

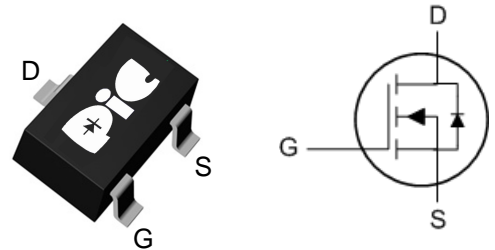
### ➤ General Description

This PAN2520NS N-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
- Green Device Available
- Excellent  $CdV/dt$  effect decline
- Advanced high cell density Trench technology
- SOT-23S package design

### ➤ SOT-23S



### ➤ Application

- Load Switch
- Portable instrument
- MB / NB / 3C device

### ➤ Absolute Maximum Ratings

Parameter	Symbol	Rating	Units
Drain-Source Voltage	$V_{DS}$	20	V
Gate-Source Voltage	$V_{GS}$	$\pm 12$	V
Continuous Drain Current, $V_{GS}$ @ 4.5V <sup>1</sup>	$I_D@T_A=25^\circ C$	6.0	A
Continuous Drain Current, $V_{GS}$ @ 4.5V <sup>1</sup>	$I_D@T_A=70^\circ C$	5.0	A
Pulsed Drain Current <sup>2</sup>	$I_{DM}$	17	A
Total Power Dissipation <sup>3</sup>	$P_D@T_A=25^\circ C$	1	W
Total Power Dissipation <sup>3</sup>	$P_D@T_A=70^\circ C$	0.66	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>	$R_{\theta JA}$	120	$^\circ C/W$

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

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	20	---	---	V
BVDSS Temperature Coefficient	$\Delta BV_{DSS}/\Delta T_J$	Reference to $25^\circ C, I_D=1mA$	---	0.018	---	$V/^\circ C$
Static Drain-Source On-Resistance <sup>2</sup>	$R_{DS(ON)}$	$V_{GS}=4.5V, I_D=4A$	---	21	26	m $\Omega$
		$V_{GS}=2.5V, I_D=3A$	---	28	35	
		$V_{GS}=1.8V, I_D=2A$	---	40	50	
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS}=V_{DS}, I_D=250\mu A$	0.45	---	1.0	V
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}$		---	-3.1	---	$mV/^\circ C$
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS}=16V, V_{GS}=0V, T_J=25^\circ C$	---	---	1	$\mu A$
		$V_{DS}=16V, V_{GS}=0V, T_J=55^\circ C$	---	---	5	
Gate-Source Leakage Current	$I_{GSS}$	$V_{GS}=\pm 12V, V_{DS}=0V$	---	---	$\pm 100$	nA
Forward Transconductance	$g_{fs}$	$V_{DS}=5V, I_D=4A$	---	30	---	S
Total Gate Charge (4.5V)	$Q_g$	$V_{DS}=15V, V_{GS}=4.5V, I_D=4A$	---	8.6	---	nC
Gate-Source Charge	$Q_{gs}$		---	1.37	---	
Gate-Drain Charge	$Q_{gd}$		---	2.3	---	
Turn-On Delay Time	$T_{d(on)}$	$V_{DS}=10V, V_{GS}=4.5V, R_G=3.3\Omega$ $I_D=4A$	---	5.2	---	ns
Rise Time	$T_r$		---	34	---	
Turn-Off Delay Time	$T_{d(off)}$		---	23	---	
Fall Time	$T_f$		---	9.2	---	
Input Capacitance	$C_{iss}$	$V_{DS}=15V, V_{GS}=0V, f=1MHz$	---	670	---	pF
Output Capacitance	$C_{oss}$		---	75	---	
Reverse Transfer Capacitance	$C_{rss}$		---	68	---	

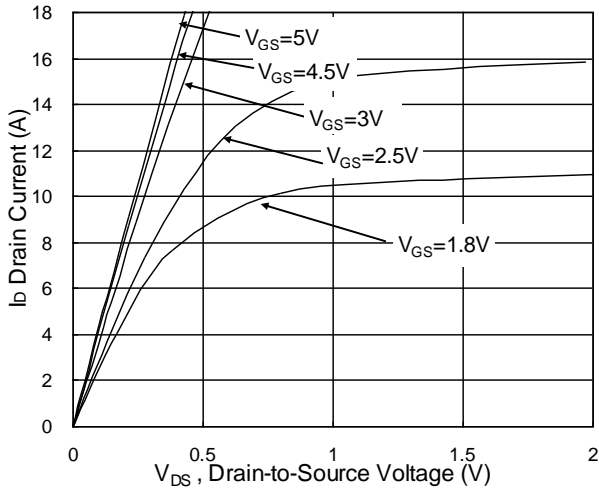
### ➤ Diode Characteristics

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Continuous Source Current <sup>1,4</sup>	$I_S$	$V_G=V_D=0V$ , Force Current	---	---	6	A
Diode Forward Voltage <sup>2</sup>	$V_{SD}$	$V_{GS}=0V, I_S=1A, T_J=25^\circ C$	---	---	1.2	V

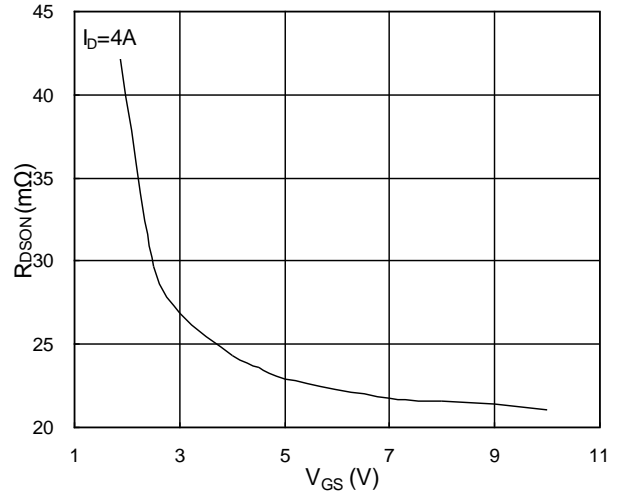
Note :

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. Ensure that the channel temperature does not exceed  $150^\circ C$ .
4. The data is theoretically the same as  $I_D$  and  $I_{DM}$ , in real applications, should be limited by total power dissipation.

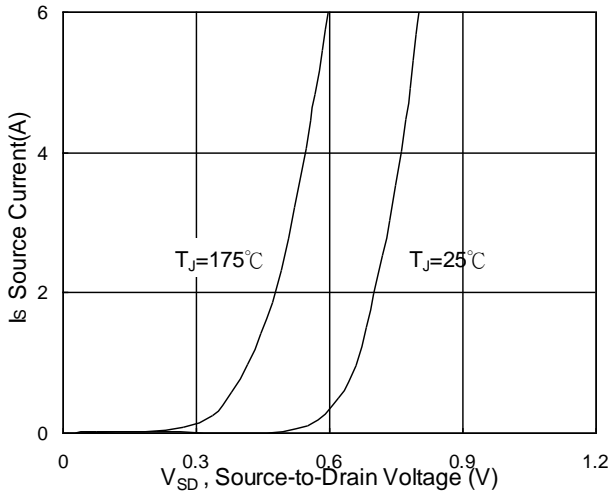
### ➤ Typical Characteristics



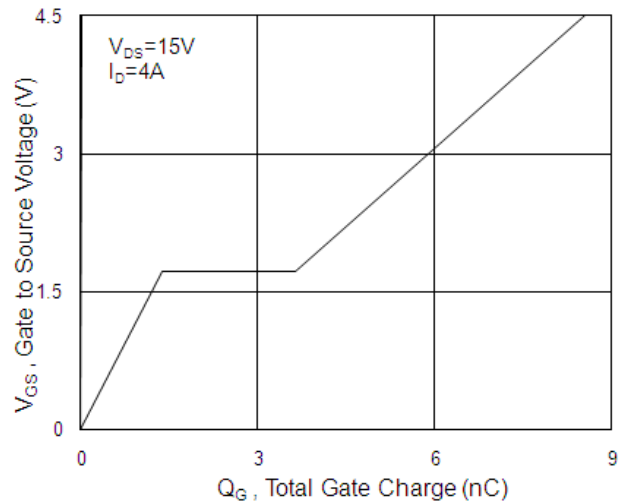
**Fig.1 Typical Output Characteristics**



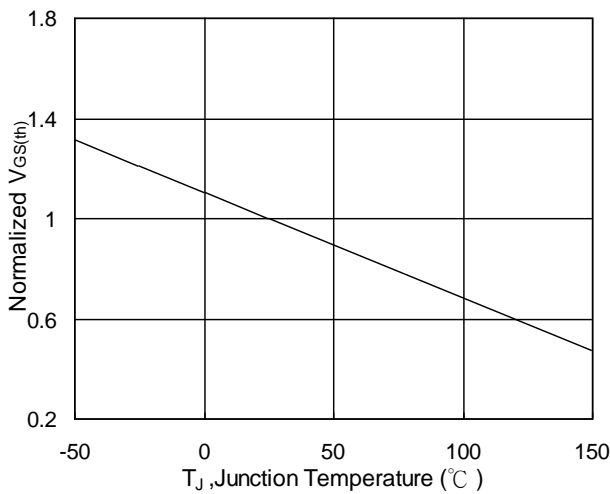
**Fig.2 On-Resistance vs. Gate-Source**



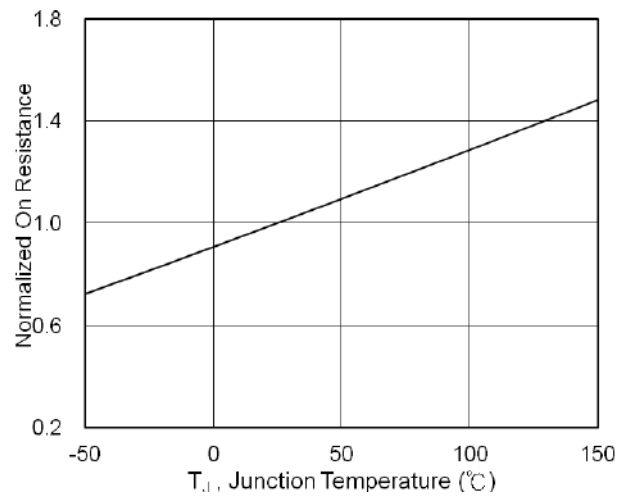
**Fig.3 Forward Characteristics Of Reverse**



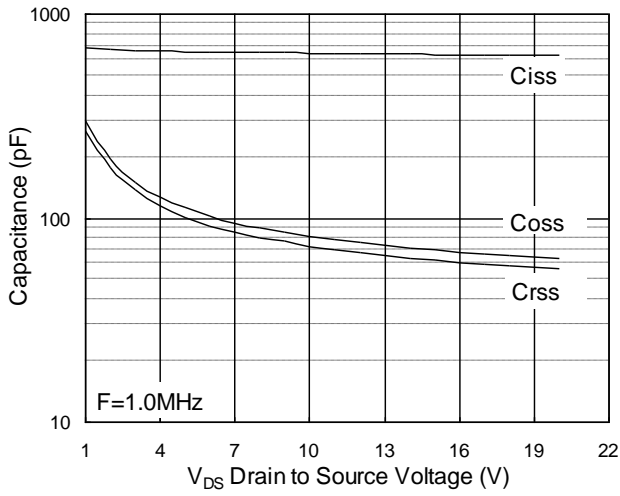
**Fig.4 Gate-Charge Characteristics**



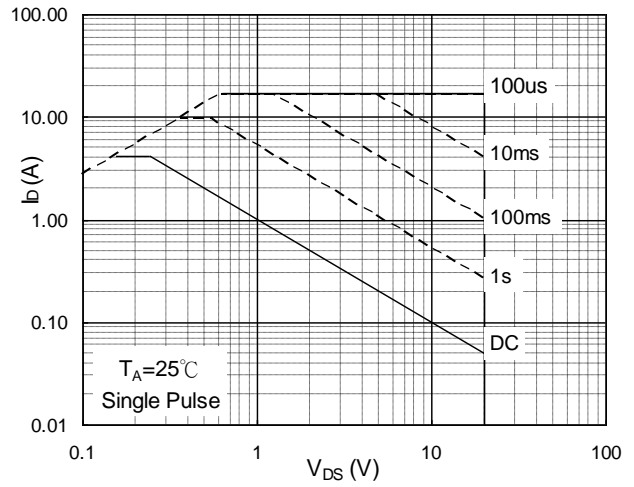
**Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$**



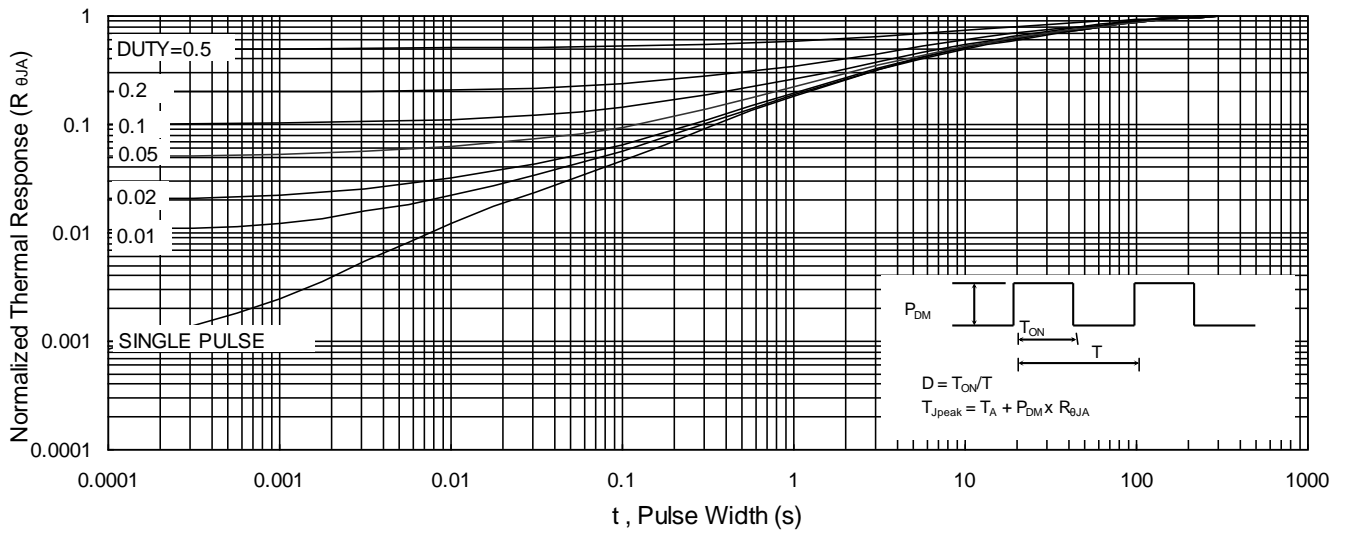
**Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_J$**



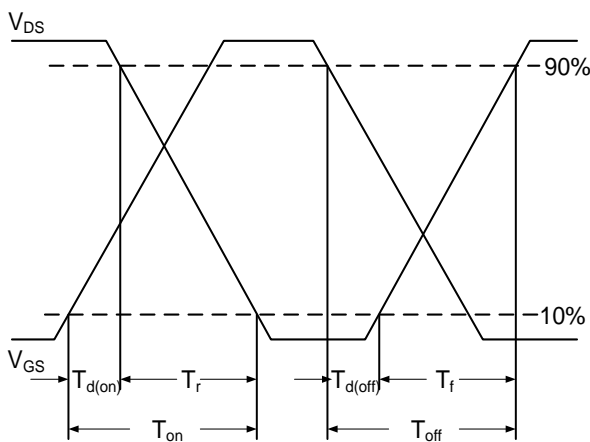
**Fig.7 Capacitance**



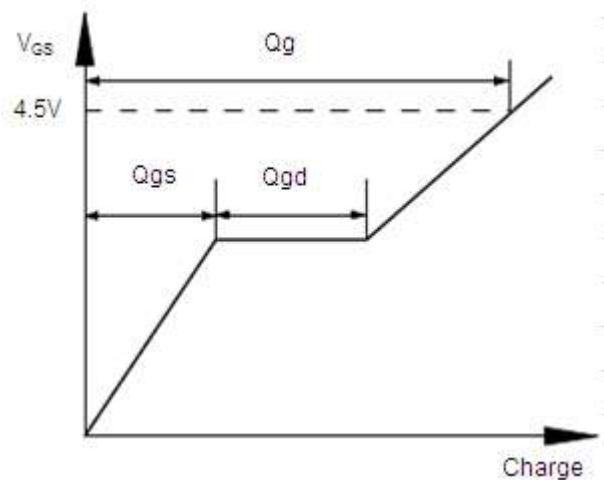
**Fig.8 Safe Operating Area**



**Fig.9 Normalized Maximum Transient Thermal Impedance**



**Fig.10 Switching Time Waveform**



**Fig.11 Gate Charge Waveform**

## ➤ Recommend IR Reflow Soldering Thermal Profile

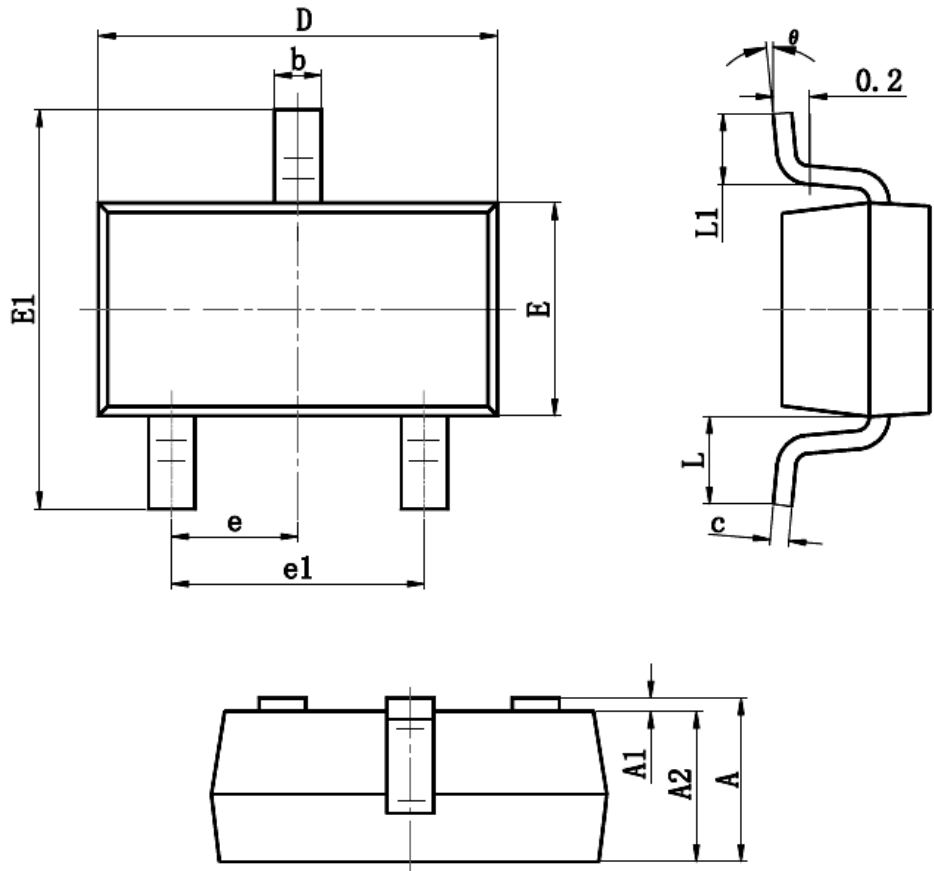


Profile Feature	Pb-Free Assembly Profile
Temperature Min. (T <sub>smin</sub> )	150°C
Temperature Max. (T <sub>smax</sub> )	200°C
Time (t <sub>s</sub> ) from (T <sub>smin</sub> to T <sub>smax</sub> )	60-120 seconds
Average Ramp-up Rate (t <sub>L</sub> to t <sub>P</sub> )	3°C/second max.
Liquidous Temperature (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
PAN2520NS	SOT-23S Reel	3000 pcs

➤ Package Information ( SOT-23S)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.200	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.100	0.035	0.039
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950 TYP		0.037 TYP	
e1	1.800	2.000	0.071	0.079
L	0.550 REF		0.022 REF	
L1	0.300	0.500	0.012	0.020
θ	0°	8°	0°	6°

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