

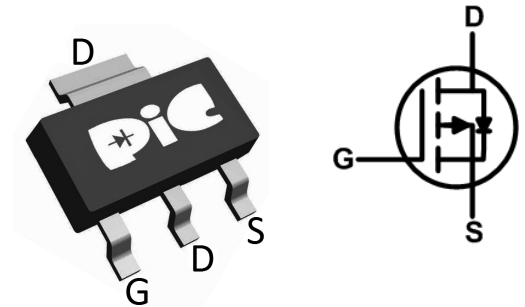
➤ General Description

This PAP31TB03QB P-Channel enhancement mode power field effect transistor is the high density trench technology and this advanced technology can provide excellent $R_{ds(On)}$ performance and efficiency for power switching and load switching application., this device also comply with the RoHS and Green Product requirement with full function reliability approved.

➤ Feature

- Green Device Available
- Super Low Gate Charge
- Excellent CdV/dt effect decline
- Advanced high cell density Trench technology
- SOT-223 package design

➤ SOT-223



➤ Application

- Motor and Load Control
- Power Management in White LED System
- Push Pull Converter
- LCD TV Inverter & AD/DC Inverter Systems.

➤ Absolute Maximum Ratings

Parameter	Symbol	Rating	Units
Drain-Source Voltage	V_{DS}	-30	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current, V_{GS} @ -10V ₁	$I_D@T_A=25^\circ C$	-5.8	A
Continuous Drain Current, V_{GS} @ -10V ₁	$I_D@T_A=70^\circ C$	-4.6	A
Pulsed Drain Current ₂	I_{DM}	-24	A
Total Power Dissipation ₃	$P_D@T_A=25^\circ C$	1.5	W
Storage Temperature Range	T_{STG}	-55 to 150	$^\circ C$
Operating Junction Temperature Range	T_J	-55 to 150	$^\circ C$
Thermal Resistance Junction-Ambient ₁	$R_{\theta JA}$	85	$^\circ C/W$
Thermal Resistance Junction-Case ₁	$R_{\theta JC}$	30	$^\circ C/W$

➤ Electrical Characteristics ($T_J=25^\circ C$ Unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V$, $I_D=-250\mu A$	-30	---	---	V
BV_{DSS} Temperature Coefficient	$\Delta BV_{DSS}/\Delta T_J$	Reference to $25^\circ C$, $I_D=-1mA$	---	-0.022	---	$V/^\circ C$
Static Drain-Source On-Resistance ²	$R_{DS(ON)}$	$V_{GS}=-10V$, $I_D=-5A$	---	26	32	$m\Omega$
		$V_{GS}=-4.5V$, $I_D=-4A$	---	36	45	
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS}=V_{DS}$, $I_D=-250\mu A$	-1.0	-1.5	-2.5	V
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}$		---	4.6	---	$mV/^\circ C$
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=-24V$, $V_{GS}=0V$, $T_J=25^\circ C$	---	---	-1	μA
		$V_{DS}=-24V$, $V_{GS}=0V$, $T_J=55^\circ C$	---	---	-5	
Gate-Source Leakage Current	I_{GSS}	$V_{GS}=\pm 20V$, $V_{DS}=0V$	---	---	± 100	nA
Forward Transconductance	g_{fs}	$V_{DS}=-5V$, $I_D=-5A$	---	17	---	S
Gate Resistance	R_g	$V_{DS}=0V$, $V_{GS}=0V$, $f=1MHz$	---	13	26	Ω
Total Gate Charge (-4.5V)	Q_g	$V_{DS}=-15V$, $V_{GS}=-4.5V$, $I_D=-5A$	---	12.6	17.6	nC
Gate-Source Charge	Q_{gs}		---	4.8	6.7	
Gate-Drain Charge	Q_{gd}		---	4.8	6.7	
Turn-On Delay Time	$T_{d(on)}$	$V_{DD}=-15V$, $V_{GS}=-10V$, $R_G=3.3\Omega$, $I_D=-5A$	---	4.6	9.2	ns
Rise Time	T_r		---	14.8	26.6	
Turn-Off Delay Time	$T_{d(off)}$		---	41	82	
Fall Time	T_f		---	19.6	39.2	
Input Capacitance	C_{iss}	$V_{DS}=-15V$, $V_{GS}=0V$, $f=1MHz$	---	1345	1883	pF
Output Capacitance	C_{oss}		---	194	272	
Reverse Transfer Capacitance	C_{rss}		---	158	221	

➤ Diode Characteristics

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Continuous Source Current ^{1,4}	I_S	$V_G=V_D=0V$, Force Current	---	---	-5.8	A
Pulsed Source Current ^{2,4}	I_{SM}		---	---	-24	A
Diode Forward Voltage ²	V_{SD}	$V_{GS}=0V$, $I_S=-1A$, $T_J=25^\circ C$	---	---	-1.2	V
Reverse Recovery Time	t_{rr}	$I_F=-5A$, $di/dt=100A/\mu s$, $T_J=25^\circ C$	---	16.3	---	nS
Reverse Recovery Charge	Q_{rr}		---	5.9	---	nC

Note :

- 1.Pulse width limited by maximum junction temperature.
- 2.The data tested by pulsed , pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$
- 3.Ensure that the channel temperature does not exceed $150^\circ C$.
- 4.The data is theoretically the same as I_D and I_{DM} , in real applications , should be limited by total power dissipation.

➤ Typical Characteristics

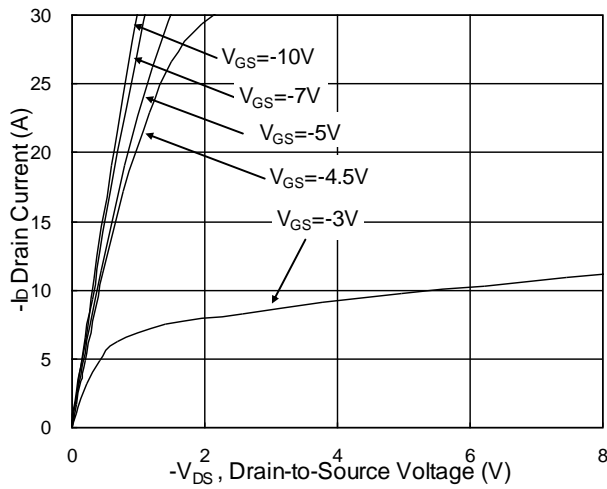


Fig.1 Typical Output Characteristics

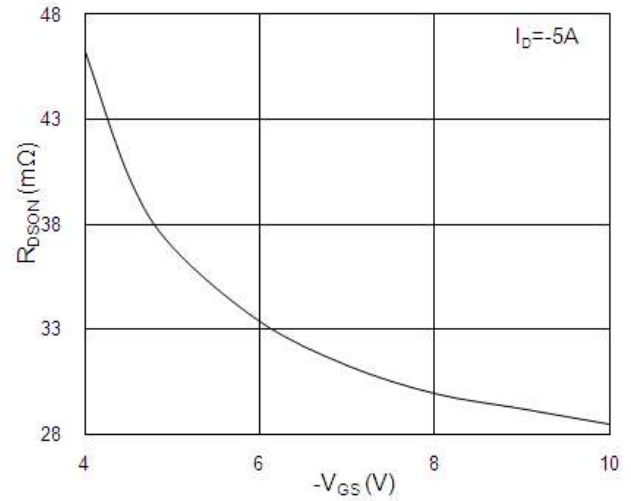


Fig.2 On-Resistance v.s Gate-Source

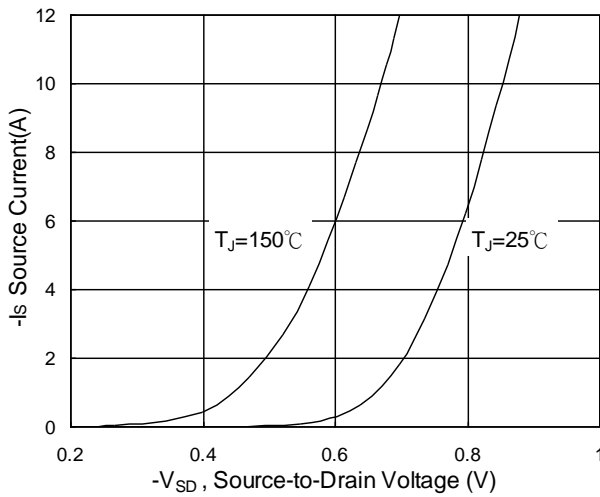


Fig.3 Forward Characteristics of Reverse

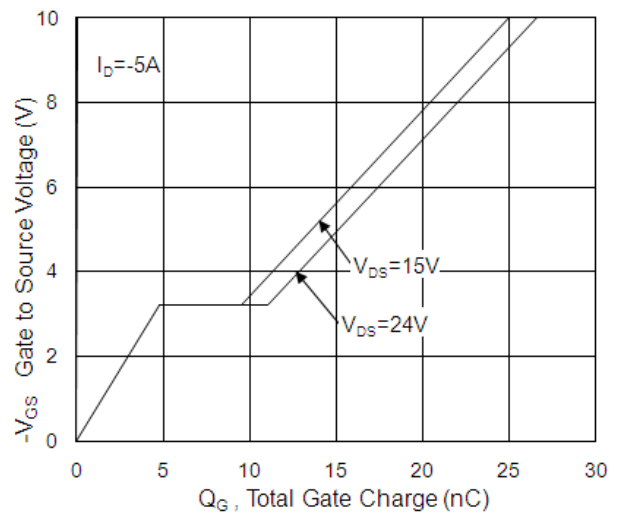


Fig.4 Gate-Charge Characteristics

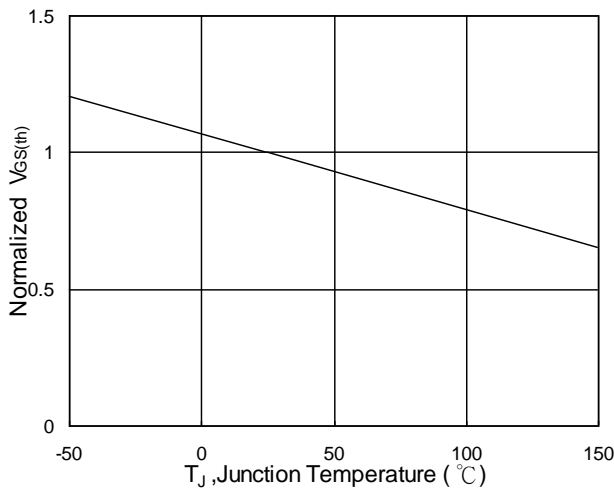


Fig.5 Normalized $V_{GS(th)}$ vs. T_J

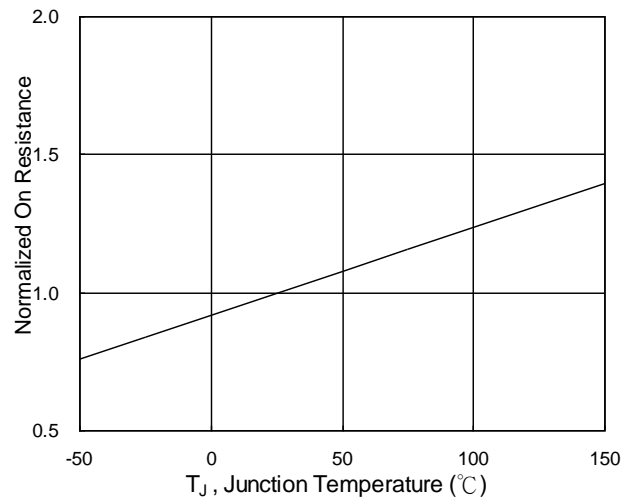


Fig.6 Normalized $R_{DS(ON)}$ vs. T_J

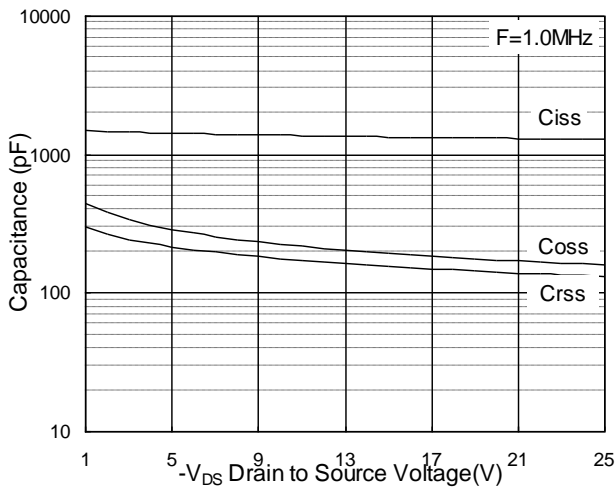


Fig.7 Capacitance

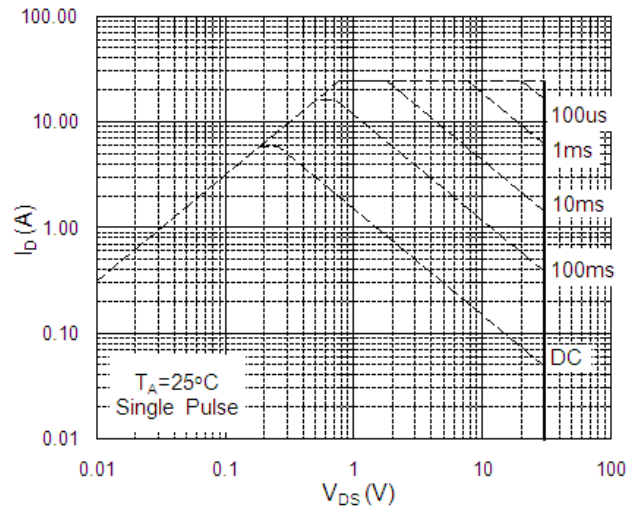


Fig.8 Safe Operating Area

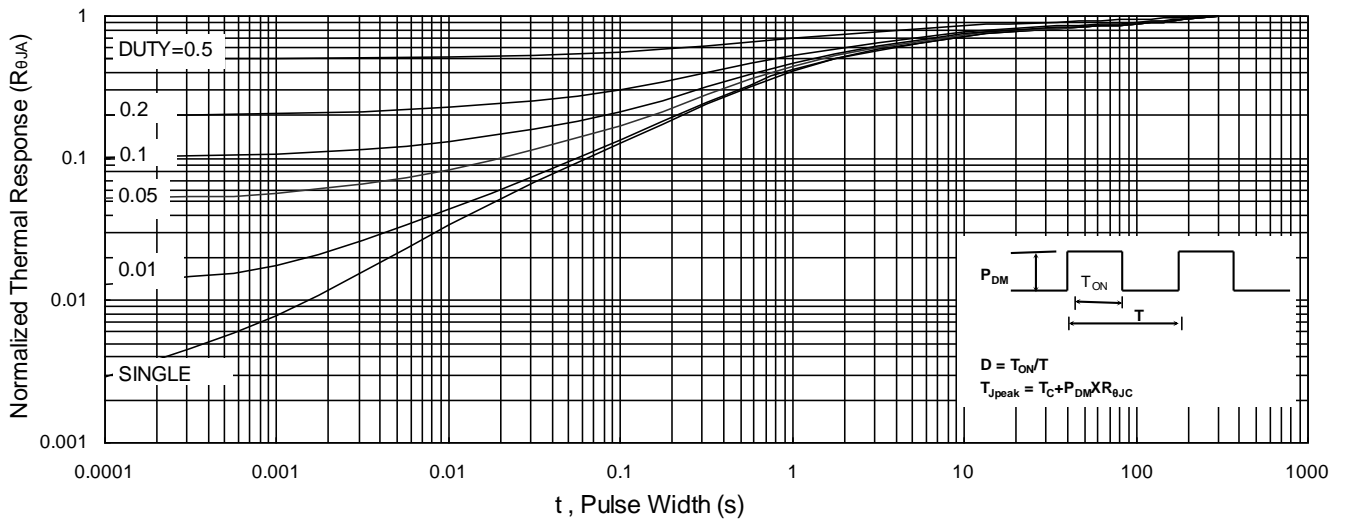


Fig.9 Normalized Maximum Transient Thermal Impedance

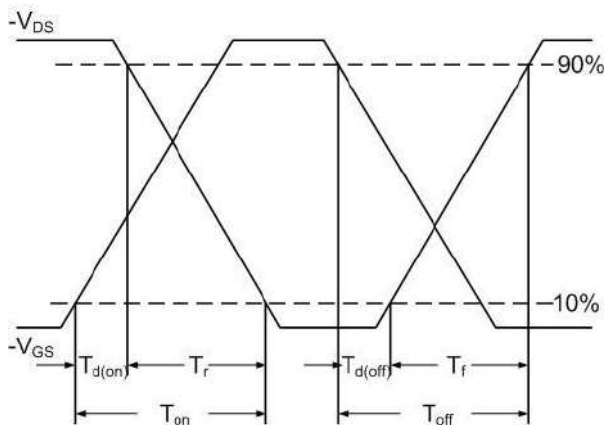


Fig.10 Switching Time Waveform

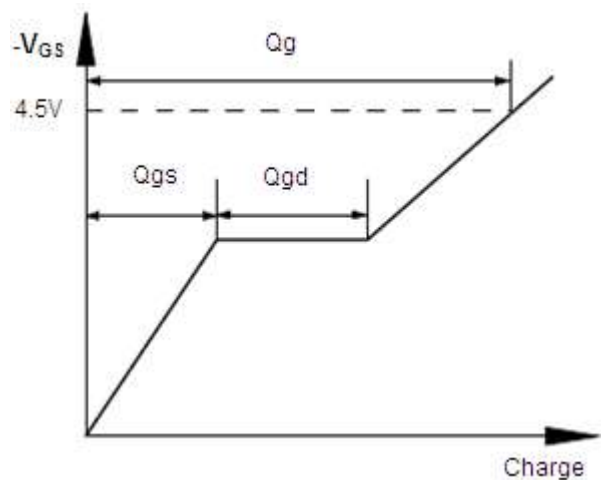
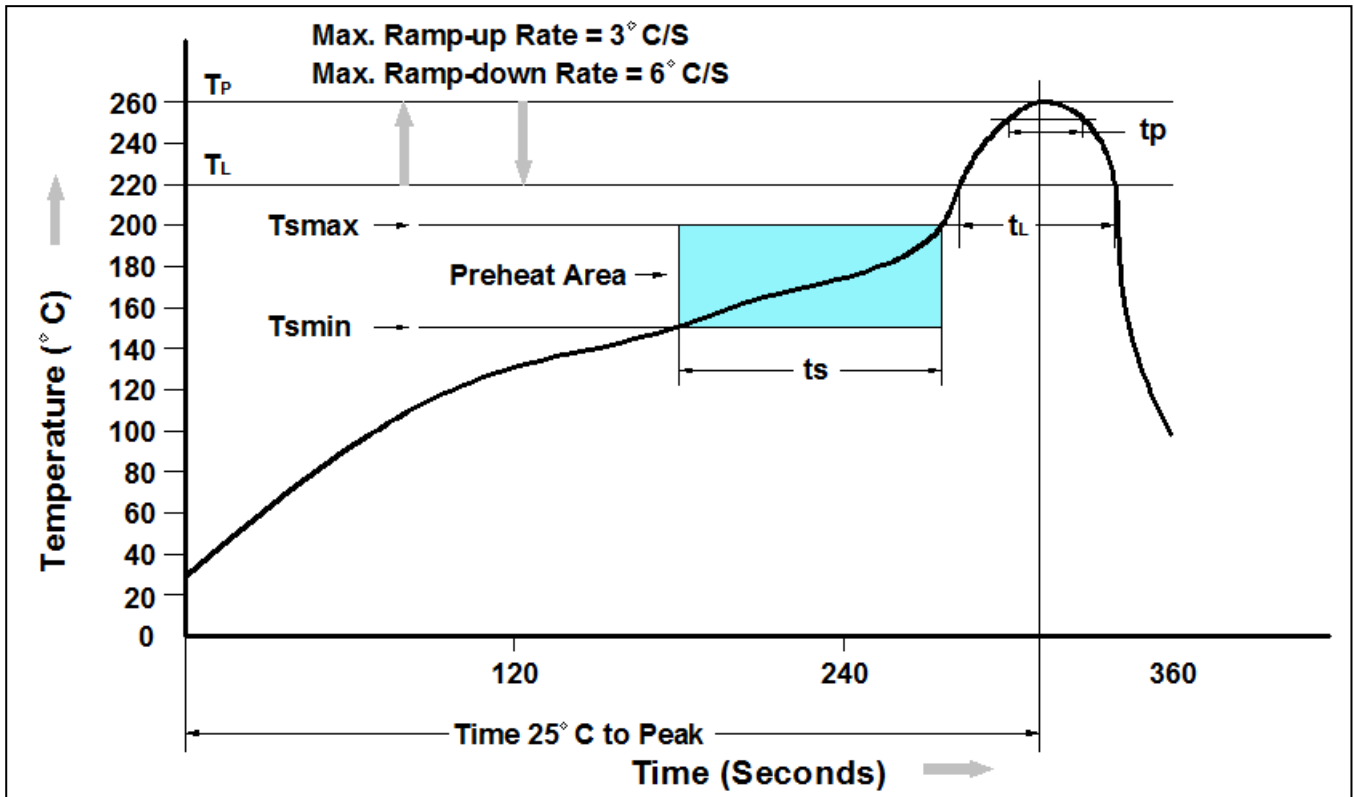


Fig.11 Gate Charge Waveform

➤ Recommend IR Reflow Soldering Thermal Profile

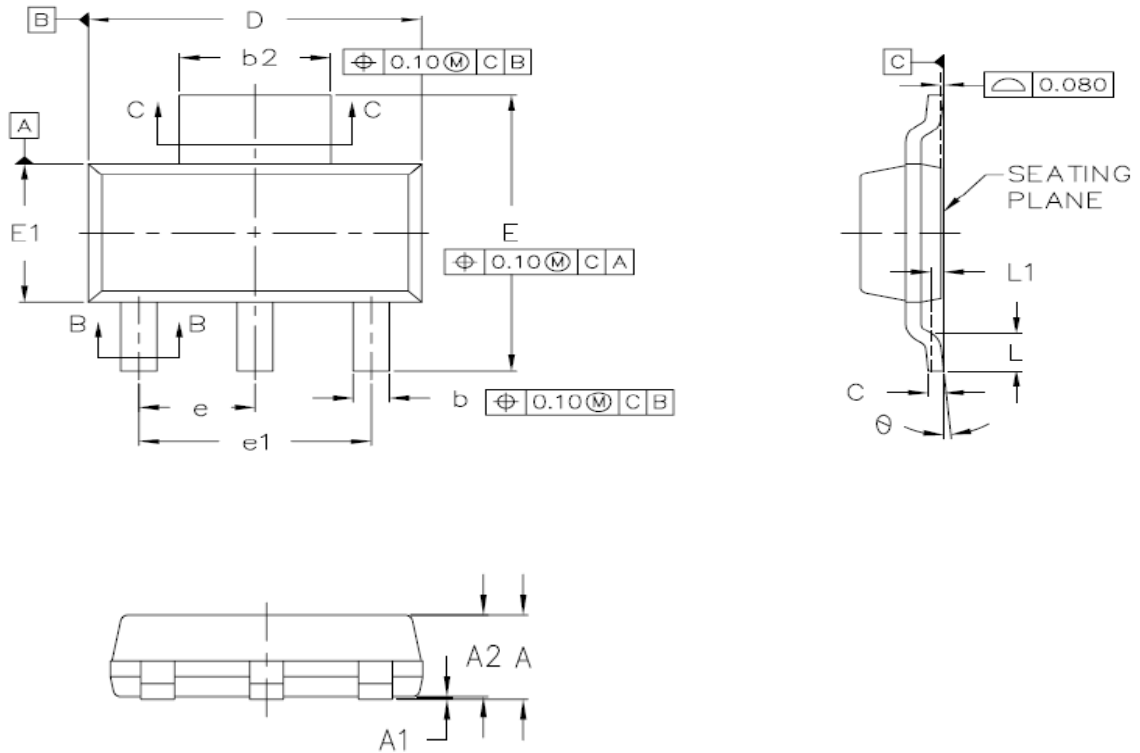


Profile Feature	Pb-Free Assembly Profile
Temperature Min. (T_{smin})	150°C
Temperature Max. (T_{smax})	200°C
Time (t_s) from (T_{smin} to T_{smax})	60-120 seconds
Average Ramp-up Rate (t_L to t_P)	3°C/second max.
Liquidous Temperature (T_L)	217°C
Time (t_L) Maintained Above (T_L)	60 – 150 seconds
Peak Temperature	260°C +0°C / -5°C
Time (t_P) within 5°C of actual Peak Temperature	30 seconds
Ramp-down Rate (T_P to T_L)	6°C/second max
Time 25°C to Peak Temperature	8 minutes max.

➤ Ordering Information

Part Number	Description	Quantity
PAP31TB01QB	SOT-223 Reel	3000 pcs

➤ Package Information (SOT-223)



DIMENSIONS	COMMON			
	MM		INCH	
	MIN.	MAX.	MIN.	MAX.
A	—	1.80	—	0.071
A1	0.02	0.10	0.001	0.004
A2	1.50	1.70	0.059	0.067
b	0.66	0.84	0.026	0.033
b1	0.60	0.79	0.024	0.031
b2	2.90	3.10	0.114	0.122
b3	2.84	3.05	0.112	0.120
c	0.23	0.35	0.009	0.014
c1	0.23	0.33	0.009	0.013
D	6.30	6.70	0.248	0.264
E	6.70	7.30	0.264	0.287
E1	3.30	3.70	0.130	0.146
e	2.30 BSC.		0.091 BSC.	
e1	4.60 BSC.		0.182 BSC.	
L	0.81	—	0.032	—
L1	0.25 BSC.		0.010 BSC.	
θ	0°	10°	0°	10°

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