

P-Channel Enhancement Mode Power MOSFET

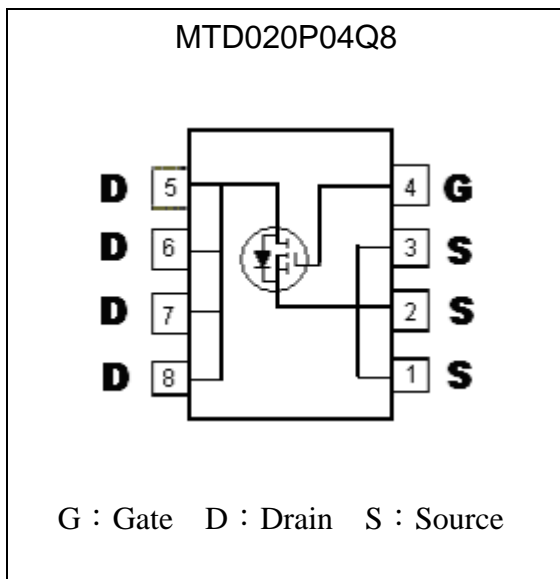
MTD020P04Q8

BV_{DSS}	-40V
I_D @ T_A=25°C, V_{GS}=-10V	-7.9A
R_{DS(ON)}@ V_{GS}=-10V, I_D=-4.5A	17.8 mΩ (typ)
R_{DS(ON)}@ V_{GS}=-5V, I_D=-4A	26.1 mΩ (typ)

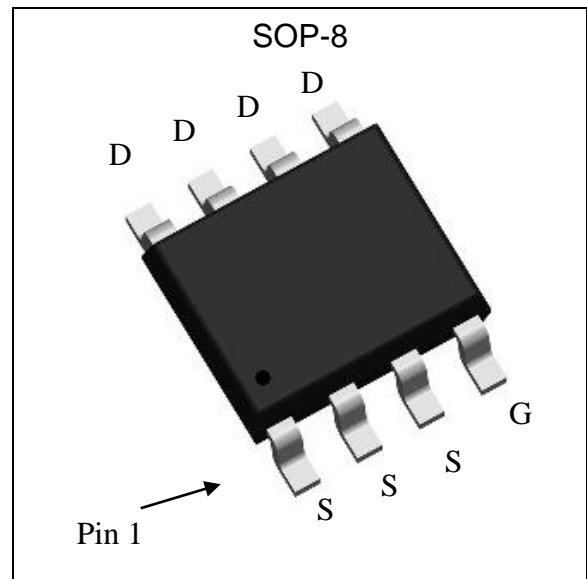
Features

- Simple drive requirement
- Low on-resistance
- Fast switching characteristic
- Pb-free & halogen-free package

Symbol

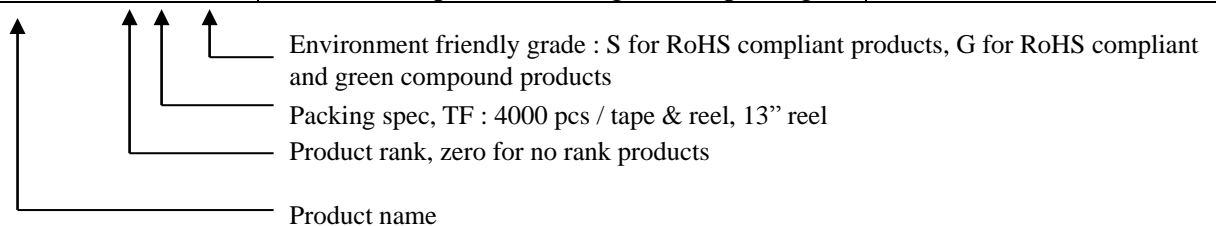


Outline



Ordering Information

Device	Package	Shipping
MTD020P04Q8-0-TF-G	SOP-8 (RoHS compliant & Halogen-free package)	4000 pcs / Tape & Reel





Absolute Maximum Ratings (Tc=25°C, unless otherwise noted)

Parameter	Symbol	Limits	Unit	
Drain-Source Voltage	V _{DS}	-40	V	
Gate-Source Voltage	V _{GS}	±20		
Continuous Drain Current @ V _{GS} =-10V, T _C =25°C	I _D	-11	A	
Continuous Drain Current @ V _{GS} =-10V, T _C =100°C		-7		
Continuous Drain Current @ V _{GS} =-10V, T _A =25°C		-7.9		
Continuous Drain Current @ V _{GS} =-10V, T _A =70°C		-6.3		
Pulsed Drain Current	I _{DM}	-40 *1		
Avalanche Current @ L=0.1mH	I _{AS}	-36		
Avalanche Energy @ L=1mH, I _D =-16A, V _{DD} =-15V	E _{AS}	128 *3	mJ	
Repetitive Avalanche Energy @ L=0.05mH	E _{AR}	0.5 *2		
Total Power Dissipation	P _D	T _A =25 °C	2.5	W
		T _A =70 °C	1.6	
Operating Junction and Storage Temperature	T _j , T _{stg}	-55~+150	°C	

Note : *1. Pulse width limited by maximum junction temperature
 *2. Duty cycle ≤ 1%
 *3. 100% tested by conditions of L=0.1mH, I_{AS}=-10A, V_{GS}=-10V, V_{DD}=-15V

Thermal Data

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-case	R _{θJC}	25	°C/W
Thermal Resistance, Junction-to-ambient (Note)	R _{θJA}	50	

Note : 50°C / W when mounted on a 1 in² pad of 2 oz copper, t≤10s; 125°C/W when mounted on minimum pad.

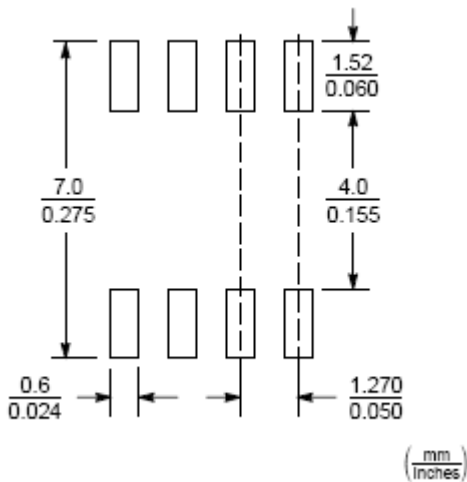
Characteristics (Tc=25°C, unless otherwise specified)

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Static					
BV _{DSS}	-40	-	-	V	V _{GS} =0V, I _D =-250μA
V _{GS(th)}	-1.5	-	-3.0		V _{DS} = V _{GS} , I _D =-250μA
G _{FS}	-	11.4	-	S	V _{DS} = -10V, I _D =-5A
I _{GSS}	-	-	±100	nA	V _{GS} =±20V, V _{DS} =0V
I _{DSS}	-	-	1	μA	V _{DS} = -32V, V _{GS} = 0V
	-	-	10		V _{DS} = -32V, V _{GS} = 0V, T _j =55°C
*R _{DS(ON)}	-	17.8	25	mΩ	V _{GS} = -10V, I _D =-4.5A
	-	26.1	42		V _{GS} = -5V, I _D =-4A
Dynamic					
Q _g *1, 2	-	33.7	50	nC	V _{DS} =-20V, I _D =-4A, V _{GS} =-10V
Q _{gs} *1, 2	-	5.6	-		
Q _{gd} *1, 2	-	7.5	-		
C _{iss}	-	1659	-	pF	V _{DS} =-20V, V _{GS} =0V, f=1MHz
C _{oss}	-	130	-		
C _{rss}	-	106	-		

Characteristics (Cont. Tc=25°C, unless otherwise specified)

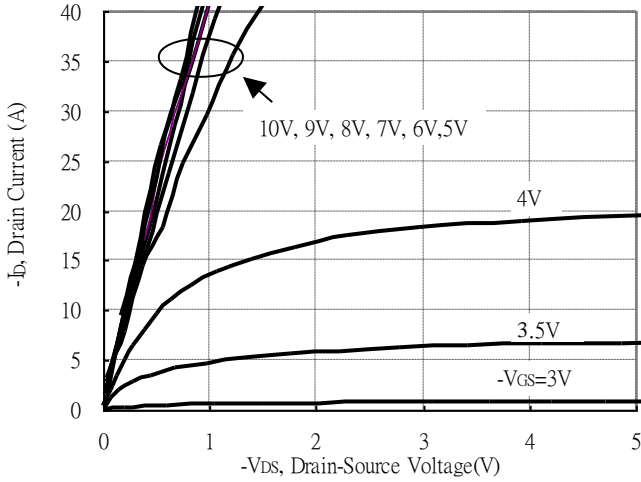
Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Dynamic					
$t_{d(ON)}$ *1, 2	-	12.6	25	ns	$V_{DS}=-20V, I_D=-4.5A, V_{GS}=-10V,$ $R_G=1\Omega$
t_r *1, 2	-	19.8	40		
$t_{d(OFF)}$ *1, 2	-	68.8	138		
t_f *1, 2	-	12.4	25		
Source-Drain Diode Ratings and Characteristics					
I_S *1	-	-	-4	A	
I_{SM} *3	-	-	-16		
V_{SD} *1	-	-0.82	-1.2	V	$I_S=-5A, V_{GS}=0V$
t_{rr}	-	13.9	-	ns	$I_F=-5A, dI_F/dt=100A/\mu s$
Q_{rr}	-	9.1	-	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.

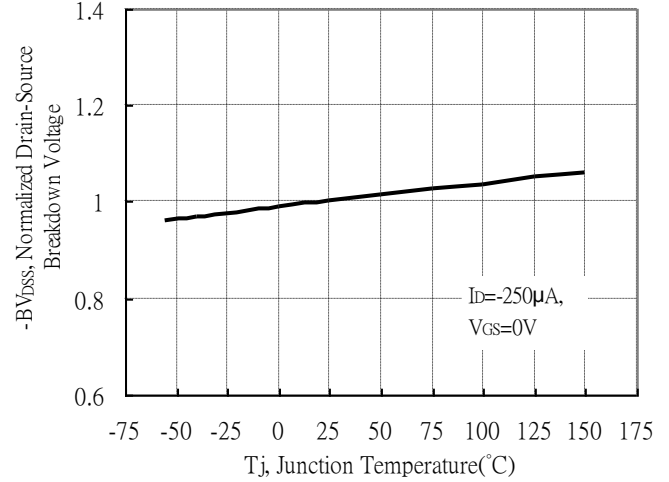
Recommended Soldering Footprint


Typical Characteristics

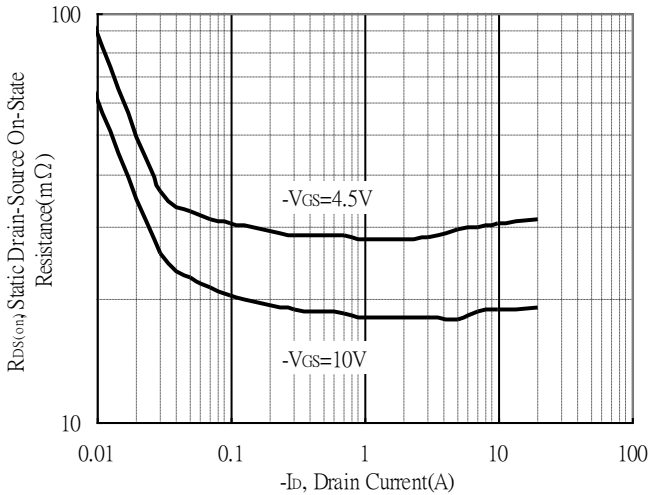
Typical Output Characteristics



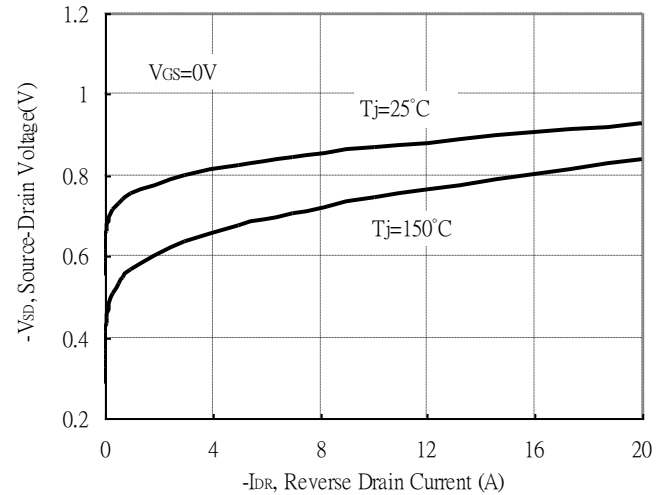
Brekdown Voltage vs Ambient Temperature



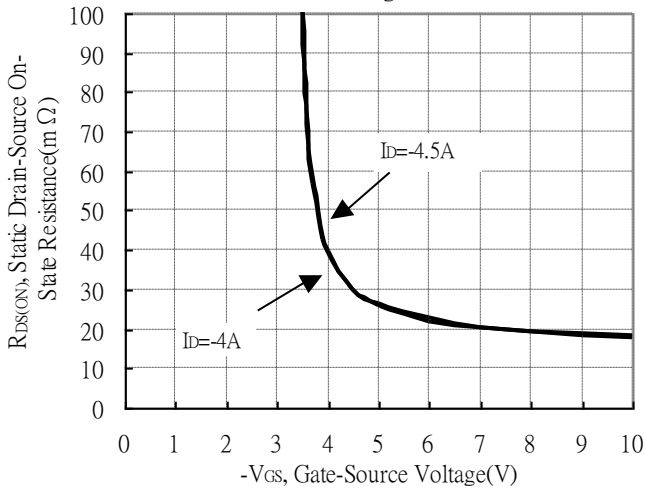
Static Drain-Source On-State resistance vs Drain Current



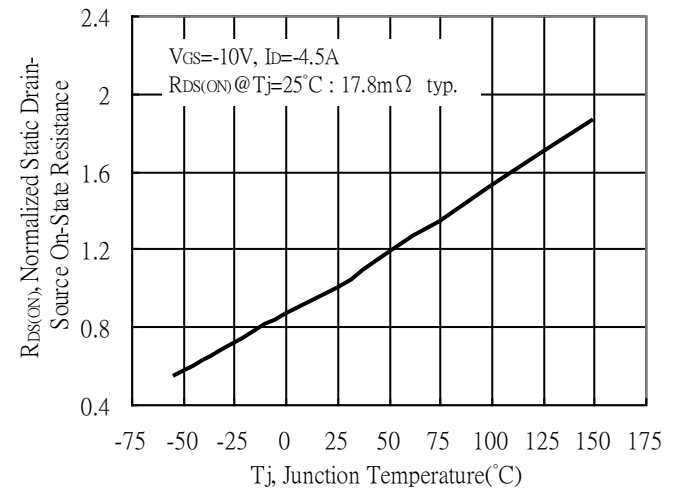
Reverse Drain Current vs Source-Drain Voltage



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

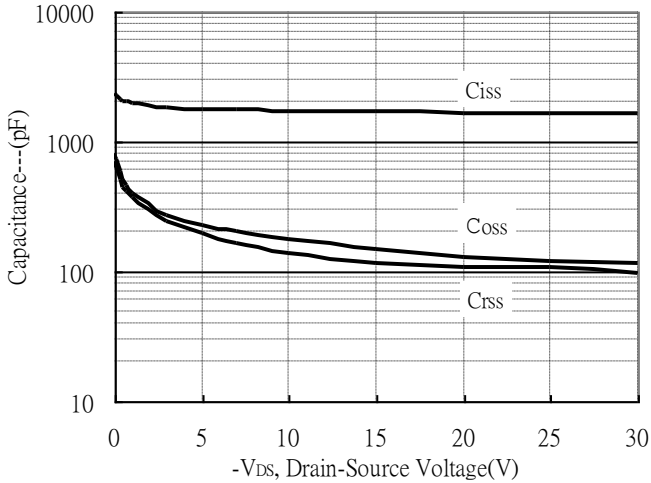


Drain-Source On-State Resistance vs Junction Temperature

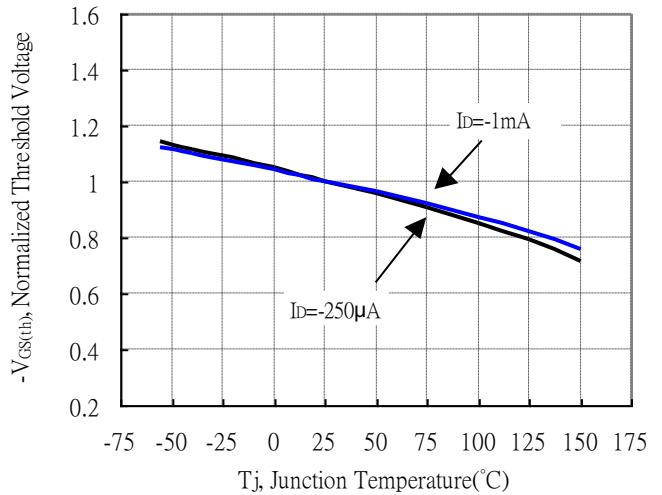


Typical Characteristics(Cont.)

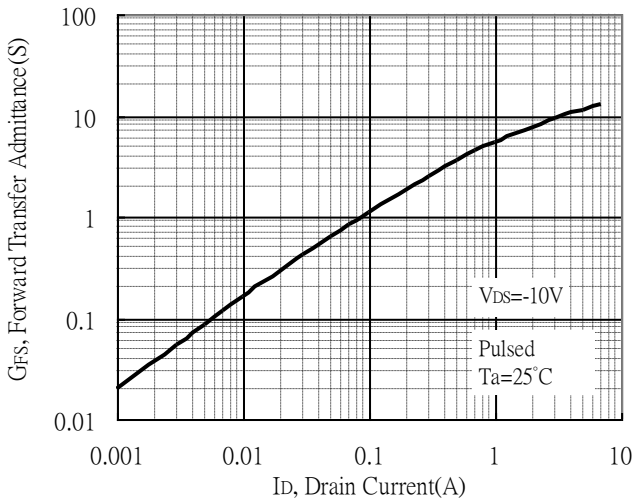
Capacitance vs Drain-to-Source Voltage



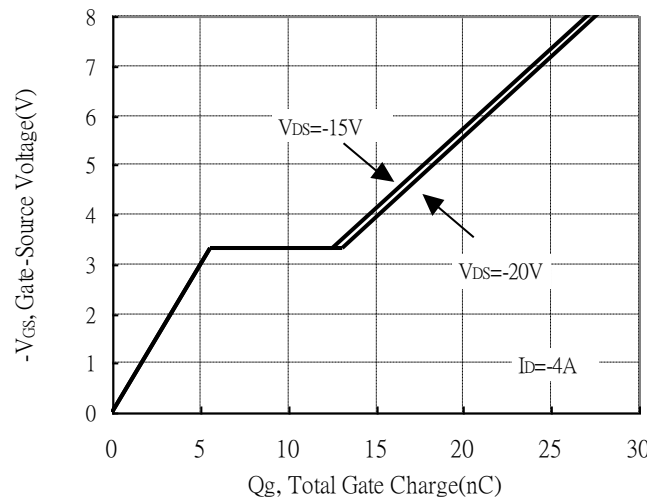
Threshold Voltage vs Junction Temperature



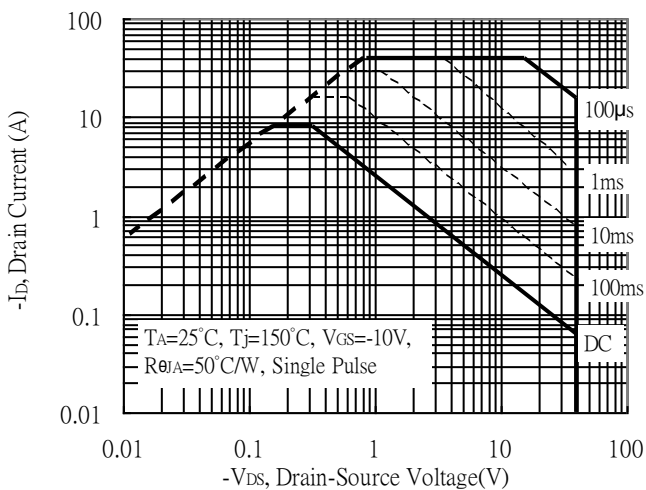
Forward Transfer Admittance vs Drain Current



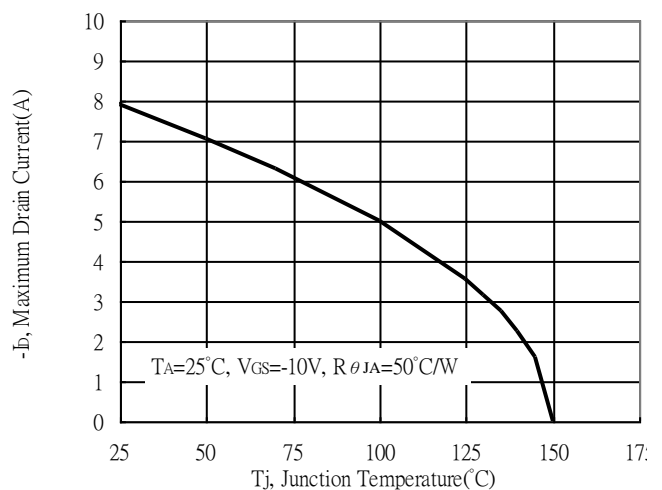
Gate Charge Characteristics



Maximum Safe Operating Area



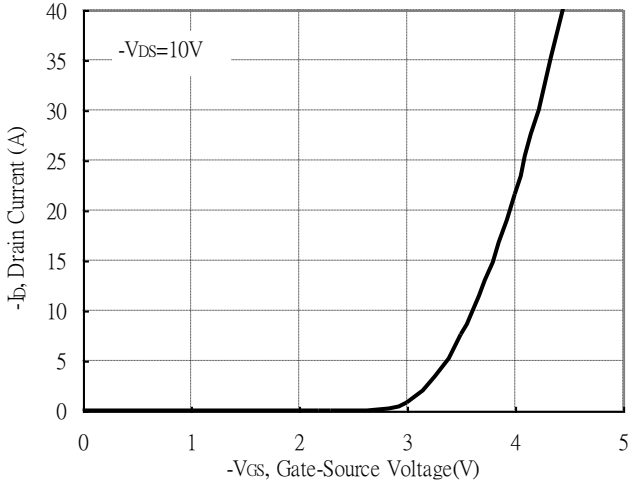
Maximum Drain Current vs Junction Temperature



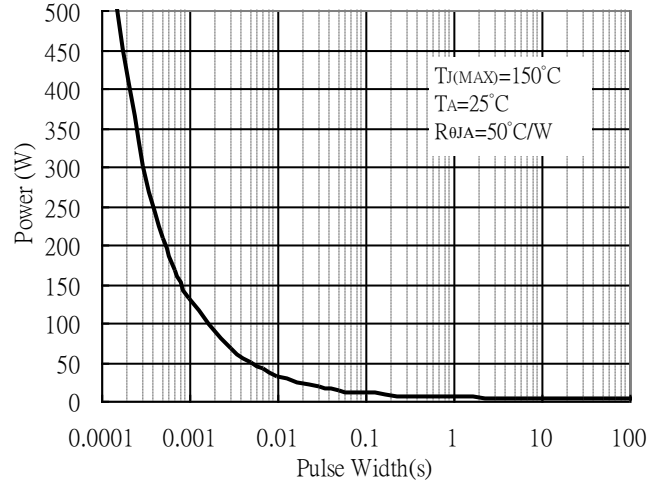


Typical Characteristics(Cont.)

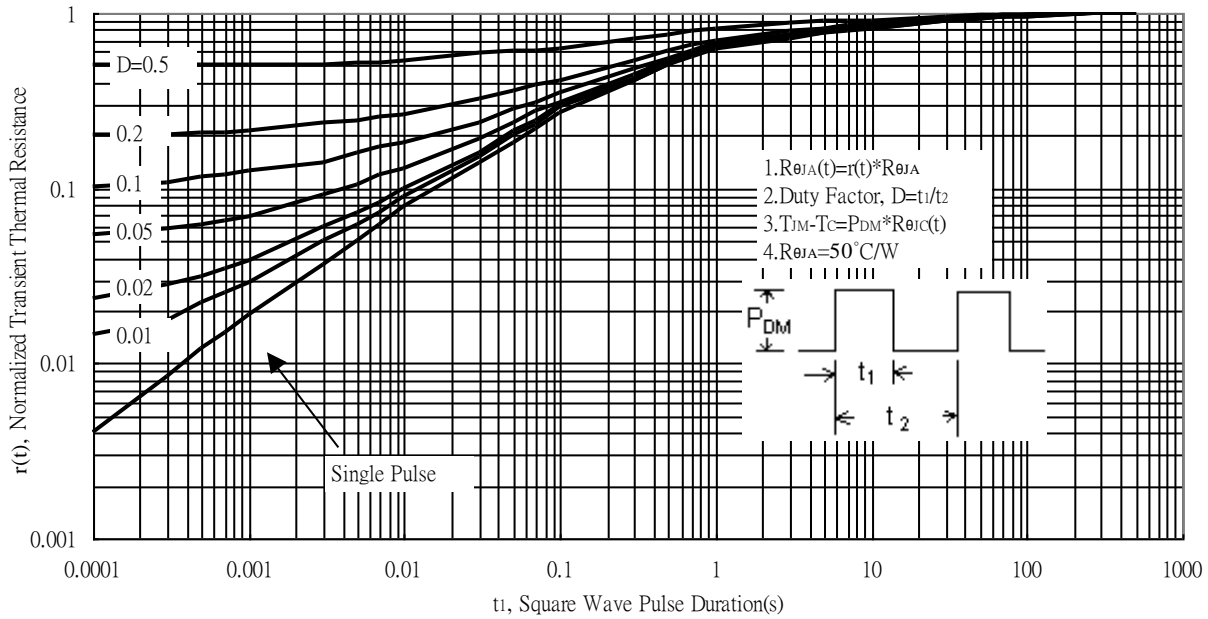
Typical Transfer Characteristics



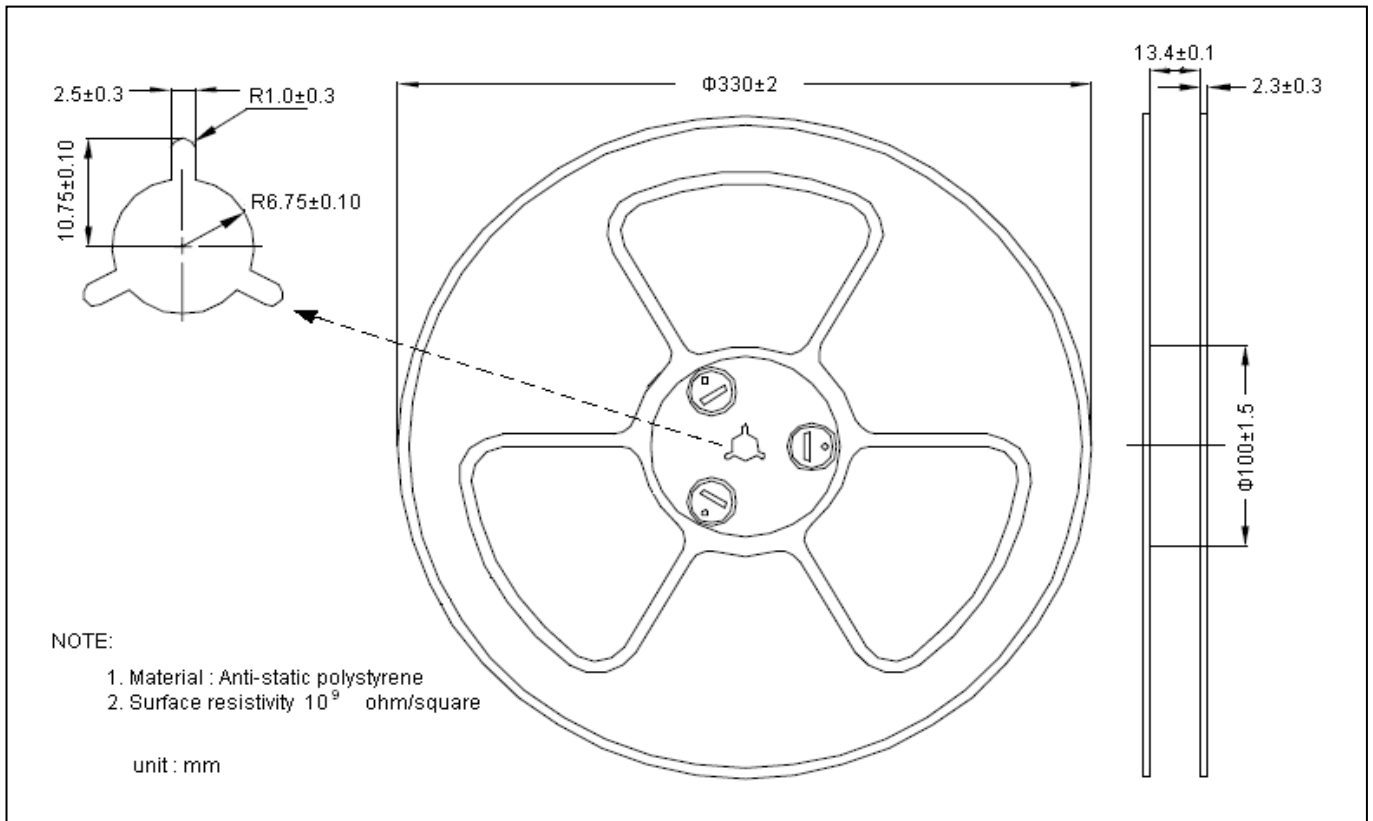
Single Pulse Power Rating, Junction to Ambient
 (Note on page 2)



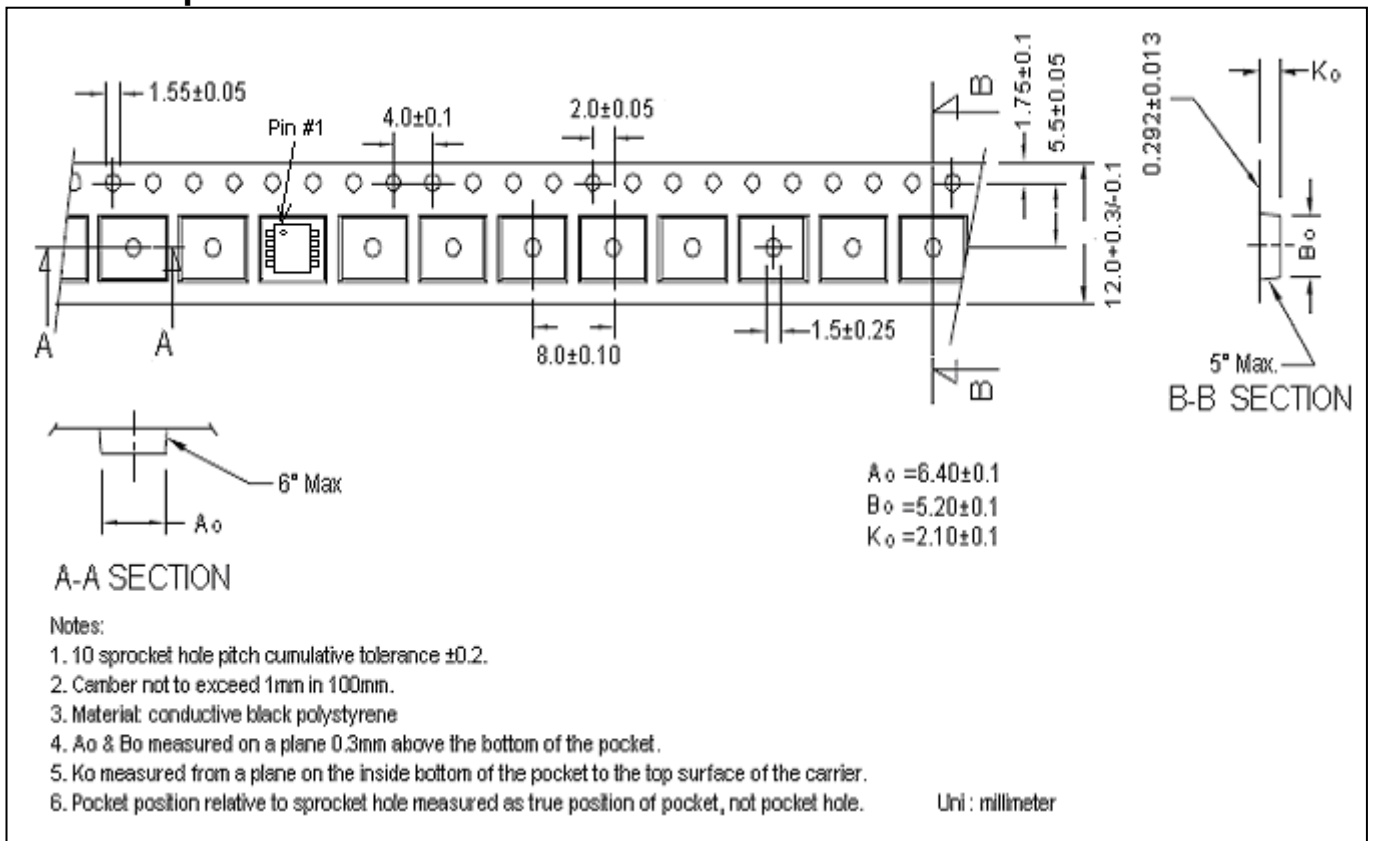
Transient Thermal Response Curves



Reel Dimension



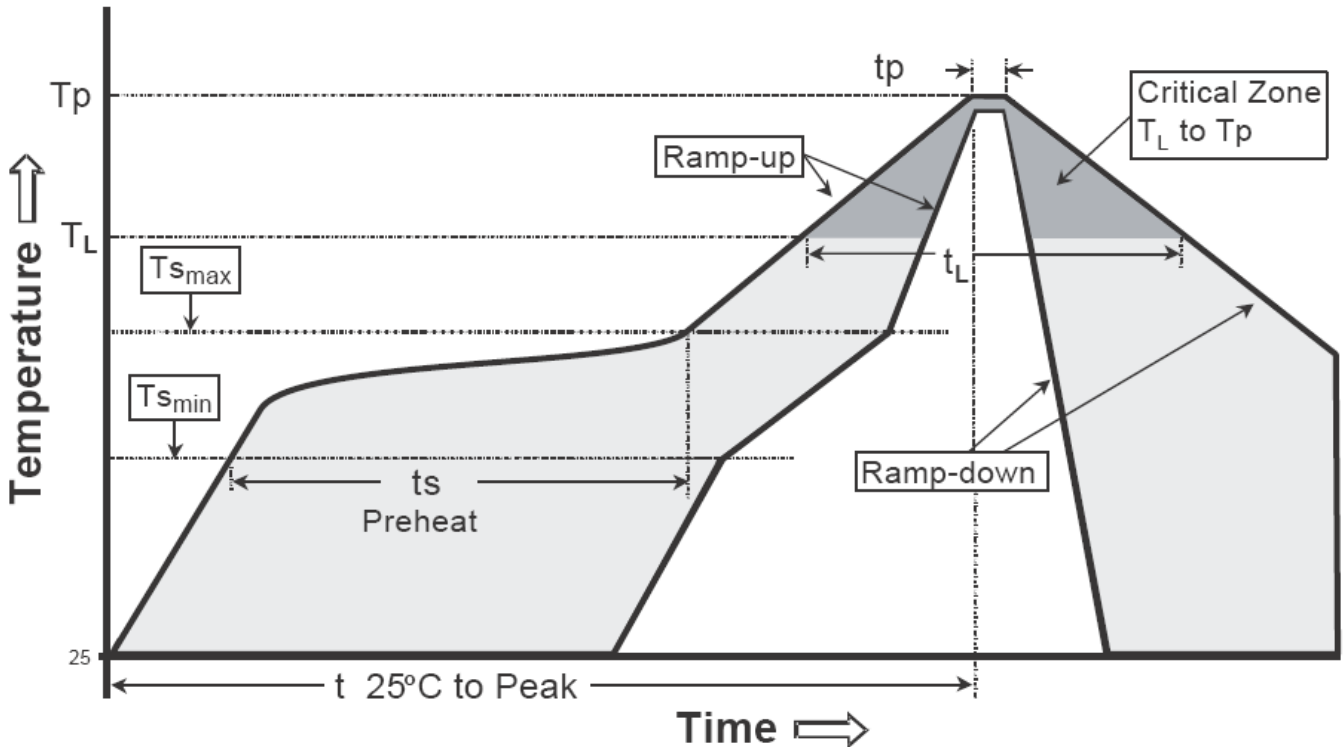
Carrier Tape Dimension



Recommended wave soldering condition

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

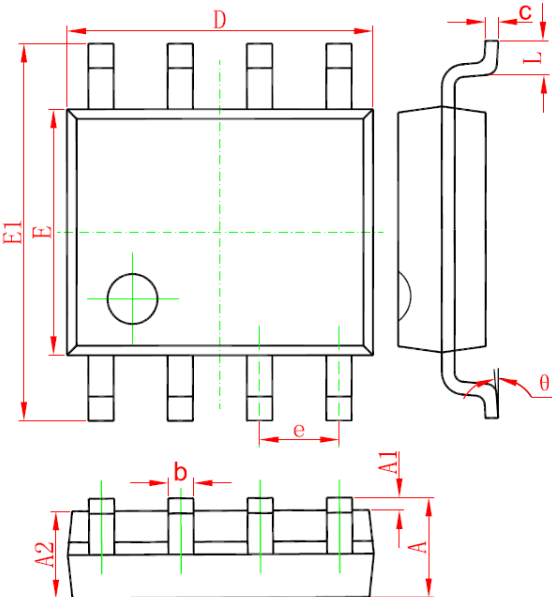
Recommended temperature profile for IR reflow



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

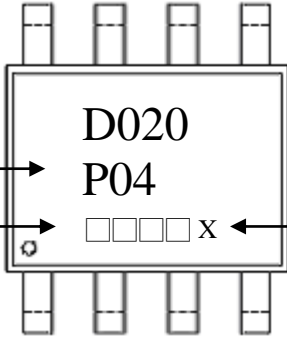
Note :1. All temperatures refer to topside of the package, measured on the package body surface.
 2.For devices mounted on FR-4 PCB of 1.6mm or equivalent grade PCB. If other grade PCB is used, care should be taken to match the coefficients of thermal expansion between components and PCB. If they are 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



The diagram shows three views of an 8-lead SOP-8 package: a top view with dimensions D (width), E (height), and E1 (total height including leads); a side view with dimensions L (lead length), c (lead thickness), and θ (lead angle); and a bottom view with dimensions A (height), A1 (height to lead base), A2 (height to lead tip), and b (lead pitch). The top view also shows a dashed centerline and a circular mark on the left side.

Marking:



The marking diagram shows a top view of the package with the following markings: "D020" in the top right, "P04" in the top left, and four square boxes followed by an "X" in the center. Arrows point from labels to these markings: "Device Code" to "D020", "Date Code" to the square boxes, and "Assembly site code" to the "X".

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→ site 1, G →site 2

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.

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