N-Channel Enhancement Mode Power MOSFET

MTB020N03KL3

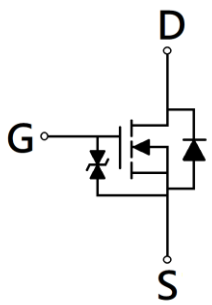
Features

- Low On Resistance
- Low Gate Charge
- Fast Switching Characteristic
- ESD protected gate

BV_{DSS}	30V
I_D@V_{GS}=10V, T_C=25°C	14A
I_D@V_{GS}=10V, T_A=25°C	6A
$R_{DS(ON)}$ typ.@V_{GS}=10V, I_D=6A	22mΩ
$R_{DS(ON)}$ typ.@V_{GS}=4.5V, I_D=4A	26mΩ

Equivalent Circuit

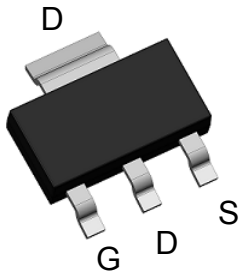
MTB020N03KL3



G : Gate S : Source D : Drain

Outline

SOT-223



Ordering Information

Device	Package	Shipping
MTB020N03KL3-0-T3-G	SOT-223 (Pb-free lead plating and halogen-free package)	2500 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
- Product rank, zero for no rank products
- Product name

Absolute Maximum Ratings (T_A=25°C)

Parameter			Symbol	Limits	Unit
Drain-Source Voltage			V_{DS}	30	V
Gate-Source Voltage			V_{GS}	±20	
Continuous Drain Current @ V_{GS}=10V, T_C=25°C		*a	I_D	14	A
Continuous Drain Current @ V_{GS}=10V, T_C=100°C		*a		8.8	
Continuous Drain Current @ V_{GS}=10V, T_A=25°C		*b		6	
Continuous Drain Current @ V_{GS}=10V, T_A=70°C		*b		4.8	
Pulsed Drain Current		*c	I_{DM}	56	
Continuous Body Diode Forward Current @ T_C=25°C		*a	I_S	8.7	
Avalanche Current @ L=0.1mH			I_{AS}	10	
Avalanche Energy @ L=0.5mH			E_{AS}	6.3	mJ
Total Power Dissipation	T_C=25°C	*a	P_D	10.5	W
	T_C=100°C	*a		4.2	
	T_A=25°C	*b		1.9	
	T_A=70°C	*b		1.2	
Operating Junction and Storage Temperature Range			T_J, T_{stg}	-55~+150	°C

Thermal Data

Parameter		Symbol	Steady State	Unit
Thermal Resistance, Junction-to-case		$R_{\theta JC}$	12	°C/W
Thermal Resistance, Junction-to-ambient	*b	$R_{\theta JA}$	66	

Note:

*a. 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.

*b. The value of $R_{\theta JA}$ is measured with the device mounted on 1 in² FR-4 board with 2 oz. copper, in a still air environment with T_A=25°C. The power dissipation P_D 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.

*c. 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.

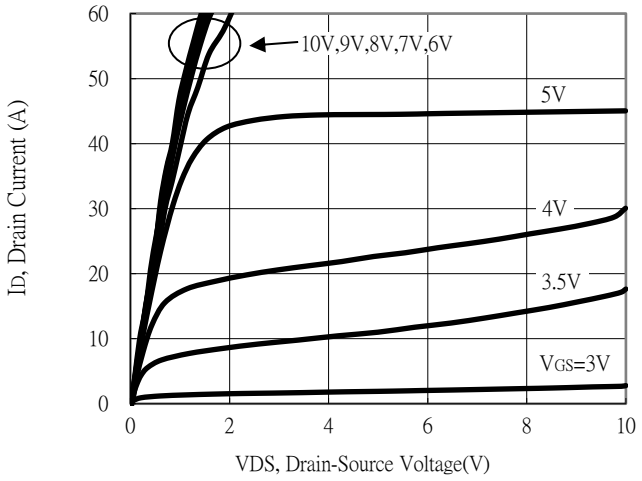
Electrical Characteristics (T_A=25°C, unless otherwise specified)

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
G_{FS}	-	4.5	-	S	V_{DS}=10V, I_D=4A
I_{GSS}	-	-	±10	μA	V_{GS}=±16V, V_{DS}=0V
I_{DSS}	-	-	1		V_{DS}=24V, V_{GS}=0V
$R_{DS(ON)}$	-	22	28	mΩ	V_{GS}=10V, I_D=6A
	-	26	36		V_{GS}=4.5V, I_D=4A
Dynamic					
Ciss	-	450	-	pF	V_{DS}=15V, V_{GS}=0V, f=1MHz
Coss	-	80	-		
Crss	-	60	-		
Rg	-	9	-	Ω	f=1MHz
Qg *1, 2	-	11	-	nC	V_{DS}=15V, I_D=4A, V_{GS}=10V
Qgs *1, 2	-	1.5	-		
Qgd *1, 2	-	2.5	-		
$t_{d(ON)}$ *1, 2	-	6	-	ns	V_{DS}=15V, I_D=1A, V_{GS}=10V, R_{GS}=6Ω
tr *1, 2	-	17	-		
$t_{d(OFF)}$ *1, 2	-	32	-		
t_f *1, 2	-	11	-		
Source-Drain Diode					
V_{SD} *1	-	0.85	1.2	V	I_S=6A, V_{GS}=0V
trr	-	9	-	ns	I_F=2.3A, dI_F/dt=100A/μs
Qrr	-	3.8	-	nC	

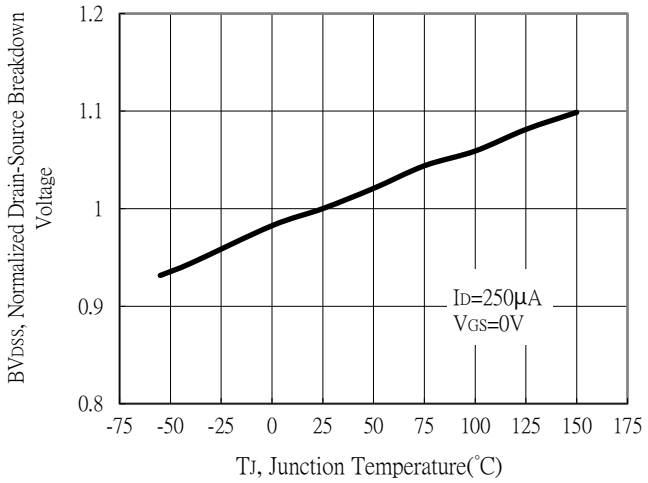
Note:
*1. Pulse Test : Pulse Width ≤300μs, Duty Cycle≤2%
*2. Independent of operating temperature

Typical Characteristics

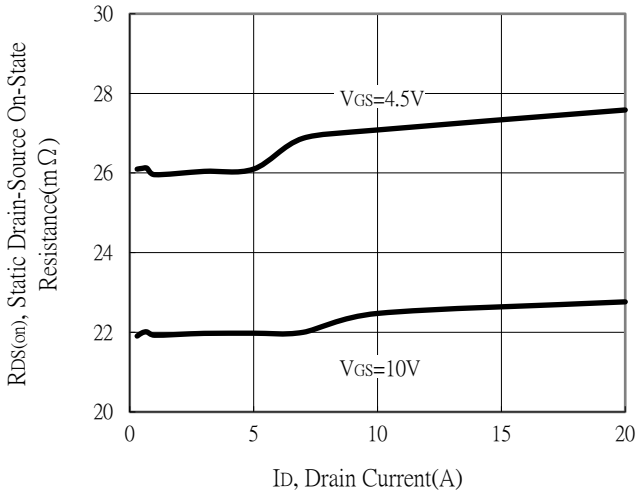
Typical Output Characteristics



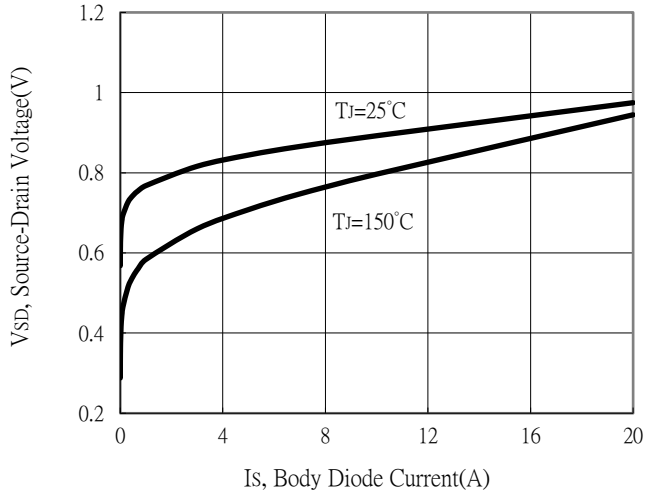
Breakdown Voltage vs Junction Temperature



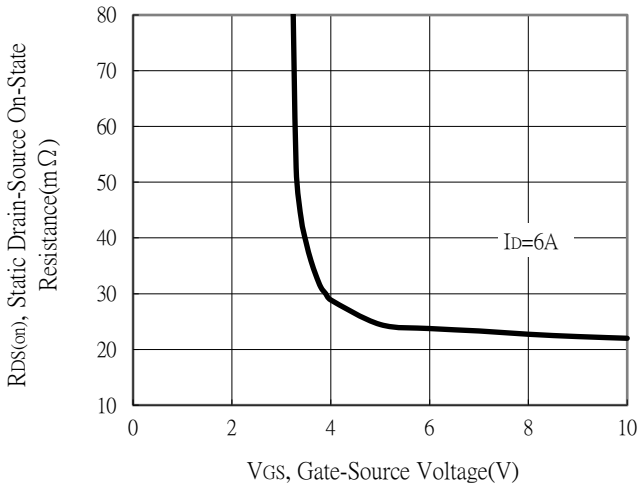
Static Drain-Source On-State resistance vs Drain Current



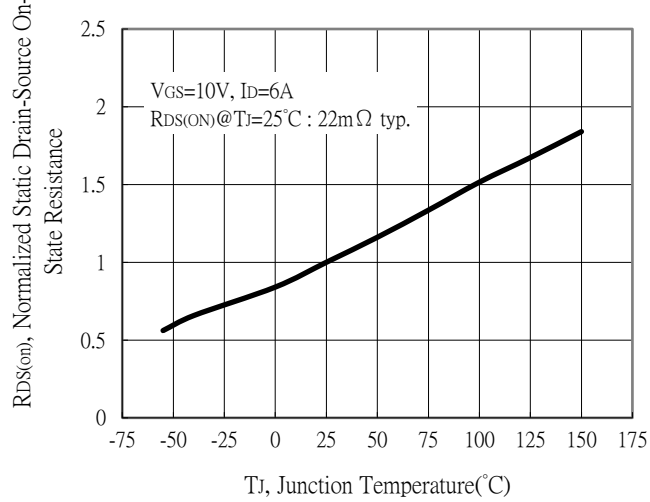
Body Diode Current vs Source-Drain Voltage



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

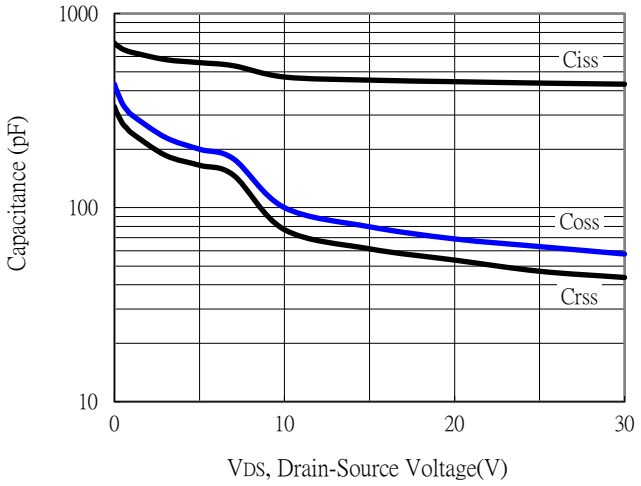


Drain-Source On-State Resistance vs Junction Temperature

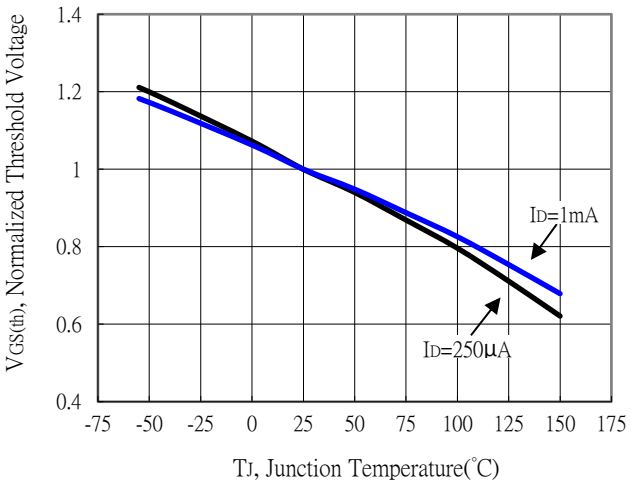


Typical Characteristics (Cont.)

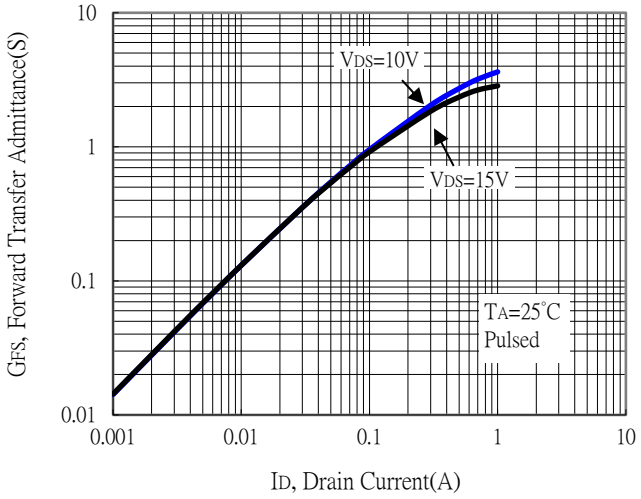
Capacitance vs Drain-to-Source Voltage



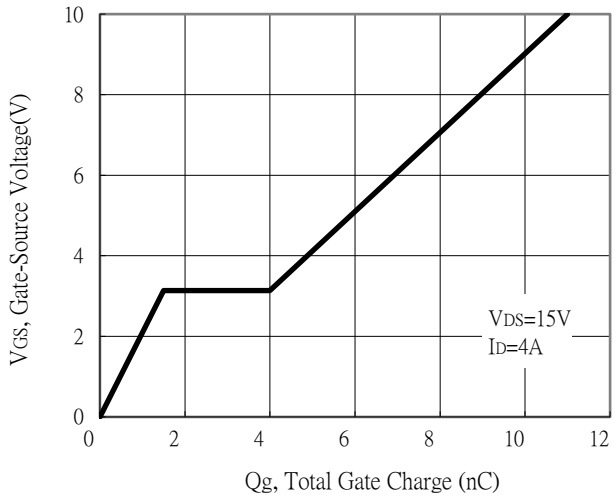
Threshold Voltage vs Junction Temperature



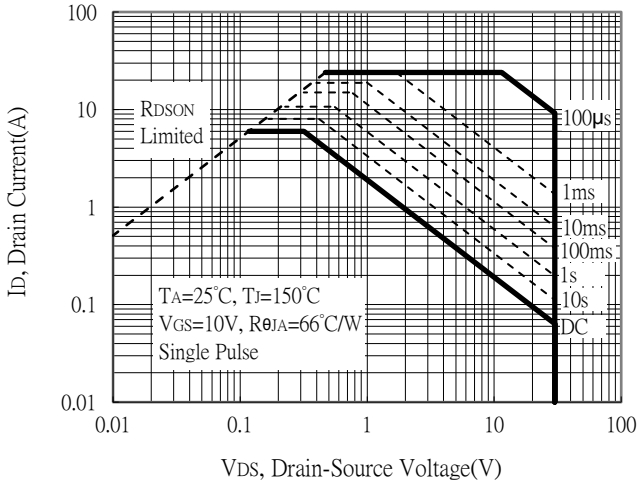
Forward Transfer Admittance vs Drain Current



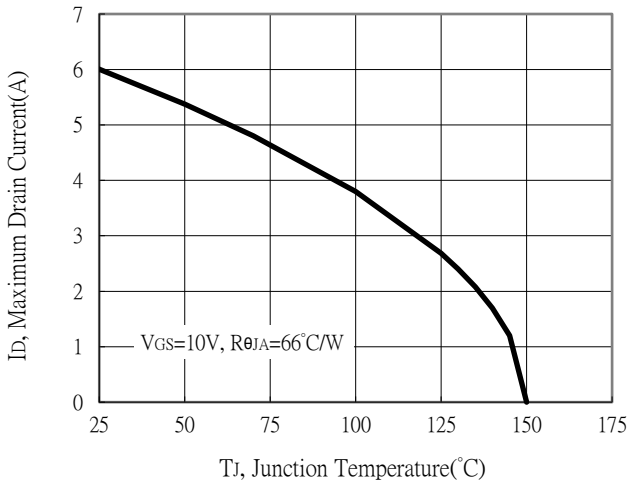
Gate Charge Characteristics



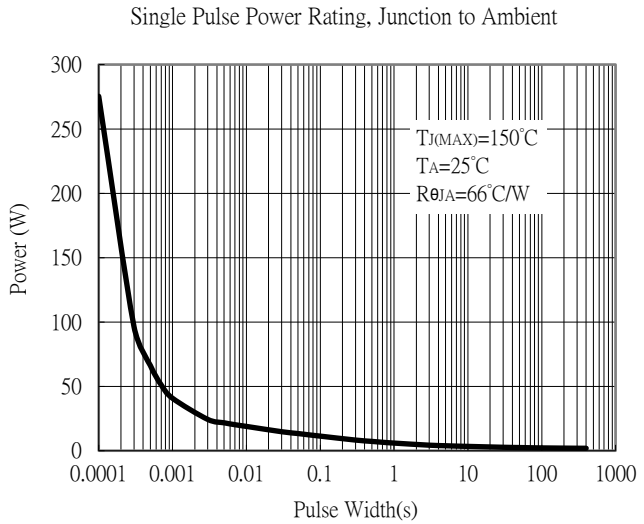
Maximum Safe Operating Area

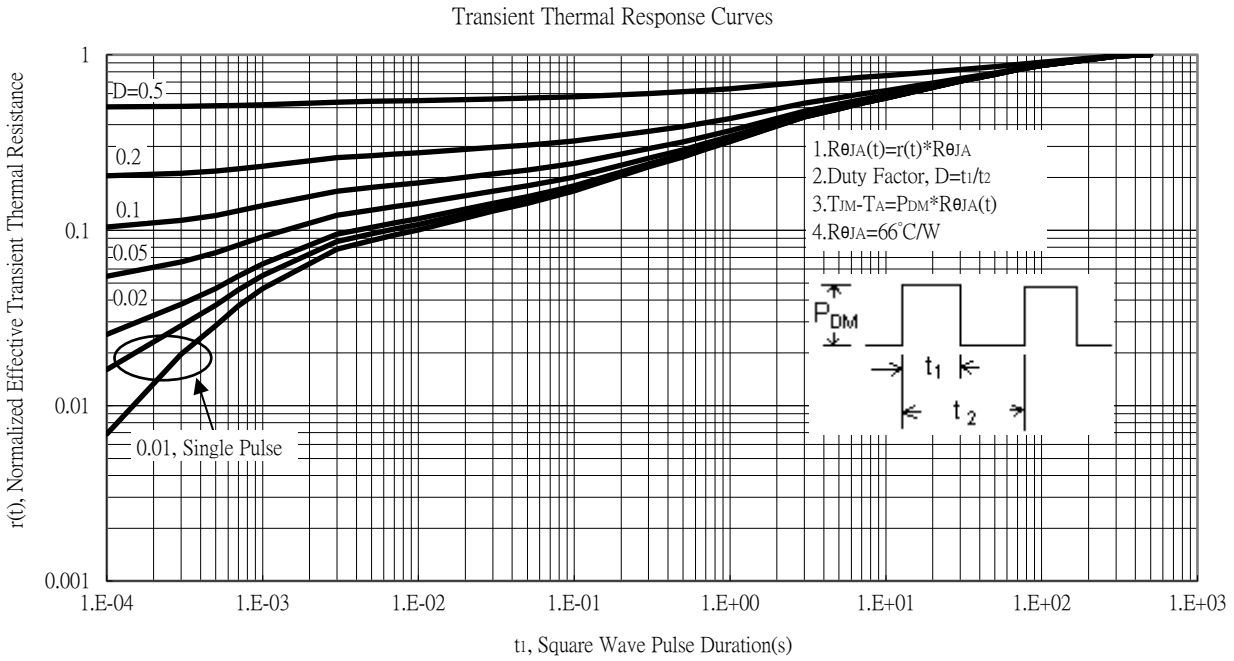


Maximum Drain Current vs Junction Temperature

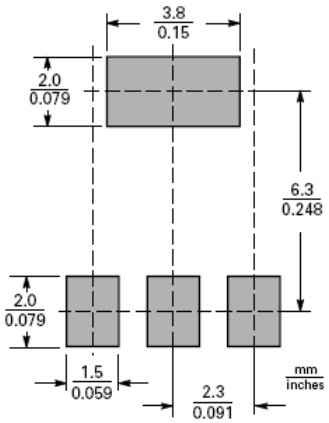


Typical Characteristics (Cont.)

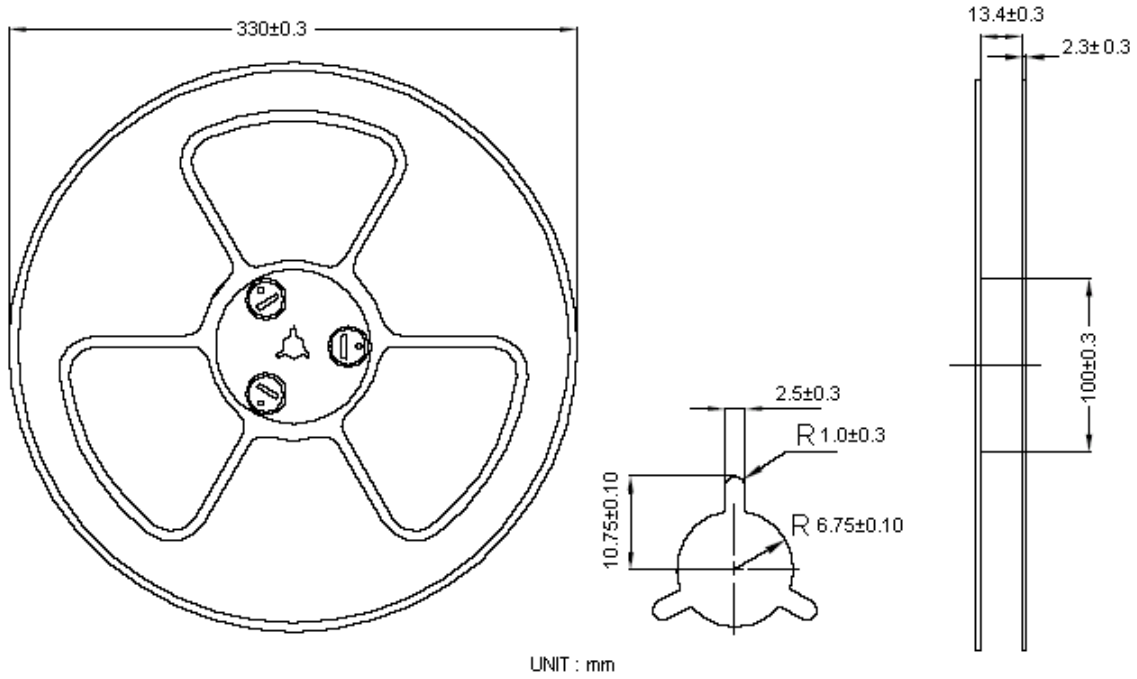




Recommended soldering footprint



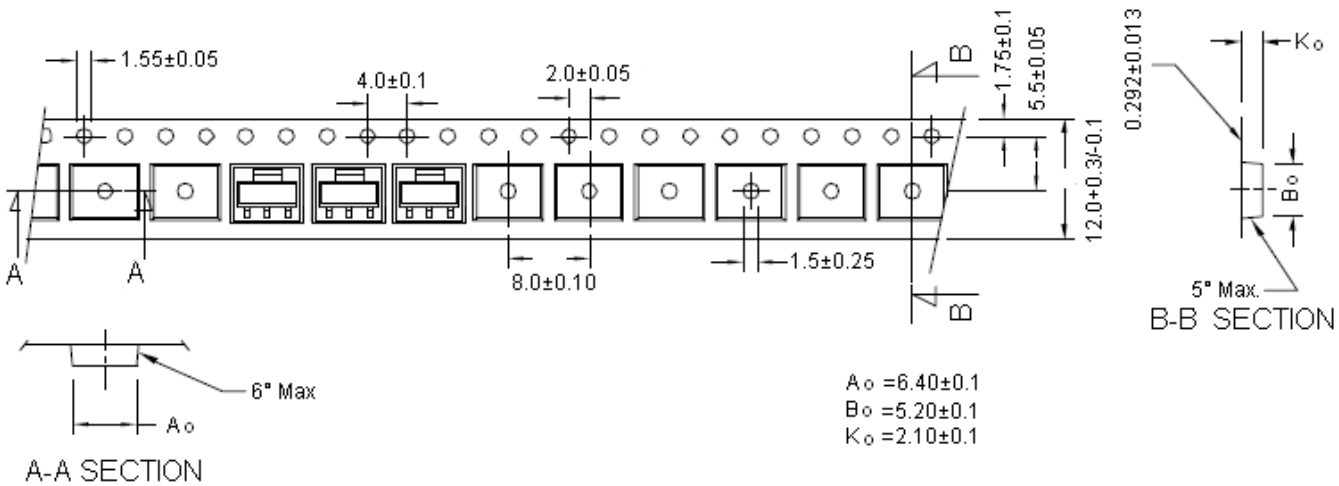
Reel Dimension



UNIT : mm

NOTE : 1. Material : Anti-static polystyrene
2. Surface resistivity 10^9 Ω/sq

Carrier Tape Dimension



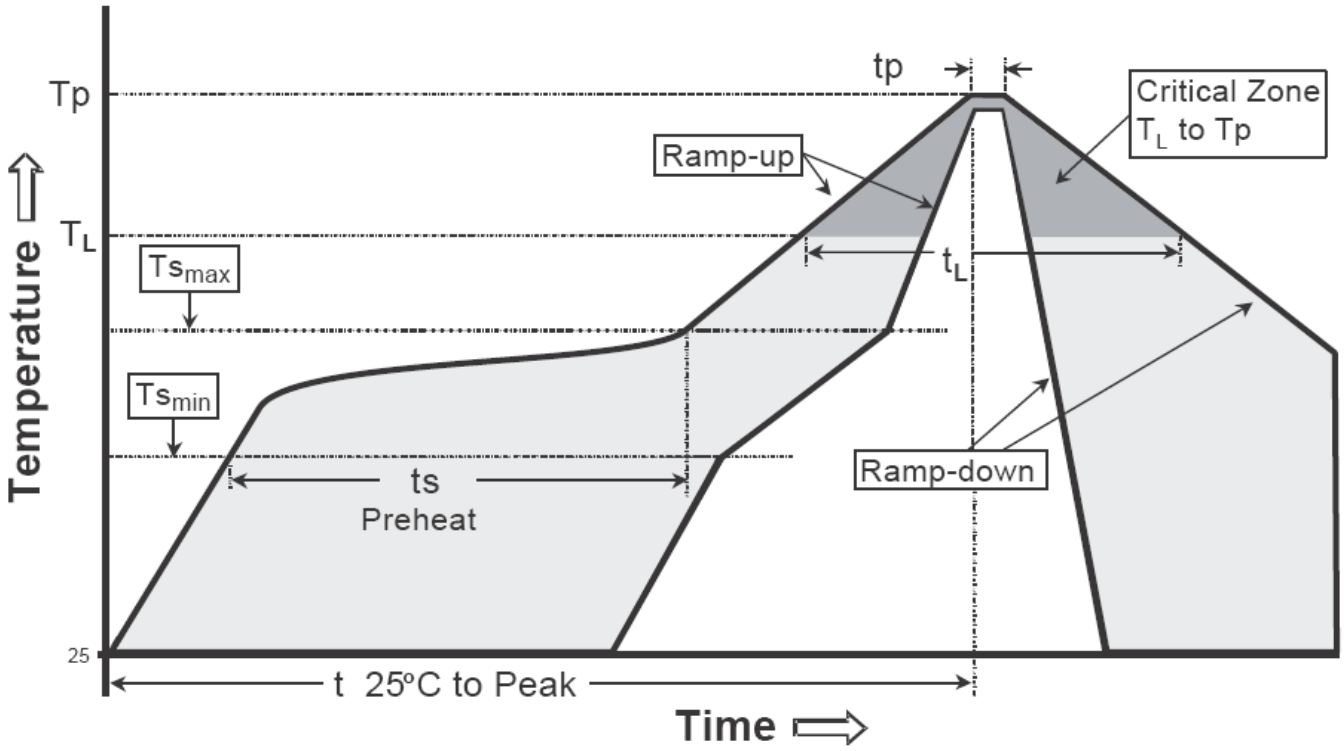
Notes:
1. 10 sprocket hole pitch cumulative tolerance ±0.2.
2. Camber not to exceed 1mm in 100mm.
3. Material: conductive black polystyrene
4. Ao & Bo measured on a plane 0.3mm above the bottom of the pocket.
5. Ko measured from a plane on the inside bottom of the pocket to the top surface of the carrier.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

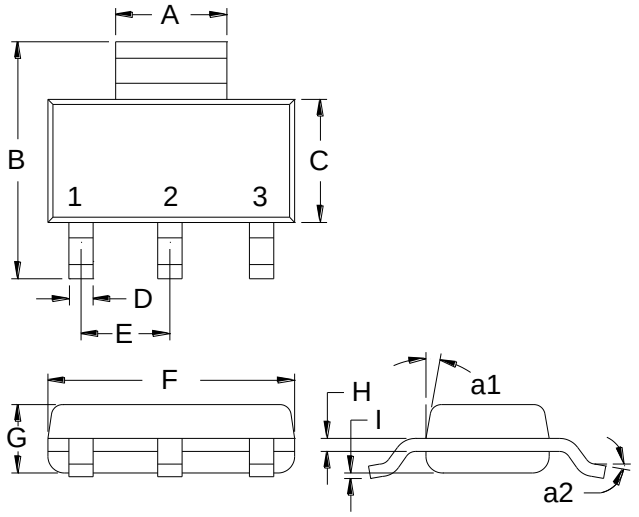
Recommended temperature profile for IR reflow



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 −Temperature Min(T_S min) −Temperature Max(T_S max) −Time($t_{s\,min}$ to $t_{s\,max}$)	100°C 150°C 60-120 seconds	150°C 200°C 60-180 seconds
Time maintained above: −Temperature (T_L) − Time (t_L)	183°C 60-150 seconds	217°C 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.

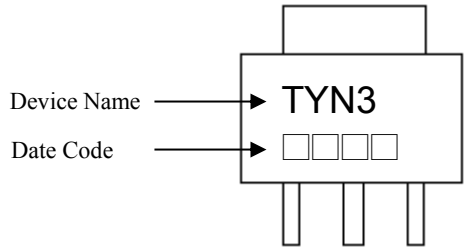
Note : All temperatures refer to topside of the package, measured on the package body surface.

SOT-223 Dimension



3-Lead SOT-223 Plastic
Surface Mounted Package
CYStek Package Code: L3

Marking:



Style: Pin 1.Gate 2.Drain 3.Source

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 : prodcution serial number, 01~99

*: Typical

DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.1142	0.1220	2.90	3.10	G	0.0551	0.0709	1.40	1.80
B	0.2638	0.2874	6.70	7.30	H	0.0098	0.0138	0.23	0.35
C	0.1299	0.1457	3.30	3.70	I	0.0008	0.0039	0.02	0.10
D	0.0236	0.0315	0.60	0.80	a1	*13°	-	*13°	-
E	*0.0906	-	*2.30	-	a2	0°	10°	0°	10°
F	0.2480	0.2638	6.30	6.70					

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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