



# SPN220N04

## N-Channel Enhancement Mode MOSFET

### DESCRIPTION

The SPN220N04 is the N-Channel enhancement mode power field effect transistors are produced using high cell density, DMOS trench technology. The SPN220N04 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.

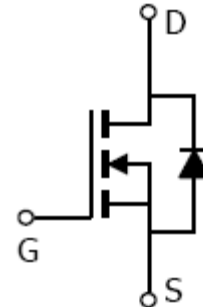
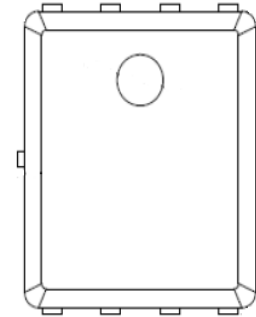
### APPLICATIONS

- High Frequency Synchronous Buck Converter
- DC/DC Power System
- Load Switch

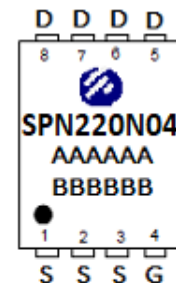
### FEATURES

- ◆ 40V/220A,  $R_{DS(ON)}=1.1m\Omega@V_{GS}=10V$
- ◆ Super high density cell design for extremely low  $R_{DS(ON)}$
- ◆ Exceptional on-resistance and maximum DC current capability
- ◆ PPAK5x6-8L package design

### PIN CONFIGURATION(PPAK5x6-8L)



### PART MARKING



A : Lot Code  
 B : Date Code  
 (YY/MM/DD)



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### PPAK5x6-8L PIN DESCRIPTION

Pin	Symbol	Description
1	S	Source
2	S	Source
3	S	Source
4	G	Gate
5	D	Drain
6	D	Drain
7	D	Drain
8	D	Drain

### ORDERING INFORMATION

Part Number	Package	Part Marking
SPN220N04DN8RGB	PPAK5x6-8L	SPN220N04

※ SPN220N04DN8RGB : 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>	40	V	
Gate –Source Voltage	V <sub>GSS</sub>	±20	V	
Continuous Drain Current (Silicon Limited)	I <sub>D</sub>	T <sub>C</sub> =25°C	220	A
		T <sub>C</sub> =100°C	140	
Pulsed Drain Current	I <sub>DM</sub>	400	A	
Avalanche Current	I <sub>AS</sub>	116	A	
Single Pulse Avalanche Energy	E <sub>AS</sub>	673	mJ	
Power Dissipation	P <sub>D</sub>	83	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>	1.5	°C/W	
Thermal Resistance-Junction to Ambient	R <sub>θJA</sub>	55	°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	$V_{(BR)DSS}$	$V_{GS}=0V, I_D=250\mu A$	40			V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	2.8	4.0	V
Gate Leakage Current	$I_{GSS}$	$V_{DS}=0V, V_{GS}=\pm 20V$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=32V, V_{GS}=0V$			1	uA
		$V_{DS}=32V, V_{GS}=0V, T_J=55^\circ C$			5	
On-State Drain Current	$I_{D(on)}$	$V_{DS}\geq 5V, V_{GS}=10V$			100	A
Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=20A$		0.9	1.1	mΩ
Gate Resistance	$R_g$	$V_{DS}=V_{GS}=0V, f=1MHz$		1.2		Ω
Diode Forward Voltage	$V_{SD}$	$I_S=1A, V_{GS}=0V$			1.2	V
<b>Dynamic</b>						
Total Gate Charge	$Q_g$	$V_{DS}=20V, V_{GS}=10V$ $I_D=20A$		108		nC
Gate-Source Charge	$Q_{gs}$			25.4		
Gate-Drain Charge	$Q_{gd}$			26.8		
Input Capacitance	$C_{iss}$	$V_{DS}=20V, V_{GS}=0V$ $f=1MHz$		6601		pF
Output Capacitance	$C_{oss}$			2073		
Reverse Transfer Capacitance	$C_{rss}$			248		
Turn-On Time	$t_{d(on)}$	$V_{DD}=20V,$ $I_D=20A, V_{GEN}=10V$ $R_G=1.5\Omega$		20		nS
	$t_r$			145		
Turn-Off Time	$t_{d(off)}$			55		
	$t_f$			18		



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## TYPICAL CHARACTERISTICS

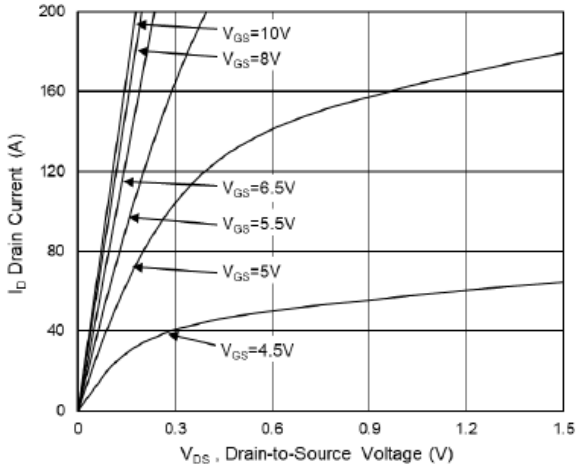


Fig.1 Typical Output Characteristics

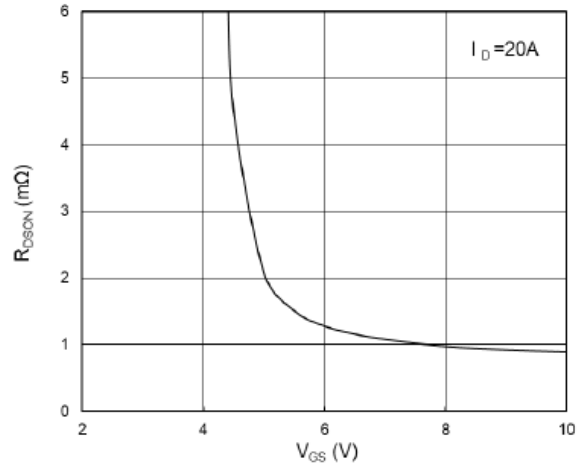


Fig.2 On-Resistance vs G-S Voltage

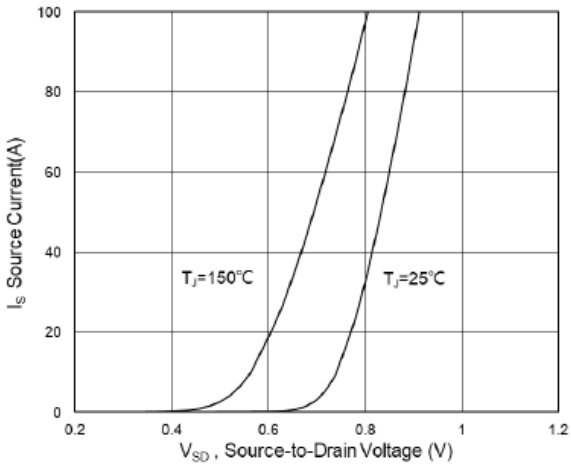


Fig.3 Source Drain Forward Characteristics

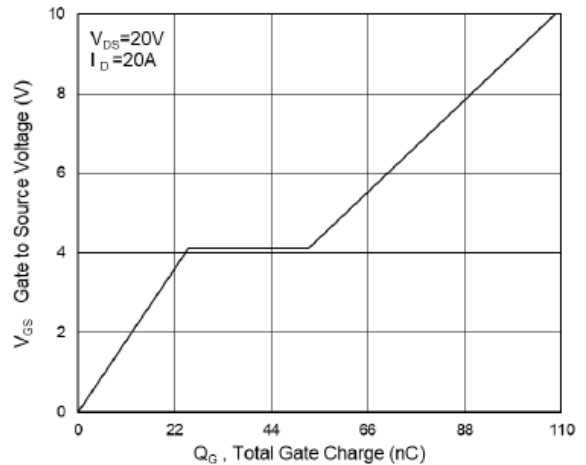


Fig.4 Gate-Charge Characteristics

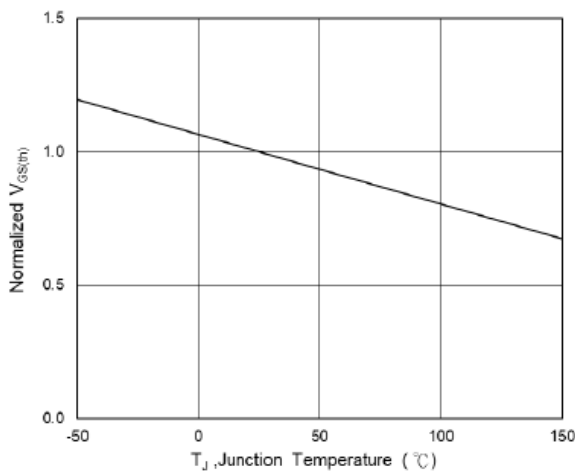


Fig.5 Normalized  $V_{GS(th)}$  vs  $T_J$

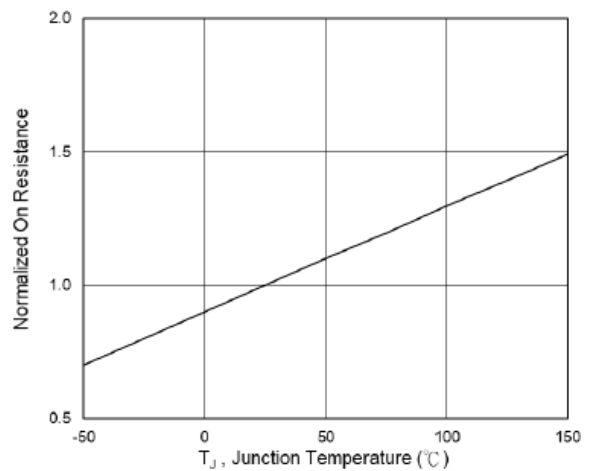


Fig.6 Normalized  $R_{DS(on)}$  vs  $T_J$



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## TYPICAL CHARACTERISTICS

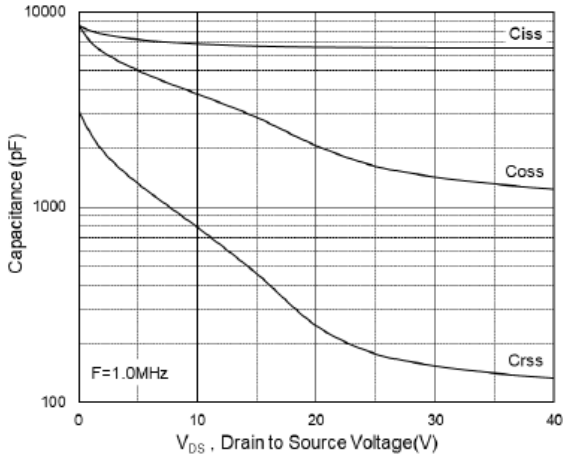


Fig.7 Capacitance

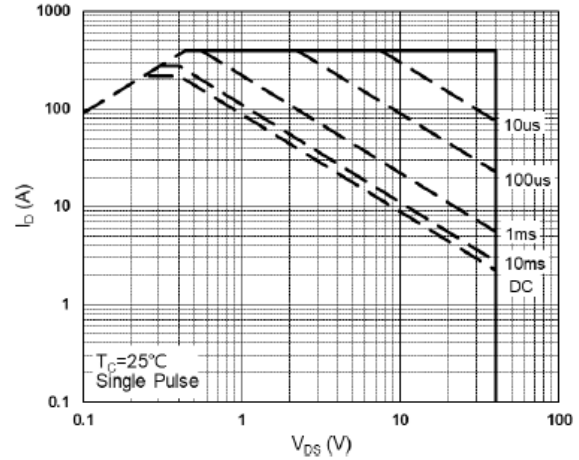


Fig.8 Safe Operating Area

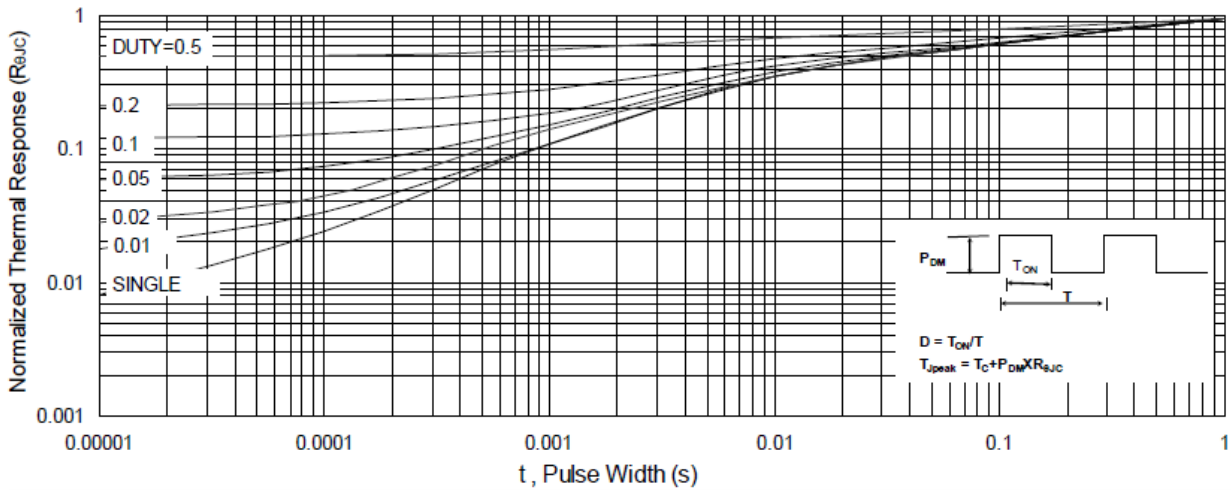


Fig.9 Normalized Maximum Transient Thermal Impedance

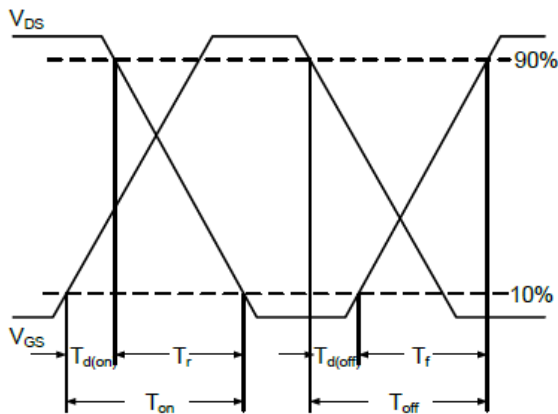


Fig.10 Switching Time Waveform

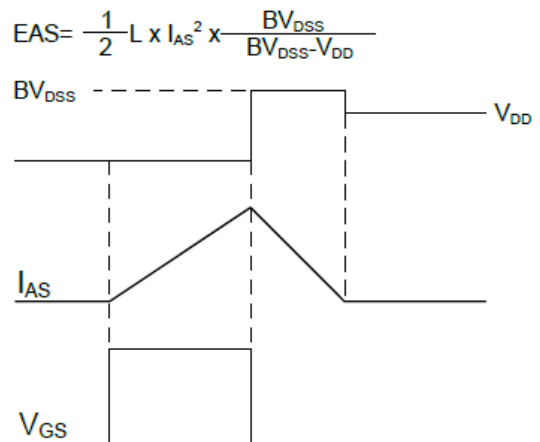


Fig.11 Unclamped Inductive Switching Waveform



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