



# SPN166T06

## N-Channel Enhancement Mode MOSFET

### DESCRIPTION

The SPN166T06 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

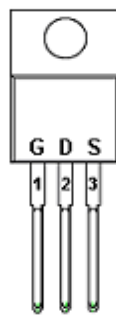
- DC/DC Converter
- Load Switch
- SMPS Secondary Side Synchronous Rectifier
- Motor Control
- Power Tool

### FEATURES

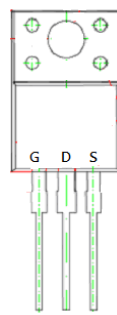
- ◆ 60V/166A,  $R_{DS(ON)}=2.4m\Omega@V_{GS}=10V$   
 $R_{DS(ON)}=3.5m\Omega@V_{GS}=4.5V$
- ◆ Super high density cell design for extremely low  $R_{DS(ON)}$
- ◆ Exceptional on-resistance and maximum DC current capability
- ◆ TO-220-3L/TO-220F-3L/TO-252-2L/PPAK5x6-8L package design

### PIN CONFIGURATION

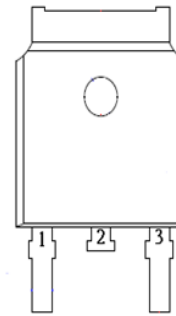
TO-220



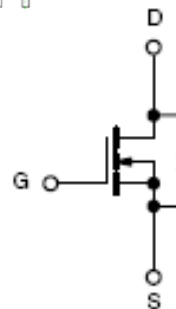
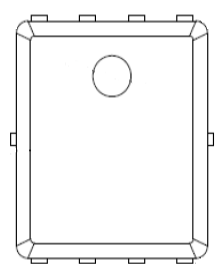
TO-220F



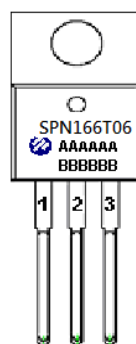
TO-252



PPAK 5x6



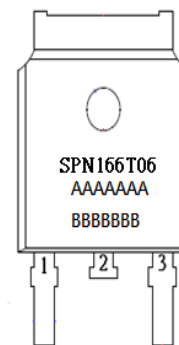
### PART MARKING



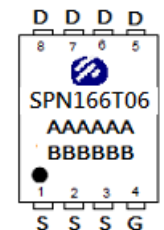
A : Lot Code  
B : Date Code  
(YY/MM/DD)



A: Lot Code  
B: Date Code  
(YYMMDD)



A : Lot Code  
B : Date Code



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



# SPN166T06

## N-Channel Enhancement Mode MOSFET

### 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
SPN166T06T220TGB	TO-220-3L	SPN166T06
SPN166T06T220FTGB	TO-220F-3L	SPN166T06
SPN166T06T252RGB	TO-252-2L	SPN166T06
SPN166T06DN8RGB	PPAK5x6-8L	SPN166T06

- ※ SPN166T06T220TGB : Tube ; Pb – Free ; Halogen – Free
- ※ SPN166T06T220FTGB : Tube ; Pb – Free ; Halogen – Free
- ※ SPN166T06T252RGB : Tape& Reel ; Pb – Free ; Halogen – Free
- ※ SPN166T06DN82RGB : Tape&Reel ; Pb – Free ; Halogen - Free



# SPN166T06

## N-Channel Enhancement Mode MOSFET

### ABSOLUTE MAXIMUM RATINGS

(TA=25°C Unless otherwise noted)

Parameter	Symbol	Typical	Unit	
Drain-Source Voltage	V <sub>DSS</sub>	60	V	
Gate –Source Voltage	V <sub>GSS</sub>	±20	V	
Continuous Drain Current (Silicon Limited)(TO-220/TO-220F/TO-252)	I <sub>D</sub>	T <sub>c</sub> =25°C	166	A
		T <sub>c</sub> =70°C	118	
Continuous Drain Current (Silicon Limited)(PPAK5x6)	I <sub>D</sub>	T <sub>c</sub> =25°C	161	A
		T <sub>c</sub> =70°C	102	
Pulsed Drain Current	I <sub>DM</sub>	400	A	
Power Dissipation @ T <sub>c</sub> =25°C	P <sub>D</sub>	TO-220	104	W
Power Dissipation @ T <sub>c</sub> =25°C		TO-252/TO-220F	93	
Power Dissipation @ T <sub>c</sub> =25°C		PPAK5x6	83	
Avalanche Energy with Single Pulse ( T <sub>c</sub> =25°C , L=0.4mH. )	EAS	320	mJ	
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 (TO-220/TO-220F)	R <sub>θJC</sub>	1.2	°C/W	
Thermal Resistance-Junction to Case (TO-252)	R <sub>θJC</sub>	1.35	°C/W	
Thermal Resistance-Junction to Case (PPAK5x6)	R <sub>θJC</sub>	1.5	°C/W	

#### Note :

The maximum current rating is package limited at 78A for TO-220F-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



# SPN166T06

## N-Channel Enhancement Mode MOSFET

### ELECTRICAL CHARACTERISTICS

(TA=25°C Unless otherwise noted)

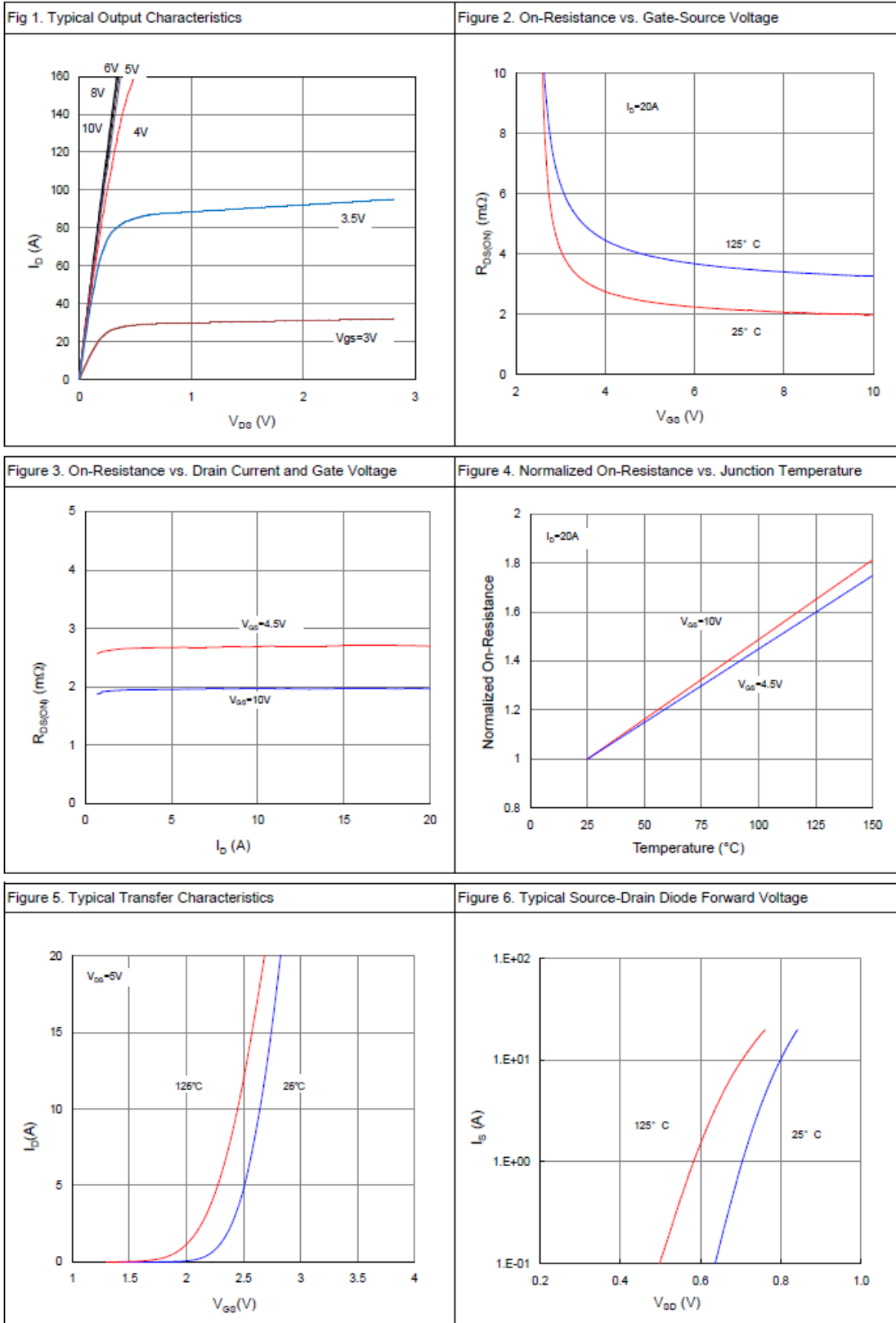
Parameter	Symbol	Conditions	Min.	Typ	Max.	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS}=0V, I_D=250\mu A$	60			V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1.0	1.6	2.4	V
Gate Leakage Current	$I_{GSS}$	$V_{DS}=0V, V_{GS}=\pm 20V$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=48V, V_{GS}=0V$ $T_J=25^\circ C$			1	uA
		$V_{DS}=48V, V_{GS}=0V$ $T_J=100^\circ C$			100	
Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=20A$		2.0	2.4	mΩ
		$V_{GS}=4.5V, I_D=20A$		2.7	3.5	
Forward Transconductance	$g_{fs}$	$V_{DS}=5V, I_D=20A$		80		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, $f=1MHz$		1.6		Ω
<b>Dynamic</b>						
Total Gate Charge (10V)	$Q_g$	$V_{DS}=30V, V_{GS}=10V$ $I_D=20A$		64		nC
Total Gate Charge (4.5V)	$Q_g$			31		
Gate-Source Charge	$Q_{gs}$			18		
Gate-Drain Charge	$Q_{gd}$			12		
Input Capacitance	$C_{iss}$	$V_{DS}=30V, V_{GS}=0V$ $f=1MHz$		4424		pF
Output Capacitance	$C_{oss}$			1670		
Reverse Transfer Capacitance	$C_{rss}$			73		
Turn-On Time	$t_d(on)$	$V_{DD}=30V, I_D=20A$ $V_{GEN}=10V, R_G=10\Omega$		14		nS
	$t_r$			11		
Turn-Off Time	$t_d(off)$			58		
	$t_f$			17		



# SPN166T06

## N-Channel Enhancement Mode MOSFET

### TYPICAL CHARACTERISTICS





# SPN166T06

## N-Channel Enhancement Mode MOSFET

### TYPICAL CHARACTERISTICS

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

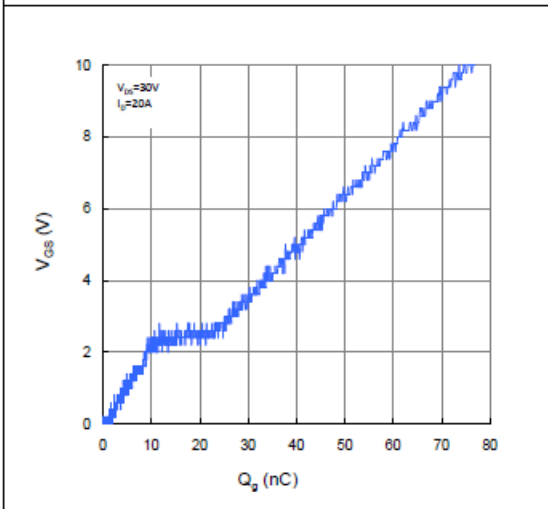


Figure 8. Typical Capacitance vs. Drain-to-Source Voltage

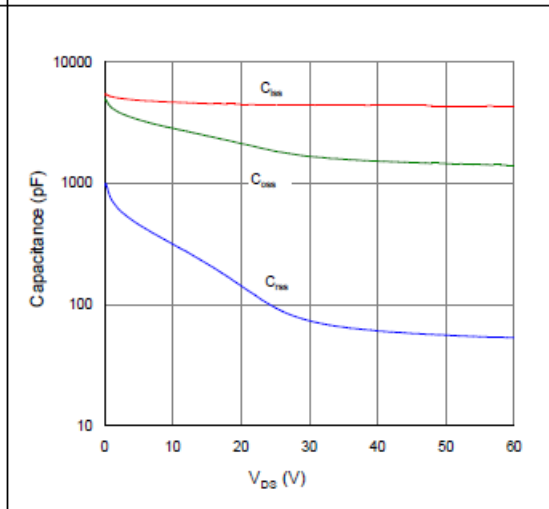


Figure 9. Maximum Safe Operating Area

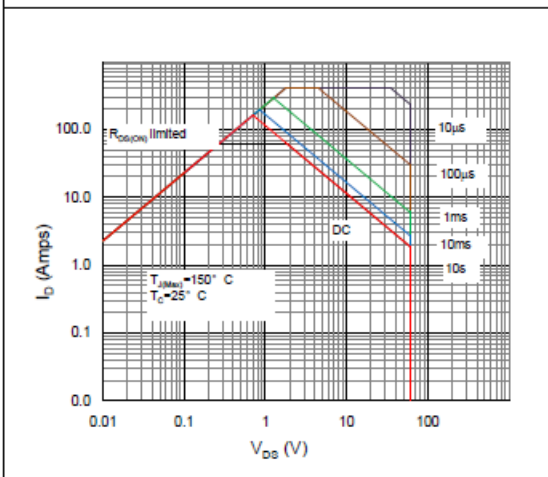


Figure 10. Maximum Drain Current vs. Case Temperature

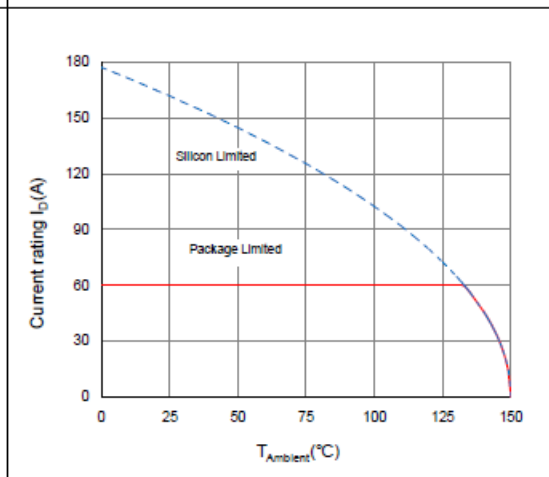
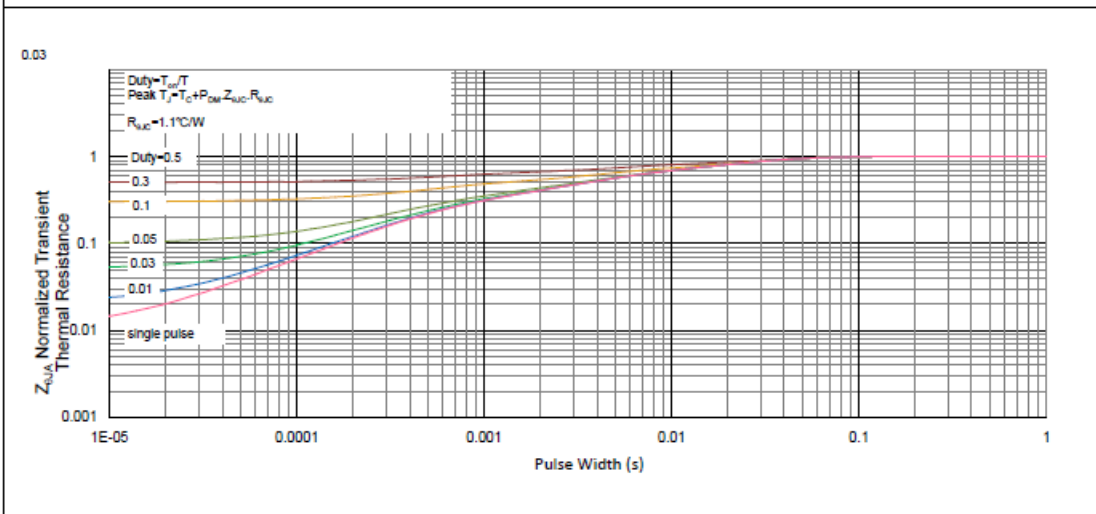


Figure 11. Normalized Maximum Transient Thermal Impedance, Junction-to-Ambient

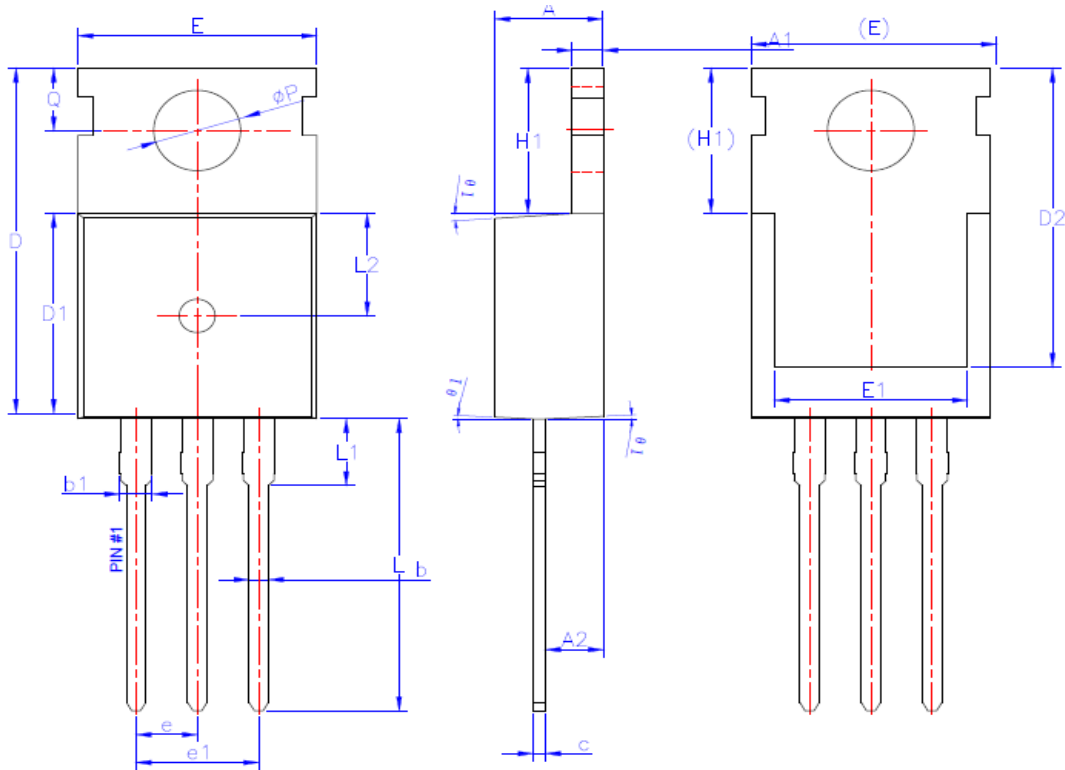




# SPN166T06

## N-Channel Enhancement Mode MOSFET

### TO-220-3L PACKAGE OUTLINE



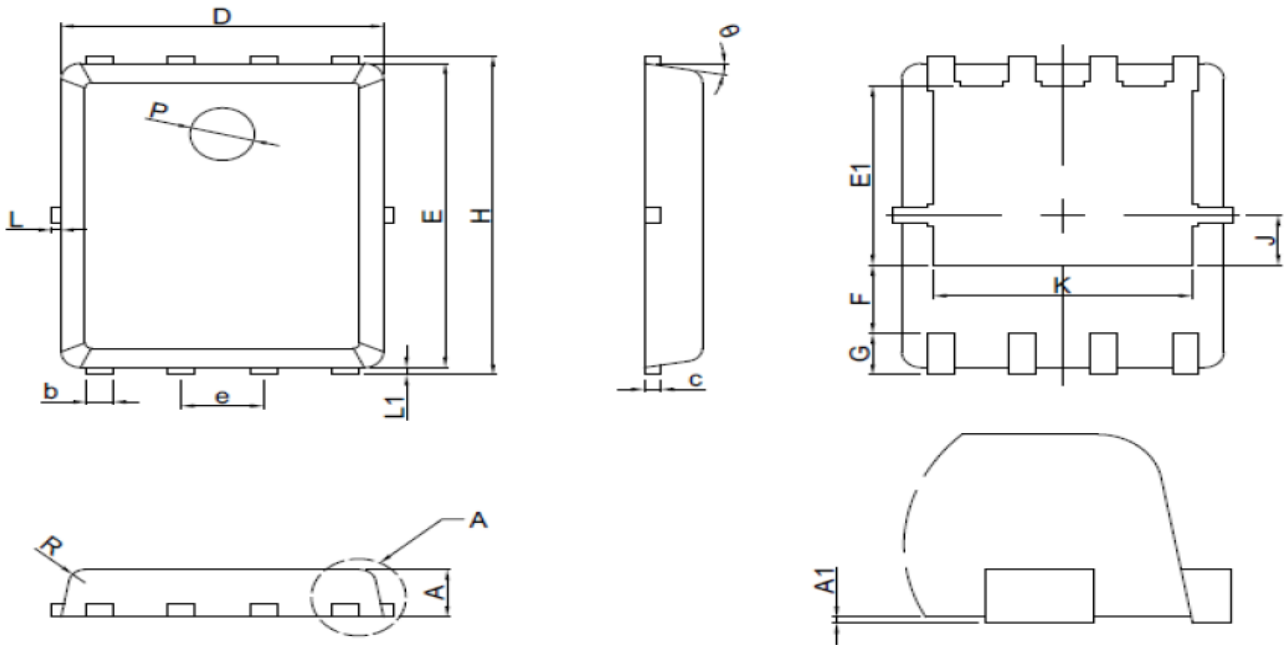
SYMBOL	MIN	NOM	MAX
A	4.40	4.50	4.60
A1	1.27	1.30	1.33
A2	2.30	2.40	2.50
b	0.70	0.60	0.90
b1	-	-	1.40
c	0.45	0.50	0.60
D	15.30	15.70	16.10
D1	9.10	9.20	9.30
D2	13.10	-	13.70
E	9.70	9.90	10.20
E1	7.80	8.00	8.20
e	2.54BSC		
e1	5.08BSC		
H1	6.30	6.50	6.70
L	12.78	13.08	13.38
L1	-	-	3.50
L2	4.6REF		
φ P	3.55	3.60	3.65
Q	2.73	-	2.87
θ 1	1°	3°	5°



# SPN166T06

## N-Channel Enhancement Mode MOSFET

### PPAK5x6-8L PACKAGE OUTLINE



SYMBOL	MILLIMETERS		
	MIN	NOM	MAX
A	0.8	0.95	1.1
A1	0.00	0.03	0.05
b	0.33	0.41	0.51
c	0.254 REF		
D	4.80	4.95	5.10
F	1.40 REF		
E	5.70	5.80	5.90
e	1.27 BSC		
H	5.90	6.05	6.20
L1	0.06	0.13	0.20
G	0.60 REF		
J	0.95 BSC		
K	4.00 REF		
L	---	----	0.20
P	1.00 REF		
E1	3.40REF		
E2	0.95 REF		
$\theta$	6°	10°	14°
R	0.25REF		

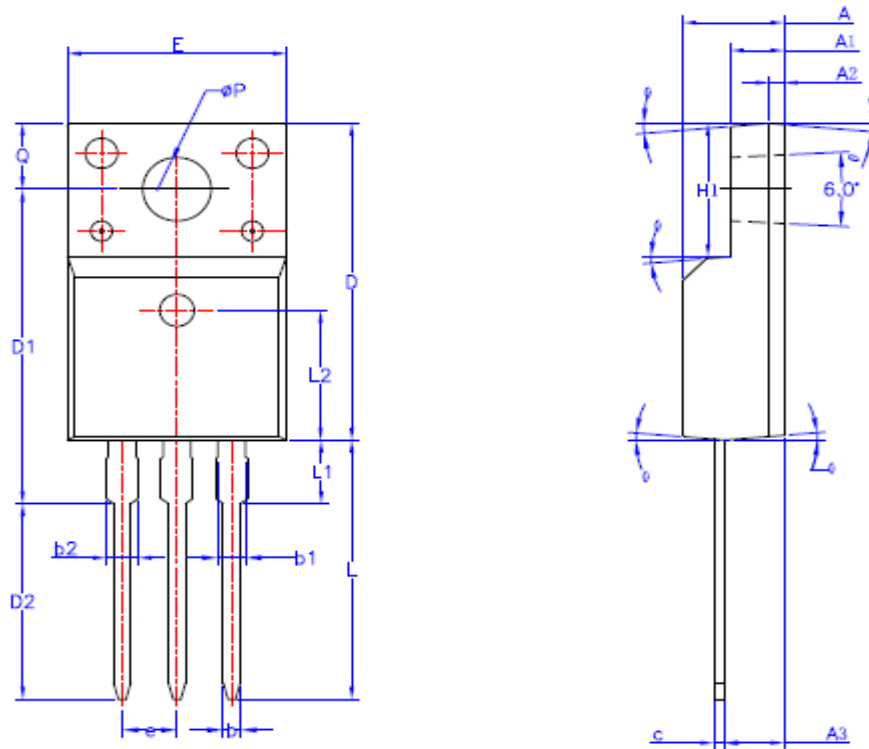




# SPN166T06

## N-Channel Enhancement Mode MOSFET

### TO-220F-3L PACKAGE OUTLINE



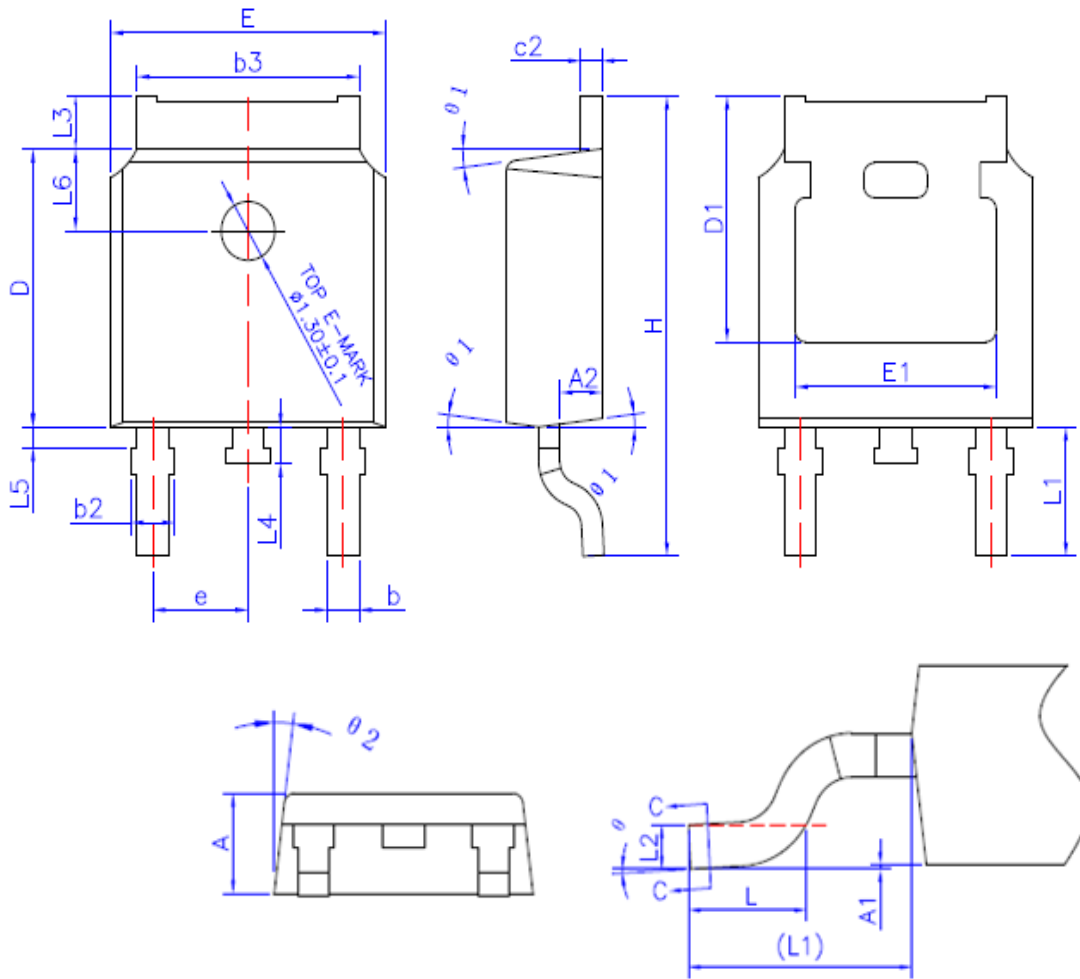
SYMBOL	MIN	NOM	MAX
A	4.50	4.70	4.83
A1	2.34	2.54	2.74
A2	0.7REF		
A3	2.56	2.76	2.93
b	0.70	--	0.90
b1	1.18	--	1.40
b2	--	--	1.47
c	0.45	0.50	0.60
D	15.67	15.87	16.07
D1	15.55	15.75	15.95
D2	9.60	9.80	10.00
E	9.96	10.16	10.36
e	2.54BSC		
H1	6.48	6.68	6.88
L	12.68	12.98	13.28
L1	-	-	3.50
L2	6.50REF		
φ P	3.08	3.18	3.28
Q	3.20	-	3.40
θ 1	1°	3°	5°



# SPN166T06

## N-Channel Enhancement Mode MOSFET

### TO-252-2L PACKAGE OUTLINE



SYMBOL	MIN	NOM	MAX
A	2.20	2.30	2.40
A1	0.00	--	0.15
A2	0.90	1.01	1.10
b	0.72	-	0.85
b2	0.72	--	0.90
b3	5.13	5.33	5.46
c	0.47	--	0.60
c2	0.47	--	0.60
D	6.00	6.10	6.20
D1	5.25	--	--
E	6.40	6.60	6.80
E1	4.70	--	--
e	2.3REF		
H	9.80	10.10	10.40
L	1.40	1.60	1.80
L1	2.90REF		
L2	0.508BSC		
L3	0.90	--	1.25
L4	0.60	0.80	1.00
L5	0.15	--	0.75
L6	1.80REF		
$\theta$	0°	3°	8°
$\theta 1$	5°	7°	9°
$\theta 2$	5°	7°	9°



# SPN166T06

## N-Channel Enhancement Mode MOSFET

---

Information provided is alleged to be exact and consistent. SYNC Power Corporation presumes no responsibility for the penalties of use of such information or for any violation of patents or other rights of third parties which may result from its use. No license is granted by allegation or otherwise under any patent or patent rights of SYNC Power Corporation. Conditions mentioned in this publication are subject to change without notice. This publication surpasses and replaces all information previously supplied. SYNC Power Corporation products are not authorized for use as critical components in life support devices or systems without express written approval of SYNC Power Corporation.

© The SYNC Power logo is a registered trademark of SYNC Power Corporation

© 2017 SYNC Power Corporation – Printed in Taiwan – All Rights Reserved

SYNC Power Corporation

7F-2, No.3-1, Park Street

NanKang District (NKSP), Taipei, Taiwan 115

Phone: 886-2-2655-8178

Fax: 886-2-2655-8468

© <http://www.syncpower.com>