



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

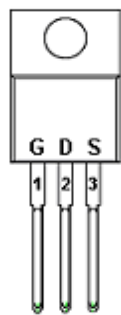
- DC/DC Converter
- Load Switch
- SMPS Secondary Side Synchronous Rectifier
- Motor Control
- Power Tool

FEATURES

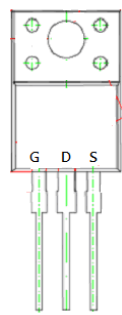
- ◆ 60V/20A, $R_{DS(ON)}=2.4m\Omega@V_{GS}=10V$
 $R_{DS(ON)}=3.5m\Omega@V_{GS}=4.5V$
- ◆ Super high density cell design for extremely low $R_{DS(ON)}$
- ◆ Exceptional on-resistance and maximum DC current capability
- ◆ TO-220/TO-220F/TO-252/PPAK5X6 package design

PIN CONFIGURATION

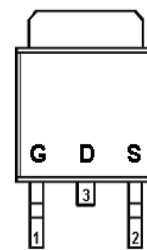
TO-220



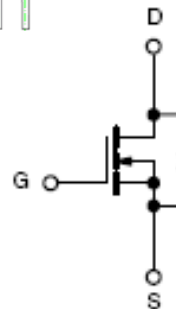
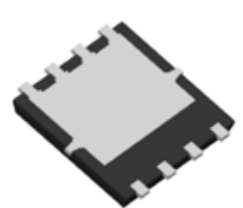
TO-220F



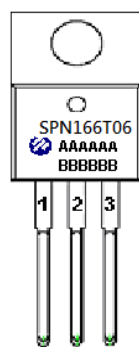
TO-252



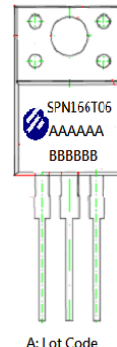
PPAK 5X6



PART MARKING



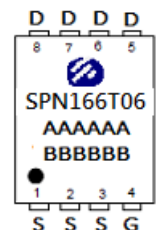
A : Lot Code
B : Date Code
(YY/MM/DD)



A: Lot Code
B: Date Code
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A : Lot Code
B : Date Code



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



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TO-220/TO-220F/TO-252 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	SPN166T06
SPN166T06DN8RGB	PPAK5x6	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



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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 (TO-220/TO-220F/TO-252)	T _c =25°C	I _D	166	A
	T _c =100°C		118	
Continuous Drain Current (PPAK5x6)	T _c =25°C	I _D	156	A
	T _c =100°C		98	
Pulsed Drain Current (TO-220/TO-220F/TO-252)		I _{DM}	450	A
Pulsed Drain Current (PPAK5x6)		I _{DM}	400	A
Power Dissipation @ T _c =25°C	TO-220/TO-220F	P _D	168	W
Power Dissipation @ T _c =25°C	TO-252		125	
Power Dissipation @ T _c =25°C	PPAK5x6		114	
Avalanche Energy with Single Pulse (T _c =25°C, L=0.4mH.) (TO-220/TO-220F/TO-252)		EAS	290	mJ
Avalanche Energy with Single Pulse (T _c =25°C, L=0.4mH.) (PPAK5x6)			320	
Operating Junction Temperature		T _J	-55/150	°C
Storage Temperature Range		T _{STG}	-55/150	°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}	1.1	°C/W



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ELECTRICAL CHARACTERISTICS

(TA=25°C Unless otherwise noted)

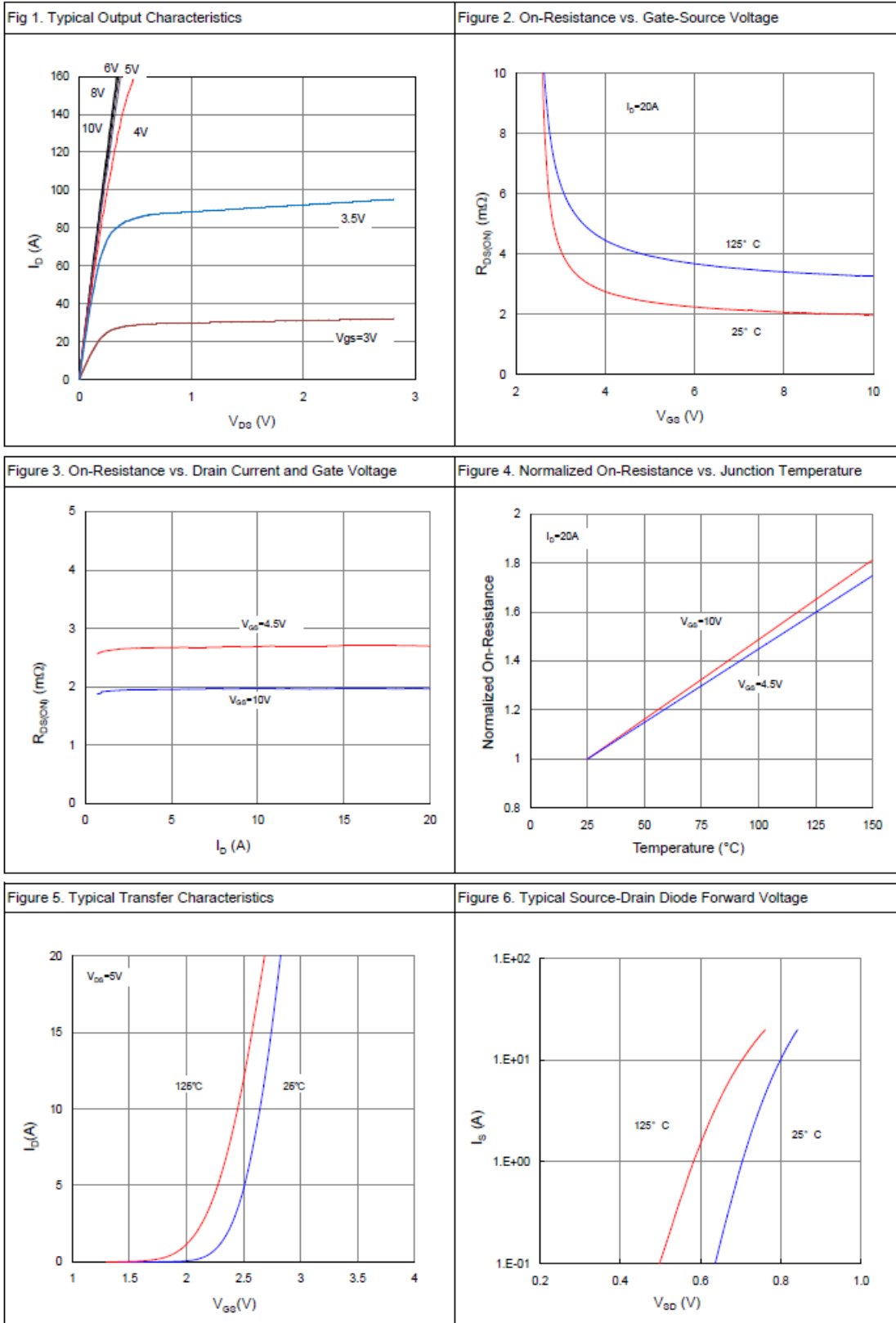
Parameter	Symbol	Conditions	Min.	Typ	Max.	Unit
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS}=0V, I_D=250\mu A$	60			V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1.0	1.6	2.4	
Gate Leakage Current	I_{GSS}	$V_{DS}=0V, V_{GS}=\pm 20V$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=60V, V_{GS}=0V$ $T_J = 25^\circ C$			1	uA
		$V_{DS}=60V, V_{GS}=0V$ $T_J = 100^\circ C$			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
Dynamic						
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		



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TYPICAL CHARACTERISTICS





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TYPICAL CHARACTERISTICS

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

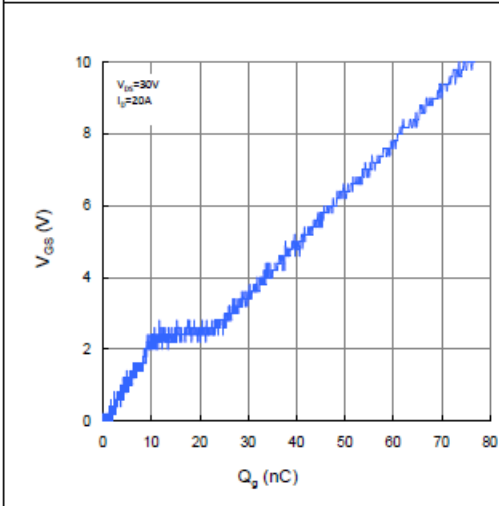


Figure 8. Typical Capacitance vs. Drain-to-Source Voltage

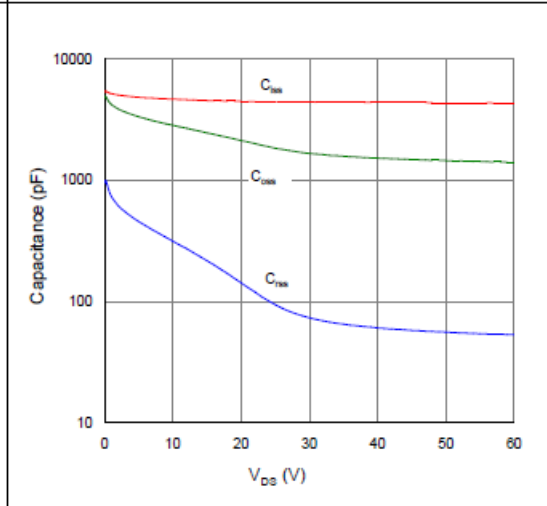


Figure 9. Maximum Safe Operating Area

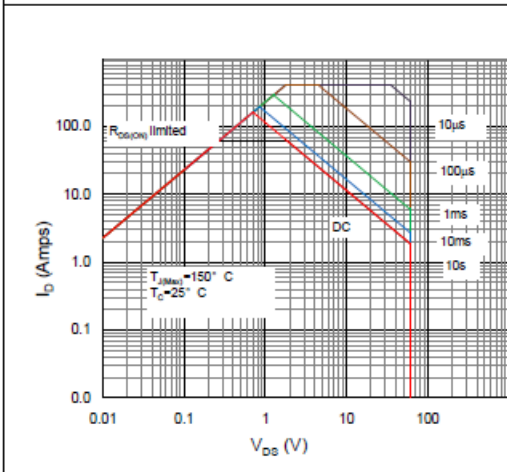


Figure 10. Maximum Drain Current vs. Case Temperature

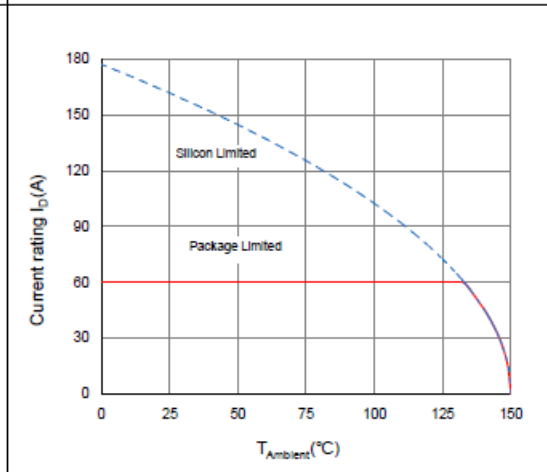
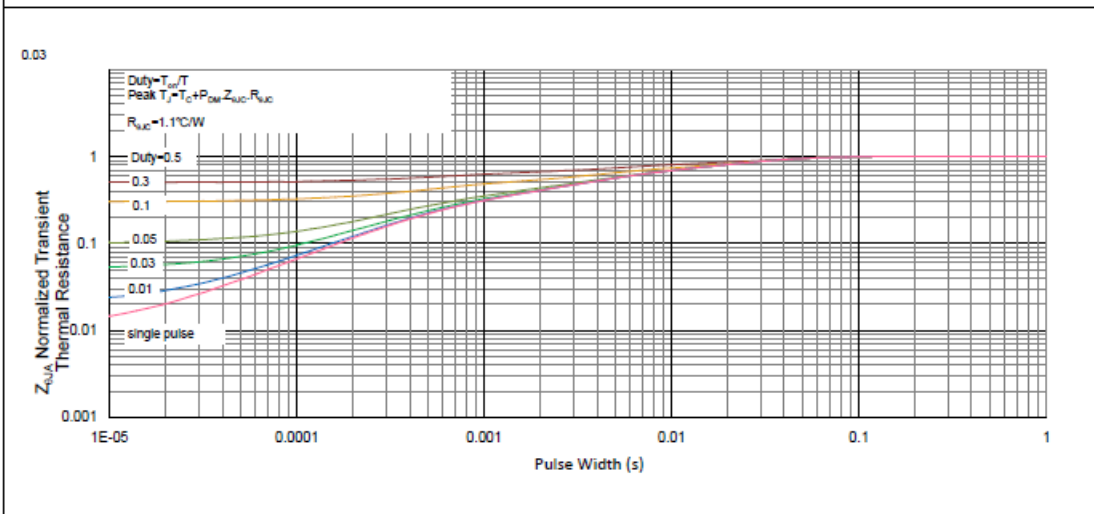


Figure 11. Normalized Maximum Transient Thermal Impedance, Junction-to-Ambient

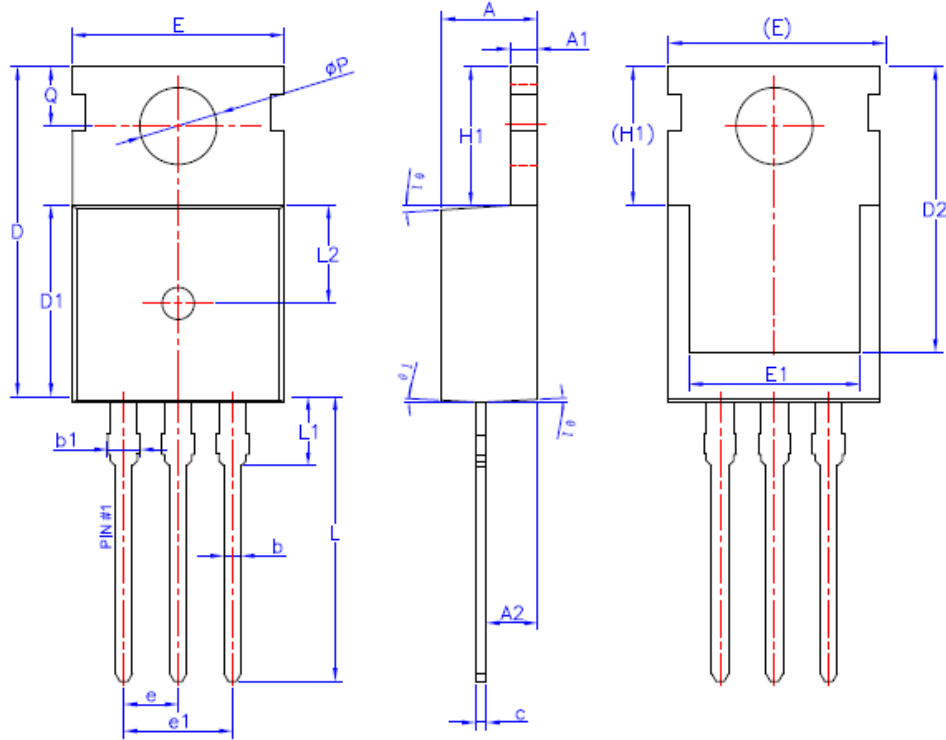




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TO-220-3L PACKAGE OUTLINE



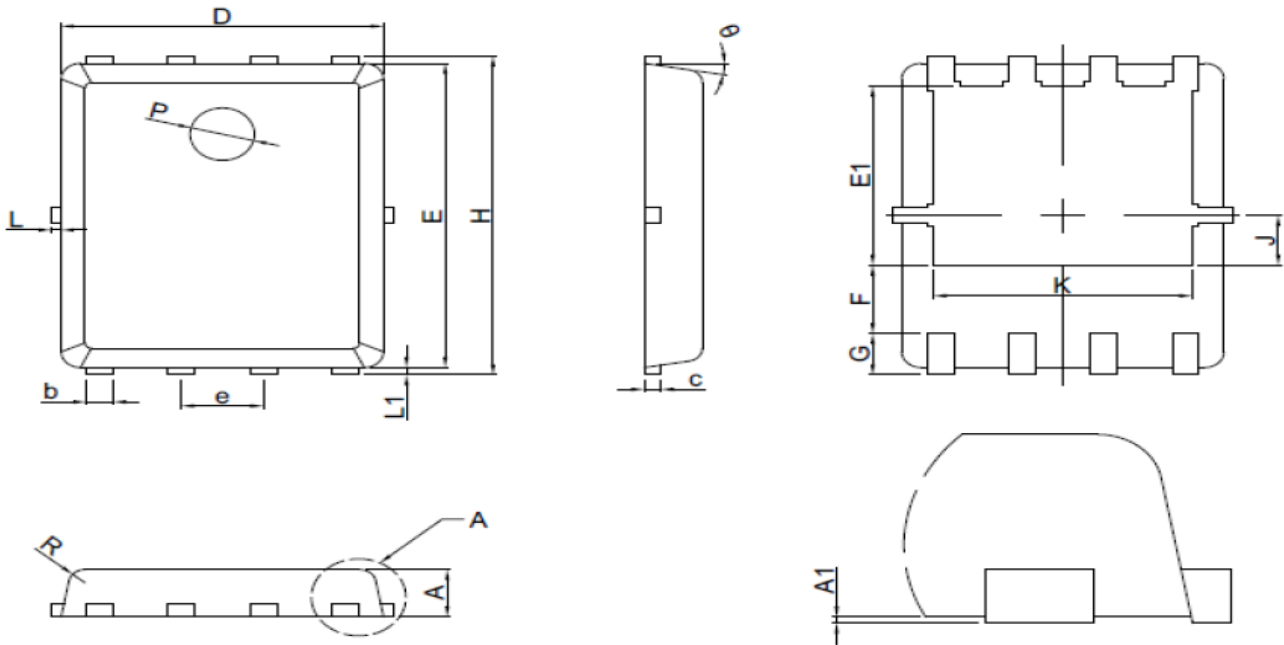
SYMBOL	MIN	NOM	MAX
A	4.40	4.50	4.60
A1	1.27	1.30	1.33
A2	2.30	2.40	2.50
b	0.70	—	0.90
b1	1.42	—	1.57
c	0.45	0.50	0.60
D	15.30	15.70	16.10
D1	9.10	9.20	9.30
D2	13.10	—	13.70
E	9.70	9.90	10.20
E1	7.80	8.00	8.20
e	2.54BSC		
e1	5.08BSC		
H1	6.30	6.50	6.70
L	12.78	13.08	13.38
L1	—	—	3.50
L2	4.60REF		
øP	3.55	3.60	3.65
Q	2.73	—	2.87
ø1	1°	3°	5°



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PPAK5X6 PACKAGE OUTLINE



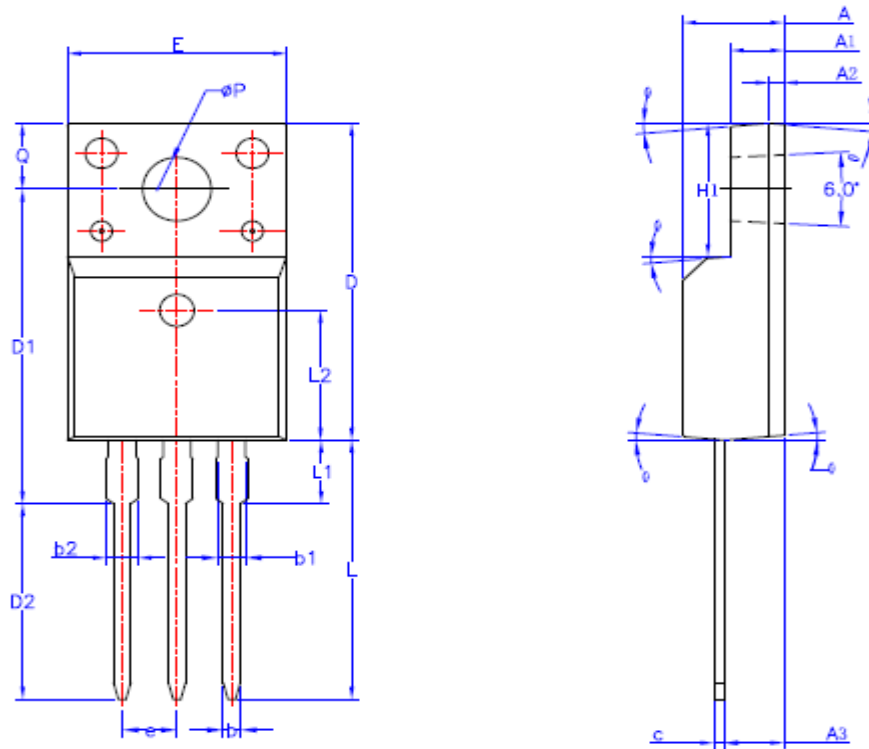
SYMBOL	MILLIMETERS		
	MIN	NOM	MAX
A	0.8	0.95	1.1
A1	0.00	0.03	0.05
b	0.33	0.41	0.51
c	0.254 REF		
D	4.80	4.95	5.10
F	1.40 REF		
E	5.70	5.80	5.90
e	1.27 BSC		
H	5.90	6.05	6.20
L1	0.06	0.13	0.20
G	0.60 REF		
J	0.95 BSC		
K	4.00 REF		
L	---	----	0.20
P	1.00 REF		
E1	3.40REF		
E2	0.95 REF		
θ	6°	10°	14°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



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TO-220F-3L PACKAGE OUTLINE



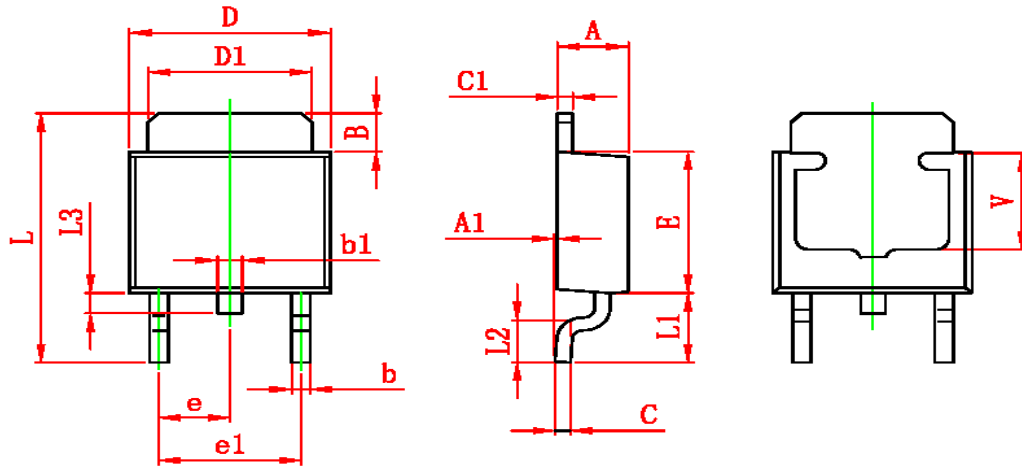
SYMBOL	MIN	NOM	MAX
A	4.50	4.70	4.83
A1	2.34	2.54	2.74
A2	0.70 REF		
A3	2.56	2.76	2.93
b	0.70	—	0.90
b1	1.18	—	1.38
b2	—	—	1.47
c	0.45	0.50	0.60
D	15.67	15.87	16.07
D1	15.55	15.75	15.95
D2	9.60	9.80	10.0
E	9.96	10.16	10.36
e	2.54BSC		
H1	6.48	6.68	6.88
L	12.68	12.98	13.28
L1	—	—	3.50
L2	6.50REF		
∅P	3.08	3.18	3.28
Q	3.20	—	3.40
θ 1	1°	3°	5°



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TO-252 PACKAGE OUTLINE



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
B	1.350	1.650	0.053	0.065
b	0.500	0.700	0.020	0.028
b1	0.700	0.900	0.028	0.035
c	0.430	0.580	0.017	0.023
c1	0.430	0.580	0.017	0.023
D	6.350	6.650	0.250	0.262
D1	5.200	5.400	0.205	0.213
E	5.400	5.700	0.213	0.224
e	2.300 TYP		0.091 TYP	
e1	4.500	4.700	0.177	0.185
L	9.500	9.900	0.374	0.390
L1	2.550	2.900	0.100	0.114
L2	1.400	1.780	0.055	0.070
L3	0.350	0.650	0.014	0.026
V	3.80 REF		0.150 REF	



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