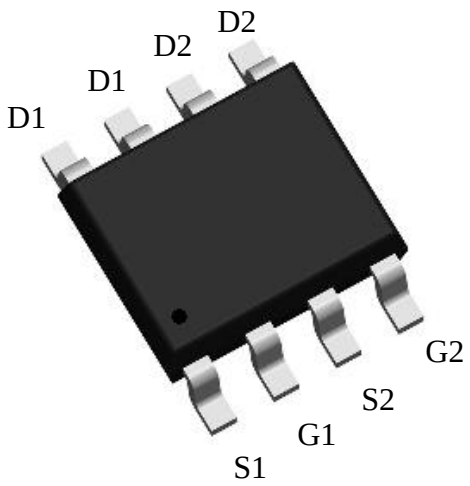
MTB1K0A20KQ8




G：Gate D：Drain S：Source

## Outline

SOP-8




## Ordering Information

| Device | Package | Shipping |
|---|---|---|
| MTB1KA20KQ8-0-T3-G | SOP-8<br>(Pb-free lead plating and halogen-free package) | 2500 pcs / tape & reel |
| MTB1KA20KQ8-0-TF-G | SOP-8<br>(Pb-free lead plating and halogen-free package) | 4000 pcs / tape & reel |

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

Packing spec, T3 : 2500 pcs / tape & reel, 13” reel, TF : 4000 pcs/tape & reel, 13” reel

Product rank, zero for no rank products

Product name

## 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 | Tj, Tstg | -55~+150 | °C |

## Thermal Data

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Thermal Resistance, Junction-to-case, max | $R_{\theta JC}$ | 25 | °C/W |
| Thermal Resistance, Junction-to-ambient, max, dual | $R_{\theta JA}$ | 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.

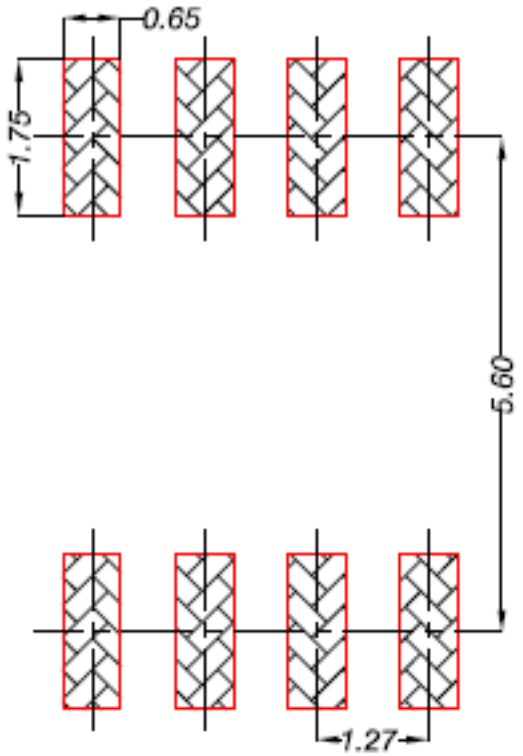
## Characteristics (Tj=25°C, unless otherwise specified)

| 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, Tj=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** | | | | | |
| Qg *1, 2 | - | 8.5 | 12.8 | nC | $V_{DS}$=160V, $I_D$=1A, $V_{GS}$=10V |
| Qgs *1, 2 | - | 1.1 | - | | |
| Qgd *1, 2 | - | 2.9 | - | | |

| | | | | | |
|---|---|---|---|---|---|
| $t_{d(ON)}$ *1, 2 | - | 16.4 | 24.6 | ns | $V_{DS}$=100V, $I_D$=2A, $V_{GS}$=10V, $R_G$=1Ω |
| tr *1, 2 | - | 27 | 40.5 | | |
| $t_{d(OFF)}$ *1, 2 | - | 101 | 152 | | |
| $t_f$ *1, 2 | - | 72 | 108 | | |
| Ciss | - | 277 | 415 | pF | $V_{GS}$=0V, $V_{DS}$=100V, f=1MHz |
| Coss | - | 15 | 22.5 | | |
| Crss | - | 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 |
| trr *1 | - | 32 | - | ns | $I_F$=1A, $dI_F/dt$=100A/μs |
| Qrr *1 | - | 35 | - | nC | |

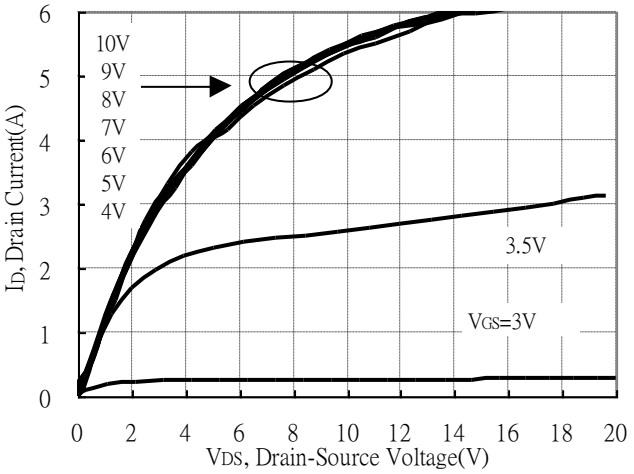
Note : *1.Pulse Test : Pulse Width ≤300μs, Duty Cycle≤2%
*2.Independent of operating temperature
*3.Pulse width limited by maximum junction temperature.

## Recommended Soldering Footprint

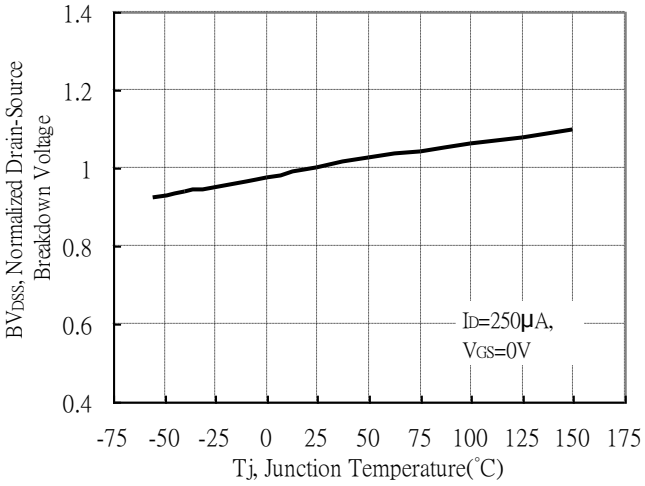


## Typical Characteristics

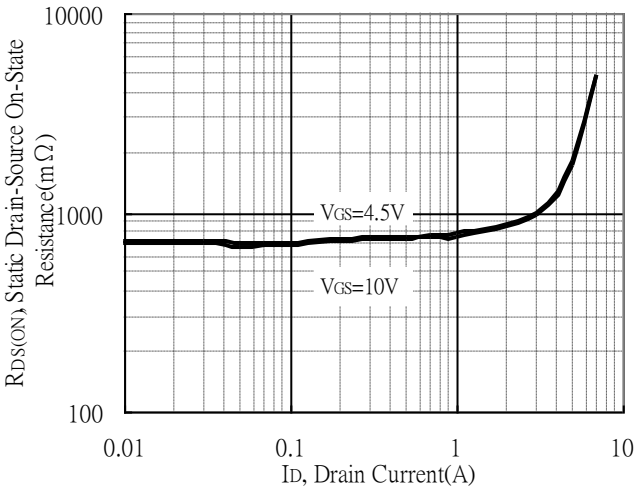
Typical Output Characteristics



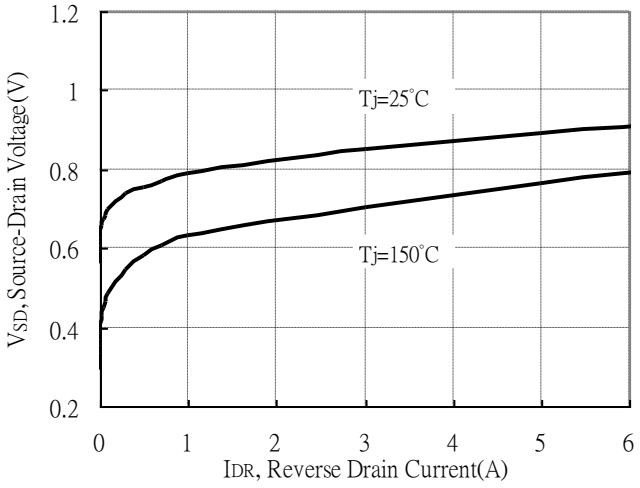

Brekdown Voltage vs Ambient Temperature



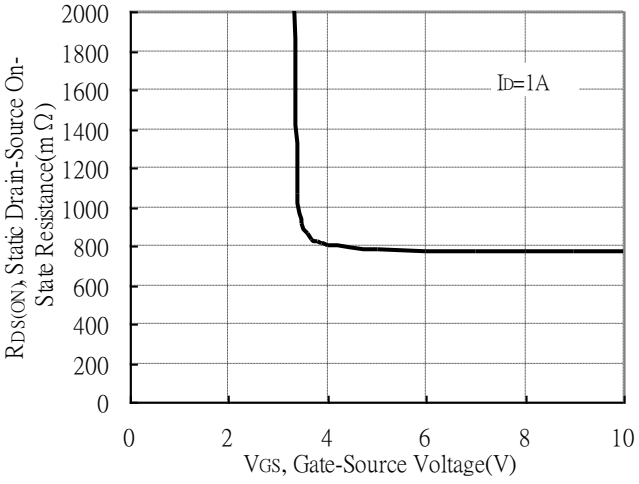

Static Drain-Source On-State resistance vs Drain Current



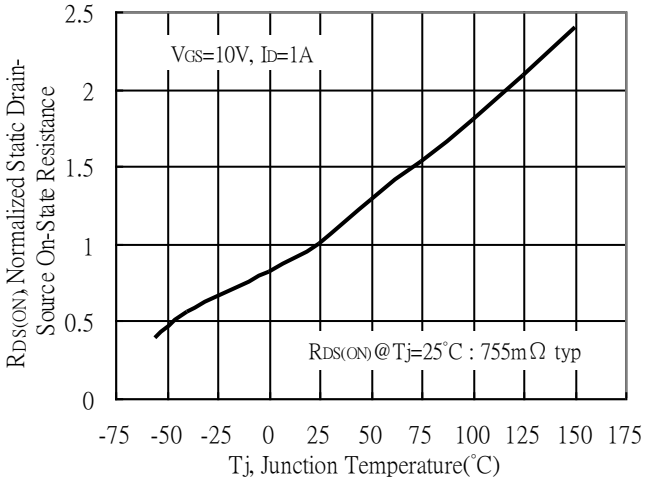

Reverse Drain Current vs Source-Drain Voltage




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

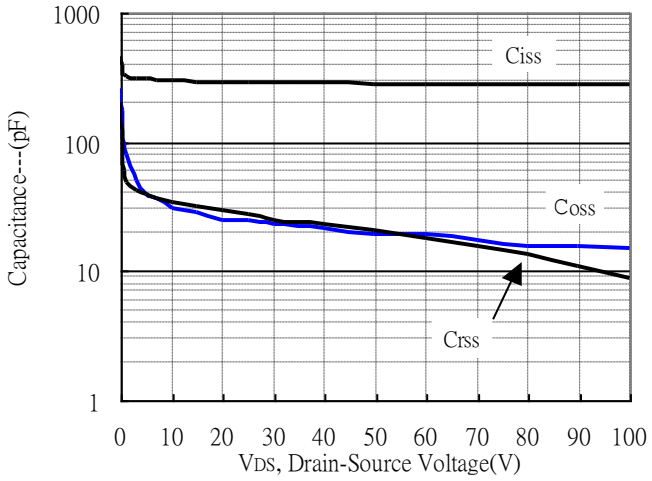



Drain-Source On-State Resistance vs Junction Tempearture

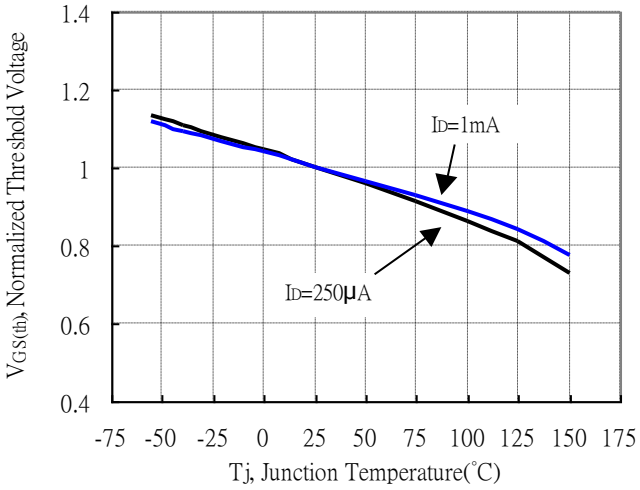


## Typical Characteristics(Cont.)

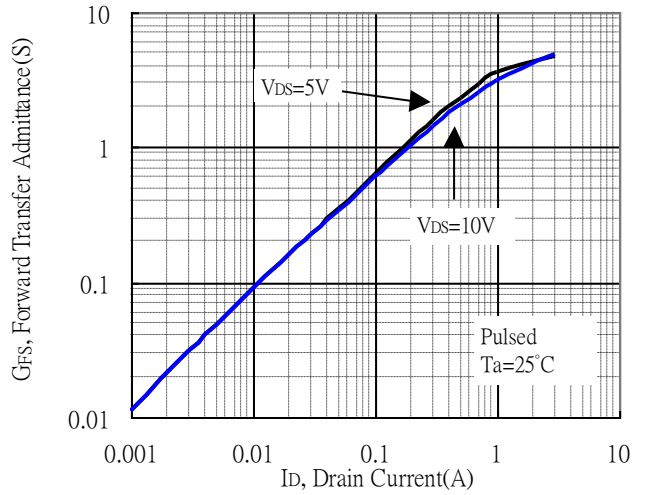
Capacitance vs Drain-to-Source Voltage



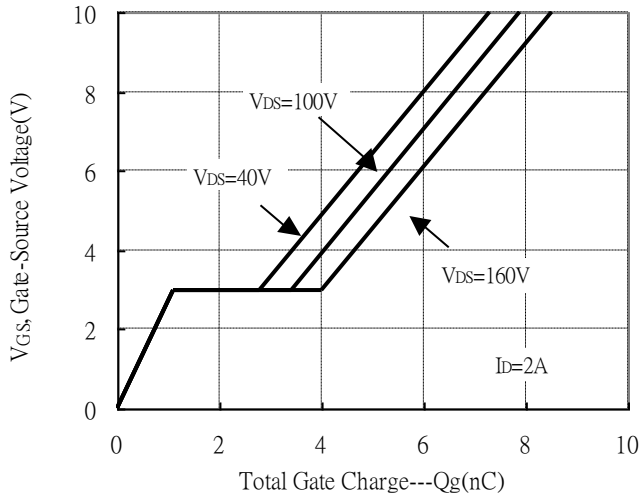

NormalizedThreshold Voltage vs Junction Tempearture



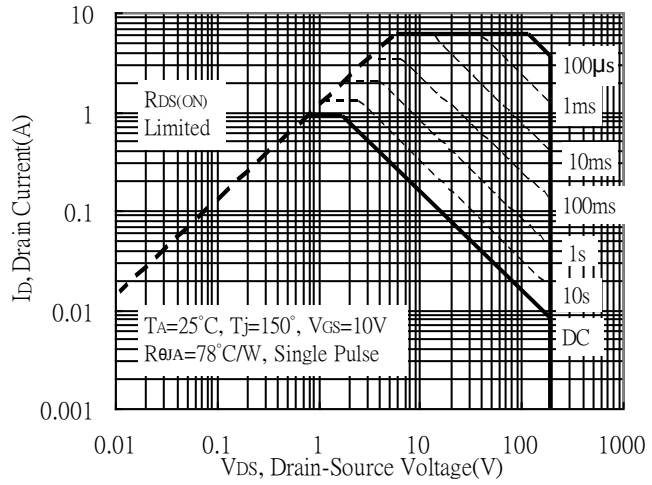

Forward Transfer Admittance vs Drain Current



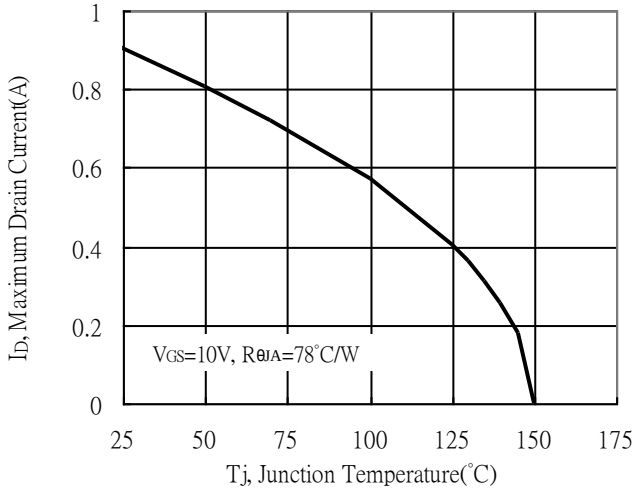

Gate Charge Characteristics




Maximum Safe Operating Area

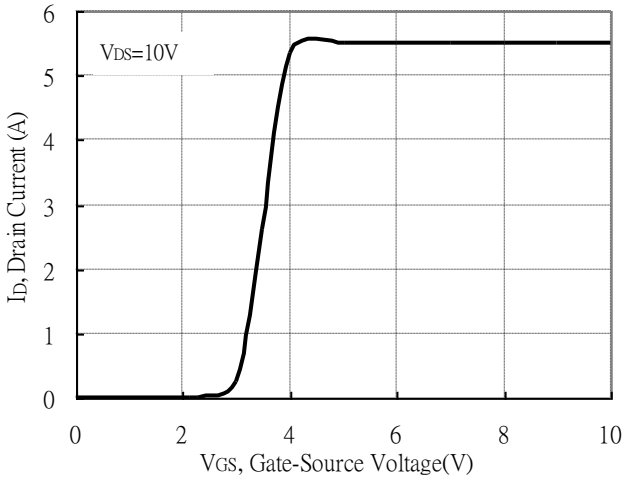



Maximum Drain Current vs Junction Temperature

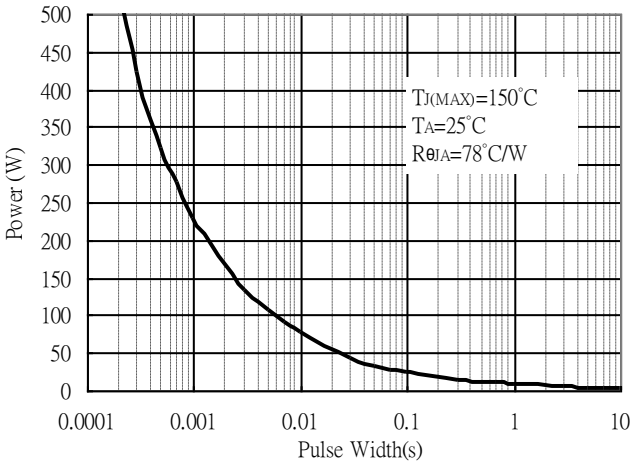


## Typical Characteristics(Cont.)

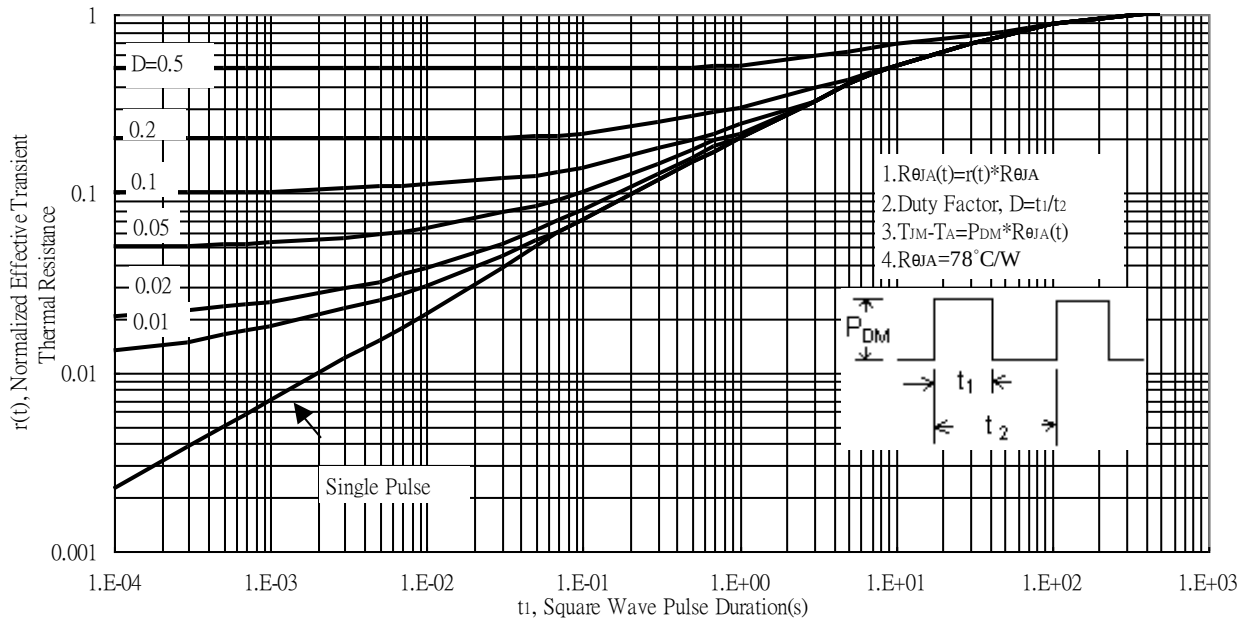
Typical Transfer Characteristics



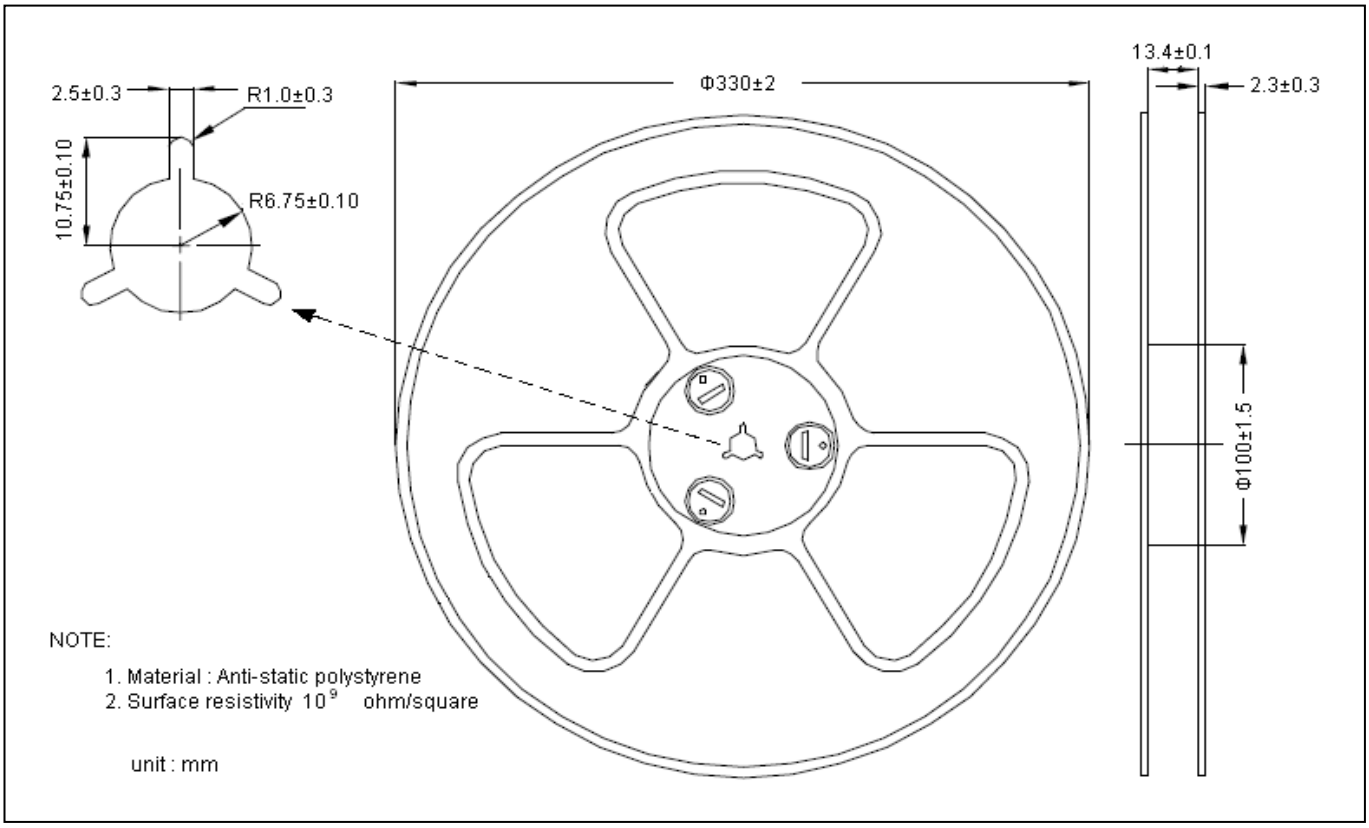

Single Pulse Maximum Power Dissipation
(Please see Note on page 2)




Transient Thermal Response Curves



## Reel Dimension

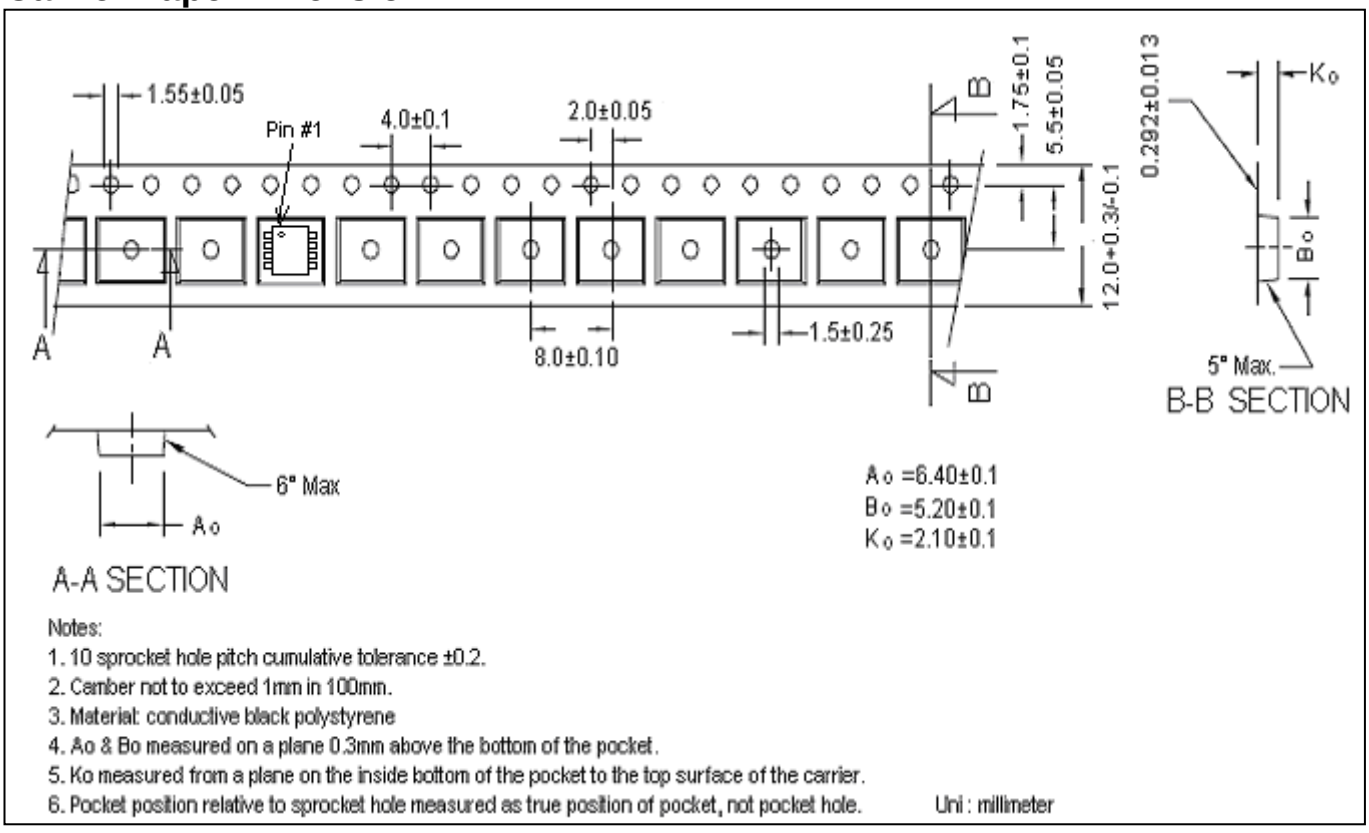



NOTE:

1. Material : Anti-static polystyrene
2. Surface resistivity $10^9$ ohm/square

unit : mm

## Carrier Tape Dimension




Notes:

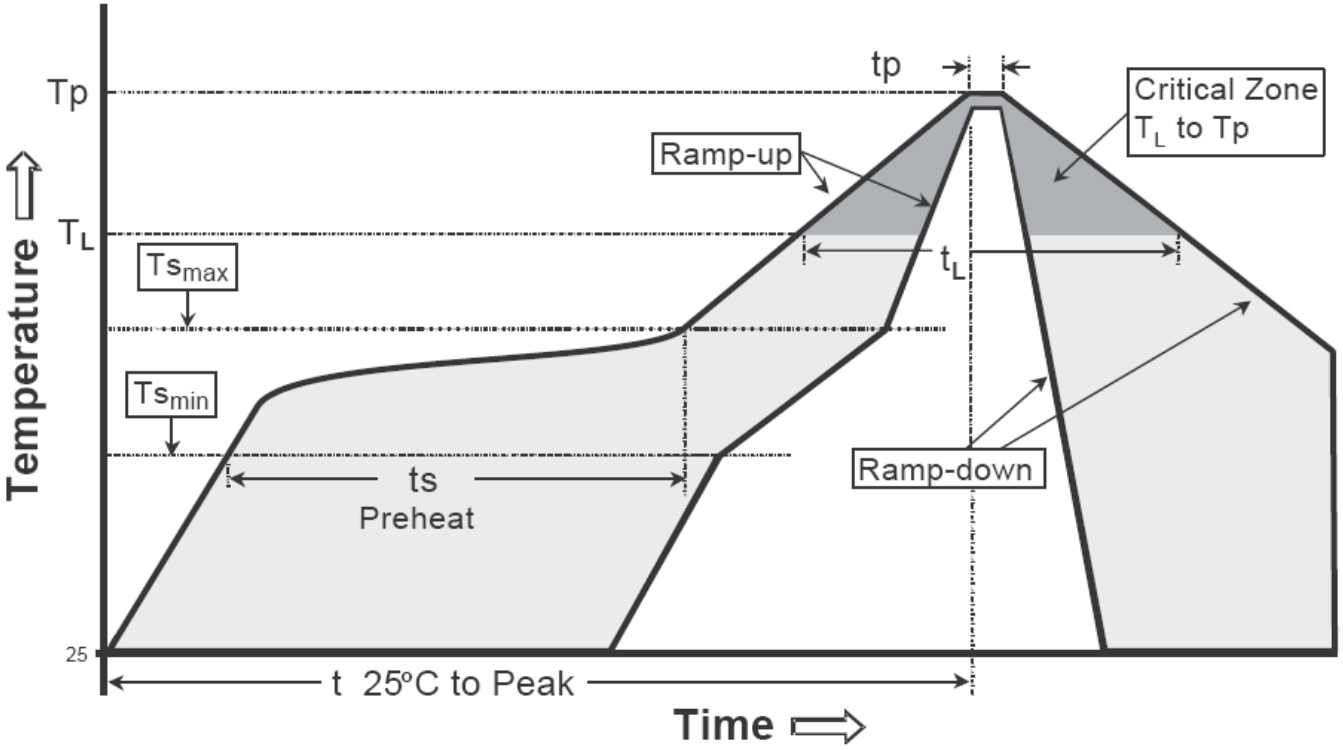
1. 10 sprocket hole pitch cumulative tolerance ±0.2.
2. Camber not to exceed 1mm in 100mm.
3. Material: conductive black polystyrene
4. Ao & Bo measured on a plane 0.3mm above the bottom of the pocket.
5. Ko measured from a plane on the inside bottom of the pocket to the top surface of the carrier.
6.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

Uni : millimeter

## Recommended wave soldering condition

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

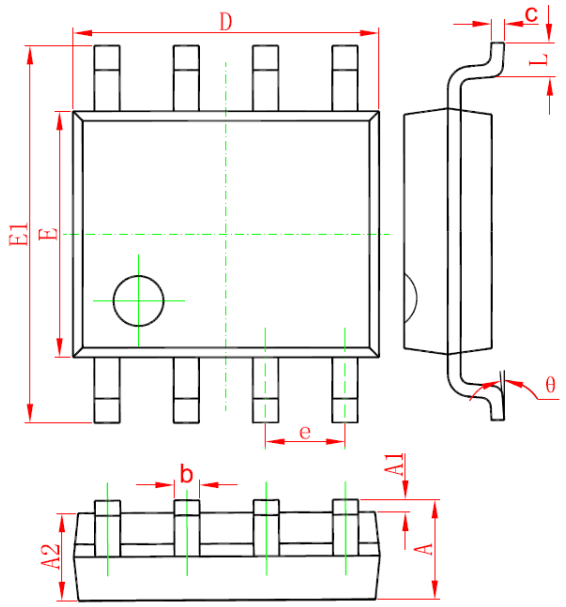
## Recommended temperature profile for IR reflow



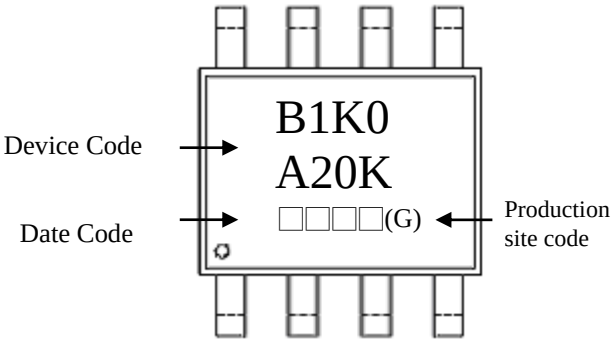

| Profile feature | Sn-Pb eutectic Assembly | Pb-free Assembly |
|---|---|---|
| Average ramp-up rate (Tsmax to Tp) | 3°C/second max. | 3°C/second max. |
| Preheat<br>−Temperature Min($T_S$ min)<br>−Temperature Max($T_S$ max)<br>−Time($t_{s\ min}$ to $t_{s\ max}$) | <br>100°C<br>150°C<br>60-120 seconds | <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(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




Marking:




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

Production 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.