

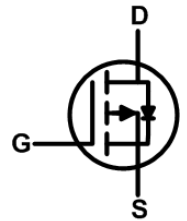
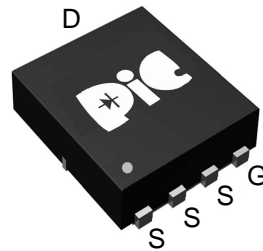
## ➤ General Description

This PAP31TY15Y 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
		10s	Steady State	
Drain-Source Voltage	$V_{DS}$	-30		V
Gate-Source Voltage	$V_{GS}$	±25		V
Continuous Drain Current, $V_{GS} @ -10V^1$	$I_D @ T_C = 25^\circ C$	-59		A
Continuous Drain Current, $V_{GS} @ -10V^1$	$I_D @ T_C = 100^\circ C$	-37		A
Continuous Drain Current, $V_{GS} @ -10V^1$	$I_D @ T_A = 25^\circ C$	-18	-11.6	A
Continuous Drain Current, $V_{GS} @ -10V^1$	$I_D @ T_A = 70^\circ C$	-14.6	-9.3	A
Pulsed Drain Current <sup>2</sup>	$I_{DM}$	-180		A
Single Pulse Avalanche Energy <sup>3</sup>	EAS	153		mJ
Avalanche Current	$I_{AS}$	-55.4		A
Total Power Dissipation <sup>4</sup>	$P_D @ T_C = 25^\circ C$	52.1		W
Total Power Dissipation <sup>4</sup>	$P_D @ T_A = 25^\circ C$	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 <sup>1</sup>	$R_{\theta JA}$	62		$^\circ C/W$
Thermal Resistance Junction-Ambient <sup>1</sup> ( $t \leq 10s$ )	$R_{\theta JA}$	25		$^\circ C/W$
Thermal Resistance Junction-Case <sup>1</sup>	$R_{\theta JC}$	2.4		$^\circ C/W$

### ➤ 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
BVDSS Temperature Coefficient	$\Delta BV_{DSS} / \Delta T_J$	Reference to $25^\circ C, I_D = -1mA$	---	-0.018	---	$V/^\circ C$
Static Drain-Source On-Resistance <sup>2</sup>	$R_{DS(ON)}$	$V_{GS} = -10V, I_D = -20A$	---	7.8	9.8	$m\Omega$
		$V_{GS} = -4.5V, I_D = -15A$	---	11	15	
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS} = V_{DS}, I_D = -250\mu A$	-1.0	---	-2.5	V
VGS(th) Temperature Coefficient	$\Delta V_{GS(th)}$		---	5.04	---	$mV/^\circ C$
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS} = -24V, V_{GS} = 0V, T_J = 25^\circ C$	---	---	1	$\mu A$
		$V_{DS} = -24V, V_{GS} = 0V, T_J = 55^\circ C$	---	---	5	
Gate-Source Leakage Current	$I_{GSS}$	$V_{GS} = \pm 25V, V_{DS} = 0V$	---	---	$\pm 100$	nA
Forward Transconductance	$g_{fs}$	$V_{DS} = -5V, I_D = -30A$	---	26.4	---	S
Total Gate Charge (-4.5V)	$Q_g$	$V_{DS} = -15V, V_{GS} = -4.5V, I_D = -15A$	---	33	---	nC
Gate-Source Charge	$Q_{gs}$		---	10.7	---	
Gate-Drain Charge	$Q_{gd}$		---	12.8	---	
Turn-On Delay Time	$T_{d(on)}$	$V_{DD} = -15V, V_{GS} = -10V, R_G = 3.3\Omega, I_D = -15A$	---	8	---	ns
Rise Time	$T_r$		---	17.8	---	
Turn-Off Delay Time	$T_{d(off)}$		---	78.4	---	
Fall Time	$T_f$		---	43.6	---	
Input Capacitance	$C_{iss}$	$V_{DS} = -15V, V_{GS} = 0V, f = 1MHz$	---	3448	---	pF
Output Capacitance	$C_{oss}$		---	508	---	
Reverse Transfer Capacitance	$C_{rss}$		---	421	---	

### ➤ Diode Characteristics

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Continuous Source Current <sup>1,5</sup>	$I_S$	$V_G = V_D = 0V$ , Force Current	---	---	-59	A
Diode Forward Voltage <sup>2</sup>	$V_{SD}$	$V_{GS} = 0V, I_S = -1A, T_J = 25^\circ C$	---	---	-1.2	V
Reverse Recovery Time	$t_{rr}$	$I_F = -15A, di/dt = 100A/\mu s, T_J = 25^\circ C$	---	29	---	nS
Reverse Recovery Charge	$Q_{rr}$		---	15	---	nC

Note :

1. Pulse width limited by maximum junction temperature.

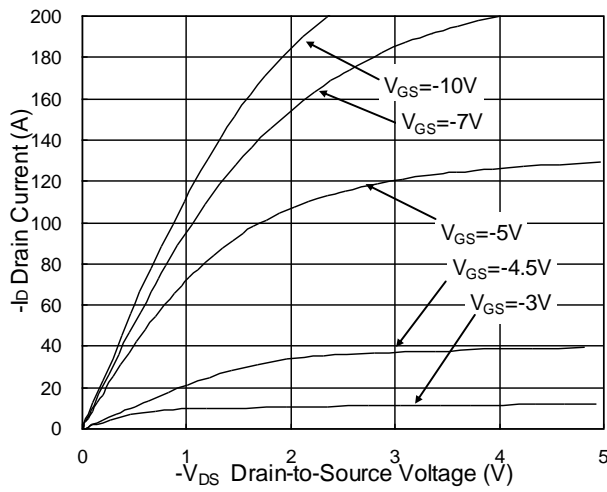
2. The data tested by pulsed, pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$

3. The EAS data shows Max. rating. The test condition is  $V_{DD} = -25V, V_{GS} = -10V, L = 0.1mH, I_{AS} = -55.4A$

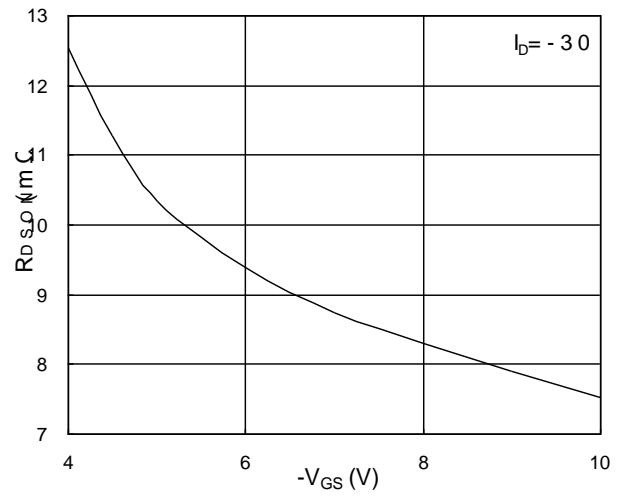
4. Ensure that the channel temperature does not exceed  $150^\circ C$ .

5. The data is theoretically the same as  $I_D$  and  $I_{DM}$ , in real applications, should be limited by total power dissipation.

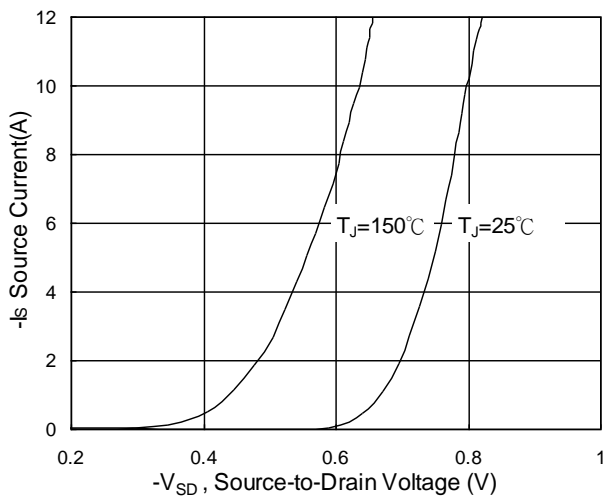
## ➤ Typical Characteristics



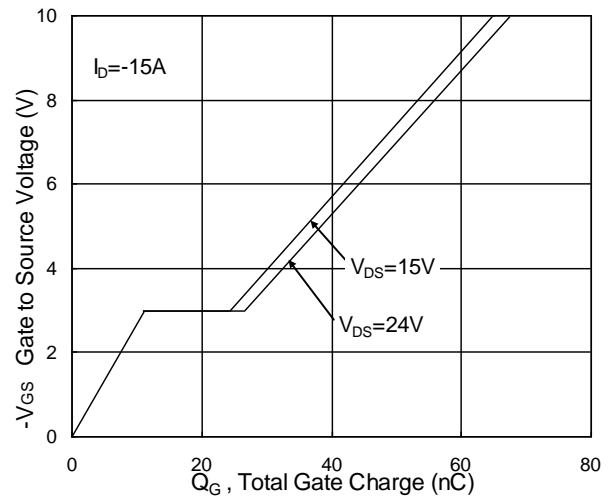
**Fig.1 Typical Output Characteristics**



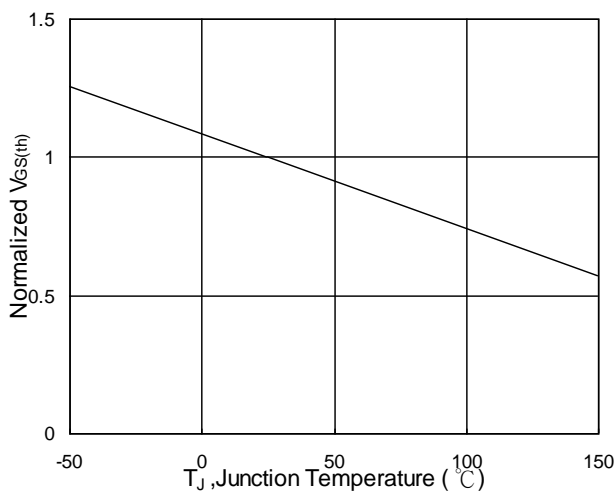
**Fig.2 On-Resistance v.s Gate-Source**



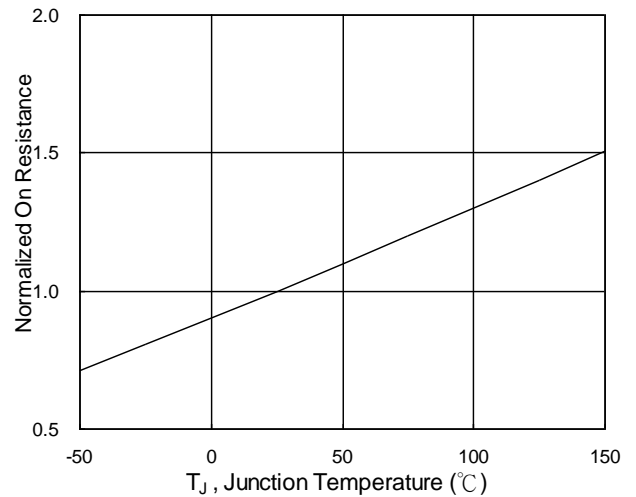
**Fig.3 Forward Characteristics Of Reverse**



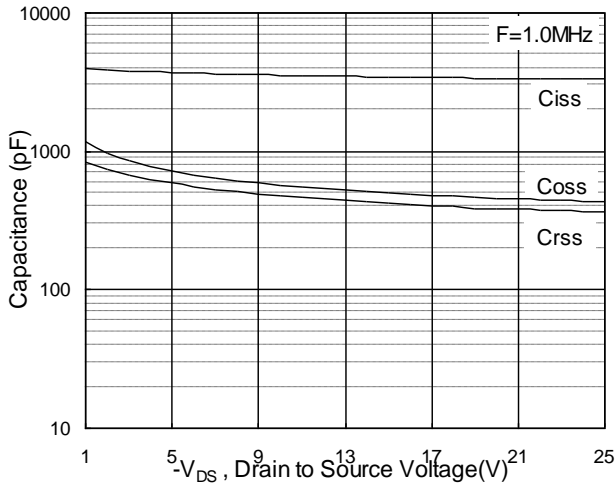
**Fig.4 Gate-Charge Characteristics**



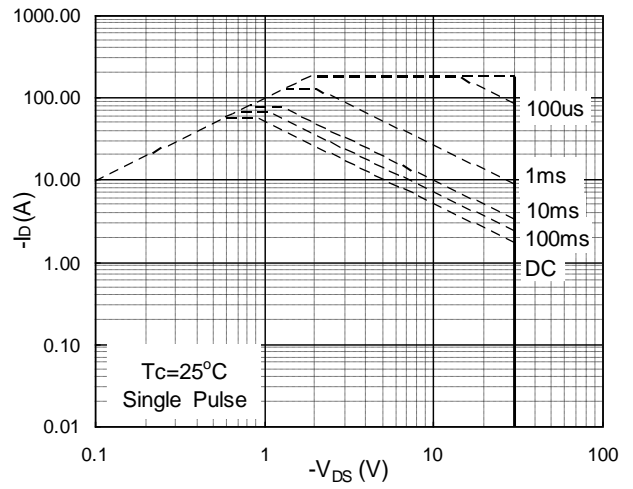
**Fig.5 Normalized  $V_{GS(th)}$  v.s  $T_J$**



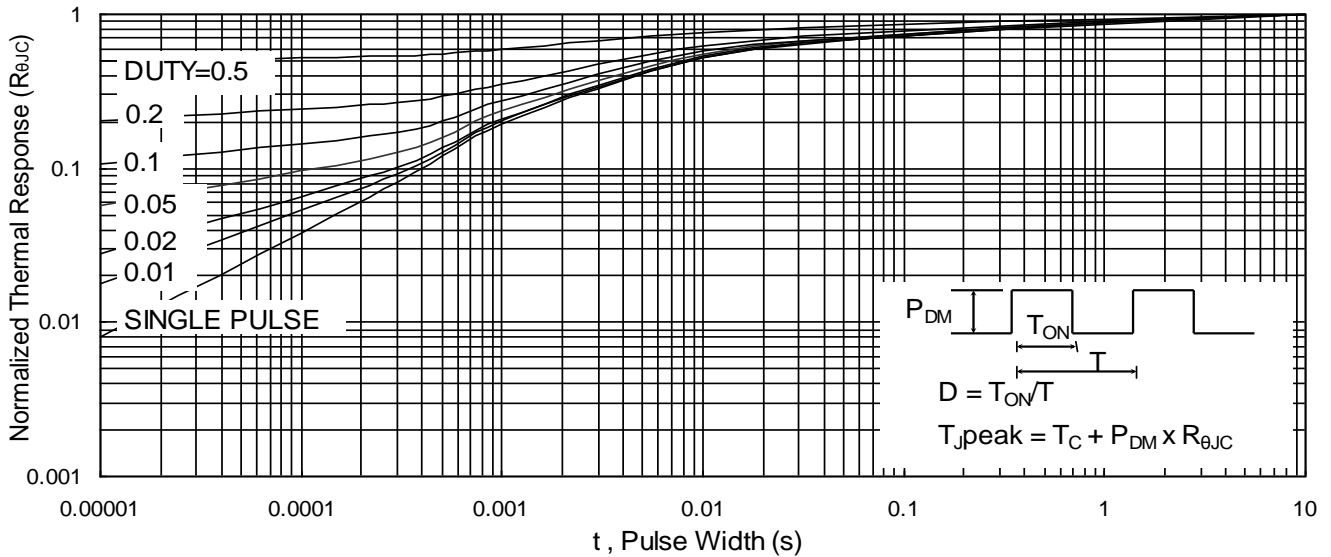
**Fig.6 Normalized  $R_{DS(on)}$  v.s  $T_J$**



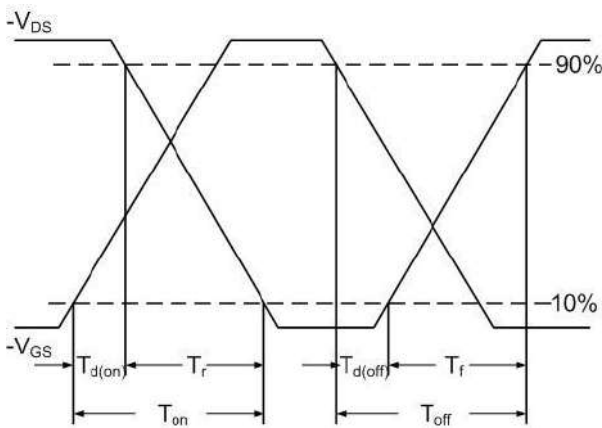
**Fig.7 Capacitance**



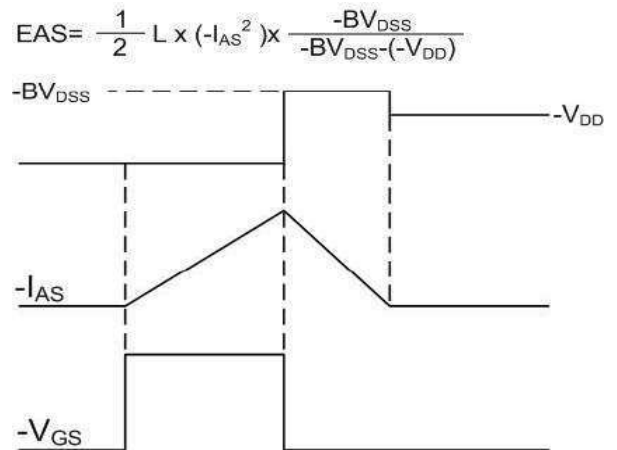
**Fig.8 Safe Operating Area**



**Fig.9 Normalized Maximum Transient Thermal Impedance**



**Fig.10 Switching Time Waveform**



**Fig.11 Unclamped Inductive Switching Waveform**

➤ Recommand IR Reflow Soldering Thermal Profile

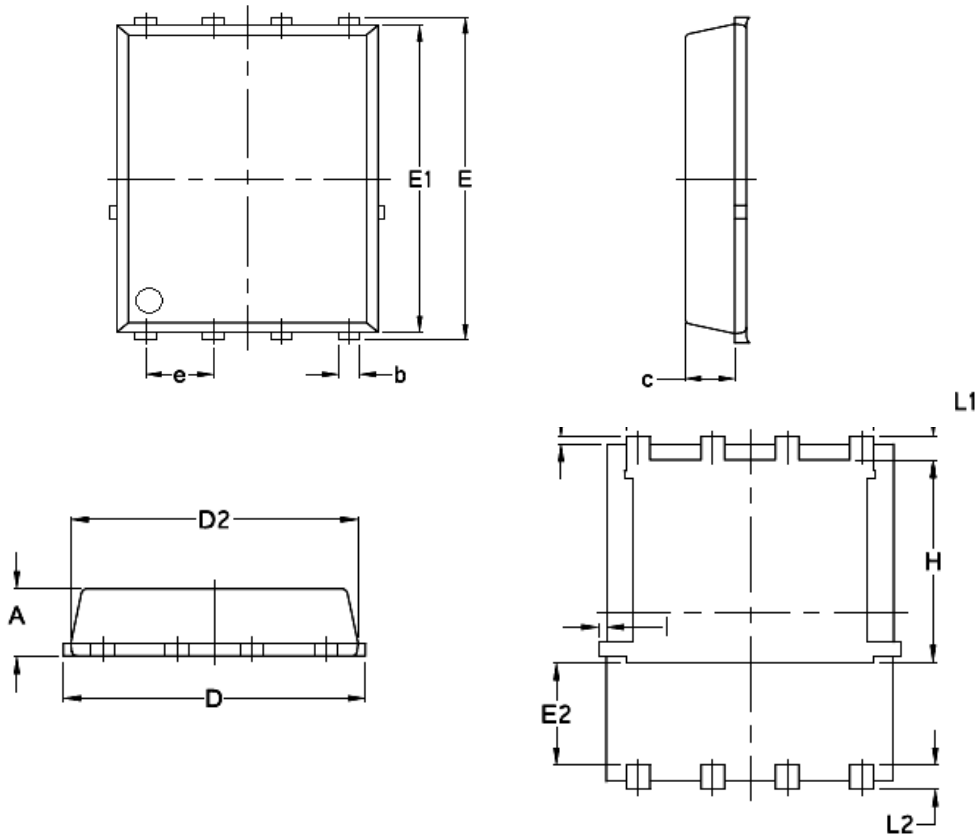


Profile Feature	Pb-Free Assembly Profile
Temperature Min. (T <sub>smin</sub> )	150°C
Temperature Max. (T <sub>smax</sub> )	200°C
Time (t <sub>s</sub> ) from (T <sub>smin</sub> to T <sub>smax</sub> )	60-120 seconds
Average Ramp-up Rate (t <sub>L</sub> to t <sub>P</sub> )	3°C/second max.
Liquidous Temperature (T <sub>L</sub> )	217°C
Time (t <sub>L</sub> ) Maintained Above (T <sub>L</sub> )	60 – 150 seconds
Peak Temperature	260°C +0°C / -5°C
Time (t <sub>P</sub> ) within 5°C of actual Peak Temperature	30 seconds
Ramp-down Rate (T <sub>P</sub> to T <sub>L</sub> )	6°C/second max
Time 25°C to Peak Temperature	8 minutes max.

➤ Ordering Information

Part Number	Description	Quantity
PAP31TY15Y	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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