N-Ch and P-Ch Fast Switching MOSFET

V_{DS}=20V, I_D=5.0A, $RDS_{(ON)}$=40mΩ

V_{DS}=-20V, I_D=-4.5A, $RDS_{(ON)}$=100mΩ

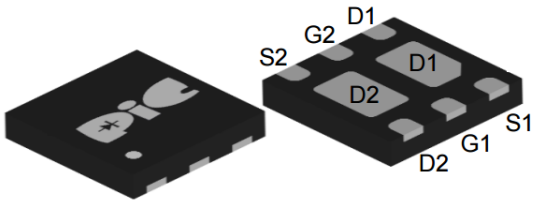
➢ General Description

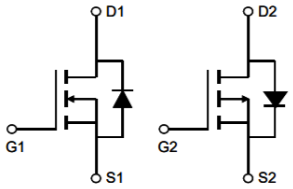
This PAC2903S N&P Channel enhancement mode power field effect transistor is the high density trench technology and this advanced technology can provide excellent Rds(On) performance and efficiency for power switching and load switching application., this device also comply with the RoHS and Green Product requirement with full function reliability approved.

➢ Feature

- ●Super Low Gate Charge
- ●Green Device Available
- ●Excellent CdV/dt effect decline
- ●Advanced high cell density Trench technology
- ●DFN2X2A-EP2 package design

➢ DFN2X2A-EP2





➢ Absolute Maximum Ratings

Parameter	Symbol	Rating		Units
		N-Channel	P-Channel	
		Steady State	Steady State	
Drain-Source Voltage	V_{DS}	20	-20	V
Gate-Source Voltage	V_{GS}	±12	±12	V
Continuous Drain Current[1]	I_D@T_C=25℃	5	-4.5	A
Continuous Drain Current[1]	I_D@T_C=70℃	4.2	-3.7	A
Pulsed Drain Current[2]	I_{DM}	15	-12	A
Total Power Dissipation[3]	P_D@T_A=25℃	1.56	1.56	W
Total Power Dissipation[3]	P_D@T_C=25℃	8.3	8.3	W
Storage Temperature Range	T_{STG}	-55 to 150	-55 to 150	℃
Operating Junction Temperature Range	T_J	-55 to 150	-55 to 150	℃
Thermal Resistance Junction-ambient [1]	$R_{\theta JA}$	80		℃/W
Thermal Resistance Junction-ambient [1]	$R_{\theta JC}$	15		℃/W

N-Ch and P-Ch Fast Switching MOSFET

V_{DS}=20V, I_D=5.0A, $RDS_{(ON)}$=40mΩ

V_{DS}=-20V, I_D=-4.5A, $RDS_{(ON)}$=100mΩ

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

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V , I_D=250uA	20	---	---	V
Static Drain-Source On-Resistance[2]	$R_{DS(ON)}$	V_{GS}=4.5V , I_D=3A	---	28	40	mΩ
		V_{GS}=2.5V , I_D=2A	---	37	55	
		V_{GS}=1.8V , I_D=1.5A	---	51	70	
Gate Threshold Voltage	$V_{GS(th)}$	V_{GS}=V_{DS} , I_D =250uA	0.4	---	1.0	V
Drain-Source Leakage Current	I_{DSS}	V_{DS}=16V , V_{GS}=0V , T_J=25℃	---	---	1	uA
		V_{DS}=16V , V_{GS}=0V , T_J=55℃	---	---	5	
Gate-Source Leakage Current	I_{GSS}	V_{GS}=±12V , V_{DS}=0V	---	---	±100	nA
Forward Transconductance	gfs	V_{DS}=5V , I_D=3A	---	10.5	---	S
Total Gate Charge (4.5V)	Q_g	V_{DS}=15V , V_{GS}=4.5V , I_D=3A	---	4.6	---	nC
Gate-Source Charge	Q_{gs}		---	0.7	---	
Gate-Drain Charge	Q_{gd}		---	1.5	---	
Turn-On Delay Time	$T_{d(on)}$	V_{DD}=10V , V_{GS}=4.5V , R_G=3.3Ω I_D=3A	---	1.6	---	ns
Rise Time	T_r		---	42	---	
Turn-Off Delay Time	$T_{d(off)}$		---	14	---	
Fall Time	T_f		---	7	---	
Input Capacitance	C_{iss}	V_{DS}=15V , V_{GS}=0V , f=1MHz	---	310	---	pF
Output Capacitance	C_{oss}		---	49	---	
Reverse Transfer Capacitance	C_{rss}		---	35	---	

➢ Diode Characteristics

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Continuous Source Current[1,4]	I_S	V_G=V_D=0V , Force Current	---	---	1.5	A
Diode Forward Voltage[2]	V_{SD}	V_{GS}=0V , I_S=1A , T_J=25℃	---	---	1.2	V

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 ID and IDM , in real applications , should be limited by total power dissipation.

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

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V , I_D=-250uA	-20	---	---	V
Static Drain-Source On-Resistance[2]	$R_{DS(ON)}$	V_{GS}=-4.5V , I_D=-3A	---	85	100	mΩ
		V_{GS}=-2.5V , I_D=-1.5A	---	125	145	
		V_{GS}=-1.8V , I_D=-0.5A	---	170	200	
Gate Threshold Voltage	$V_{GS(th)}$	V_{GS}=V_{DS} , I_D =-250uA	-0.4	---	-1.0	V
Drain-Source Leakage Current	I_{DSS}	V_{DS}=-16V , V_{GS}=0V , T_J=25℃	---	---	-1	uA
		V_{DS}=-16V , V_{GS}=0V , T_J=55℃	---	---	-5	
Gate-Source Leakage Current	I_{GSS}	V_{GS}=±12V , V_{DS}=0V	---	---	±100	nA
Forward Transconductance	gfs	V_{DS}=-5V , I_D=-3A	---	12.2	---	S
Total Gate Charge (-4.5V)	Q_g	V_{DS}=-15V , V_{GS}=-4.5V , I_D=-3A	---	10.1	---	nC
Gate-Source Charge	Q_{gs}		---	1.21	---	
Gate-Drain Charge	Q_{gd}		---	2.46	---	
Turn-On Delay Time	$T_{d(on)}$	V_{DD}=-10V , V_{GS}=-4.5V , R_G=3.3Ω I_D=-3A	---	5.6	---	ns
Rise Time	T_r		---	32.2	---	
Turn-Off Delay Time	$T_{d(off)}$		---	45.6	---	
Fall Time	T_f		---	29.2	---	
Input Capacitance	C_{iss}	V_{DS}=-15V , V_{GS}=0V , f=1MHz	---	677	---	pF
Output Capacitance	C_{oss}		---	82	---	
Reverse Transfer Capacitance	C_{rss}		---	73	---	

➢ Diode Characteristics

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Continuous Source Current[1,4]	I_S	V_G=V_D=0V , Force Current	---	---	-1.5	A
Diode Forward Voltage[2]	V_{SD}	V_{GS}=0V , I_S=1A , T_J=25℃	---	---	-1	V

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 ID and IDM , in real applications , should be limited by total power dissipation.

➢ N-Channel Typical Characteristics

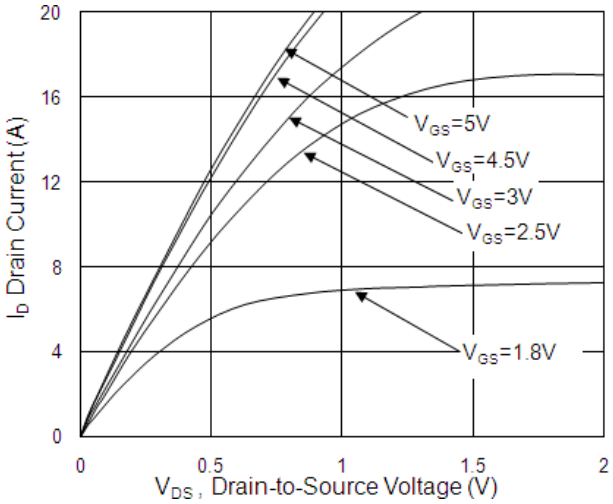


Fig.1 Typical Output Characteristics

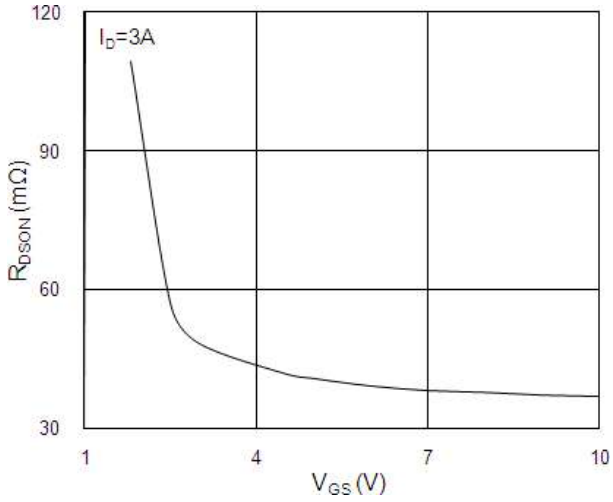


Fig.2 On-Resistance vs G-S Voltage

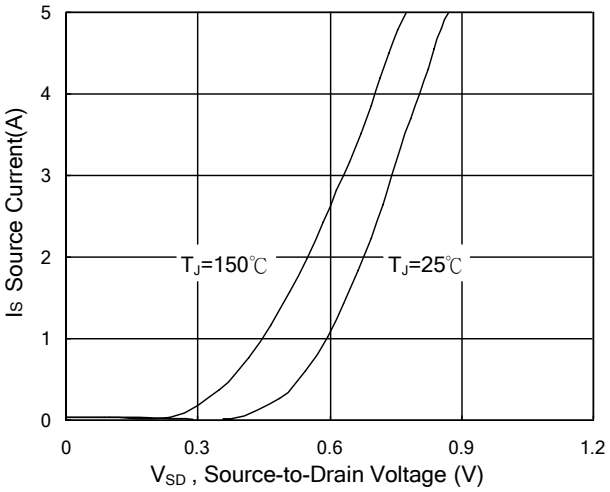


Fig.3 Source Drain Forward Characteristics

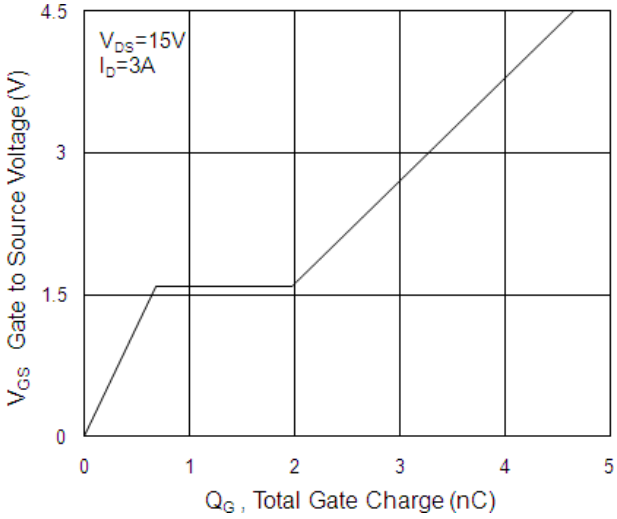


Fig.4 Gate-Charge Characteristics

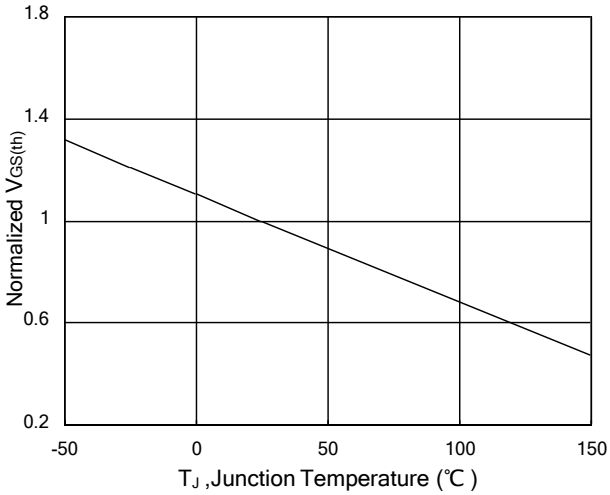


Fig.5 Normalized $V_{GS(th)}$ vs T_J

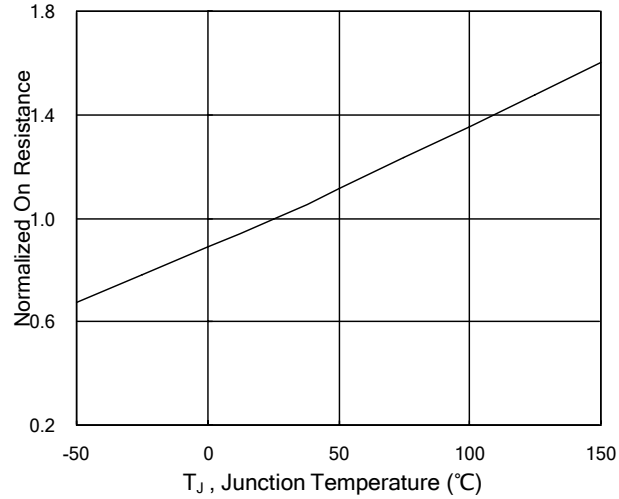


Fig.6 Normalized R_{DSON} vs T_J

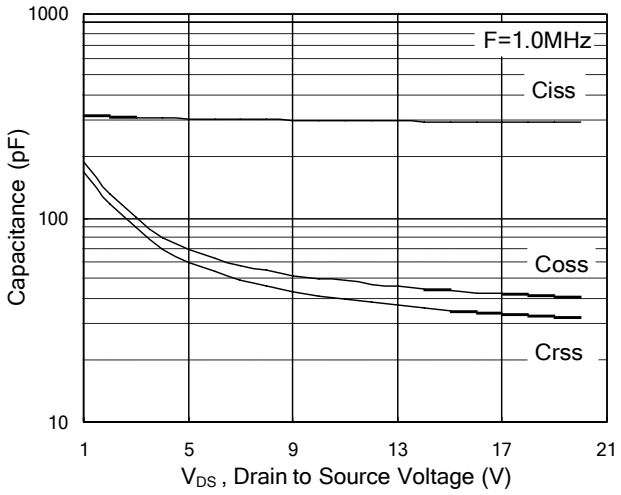


Fig.7 Capacitance

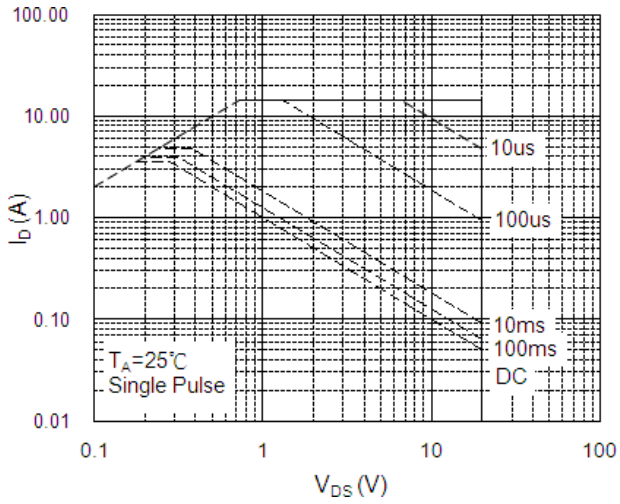


Fig.8 Safe Operating Area

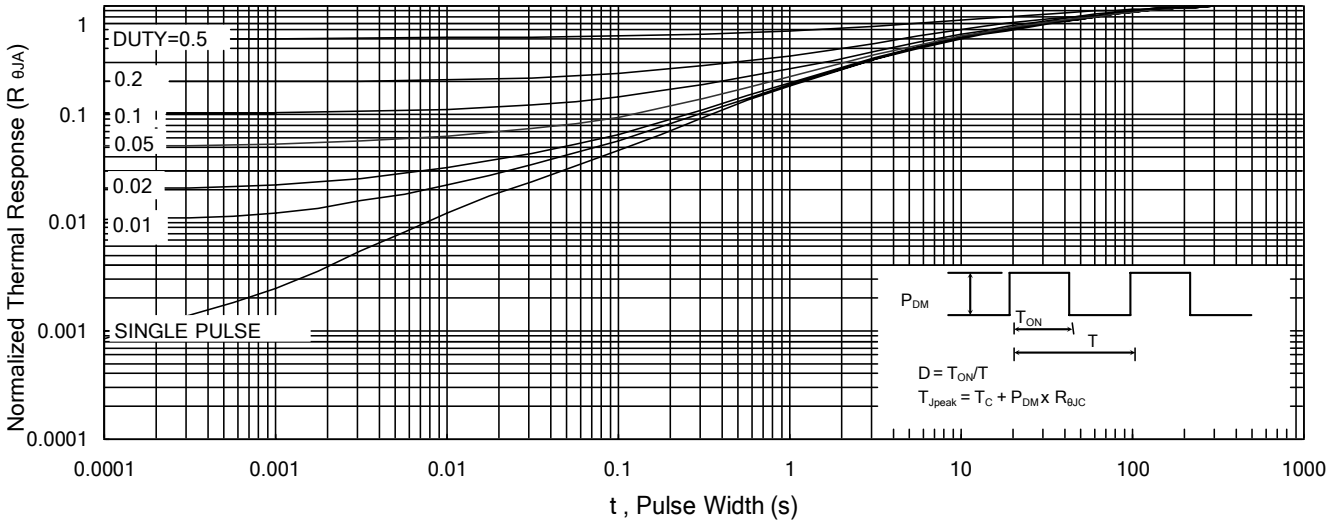


Fig.9 Normalized Maximum Transient Thermal Impedance

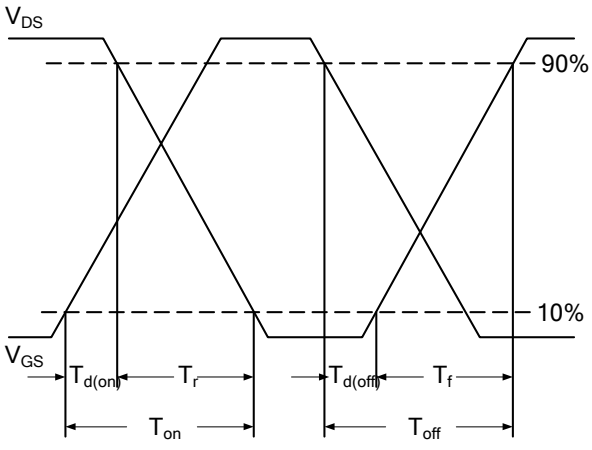


Fig.10 Switching Time Waveform

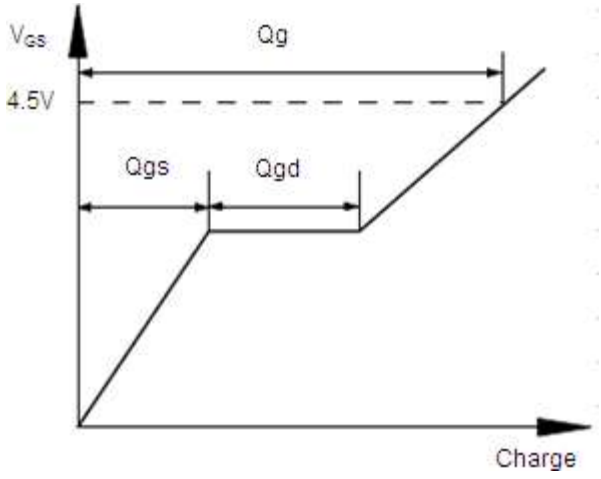


Fig.11 Gate Charge Waveform

➢ P-Channel Typical Characteristics

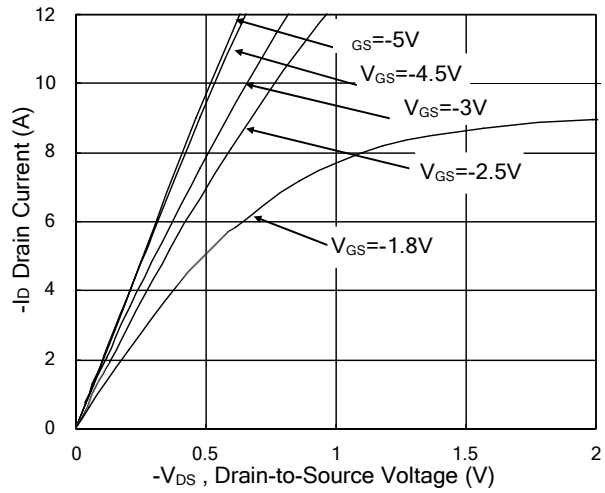


Fig.1 Typical Output Characteristics

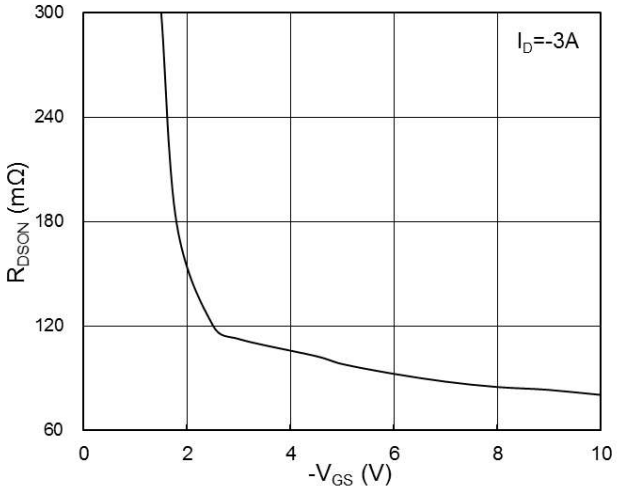


Fig.2 On-Resistance vs G-S Voltage

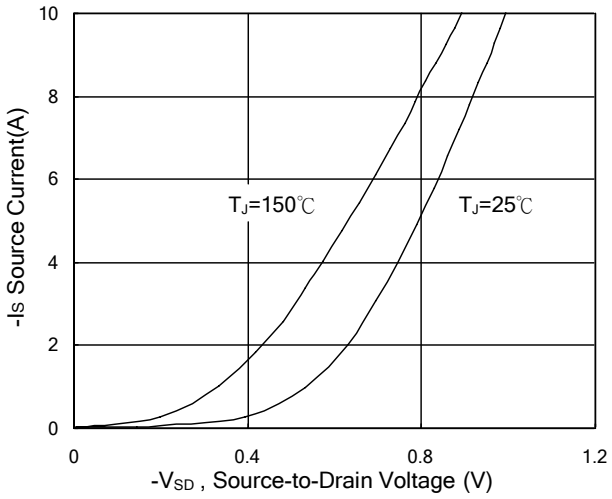


Fig.3 Source Drain Forward Characteristics

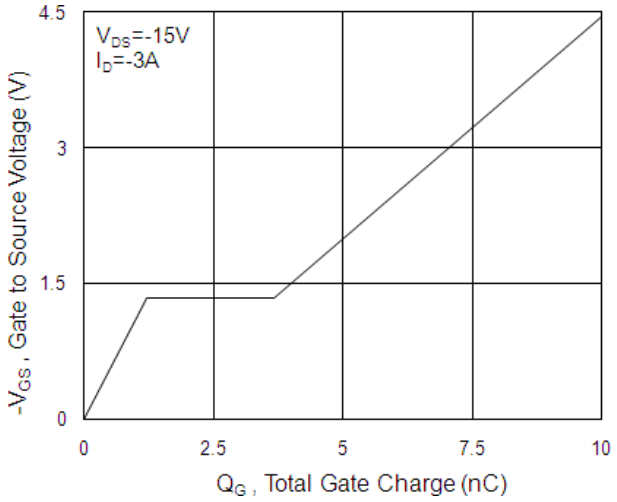


Fig.4 Gate-Charge Characteristics

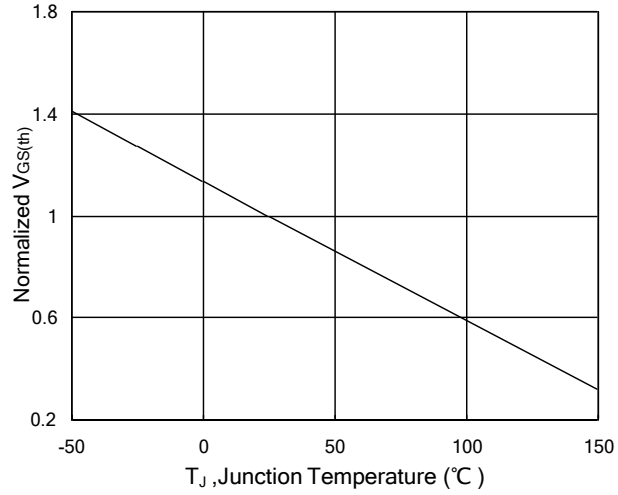


Fig.5 Normalized $V_{GS(th)}$ vs T_J

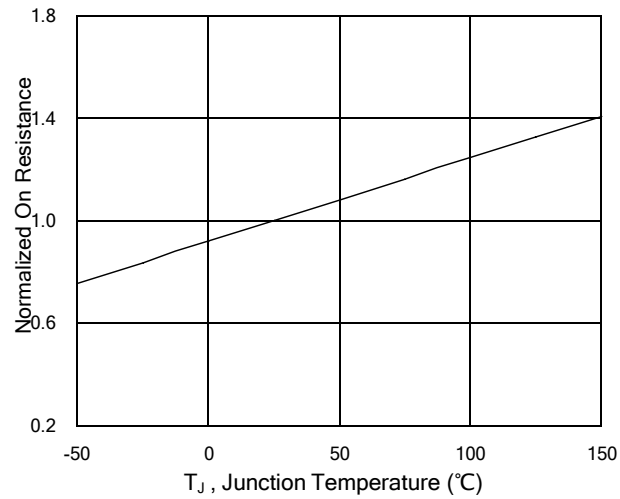


Fig.6 Normalized R_{DSON} vs T_J

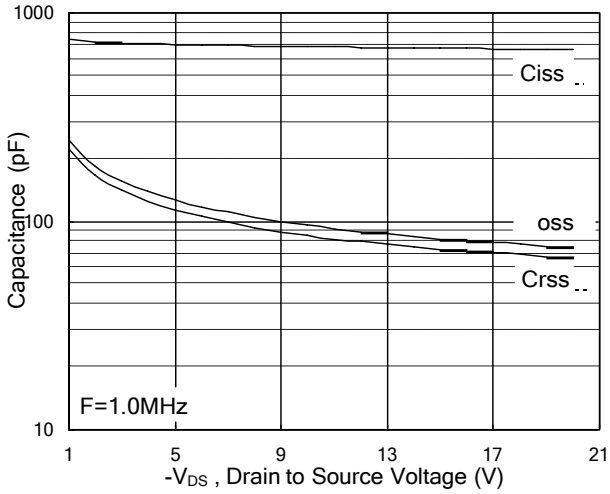


Fig.7 Capacitance

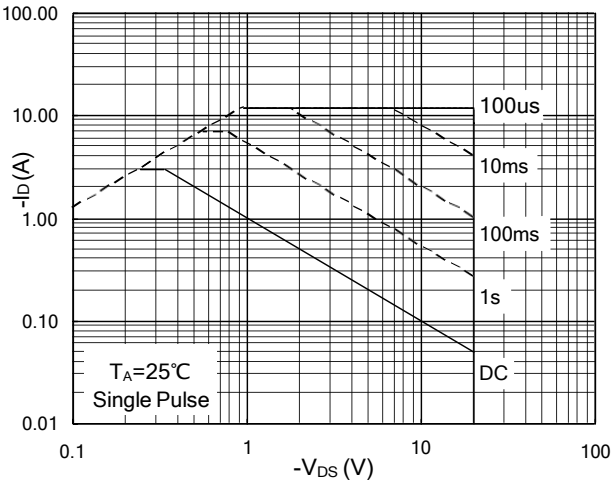


Fig.8 Safe Operating Area

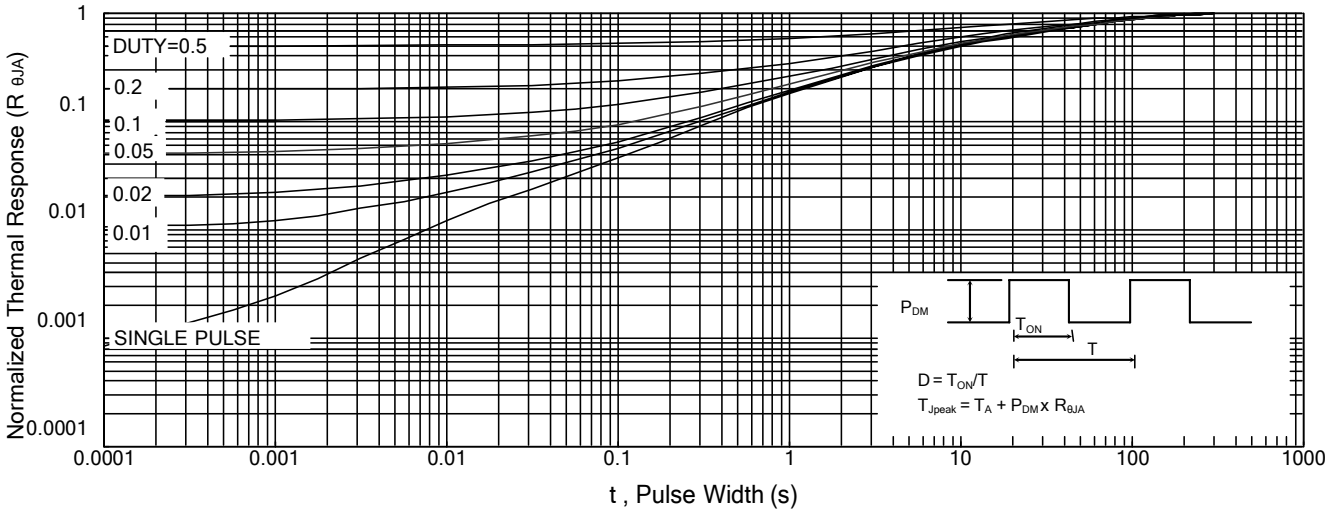


Fig.9 Normalized Maximum Transient Thermal Impedance

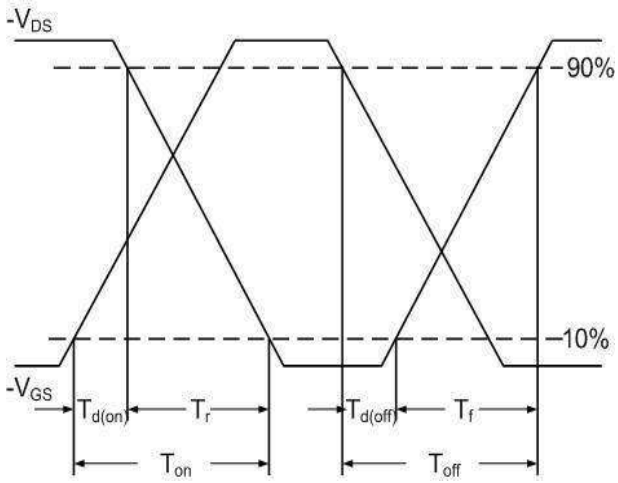


Fig.10 Switching Time Waveform

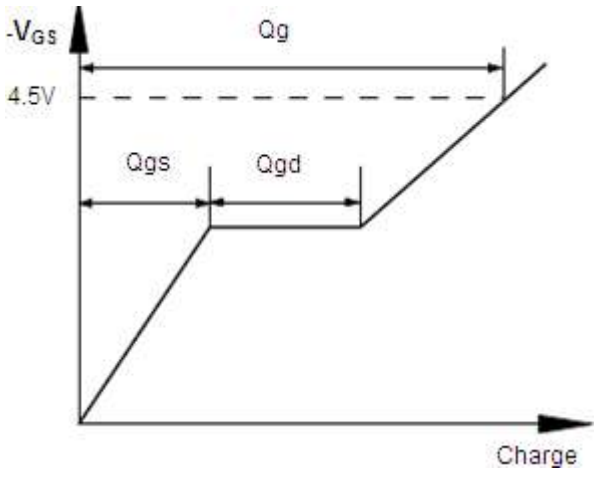
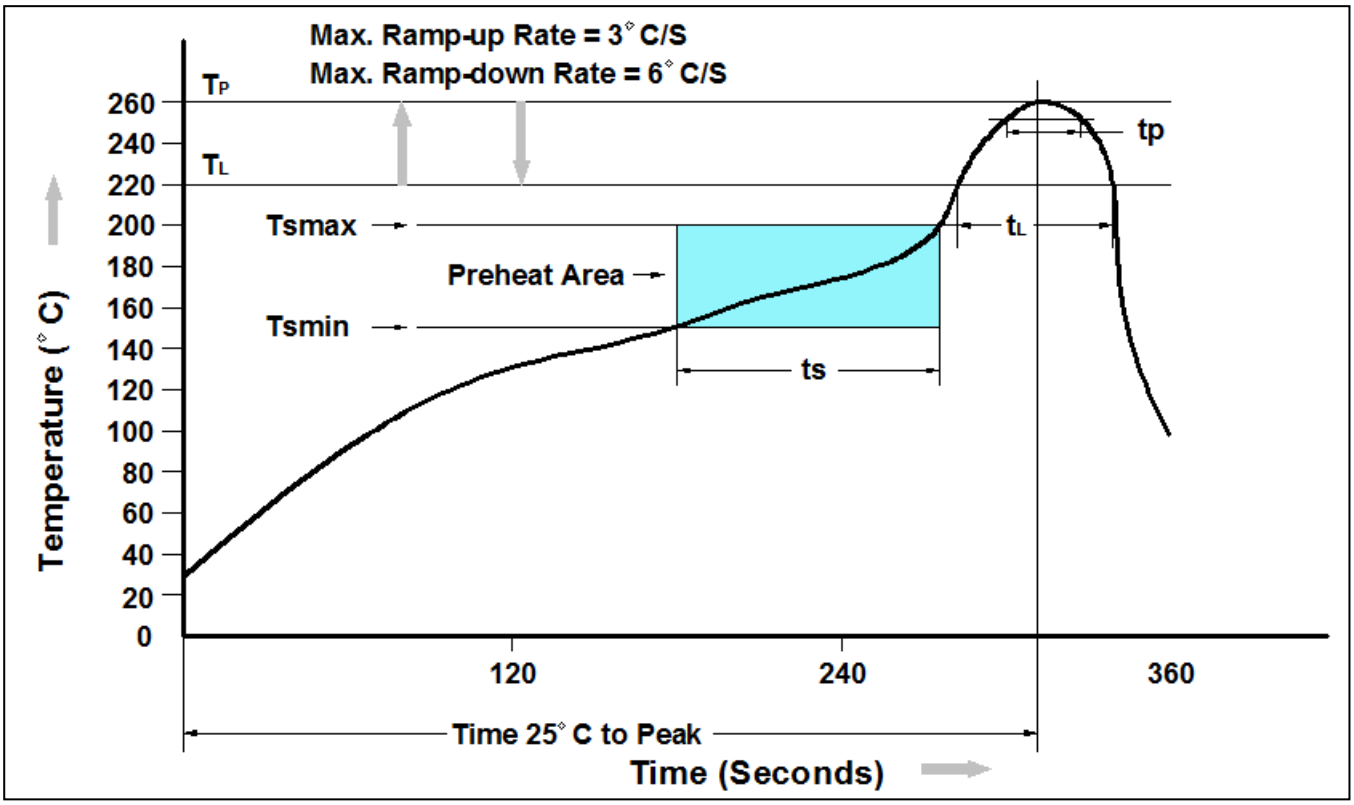


Fig.11 Gate Charge Waveform

➢ Recommand IR Reflow Soldering Thermal Profile

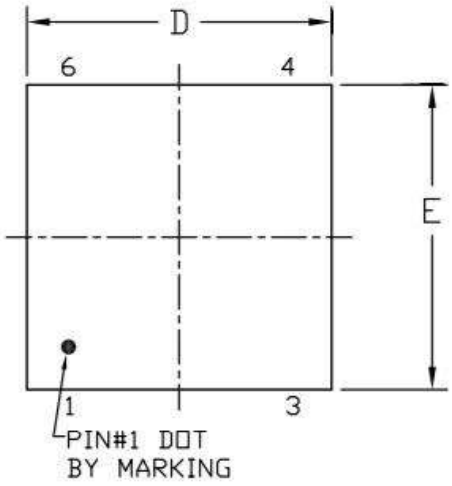


Profile Feature	Pb-Free Assembly Profile
Temperature Min. (Tsmin)	150°C
Temperature Max. (Tsmax)	200°C
Time (ts) from (Tsmin to Tsmax)	60-120 seconds
Average Ramp-up Rate (tL to tP)	3°C/second max.
Liquidous Temperature (TL)	217°C
Time (tL) Maintained Above (TL)	60 – 150 seconds
Peak Temperature	260°C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

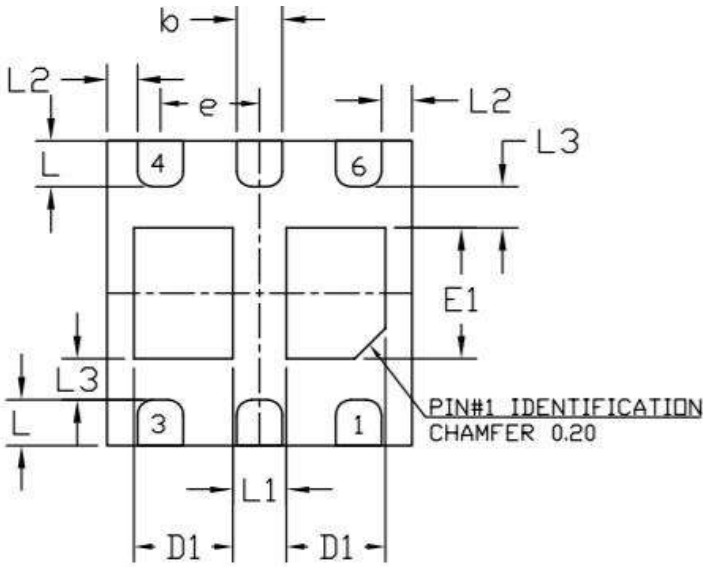
➢ Ordering Information

Part Number	Description	Quantity
PAC2903S	DFN2X2A-EP2 Reel	3000 pcs

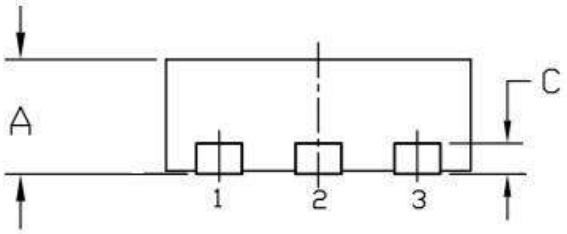
➢ Package Information (DFN2X2A-EP2)



TOP VIEW

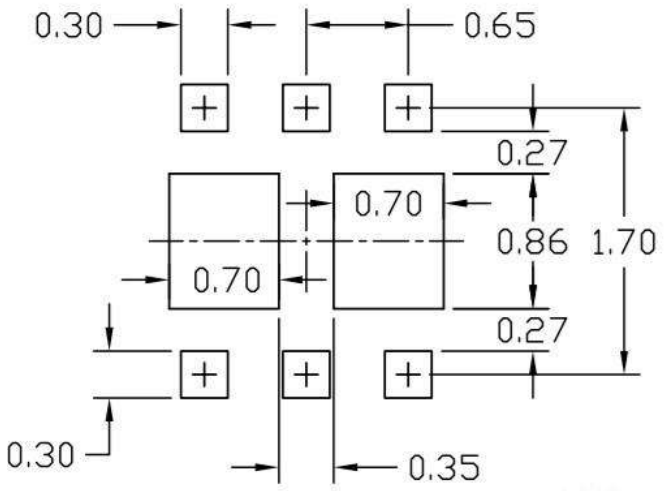


BOTTOM VIEW



FRONT VIEW

RECOMMENDED LAND PATTERN



SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.70	0.75	0.80	0.028	0.030	0.031
b	0.25	0.30	0.35	0.010	0.012	0.014
c	0.20 Ref.			0.008 Ref.		
D	1.90	2.00	2.10	0.075	0.079	0.083
D1	0.620	0.650	0.680	0.024	0.026	0.027
E	1.90	2.00	2.10	0.075	0.079	0.083
E1	0.76	0.86	0.96	0.030	0.034	0.038
e	0.65 BSC			0.026 BSC		
L	0.25	0.30	0.35	0.010	0.012	0.014
L1	0.320	0.350	0.380	0.013	0.014	0.015
L2	0.170	0.200	0.230	0.007	0.008	0.009
L3	0.240	0.270	0.300	0.009	0.011	0.012

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- Though Paceleader make effort to improve product quality and reliability, Product can malfunction and fail due to their inherent electrical sensitivity and vulnerability to physical stress, it is the responsibility of the customer, when utilizing Paceleader products, to comply with the standards of safety in making a safe design for entire system and to avoid situation in which a malfunction or failure., In developing a new designs, customer should ensure that the device which shown in this documents are used within specified operating ranges.

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