

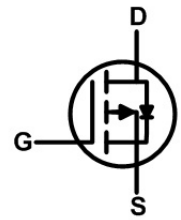
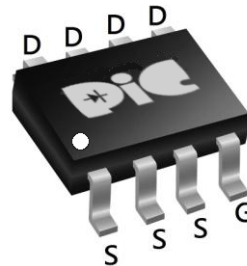
## ➤ General Description

This PAP31TJ05J 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

## ➤ SOP-8



## ➤ Application

- Notebook CPU Core-High-Side Switch

## ➤ Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Drain-Source Voltage	$V_{DS}$	-30	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current, $V_{GS} @ -10V^1$	$I_D @ T_A=25^\circ C$	-11.5	A
Continuous Drain Current, $V_{GS} @ -10V^1$	$I_D @ T_A=70^\circ C$	-9	A
Pulsed Drain Current <sup>2</sup>	$I_{DM}$	-46	A
Single Pulse Avalanche Energy <sup>3</sup>	EAS	125	mJ
Avalanche Current	$I_{AS}$	-50	A
Total Power Dissipation <sup>4</sup>	$P_D @ T_A=25^\circ C$	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 <sup>1</sup>	$R_{\theta JA}$	75	$^\circ C/W$
Thermal Resistance Junction-Ambient <sup>1</sup> ( $t \leq 10s$ )		40	$^\circ C/W$
Thermal Resistance Junction-Case <sup>1</sup>		$R_{\theta JC}$	24

## ➤ 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 $25^\circ C$ , $I_D=-1mA$	---	-0.023	---	$V/^\circ C$
Static Drain-Source On-Resistance <sup>2</sup>	$R_{DS(ON)}$	$V_{GS}=-10V$ , $I_D=-10A$	---	---	15	$m\Omega$
		$V_{GS}=-4.5V$ , $I_D=-10A$	---	---	25	
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	$\mu A$
		$V_{DS}=-24V$ , $V_{GS}=0V$ , $T_J=55^\circ C$	---	---	-5	
Gate-Source Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V$ , $V_{DS}=0V$	---	---	$\pm 100$	nA
Forward Transconductance	gfs	$V_{DS}=-5V$ , $I_D=-10A$	---	24	---	S
Gate Resistance	$R_g$	$V_{DS}=0V$ , $V_{GS}=0V$ , $f=1MHz$	---	9	---	$\Omega$
Total Gate Charge (-4.5V)	$Q_g$	$V_{DS}=-15V$ , $V_{GS}=-4.5V$ , $I_D=-10A$	---	20	---	nC
Gate-Source Charge	$Q_{gs}$		---	5.1	---	
Gate-Drain Charge	$Q_{gd}$		---	7.3	---	
Turn-On Delay Time	$T_{d(on)}$	$V_{DD}=-15V$ , $V_{GS}=-10V$ , $R_G=3.3\Omega$ $I_D=-1A$	---	33.8	---	ns
Rise Time	$T_r$		---	35.8	---	
Turn-Off Delay Time	$T_{d(off)}$		---	72.8	---	
Fall Time	$T_f$		---	10.6	---	
Input Capacitance	$C_{iss}$	$V_{DS}=-15V$ , $V_{GS}=0V$ , $f=1MHz$	---	2215	---	pF
Output Capacitance	$C_{oss}$		---	310	---	
Reverse Transfer Capacitance	$C_{rss}$		---	237	---	

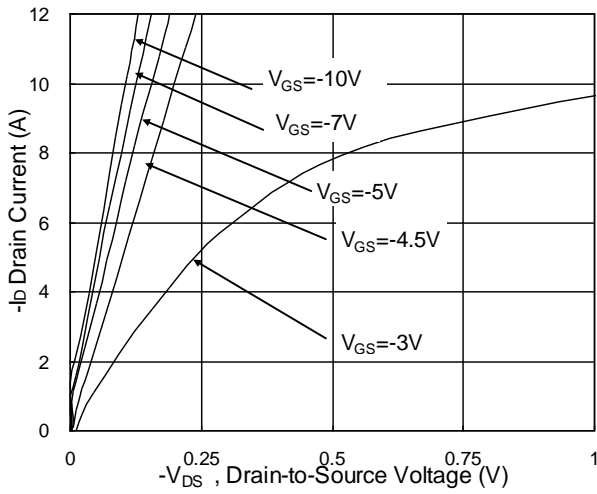
## ➤ Diode Characteristics

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Continuous Source Current <sup>1,5</sup>	$I_S$	$V_G=V_D=0V$ , Force Current	---	---	-11.5	A
Pulsed Source Current <sup>2,5</sup>	$I_{SM}$		---	---	-46	A
Diode Forward Voltage <sup>2</sup>	$V_{SD}$	$V_{GS}=0V$ , $I_S=-1A$ , $T_J=25^\circ C$	---	---	-1	V

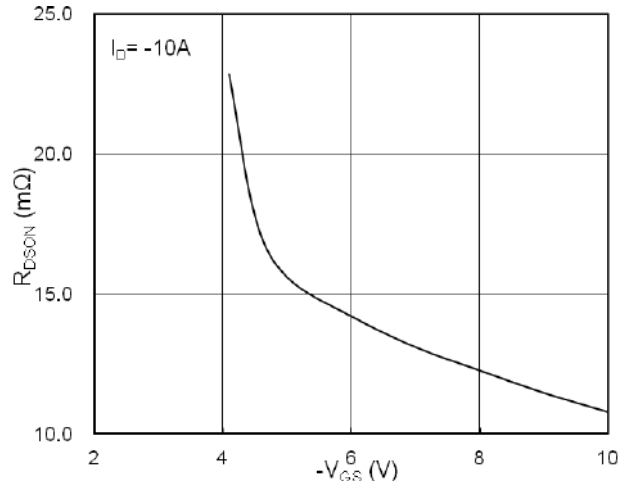
Note :

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  $V_{DD}=-25V$ ,  $V_{GS}=-10V$ ,  $L=0.1mH$ ,  $I_{AS}=-50A$
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.

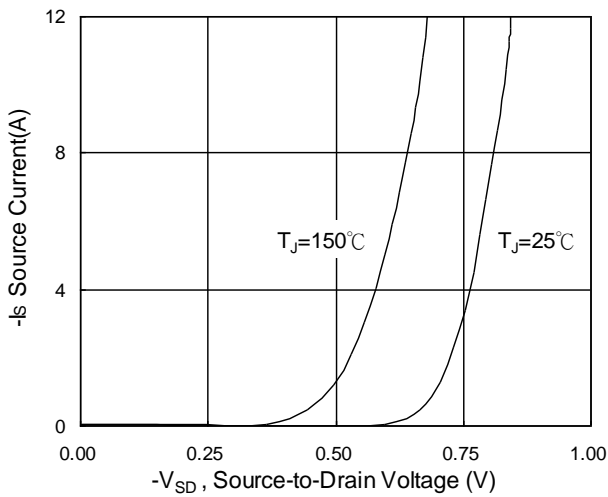
## ➤ Typical Characteristics



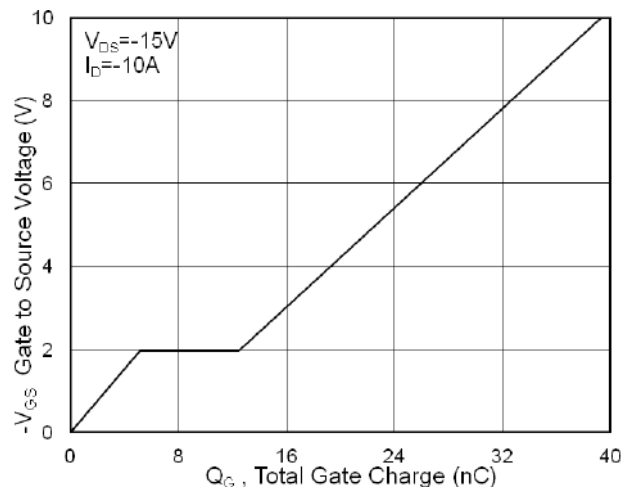
**Fig.1 Typical Output Characteristics**



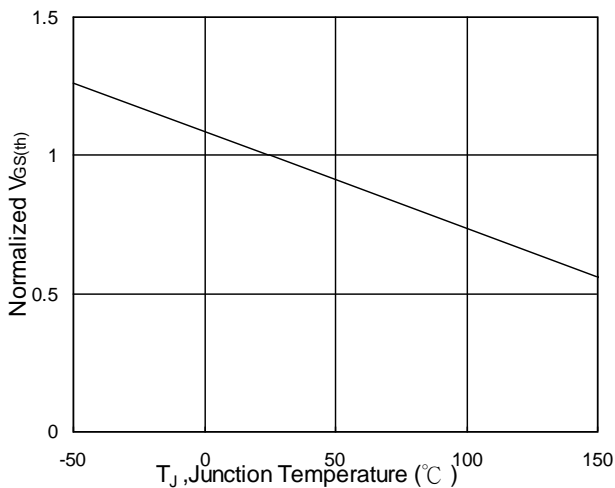
**Fig.2 On-Resistance vs. G-S Voltage**



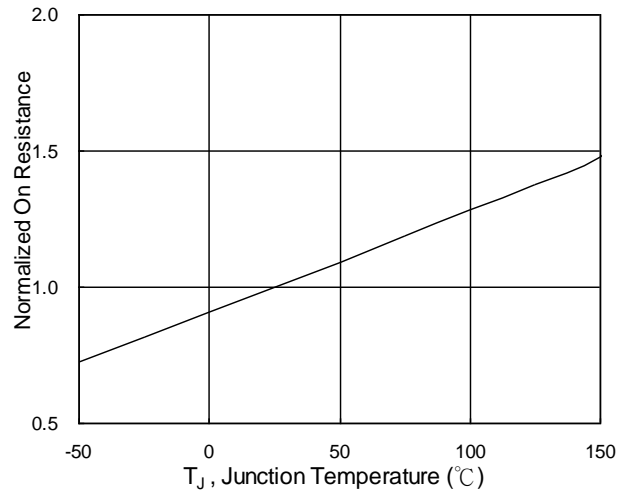
**Fig.3 Forward Characteristics of Reverse**



**Fig.4 Gate-charge Characteristics**



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



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

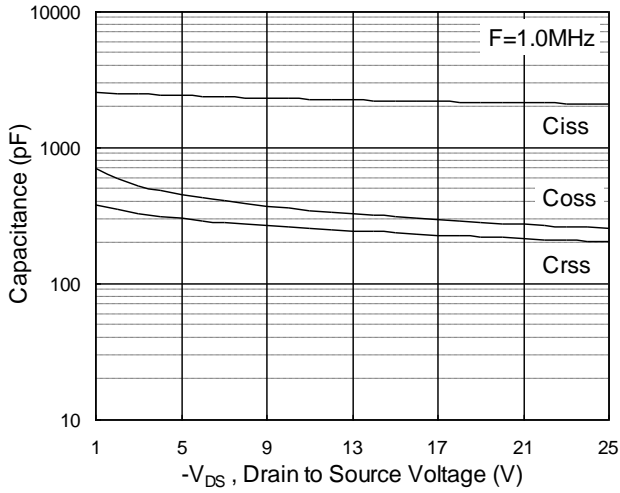


Fig.7 Capacitance

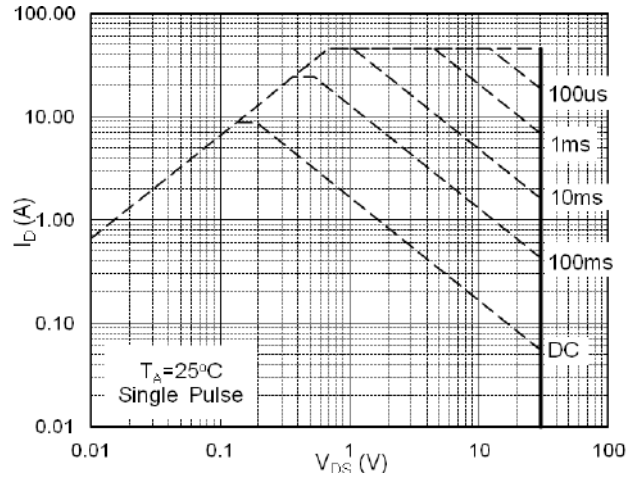


Fig.8 Safe Operating Area

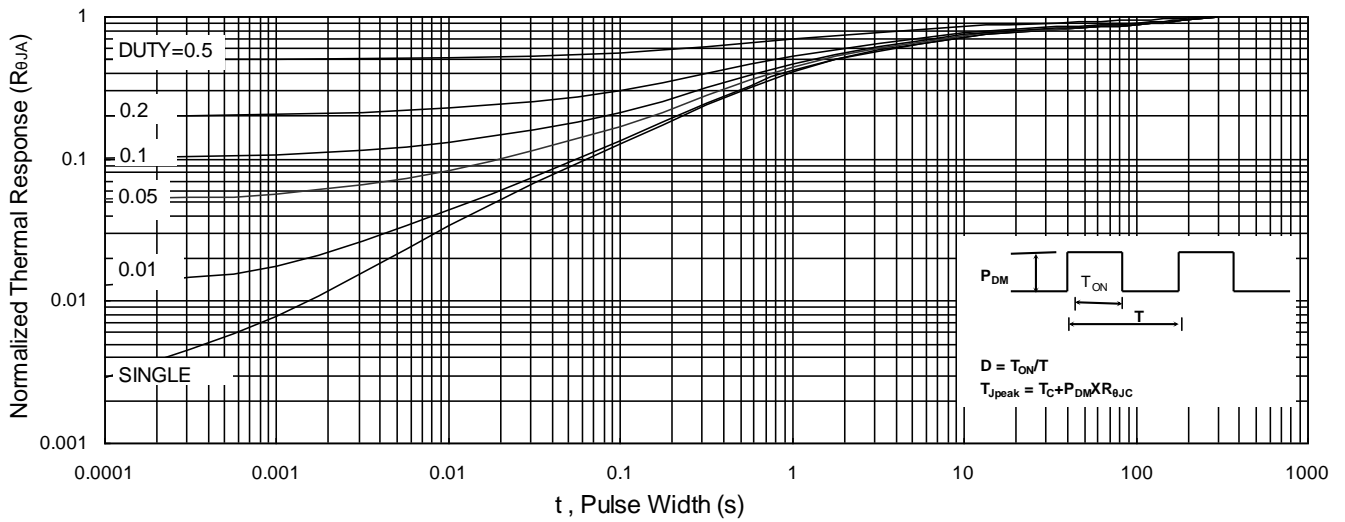


Fig.9 Normalized Maximum Transient Thermal Impedance

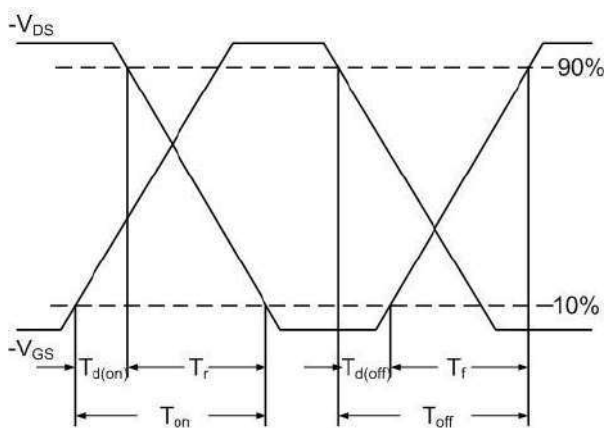


Fig.10 Switching Time Waveform

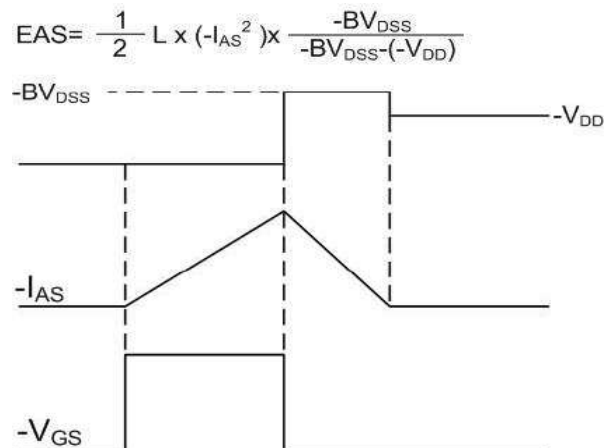


Fig.11 Unclamped Inductive Waveform

## ➤ Recommand IR Reflow Soldering Thermal Profile

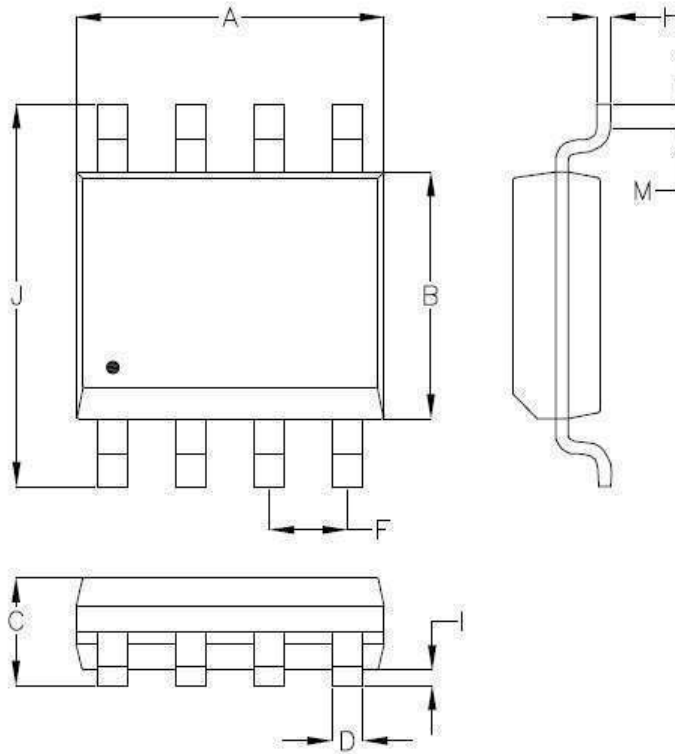


Profile Feature	Pb-Free Assembly Profile
Temperature Min. (T <sub>smin</sub> )	150°C
Temperature Max. (T <sub>smax</sub> )	200°C
Time (t <sub>s</sub> ) from (T <sub>smin</sub> to T <sub>smax</sub> )	60-120 seconds
Average Ramp-up Rate (t <sub>L</sub> to t <sub>P</sub> )	3°C/second max.
Liquidous Temperature (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
PAP31TJ05J	SOP-8 Reel	2500 pcs

➤ Package Information (SOP-8)



SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.700	5.150	0.185	0.203
B	3.700	4.100	0.146	0.161
C	1.23	1.753	0.048	0.069
D	0.310	0.510	0.012	0.020
F	1.070	1.470	0.042	0.058
H	0.160	0.254	0.006	0.010
I	0.050	0.254	0.002	0.010
J	5.750	6.250	0.226	0.246
M	0.400	1.270	0.016	0.050

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