

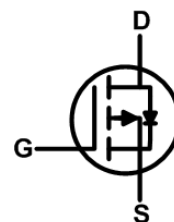
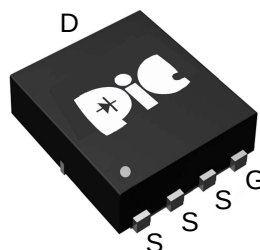
➤ General Description

This PAP31TY13Y 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

➤ DFN5X6A-EP1



➤ Application

- DC/DC Primary Side Switch
- Industrial Synchronous
- Rectification Load Switch
- DC/DC Converters

➤ Absolute Maximum Ratings

Parameter	Symbol	Rating	Units
Drain-Source Voltage	V_{DS}	-30	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current, $-V_{GS} @ -10V_1$	$I_D @ T_C = 25^\circ C$	-31	A
Continuous Drain Current, $-V_{GS} @ -10V_1$	$I_D @ T_C = 100^\circ C$	-24	A
Continuous Drain Current, $-V_{GS} @ -10V_1$	$I_D @ T_A = 25^\circ C$	-7	A
Pulsed Drain Current ₂	I_{DM}	-62	A
Single Pulse Avalanche Energy ₃	EAS	45	mJ
Avalanche Current	I_{AS}	-30	A
Total Power Dissipation ₄	$P_D @ T_C = 25^\circ C$	41.7	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 Case ₁	$R_{\theta JC}$	3	$^\circ C/W$

➤ 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 $25^\circ C$, $I_D = -1mA$	---	-0.021	---	V/ $^\circ C$
Static Drain-Source On-Resistance ²	$R_{DS(ON)}$	$V_{GS} = -10V$, $I_D = -8A$	---	25	30	$m\Omega$
		$V_{GS} = -4.5V$, $I_D = -6A$	---	45	55	
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	$\Delta V_{GS(th)}$		---	-4.2	---	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}	$V_{DS} = -5V$, $I_D = -12A$	---	15	---	S
Gate Resistance	R_g	$V_{DS} = 0V$, $V_{GS} = 0V$, $f = 1MHz$	---	15	30	Ω
Total Gate Charge (-4.5V)	Q_g	$V_{DS} = -20V$, $V_{GS} = -4.5V$, $I_D = -12A$	---	9.8	---	nC
Gate-Source Charge	Q_{gs}		---	2.2	---	
Gate-Drain Charge	Q_{gd}		---	3.4	---	
Turn-On Delay Time	$T_{d(on)}$	$V_{DD} = -24V$, $V_{GS} = -10V$, $R_G = 3.3\Omega$, $I_D = -1A$	---	16.4	---	ns
Rise Time	T_r		---	20.2	---	
Turn-Off Delay Time	$T_{d(off)}$		---	55	---	
Fall Time	T_f		---	10	---	
Input Capacitance	C_{iss}	$V_{DS} = -15V$, $V_{GS} = 0V$, $f = 1MHz$	---	930	---	pF
Output Capacitance	C_{oss}		---	148	---	
Reverse Transfer Capacitance	C_{rss}		---	115	---	

➤ Diode Characteristics

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Continuous Source Current ^{1,5}	I_S	$V_{GS} = V_D = 0V$, Force Current	---	---	-31	A
Pulsed Source Current ^{2,5}	I_{SM}		---	---	-62	A
Diode Forward Voltage ²	V_{SD}	$V_{GS} = 0V$, $I_S = -1A$, $T_J = 25^\circ C$	---	---	-1.2	V

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 $V_{DD} = -25V$, $V_{GS} = -10V$, $L = 0.1mH$, $I_{AS} = -30A$
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

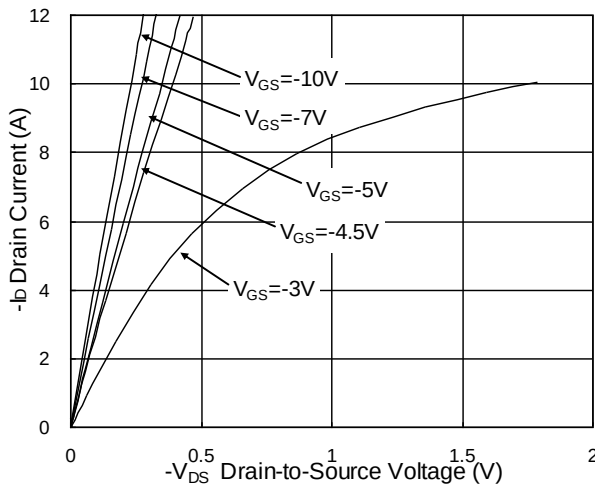


Fig.1 Typical Output Characteristics

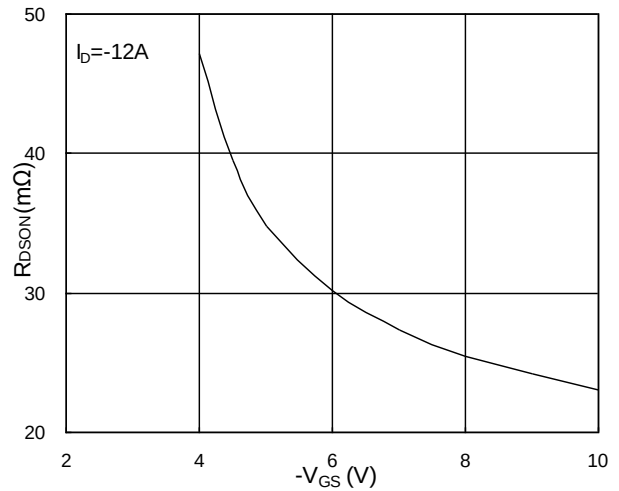


Fig.2 On-Resistance v.s Gate-Source

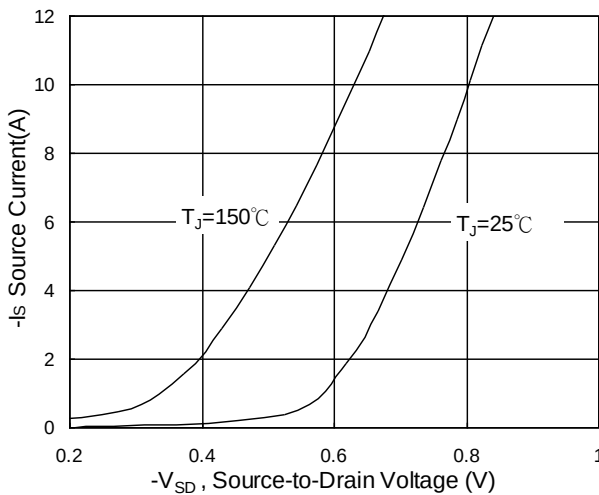


Fig.3 Forward Characteristics of Reverse

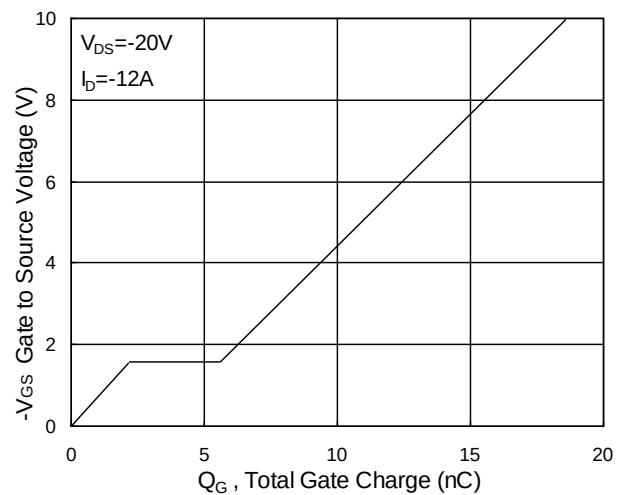


Fig.4 Gate-Charge Characteristics

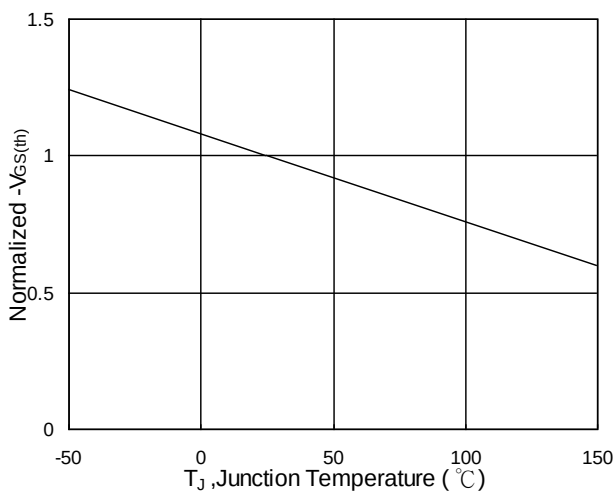


Fig.5 Normalized $V_{GS(th)}$ v.s T_J

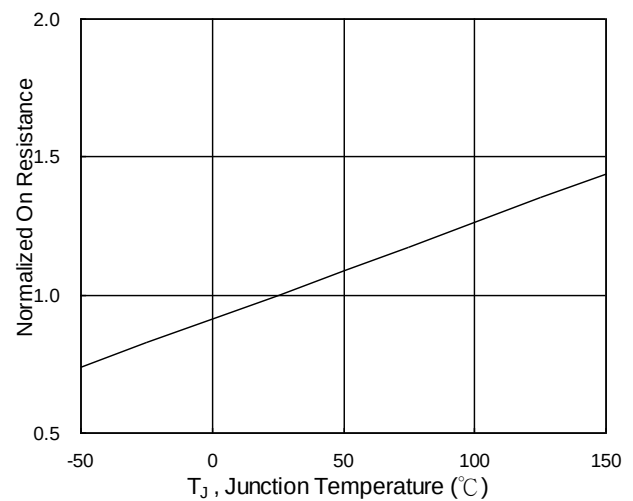


Fig.6 Normalized $R_{DS(ON)}$ v.s T_J

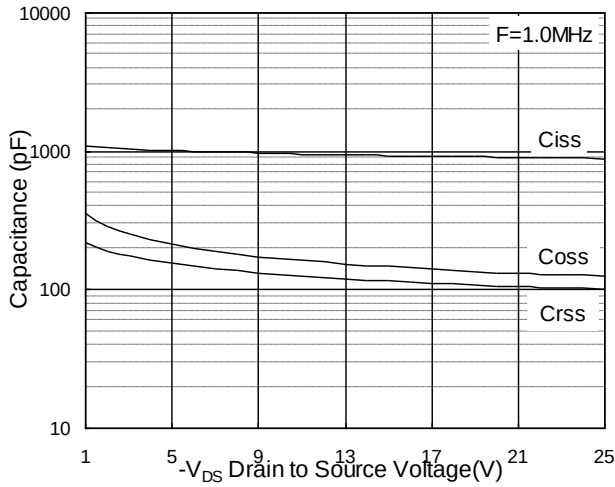


Fig.7 Capacitance

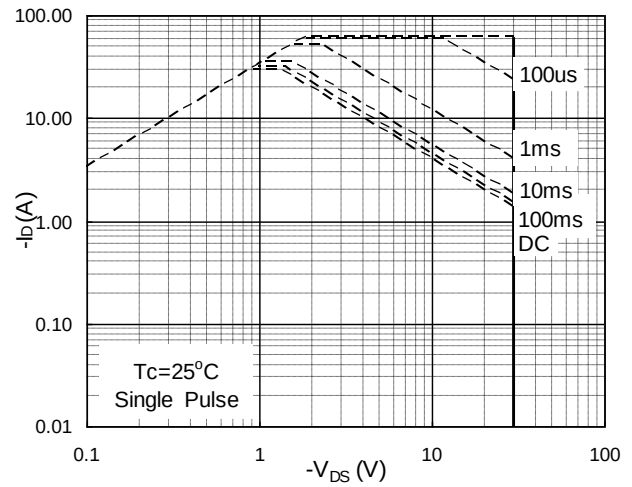


Fig.8 Safe Operating Area

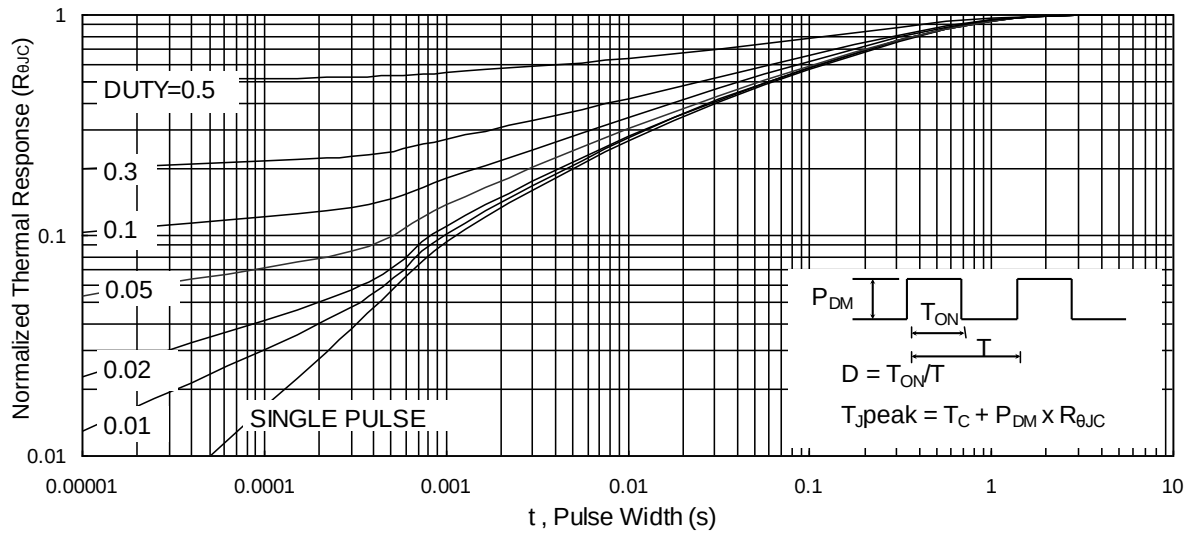


Fig.9 Normalized Maximum Transient Thermal Impedance

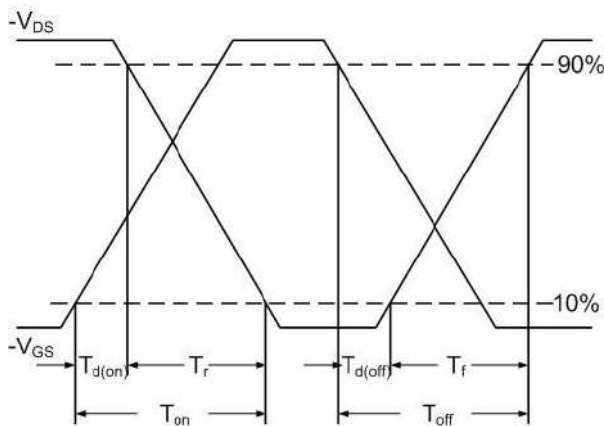


Fig.10 Switching Time Waveform

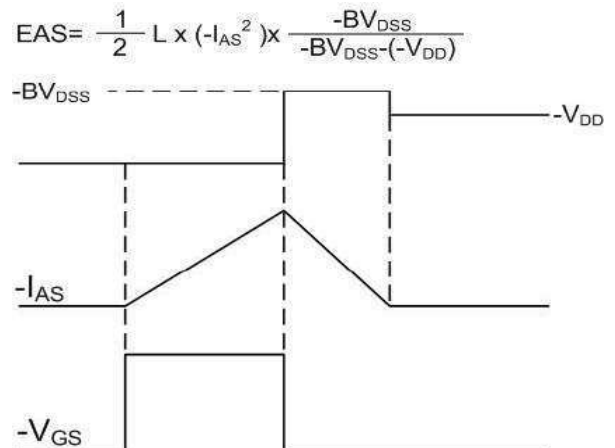
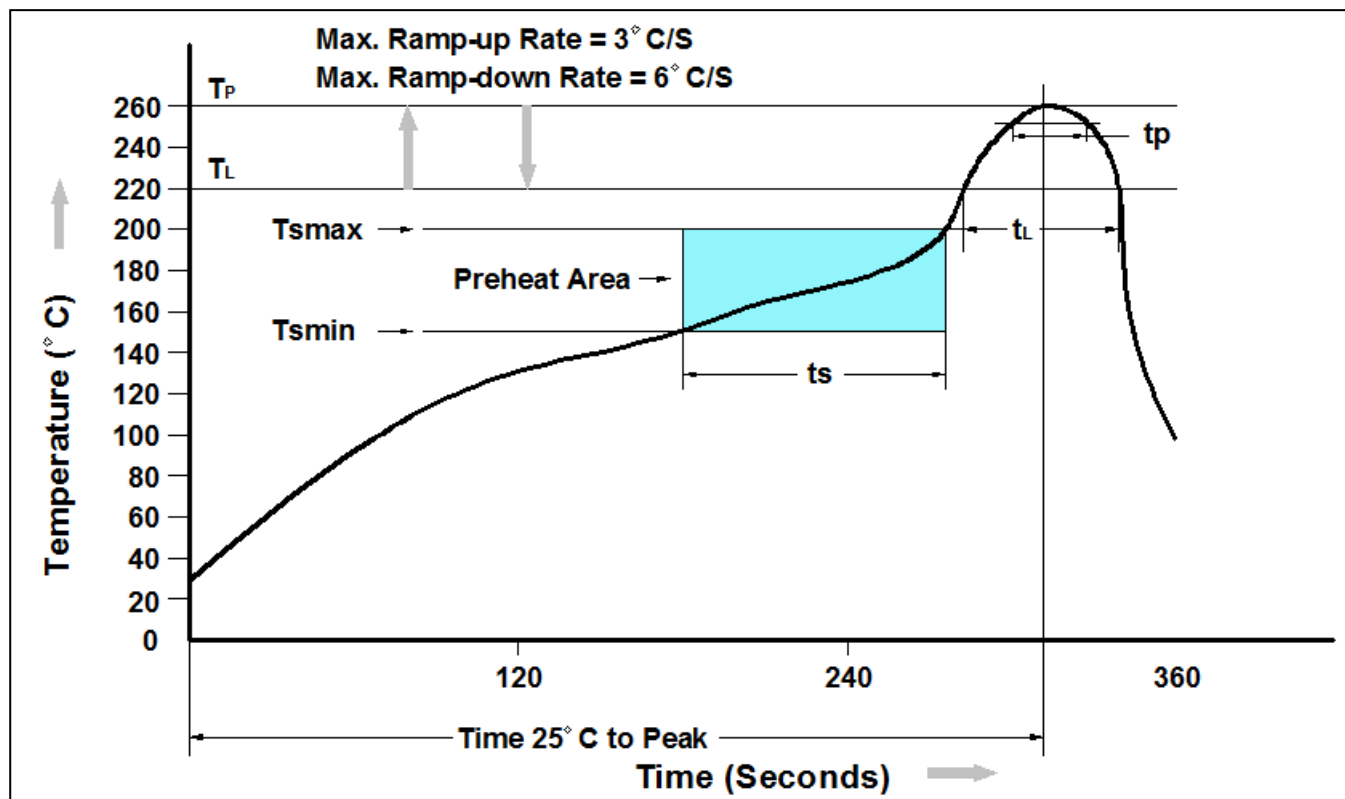


Fig.11 Unclamped Inductive Waveform

➤ Recommend IR Reflow Soldering Thermal Profile

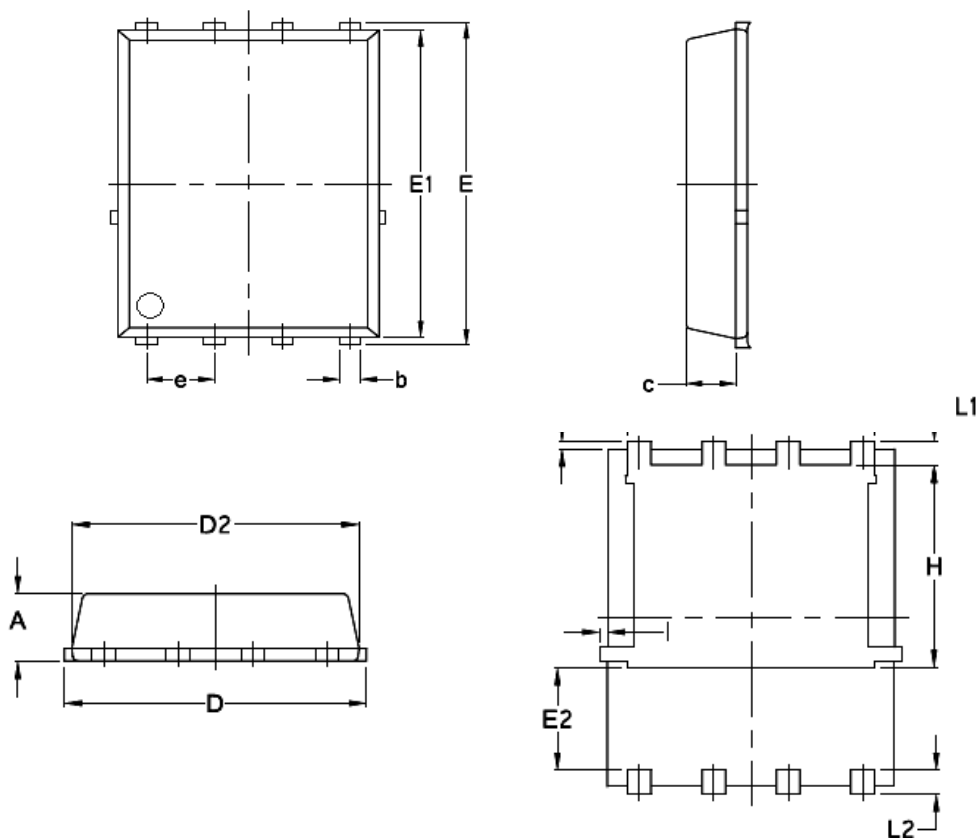


Profile Feature	Pb-Free Assembly Profile
Temperature Min. (Tlmin)	150°C
Temperature Max. (Tlmax)	200°C
Time (ts) from (Tlmin to Tlmax)	60-120 seconds
Average Ramp-up Rate (tl to tp)	3°C/second max.
Liquidous Temperature (Tl)	217°C
Time (tl) Maintained Above (Tl)	60 – 150 seconds
Peak Temperature	260°C +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
PAP31TY13Y	DFN5X6A-EP1 Reel	3000 pcs

➤ Package Information (DFN5X6A-EP1)



SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.03	1.17	0.0406	0.0461
b	0.34	0.48	0.0134	0.0189
c	0.824	0.970	0.0324	0.0382
D	4.80	5.40	0.1890	0.2126
D1	4.11	4.31	0.1618	0.1697
D2	4.80	5.00	0.1890	0.1969
I	---	0.18	---	0.0070
E	5.90	6.15	0.2323	0.2421
E1	5.65	5.85	0.2224	0.2303
E2	1.10	---	0.0433	---
e	1.27 BSC		0.05 BSC	
H	3.30	3.78	0.1299	0.1488
L	0.05	0.25	0.0020	0.0098
L1	0.38	0.61	0.0150	0.0240
L2	0.38	0.71	0.0150	0.0279

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