

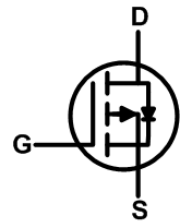
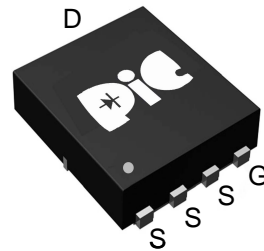
## ➤ General Description

This PAP61TV13V P-Channel enhancement mode power field effect transistor is the high density trench technology and this advanced technology can provide excellent Rds(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

## ➤ DFN3X3A-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 <sub>DS</sub>	-60	V
Gate-Source Voltage	V <sub>GS</sub>	±20	V
Continuous Drain Current, V <sub>GS</sub> @ -10V <sup>1</sup>	I <sub>D</sub> @T <sub>C</sub> =25°C	-13	A
Continuous Drain Current, V <sub>GS</sub> @ -10V <sup>1</sup>	I <sub>D</sub> @T <sub>C</sub> =100°C	-8.3	A
Continuous Drain Current, V <sub>GS</sub> @ -10V <sup>1</sup>	I <sub>D</sub> @T <sub>A</sub> =25°C	-3.3	A
Continuous Drain Current, V <sub>GS</sub> @ -10V <sup>1</sup>	I <sub>D</sub> @T <sub>A</sub> =70°C	-2.7	A
Pulsed Drain Current <sup>2</sup>	I <sub>DM</sub>	-26	A
Single Pulse Avalanche Energy <sup>3</sup>	EAS	29.8	mJ
Avalanche Current	I <sub>AS</sub>	24.4	A
Total Power Dissipation <sup>4</sup>	P <sub>D</sub> @T <sub>C</sub> =25°C	31.3	W
Total Power Dissipation <sup>4</sup>	P <sub>D</sub> @T <sub>A</sub> =25°C	2	W
Storage Temperature Range	T <sub>STG</sub>	-55 to 150	°C
Operating Junction Temperature Range	T <sub>J</sub>	-55 to 150	°C
Thermal Resistance Junction-Ambient <sup>1</sup>	R <sub>θJA</sub>	62	°C/W
Thermal Resistance Junction-Case <sup>1</sup>	R <sub>θJC</sub>	4	°C/W

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

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V$ , $I_D=-250\mu A$	-60	---	---	V
Static Drain-Source On-Resistance <sup>2</sup>	$R_{DS(ON)}$	$V_{GS}=-10V$ , $I_D=-10A$	---	---	90	m $\Omega$
		$V_{GS}=-4.5V$ , $I_D=-5A$	---	---	132	
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS}=V_{DS}$ , $I_D=-250\mu A$	-1.0	---	-2.5	V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS}=-48V$ , $V_{GS}=0V$ , $T_J=25^\circ C$	---	---	1	uA
		$V_{DS}=-48V$ , $V_{GS}=0V$ , $T_J=55^\circ C$	---	---	5	
Gate-Source Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V$ , $V_{DS}=0V$	---	---	$\pm 100$	nA
Forward Transconductance	$g_{fs}$	$V_{DS}=-5V$ , $I_D=-4A$	---	8.7	---	S
Gate Resistance	$R_g$	$V_{DS}=0V$ , $V_{GS}=0V$ , $f=1MHz$	---	15	---	$\Omega$
Total Gate Charge (-4.5V)	$Q_g$	$V_{DS}=-12V$ , $V_{GS}=-4.5V$ , $I_D=-6A$	---	11.8	---	nC
Gate-Source Charge	$Q_{gs}$		---	1.9	---	
Gate-Drain Charge	$Q_{gd}$		---	6.5	---	
Turn-On Delay Time	$T_{d(on)}$	$V_{DD}=-15V$ , $V_{GS}=-10V$ , $R_G=3.3\Omega$ , $I_D=-1A$	---	8.8	---	ns
Rise Time	$T_r$		---	19.6	---	
Turn-Off Delay Time	$T_{d(off)}$		---	47.2	---	
Fall Time	$T_f$		---	9.6	---	
Input Capacitance	$C_{iss}$	$V_{DS}=-15V$ , $V_{GS}=0V$ , $f=1MHz$	---	1080	---	pF
Output Capacitance	$C_{oss}$		---	73	---	
Reverse Transfer Capacitance	$C_{rss}$		---	50	---	

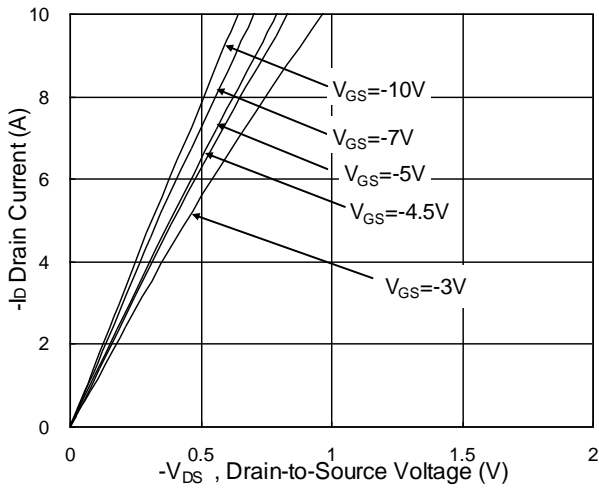
## ➤ Diode Characteristics

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Continuous Source Current <sup>1,5</sup>	$I_S$	$V_G=V_D=0V$ , Force Current	---	---	-13	A
Pulsed Source Current <sup>2,5</sup>	$I_{SM}$		---	---	-26	A
Diode Forward Voltage <sup>2</sup>	$V_{SD}$	$V_{GS}=0V$ , $I_S=-1A$ , $T_J=25^\circ C$	---	---	-1	V

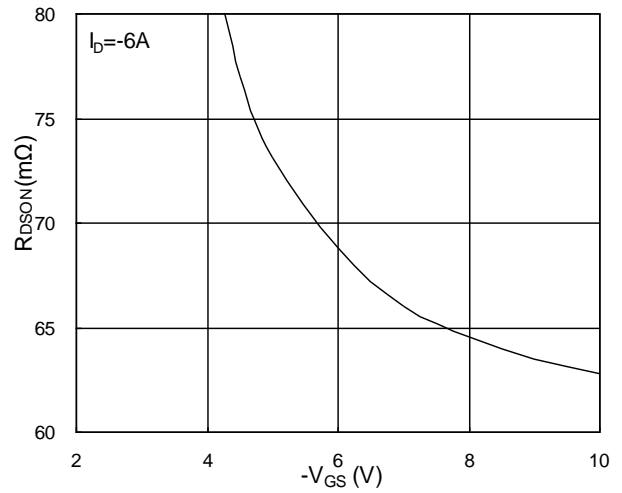
Note :

- Pulse width limited by maximum junction temperature.
- The data tested by pulsed, pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$
- The EAS data shows Max. rating. The test condition is  $V_{DD}=-25V$ ,  $V_{GS}=-10V$ ,  $L=0.1mH$ ,  $I_{AS}=-24.4A$
- Ensure that the channel temperature does not exceed  $150^\circ C$ .
- The data is theoretically the same as  $I_D$  and  $I_{DM}$ , in real applications, should be limited by total power dissipation.

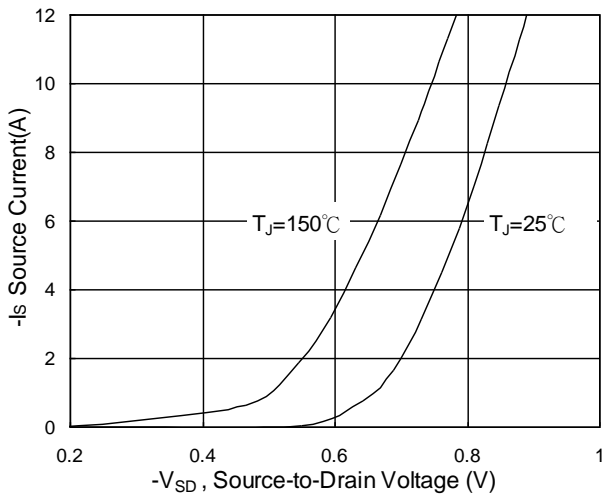
## ➤ Typical Characteristics



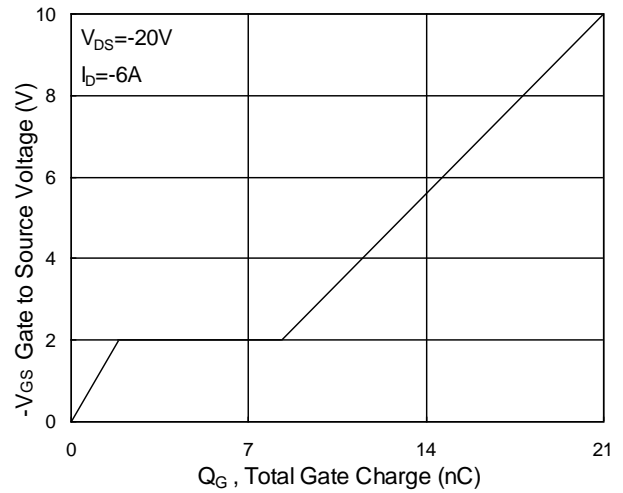
**Fig.1 Typical Output Characteristics**



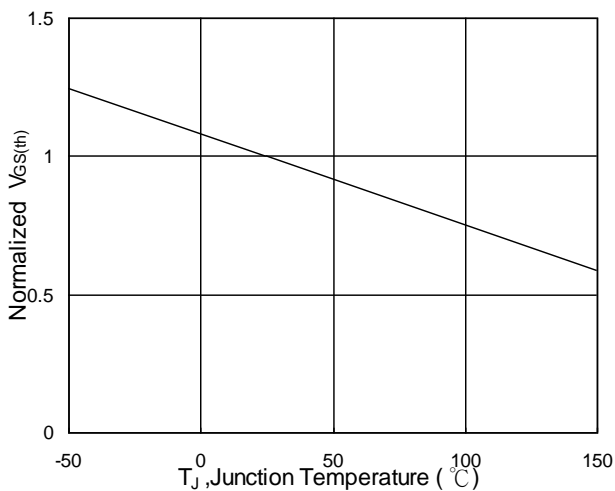
**Fig.2 On-Resistance v.s Gate-Source**



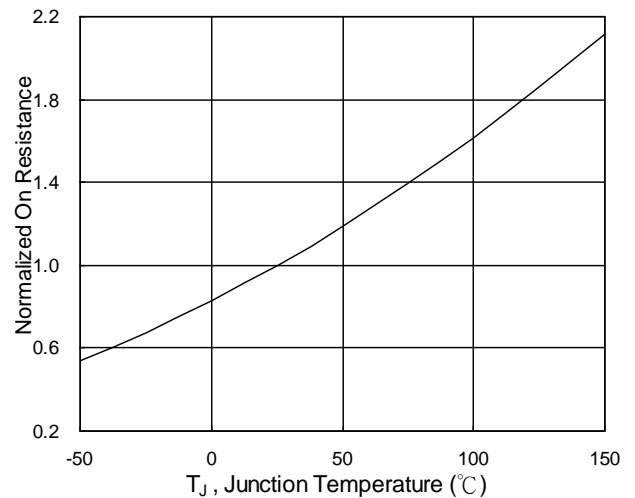
**Fig.3 Forward Characteristics of Reverse**



**Fig.4 Gate-Charge Characteristics**



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



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

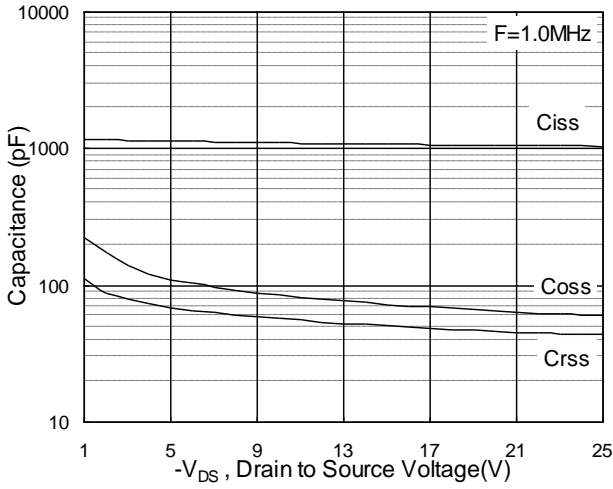


Fig.7 Capacitance

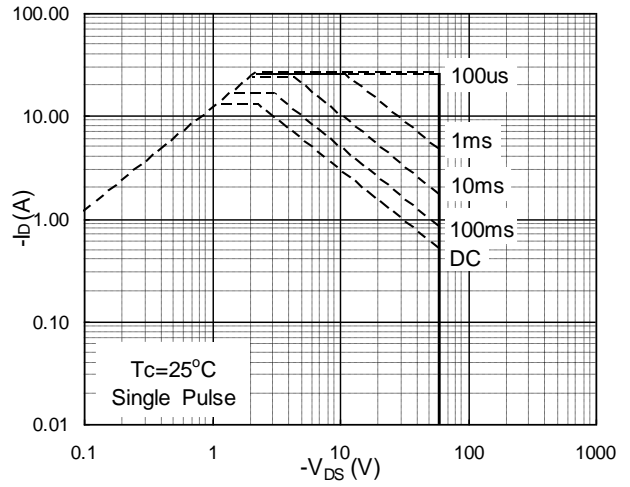


Fig.8 Safe Operating Area

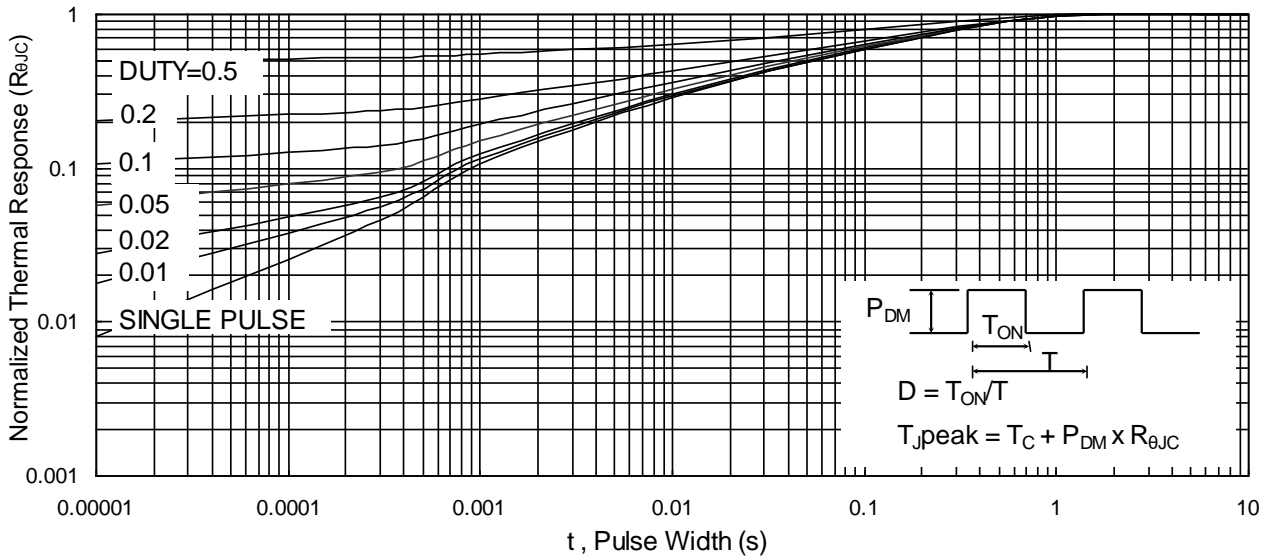


Fig.9 Normalized Maximum Transient Thermal Impedance

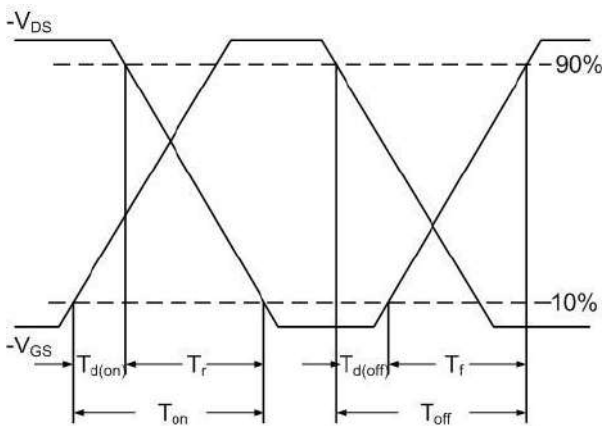


Fig.10 Switching Time Waveform

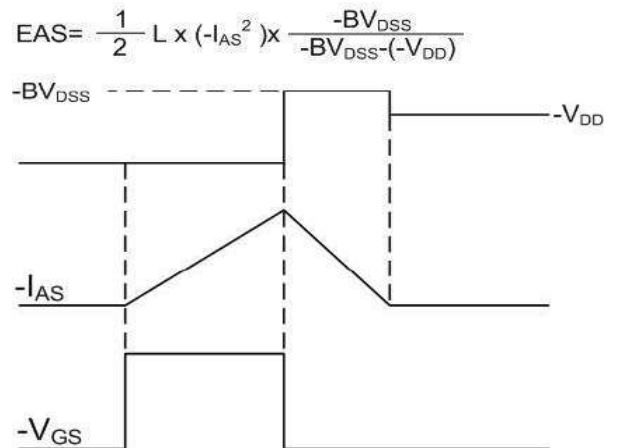


Fig.11 Unclamped Inductive Switching Waveform

➤ Recommand IR Reflow Soldering Thermal Profile

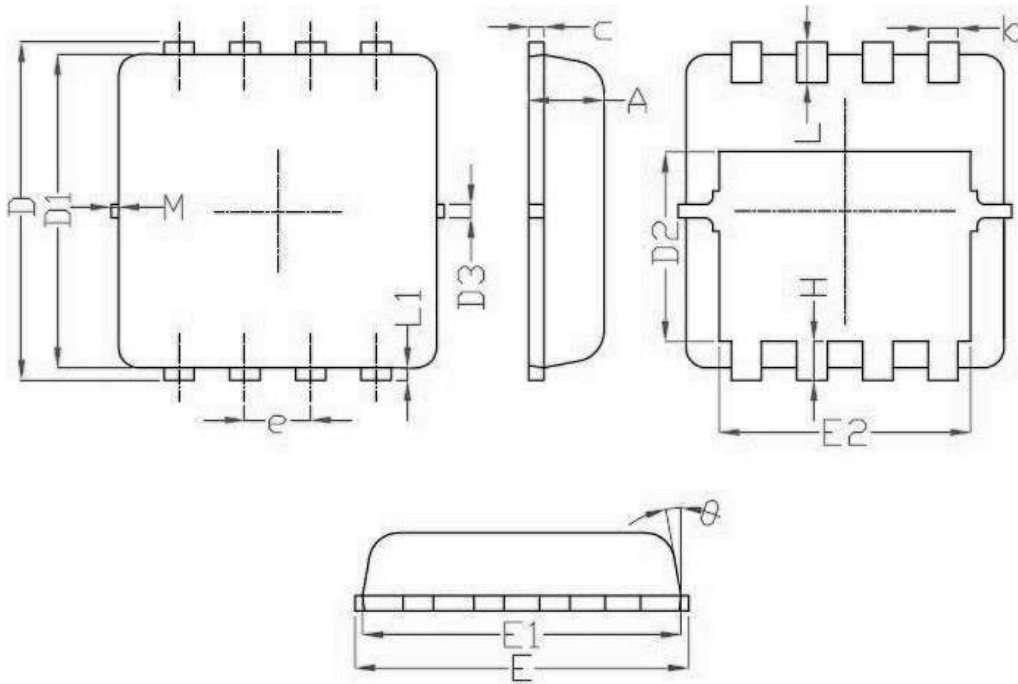


Profile Feature	Pb-Free Assembly Profile
Temperature Min. (T <sub>smin</sub> )	150°C
Temperature Max. (T <sub>smax</sub> )	200°C
Time (t <sub>s</sub> ) from (T <sub>smin</sub> to T <sub>smax</sub> )	60-120 seconds
Average Ramp-up Rate (t <sub>L</sub> to t <sub>P</sub> )	3°C/second max.
Liquidous Temperature (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
PAP61TV13V	DFN3X3A-EP1 Reel	3000 pcs

➤ **Package Information (DFN3X3A-EP1)**



SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.70	0.85	0.027	0.034
b	0.20	0.40	0.007	0.016
c	0.10	0.25	0.004	0.010
D	3.15	3.45	0.124	0.136
D1	2.90	3.20	0.114	0.126
D2	1.54	1.98	0.060	0.080
D3	0.10	0.30	0.004	0.012
E	3.15	3.45	0.124	0.136
E1	3.00	3.25	0.118	0.128
E2	2.29	2.65	0.090	0.104
e	0.65 BSC		0.025 BSC	
H	0.28	0.65	0.011	0.026
Θ	0°	14°	0°	14°
L	0.30	0.50	0.012	0.020
L1	0.13		0.005	
M	---	0.15	---	0.006

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