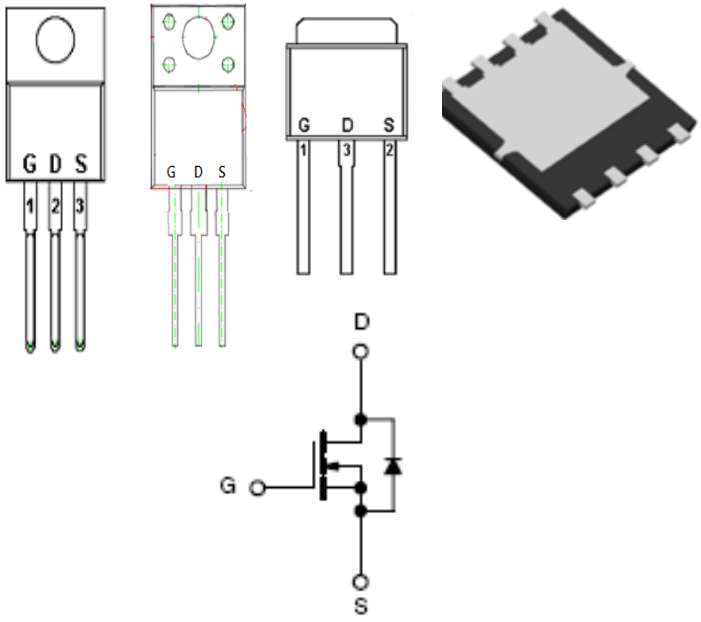
SPN125T04
N-Channel Enhancement Mode MOSFET

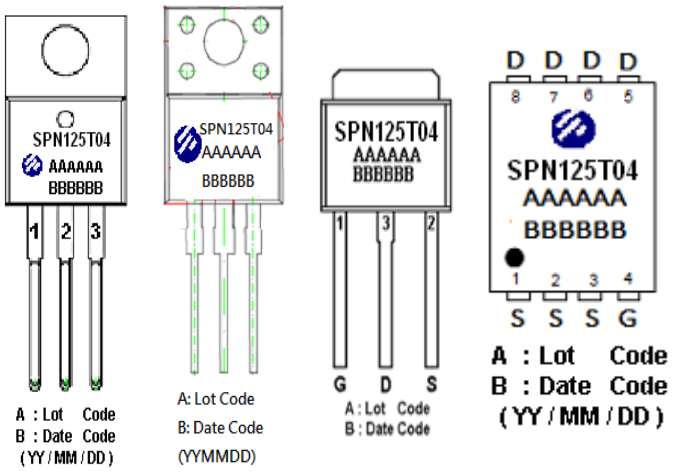
DESCRIPTION
The SPN125T04 is the N-Channel logic enhancement mode power field effect transistor which is produced using super high cell density DMOS trench technology. This high density process is especially tailored to minimize on-state resistance. These devices are particularly suitable for synchronous 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/20A, $R_{DS(ON)}$=4.5mΩ@V_{GS}=10V
- 45V/20A, $R_{DS(ON)}$=7.0mΩ@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-251/PPAK5x6 package design

PIN CONFIGURATION
TO-220 TO-220F TO-251 PPAK 5x6



PART MARKING


T0-220/TO-220F PIN DESCRIPTION

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

TO-251 PIN DESCRIPTION

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

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
SPN125T04T220TGB	TO-220-3L	SPN125T04
SPN125T04T220FTGB	TO-220F-3L	SPN125T04
SPN125T04T251TGB	TO-251	SPN125T04
SPN125T04DN8RGB	PPAK5x6	SPN125T04

※ SPN125T04T220TGB : Tube ; Pb – Free ; Halogen – Free
※ SPN125T04T220FTGB : Tube ; Pb – Free ; Halogen – Free
※ SPN125T04T251TGB : Tube ; Pb – Free ; Halogen – Free
※ SPN125T04DN8RGB : Tape&Reel ; Pb – Free ; Halogen - Free

SPN125T04
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(TJ=150℃) (TO-220/TO-220F/TO-251)	T_C=25℃	I_D	125	A
	T_C=100℃		88	
Continuous Drain Current(TJ=150℃) (PPAK5X6)	T_C=25℃	I_D	101	A
	T_C=100℃		64	
Pulsed Drain Current (TO-220/TO-220F/TO-251)		I_{DM}	350	A
Pulsed Drain Current (PPAK5X6)		I_{DM}	220	A
Power Dissipation @ T_C=25℃	TO-220/TO-220F	P_D	125	W
Power Dissipation @ T_C=25℃	TO251		83	
Power Dissipation @ T_C=25℃	PPAK5X6		72	
Avalanche Energy with Single Pulse (T_C=25℃, L = 0.3mH.)		E_{AS}	60	mJ
Operating Junction Temperature		T_J	-55/150	℃
Storage Temperature Range		T_{STG}	-55/150	℃
Thermal Resistance-Junction to Case (TO-220/TO-220F)		$R_{\theta JC}$	1.2	℃/W
Thermal Resistance-Junction to Case (TO-251)		$R_{\theta JC}$	1.35	℃/W
Thermal Resistance-Junction to Case (PPAK5X6)		$R_{\theta JC}$	1.5	℃/W

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	45			V
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=250uA	1	1.8	2.2	
Gate Leakage Current	I_{GSS}	V_{DS}=0V,V_{GS}=±20V			±100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=45V, V_{GS}=0V T_J = 25 °C			1	uA
		V_{DS}=45V, V_{GS}=0V T_J = 100 °C			100	
Drain-Source On-Resistance	$R_{DS(on)}$	V_{GS}=10V,I_D=20A		3.5	4.5	mΩ
		V_{GS}=4.5V,I_D=20A		4.6	7.0	
Forward Transconductance	gfs	V_{DS}=5V,I_D=20A		40		S
Gate Resistance	R_G	V_{GS}=0V,V_{DS}=Open, f=1MHz		1.5		Ω
Diode Forward Voltage	V_{SD}	I_F=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		42		nC
Total Gate Charge (4.5V)	Q_g			22		
Gate-Source Charge	Q_{gs}			4		
Gate-Drain Charge	Q_{gd}			10		
Input Capacitance	C_{iss}	V_{DS}=20V, V_{GS}=0V f=1MHz		2159		pF
Output Capacitance	C_{oss}			756		
Reverse Transfer Capacitance	C_{rss}			118		
Turn-On Time	td(on)	V_{DD}=20V, ID=20A V_{GEN}=10V, R_G=10Ω		12		nS
	tr			10		
Turn-Off Time	td(off)			41		
	tf			16		

TYPICAL CHARACTERISTICS

Fig 1. Typical Output Characteristics

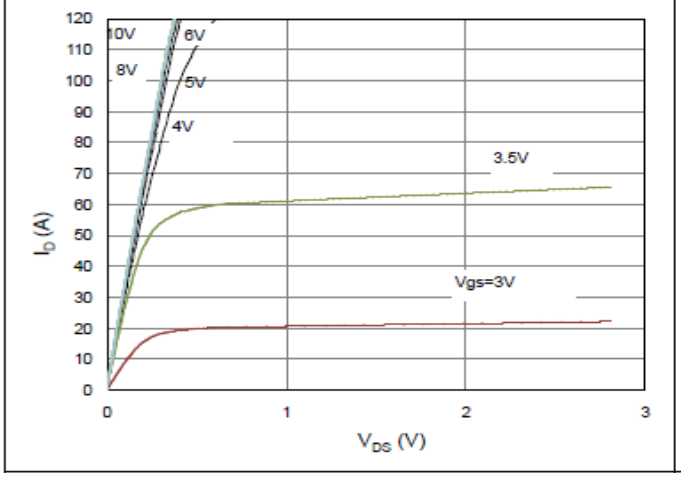


Figure 2. On-Resistance vs. Gate-Source Voltage

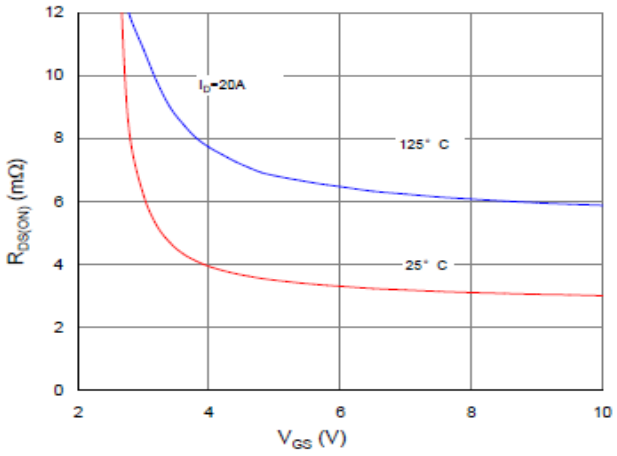


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

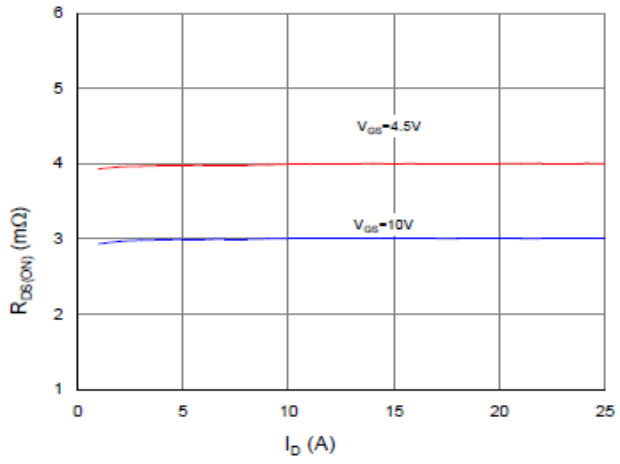


Figure 4. Normalized On-Resistance vs. Junction Temperature

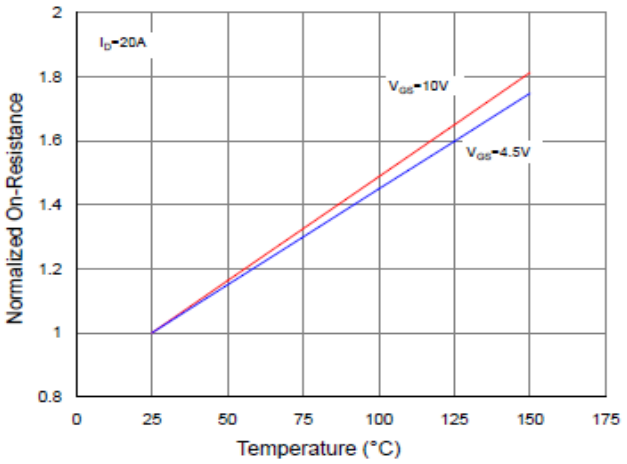


Figure 5. Typical Transfer Characteristics

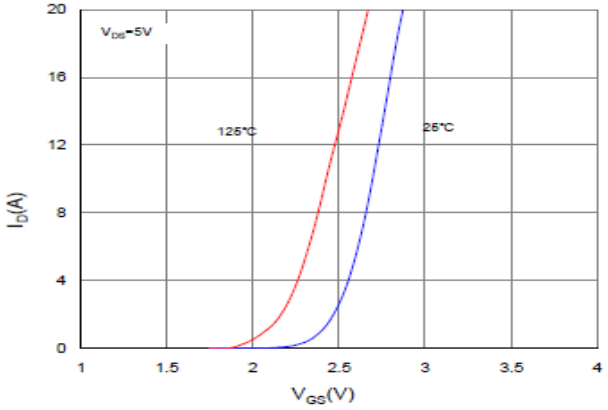
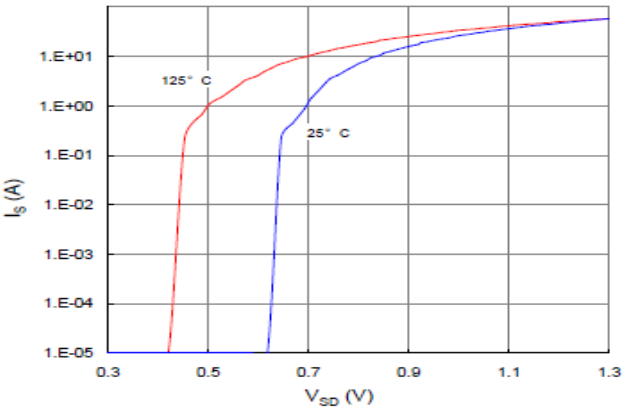


Figure 6. Typical Source-Drain Diode Forward Voltage



TYPICAL CHARACTERISTICS

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

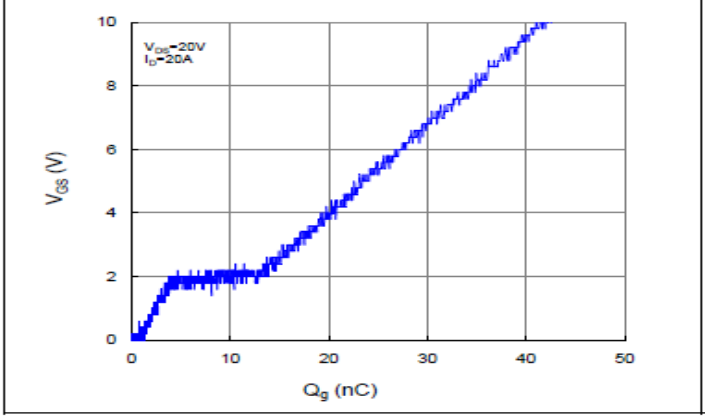


Figure 8. Typical Capacitance vs. Drain-to-Source Voltage

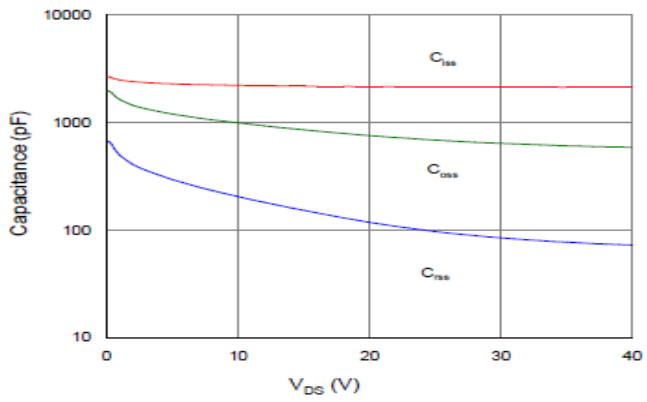


Figure 9. Maximum Safe Operating Area

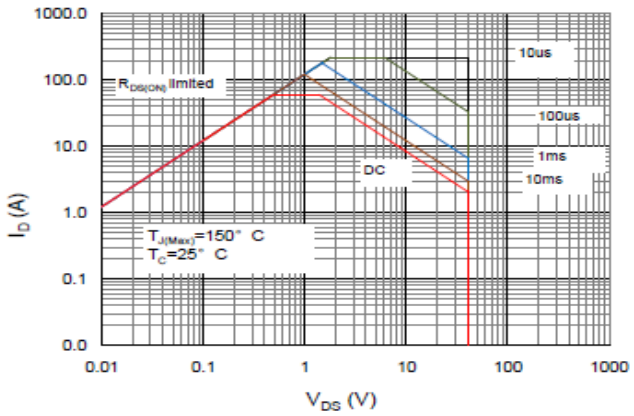


Figure 10. Maximun Drain Current vs. Case Temperature

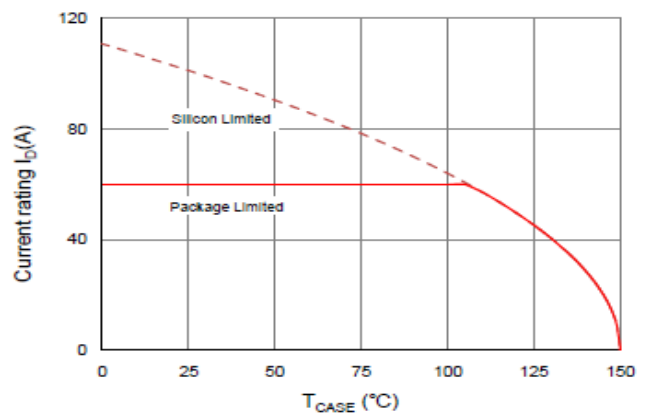
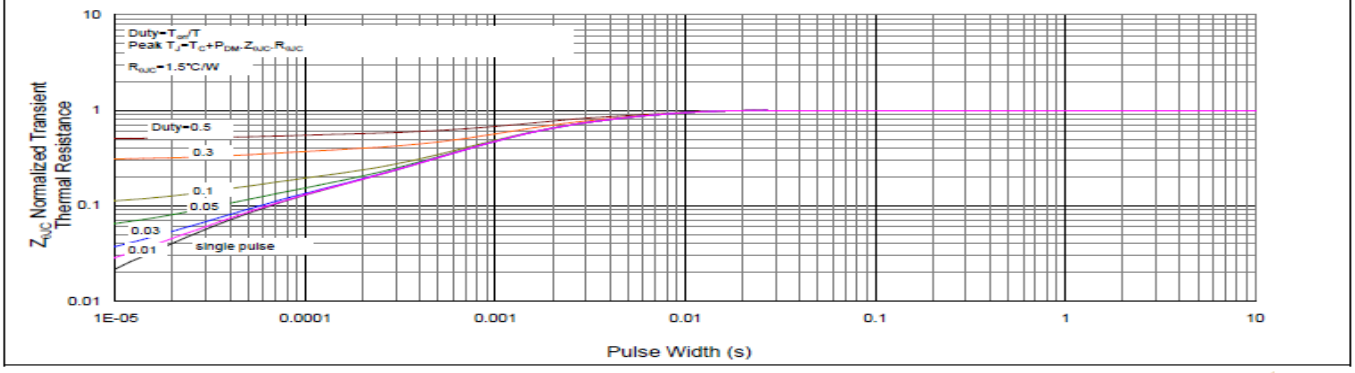
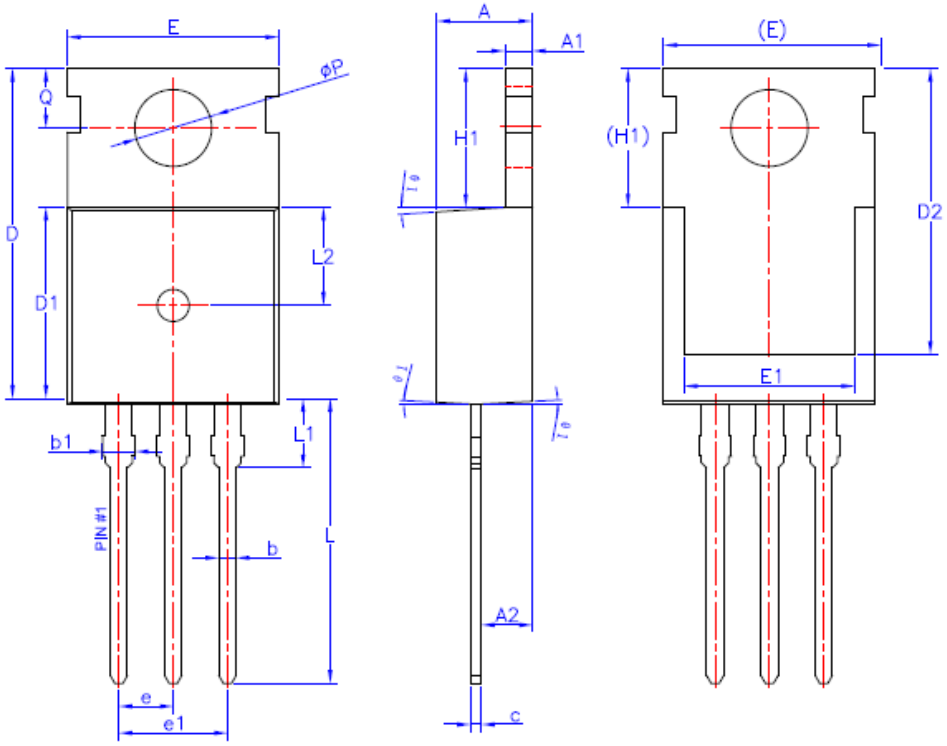


Figure 11. Normalized Maximum Transient Thermal Impedance, Junction-to-Case

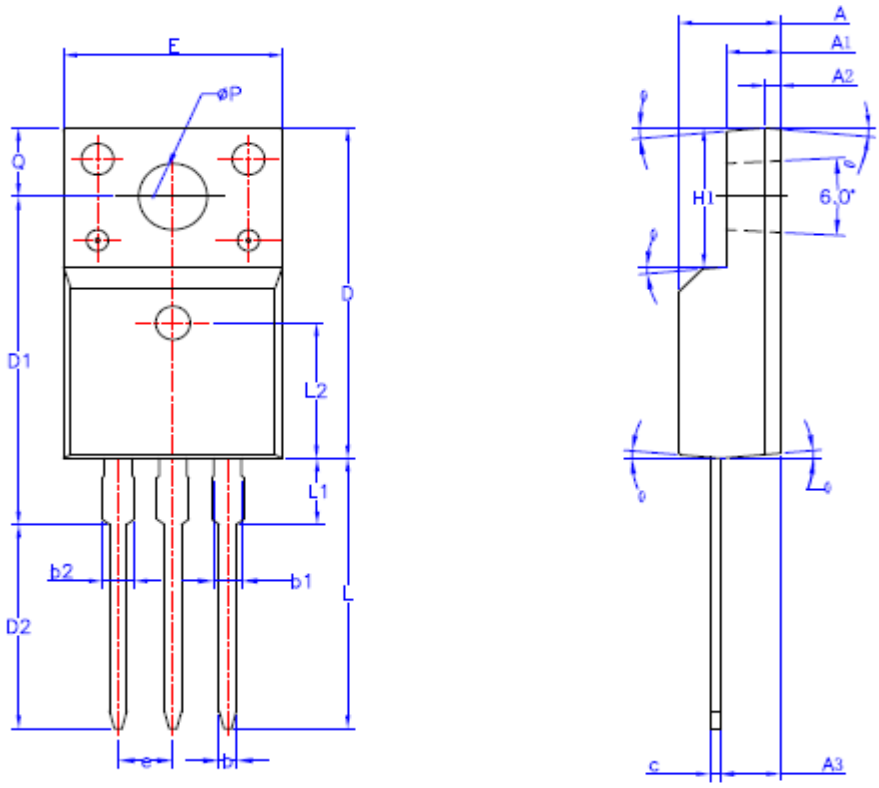


TO-220 PACKAGE OUTLINE



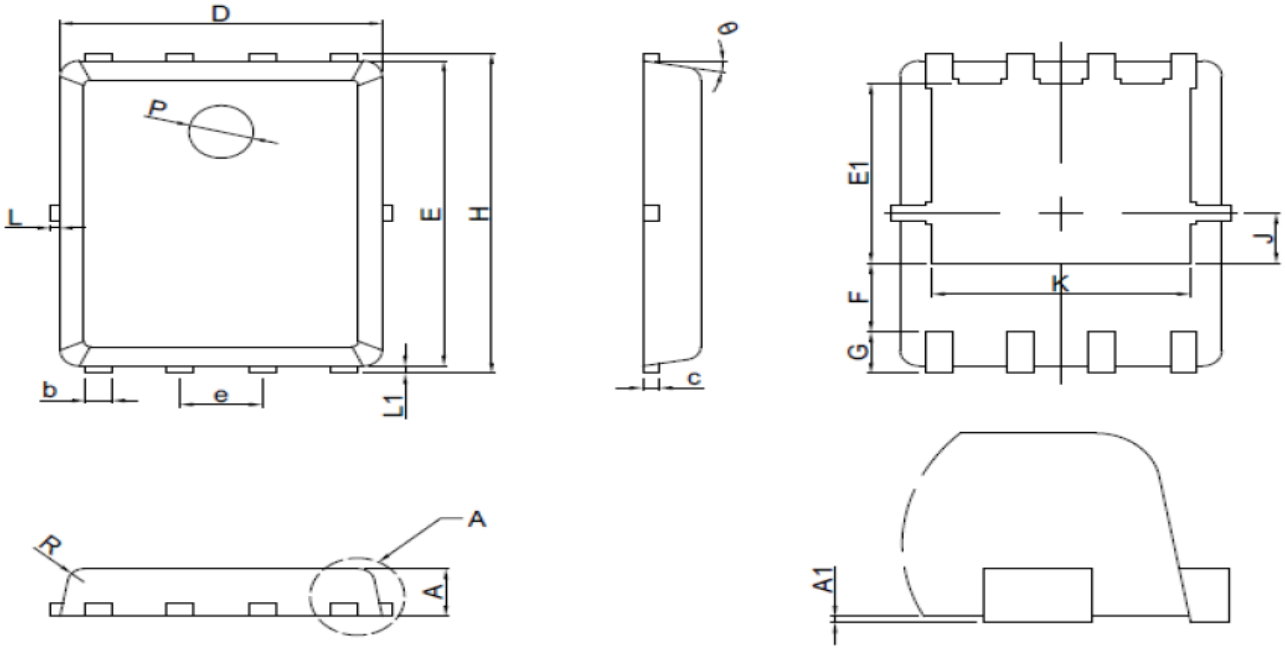
SYMBOL	MIN	NOM	MAX
A	4.40	4.50	4.60
A1	1.27	1.30	1.33
A2	2.30	2.40	2.50
b	0.70	–	0.90
b1	1.42	–	1.57
c	0.45	0.50	0.60
D	15.30	15.70	16.10
D1	9.10	9.20	9.30
D2	13.10	–	13.70
E	9.70	9.90	10.20
E1	7.80	8.00	8.20
e	2.54BSC		
e1	5.08BSC		
H1	6.30	6.50	6.70
L	12.78	13.08	13.38
L1	–	–	3.50
L2	4.60REF		
ØP	3.55	3.60	3.65
Q	2.73	–	2.87
θ1	1°	3°	5°

TO-220F-3L PACKAGE OUTLINE



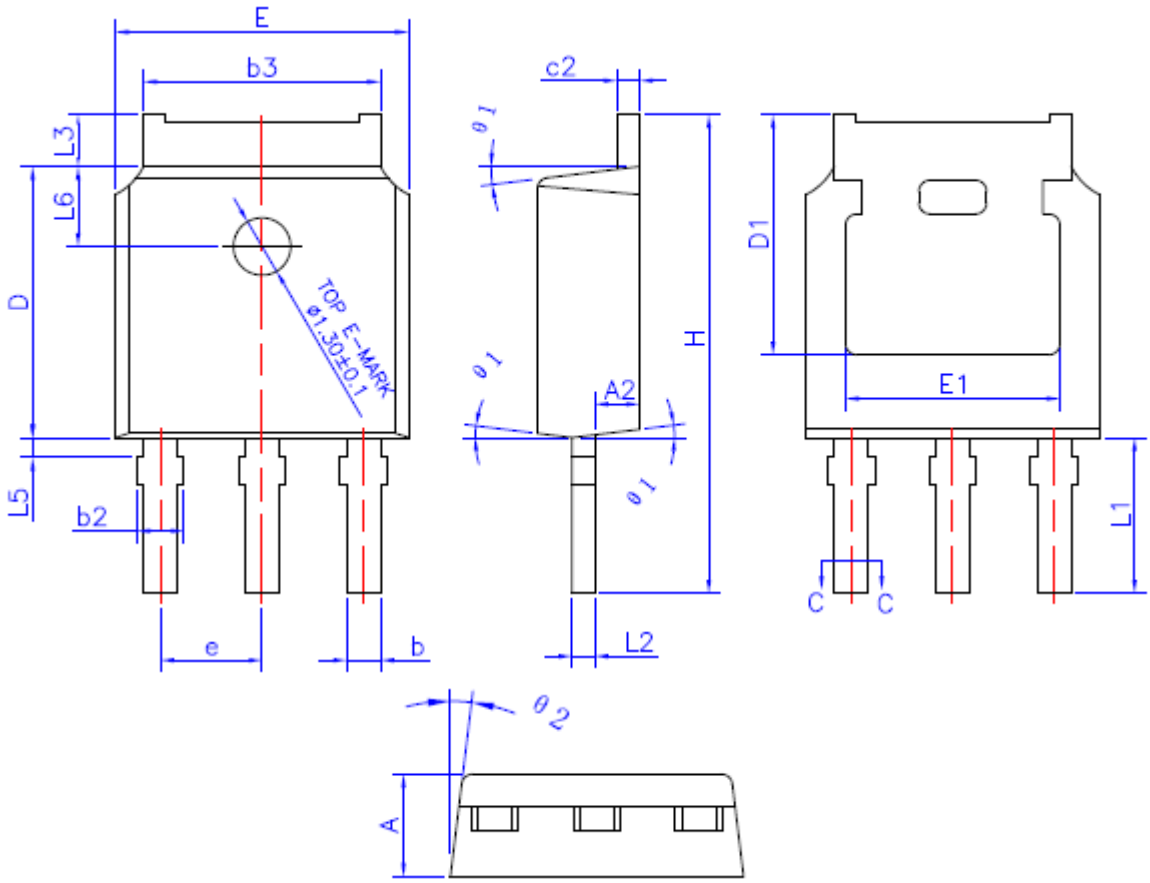
SYMBOL	MIN	NOM	MAX
A	4.50	4.70	4.83
A1	2.34	2.54	2.74
A2		0.70 REF	
A3	2.56	2.76	2.93
b	0.70	—	0.90
b1	1.18	—	1.38
b2	—	—	1.47
c	0.45	0.50	0.60
D	15.67	15.87	16.07
D1	15.55	15.75	15.95
D2	9.60	9.80	10.0
E	9.96	10.16	10.36
e		2.54BSC	
H1	6.48	6.68	6.88
L	12.68	12.98	13.28
L1	—	—	3.50
L2		6.50REF	
øP	3.08	3.18	3.28
Q	3.20	—	3.40
θ1	1°	3°	5°

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	

TO-251 PACKAGE OUTLINE



COMMON DIMENSIONS
(UNITS OF MEASURE =MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	2.20	2.30	2.38
A2	0.90	1.01	1.10
b	0.72	—	0.85
b1	0.71	0.76	0.81
b2	0.72	—	0.90
b3	5.13	5.33	5.46
c	0.47	—	0.60
c1	0.46	0.51	0.56
c2	0.47	—	0.60
D	6.00	6.10	6.20
D1	5.25	—	--
E	6.50	6.60	6.70
E1	4.70	—	--
e	2.186	2.286	2.386
H	10.40	10.70	11.00
L1		3.50 REF	
L2		0.508 BSC	
L3	0.90	—	1.25
L5	0.15	—	0.75
L6		1.80 REF	
θ1	5°	7°	9°
θ2	5°	7°	9°

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