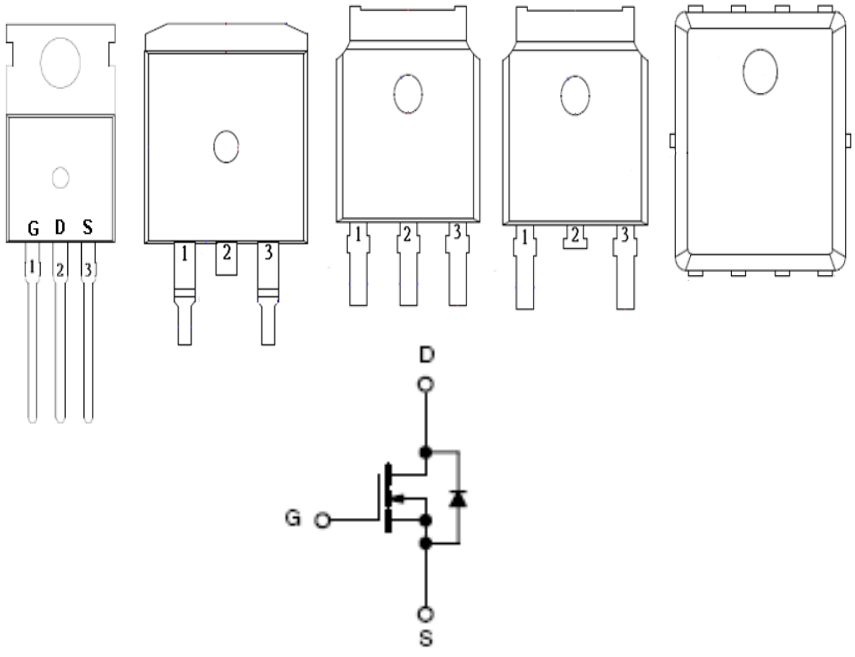
SPN166T04
N-Channel Enhancement Mode MOSFET

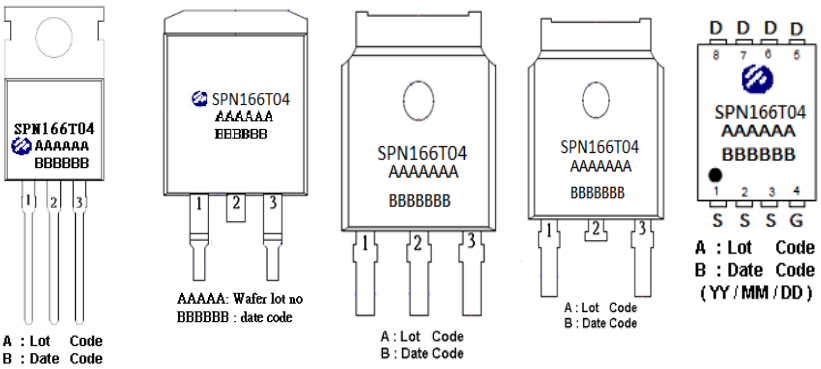
DESCRIPTION
The SPN166T04 is the N-Channel logic enhancement mode power field effect transistor which is produced using super high cell density DMOS trench technology. This high density process is especially tailored to minimize on-state resistance. These devices are particularly suitable for synchronous 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.

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

FEATURES
- 45V/166A, $R_{DS(ON)}$=2.9mΩ@V_{GS}=10V
  $R_{DS(ON)}$=4.5mΩ@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/TO-251S-3L/TO-252-2L/ PPAK5x6-8L/TO-263-2L package design

PIN CONFIGURATION
TO-220 TO-263 TO-251 TO-252 PPAK5x6



PART MARKING


PIN DESCRIPTION

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

PPAK5x6 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
SPN166T04T220TGB	TO-220-3L	SPN166T04
SPN166T04ST251TGB	TO-251S-3L	SPN166T04
SPN166T04T252RGB	TO-252-2L	SPN166T04
SPN166T04T262RGB	TO-263-2L	SPN166T04
SPN166T04DN8RGB	PPAK5x6-8L	SPN166T04

※ SPN166T04T220TGB : Tube ; Pb – Free ; Halogen – Free
※ SPN166T04ST251TGB : Tube ; Pb – Free ; Halogen – Free
※ SPN166T04T252RGB : Tape& Reel ; Pb – Free ; Halogen – Free
※ SPN166T04DN8RGB : Tape&Reel ; Pb – Free ; Halogen - Free
※ SPN166T04T262RGB : Tape& Reel ; Pb – Free ; Halogen – Free

SPN166T04
N-Channel Enhancement Mode MOSFET

ABSOULTE MAXIMUM RATINGS

(T_A=25℃ Unless otherwise noted)

Parameter		Symbol	Typical	Unit
Drain-Source Voltage		V_{DSS}	45	V
Gate –Source Voltage		V_{GSS}	±20	V
Continuous Drain Current (Silicon Limited) (TO-220/TO-263/TO-251/TO-252)	Tc=25℃	I_D	166	A
	Tc=70℃		118	
Continuous Drain Current (Silicon Limited) (PPAK5x6)	Tc=25℃	I_D	140	A
	Tc=70℃		89	
Pulsed Drain Current		I_{DM}	450	A
Power Dissipation @ Tc=25℃	TO-220/TO-263	P_D	104	W
Power Dissipation @ Tc=25℃	TO251/TO-252		93	
Power Dissipation @ Tc=25℃	PPAK5x6		83	
Avalanche Energy with Single Pulse (T_C=25℃, L = 0.1mH.)		E_{AS}	42	mJ
Operating Junction Temperature		T_J	-55/150	℃
Storage Temperature Range		T_{STG}	-55/150	℃
Thermal Resistance-Junction to Case (TO-220/TO-263)		$R_{\theta JC}$	1.2	℃/W
Thermal Resistance-Junction to Case (TO-251/TO-252)		$R_{\theta JC}$	1.35	℃/W
Thermal Resistance-Junction to Case (PPAK5x6)		$R_{\theta JC}$	1.5	℃/W

Note :

The maximum current rating is package limited at 70A for TO-251S-3L and TO-252-2L

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

ELECTRICAL CHARACTERISTICS

(T_A=25℃ Unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ	Max.	Unit
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS}=0V,I_D=250uA	45			V
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=250uA	1.0		2.2	
Gate Leakage Current	I_{GSS}	V_{DS}=0V,V_{GS}=±20V			±100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=36V, V_{GS}=0V T_J = 25 ℃			1	uA
		V_{DS}=36V, V_{GS}=0V T_J = 100 ℃			100	
Drain-Source On-Resistance	$R_{DS(on)}$	V_{GS}=10V,I_D=20A		2.5	2.9	mΩ
		V_{GS}=4.5V,I_D=20A		3.7	4.5	
Forward Transconductance	gfs	V_{DS}=5V,I_D=20A		65		S
Gate Resistance	R_G	V_{GS}=0V,V_{DS} open, f=1MHz		1.6		Ω
Diode Forward Voltage	V_{SD}	I_S=20A ,V_{GS} =0V		0.9	1.2	V
Dynamic						
Total Gate Charge (10V)	Q_g	V_{DS}=20V, V_{GS}=10V I_D = 20A		50		nC
Total Gate Charge (4.5V)	Q_g			25		
Gate-Source Charge	Q_{gs}			8		
Gate-Drain Charge	Q_{gd}			10		
Input Capacitance	C_{iss}	V_{DS}=20V, V_{GS}=0V f=1MHz		3322		pF
Output Capacitance	C_{oss}			1367		
Reverse Transfer Capacitance	C_{rss}			96		
Turn-On Time	td(on)	V_{DD}=20V, ID=20A V_{GEN}=10V, R_G=10Ω		14		nS
	tr			12		
Turn-Off Time	td(off)			57		
	tf			18		

TYPICAL CHARACTERISTICS

Fig 1. Typical Output Characteristics

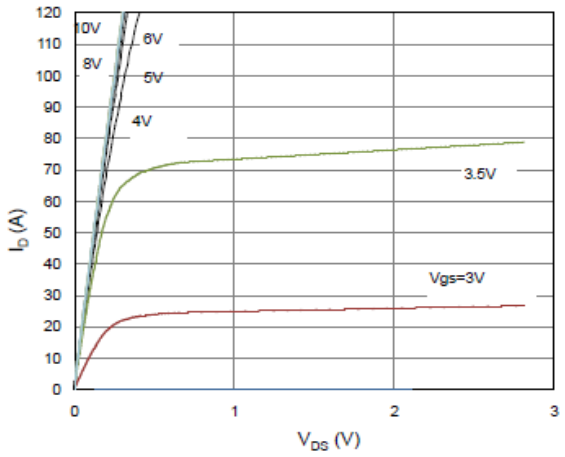


Figure 2. On-Resistance vs. Gate-Source Voltage

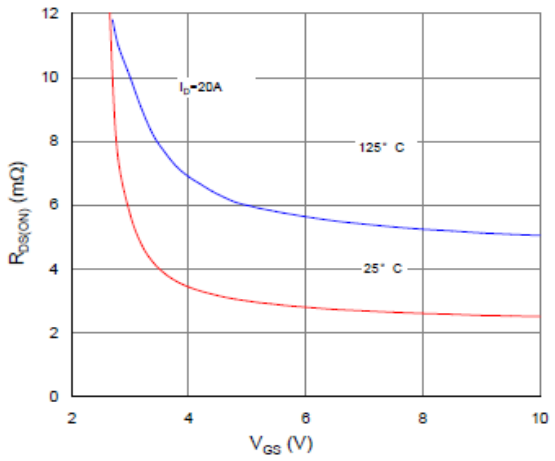


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

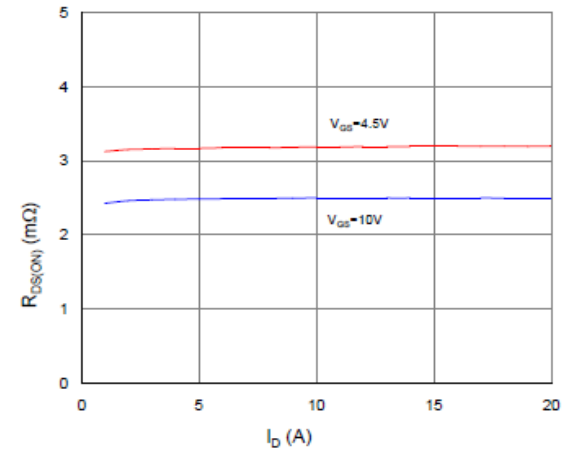


Figure 4. Normalized On-Resistance vs. Junction Temperature

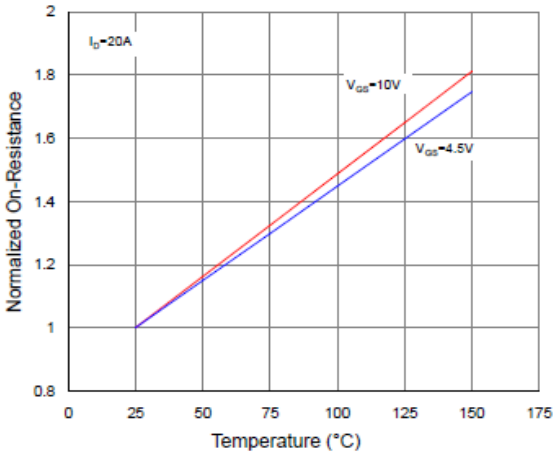


Figure 5. Typical Transfer Characteristics

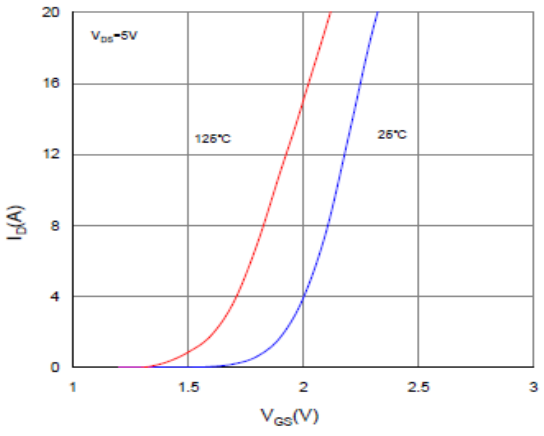
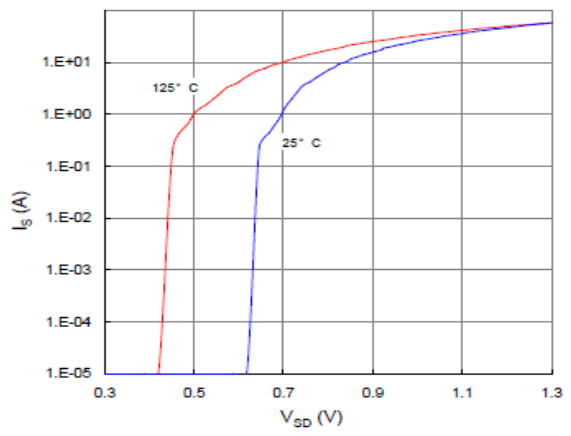


Figure 6. Typical Source-Drain Diode Forward Voltage



TYPICAL CHARACTERISTICS

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

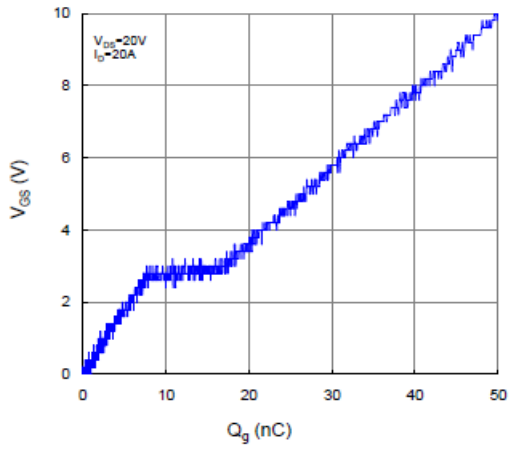


Figure 8. Typical Capacitance vs. Drain-to-Source Voltage

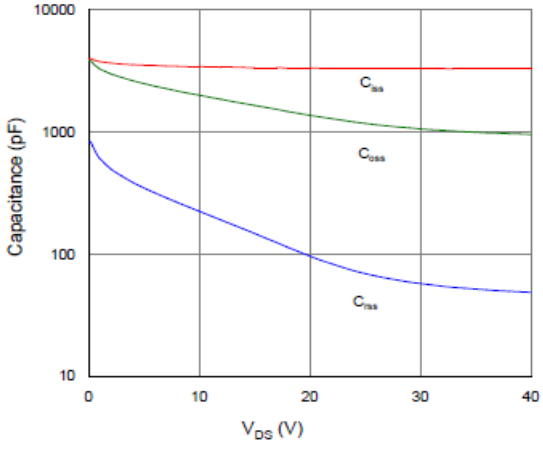


Figure 9. Maximum Safe Operating Area

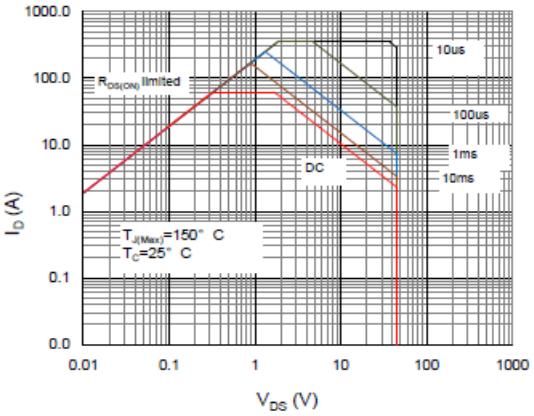


Figure 10. Maximun Drain Current vs. Case Temperature

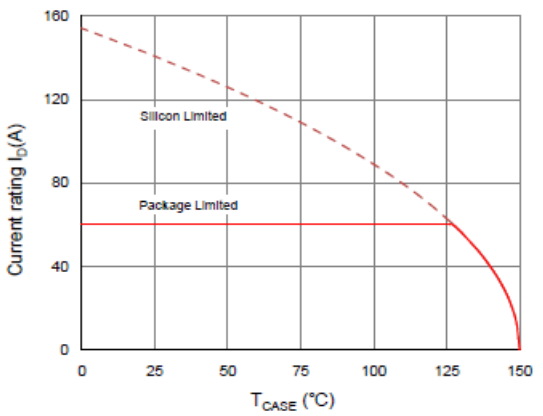
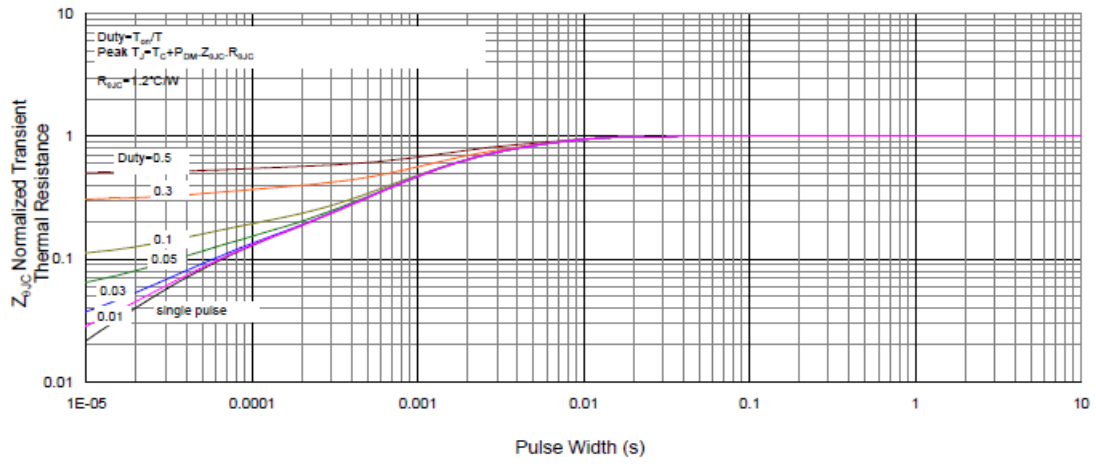


Figure 11. Normalized Maximum Transient Thermal Impedance, Junction-to-Case



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