

➤ General Description

This PAC2091C N&P Channel enhancement mode power field effect transistor is the high density trench technology and this advanced technology can provide excellent $R_{ds(On)}$ 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

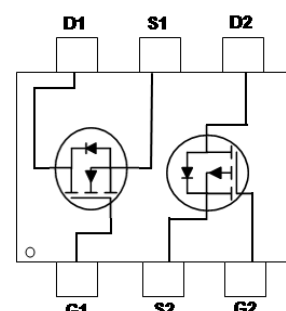
- Super Low Gate Charge
- Green Device Available
- Excellent CdV/dt effect decline
- Advanced high cell density Trench technology
- TSOP-6 package design

➤ TSOP-6



➤ Application

- Power Management in Notebook
- LED Display
- DC-DC System
- LCD Panel



➤ Absolute Maximum Ratings

Parameter	Symbol	Rating		Units
		N-Channel	P-Channel	
Drain-Source Voltage	V_{DS}	20	-20	V
Gate-Source Voltage	V_{GS}	± 12	± 12	V
Continuous Drain Current, $V_{GS} @ 4.5V^1$	$I_D @ T_A=25^\circ C$	3.8	-2.5	A
Continuous Drain Current, $V_{GS} @ 4.5V^1$	$I_D @ T_A=70^\circ C$	3	-2	A
Pulsed Drain Current ²	I_{DM}	15	-15	A
Total Power Dissipation ³	$P_D @ T_C=25^\circ C$	1.1	1.1	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 Data

Parameter	Symbol	Typ.	Max.	Unit
Thermal Resistance Junction-ambient ¹	$R_{\theta JA}$	---	110	$^\circ C/W$
Thermal Resistance Junction- ¹	$R_{\theta JA}$	---	70	$^\circ C/W$

➤ N-Channel Electrical Characteristics (T_J=25°C Unless otherwise noted)

Parameter	Conditions	Symbol	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =250μA	BV _{DSS}	20	---	---	V
Static Drain-Source On-Resistance ²	V _{GS} =4.5V, I _D =4A	R _{DS(ON)}	---	---	50	mΩ
	V _{GS} =2.5V, I _D =3A		---	---	75	
	V _{GS} =1.8V, I _D =2A		---	---	100	
Gate Threshold Voltage	V _{GS} =V _{DS} , I _D =250μA	V _{GS(th)}	0.35	---	1.0	V
Drain-Source Leakage Current	V _{DS} =16V, V _{GS} =0V, T _J =25 °C	I _{DSS}	---	---	1	μA
	V _{DS} =16V, V _{GS} =0V, T _J =55 °C		---	---	5	
Gate-Source Leakage Current	V _{GS} =±12V, V _{DS} =0V	I _{GSS}	---	---	±100	nA
Forward Transconductance	V _{DS} =5V, I _D =4A	g _{fs}	---	30	---	S
Total Gate Charge (4.5V)	V _{DS} =15V, V _{GS} =4.5V, I _D =4A	Q _g	---	8.6	---	nC
Gate-Source Charge		Q _{gs}	---	1.37	---	
Gate-Drain Charge		Q _{gd}	---	2.3	---	
Turn-On Delay Time	V _{DD} =10V, V _{GS} =4.5V, R _G =3.3Ω I _D =4A	T _{d(on)}	---	5.2	---	ns
Rise Time		T _r	---	34	---	
Turn-Off Delay Time		T _{d(off)}	---	23	---	
Fall Time		T _f	---	9.2	---	
Input Capacitance	V _{DS} =15V, V _{GS} =0V, f=1MHz	C _{iss}	---	670	---	pF
Output Capacitance		C _{oss}	---	75	---	
Reverse Transfer Capacitance		C _{rss}	---	68	---	

➤ Diode Characteristics

Parameter	Conditions	Symbol	Min.	Typ.	Max.	Unit
Continuous Source Current ^{1,4}	V _G =V _D =0V, Force Current	I _S	---	---	1.5	A
Diode Forward Voltage ²	V _{GS} =0V, I _S =1A, T _J =25 °C	V _{SD}	---	---	1.2	V
Reverse Recovery Time	I _F =4A, di/dt=100A/μs,	t _{rr}	---	8.9	---	nS
Reverse Recovery Charge	T _J =25 °C	Q _{rr}	---	1.7	---	nC

Note :

1. Pulse width limited by maximum junction temperature.
2. The data tested by pulsed, pulse width ≤ 300μs, duty cycle ≤ 2%
3. Ensure that the channel temperature does not exceed 150°C.
4. The data is theoretically the same as I_D and I_{DM}, in real applications, should be limited by total power dissipation.

➤ P-Channel Electrical Characteristics (T_J=25°C Unless otherwise noted)

Parameter	Conditions	Symbol	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =-250uA	BV _{DSS}	-20	---	---	V
Static Drain-Source On-Resistance ²	V _{GS} =-4.5V, I _D =-2.5A	R _{DS(ON)}	---	---	70	mΩ
	V _{GS} =-2.5V, I _D =-2A		---	---	95	
	V _{GS} =-1.8V, I _D =-1A		---	---	115	
Gate Threshold Voltage	V _{GS} =V _{DS} , I _D =-250uA	V _{GS(th)}	-0.4	---	-1.0	V
Drain-Source Leakage Current	V _{DS} =-16V, V _{GS} =0V, T _J =25°C	I _{DSS}	---	---	1	uA
	V _{DS} =-16V, V _{GS} =0V, T _J =55°C		---	---	5	
Gate-Source Leakage Current	V _{GS} =±12V, V _{DS} =0V	I _{GSS}	---	---	±100	nA
Forward Transconductance	V _{DS} =-5V, I _D =-3A	g _{fs}	---	9	---	S
Total Gate Charge (-4.5V)	V _{DS} =-15V, V _{GS} =-4.5V, I _D =-3A	Q _g	---	9.7	---	nC
Gate-Source Charge		Q _{gs}	---	2.05	---	
Gate-Drain Charge		Q _{gd}	---	2.43	---	
Turn-On Delay Time	V _{DD} =-10V, V _{GS} =-4.5V, R _G =3.3Ω I _D =-3A	T _{d(on)}	---	4.8	---	ns
Rise Time		T _r	---	9.6	---	
Turn-Off Delay Time		T _{d(off)}	---	52	---	
Fall Time		T _f	---	8.4	---	
Input Capacitance	V _{DS} =-15V, V _{GS} =0V, f=1MHz	C _{iss}	---	686	---	pF
Output Capacitance		C _{oss}	---	90.8	---	
Reverse Transfer Capacitance		C _{rss}	---	80.4	---	

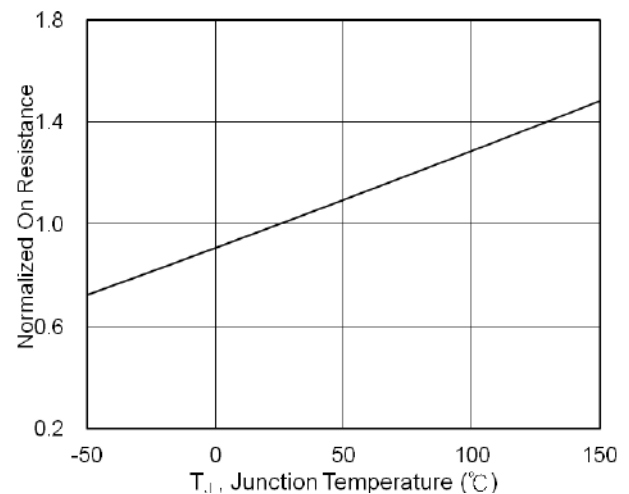
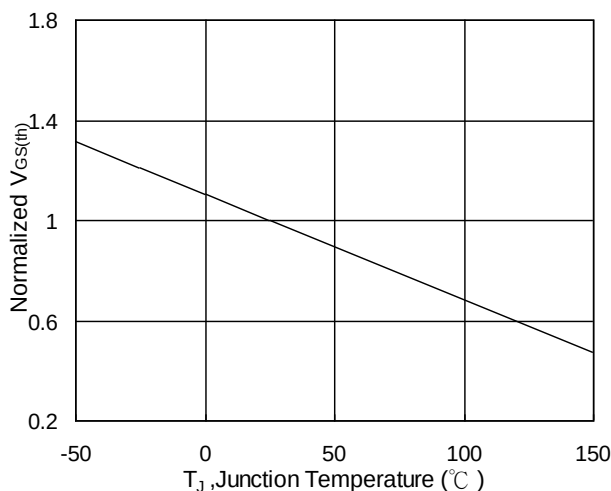
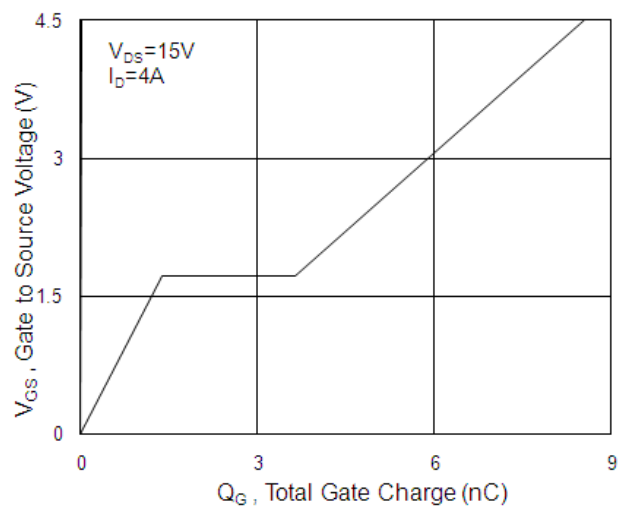
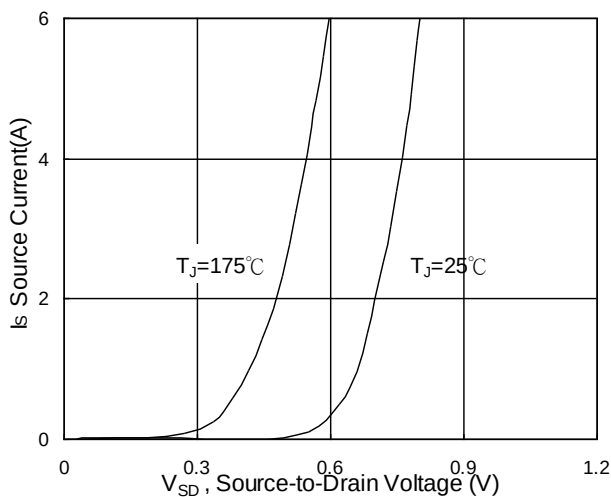
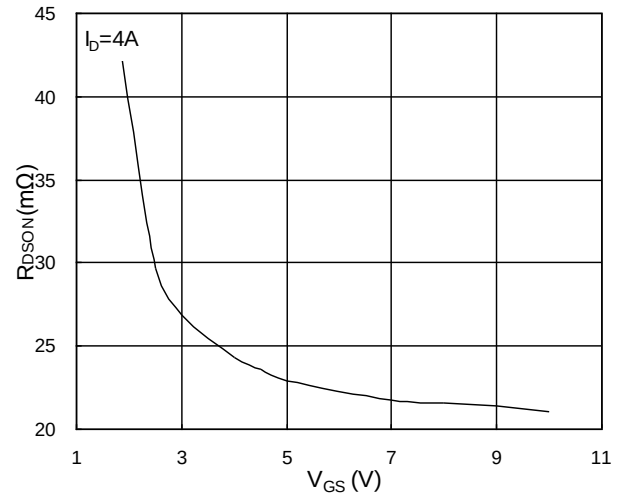
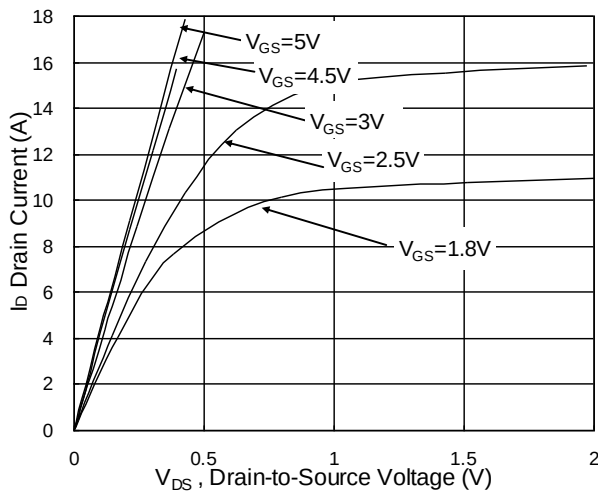
➤ Diode Characteristics

Parameter	Conditions	Symbol	Min.	Typ.	Max.	Unit
Continuous Source Current ^{1,4}	V _G =V _D =0V, Force Current	I _S	---	---	-1.5	A
Diode Forward Voltage ²	V _{GS} =0V, I _S =-1A, T _J =25°C	V _{SD}	---	---	-1.2	V
Reverse Recovery Time	I _F =-3A, dI/dt=100A/μs, T _J =25°C	t _{rr}	---	10.2	---	nS
Reverse Recovery Charge		Q _{rr}	---	2.5	---	nC

Note :

1. Pulse width limited by maximum junction temperature.
2. The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%
3. Ensure that the channel temperature does not exceed 150°C.
4. The data is theoretically the same as I_D and I_{DM}, in real applications, should be limited by total power dissipation.

➤ N-Channel Typical Characteristics



N-Ch and P-Ch Fast Switching MOSFET

$V_{DS}=20V$, $I_D=3.8A$, $R_{DS(ON)}=50m\Omega$

$V_{DS}=-20V$, $I_D=-2.5A$, $R_{DS(ON)}=70m\Omega$

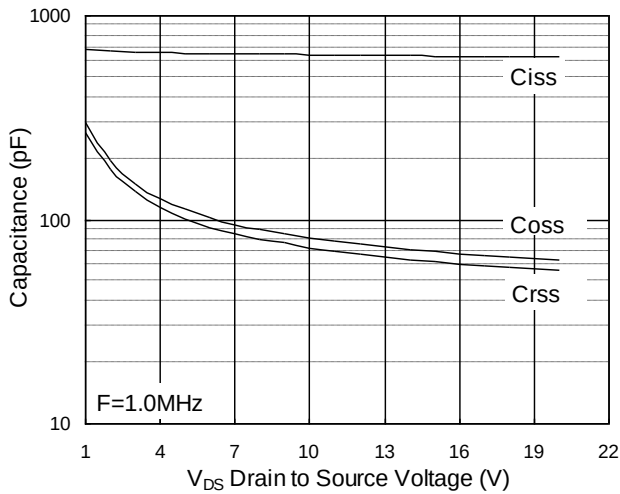


Fig.7 Capacitance

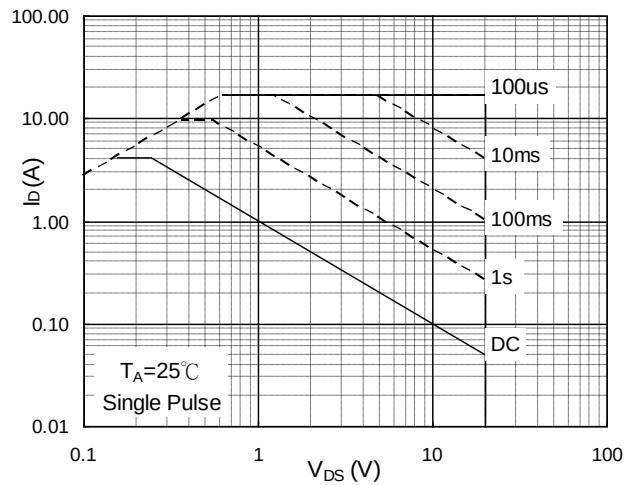


Fig.8 Safe Operating Area

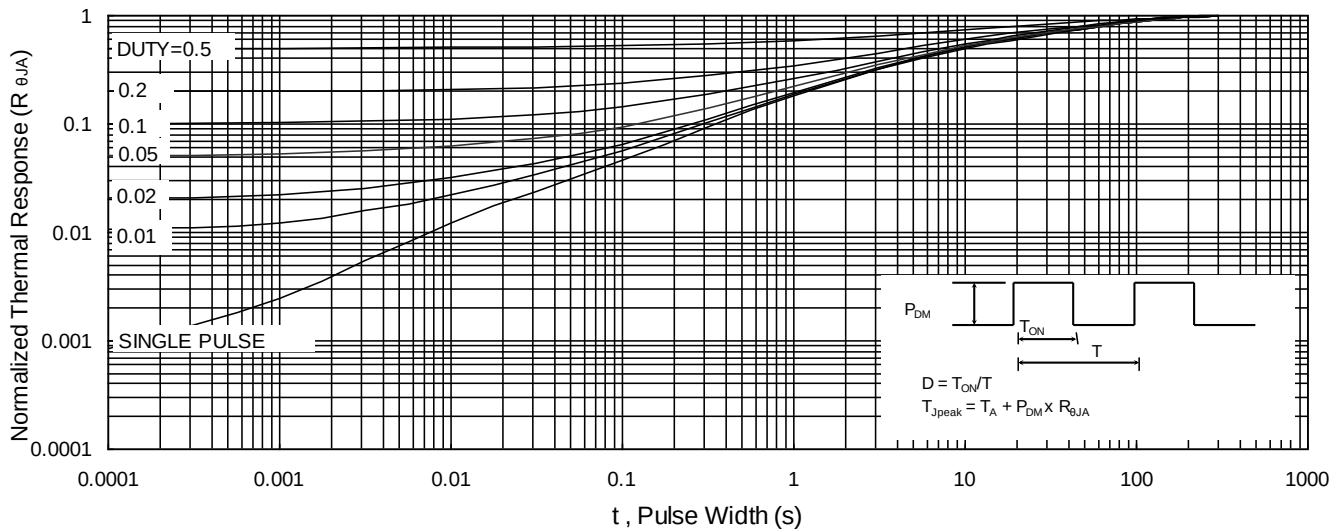


Fig.9 Normalized Maximum Transient Thermal Impedance

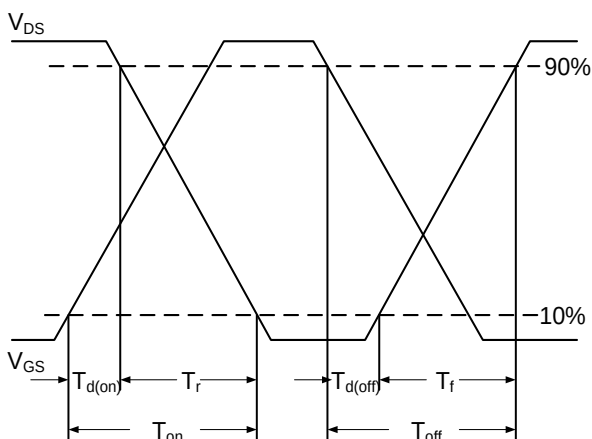


Fig.10 Switching Time Waveform

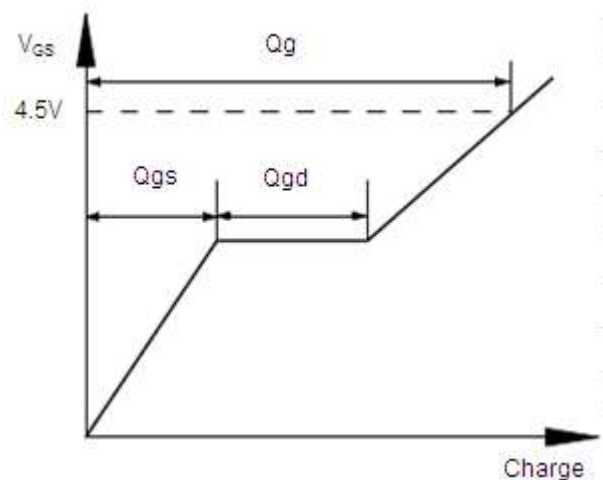


Fig.11 Gate Charge Waveform

N-Ch and P-Ch Fast Switching MOSFET

$V_{DS}=20V$, $I_D=3.8A$, $R_{DS(ON)}=50m\Omega$

$V_{DS}=-20V$, $I_D=-2.5A$, $R_{DS(ON)}=70m\Omega$

➤ P-Channel Typical Characteristics

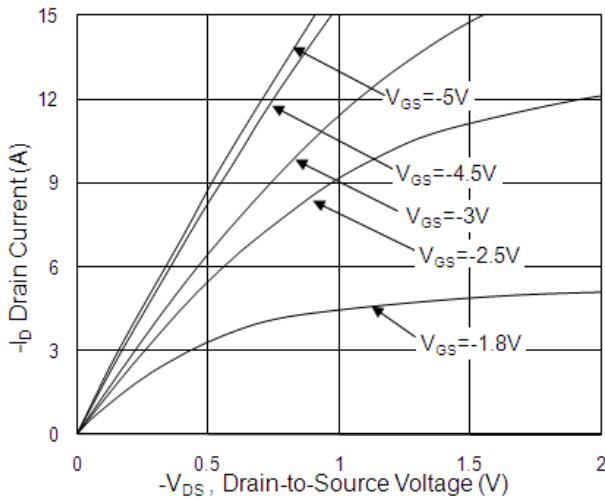


Fig.1 Typical Output Characteristics

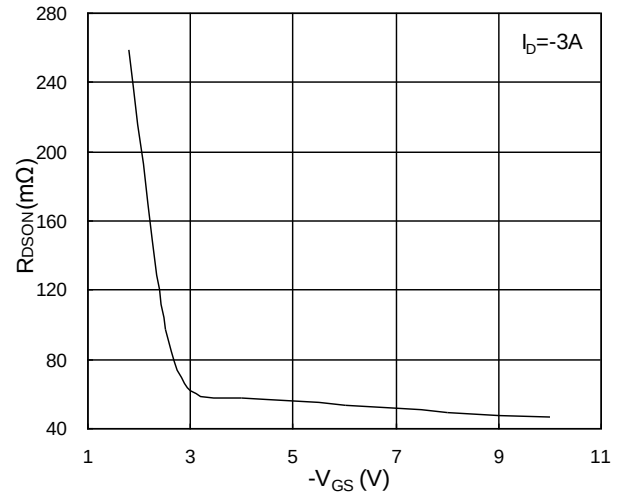


Fig.2 On-Resistance vs. G-S Voltage

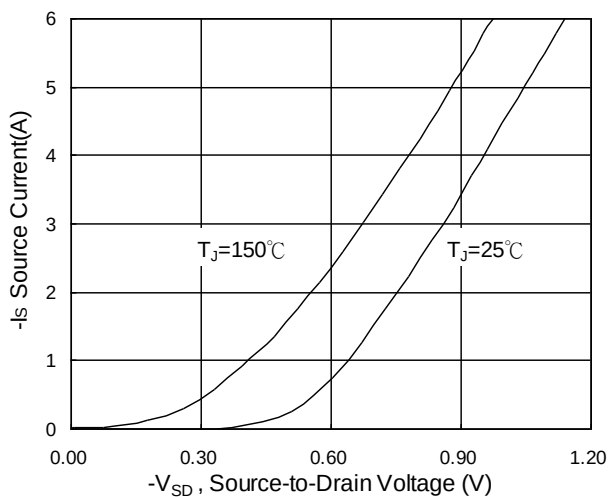


Fig.3 Source Drain Forward Characteristics

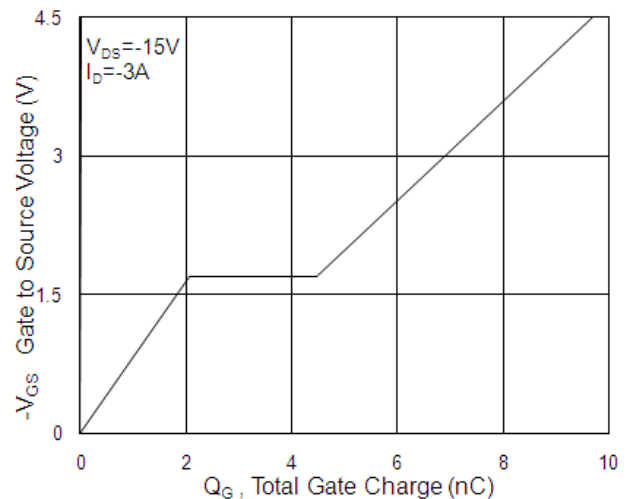


Fig.4 Gate-Charge Characteristics

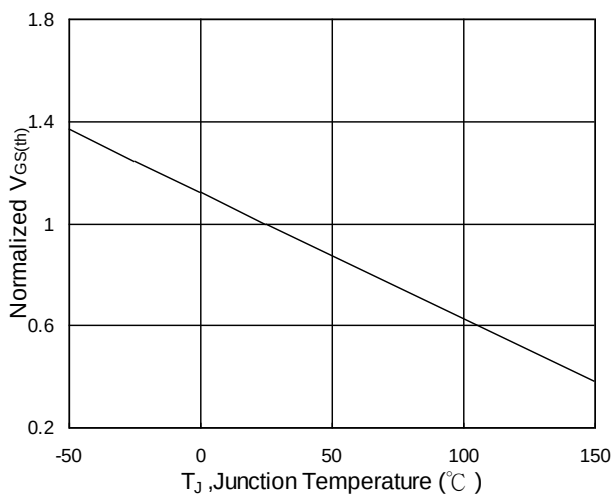


Fig.5 Normalized $V_{GS(th)}$ vs. T_J

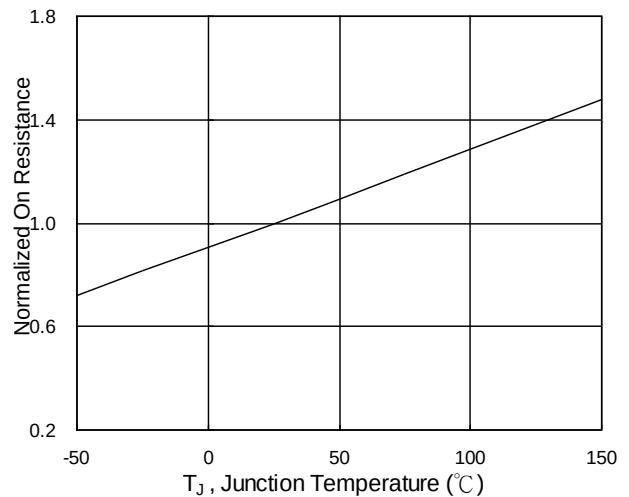


Fig.6 Normalized $R_{DS(on)}$ vs. T_J

N-Ch and P-Ch Fast Switching MOSFET

$V_{DS}=20V$, $I_D=3.8A$, $R_{DS(ON)}=50m\Omega$

$V_{DS}=-20V$, $I_D=-2.5A$, $R_{DS(ON)}=70m\Omega$

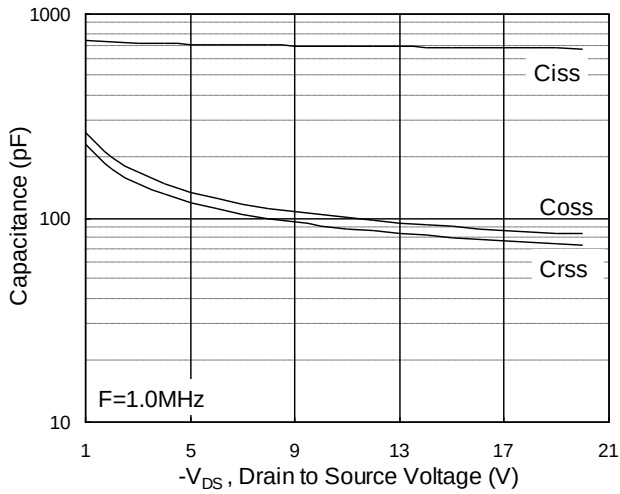


Fig.7 Capacitance

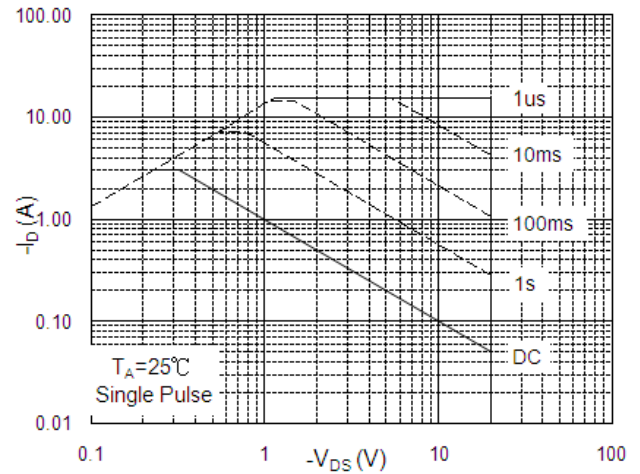


Fig.8 Safe Operating Area

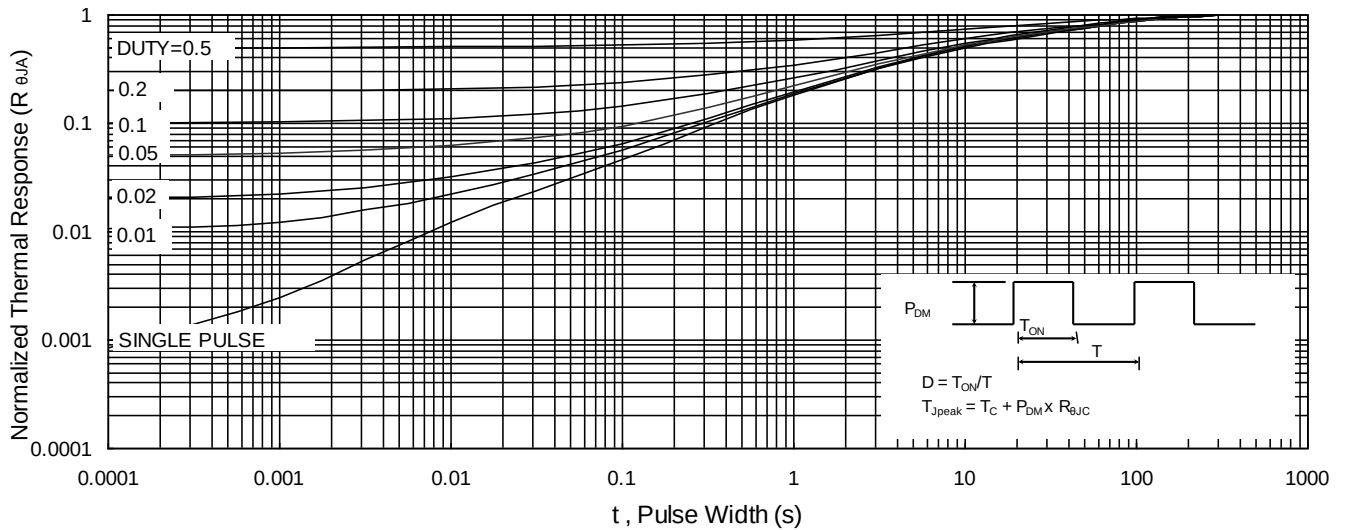


Fig.9 Normalized Maximum Transient Thermal Impedance

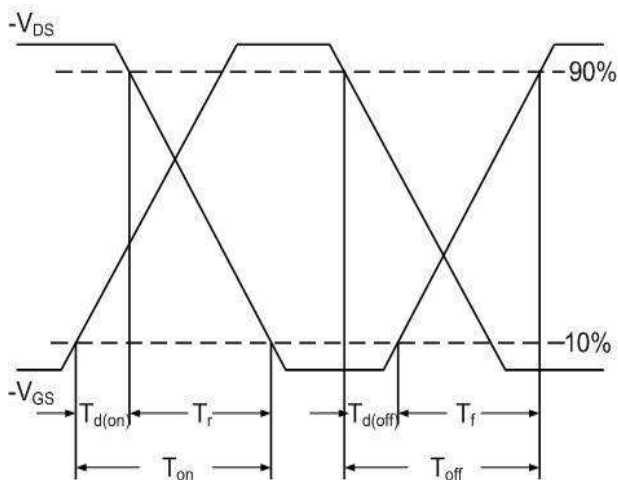


Fig.10 Switching Time Waveform

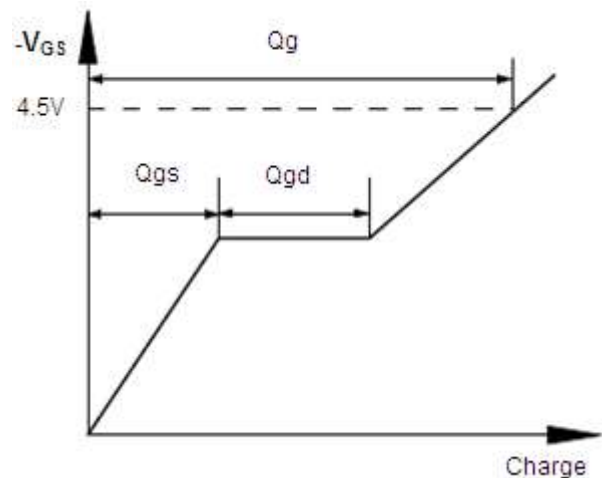


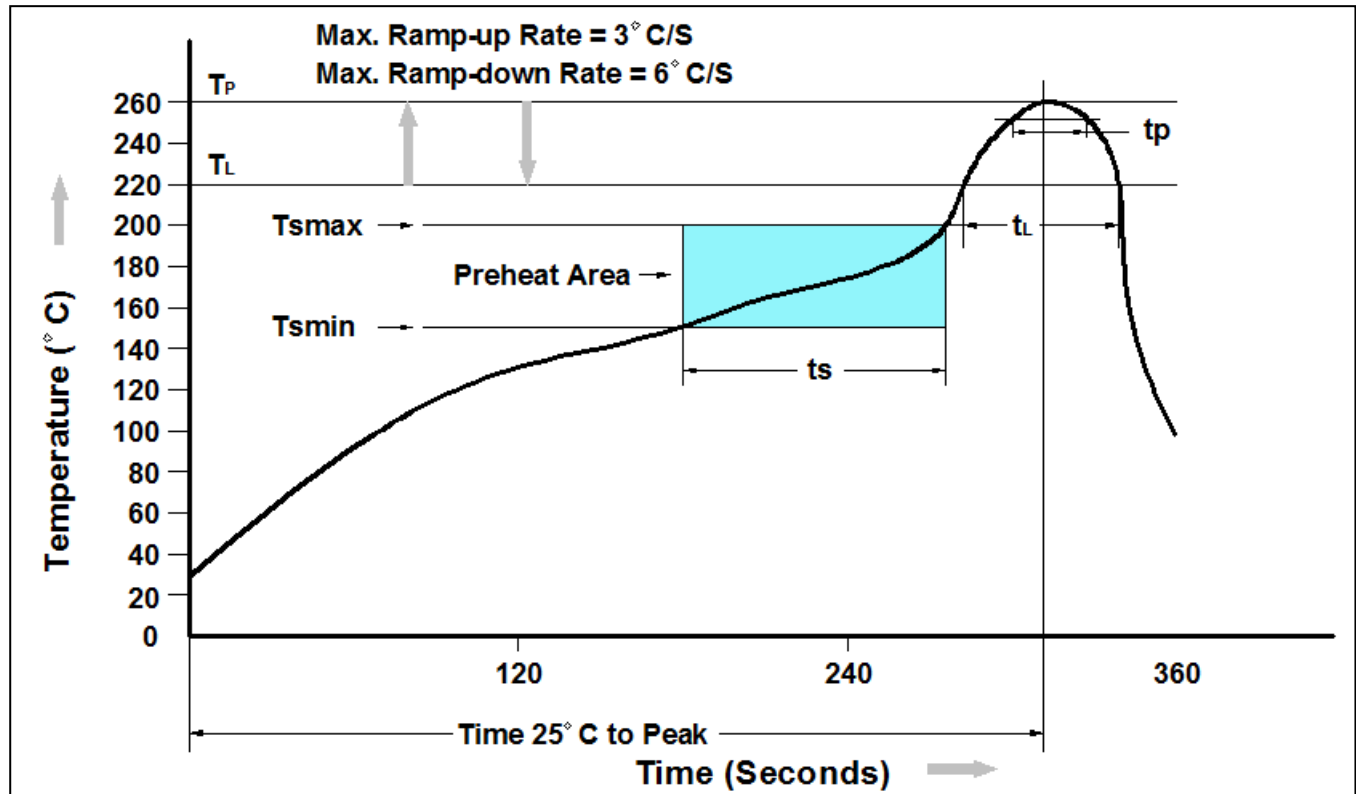
Fig.11 Gate Charge Waveform

N-Ch and P-Ch Fast Switching MOSFET

VDS=20V, ID=3.8A, RDS(ON)=50mΩ

VDS=-20V, ID=-2.5A, RDS(ON)=70mΩ

➤ Recommend IR Reflow Soldering Thermal Profile

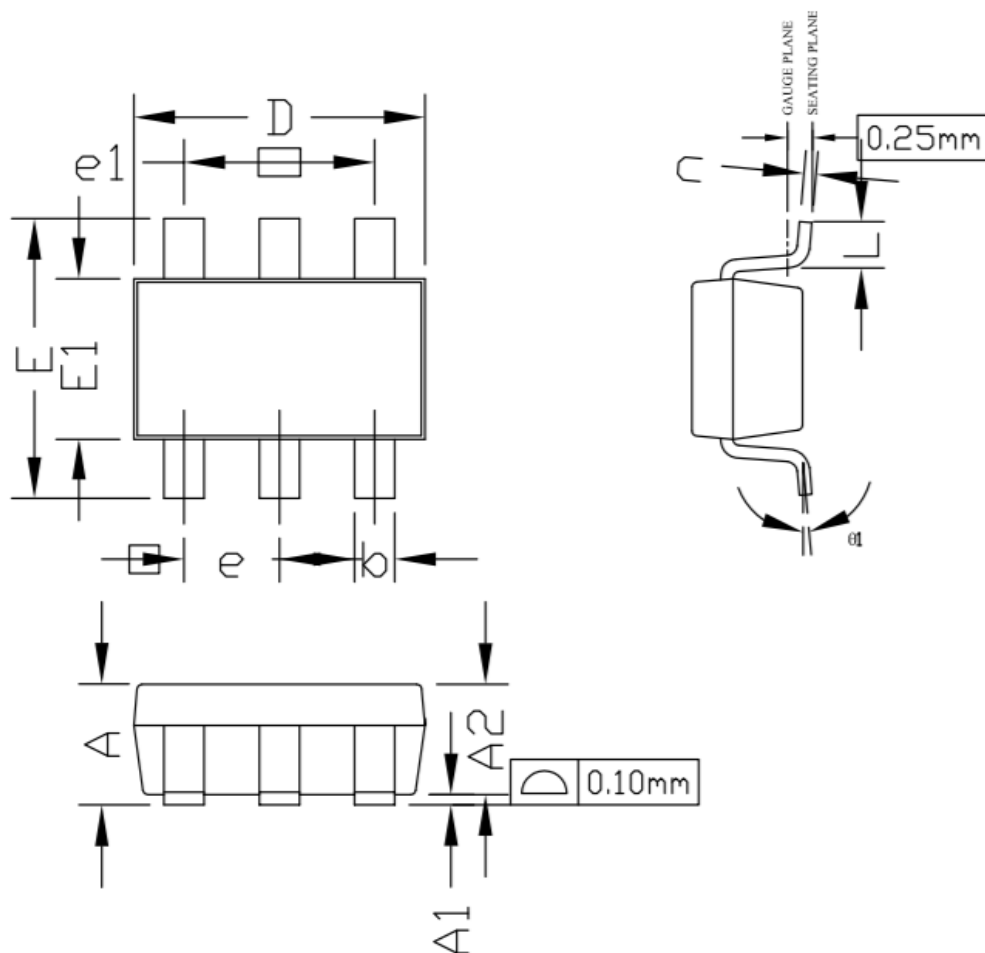


Profile Feature	Pb-Free Assembly Profile
Temperature Min. (Tmin)	150°C
Temperature Max. (Tmax)	200°C
Time (ts) from (Tmin to Tmax)	60-120 seconds
Average Ramp-up Rate (tL to tP)	3°C/second max.
Liquidous Temperature (TL)	217°C
Time (tL) Maintained Above (TL)	60 – 150 seconds
Peak Temperature	260°C +0°C / -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.

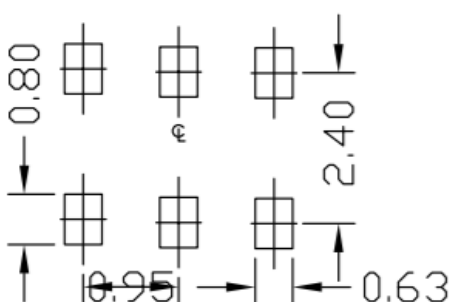
➤ Ordering Information

Part Number	Description	Quantity
PAC2091C	TSOP-6 Reel	3000 pcs

➤ Package Information (TSOP-6)



RECOMMENDED LAND PATTERN



UNIT: mm

SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.80	—	1.25	0.031	—	0.049
A1	0.00	—	0.15	0.000	—	0.006
A2	0.70	1.10	1.20	0.028	0.043	0.047
b	0.30	0.40	0.50	0.012	0.016	0.020
c	0.08	0.13	0.20	0.003	0.005	0.008
D	2.70	2.90	3.10	0.106	0.114	0.122
E	2.50	2.80	3.10	0.098	0.110	0.122
E1	1.50	1.60	1.70	0.059	0.063	0.067
e	0.95 BSC.			0.037 BSC.		
e1	1.90 BSC.			0.075 BSC.		
L	0.30	—	0.60	0.012	—	0.024
θ1	0°	—	8°	0°	—	8°

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