

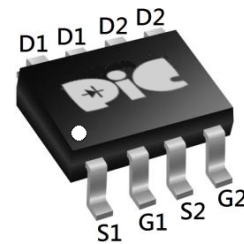
➤ General Description

This PAC39TJ05J N&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

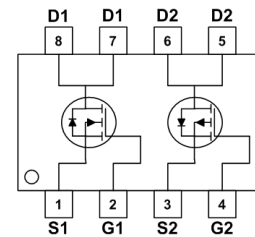
- Super Low Gate Charge
- 100% EAS Guaranteed
- Green Device Available
- Excellent CdV/dt effect decline
- Advanced high cell density Trench technology

➤ SOP-8



➤ Application

- Notebook CPU Core-High-Side Switch



➤ Absolute Maximum Ratings

Parameter	Symbol	Rating		Unit
		N-Ch	P-Ch	
Drain-Source Voltage	V_{DS}	30	-30	V
Gate-Source Voltage	V_{GS}	± 20	± 20	V
Continuous Drain Current, $V_{GS} @ 10V_1$	$I_D @ T_A=25^\circ C$	9	-6.5	A
Continuous Drain Current, $V_{GS} @ 10V_1$	$I_D @ T_A=70^\circ C$	7	-5.2	A
Pulsed Drain Current ²	I_{DM}	36	-26	A
Single Pulse Avalanche Energy ³	EAS	24	72	mJ
Avalanche Current	I_{AS}	22	-38	A
Total Power Dissipation ⁴	$P_D @ T_A=25^\circ C$	1.5	1.5	W
Storage Temperature Range	T_{STG}	-55 to 150	-55 to 150	$^\circ C$
Operating Junction Temperature Range	T_J	-55 to 150	-55 to 150	$^\circ C$
Thermal Resistance Junction-Ambient ¹	$R_{\theta JA}$	85		$^\circ C/W$
Thermal Resistance Junction-Case ¹	$R_{\theta JC}$	25		$^\circ C/W$

N-Ch and P-Ch Fast Switching MOSFET

$V_{DS}=30V$, $I_D=9.0A$, $R_{DS(ON)}=12m\Omega$

$V_{DS}=-30V$, $I_D=-6.5A$, $R_{DS(ON)}=25m\Omega$

➤ N-Channel 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 ²	$R_{DS(ON)}$	$V_{GS}=10V$, $I_D=8A$	---	---	12	m Ω
		$V_{GS}=4.5V$, $I_D=6A$	---	---	18	
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS}=V_{DS}$, $I_D=250\mu A$	1.2	---	2.5	V
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}$		---	-5.08	---	$mV/^\circ C$
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}	$V_{DS}=5V$, $I_D=8A$	---	24	---	S
Gate Resistance	R_g	$V_{DS}=0V$, $V_{GS}=0V$, $f=1MHz$	---	1.8	---	Ω
Total Gate Charge (4.5V)	Q_g	$V_{DS}=15V$, $V_{GS}=4.5V$, $I_D=8A$	---	9.63	---	nC
Gate-Source Charge	Q_{gs}		---	3.88	---	
Gate-Drain Charge	Q_{gd}		---	3.44	---	
Turn-On Delay Time	$T_{d(on)}$	$V_{DD}=15V$, $V_{GS}=10V$, $R_G=1.5\Omega$ $I_D=8A$	---	4.2	---	ns
Rise Time	T_r		---	8.2	---	
Turn-Off Delay Time	$T_{d(off)}$		---	31	---	
Fall Time	T_f		---	4	---	
Input Capacitance	C_{iss}	$V_{DS}=15V$, $V_{GS}=0V$, $f=1MHz$	---	940	---	pF
Output Capacitance	C_{oss}		---	131	---	
Reverse Transfer Capacitance	C_{rss}		---	109	---	

➤ Diode Characteristics

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Continuous Source Current ^{1,5}	I_S	$V_G=V_D=0V$, Force Current	---	---	9	A
Pulsed Source Current ^{2,5}	I_{SM}		---	---	36	A
Diode Forward Voltage ²	V_{SD}	$V_{GS}=0V$, $I_S=1A$, $T_J=25^\circ C$	---	---	1	V
Reverse Recovery Time	t_{rr}	$I_F=8A$, $dI/dt=100A/\mu s$, $T_J=25^\circ C$	---	8	---	nS
Reverse Recovery Charge	Q_{rr}		---	2.9	---	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 $V_{DD}=25V$, $V_{GS}=10V$, $L=0.1mH$, $I_{AS}=22A$

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.

N-Ch and P-Ch Fast Switching MOSFET

$V_{DS}=30V$, $I_D=9.0A$, $R_{DS(ON)}=12m\Omega$

$V_{DS}=-30V$, $I_D=-6.5A$, $R_{DS(ON)}=25m\Omega$

➤ P-Channel 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	$R_{DS(ON)}$	$V_{GS}=-10V$, $I_D=-6A$	---	---	25	m Ω
		$V_{GS}=-4.5V$, $I_D=-4A$	---	---	42	
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	uA
		$V_{DS}=-24V$, $V_{GS}=0V$, $T_J=55^\circ C$	---	---	-5	
Gate-Source Leakage Current	I_{GSS}	$V_{GS}=\pm 20V$, $V_{DS}=0V$	---	---	± 100	nA
Forward Transconductance	g_{fs}	$V_{DS}=-5V$, $I_D=-6A$	---	17	---	S
Gate Resistance	R_g	$V_{DS}=0V$, $V_{GS}=0V$, $f=1MHz$	---	13	---	Ω
Total Gate Charge (-4.5V)	Q_g	$V_{DS}=-15V$, $V_{GS}=-4.5V$, $I_D=-6A$	---	12.6	---	nC
Gate-Source Charge	Q_{gs}		---	4.8	---	
Gate-Drain Charge	Q_{gd}		---	4.8	---	
Turn-On Delay Time	$T_{d(on)}$	$V_{DD}=-15V$, $V_{GS}=-10V$, $R_G=3.3\Omega$, $I_D=-6A$	---	4.6	---	ns
Rise Time	T_r		---	14.8	---	
Turn-Off Delay Time	$T_{d(off)}$		---	41	---	
Fall Time	T_f		---	19.6	---	
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	---	---	-6.5	A
Pulsed Source Current ^{2,5}	I_{SM}		---	---	-26	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}	$I_F=-6A$, $dI/dt=100A/\mu s$, $T_J=25$	---	16.3	---	nS
Reverse Recovery Charge	Q_{rr}		---	5.9	---	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.

N-Ch and P-Ch Fast Switching MOSFET

$V_{DS}=30V, I_D=9.0A, R_{DS(ON)}=12m\Omega$

$V_{DS}=-30V, I_D=-6.5A, R_{DS(ON)}=25m\Omega$

➤ N-Channel Typical Characteristics

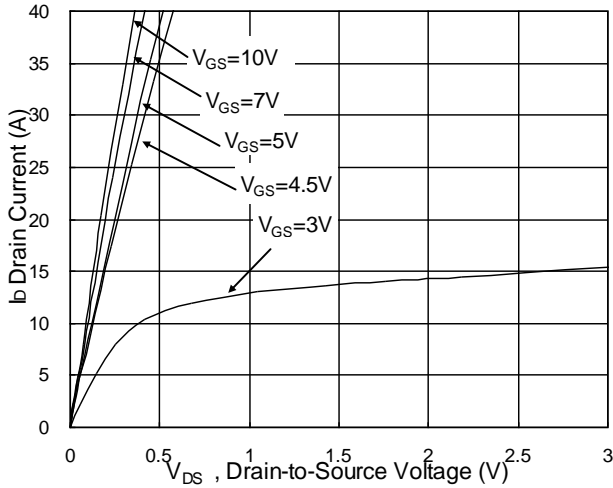


Fig.1 Typical Output Characteristics

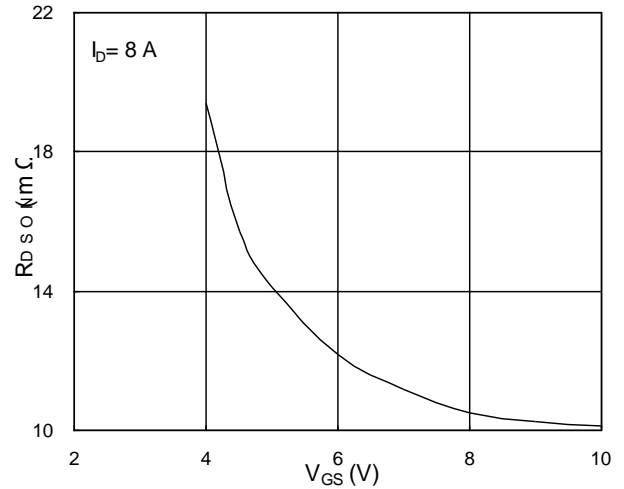


Fig.2 On-Resistance vs. G-S Voltage

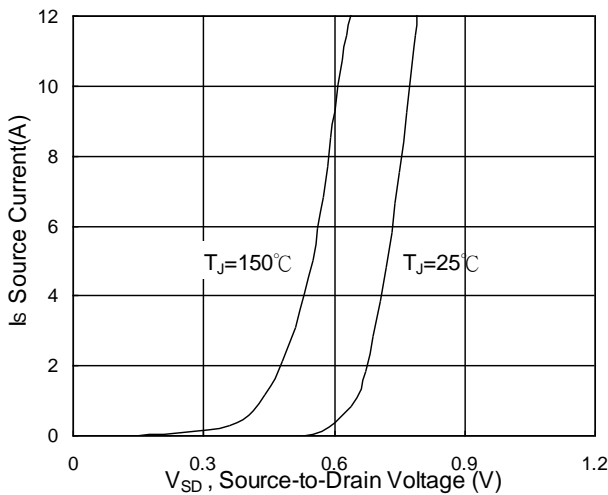


Fig.3 Forward Characteristics of Reverse

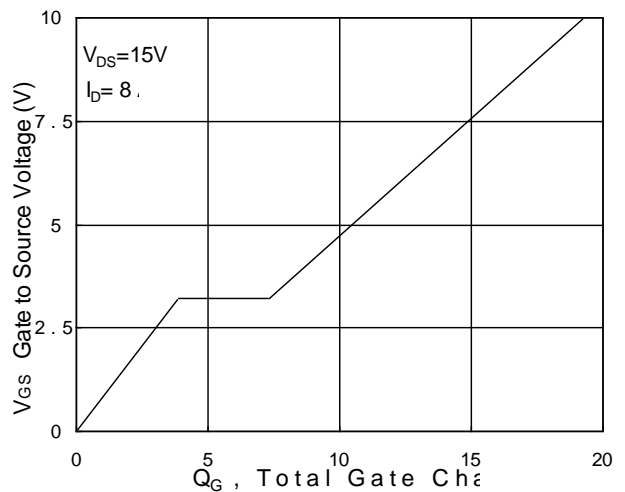


Fig.4 Gate-Charge Characteristics

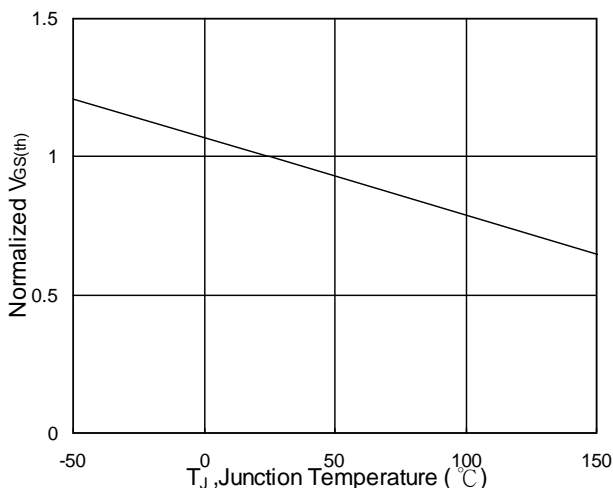


Fig.5 Normalized $V_{GS(th)}$ vs. T_J

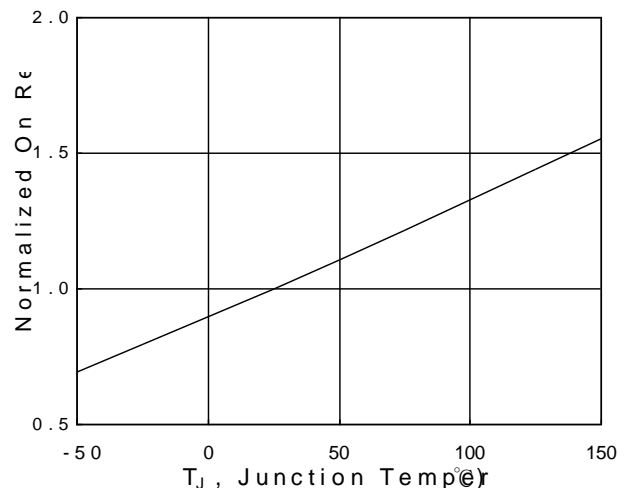


Fig.6 Normalized $R_{DS(on)}$ vs. T_J

N-Ch and P-Ch Fast Switching MOSFET

$V_{DS}=30V, I_D=9.0A, R_{DS(ON)}=12m\Omega$

$V_{DS}=-30V, I_D=-6.5A, R_{DS(ON)}=25m\Omega$

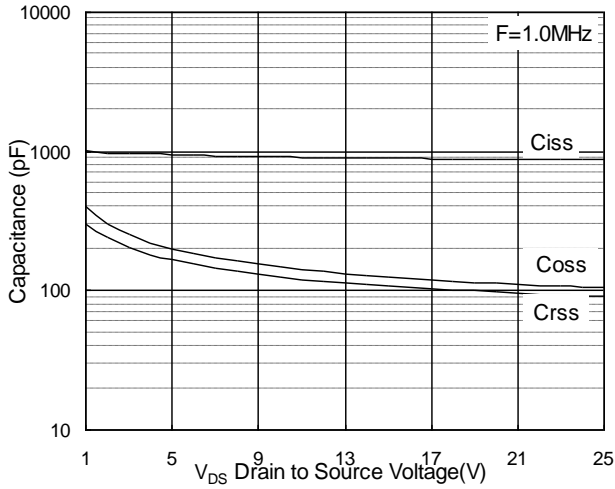


Fig.7 Capacitance

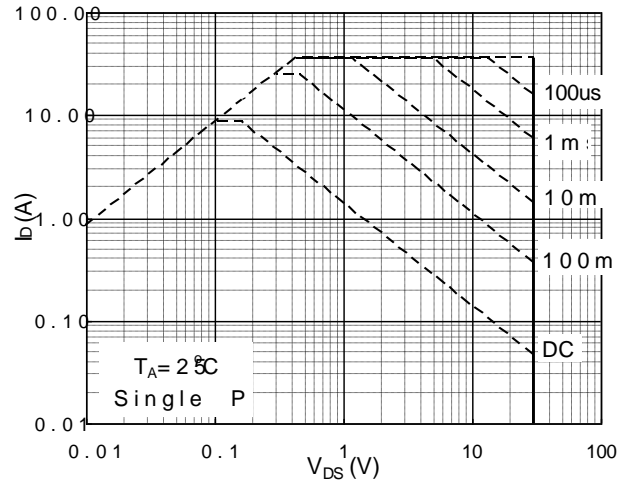


Fig.8 Safe Operating Area

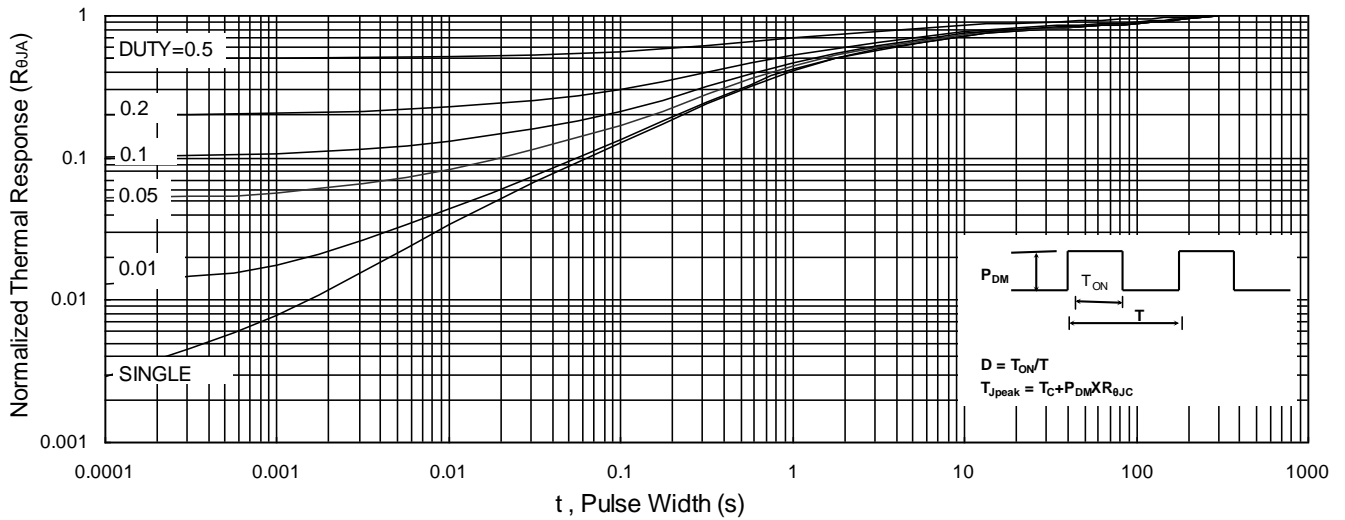


Fig.9 Normalized Maximum Transient Thermal Impedance

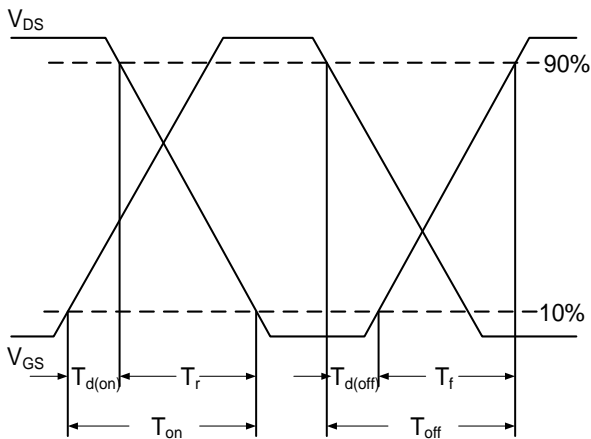


Fig.10 Switching Time Waveform

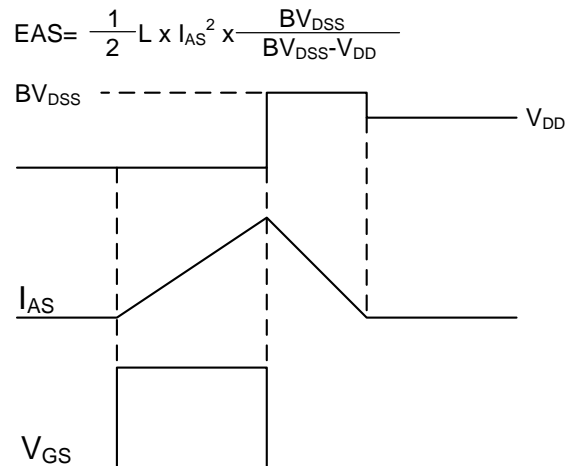


Fig.11 Unclamped Inductive Switching Waveform

N-Ch and P-Ch Fast Switching MOSFET

$V_{DS}=30V, I_D=9.0A, R_{DS(ON)}=12m\Omega$

$V_{DS}=-30V, I_D=-6.5A, R_{DS(ON)}=25m\Omega$

P-Channel Typical Characteristics

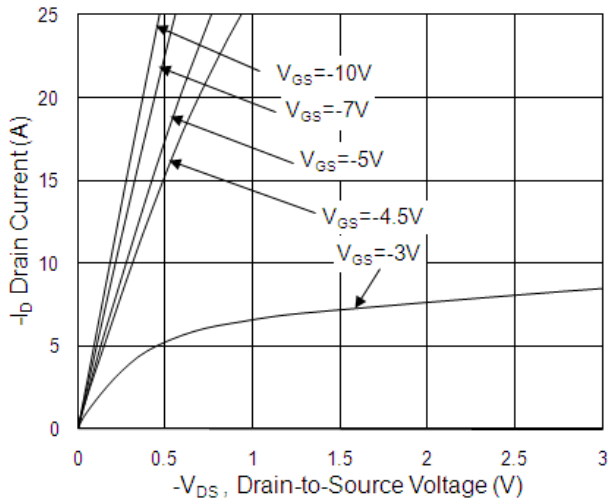


Fig.1 Typical Output Characteristics

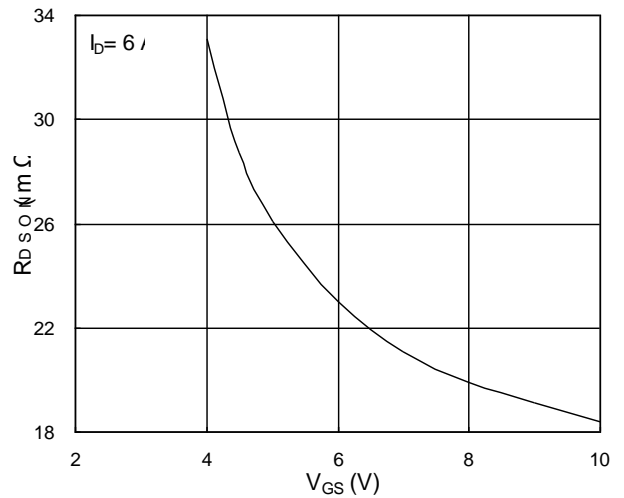


Fig.2 On-Resistance v.s Gate-Source

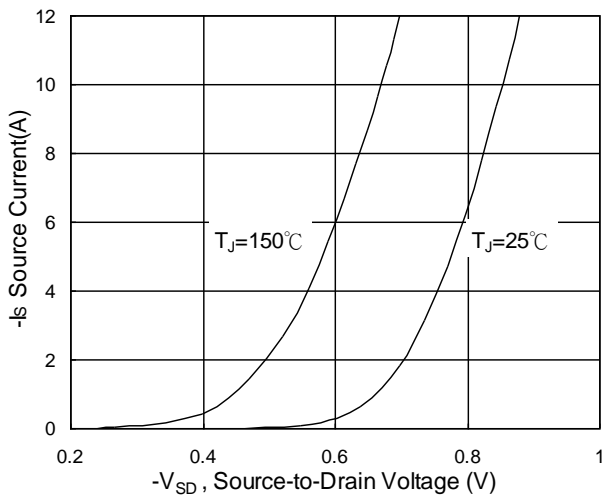


Fig.3 Forward Characteristics of Reverse

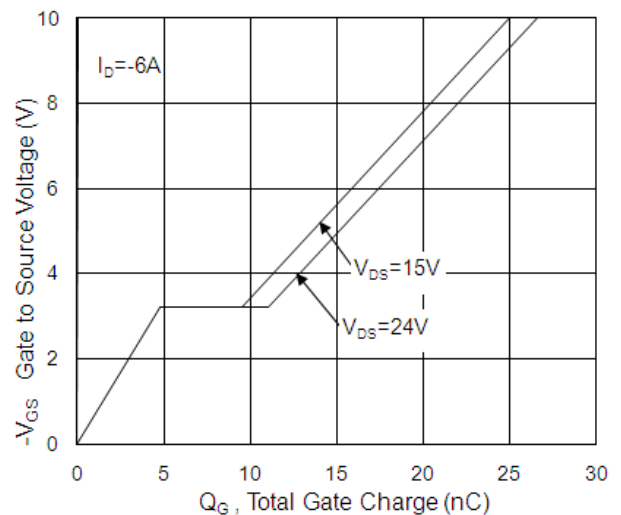


Fig.4 Gate-Charge Characteristics

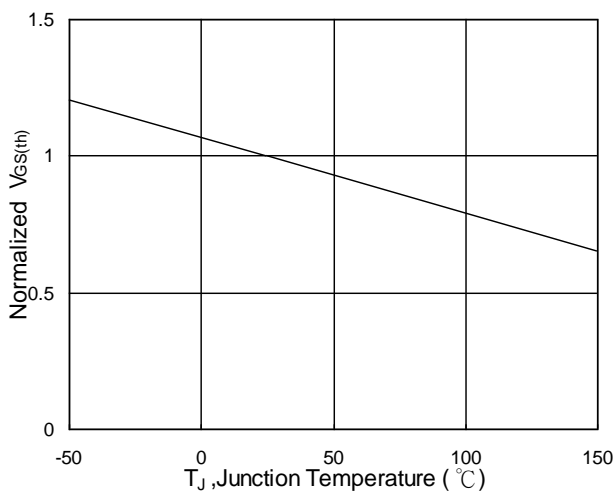


Fig.5 Normalized $V_{GS(th)}$ v.s T_J

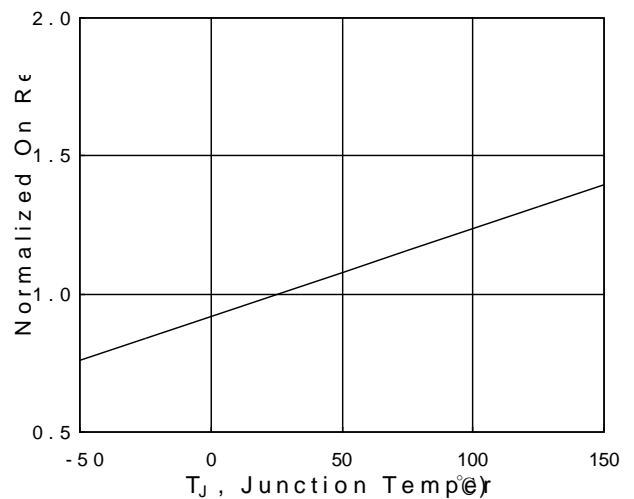


Fig.6 Normalized $R_{DS(ON)}$ v.s T_J

N-Ch and P-Ch Fast Switching MOSFET

$V_{DS}=30V, I_D=9.0A, R_{DS(ON)}=12m\Omega$

$V_{DS}=-30V, I_D=-6.5A, R_{DS(ON)}=25m\Omega$

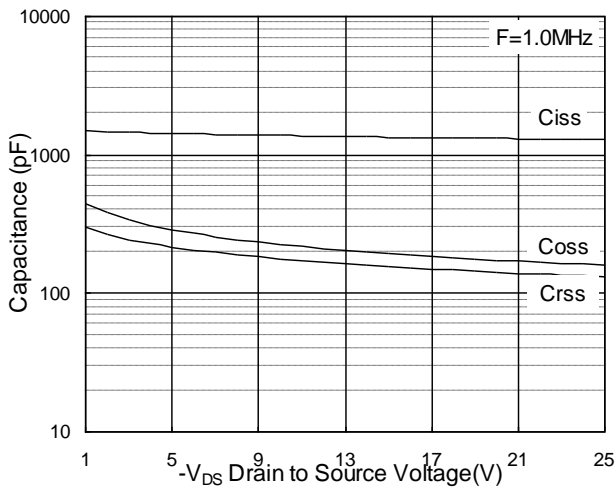


Fig.7 Capacitance

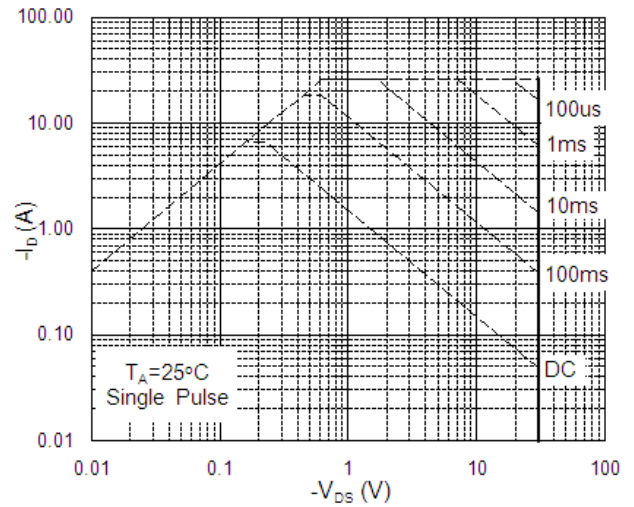


Fig.8 Safe Operating Area

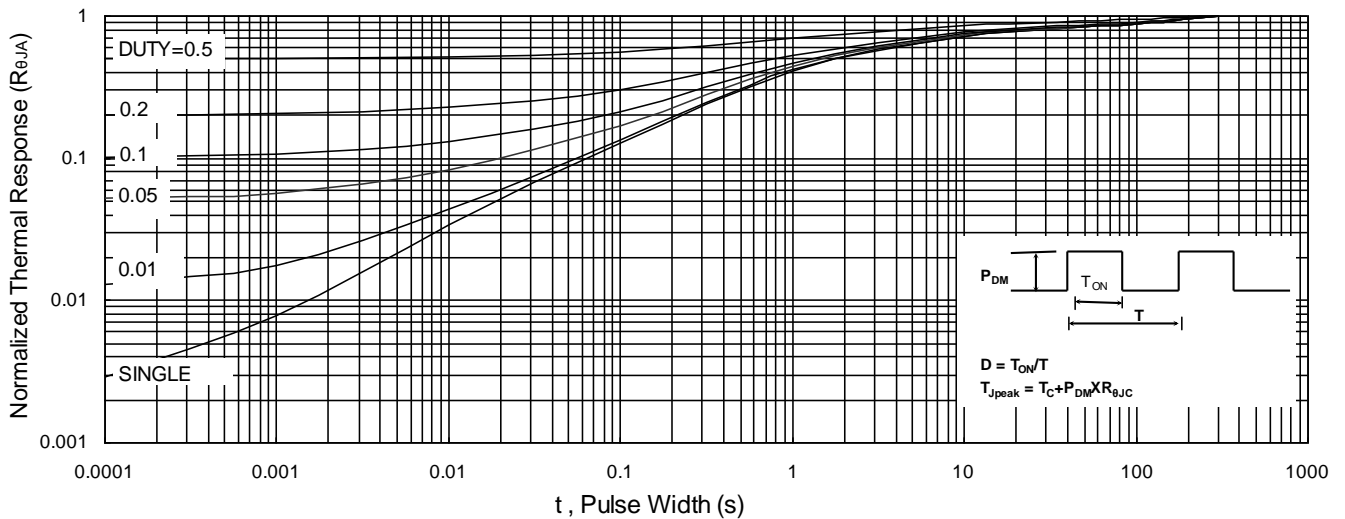


Fig.9 Normalized Maximum Transient Thermal Impedance

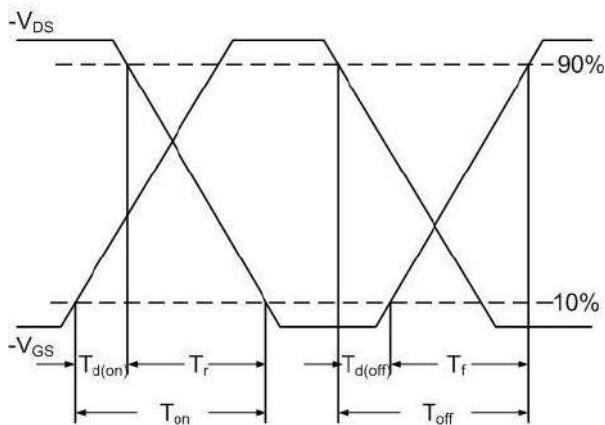


Fig.10 Switching Time Waveform

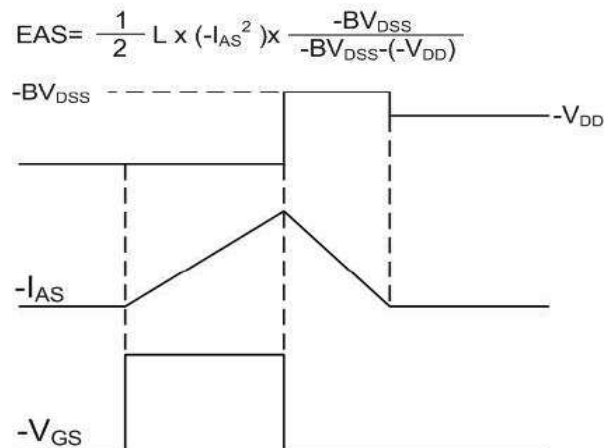


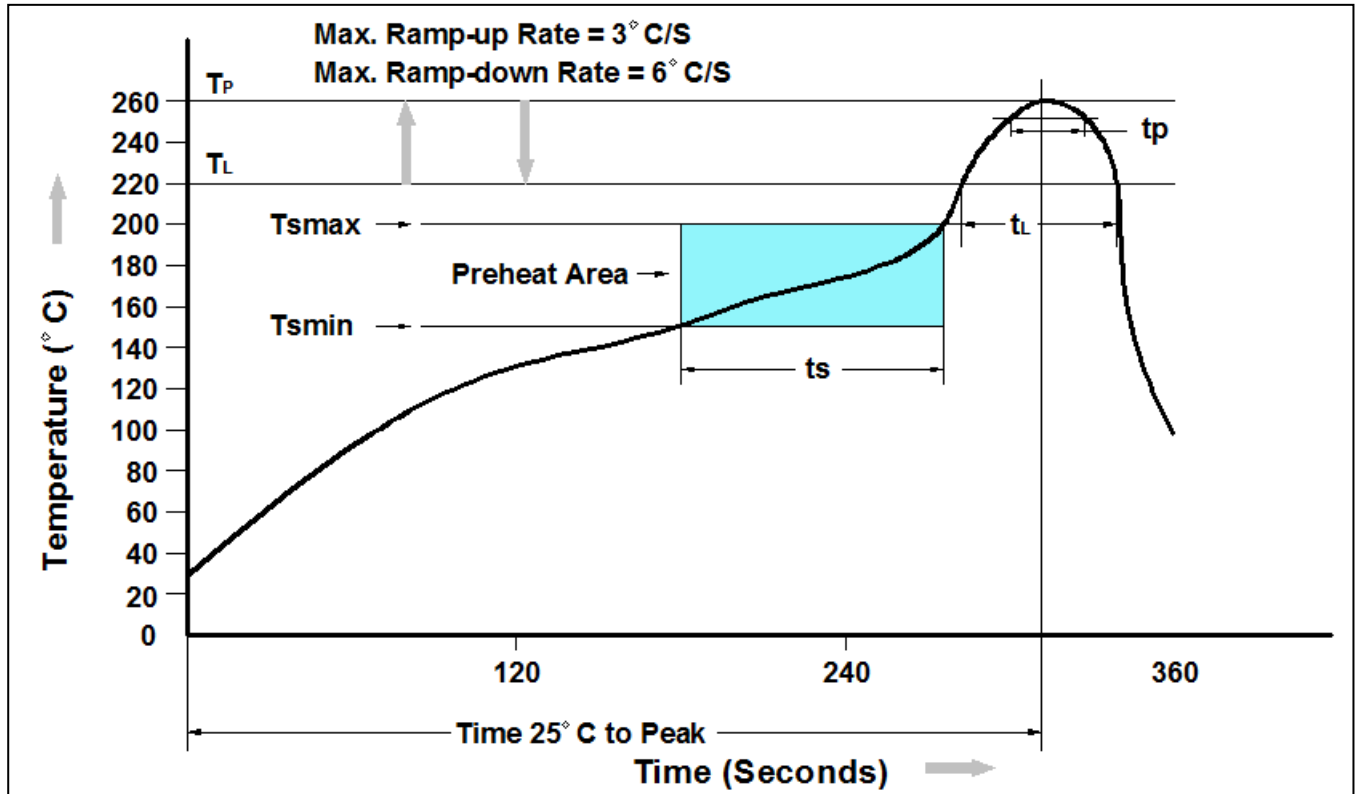
Fig.11 Unclamped Inductive Switching Waveform

N-Ch and P-Ch Fast Switching MOSFET

$V_{DS}=30V$, $I_D=9.0A$, $R_{DS(ON)}=12m\Omega$

$V_{DS}=-30V$, $I_D=-6.5A$, $R_{DS(ON)}=25m\Omega$

➤ Recommnd IR Reflow Soldering Thermal Profile



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

➤ Ordering Information

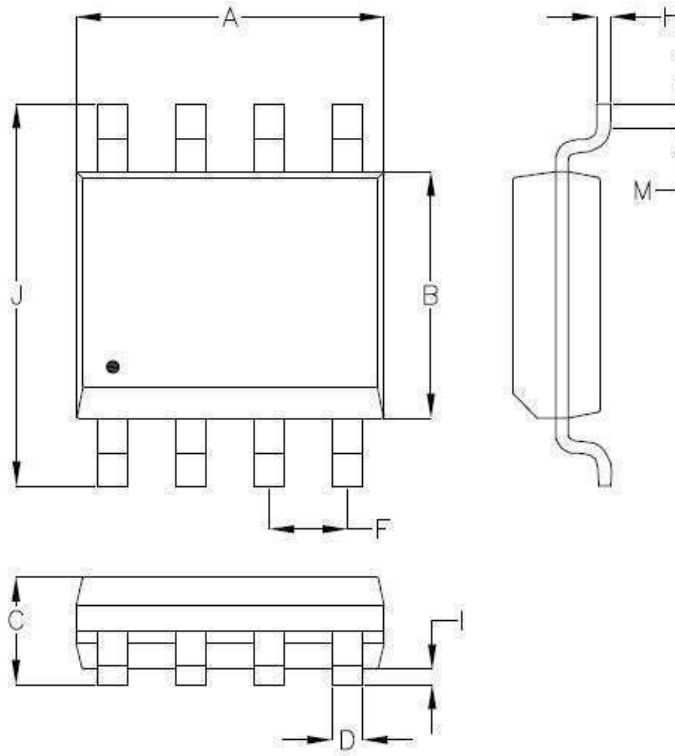
Part Number	Description	Quantity
PAC39TJ05J	SOP-8 Reel	2500 pcs

N-Ch and P-Ch Fast Switching MOSFET

$V_{DS}=30V$, $I_D=9.0A$, $R_{DS(ON)}=12m\Omega$

$V_{DS}=-30V$, $I_D=-6.5A$, $R_{DS(ON)}=25m\Omega$

➤ 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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