



# SPN2038

## N-Channel Enhancement Mode MOSFET

### DESCRIPTION

The SPN2038 is the N-Channel logic enhancement mode power field effect transistor which is produced with high cell density DMOS trench technology. The SPN2038 has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers. It has been optimized for low gate charge, low  $R_{DS(ON)}$  and fast switching speed.

### FEATURES

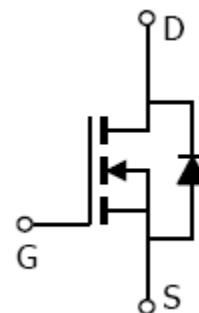
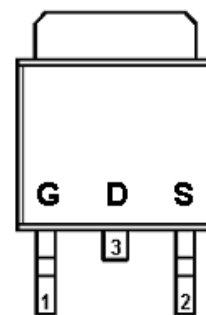
- ◆ 20V/14A,  $R_{DS(ON)}=16m\Omega@V_{GS}=4.5V$
- ◆ 20V/7A,  $R_{DS(ON)}=22m\Omega@V_{GS}=2.5V$
- ◆ Super high density cell design for extremely low  $R_{DS(ON)}$
- ◆ Exceptional on-resistance and maximum DC current capability

### APPLICATIONS

- Power Management in Note book
- Powered System
- DC/DC Converter
- Load Switch

### PIN CONFIGURATION

TO-252



### PART MARKING





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### PIN DESCRIPTION

Pin	Symbol	Description
1	G	Gate
2	S	Source
3	D	Drain

### ORDERING INFORMATION

Part Number	Package	Part Marking
SPN2038T252RGB	TO-252	SPN2038

※ SPN2038T252RGB : Tape Reel ; Pb – Free ; Halogen - Free

### ABSOLUTE MAXIMUM RATINGS

(TA=25°C Unless otherwise noted)

Parameter	Symbol	Typical	Unit	
Drain-Source Voltage	V <sub>DSS</sub>	20	V	
Gate –Source Voltage	V <sub>GSS</sub>	±16	V	
Continuous Drain Current	I <sub>D</sub>	T <sub>C</sub> =25°C	28	A
		T <sub>C</sub> =100°C	18	
Pulsed Drain Current	I <sub>DM</sub>	70	A	
Power Dissipation	P <sub>D</sub>	25	W	
Operating Junction Temperature	T <sub>J</sub>	-55/150	°C	
Storage Temperature Range	T <sub>STG</sub>	-55/150	°C	
Thermal Resistance-Junction to Case	R <sub>θJC</sub>	5	°C/W	



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### ELECTRICAL CHARACTERISTICS

(TA=25°C Unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ	Max.	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS}=0V, I_D=250\mu A$	20			V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	0.5		1.2	
Gate Leakage Current	$I_{GSS}$	$V_{DS}=0V, V_{GS}=\pm 16V$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=16V, V_{GS}=0V$			1	uA
		$V_{DS}=16V, V_{GS}=0V$ $T_J=55^\circ C$			5	
On-State Drain Current	$I_{D(on)}$	$V_{DS}\geq 5V, V_{GS}=4.5V$	28			A
Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS}=4.5V, I_D=14A$		0.016	0.02	$\Omega$
		$V_{GS}=2.5V, I_D=7A$		0.022	0.028	
Forward Transconductance	$g_{fs}$	$V_{DS}=5V, I_D=14A$		30		S
Diode Forward Voltage	$V_{SD}$	$I_S=1A, V_{GS}=0V$			1.2	V
<b>Dynamic</b>						
Total Gate Charge	$Q_g$	$V_{DS}=15V, V_{GS}=4.5V$ $I_D=14A$		9.8		nC
Gate-Source Charge	$Q_{gs}$			2.1		
Gate-Drain Charge	$Q_{gd}$			3		
Input Capacitance	$C_{iss}$	$V_{DS}=15, V_{GS}=0V$ $f=1MHz$		772		pF
Output Capacitance	$C_{oss}$			83		
Reverse Transfer Capacitance	$C_{rss}$			79		
Turn-On Time	$t_{d(on)}$	$V_{DD}=10V, I_D=14A,$ $V_{GS}=4.5V, R_G=3.3\Omega$		4		nS
	$t_r$			12.5		
Turn-Off Time	$t_{d(off)}$			20		
	$t_f$			8		



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## TYPICAL CHARACTERISTICS

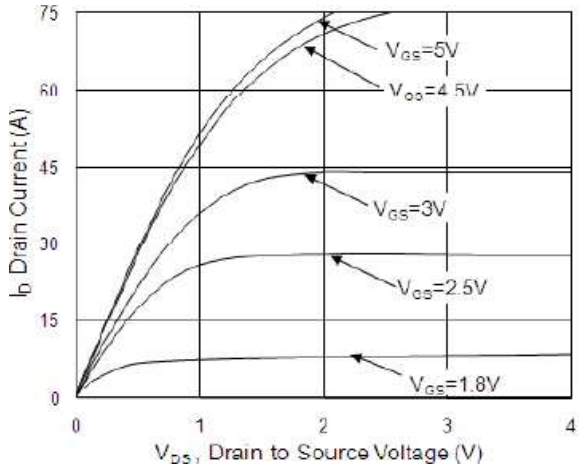


Fig. 1 Typical Output Characteristics

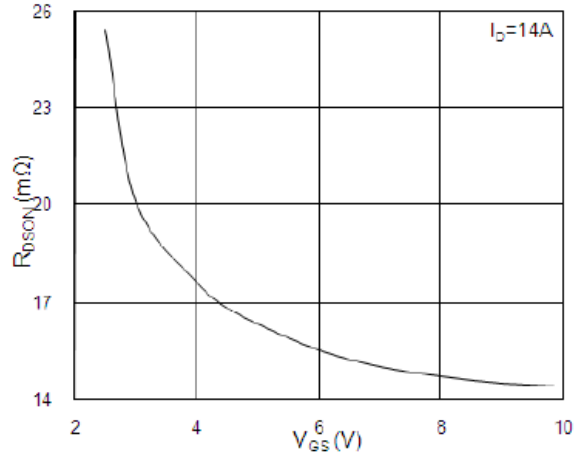


Fig. 2 On-Resistance vs Gate Voltage

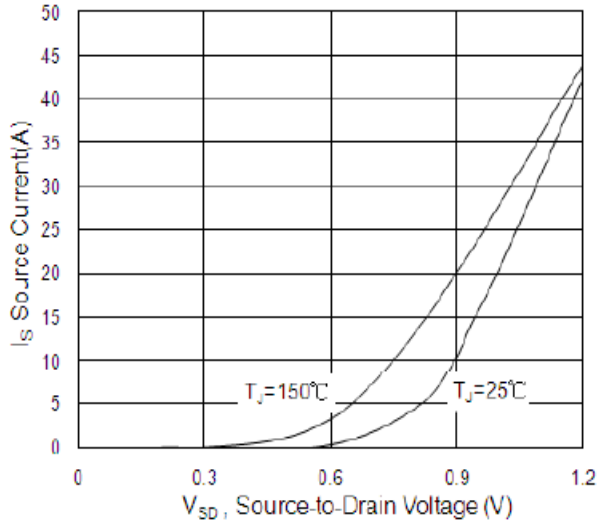


Fig. 3 Forward Characteristics

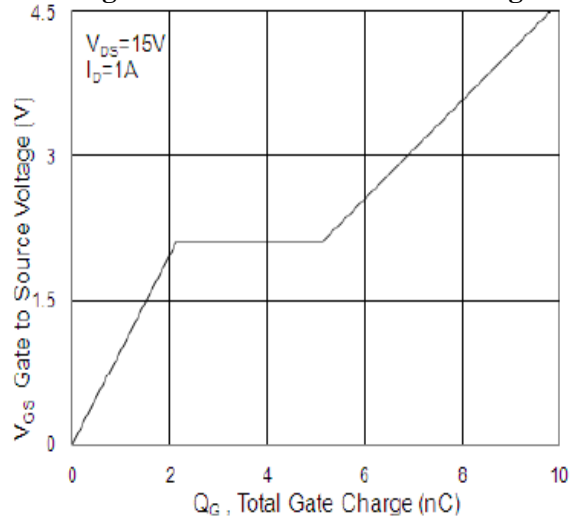


Fig. 4 Total Gate Charge

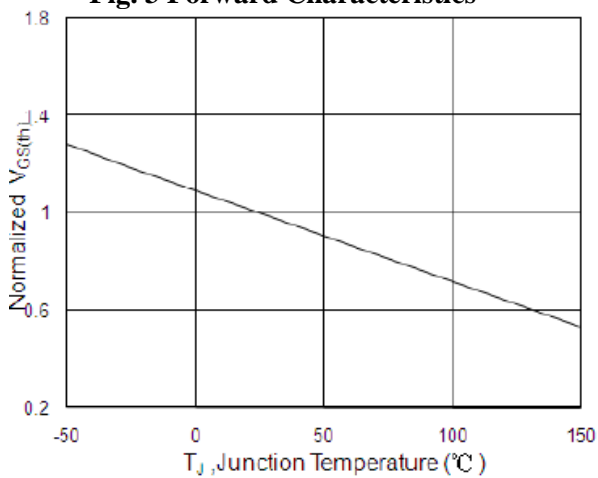


Fig. 5 Vgs vs Temperature

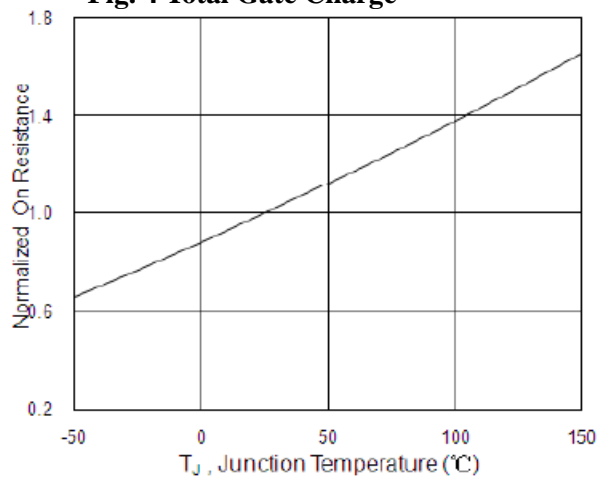


Fig. 6 Rds(on) vs Temperature



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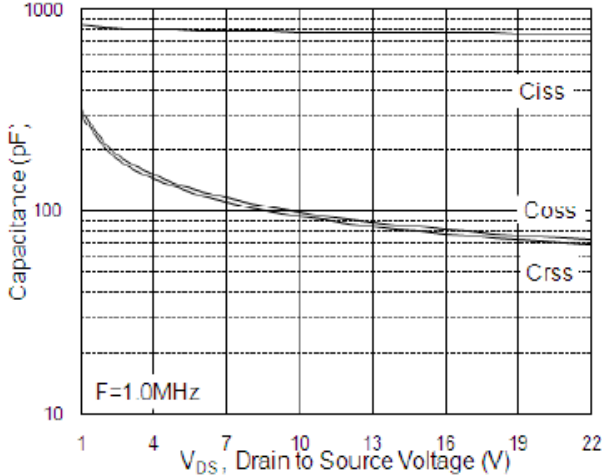


Fig. 7 Capacitance vs Vds

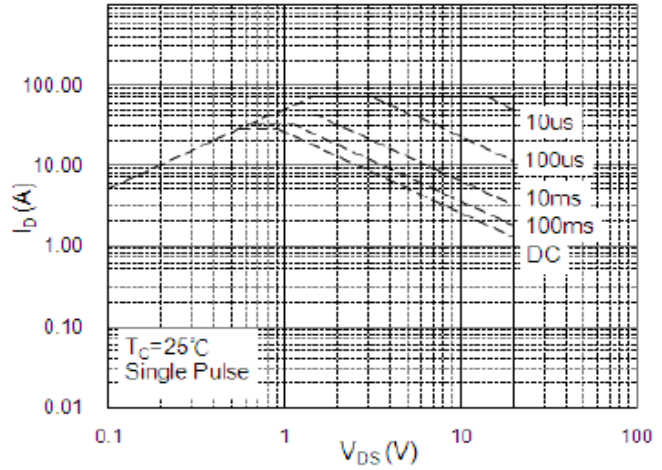


Fig. 8 Safe Operation Region

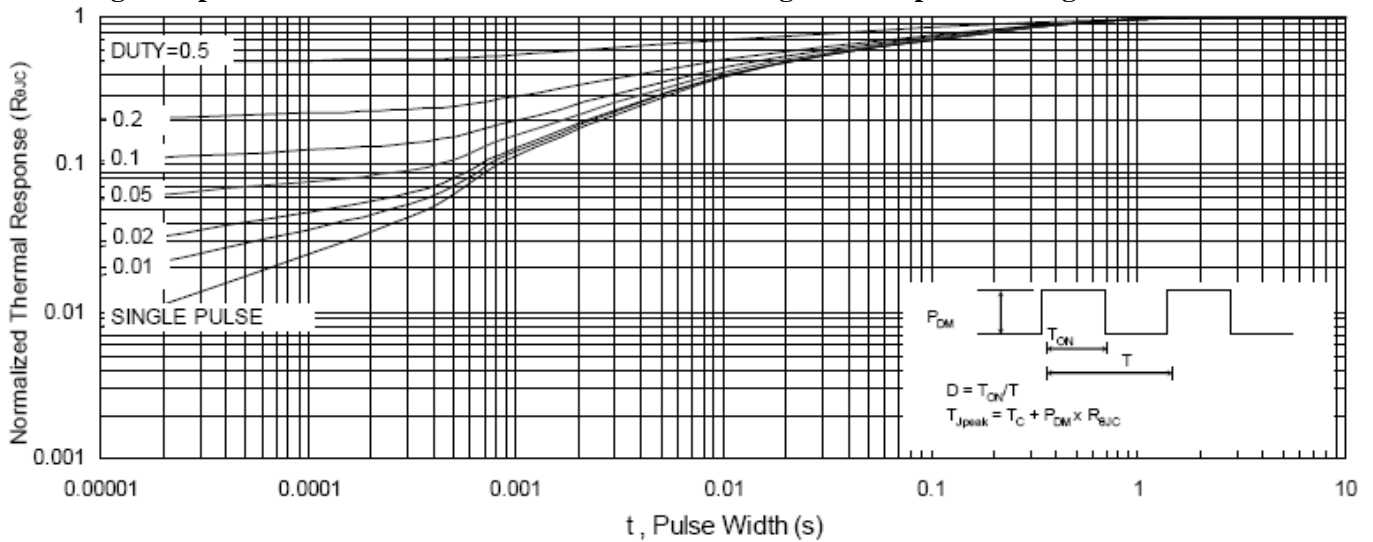


Fig. 9 Maximum Transient Thermal Impedance

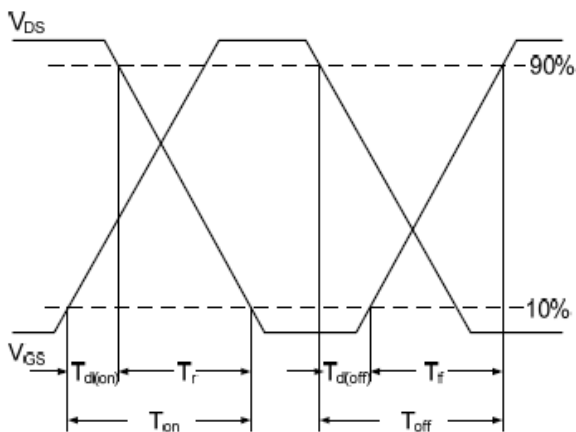


Fig. 10 Switching Time Waveform

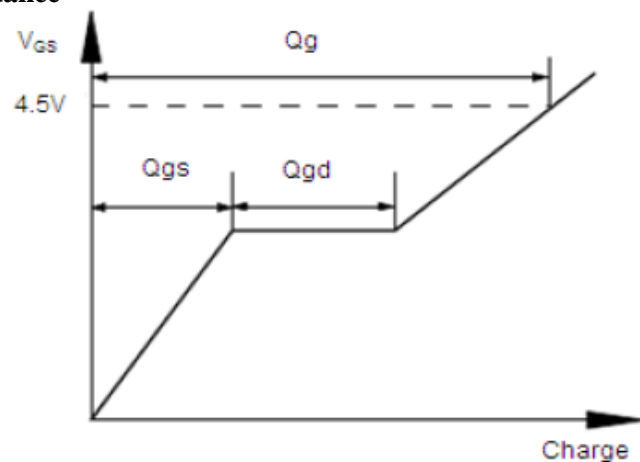


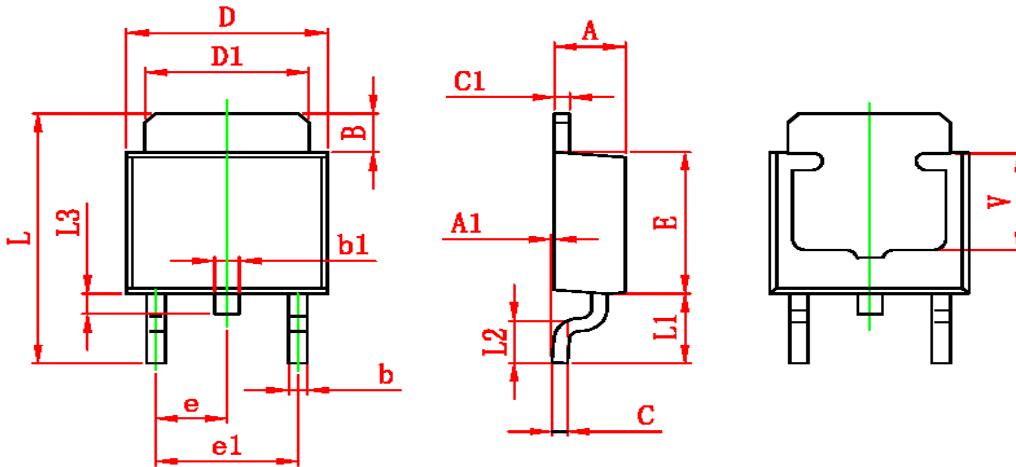
Fig. 11 Gate Charge Waveform



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### TO-252 PACKAGE OUTLINE



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
B	1.350	1.650	0.053	0.065
b	0.500	0.700	0.020	0.028
b1	0.700	0.900	0.028	0.035
c	0.430	0.580	0.017	0.023
c1	0.430	0.580	0.017	0.023
D	6.350	6.650	0.250	0.262
D1	5.200	5.400	0.205	0.213
E	5.400	5.700	0.213	0.224
e	2.300 TYP		0.091 TYP	
e1	4.500	4.700	0.177	0.185
L	9.500	9.900	0.374	0.390
L1	2.550	2.900	0.100	0.114
L2	1.400	1.780	0.055	0.070
L3	0.350	0.650	0.014	0.026
V	3.80 REF		0.150 REF	



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