



# SPN125T06

## N-Channel Enhancement Mode MOSFET

### DESCRIPTION

The SPN125T06 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 RDS(ON) and fast switching speed.

### APPLICATIONS

- AC/DC Synchronous Rectifier
- Load Switch
- UPS
- Motor Control
- Power Tool

### FEATURES

- ◆ 60V/125A , RDS(ON)=4.3mΩ@VGS=10V  
60V/125A , RDS(ON)=5.6mΩ@VGS=4.5V
- ◆ Super high density cell design for extremely low RDS (ON)
- ◆ Exceptional on-resistance and maximum DC current capability
- ◆ TO-220-3L/TO-220F-3L/TO-251S-3L/TO-252-2L /PPAK5x6-8L/TO-263-2L package design

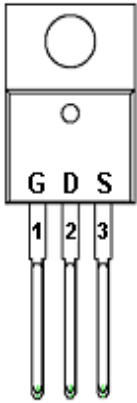


# SPN125T06

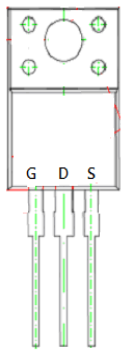
# N-Channel Enhancement Mode MOSFET

## PIN CONFIGURATION

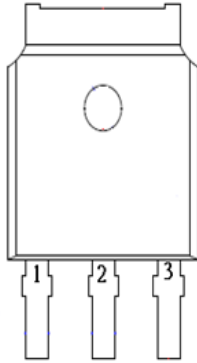
TO-220



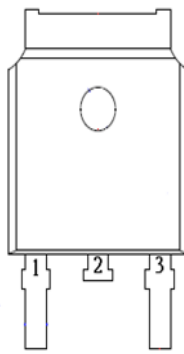
TO-220F



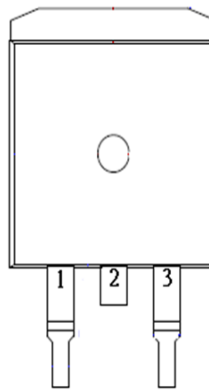
TO-251S-3L



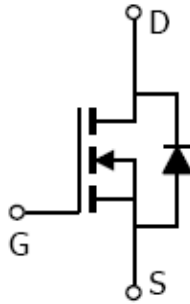
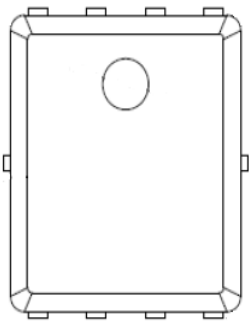
TO-252-2L



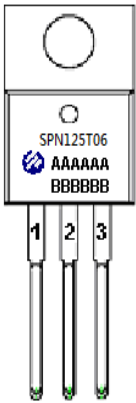
TO-263-2L



PPAK5x6



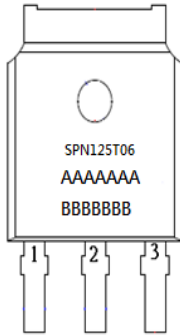
## PART MARKING



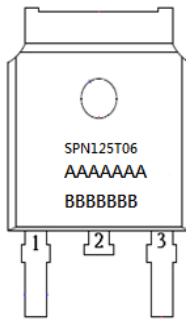
A : Lot Code  
B : Date Code  
(YY/MM/DD)



A: Lot Code  
B: Date Code  
(YYMMDD)



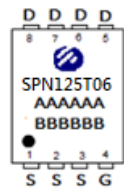
A : Lot Code  
B : Date Code



A : Lot Code  
B : Date Code



AAAAA: Wafer lot no  
BBBBBB : date code



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



# SPN125T06

## N-Channel Enhancement Mode MOSFET

### TO-220/TO-220F/TO-251/TO-252/TO-263 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
SPN125T06T220TGB	TO-220-3L	SPN125T06
SPN125T06T220FTGB	TO-220F-3L	SPN125T06
SPN125T06ST251TGB	TO-251S-3L	SPN125T06
SPN125T06T252RGB	TO-252-2L	SPN125T06
SPN125T06T262RGB	TO-263-2L	SPN125T06
SPN125T06DN8RGB	PPAK5x6-8L	SPN125T06

- ※ SPN125T06T220TGB : Tube ; Pb – Free ; Halogen – Free
- ※ SPN125T06T220FTGB : Tube ; Pb – Free ; Halogen – Free
- ※ SPN125T06ST251TGB : Tube ; Pb – Free ; Halogen – Free
- ※ SPN125T06T252RGB : Tape&Reel ; Pb – Free ; Halogen – Free
- ※ SPN125T06T262RGB : Tape&Reel ; Pb – Free ; Halogen – Free
- ※ SPN125T06DN8RGB : Tape&Reel ; Pb – Free ; Halogen - Free



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## N-Channel Enhancement Mode MOSFET

### ABSOLUTE MAXIMUM RATINGS

(T<sub>A</sub>=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)	I <sub>D</sub>	T <sub>c</sub> =25°C	125	A
		T <sub>c</sub> =70°C	88	
Pulsed Drain Current	I <sub>DM</sub>	400	A	
Power Dissipation@ T <sub>c</sub> =25°C	P <sub>D</sub>	TO-220/TO-263	104	W
Power Dissipation@ T <sub>c</sub> =25°C		TO-251S/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=0.1mH.)	EAS	219	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/TO-263)	R <sub>θJC</sub>	1.2	°C/W	
Thermal Resistance-Junction to Case (TO-251S/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 120A for TO-263-2L and TO-220-3L

The maximum current rating is package limited at 78A for TO-220F-3L

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



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## 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		2.4	
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	$R_{DS(on)}$	$V_{GS}=10V, I_D=20A$		3.6	4.3	mΩ
		$V_{GS}=4.5V, I_D=20A$		4.5	5.6	
Forward Transconductance	$g_{fs}$	$V_{DS}=5V, I_D=20A$		75		S
Gate Resistance	$R_G$	$V_{GS}=0V, V_{DS}=\text{Open},$ $f=1\text{MHz}$		1.6		Ω
Diode Forward Voltage	$V_{SD}$	$I_S=20A, V_{GS}=0V$			1.2	V
<b>Dynamic</b>						
Total Gate Charge (10V)	$Q_g$	$V_{DS}=30V, V_{GS}=10V$ $I_D = 20A$		54		nC
Total Gate Charge (4.5V)	$Q_g$			27		
Gate-Source Charge	$Q_{gs}$			14		
Gate-Drain Charge	$Q_{gd}$			6		
Input Capacitance	$C_{iss}$	$V_{DS}=30V, V_{GS}=0V$ $f=1\text{MHz}$		3800		pF
Output Capacitance	$C_{oss}$			520		
Reverse Transfer Capacitance	$C_{rss}$			50		
Turn-On Time	$t_{d(on)}$	$V_{DD}=30V, I_D=20A$ $V_{GEN}=10V, R_G=10\Omega$		16		nS
	$t_r$			36		
Turn-Off Time	$t_{d(off)}$			55		
	$t_f$			35		



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## TYPICAL CHARACTERISTICS

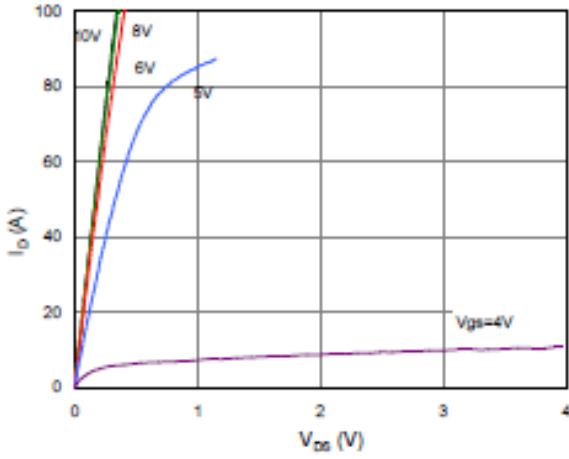


Fig. 1 Output Characteristics

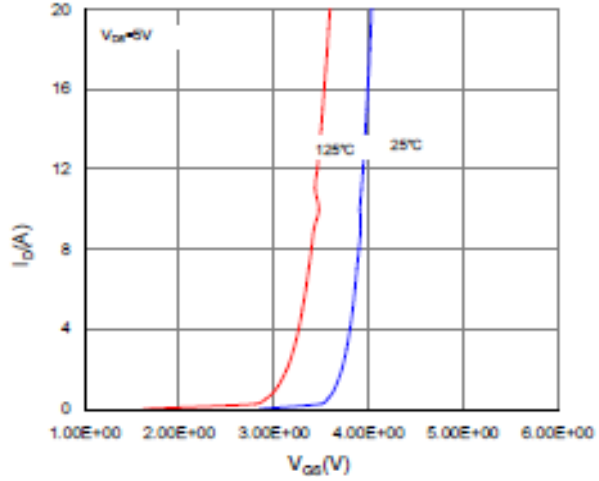


Fig. 2 Transfer Characteristics

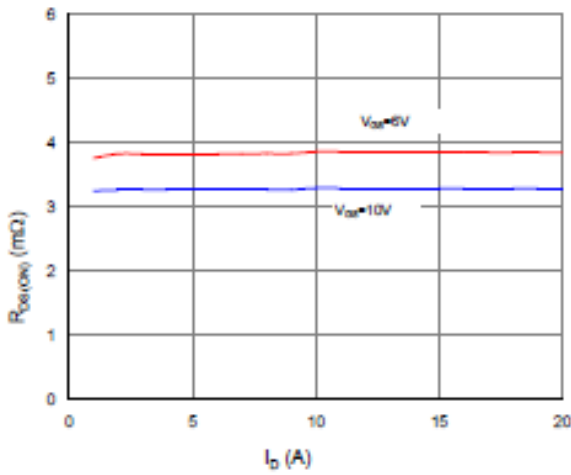


Fig. 3 On Resistances vs Drain Current

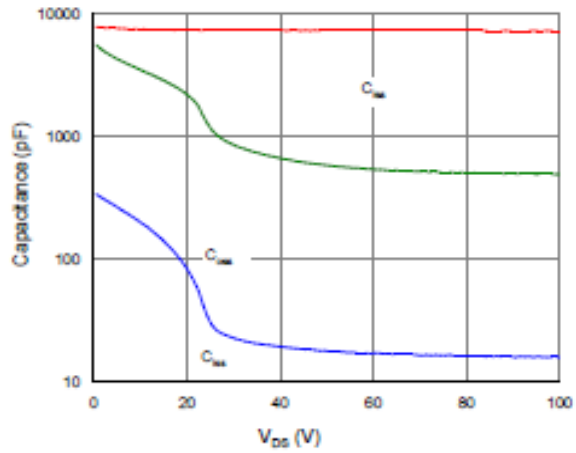


Fig. 4 Capacitance

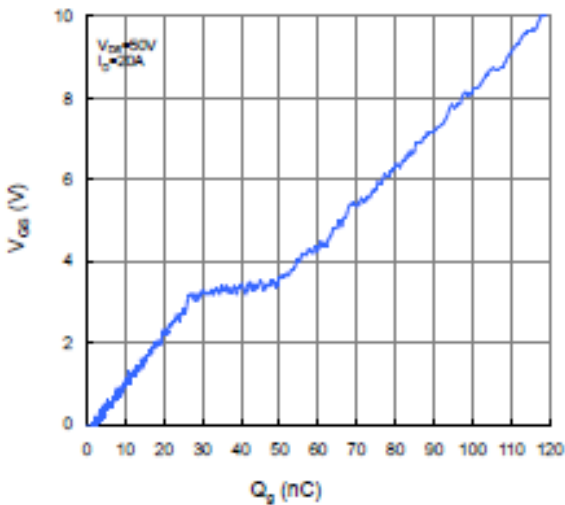


Fig. 5 Gate Charge

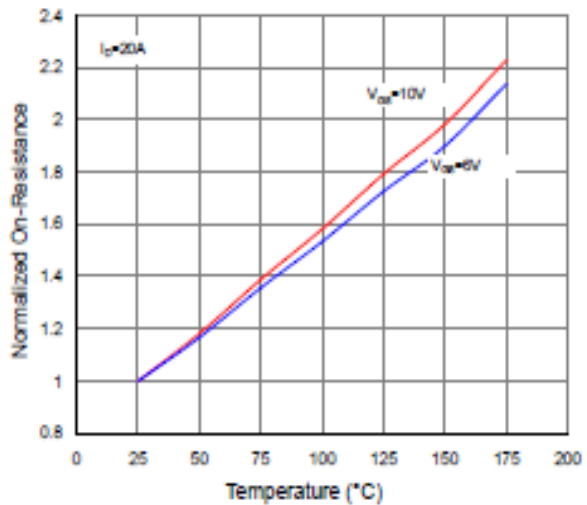


Fig. 6 On-Resistance vs Junction Temperature



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### TYPICAL CHARACTERISTICS

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

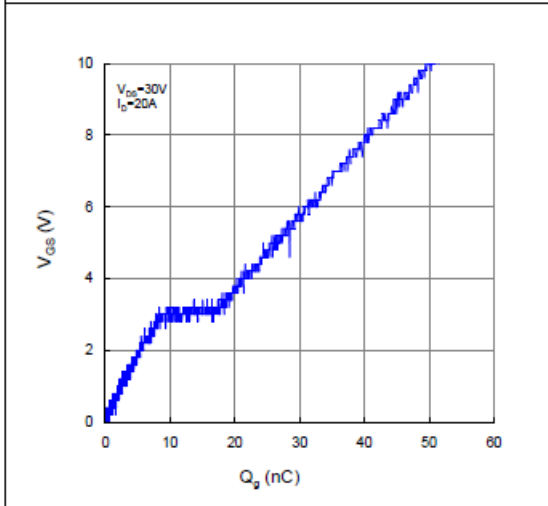


Figure 8. Typical Capacitance vs. Drain-to-Source Voltage

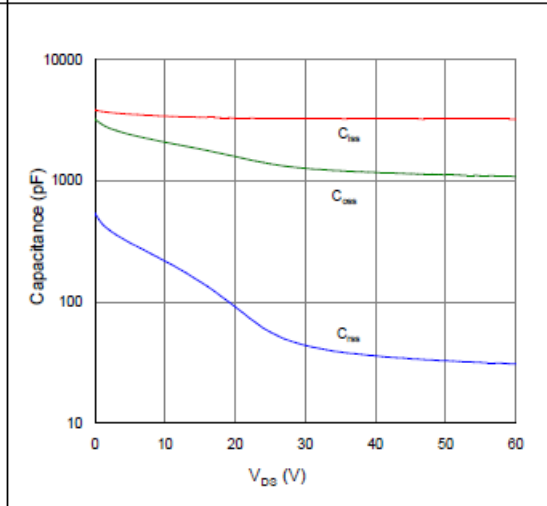


Figure 9. Maximum Safe Operating Area

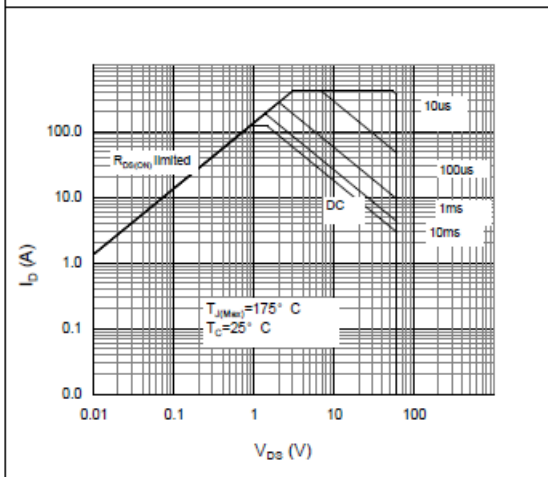


Figure 10. Maximum Drain Current vs. Case Temperature

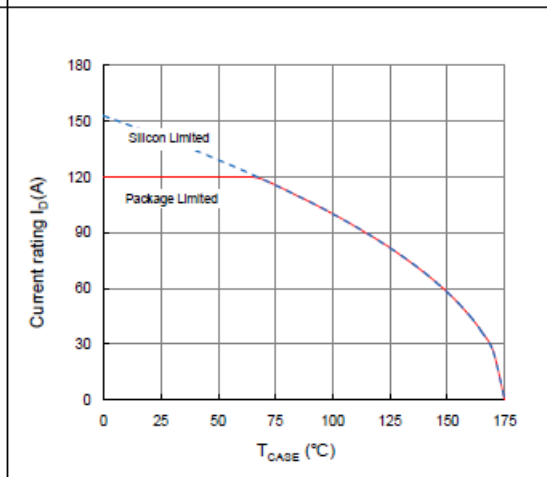
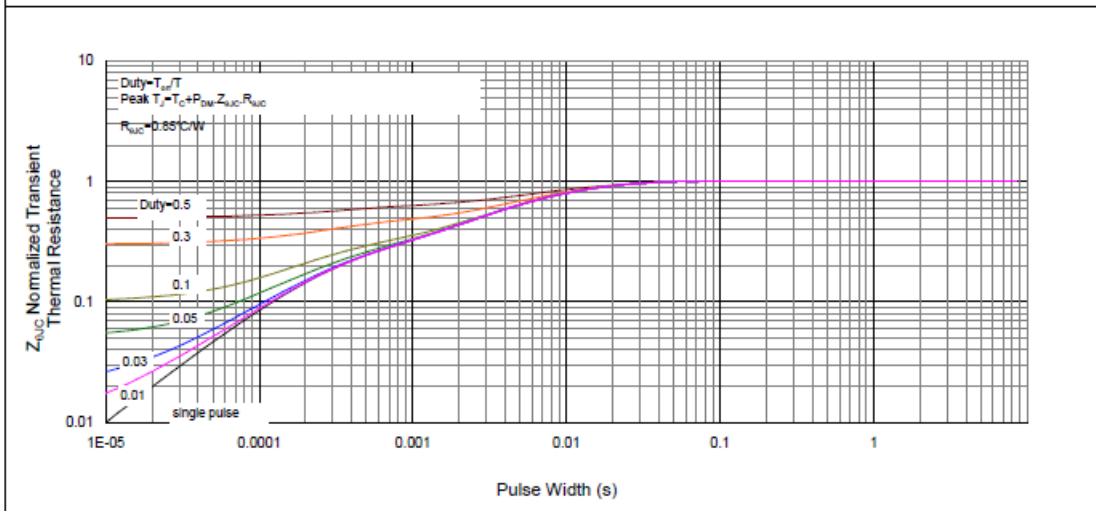


Figure 11. Normalized Maximum Transient Thermal Impedance, Junction-to-Case

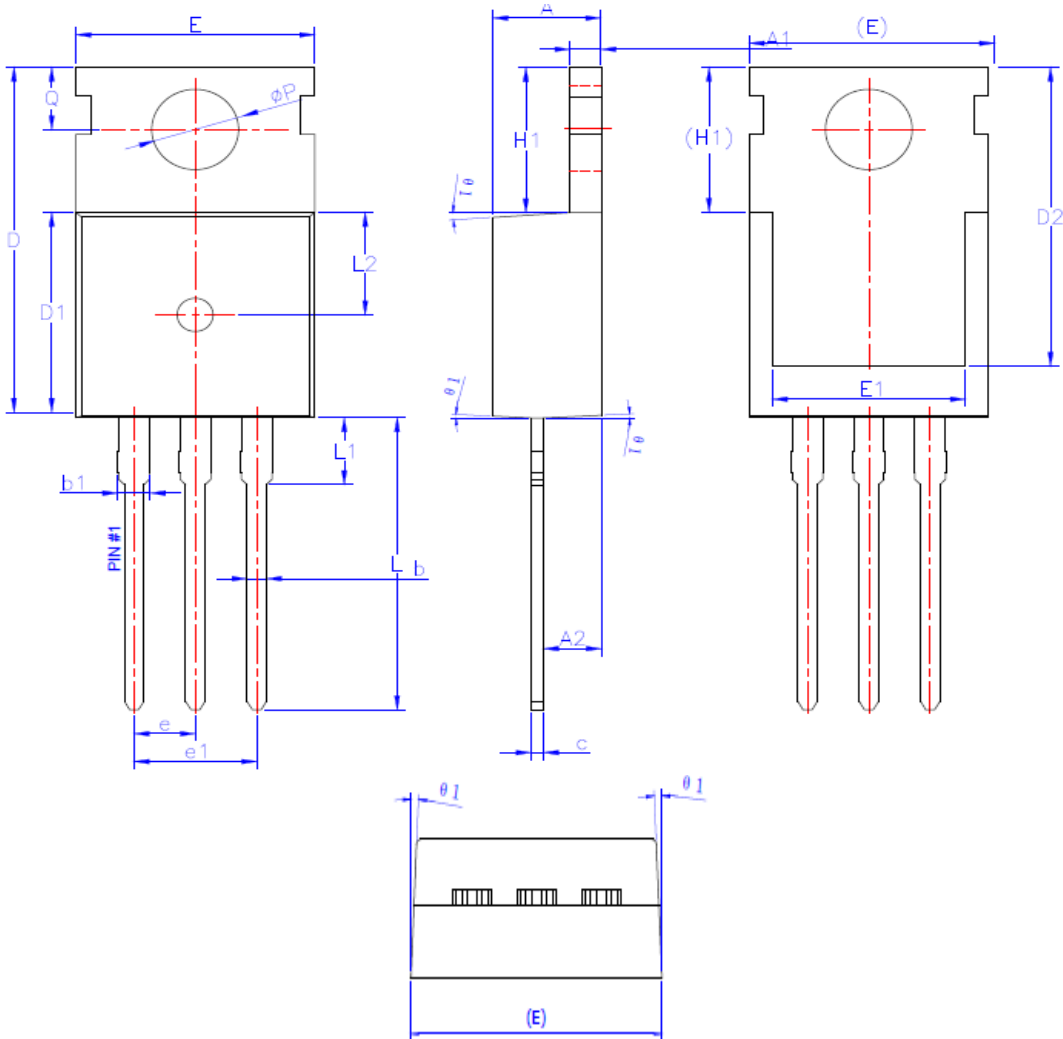




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## N-Channel Enhancement Mode MOSFET

### 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	-	0.90
b1	-	-	1.40
c	0.45	0.50	0.50
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		
$\phi P$	3.55	3.60	3.65
Q	2.73	-	2.87
$\theta 1$	1°	3°	5°

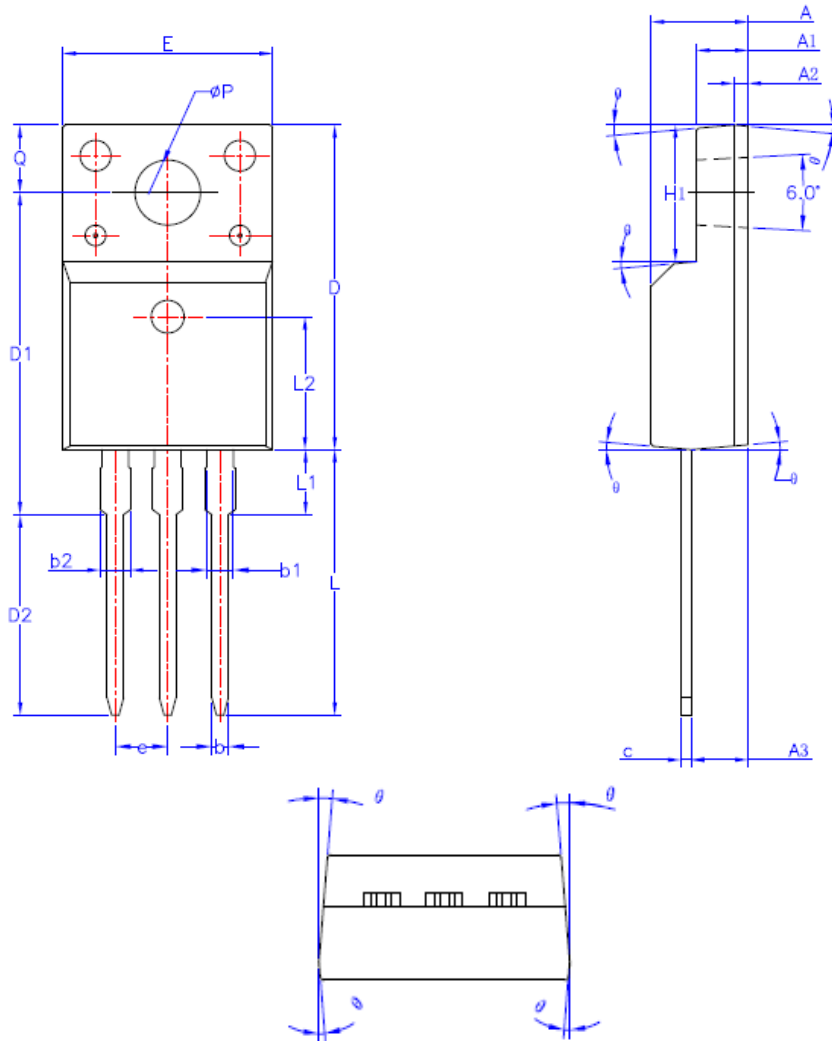




# SPN125T06

## N-Channel Enhancement Mode MOSFET

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



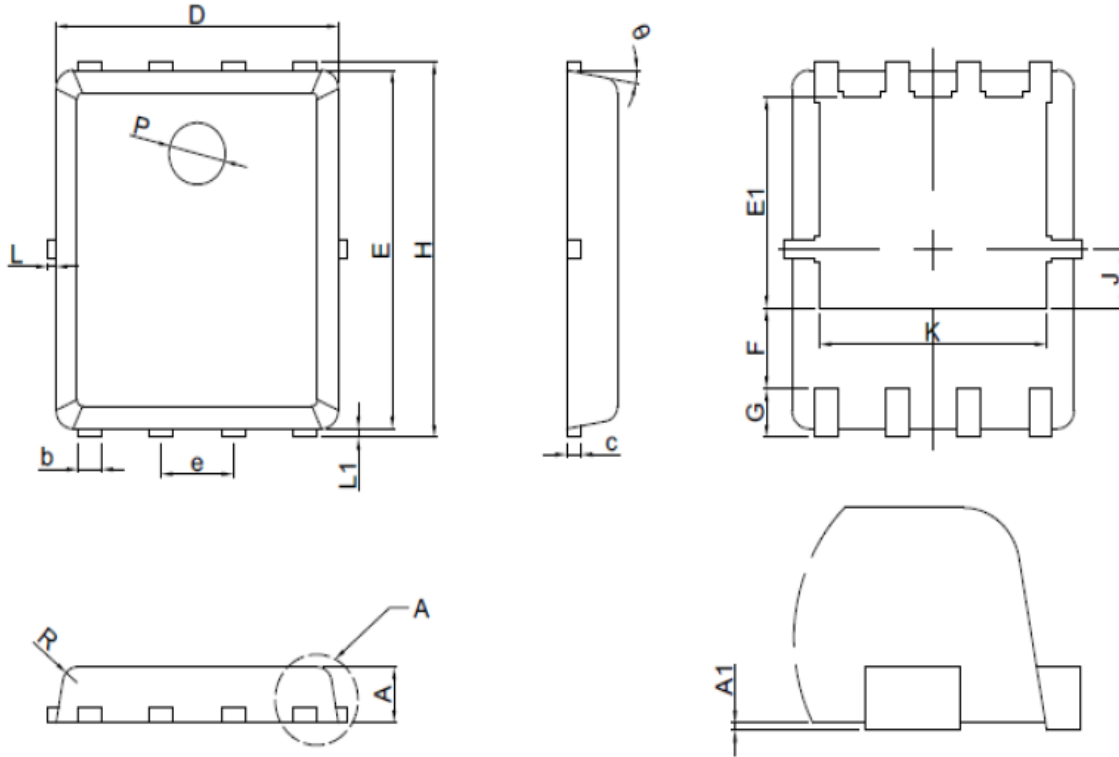
SYMBOL	MIN	NOM	MAX
A	4.50	4.70	4.83
A1	2.34	2.54	2.74
A2	0.7REF		
A3	2.56	2.76	2.93
b	0.70	--	0.90
b1	1.18	--	1.40
b2	--	--	1.47
c	0.45	0.50	0.60
D	15.67	15.87	16.07
D1	15.55	15.75	15.95
D2	9.60	9.80	10.00
E	9.96	10.16	10.36
e	2.54BSC		
H1	6.48	6.68	6.88
L	12.68	12.98	13.28
L1	-	-	3.50
L2	6.50REF		
Φ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



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## N-Channel Enhancement Mode MOSFET

### PPAK5x6-8L PACKAGE OUTLINE



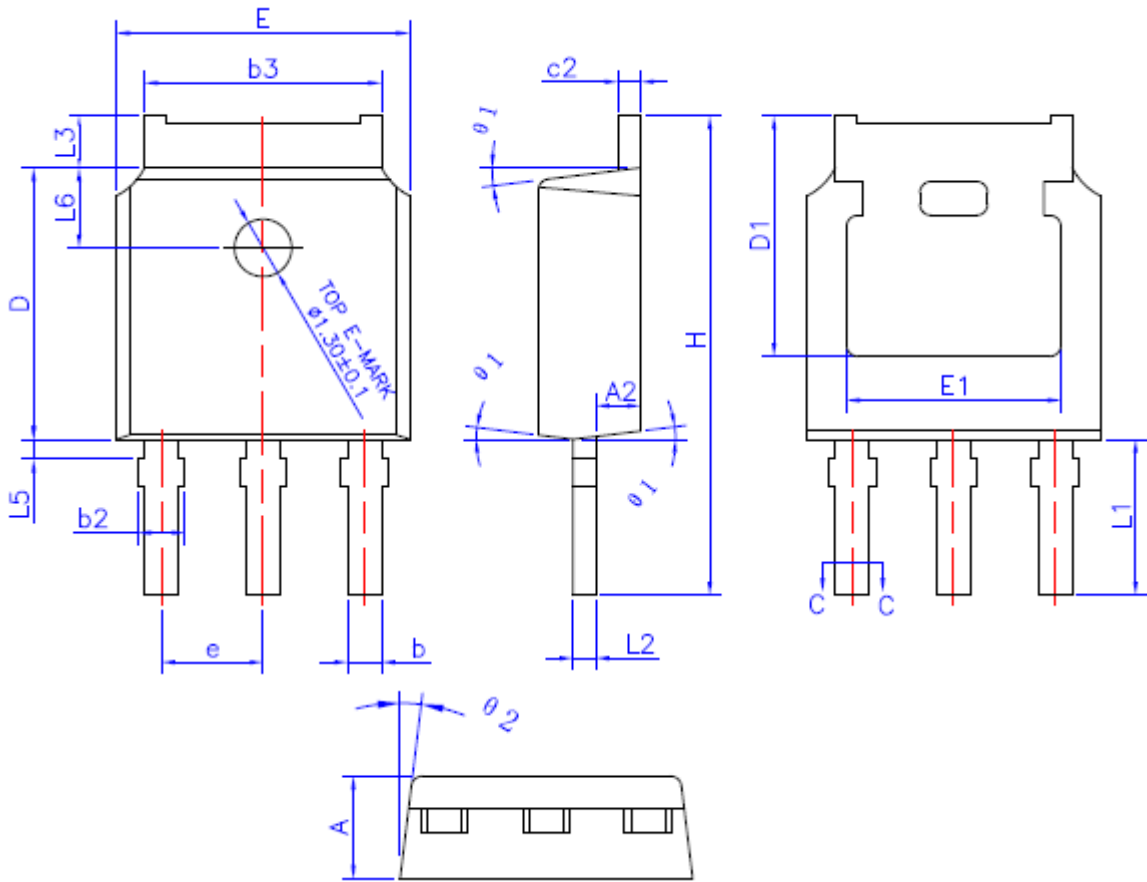
SYMBOL	MILLIMETERS		
	MIN	NOM	MAX
A	0.8	0.95	1.1
A1	0	0.03	0.05
b	0.33	0.41	0.51
c	0.254 REF		
D	4.80	4.95	5.10
F	1.40 REF		
E	5.70	5.80	5.90
e	1.27 BSC		
H	5.90	6.05	6.20
L1	0.06	0.13	0.20
G	0.60 REF		
J	0.95 BSC		
K	4.00 REF		
L	---	----	0.20
P	1.00 REF		
E1	3.40REF		
E2	0.95 REF		
$\theta$	6°	10°	14°
R	0.25REF		



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## N-Channel Enhancement Mode MOSFET

### TO-251S-3L PACKAGE OUTLINE



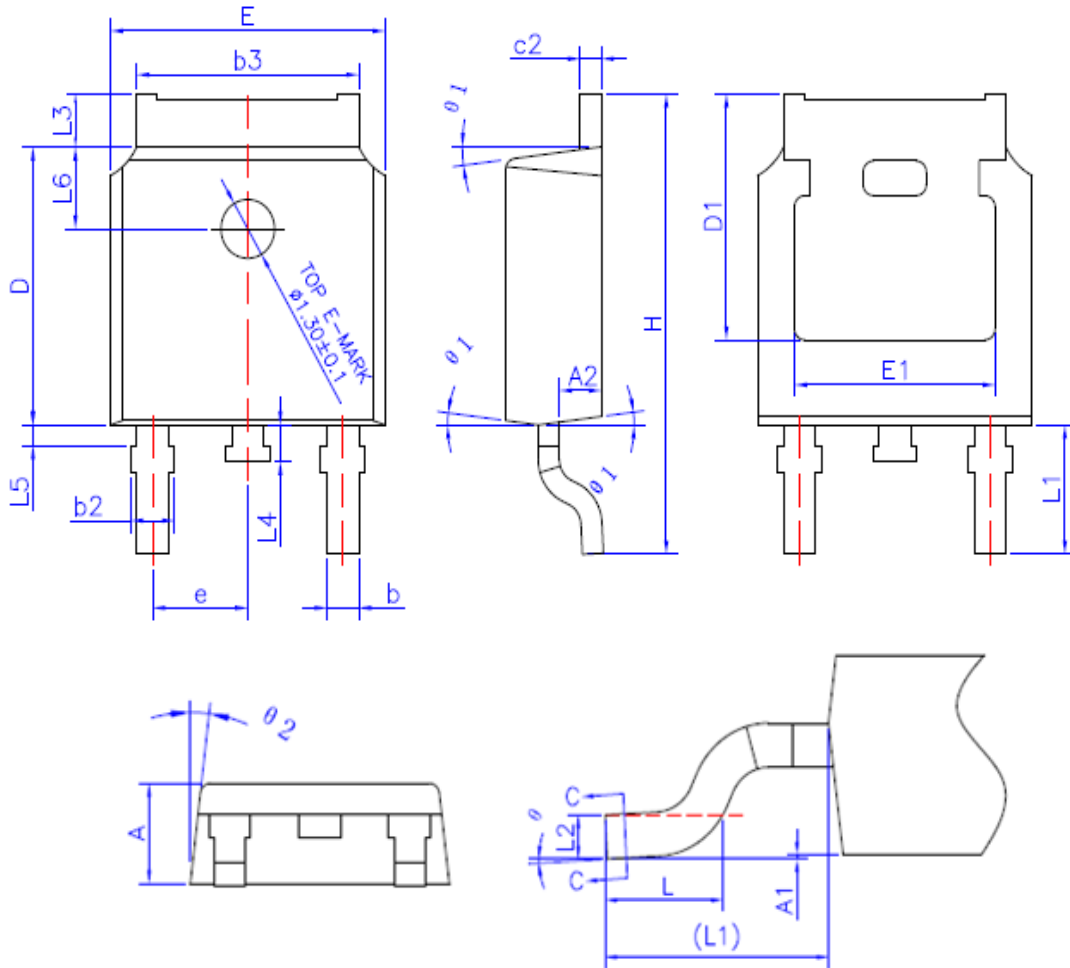
SYMBOL	MIN	NOM	MAX
A	2.20	2.30	2.40
A2	0.86	1.01	1.16
b	0.66	-	0.86
b2	0.66	--	0.96
b3	5.10	5.28	5.46
c	0.46	--	0.60
c2	0.47	--	0.60
D	6.00	6.10	6.20
D1	5.35REF		
E	6.40	6.60	6.80
E1	4.83REF		
e	2.3REF		
H	9.80	10.40	11.00
L1	3.50REF		
L2	0.508BSC		
L3	0.90	--	1.25
L5	0.15	--	0.75
L6	1.80REF		
θ 1	5°	7°	9°
θ 2	5°	7°	9°



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## N-Channel Enhancement Mode MOSFET

### TO-252-2L PACKAGE OUTLINE



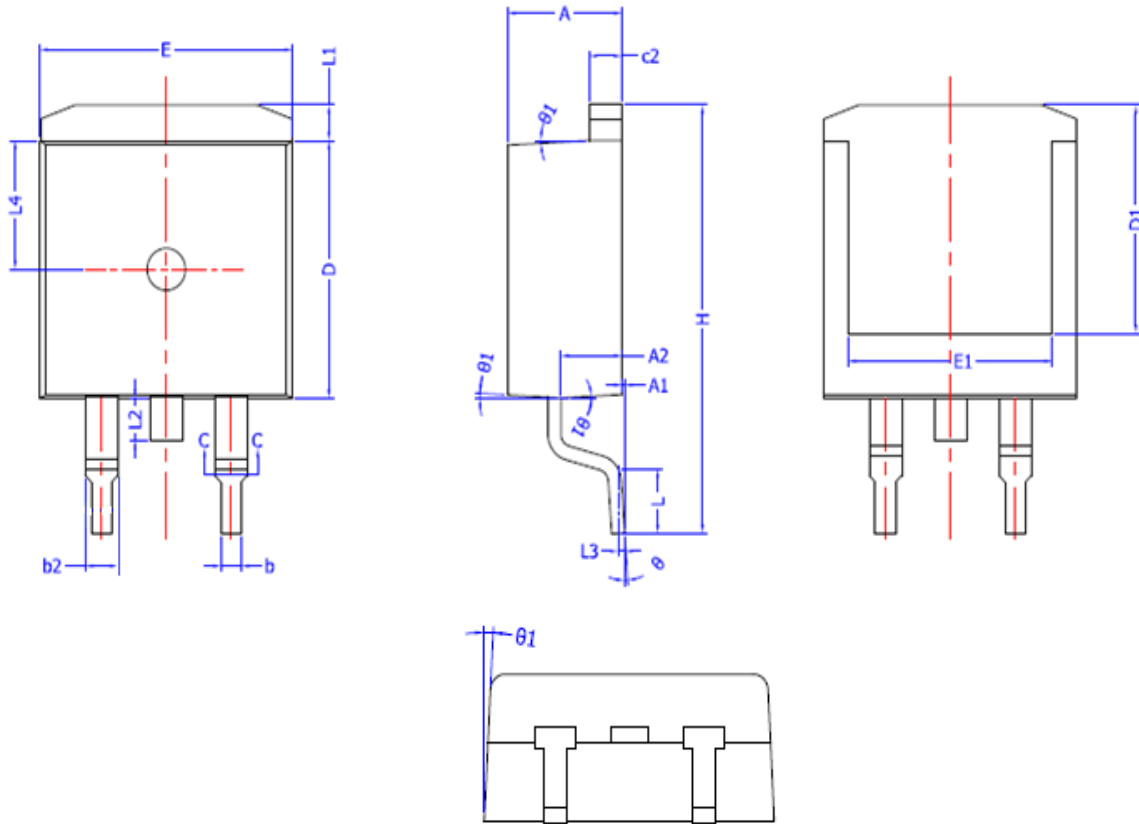
SYMBOL	MIN	NOM	MAX
A	2.20	2.30	2.40
A1	0.00	--	0.15
A2	0.90	1.01	1.10
b	0.72	-	0.85
b2	0.72	--	0.90
b3	5.13	5.33	5.46
c	0.47	--	0.60
c2	0.47	--	0.60
D	6.00	6.10	6.20
D1	5.25	--	--
E	6.40	6.60	6.80
E1	4.70	--	--
e	2.3REF		
H	9.80	10.10	10.40
L	1.40	1.60	1.80
L1	2.90REF		
L2	0.508BSC		
L3	0.90	--	1.25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



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## N-Channel Enhancement Mode MOSFET

### TO-263-2L PACKAGE OUTLINE



SYMBOL	MIN	NOM	MAX
A	4.40	4.50	4.60
A1	0.00	0.10	0.25
A2	2.20	2.40	2.60
b	0.71	-	0.91
b2	1.17	--	1.37
c	0.47	--	0.60
c2	1.25	1.30	1.35
D	9.10	9.20	9.30
D1	8.00	--	--
E	9.80	9.90	10.00
E1	7.80	--	--
e	2.54BSC		
H	14.90	15.30	15.70
L	2.00	2.30	2.60
L1	1.12	1.27	1.42
L2	--	--	1.75
L3	0.25BSC		
L4	4.60 REF		
$\theta$	0°	--	8°
$\theta 1$	1°	3°	5°



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