



# SPN6098

## N-Channel Enhancement Mode MOSFET

### DESCRIPTION

The SPN6098 is the N-Channel logic enhancement mode power field effect transistors are produced using high cell density, DMOS trench technology. This high density process is especially tailored to minimize on-state resistance. These devices are particularly suited for most of synchronous buck converter applications.

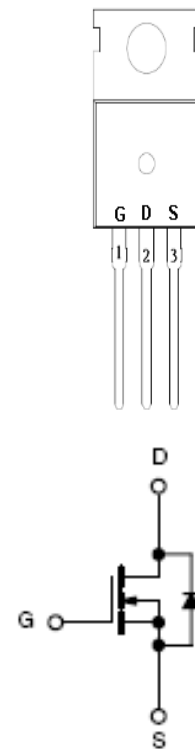
### FEATURES

- ◆ 60V/60A,  $R_{DS(ON)} = 12m\Omega @ V_{GS} = 10V$
- ◆ 60V/60A,  $R_{DS(ON)} = 15.0m\Omega @ V_{GS} = 4.5V$
- ◆ Super high density cell design for extremely low  $R_{DS(ON)}$
- ◆ Exceptional on-resistance and maximum DC current capability
- ◆ TO-220-3L package design

### APPLICATIONS

- DC/DC Converter
- Load Switch
- Synchronous Buck Converter

### PIN CONFIGURATION( TO-220-3L )



### PART MARKING





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### PIN DESCRIPTION

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

### ORDERING INFORMATION

Part Number	Package	Part Marking
SPN6098T220TG	TO-220-3L	SPN6098
SPN6098T220TGB	TO-220-3L	SPN6098

※ SPN6098T220TG: Tube ; Pb – Free

※ SPN6098T220TGB: Tube ; Pb – Free; Halogen – Free

### ABSOLUTE MAXIMUM RATINGS

( $T_A=25^{\circ}\text{C}$  Unless otherwise noted)

Parameter	Symbol	Typical	Unit
Drain-Source Voltage	$V_{DSS}$	60	V
Gate –Source Voltage	$V_{GSS}$	$\pm 20$	V
Continuous Drain Current( $T_J=150^{\circ}\text{C}$ )	$I_D$	$T_A=25^{\circ}\text{C}$	60
		$T_A=100^{\circ}\text{C}$	47
Pulsed Drain Current	$I_{DM}$	120	A
Avalanche Current	$I_{AS}$	38	A
Power Dissipation	$P_D$	62	W
Avalanche Energy with Single Pulse ( $T_J=25^{\circ}\text{C}$ , $L = 0.1\text{mH}$ , $I_{AS} = 38\text{A}$ , $V_{DD} = 25\text{V}$ .)	$E_{AS}$	123	mJ
Operating Junction Temperature	$T_J$	-55/150	$^{\circ}\text{C}$
Storage Temperature Range	$T_{STG}$	-55/150	$^{\circ}\text{C}$
Thermal Resistance-Junction to Ambient	$R_{\theta JA}$	62	$^{\circ}\text{C}/\text{W}$



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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	$V_{(BR)DSS}$	$V_{GS}=0V, I_D=250\mu A$	60			V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1.0		2.5	V
Gate Leakage Current	$I_{GSS}$	$V_{DS}=0V, V_{GS}=\pm 20V$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=48V, V_{GS}=0V$			1	uA
		$V_{DS}=48V, V_{GS}=0V$ $T_J = 55^\circ C$			5	
On-State Drain Current	$I_{D(on)}$	$V_{DS} \geq 5V, V_{GS} = 10V$	60			A
Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS} = 10V, I_D=15A$		10	12	mΩ
		$V_{GS} = 4.5V, I_D=10A$		12	15	
Forward Transconductance	$g_{fs}$	$V_{DS}=5V, I_D=15A$		47		S
Diode Forward Voltage	$V_{SD}$	$I_S=60A, V_{GS} = 0V$			1.2	V
<b>Dynamic</b>						
Total Gate Charge	$Q_g$	$V_{DS}=48V, V_{GS}=4.5V$ $I_D= 12A$		24		nC
Gate-Source Charge	$Q_{gs}$			6.9		
Gate-Drain Charge	$Q_{gd}$			10		
Input Capacitance	$C_{iss}$	$V_{DS}=15V, V_{GS}=0V$ $f=1MHz$		3200		pF
Output Capacitance	$C_{oss}$			210		
Reverse Transfer Capacitance	$C_{rss}$			145		
Turn-On Time	$t_{d(on)}$	$V_{DD}=30V, I_D=2A,$ $V_{GEN}=10V, R_G=3.3\Omega$		20		nS
	$t_r$			4		
Turn-Off Time	$t_{d(off)}$			84.5		
	$t_f$			6.5		



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## TYPICAL CHARACTERISTICS

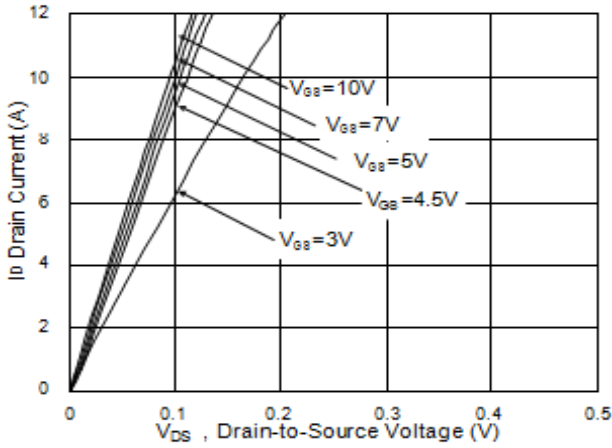


Fig. 1 Typical Output Characteristics

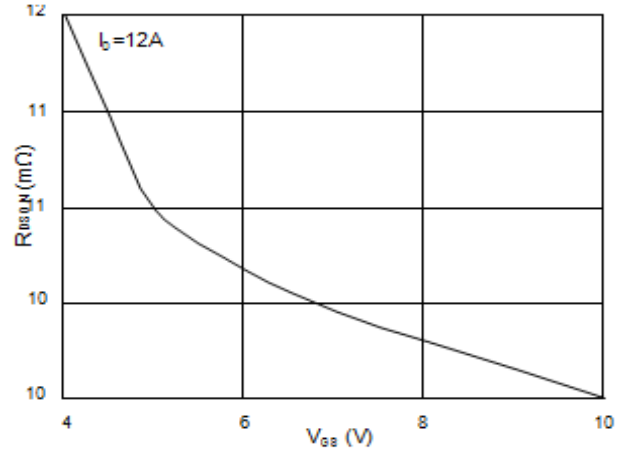


Fig. 2 On-Resistance vs. Gate Voltage

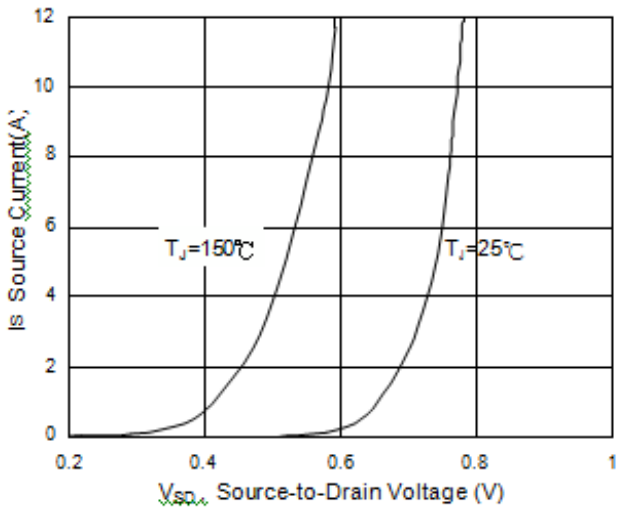


Fig. 3 Forward Characteristics  
Reverse Diodes

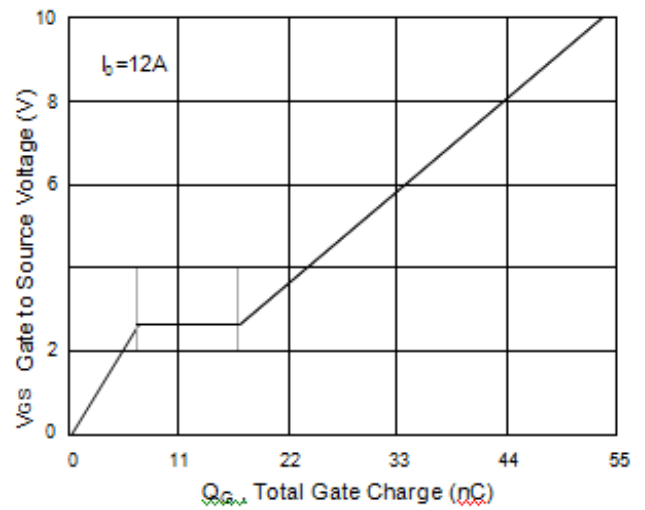


Fig. 4 Gate Charge Characteristics

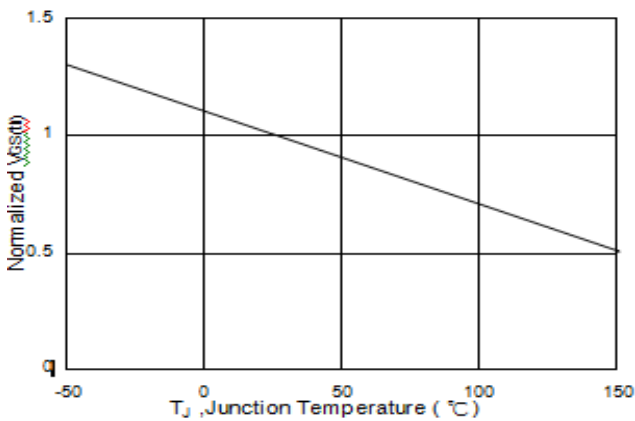


Fig. 5 Vgs vs. Junction Temperature

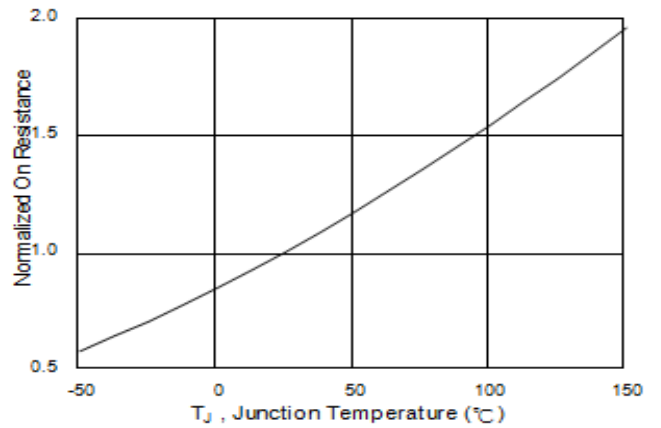


Fig. 6 On-Resistance vs. Temperature



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## TYPICAL CHARACTERISTICS

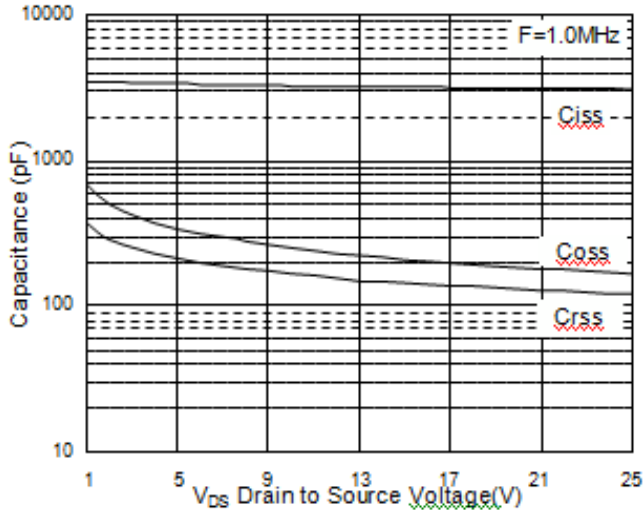


Fig. 7 Typical Capacitance Characteristics

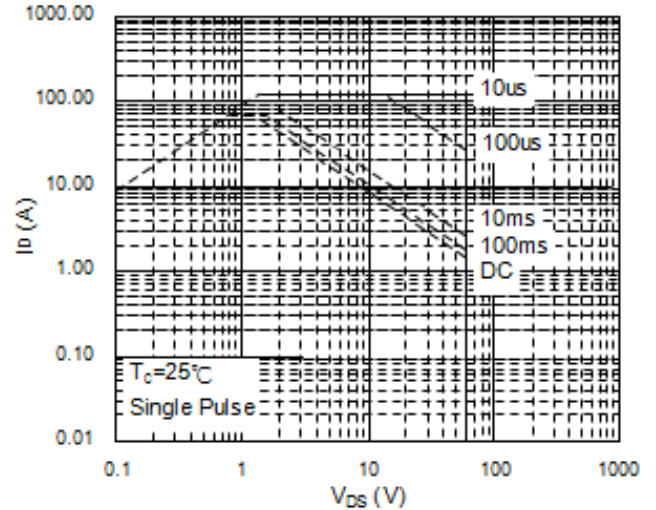


Fig. 8 Maximum Safe Operation Area

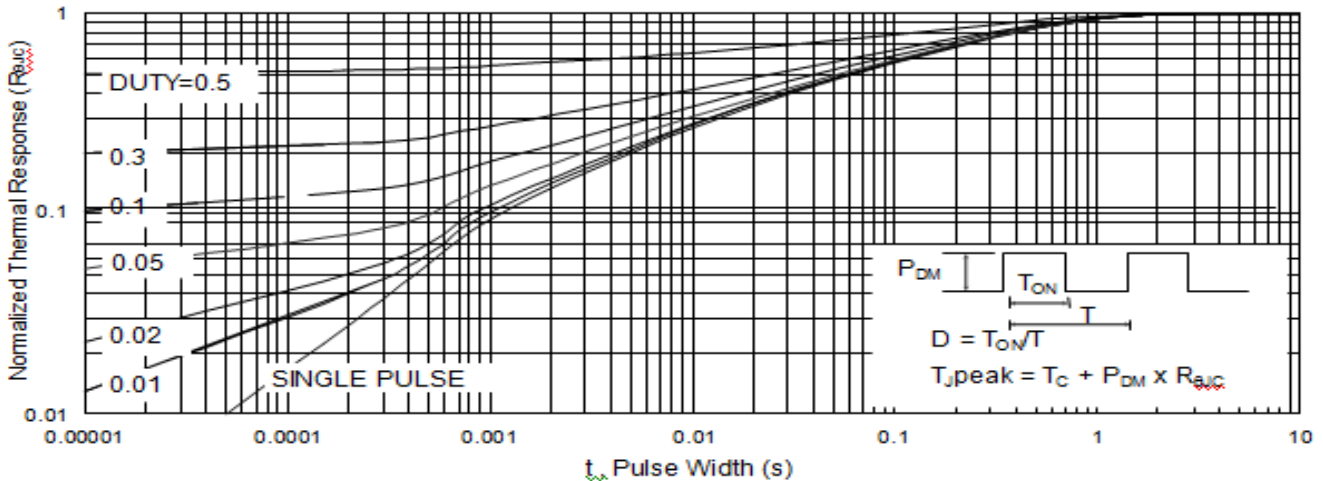


Fig. 9 Effective Transient Thermal Impedance

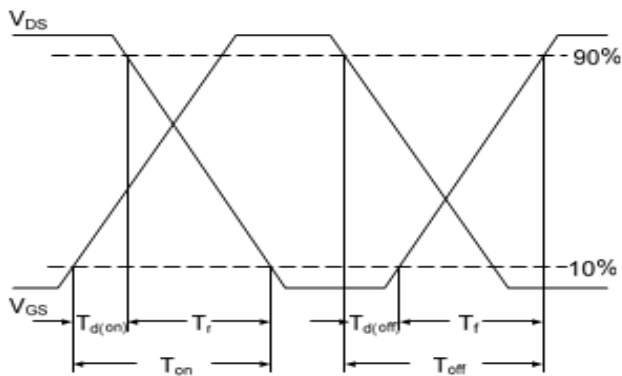


Fig. 10 Switching Time Waveform

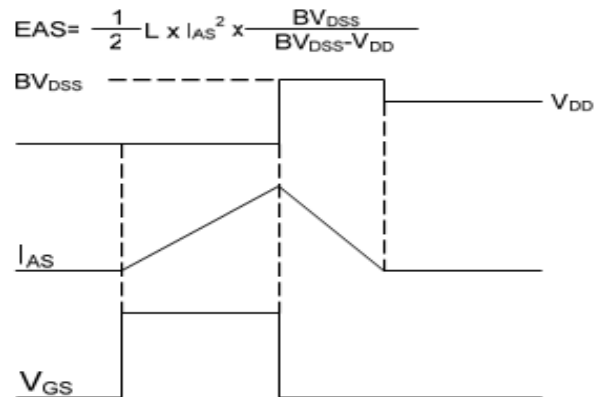
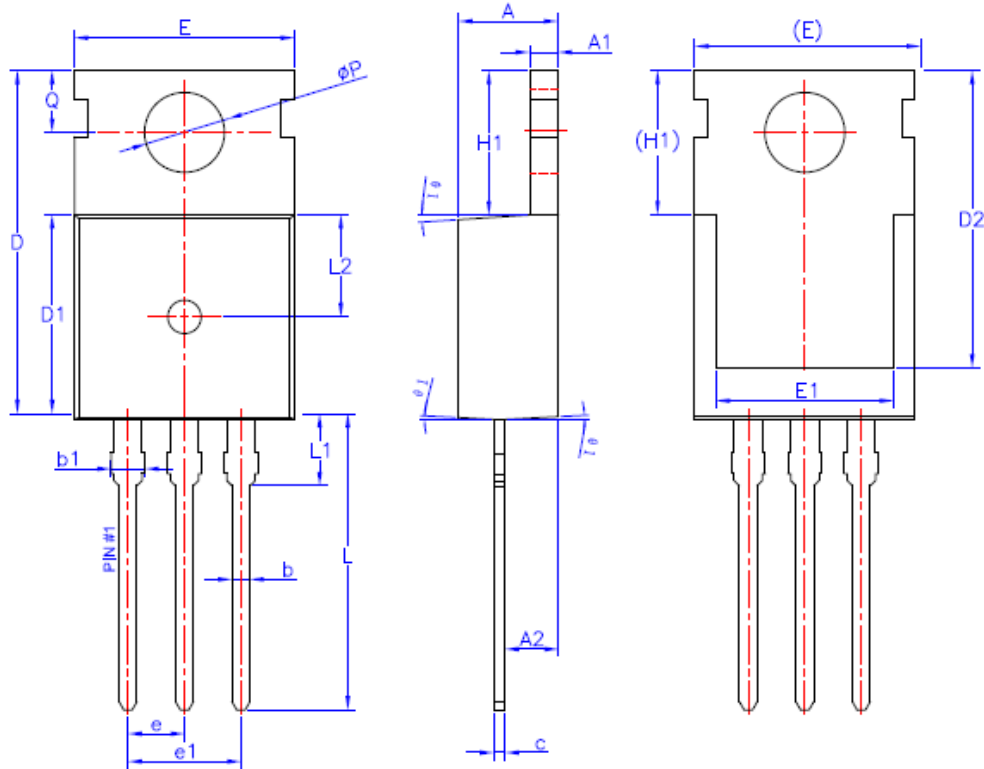


Fig. 11 Unclamped Inductive Waveform



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## TO-220-3L PACKAGE OUTLINE



SYMBOL	MIN	NOM	MAX
A	4.40	4.50	4.60
A1	1.27	1.30	1.33
A2	2.30	2.40	2.50
b	0.70	—	0.90
b1	1.42	—	1.57
c	0.45	0.50	0.60
D	15.30	15.70	16.10
D1	9.10	9.20	9.30
D2	13.10	—	13.70
E	9.70	9.90	10.20
E1	7.80	8.00	8.20
e	2.54BSC		
e1	5.08BSC		
H1	6.30	6.50	6.70
L	12.78	13.08	13.38
L1	—	—	3.50
L2	4.60REF		
phi P	3.55	3.60	3.65
Q	2.73	—	2.87
theta 1	1°	3°	5°



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