

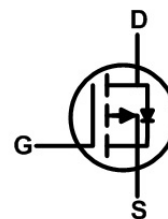
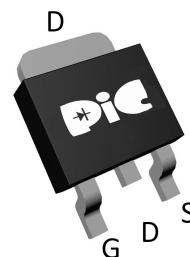
➤ General Description

This PAP31TX03X 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

- Super Low Gate Charge
- 100% EAS Guaranteed
- Green Device Available
- Excellent CdV/dt effect decline
- Advanced high cell density Trench technology

➤ TO-252



➤ Application

- Switch application
- DC/DC Converters Power
- Tools

➤ Absolute Maximum Ratings

Parameter	Symbol	Rating		Units
		10s	Steady State	
Drain-Source Voltage	V_{DS}	-30		V
Gate-Source Voltage	V_{GS}	± 20		V
Continuous Drain Current, V_{GS} @ -10V ¹	$I_D@T_C=25^\circ C$	-35		A
Continuous Drain Current, V_{GS} @ -10V ¹	$I_D@T_C=100^\circ C$	-22		A
Continuous Drain Current, V_{GS} @ -10V ¹	$I_D@T_A=25^\circ C$	-13.4	-8.5	A
Continuous Drain Current, V_{GS} @ -10V ¹	$I_D@T_A=70^\circ C$	-10.7	-6.8	A
Pulsed Drain Current ²	I_{DM}	-70		A
Single Pulse Avalanche Energy ³	EAS	72.2		mJ
Avalanche Current	I_{AS}	-38		A
Total Power Dissipation ⁴	$P_D@T_C=25^\circ C$	34.7		W
Total Power Dissipation ⁴	$P_D@T_A=25^\circ C$	5	2	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	$R_{\theta JA}$	62		$^\circ C/W$
Thermal Resistance Junction-Ambient ¹ (t ≤ 10s)	$R_{\theta JA}$	25		$^\circ C/W$
Thermal Resistance Junction-Case ¹	$R_{\theta JC}$	3.6		$^\circ C/W$

➤ 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	$R_{DS(ON)}$	$V_{GS}=-10V$, $I_D=-15A$	---	---	20	$m\Omega$
		$V_{GS}=-4.5V$, $I_D=-10A$	---	---	32	
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS}=V_{DS}$, $I_D=-250\mu A$	-1.0	---	-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}	$V_{DS}=-5V$, $I_D=-10A$	---	5	---	S
Gate Resistance	R_g	$V_{DS}=0V$, $V_{GS}=0V$, $f=1MHz$	---	13	---	Ω
Total Gate Charge (-4.5V)	Q_g	$V_{DS}=-15V$, $V_{GS}=-4.5V$, $I_D=-15A$	---	12.5	---	nC
Gate-Source Charge	Q_{gs}		---	5.4	---	
Gate-Drain Charge	Q_{gd}		---	5	---	
Turn-On Delay Time	$T_{d(on)}$	$V_{DD}=-15V$, $V_{GS}=-10V$, $R_G=3.3\Omega$, $I_D=-15A$	---	4.4	---	ns
Rise Time	T_r		---	11.2	---	
Turn-Off Delay Time	$T_{d(off)}$		---	34	---	
Fall Time	T_f		---	18	---	
Input Capacitance	C_{iss}	$V_{DS}=-15V$, $V_{GS}=0V$, $f=1MHz$	---	1345	---	pF
Output Capacitance	C_{oss}		---	194	---	
Reverse Transfer Capacitance	C_{rss}		---	158	---	

➤ Diode Characteristics

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Continuous Source Current ^{1,5}	I_S	$V_G=V_D=0V$, Force Current	---	---	-35	A
Pulsed Source Current ^{2,5}	I_{SM}		---	---	-70	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}	$I_F=-15A$, $dI/dt=100A/\mu s$, $T_J=25^\circ C$	---	12.4	---	nS
Reverse Recovery Charge	Q_{rr}		---	5	---	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. The EAS data shows Max. rating. The test condition is $V_{DD}=-25V$, $V_{GS}=-10V$, $L=0.1mH$, $I_{AS}=-38A$
4. Ensure that the channel temperature does not exceed $150^\circ C$.
5. The data is theoretically the same as I_D and I_{DM} , in real applications, should be limited by total power dissipation.

➤ Typical Characteristics

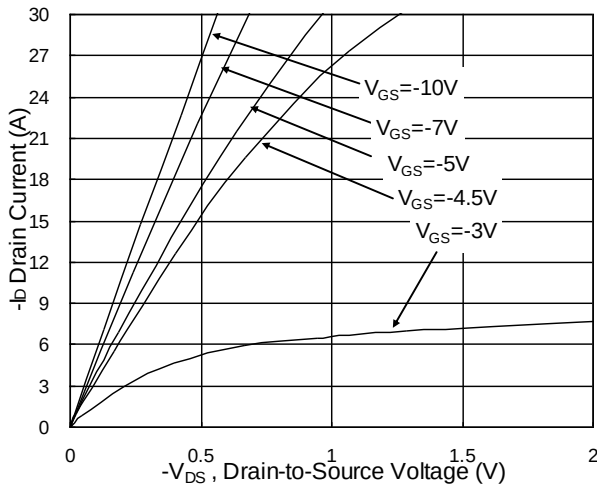


Fig.1 Typical Output Characteristics

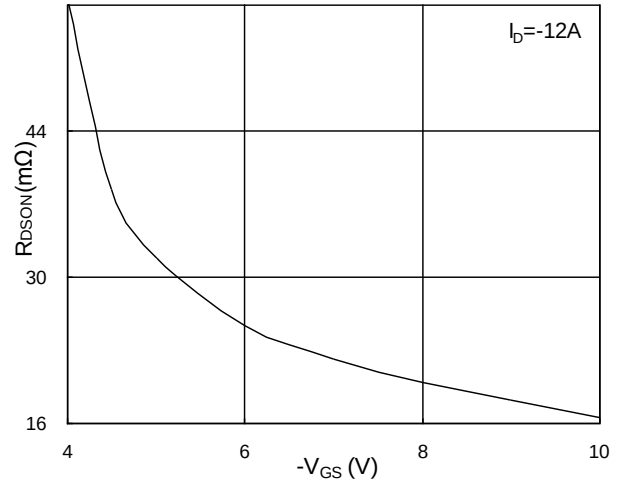


Fig.2 On-Resistance v.s Gate-Source

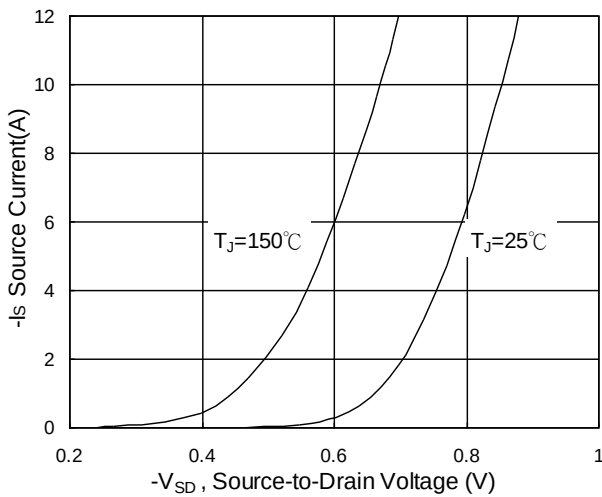


Fig.3 Forward Characteristics of Reverse

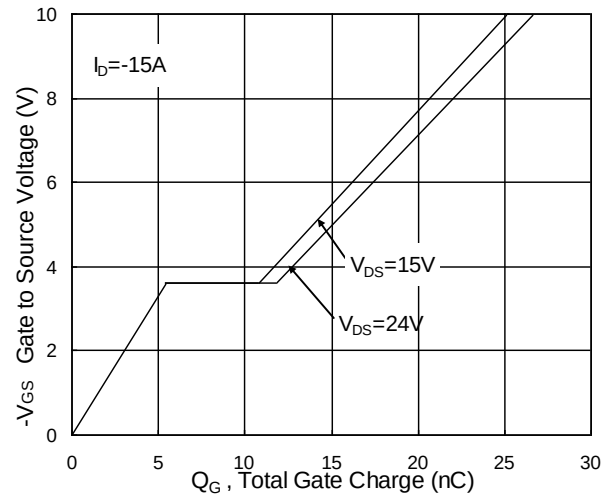


Fig.4 Gate-Charge Characteristics

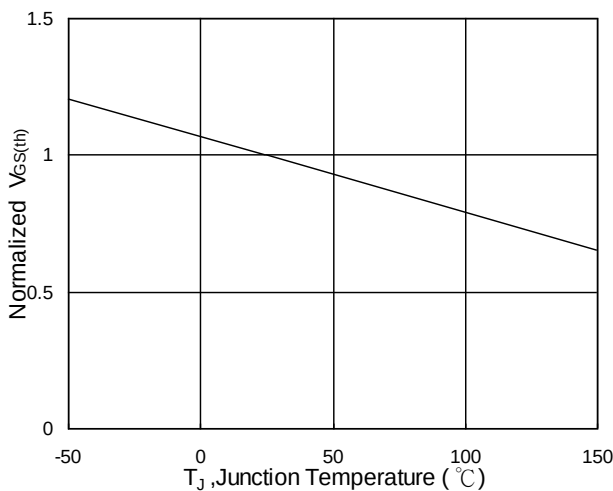


Fig.5 Normalized $V_{GS(th)}$ v.s T_J

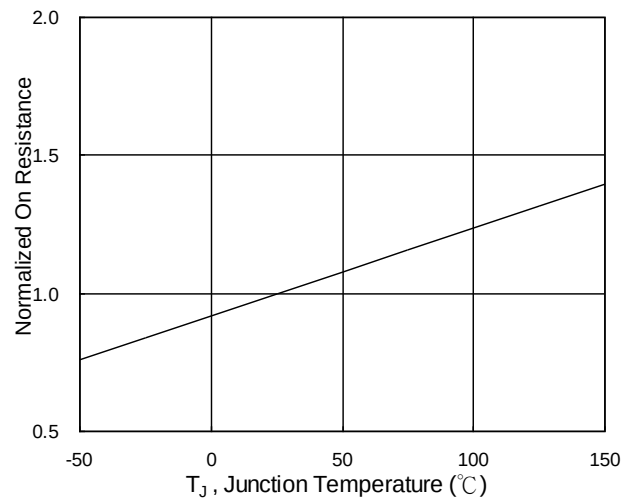


Fig.6 Normalized $R_{DS(on)}$ v.s T_J

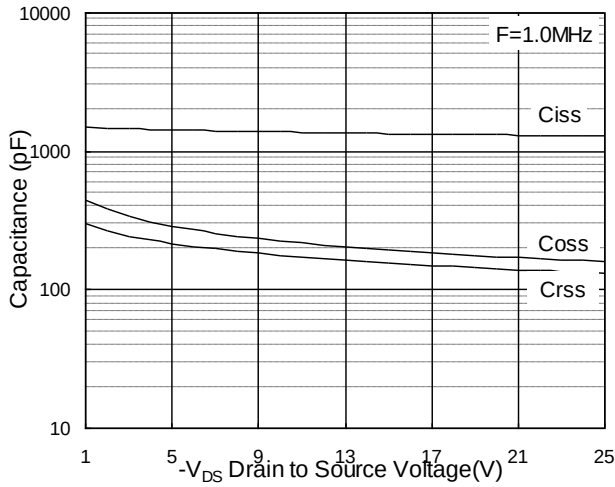


Fig.7 Capacitance

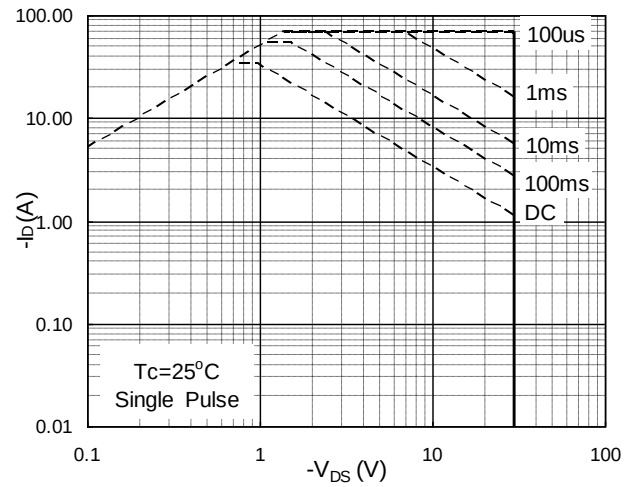


Fig.8 Safe Operating Area

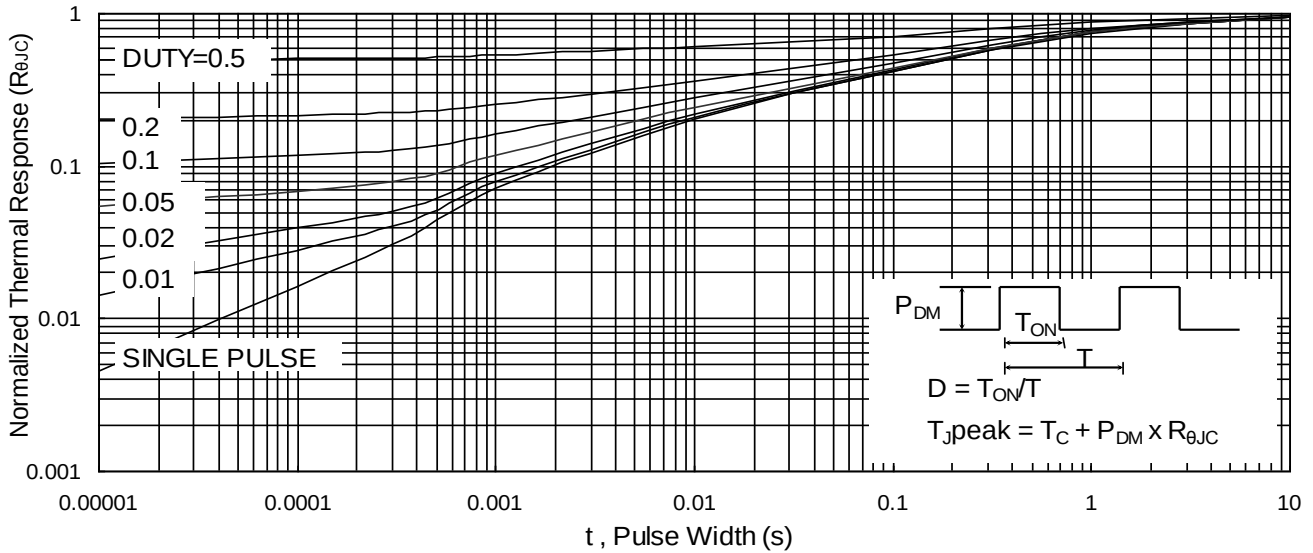


Fig.9 Normalized Maximum Transient Thermal Impedance

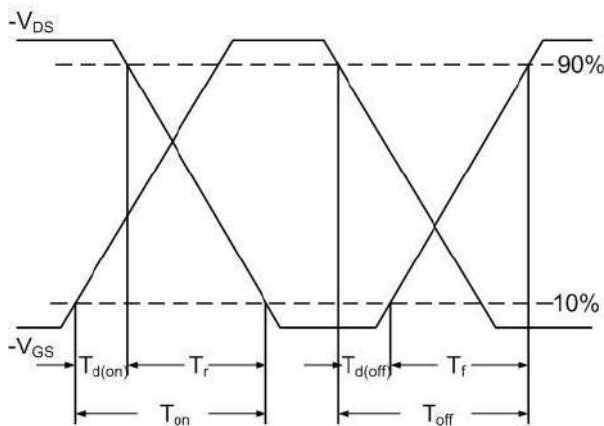


Fig.10 Switching Time Waveform

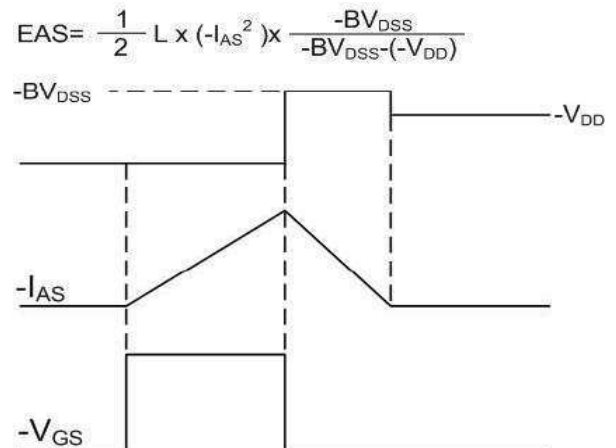
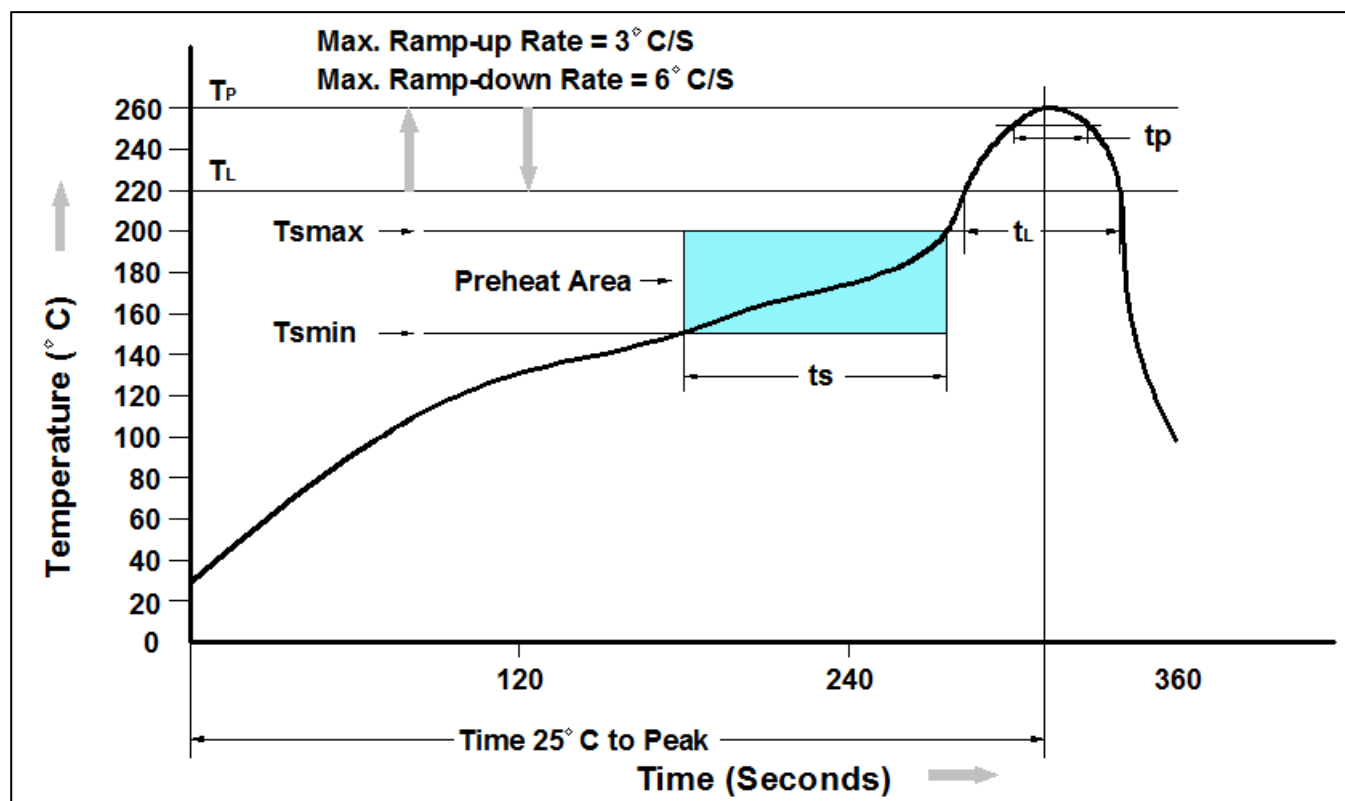


Fig.11 Unclamped Inductive Switching Waveform

➤ Recommend IR Reflow Soldering Thermal Profile

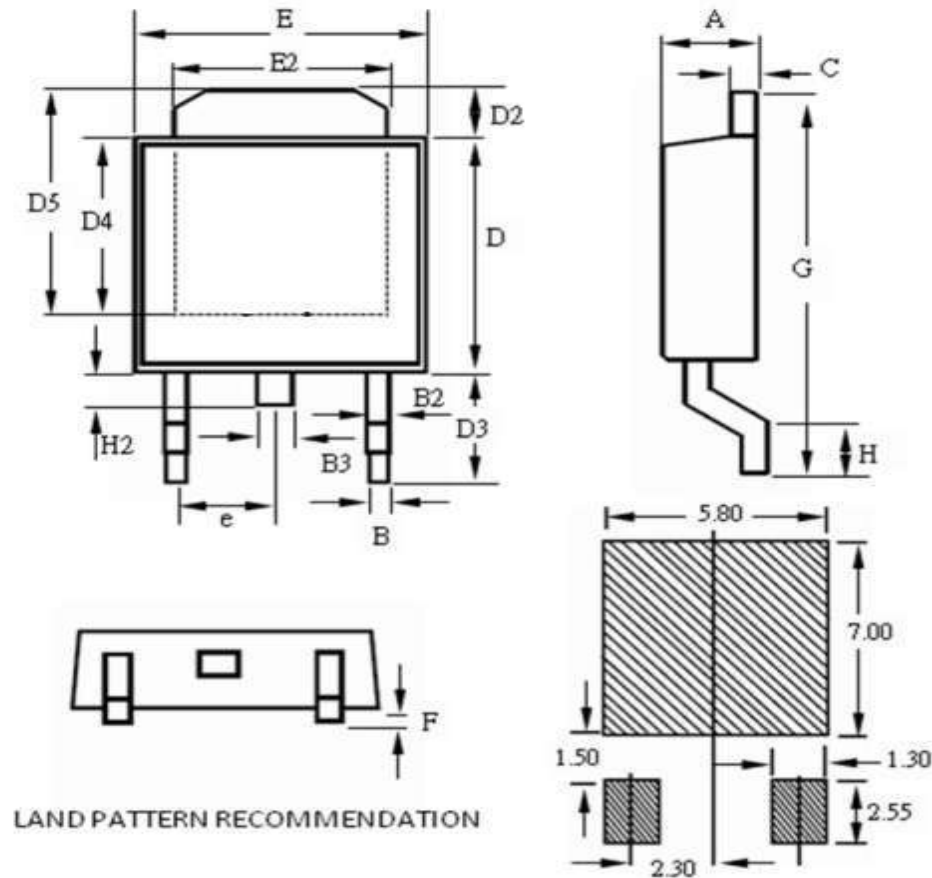


Profile Feature	Pb-Free Assembly Profile
Temperature Min. (Tsmin)	150°C
Temperature Max. (Tsmax)	200°C
Time (ts) from (Tsmin to Tsmax)	60-120 seconds
Average Ramp-up Rate (tL to tP)	3°C/second max.
Liquidous Temperature (TL)	217°C
Time (tL) Maintained Above (TL)	60 – 150 seconds
Peak Temperature	260°C +0°C / -5°C
Time (tP) within 5°C of actual Peak Temperature	30 seconds
Ramp-down Rate (TP to TL)	6°C/second max
Time 25°C to Peak Temperature	8 minutes max.

➤ Ordering Information

Part Number	Description	Quantity
PAP31TX03X	TO-252 Reel	2500 pcs

➤ Package Information (TO-252)



SYMBOLS	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	2.10	--	2.50	0.083	--	0.098
B	0.30	--	0.89	0.012	--	0.035
B2	0.40	--	1.14	0.016	--	0.045
B3	0.60	--	1.00	0.024	--	0.039
C	0.40	--	0.89	0.016	--	0.035
D	5.30	--	6.25	0.209	--	0.246
D2	0.50	--	1.70	0.020	--	0.067
D3	2.20	--	3.40	0.087	--	0.134
D4	4.32	--	--	0.170	--	--
D5	5.21	--	--	0.205	--	--
E	6.30	--	6.73	0.248	--	0.265
E2	4.80	--	5.46	0.189	--	0.215
F	0.00	--	0.30	0.000	--	0.012
G	9.20	--	10.41	0.362	--	0.410
H	0.90	--	1.95	0.035	--	0.077
H2	0.50	--	1.10	0.020	--	0.043
e	--	2.30	--	--	0.091	--

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