

P-CHANNEL ENHANCEMENT MODE POWER MOSFET

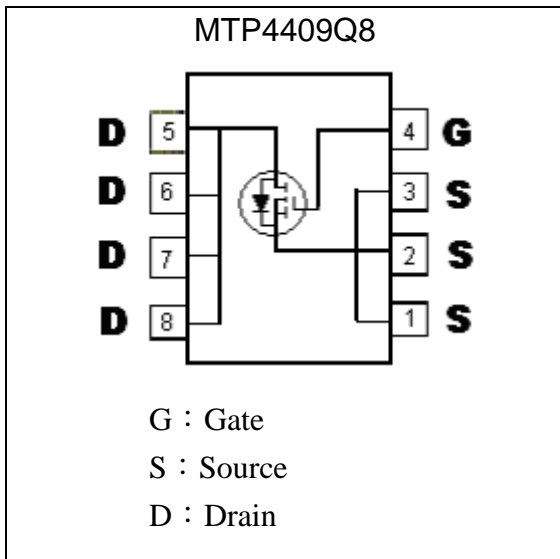
MTP4409Q8

BVDSS	-30V
ID@VGS=-10V, TA=25 °C	-15A
RDSON@VGS=-10V, ID=-15A	6.5mΩ (typ)
RDSON@VGS=-4.5V, ID=-10A	9.9mΩ (typ)

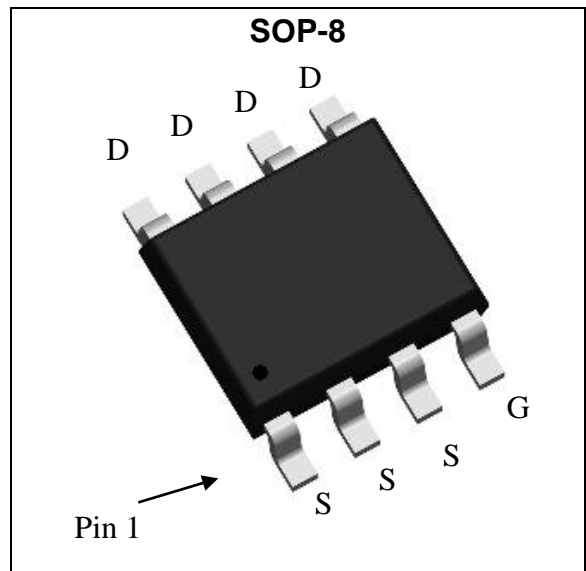
Features

- Simple drive requirement
- Low on-resistance
- Fast switching speed
- Pb-free and Halogen-free package

Equivalent Circuit

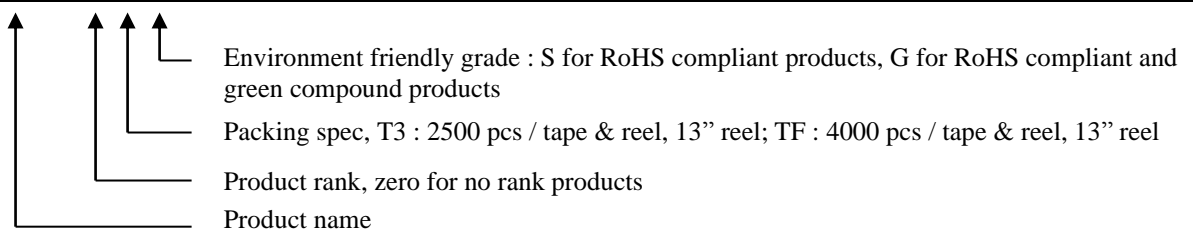


Outline



Ordering Information

Device	Package	Shipping
MTP4409Q8-0-T3-G	SOP-8 (Pb-free lead plating and halogen-free package)	2500 pcs / tape & reel
MTP4409Q8-0-TF-G	SOP-8 (Pb-free lead plating and halogen-free package)	4000 pcs / tape & reel





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

Parameter	Symbol	Limits	Unit	
Drain-Source Breakdown Voltage	BV _{DSS}	-30	V	
Gate-Source Voltage	V _{GS}	±25		
Continuous Drain Current @ V _{GS} =-10V, T _A =25 °C	I _D	-15	A	
Continuous Drain Current @ V _{GS} =-10V, T _A =100 °C		-9.5		
Pulsed Drain Current (Note 1)	I _{DM}	-160		
Avalanche Current @ L=1mH	I _{AS}	-15		
Avalanche Energy @ L=1mH, I _D =-15A, V _{DD} =-15V	E _{AS}	113 (Note3)	mJ	
Power Dissipation (Note 2)	P _D	T _A =25 °C	3.1	W
		T _A =100 °C	1.2	
Operating Junction and Storage Temperature Range	T _j ; T _{stg}	-55~+150	°C	

Note : 1.Pulse width limited by maximum junction temperature.
 2.Surface mounted on 1 in² copper pad of FR-4 board, t≤10s.
 3.100% tested by conditions of L=0.1mH, I_{AS}=-15A, V_{GS}=-10V, V_{DD}=-15V

Electrical Characteristics (T_C=25°C, unless otherwise noted)

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Static					
BV _{DSS}	-30	-	-	V	V _{GS} =0V, I _D =-250μA
V _{GS(th)}	-1	-	-2.5		V _{DS} =V _{GS} , I _D =-250μA
I _{GSS}	-	-	±100	nA	V _{GS} =±25V, V _{DS} =0V
I _{DSS}	-	-	-1	μA	V _{DS} =-24V, V _{GS} =0V
	-	-	-10		V _{DS} =-20V, V _{GS} =0V, T _j =125°C
R _{DS(ON)} (Note 1)	-	6.5	9	mΩ	I _D =-15A, V _{GS} =-10V
	-	9.9	15		I _D =-10A, V _{GS} =-4.5V
G _{FS} (Note 1)	-	28	-	S	V _{DS} =-10V, I _D =-15A
Dynamic					
C _{iss}	-	2782	-	pF	V _{DS} =-15V, V _{GS} =0V, f=1MHz
C _{oss}	-	371	-		
C _{rss}	-	235	-		
t _{d(ON)} (Note 1&2)	-	12.8	-	ns	V _{DS} =-15V, I _D =-15A, V _{GS} =-10V, R _G =3Ω
t _r (Note 1&2)	-	19.8	-		
t _{d(OFF)} (Note 1&2)	-	110.2	-		
t _f (Note 1&2)	-	49.6	-		
Q _g (V _{GS} =10V) (Note 1&2)	-	53.8	-	nC	V _{DS} =-15V, I _D =-15A, V _{GS} =-10V
Q _g (V _{GS} =4.5V) (Note 1&2)	-	27	-		
Q _{gs} (Note 1&2)	-	9	-		
Q _{gd} (Note 1&2)	-	11	-		
R _g	-	13.5	-	Ω	f=1MHz

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

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Source-Drain Diode					
I _S	-	-	-10	A	
I _{SM} (Note 3)	-	-	-40		
V _{SD} (Note 1)	-	-0.8	-1.2	V	I _F =I _S , V _{GS} =0V
trr	-	16.6	-	ns	I _F =-10A, dI _F /dt=100A/μs
Qrr	-	8.3	-	nC	

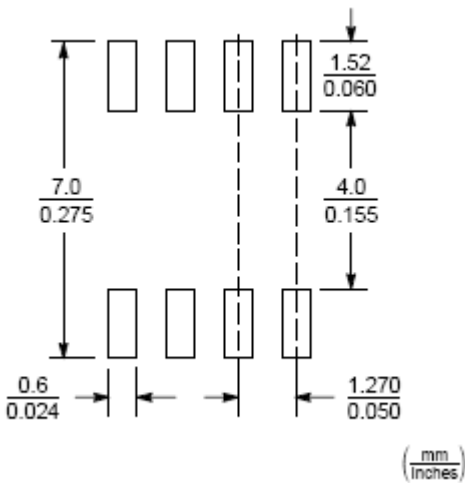
Note : 1.Pulse Test : Pulse Width ≤300μs, Duty Cycle≤2%
 2.Independent of operating temperature
 3.Pulse width limited by maximum junction temperature

Thermal Resistance Ratings

Thermal Resistance	Symbol	Typical	Maximum	Unit
Junction-to-Case	R _{θJC}	22	25	°C / W
Junction-to-Ambient (Note)	R _{θJA}	33	40	

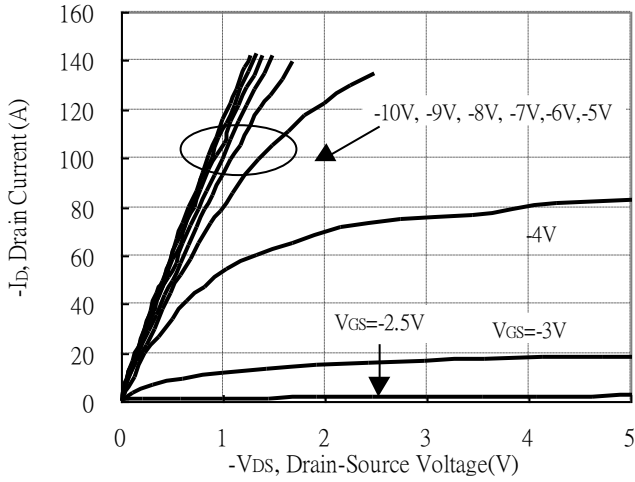
Note : W when mounted on a 1 in² pad of 2 oz copper, t≤10s; 125°C/W when mounted on minimum copper pad.

Recommended Soldering Footprint

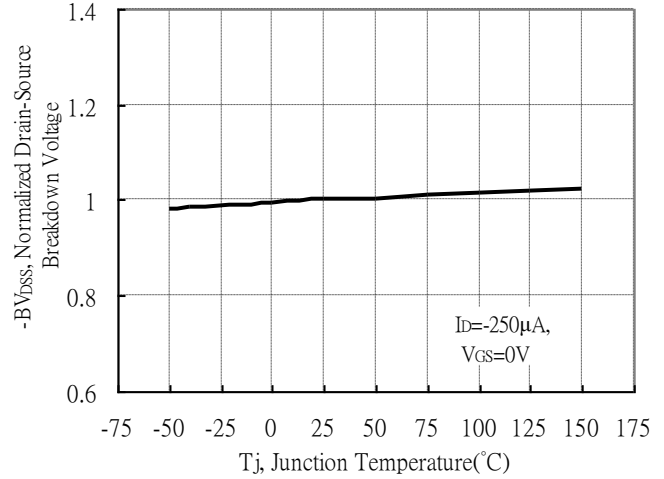


Typical Characteristics

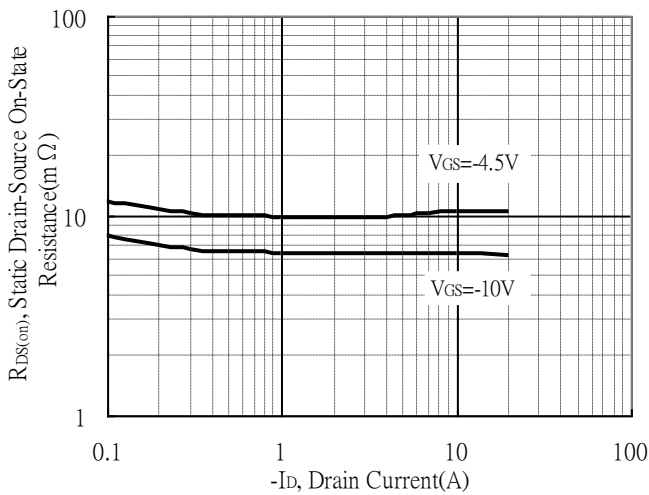
Typical Output Characteristics



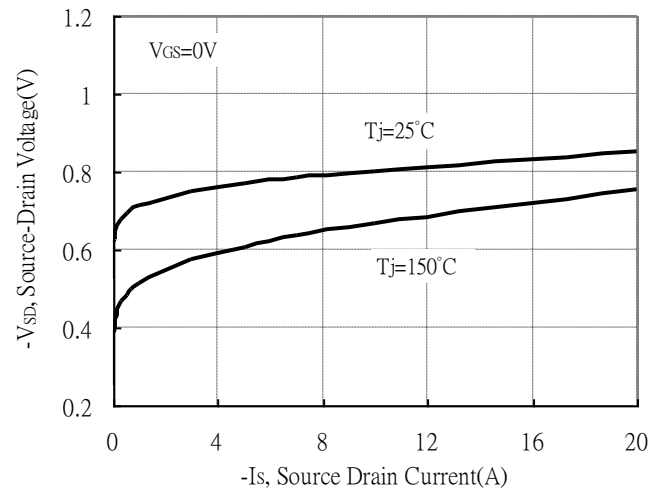
Normalized Brekdown Voltage vs Ambient Temperature



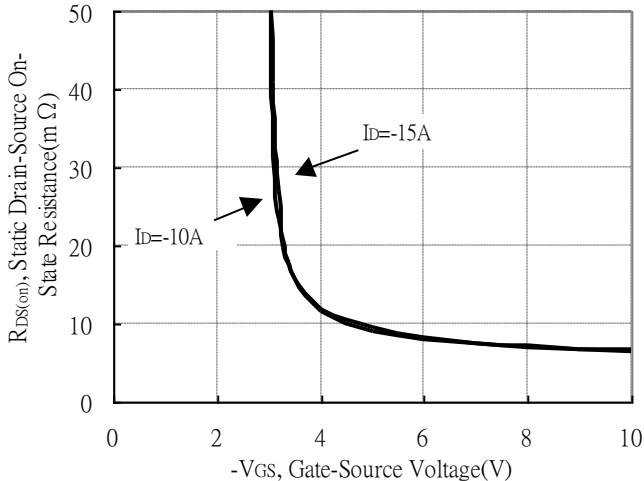
Static Drain-Source On-State resistance vs Drain Current



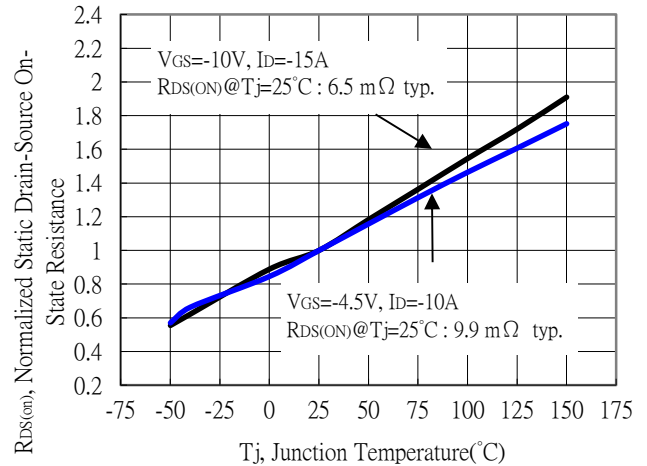
Source Drain Current vs Source-Drain Voltage



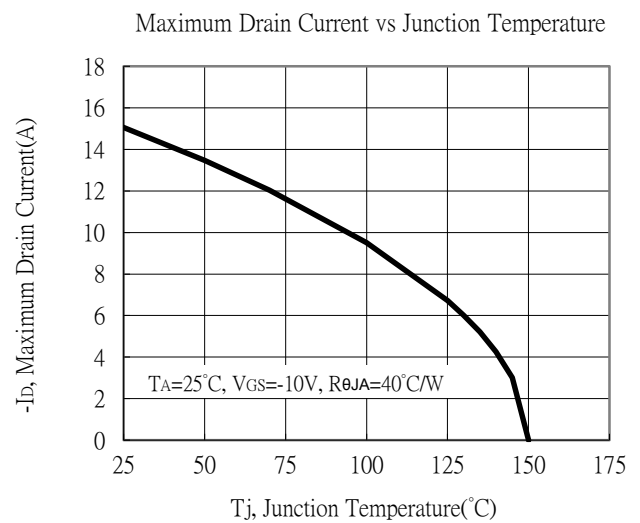
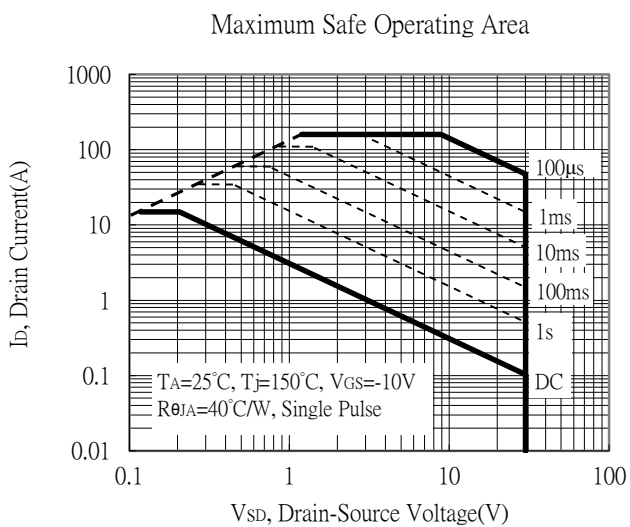
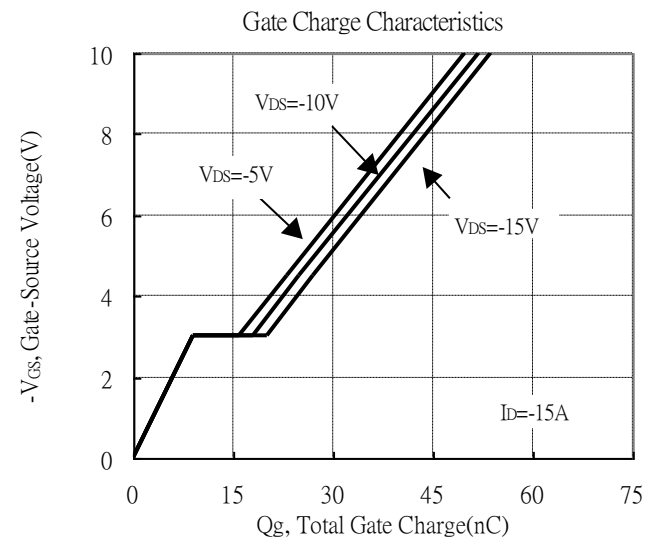
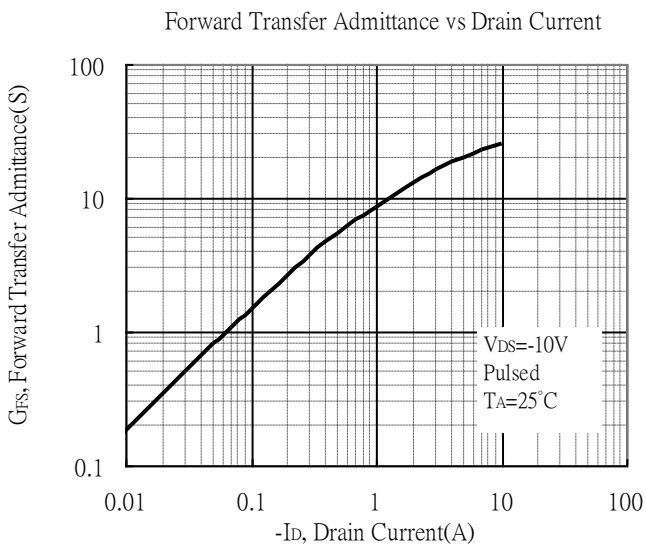
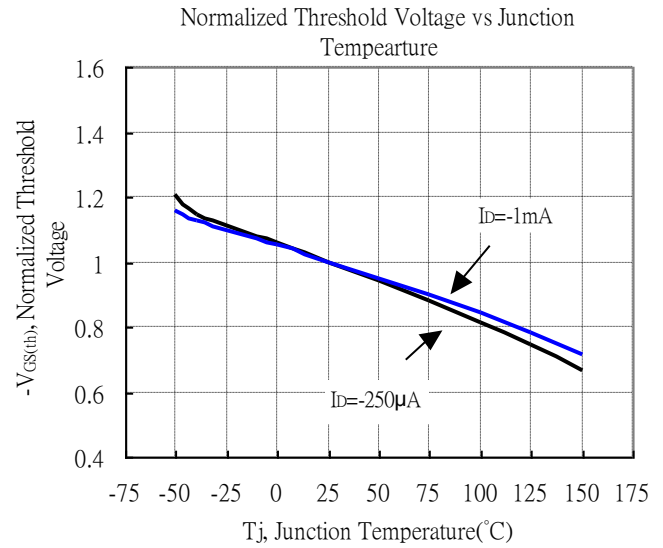
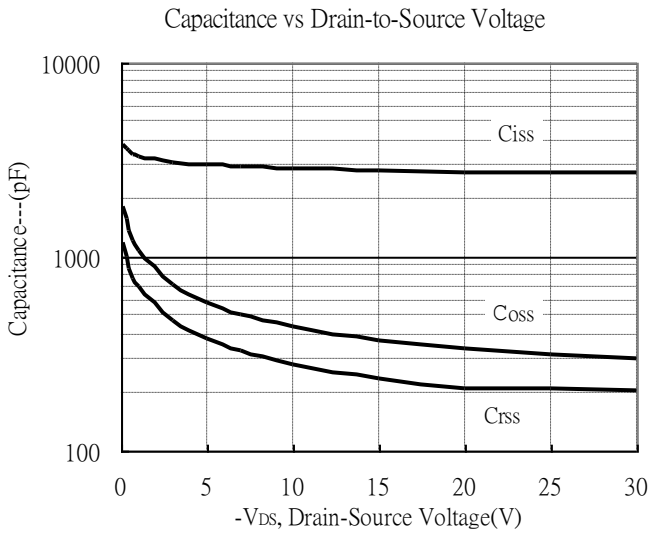
Static Drain-Source On-State Resistance vs Gate-Source Voltage



Normalized Drain-Source On-State Resistance vs Junction Temperature

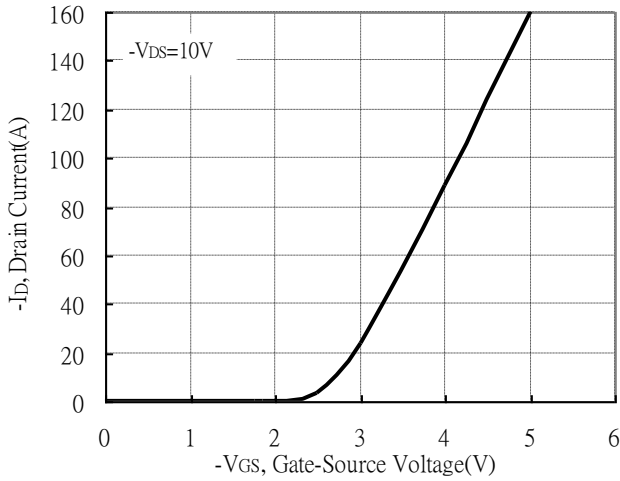


Typical Characteristics(Cont.)

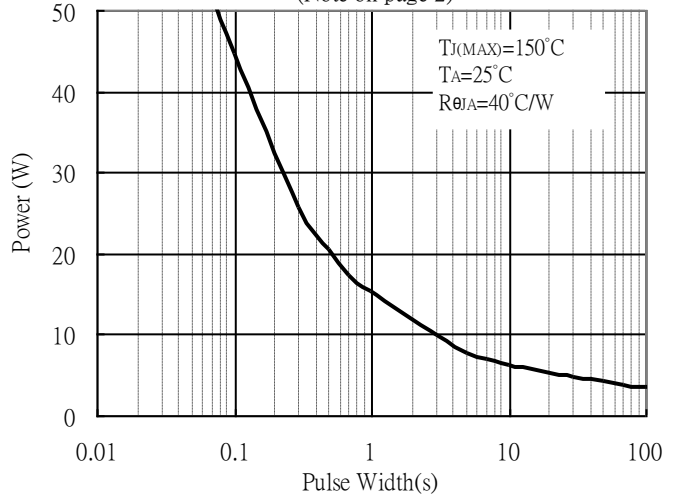


Typical Characteristics(Cont.)

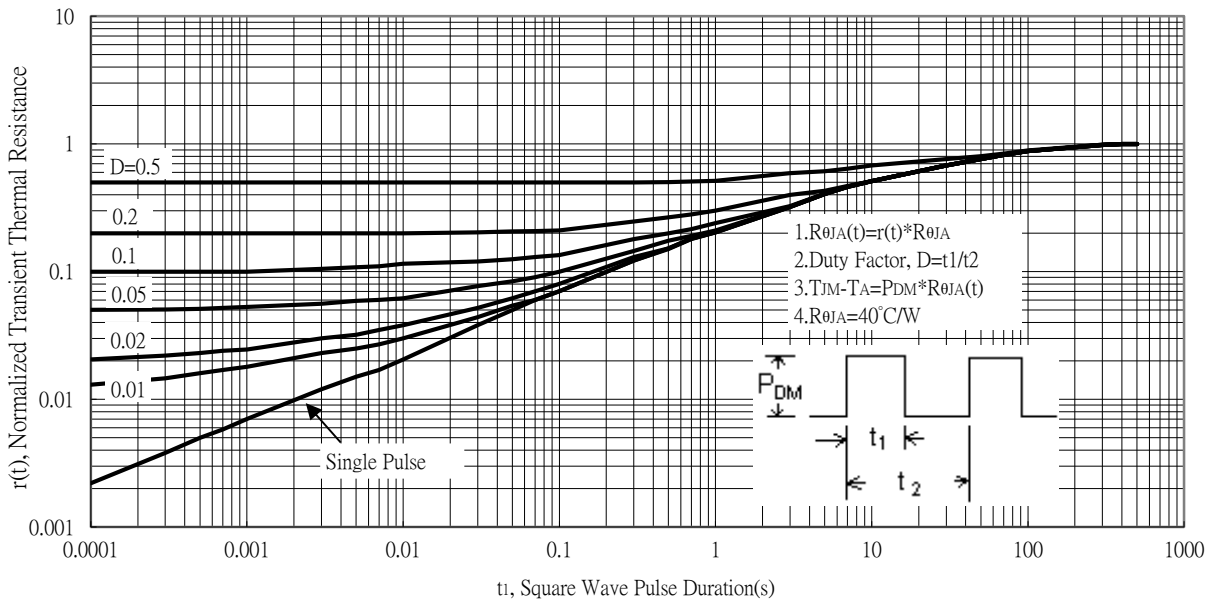
Typical Transfer Characteristics



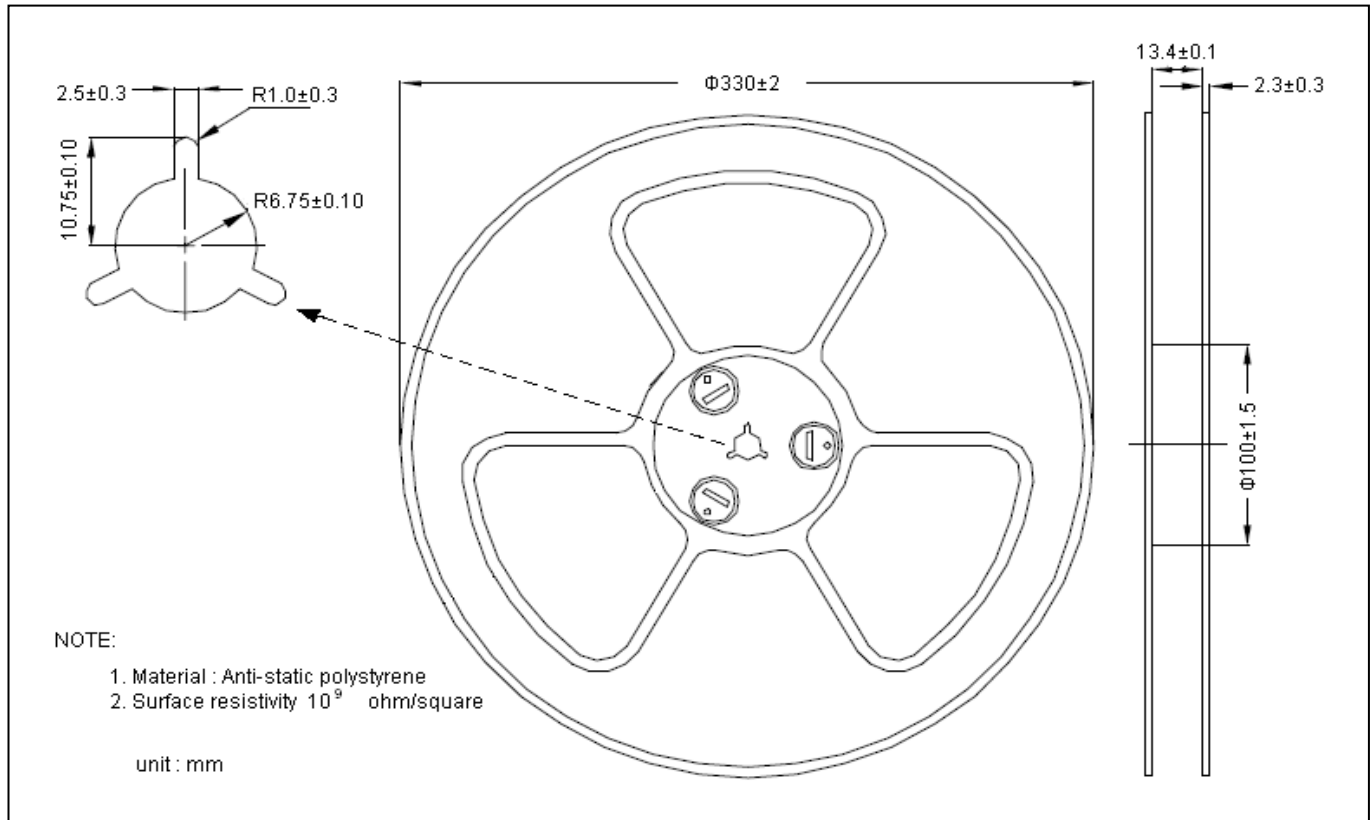
Single Pulse Power Rating, Junction to Ambient
 (Note on page 2)



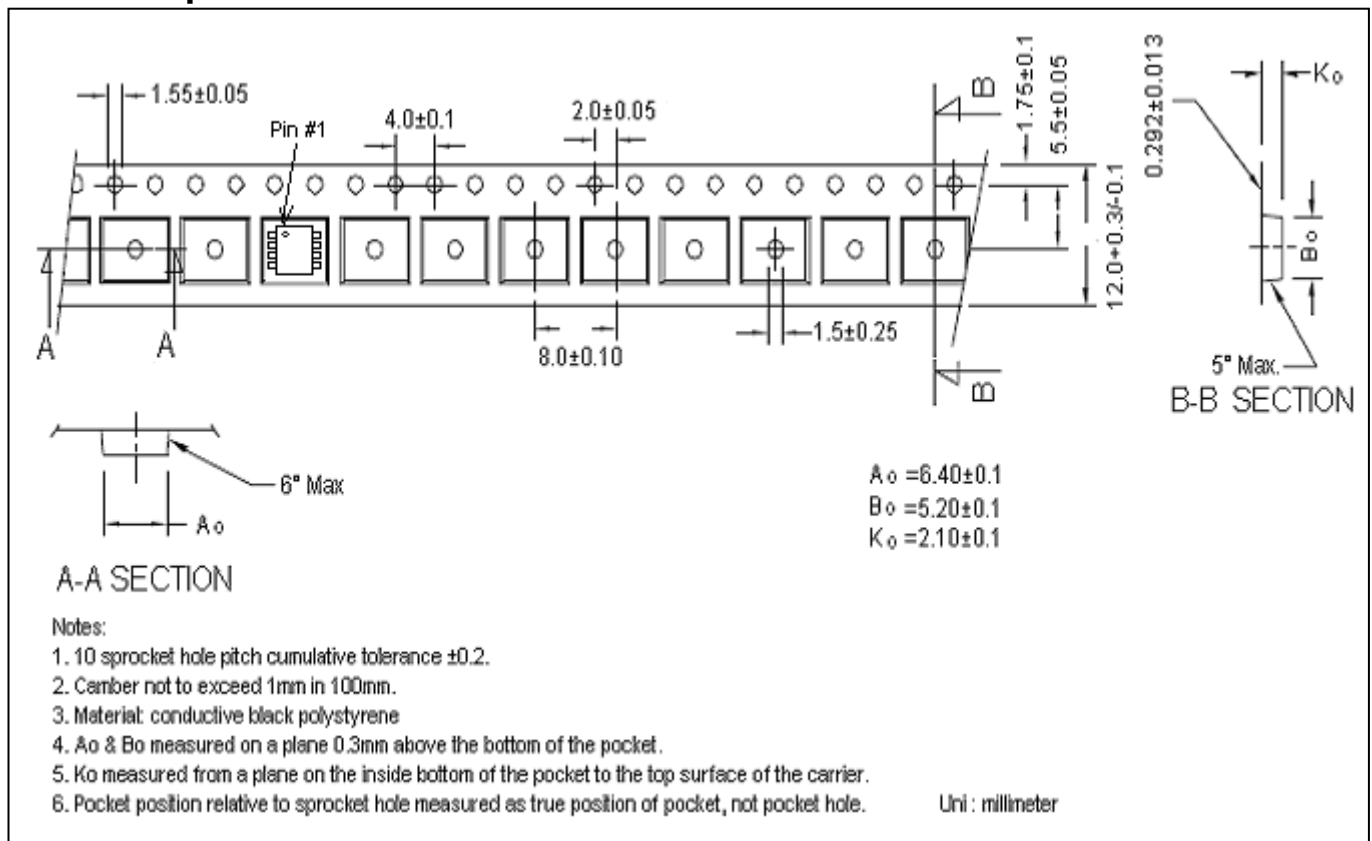
Transient Thermal Response Curves



Reel Dimension



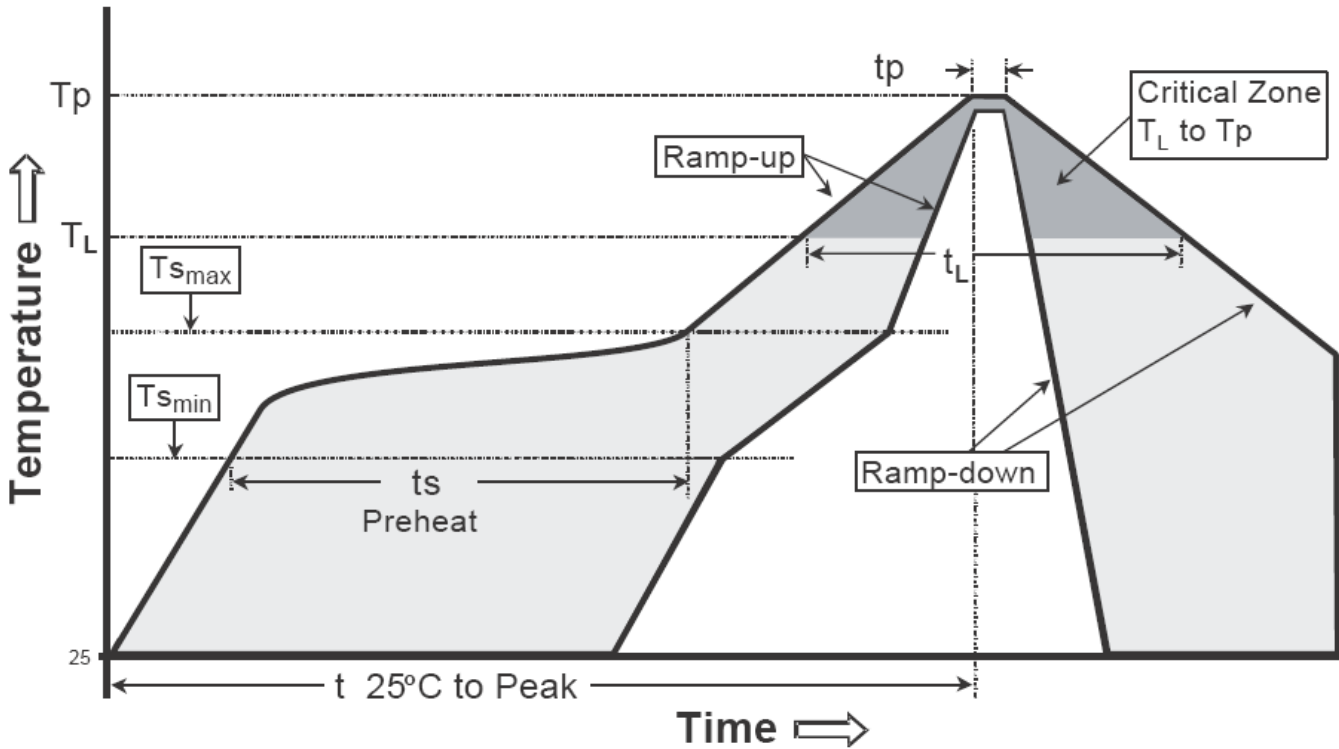
Carrier Tape Dimension



Recommended wave soldering condition

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

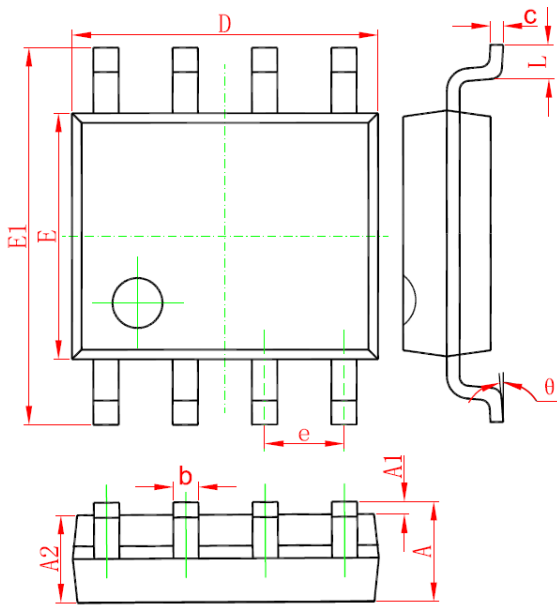
Recommended temperature profile for IR reflow



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

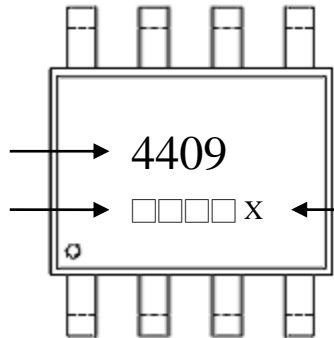
Note :1. All temperatures refer to topside of the package, measured on the package body surface.
 2.For devices mounted on FR-4 PCB of 1.6mm or equivalent grade PCB. If other grade PCB is used, care should be taken to match the coefficients of thermal expansion between components and PCB. If they are 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 the SOP-8 package: a top view with dimensions D, E, E1, and e; a side view with dimensions L, c, and angle θ; and a bottom view with dimensions A, A1, A2, and b.

Marking:



Device Code → 4409
 Date Code → □□□□ X ← Assembly site code

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→ site 1, G →site 2

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

DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	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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