N-Channel Enhancement Mode Power MOSFET

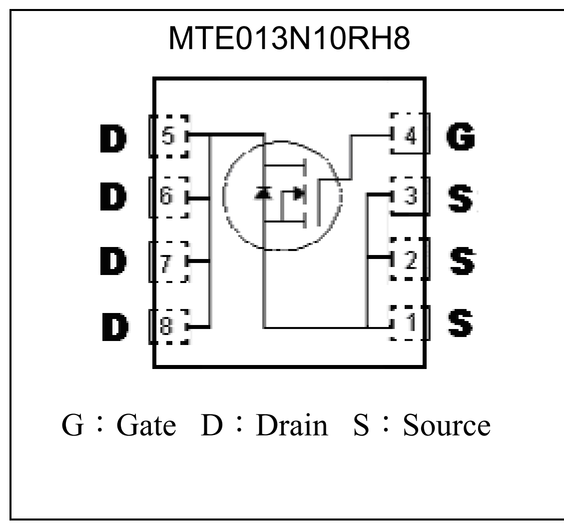
MTE013N10RH8

BV_{DSS}		100V
I_D@V_{GS}=10V, T_C=25°C		39A
I_D@V_{GS}=10V, T_A=25°C		13.1A
$R_{DSON(TYP)}$	V_{GS}=10V, I_D=15A	12mΩ

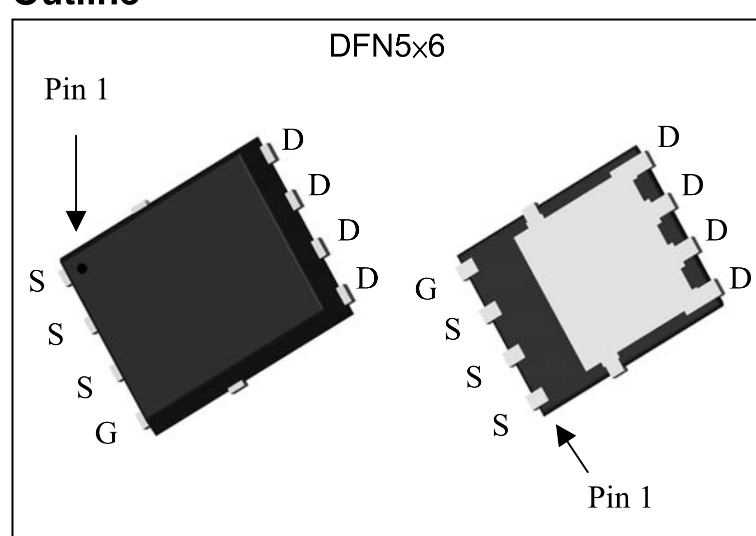
Features

- Single Drive Requirement
- Low On-resistance
- Fast Switching Characteristic
- Repetitive Avalanche Rated
- Pb-free lead plating and Halogen-free package

Symbol



Outline



Ordering Information

Device	Package	Shipping
MTE013N10RH8-0-T6-G	DFN 5 ×6 (Pb-free lead plating and halogen-free package)	3000 pcs / tape & reel

- Environment friendly grade : S for RoHS compliant products, G for RoHS compliant and green compound products
- Packing spec, T6 : 3000 pcs / tape & reel,13" reel
- Product rank, zero for no rank products
- Product name

Absolute Maximum Ratings (Ta=25°C)

Parameter		Symbol	10s	Steady State	Unit
Drain-Source Voltage		V_{DS}	100		V
Gate-Source Voltage		V_{GS}	±20		V
Continuous Drain Current @ T_C=25°C, V_{GS}=10V (Note 1)		I_D	39		A
Continuous Drain Current @ T_C=100°C, V_{GS}=10V (Note 1)		I_D	24.7		A
Continuous Drain Current @ T_A=25°C, V_{GS}=10V (Note 2)		I_{DSM}	13.1	8.7	A
Continuous Drain Current @ T_A=70°C, V_{GS}=10V (Note 2)		I_{DSM}	10.5	7.0	A
Continuous Drain Current @ T_A=85°C, V_{GS}=10V (Note 2)		I_{DSM}	9.4	6.3	A
Pulsed Drain Current (Note 3)		I_{DM}	156 *1		A
Avalanche Current @ L=0.1mH (Note 3)		I_{AS}	39		A
Avalanche Energy @ L=1mH, I_D=26A, V_{DD}=50V (Note 4)		E_{AS}	338		mJ
Repetitive Avalanche Energy @ L=0.05mH (Note 3)		E_{AR}	5 *2		mJ
Total Power Dissipation	T_C=25℃ (Note 1)	P_D	50		W
	T_C=100℃ (Note 1)	P_D	20		W
	T_A=25°C (Note 2)	P_{DSM}	5.7	2.5	W
	T_A=70°C (Note 2)	P_{DSM}	4.0	1.8	W
	T_A=85°C (Note 2)	P_{DSM}	3.6	1.6	W
Operating Junction and Storage Temperature Range		Tj, Tstg	-55~+150		°C

Thermal Data

Parameter		Symbol	Typical	Maximum	Unit
Thermal Resistance, Junction-to-ambient (Note 2)	t≤10s	$R_{\theta JA}$	18	22	°C/W
	Steady State	$R_{\theta JA}$	42	50	°C/W
Thermal Resistance, Junction-to-case		$R_{\theta JC}$	2.2	2.5	°C/W

Note : 1.The power dissipation P_D is based on $T_{J(MAX)}$=150°C, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.

2.The value of $R_{\theta JA}$ is measured with the device mounted on 1 in^2 FR-4 board with 2 oz. copper, in a still air environment with T_A=25°C. The power dissipation P_{DSM} is based on $R_{\theta JA}$ and the maximum allowed junction temperature of 150°C. The value in any given application depends on the user's specific board design.

3.Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}$=150°C. Ratings are based on low frequency and low duty cycles to keep initial T_J=25°C.

4.100% tested by conditions of L=2mH, I_{AS}=10A, V_{GS}=10V, V_{DD}=25V

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

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Static					
BV_{DSS}	100	-	-	V	V_{GS}=0V, I_D=250μA
$V_{GS(th)}$	2	-	4	V	V_{DS} = V_{GS}, I_D=250μA
G_{FS} *1	-	18.3	-	S	V_{DS} =10V, I_D=20A
I_{GSS}	-	-	±100	nA	V_{GS}=±20V
I_{DSS}	-	-	1	μA	V_{DS} =80V, V_{GS} =0V
	-	-	25		V_{DS} =80V, V_{GS} =0V, Tj=125°C
$R_{DS(ON)}$ *1	-	12	16	mΩ	V_{GS} =10V, I_D=15A
Dynamic					
Ciss	-	2269	-	pF	V_{GS}=0V, V_{DS}=50V, f=1MHz
Coss	-	181	-		
Crss	-	15	-		
Qg *1, 2	-	37.8	-	nC	V_{DS}=80V, V_{GS}=10V, I_D=15A
Qgs *1, 2	-	12.7	-		
Qgd *1, 2	-	9.1	-		
$t_{d(ON)}$ *1, 2	-	25.2	-	ns	V_{DD}=50V, I_D=15A, V_{GS}=10V, R_G=1Ω
tr *1, 2	-	17.4	-		
$t_{d(OFF)}$ *1, 2	-	39.6	-		
t_f *1, 2	-	8	-		
Rg	-	2.9	-	Ω	f=1MHz
Source-Drain Diode					
I_S *1	-	-	39	A	
I_{SM} *3	-	-	156		
V_{SD} *1	-	0.83	1.2	V	I_S=15A, V_{GS}=0V
trr	-	34	-	ns	I_F=15A, dI_F/dt=100A/μs
Qrr	-	53	-	nC	

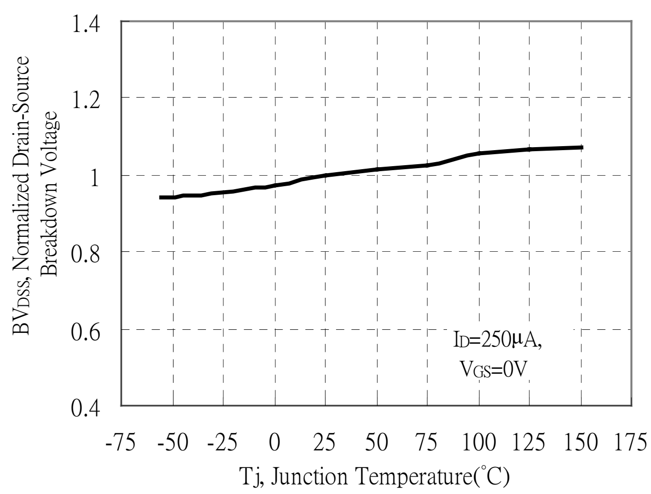
Note : *1.Pulse Test : Pulse Width ≤300μs, Duty Cycle≤2%
*2.Independent of operating temperature
*3.Pulse width limited by maximum junction temperature.

Typical Characteristics

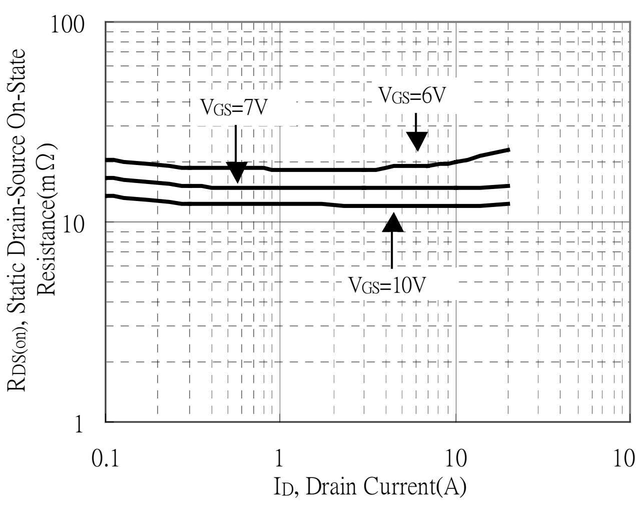
Typical Output Characteristics

50
40
30
20
10
0
0 2 4 6 8 10
I_D, Drain Current (A)
V_{DS}, Drain-Source Voltage(V)
10V, 9V, 8V,7V,6.5V
6V
5.5V
5V
V_{GS}=4.5V

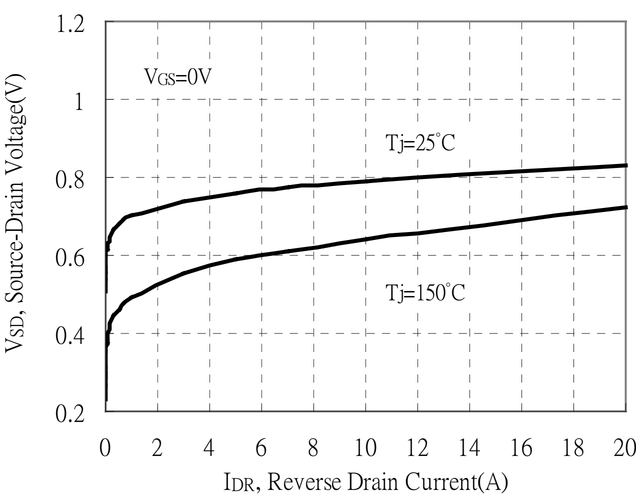
Brekdown Voltage vs Ambient Temperature



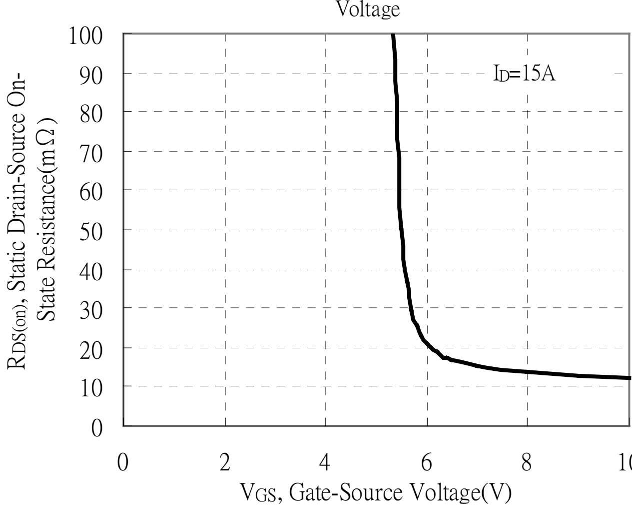
Static Drain-Source On-State resistance vs Drain Current



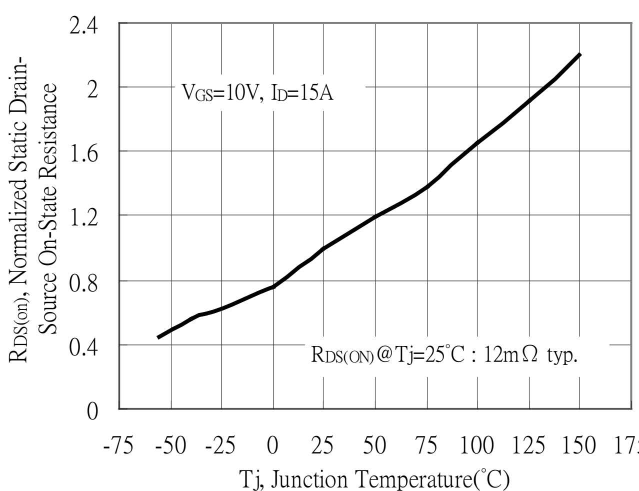
Reverse Drain Current vs Source-Drain Voltage



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



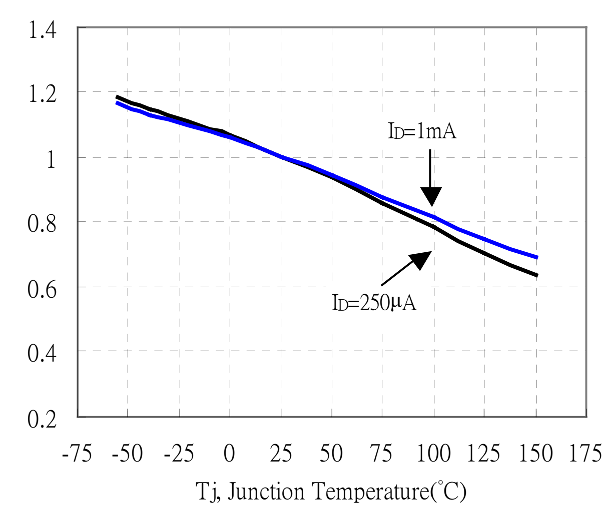
Drain-Source On-State Resistance vs Junction Tempearture

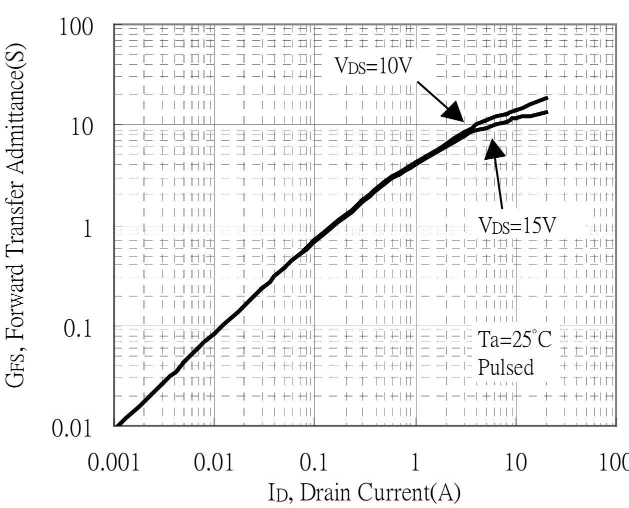


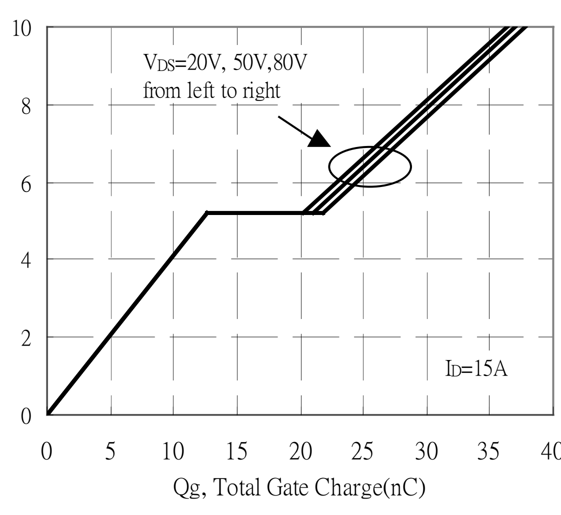
Typical Characteristics(Cont.)

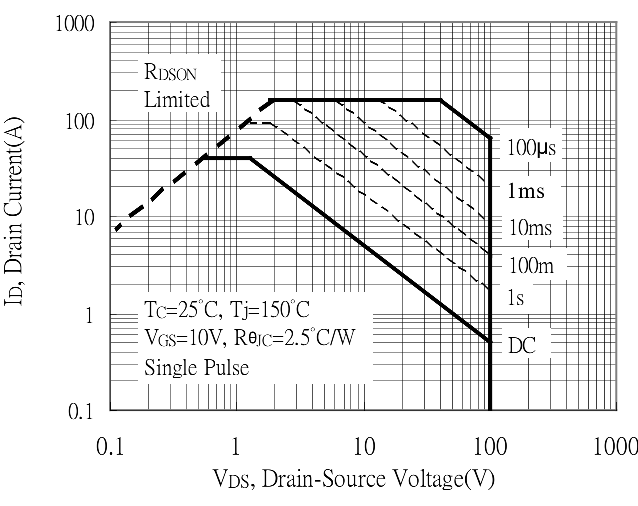
Capacitance vs Drain-to-Source Voltage

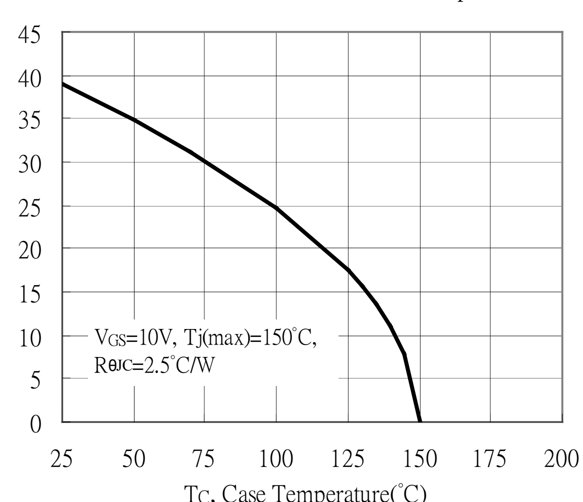
Ciss
Coss
Crss
Capacitance---(pF)
VDS, Drain-Source Voltage(V)



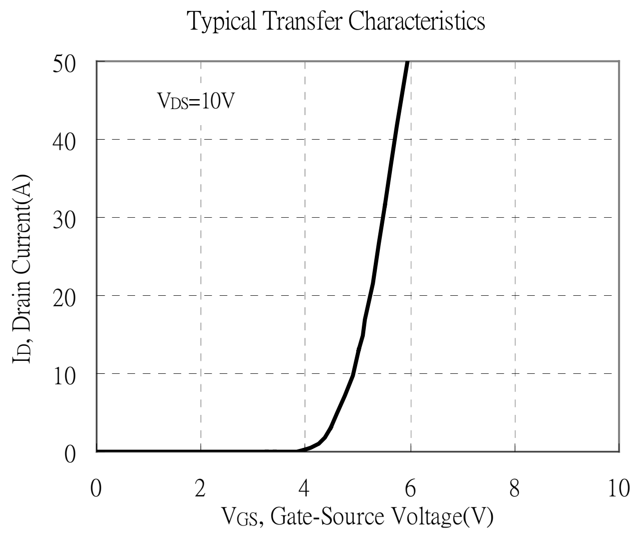


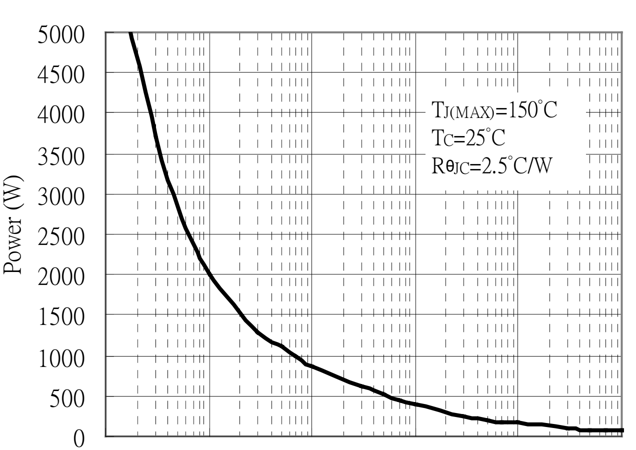






Typical Characteristics(Cont.)





Transient Thermal Response Curves

r(t), Normalized Effective Transient Thermal Resistance

1
0.1
0.01
0.001

D=0.5
0.2
0.1
0.05
0.02
0.01
Single Pulse

1.RθJC(t)=r(t)*RθJC
2.Duty Factor, D=t1/t2
3.TJM-TC=PDM*RθJC(t)
4.RθJC=2.5°C/W

PDM
t1
t2

1.E-04
1.E-03
1.E-02
1.E-01
1.E+00
1.E+01
1.E+02
1.E+03

t1, Square Wave Pulse Duration(s)

Recommended Soldering Footprint & Stencil Design

4.7
4.2
0.9
(3)
0.6
(4)
0.25
(2)
0.25
(2)
0.6
(3)
0.25
(2)
SR opening =
Cu + 0.075
SP opening =
Cu – 0.050
3.45
3.5
2.55
2
1.1
2.15
3.3
1.27
0.7
(4)
3.81

solder lands

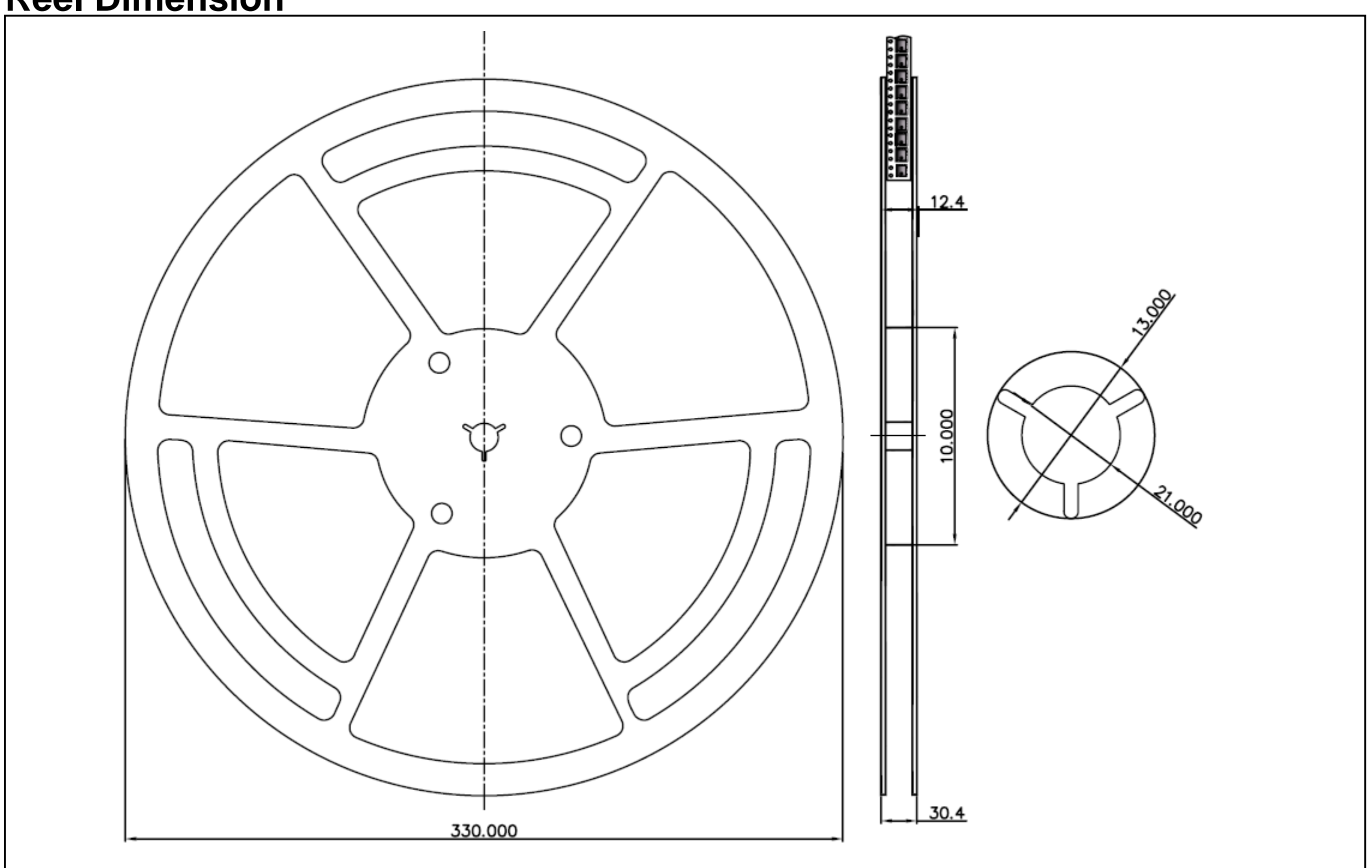
solder paste
125 μm stencil

solder resist

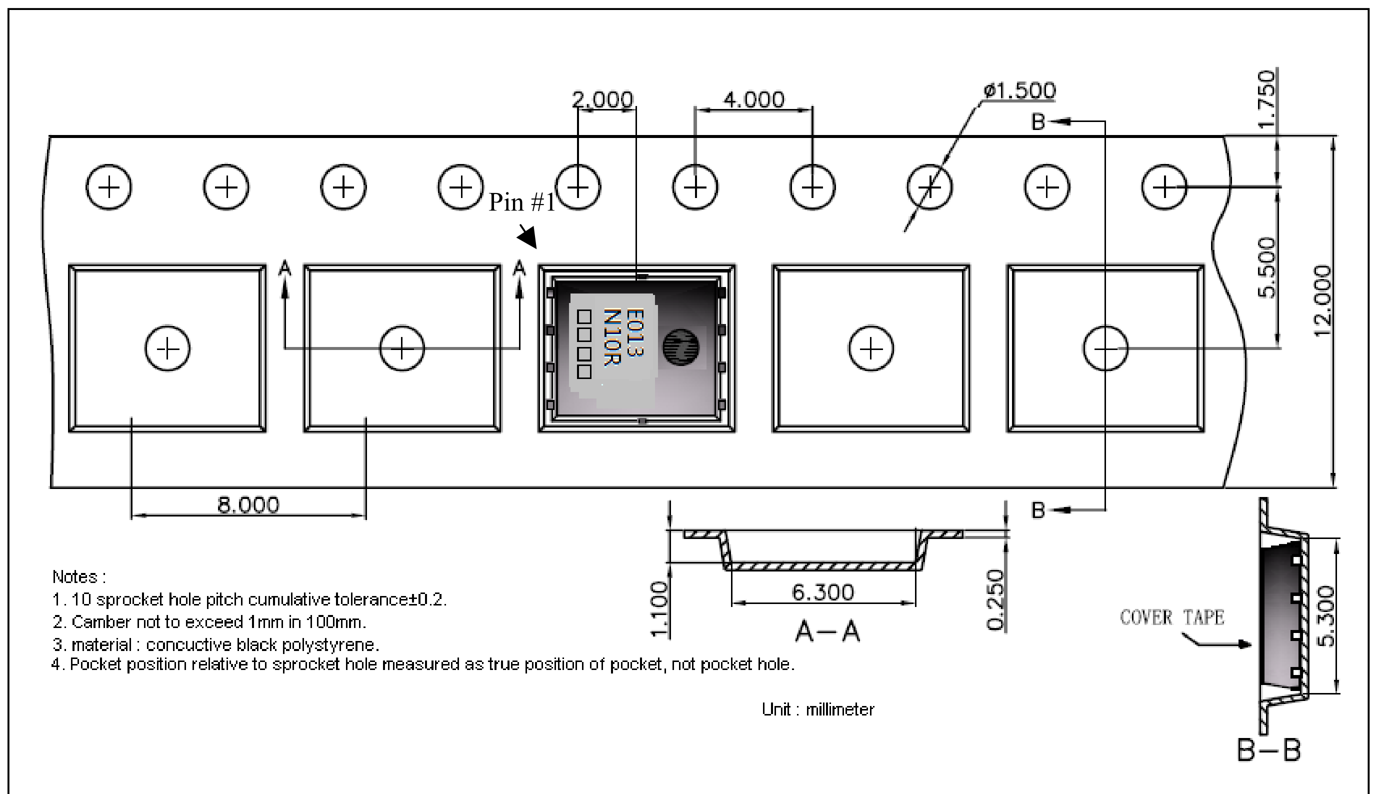
occupied area

unit : mm

Reel Dimension



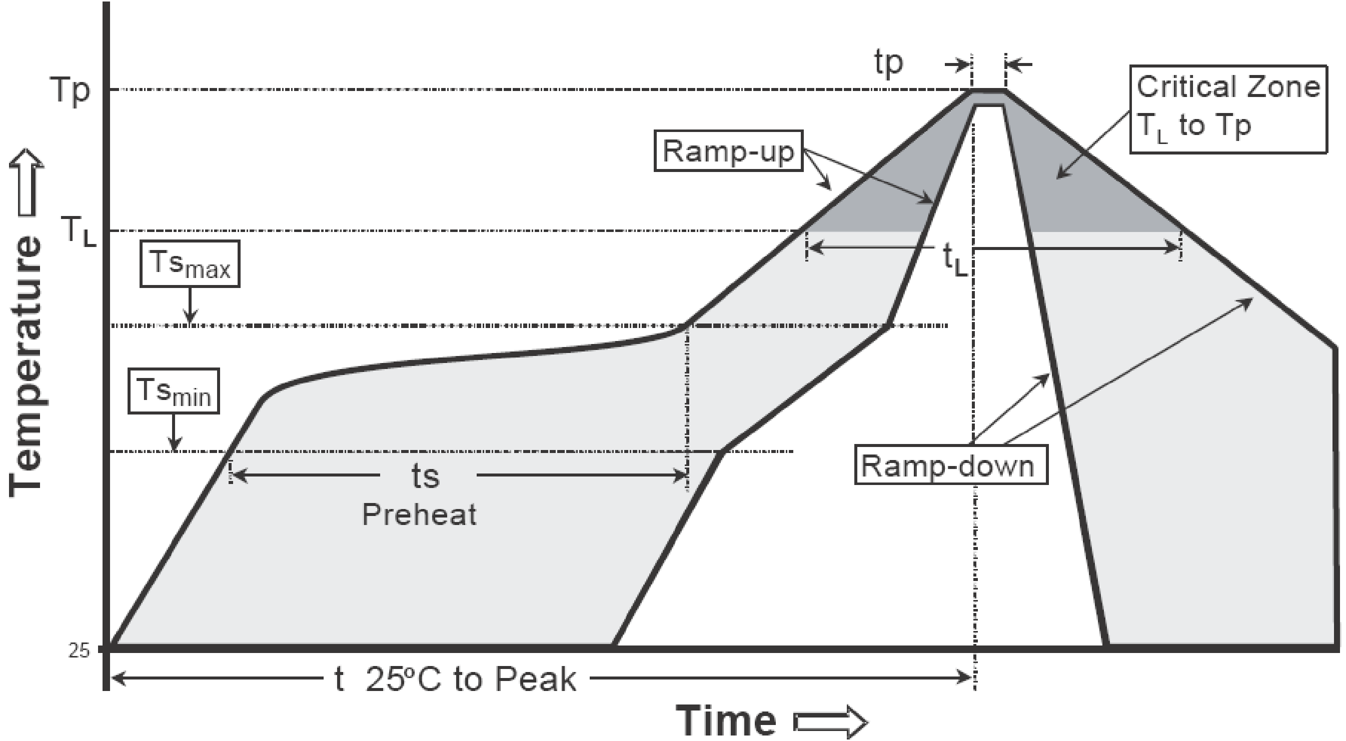
Carrier Tape Dimension



Recommended wave soldering condition

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

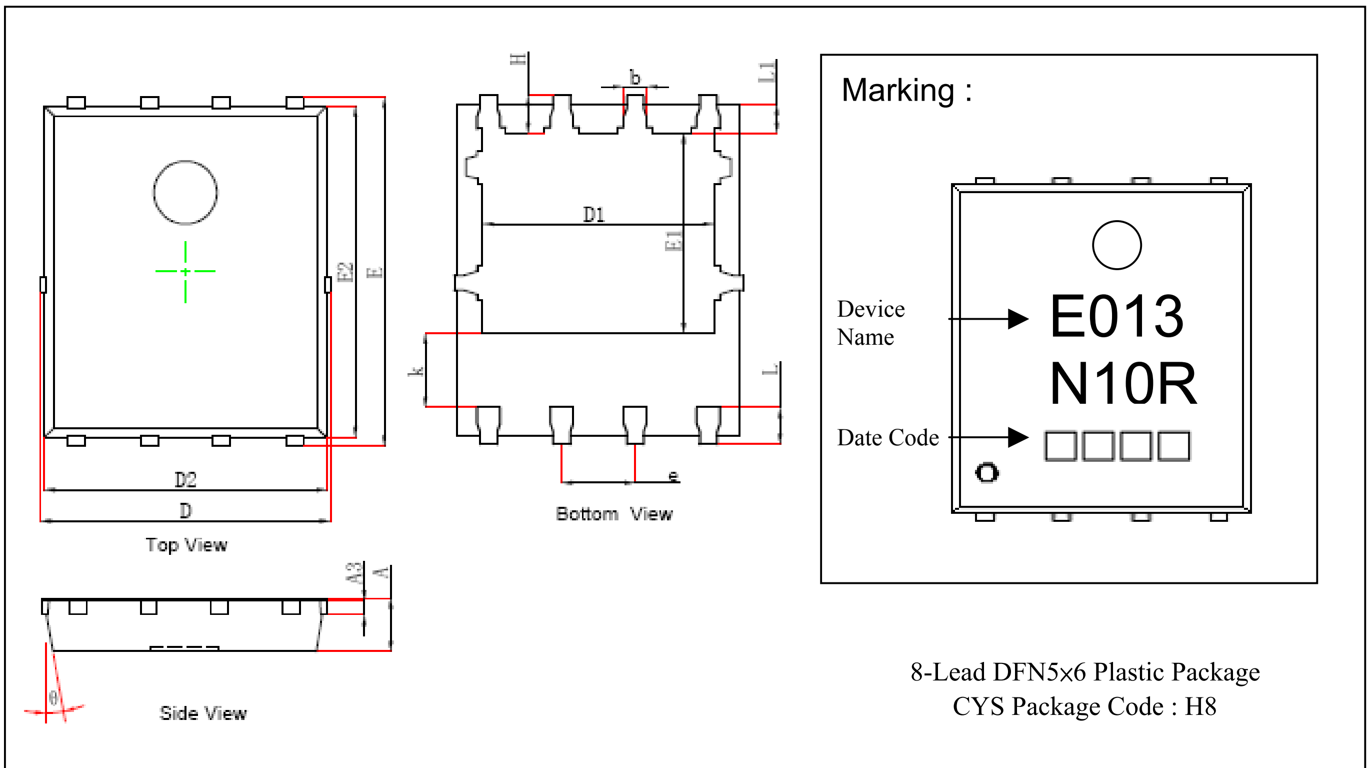
Recommended temperature profile for IR reflow



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) −Temperature Max(Ts max) −Time(ts min to ts max)	 100°C 150°C 60-120 seconds	 150°C 200°C 60-180 seconds
Time maintained above: −Temperature (TL) − Time (tL)	 183°C 60-150 seconds	 217°C 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.

DFN5×6 Dimension



8-Lead DFN5x6 Plastic Package
CYS Package Code : H8

<table>
<tr><td rowspan="2">DIM</td><td colspan="2">Millimeters</td><td colspan="2">Inches</td><td rowspan="2">DIM</td><td colspan="2">Millimeters</td><td colspan="2">Inches</td></tr>
<tr><td>Min.</td><td>Max.</td><td>Min.</td><td>Max.</td><td>Min.</td><td>Max.</td><td>Min.</td><td>Max.</td></tr>
<tr><td>A</td><td>0.900</td><td>1.000</td><td>0.035</td><td>0.039</td><td>k</td><td>1.190</td><td>1.390</td><td>0.047</td><td>0.055</td></tr>
<tr><td>A3</td><td colspan="2">0.254 REF</td><td colspan="2">0.010 REF</td><td>b</td><td>0.350</td><td>0.450</td><td>0.014</td><td>0.018</td></tr>
<tr><td>D</td><td>4.944</td><td>5.096</td><td>0.195</td><td>0.201</td><td>e</td><td colspan="2">1.270 TYP.</td><td colspan="2">0.050 TYP.</td></tr>
<tr><td>E</td><td>5.974</td><td>6.126</td><td>0.235</td><td>0.241</td><td>L</td><td>0.559</td><td>0.711</td><td>0.022</td><td>0.028</td></tr>
<tr><td>D1</td><td>3.910</td><td>4.110</td><td>0.154</td><td>0.162</td><td>L1</td><td>0.424</td><td>0.576</td><td>0.017</td><td>0.023</td></tr>
<tr><td>E1</td><td>3.375</td><td>3.575</td><td>0.133</td><td>0.141</td><td>H</td><td>0.574</td><td>0.726</td><td>0.023</td><td>0.029</td></tr>
<tr><td>D2</td><td>4.824</td><td>4.976</td><td>0.190</td><td>0.196</td><td>θ</td><td>10°</td><td>12°</td><td>10°</td><td>12°</td></tr>
<tr><td>E2</td><td>5.674</td><td>5.826</td><td>0.223</td><td>0.229</td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

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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