



SPN166N06

N-Channel Enhancement Mode MOSFET

DESCRIPTION

The SPN166N06 is the N-Channel enhancement mode power field effect transistor which is produced using super high cell density DMOS trench technology. This high density process is especially tailored to minimize on-state resistance. These devices are particularly suitable for synchronous rectifier application, Motor control power management and other Power Tool circuits. It has been optimized for low gate charge, low $R_{DS(ON)}$ and fast switching speed.

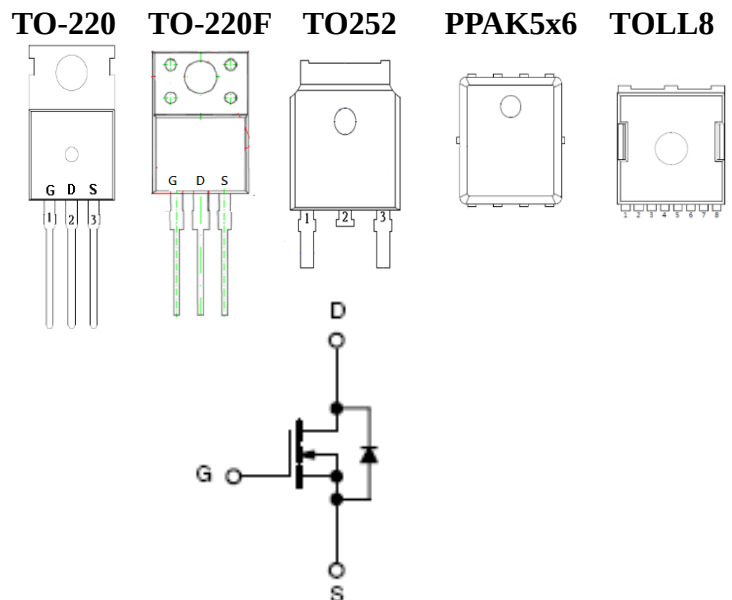
FEATURES

- ◆ 60V/166A, $R_{DS(ON)}=3.1m\Omega@V_{GS}=10V$
- ◆ Super high density cell design for extremely low $R_{DS(ON)}$
- ◆ Exceptional on-resistance and maximum DC current capability
- ◆ TO-220-3L/TO-252-2L/PPAK5x6-8L/ TOLL-8 package design

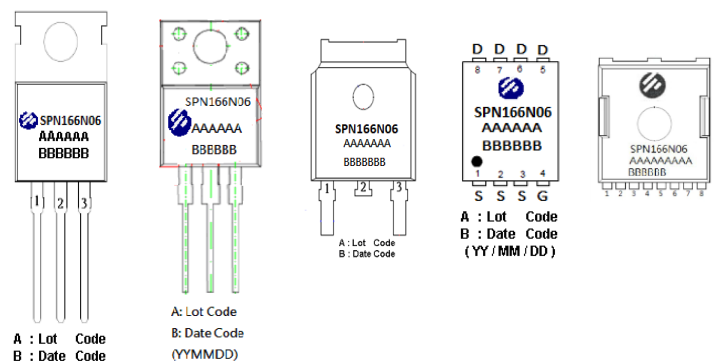
APPLICATIONS

- DC/DC Converter
- Load Switch
- SMPS Secondary Side Synchronous Rectifier
- Motor Control
- Power Tool

PIN CONFIGURATION



PART MARKING





SPN166N06

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PIN DESCRIPTION

TO220/TO220F/TO252

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

PPAK5x6 PIN DESCRIPTION

Pin	Symbol	Description
1~3	S	Source
4	G	Gate
5~8	D	Drain

TOLL-8

Pin	Symbol	Description
1	G	Gate
2~8	S	Source
Tab	D	Drain

ORDERING INFORMATION

Part Number	Package	Part Marking
SPN166N06T220TGB	TO-220-3L	SPN166N06
SPN166N06T220FTGB	TO-220F-3L	SPN166N06
SPN166N06T252RGB	TO-252-2L	SPN166N06
SPN166N06DN8RGB	PPAK5x6-8L	SPN166N06
SPN166N06TOL8RGB	TOLL-8	SPN166N06

- ※ SPN166N06T220TGB : Tube ; Pb – Free ; Halogen – Free
- ※ SPN166N06T220FTGB : Tube ; Pb – Free ; Halogen – Free
- ※ SPN166N06T252RGB : Tape&Reel ; Pb – Free ; Halogen - Free
- ※ SPN166N06DN8RGB : Tape&Reel ; Pb – Free ; Halogen – Free
- ※ SPN166N06TOL8RGB: Tape&Reel ; Pb – Free ; Halogen – Free



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ABSOLUTE MAXIMUM RATINGS

(TA=25°C Unless otherwise noted)

Parameter		Symbol	Typical	Unit
Drain-Source Voltage		V _{DSS}	60	V
Gate –Source Voltage		V _{GSS}	±20	V
Continuous Drain Current (Silicon Limited)	Tc=25°C	I _D	181	A
	Tc=100°C		128	
Pulsed Drain Current		I _{DM}	400	A
Power Dissipation @ Tc=25°C	TO-220	P _D	104	W
	TO-252		93	
	PPAK5x6		83	
	TOLL-8		297	
Avalanche Energy with Single Pulse (Tc=25°C , L=0.1mH.)		E _{AS}	259	mJ
Operating Junction Temperature		T _J	-55/175	°C
Storage Temperature Range		T _{STG}	-55/175	°C
Thermal Resistance-Junction to Case (TO-220/TO-220F)		R _{θJC}	1.2	°C/W
Thermal Resistance-Junction to Case (TO-252)		R _{θJC}	1.35	°C/W
Thermal Resistance-Junction to Case (PPAK5x6)		R _{θJC}	1.5	°C/W
Thermal Resistance-Junction to Case (TOLL-8)		R _{θJC}	0.42	°C/W

Note :

The maximum current rating is package limited at 120A for TO-220-3L

The maximum current rating is package limited at 70A for TO-252-2L

The maximum current rating is package limited at 80A for PPAK5x6-8L



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ELECTRICAL CHARACTERISTICS

(T_A=25°C Unless otherwise noted)

Parameter		Symbol	Conditions	Min.	Typ	Max.	Unit
Static							
Drain-Source Breakdown Voltage		V _{(BR)DSS}	V _{GS} =0V, I _D =250uA	60			V
Gate Threshold Voltage		V _{GS(th)}	V _{DS} =V _{GS} , I _D =250uA	2.0		4.0	
Gate Leakage Current		I _{GSS}	V _{DS} =0V, V _{GS} =±20V			±100	nA
Zero Gate Voltage Drain Current		I _{DSS}	V _{DS} =48V, V _{GS} =0V T _J =25°C			1	uA
			V _{DS} =48V, V _{GS} =0V T _J =100°C			100	
Drain-Source On-Resistance	PPAK5x6, TOLL8	R _{DS(on)}	V _{GS} =10V, I _D =20A		2.6	3.1	mΩ
	TO220, TO220F, TO252				2.9	3.3	
Forward Transconductance		g _{fs}	V _{DS} =5V, I _D =20A		66		S
Diode Forward Voltage		V _{SD}	I _S =20A, V _{GS} =0V		0.9	1.2	V
Gate Resistance		R _G	V _{GS} =0V, V _{DS} open, f=1MHz		1.25		Ω
Dynamic							
Total Gate Charge (10V)	Q _g	V _{DS} =30V, V _{GS} =10V I _D =20A			66		nC
Gate-Source Charge	Q _{gs}				16		
Gate-Drain Charge	Q _{gd}				16		
Input Capacitance	C _{iss}	V _{DS} =30V, V _{GS} =0V f=1MHz			4348		pF
Output Capacitance	C _{oss}				1501		
Reverse Transfer Capacitance	C _{rss}				92		
Turn-On Time	td(on)	V _{DD} =30V, I _D =20A V _{GEN} =10V, R _G =10Ω			15		nS
	tr				12		
Turn-Off Time	td(off)				52		
	tf				19		



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TYPICAL CHARACTERISTICS

Fig 1. Typical Output Characteristics

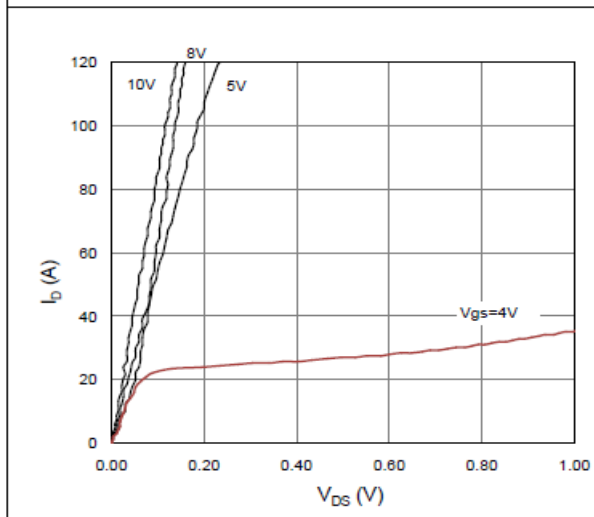


Figure 2. On-Resistance vs. Gate-Source Voltage

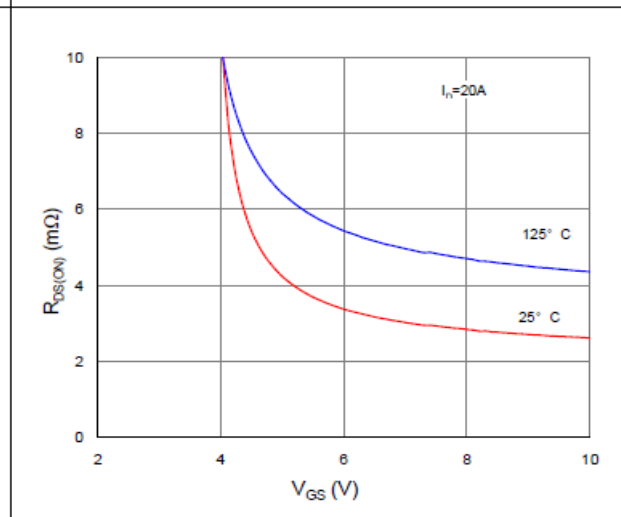


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

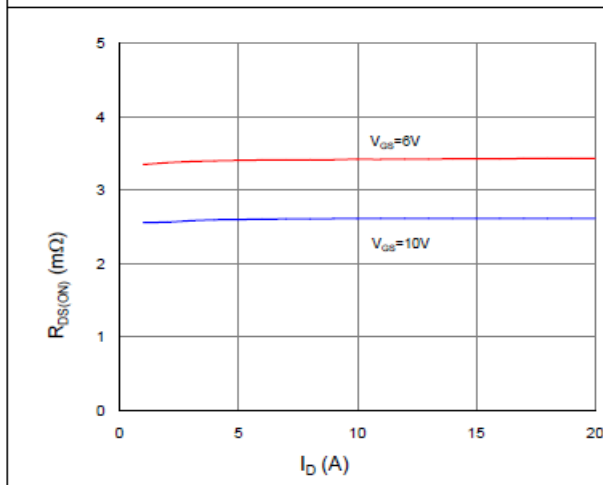


Figure 4. Normalized On-Resistance vs. Junction Temperature

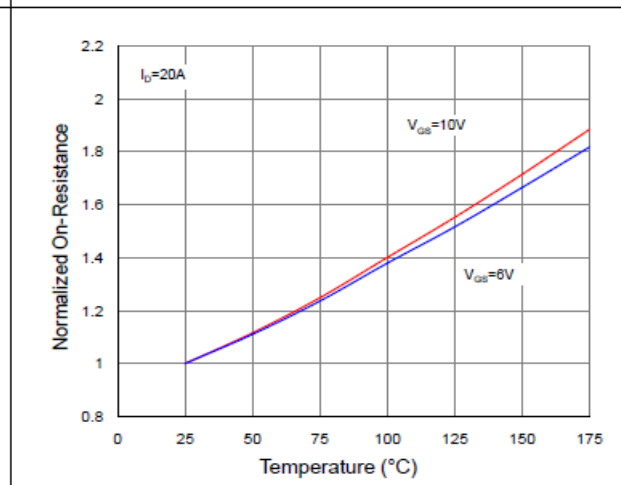


Figure 5. Typical Transfer Characteristics

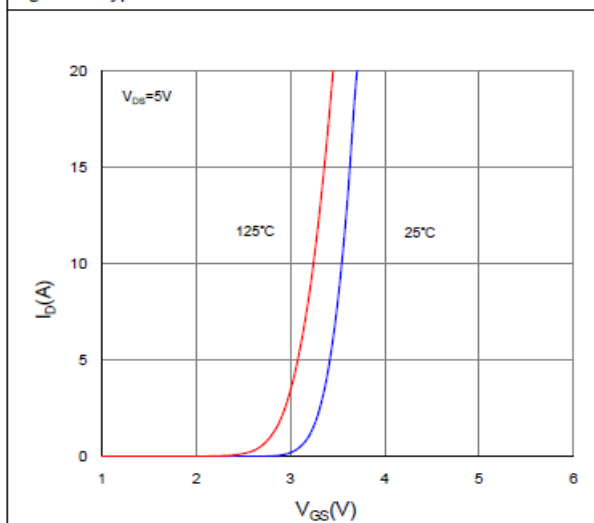
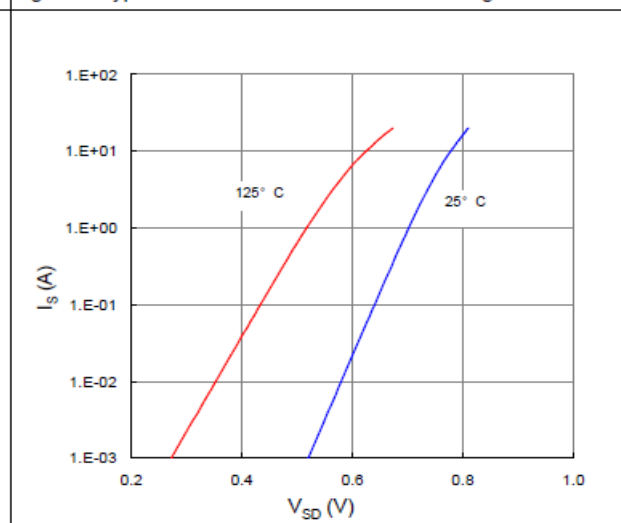


Figure 6. Typical Source-Drain Diode Forward Voltage





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TYPICAL CHARACTERISTICS

Figure 7. Typical Gate-Charge vs. Gate-to-Source Voltage

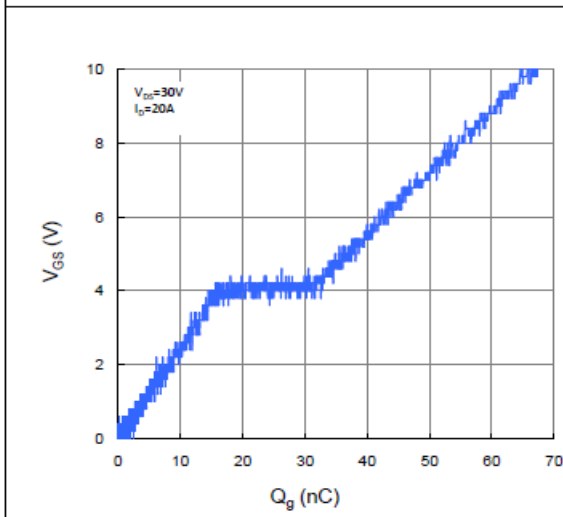


Figure 8. Typical Capacitance vs. Drain-to-Source Voltage

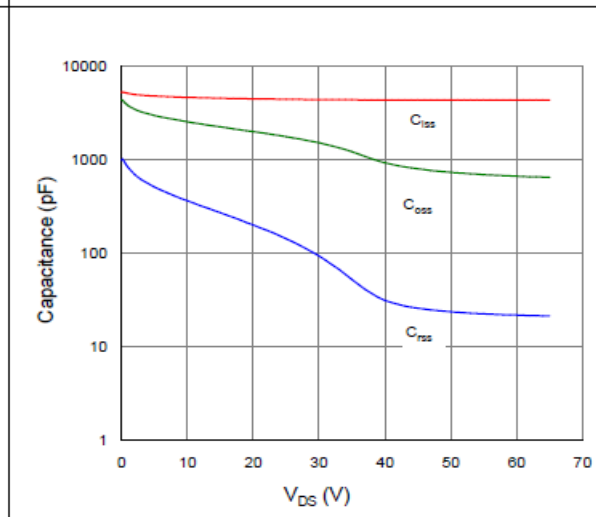


Figure 9. Maximum Safe Operating Area

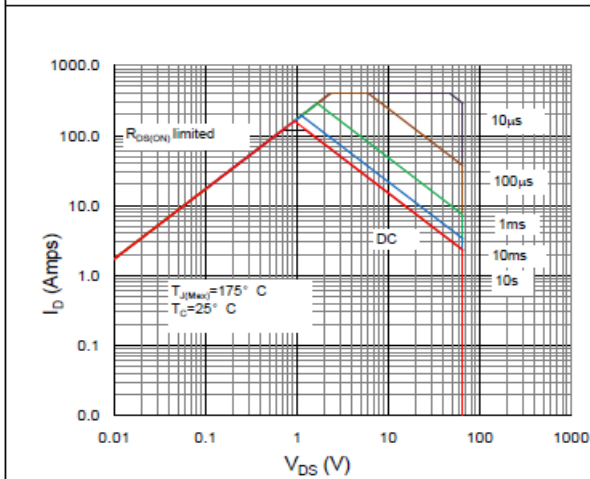


Figure 10. Maximum Drain Current vs. Case Temperature

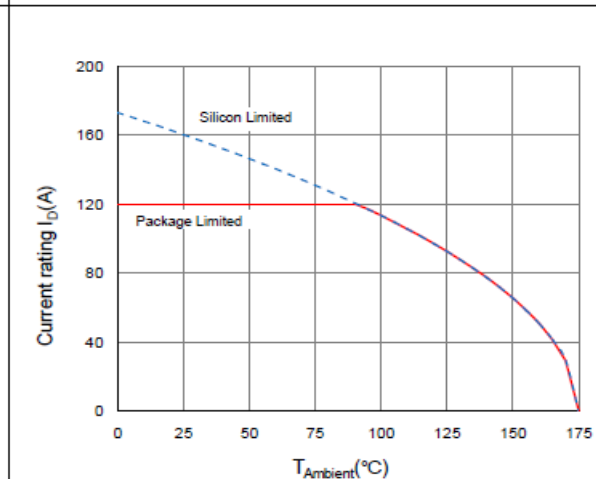
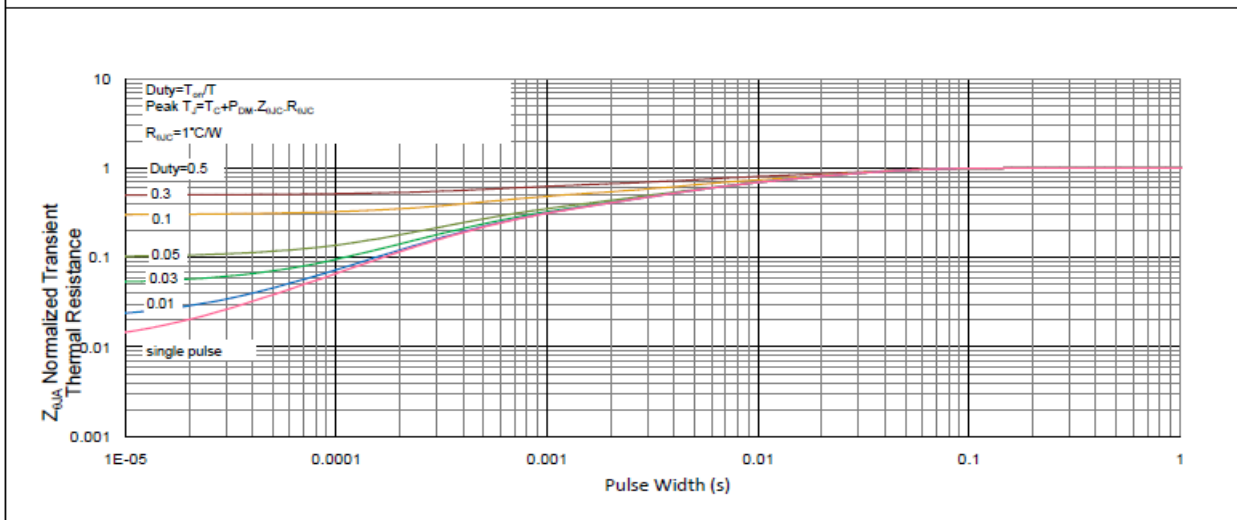


Figure 11. Normalized Maximum Transient Thermal Impedance, Junction-to-Ambient





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