P-CHANNEL ENHANCEMENT MODE POWER MOSFET

MTB20P03L3

BV_{DSS}	-30V
I_D	-10A
$R_{DSON(MAX)}$	20mΩ

Description

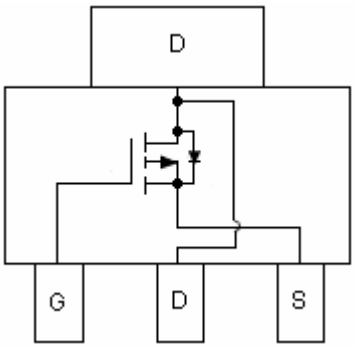
The MTB20P03L3 is a P-channel enhancement-mode MOSFET, providing the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost effectiveness.
The SOT-223 package is universally preferred for all commercial-industrial surface mount applications and suited for low voltage applications such as DC/DC converters.

Features

- $R_{DS(ON)}$=20mΩ@V_{GS}=-10V, I_D=-10A
  $R_{DS(ON)}$=35mΩ@V_{GS}=-5V, I_D=-7A
- Simple drive requirement
- Low on-resistance
- Fast switching speed
- Pb-free lead plating package

Equivalent Circuit

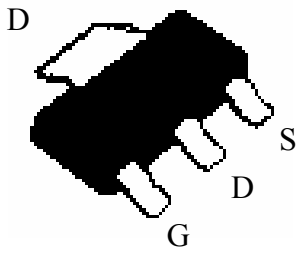
MTB20P03L3



G：Gate
S：Source
D：Drain

Outline

SOT-223



Absolute Maximum Ratings (Ta=25°C)

Parameter		Symbol	Limits	Unit
Drain-Source Voltage		V_{DS}	-30	V
Gate-Source Voltage		V_{GS}	±25	V
Continuous Drain Current @ T_C=25°C		I_D	-10	A
Continuous Drain Current @ T_C=100°C			-8	A
Pulsed Drain Current		I_{DM}	-40 *1	A
Avalanche Current		I_{AS}	-15	A
Avalanche Energy @ L=0.1mH, I_D=-10A, R_G=25Ω		E_{AS}	5	mJ
Repetitive Avalanche Energy @ L=0.05mH		E_{AR}	2.5 *2	mJ
Total Power Dissipation	T_A=25℃	P_D	3.3	W
	T_A=100℃		1.65	W
Operating Junction and Storage Temperature Range		Tj, Tstg	-55~+175	°C

Thermal Data

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-case, max	$R_{th,j-c}$	25	°C/W
Thermal Resistance, Junction-to-ambient, max	$R_{th,j-a}$	45 *3	°C/W

Note : 1. Pulse width limited by maximum junction temperature
2. Duty cycle≤1%
3. Surface mounted on 1 in² copper pad of FR-4 board, 110°C/W when mounted on minimum copper pad

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

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Static					
BV_{DSS}	-30	-	-	V	V_{GS}=0, I_D=-250μA
$V_{GS(th)}$	-1	-1.5	-3	V	V_{DS}=V_{GS}, I_D=-250μA
I_{GSS}	-	-	±100	nA	V_{GS}=±25V, V_{DS}=0
I_{DSS}	-	-	-1	μA	V_{DS}=-24V, V_{GS}=0
I_{DSS}	-	-	-10	μA	V_{DS}=-20V, V_{GS}=0, Tj=125°C
$I_{D(ON)}$ *1	-40	-	-	A	V_{DS}=-5V, V_{GS}=-10V
$R_{DS(ON)}$ *1	-	15	20	mΩ	I_D=-10A, V_{GS}=-10V
	-	25	35		I_D=-7A, V_{GS}=-5V
G_{FS} *1	-	24	-	S	V_{DS}=-5V, I_D=-10A
Dynamic					
Ciss	-	2815	-	pF	V_{DS}=-15V, V_{GS}=0, f=1MHz
Coss	-	1060	-		
Crss	-	955	-		

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

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
$t_{d(ON)}$ *1, 2	-	12	-	ns	V_{DD}=-15V, I_D=-1A, V_{GS}=-10V, R_G=2.7Ω
tr *1, 2	-	10	-		
$t_{d(OFF)}$ *1, 2	-	35	-		
t_f *1, 2	-	7	-		
Qg (V_{GS}=10V) *1, 2	-	25	-	nC	V_{DS}=-15V, I_D=-10A, V_{GS}=-10V,
Qg (V_{GS}=4.5V) *1, 2	-	18	-		
Qgs *1, 2	-	7	-		
Qgd *1, 2	-	9	-		
Rg	-	4	-	Ω	V_{GS}=15mV, V_{DS}=0, f=1MHz
Source-Drain Diode					
I_S *1	-	-	-3	A	
I_{SM} *3	-	-	-12		
V_{SD} *1	-	-	-1.2	V	I_F=I_S, V_{GS}=0V
trr	-	32	-	ns	I_F=I_S, dI_F/dt=100A/μs
Qrr	-	26	-	nC	

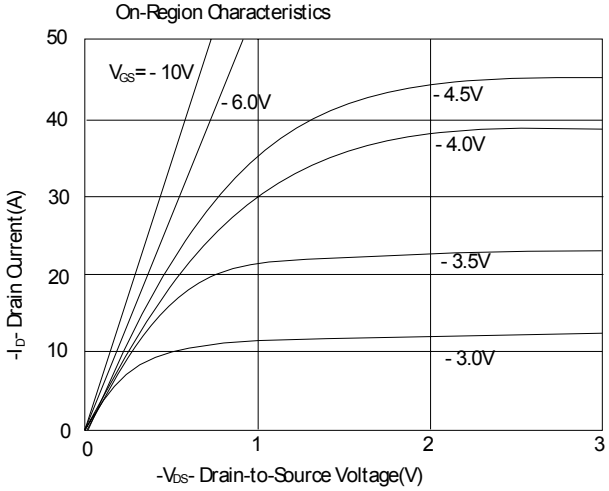
Note : *1.Pulse Test : Pulse Width ≤300μs, Duty Cycle≤2%
*2.Independent of operating temperature
*3.Pulse width limited by maximum junction temperature.

Ordering Information

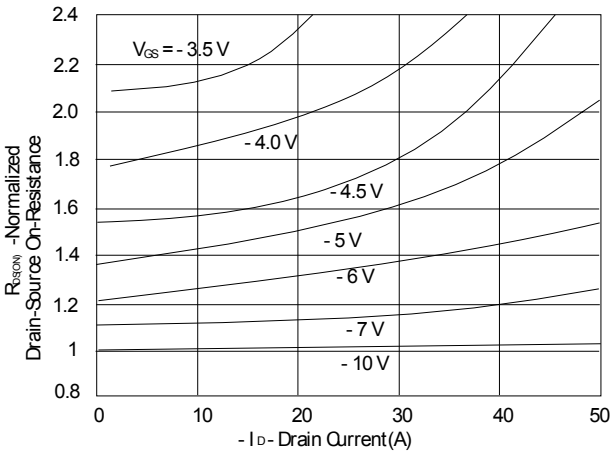
Device	Package	Shipping
MTB20P03L3	SOT-223 (Pb-free lead plating package)	2500 pcs / Tape & Reel

Typical Characteristics

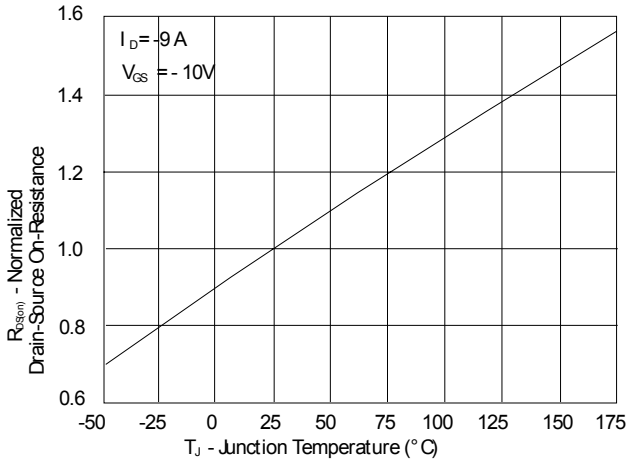
On-Region Characteristics



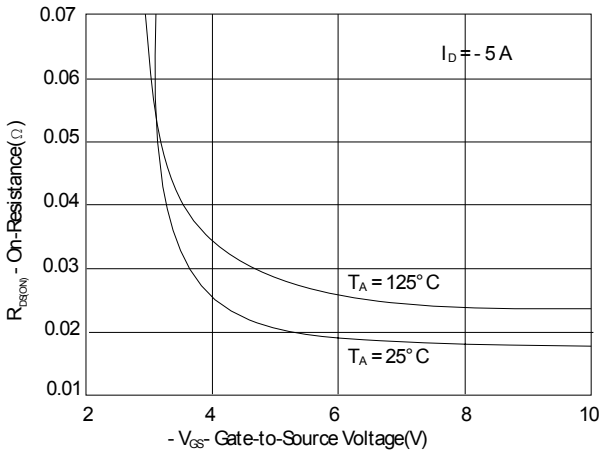
On-Resistance Variation with Drain Current and Gate Voltage



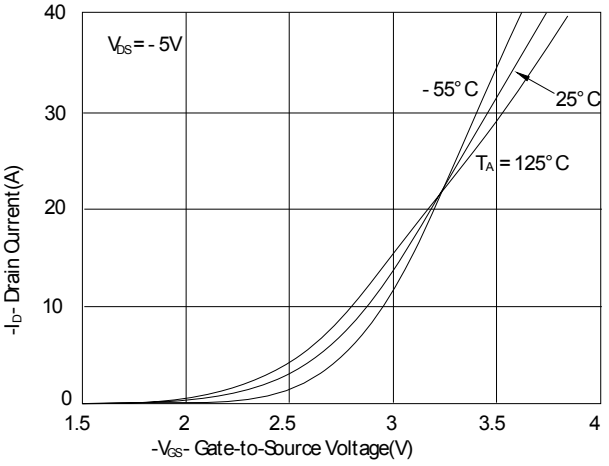
On-Resistance Variation with Temperature



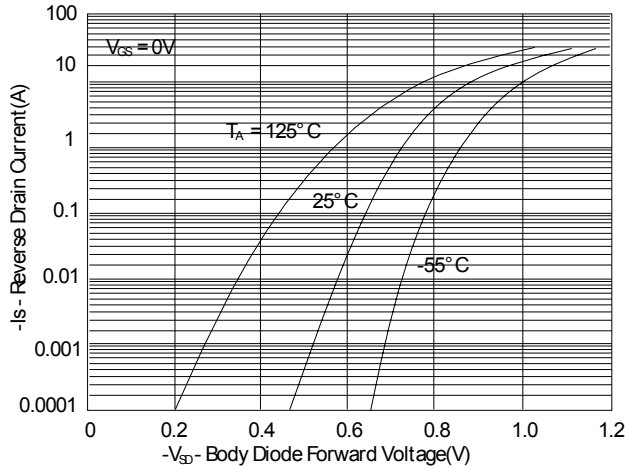
On-Resistance Variation with Gate-to-Source Voltage



Transfer Characteristics

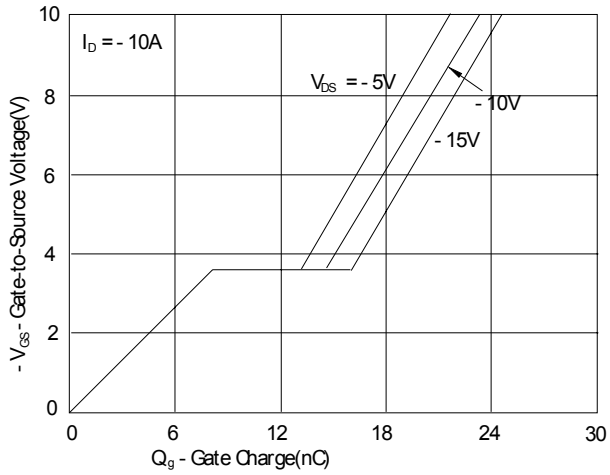


Body Diode Forward Voltage Variation with Source Current and Temperature

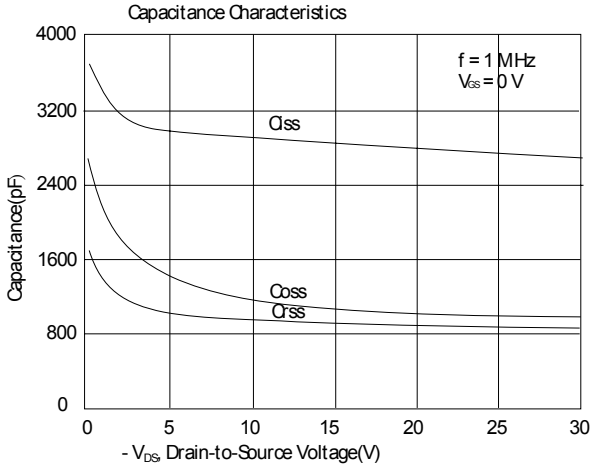


Typical Characteristics(Cont.)

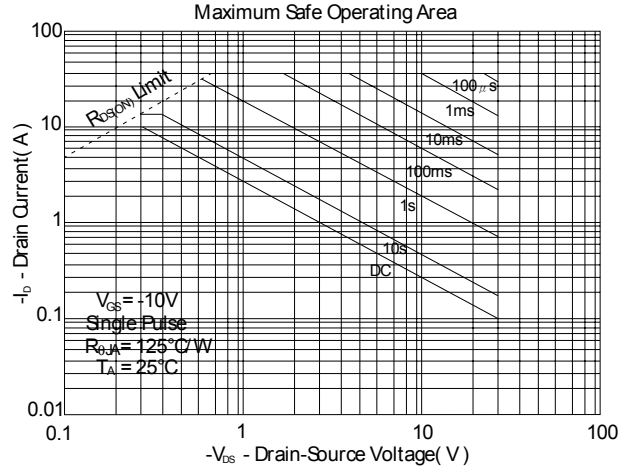
Gate Charge Characteristics



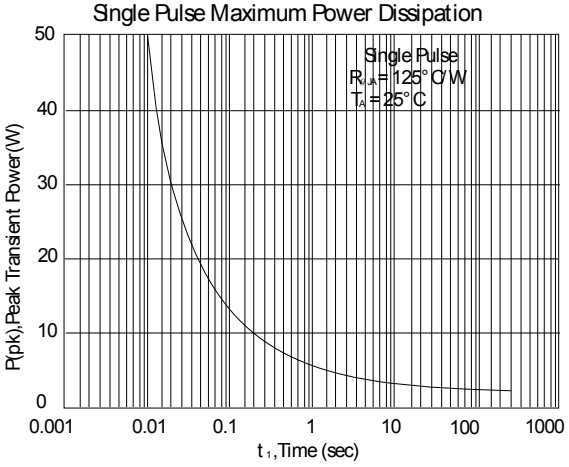
Capacitance Characteristics



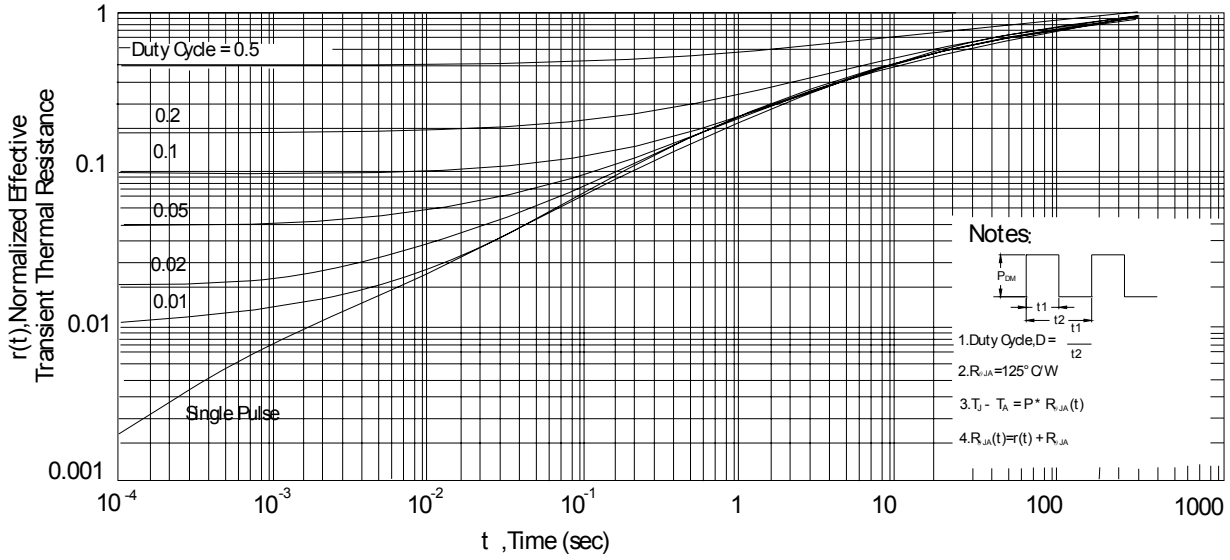
Maximum Safe Operating Area



Single Pulse Maximum Power Dissipation



Transient Thermal Response Curve



Test Circuit and Waveforms

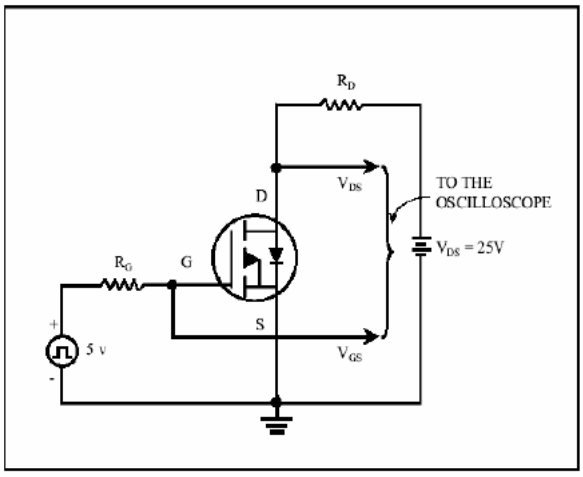


Fig 13. Switching Time Circuit

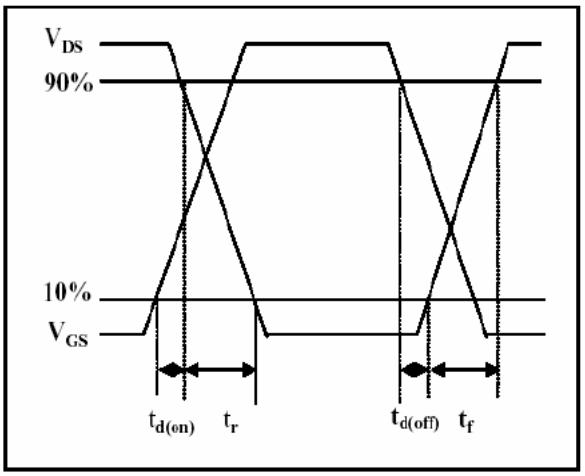


Fig 14. Switching Time Waveform

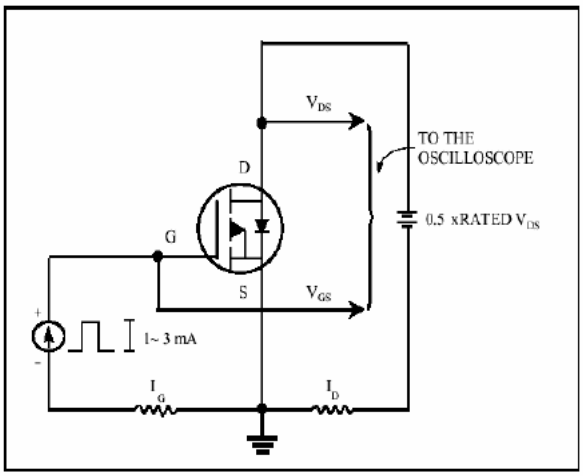


Fig 15. Gate Charge Circuit

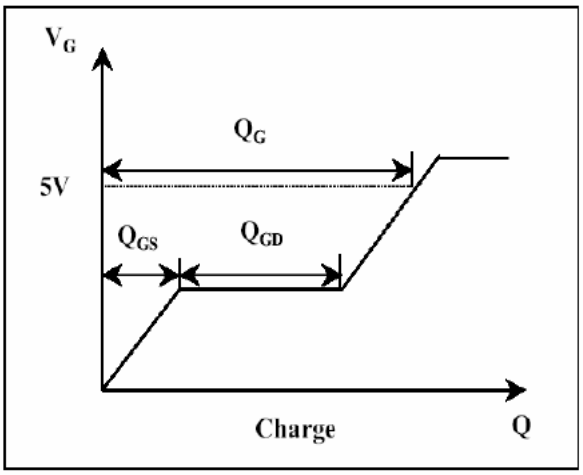
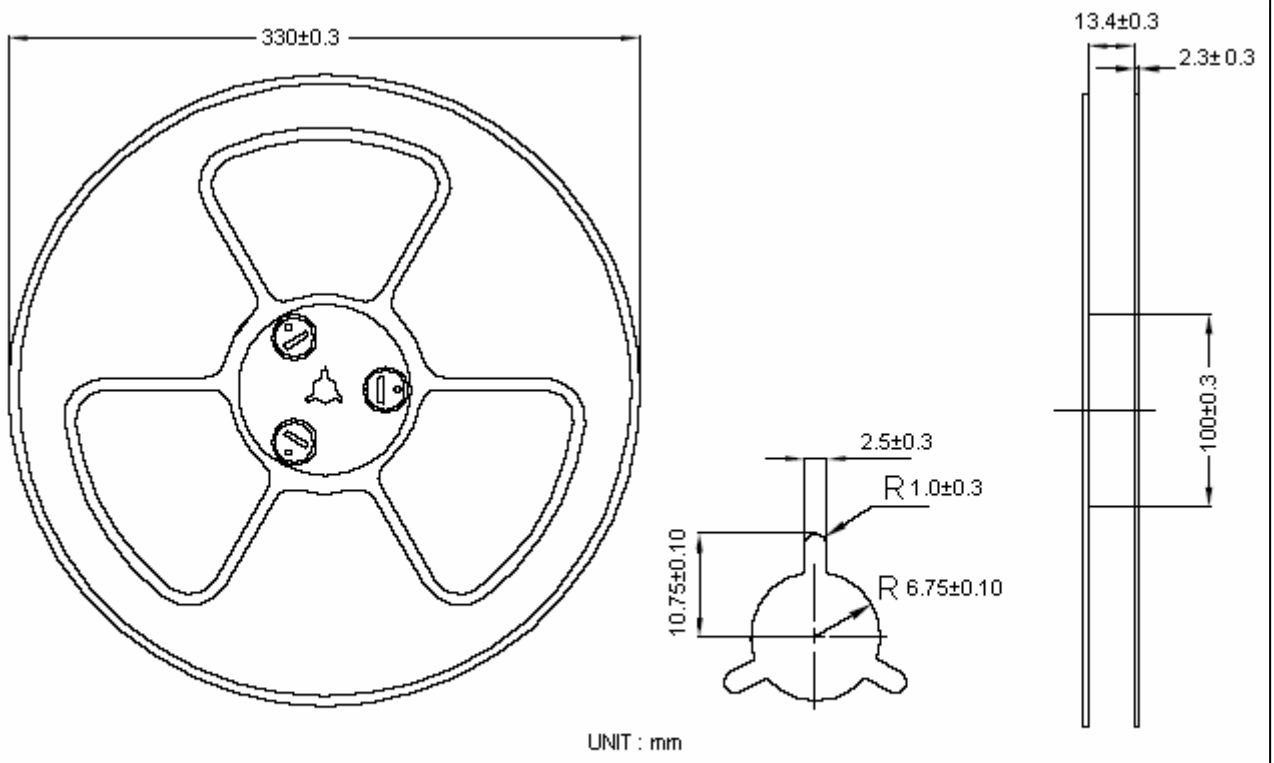


Fig 16. Gate Charge Waveform

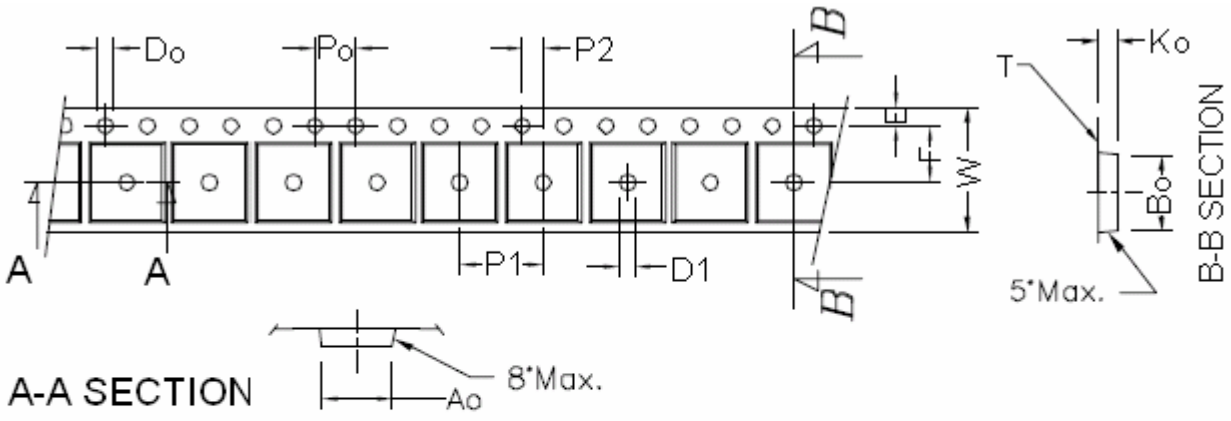
Reel Dimension



UNIT : mm

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

Carrier Tape Dimension



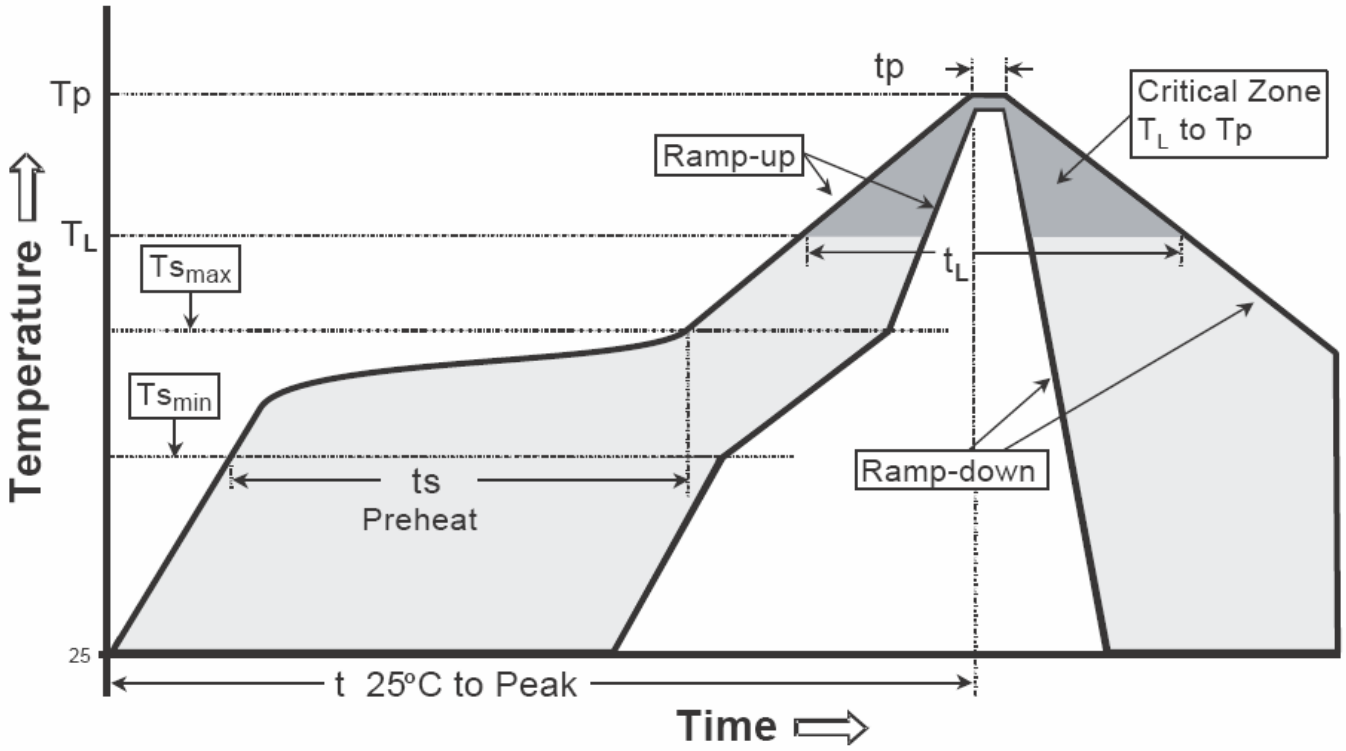
Symbol	Ao	Bo	Ko	Po	P1	P2	T
Spec	6.83±0.1	7.42±0.1	1.88±0.1	4.0±0.1	8.0±0.10	2.0±0.05	0.292±0.02
Symbol	E	F	Do	D1	W	10Po	
Spec	1.75±0.1	5.5±0.05	1.60±0.1	1.5±0.25	$12^{+0.3}_{-0.1}$	40.0±0.2	

Unit : mm

Recommended wave soldering condition

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

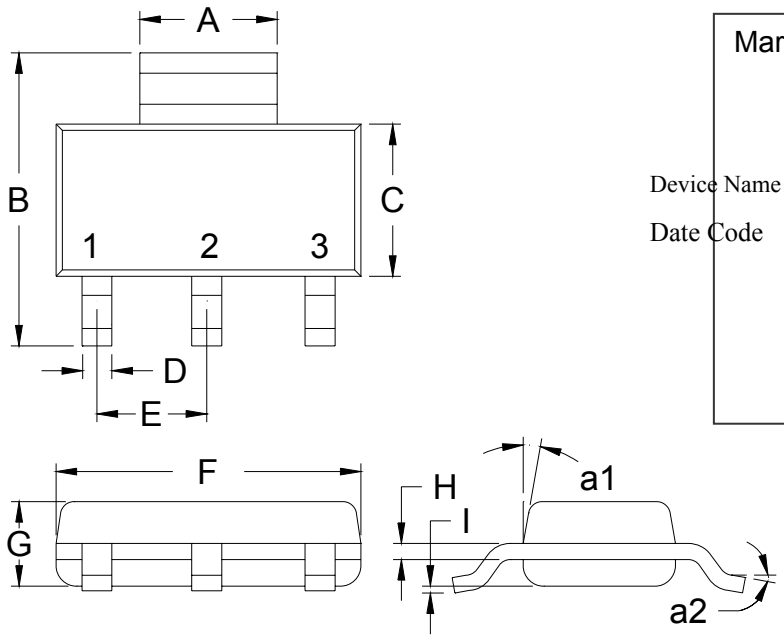
Recommended temperature profile for IR reflow

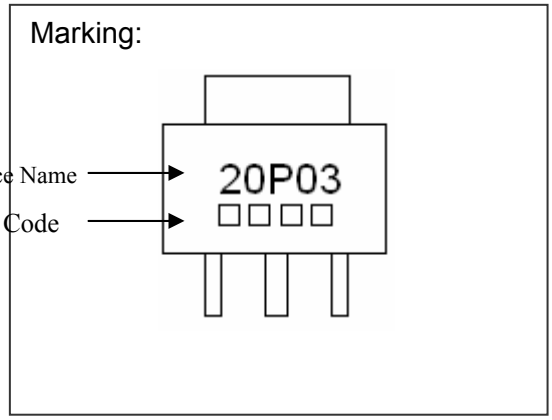


Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
Average ramp-up rate (Tsmax to Tp)	3°C/second max.	3°C/second max.
Preheat −Temperature Min(T_S min) −Temperature Max(T_S max) −Time($t_{s\ min}$ to $t_{s\ max}$)	 100°C 150°C 60-120 seconds	 150°C 200°C 60-180 seconds
Time maintained above: −Temperature (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





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

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

*: 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	0.25	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