



# SPN10T10

## N-Channel Enhancement Mode MOSFET

### DESCRIPTION

The SPN10T10 is the N-Channel enhancement mode power field effect transistor which is produced using super high cell density DMOS trench technology. The SPN10T10 has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers. It has been optimized for low gate charge, low  $R_{DS(ON)}$  and fast switching speed.

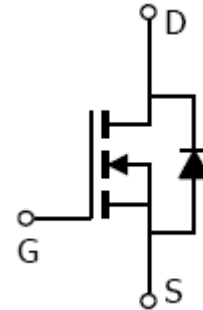
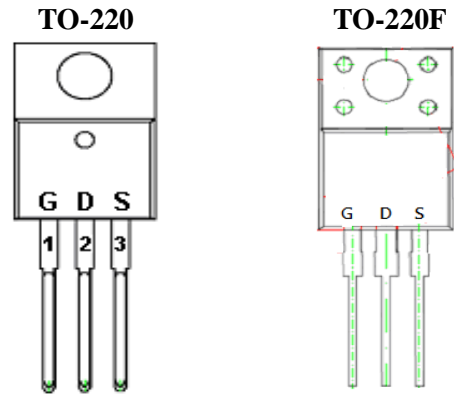
### FEATURES

- ◆ 100V/5A,  $R_{DS(ON)} = 160m\Omega @ V_{GS} = 10V$
- ◆ High density cell design for extremely low  $R_{DS(ON)}$
- ◆ Exceptional on-resistance and maximum DC current capability
- ◆ TO-220, TO-220F package design

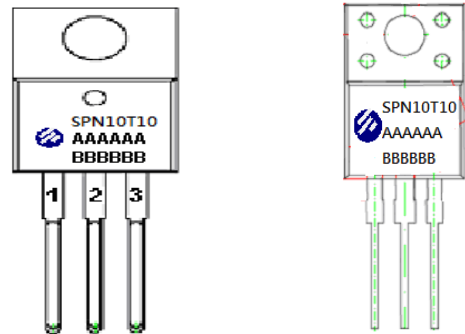
### APPLICATIONS

- Powered System
- DC/DC Converter
- Load Switch

### PIN CONFIGURATION



### PART MARKING



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

A: Lot Code  
B: Date Code  
(YYMMDD)



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### PIN DESCRIPTION

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

### ORDERING INFORMATION

Part Number	Package	Part Marking
SPN10T10T220TGB	TO-220	SPN10T10
SPN10T10T220FTGB	TO-220F	SPN10T10

※ SPN10T10T220TGB : Tube ; Pb – Free ; Halogen - Free

※ SPN10T10T220FTGB : Tube ; Pb – Free ; Halogen - Free

### ABSOLUTE MAXIMUM RATINGS

(TA=25°C Unless otherwise noted)

Parameter	Symbol	Typical	Unit
Drain-Source Voltage	V <sub>DSS</sub>	100	V
Gate –Source Voltage	V <sub>GSS</sub>	±20	V
Continuous Drain Current(T <sub>J</sub> =150°C)	I <sub>D</sub>	T <sub>C</sub> =25°C	9
		T <sub>C</sub> =100°C	5.6
Pulsed Drain Current	I <sub>DM</sub>	30	A
Avalanche Current	I <sub>AS</sub>	9	A
Power Dissipation	P <sub>D</sub>	T <sub>C</sub> = 25°C	28
		T <sub>C</sub> =100°C	10
Operating Junction Temperature	T <sub>J</sub>	150	°C
Storage Temperature Range	T <sub>STG</sub>	-55/150	°C
Thermal Resistance-Junction to Ambient	R <sub>θJA</sub>	65	°C/W



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### ELECTRICAL CHARACTERISTICS

(TA=25°C Unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ	Max.	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS}=0V, I_D=250\mu A$	100			V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1		3	
Gate Leakage Current	$I_{GSS}$	$V_{DS}=0V, V_{GS}=\pm 20V$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=80V, V_{GS}=0V$			25	uA
		$V_{DS}=80V, V_{GS}=0V$ $T_J=125^\circ C$			250	
On-State Drain Current	$I_{D(on)}$	$V_{DS}\geq 5V, V_{GS}=10V$	9			A
Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=5A$		0.110	0.160	$\Omega$
Forward Transconductance	$g_{fs}$	$V_{DS}=10V, I_D=5A$		5.6		S
Diode Forward Voltage	$V_{SD}$	$I_S=9A, V_{GS}=0V$			1.3	V
<b>Dynamic</b>						
Total Gate Charge	$Q_g$	$V_{DS}=80V, V_{GS}=10V$ $I_D=5A$		10	16	nC
Gate-Source Charge	$Q_{gs}$			2.5		
Gate-Drain Charge	$Q_{gd}$			4.5		
Input Capacitance	$C_{iss}$	$V_{DS}=25V, V_{GS}=0V$ $f=1MHz$		430		pF
Output Capacitance	$C_{oss}$			56		
Reverse Transfer Capacitance	$C_{rss}$			35		
Turn-On Time	$t_{d(on)}$	$V_{DD}=50V, R_L=10\Omega$ $I_D=5A, V_{GEN}=10V$ $R_G=3.3\Omega$		6.5		nS
	$t_r$			10		
Turn-Off Time	$t_{d(off)}$			13		
	$t_f$			3.4		



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## TYPICAL CHARACTERISTICS

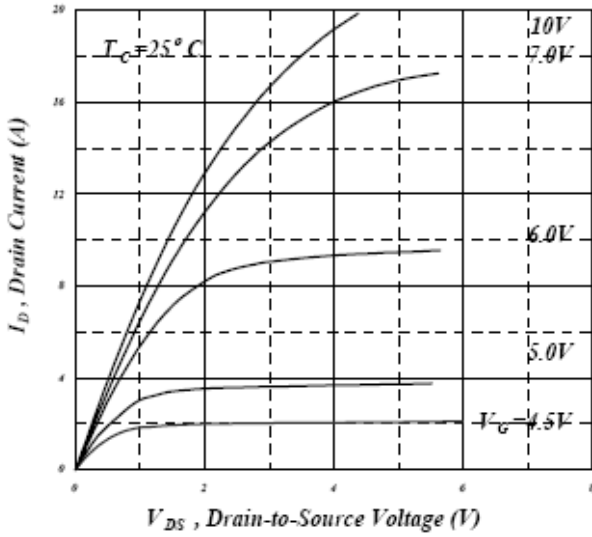


Fig 1. Typical Output Characteristics

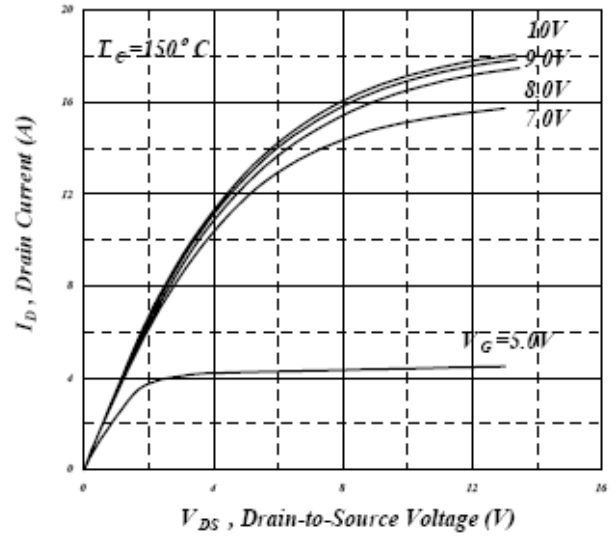


Fig 2. Typical Output Characteristics

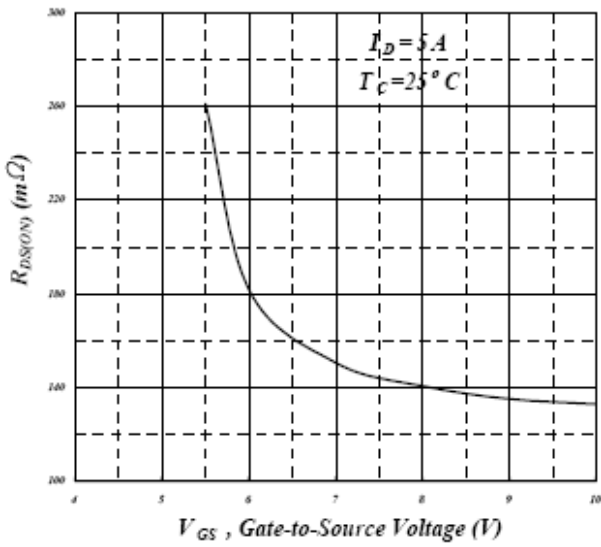


Fig 3. On-Resistance v.s. Gate Voltage

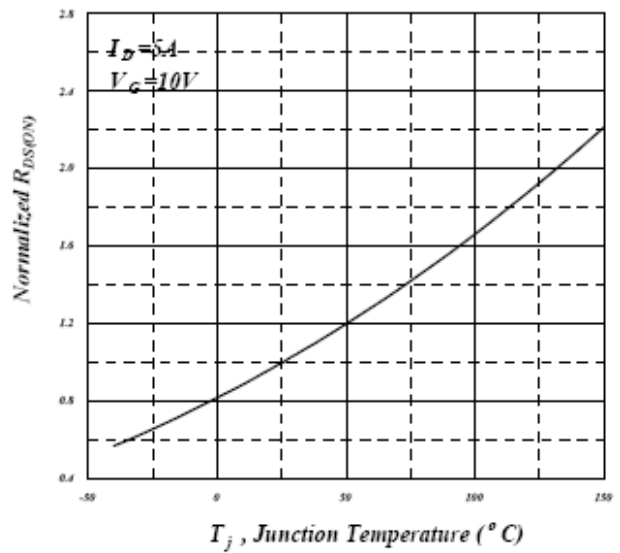


Fig 4. Normalized On-Resistance v.s. Junction Temperature



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## TYPICAL CHARACTERISTICS

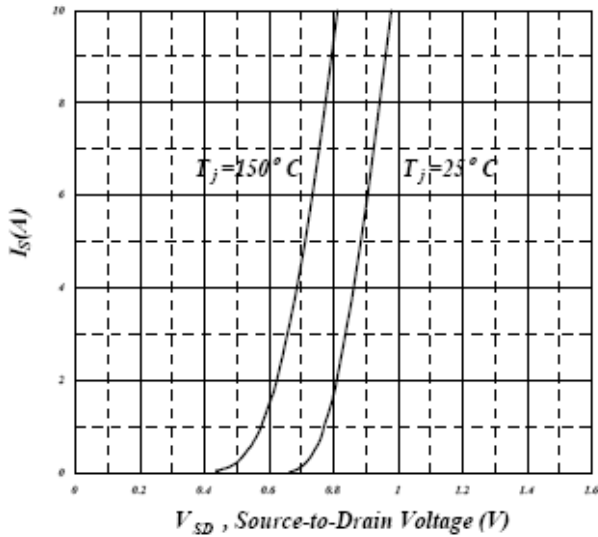


Fig 5. Forward Characteristic of Reverse Diode

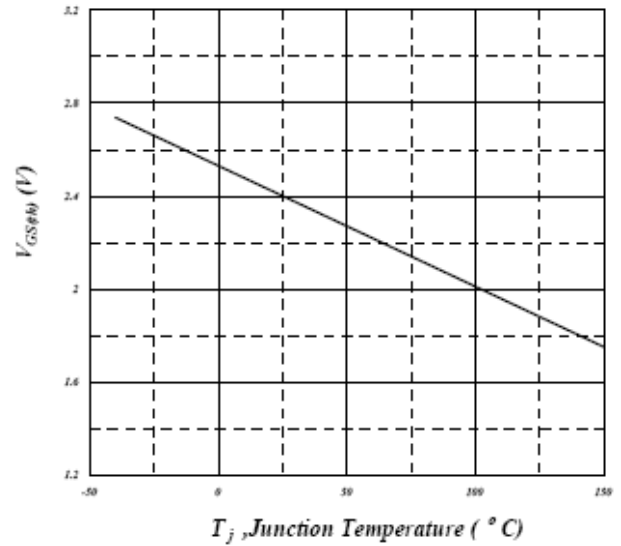


Fig 6. Gate Threshold Voltage v.s. Junction Temperature

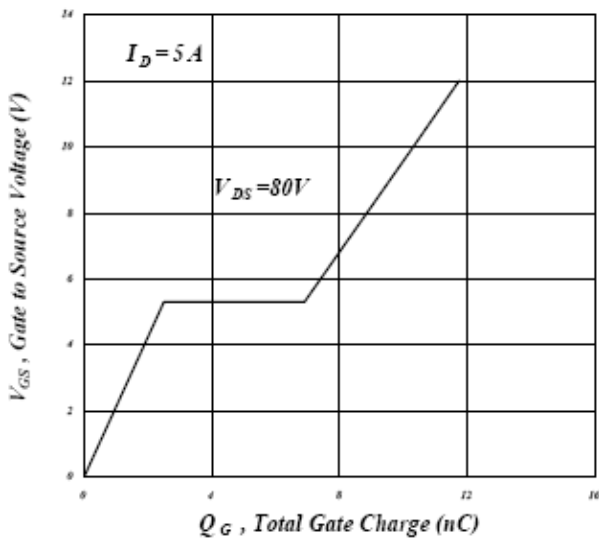


Fig 7. Gate Charge Characteristics

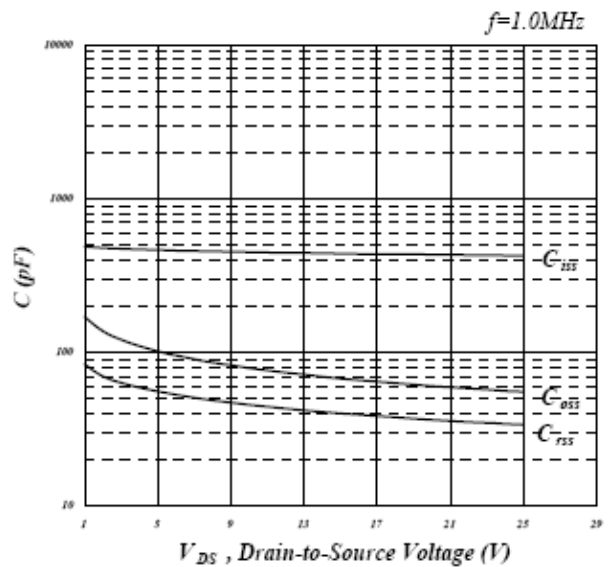


Fig 8. Typical Capacitance Characteristics



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## TYPICAL CHARACTERISTICS

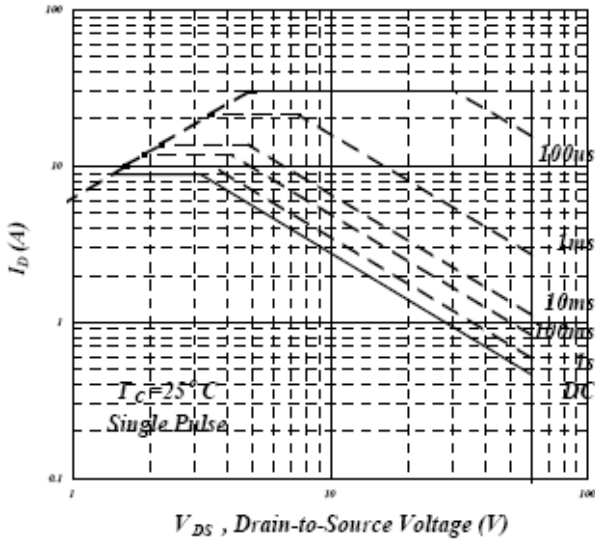


Fig 9. Maximum Safe Operating Area

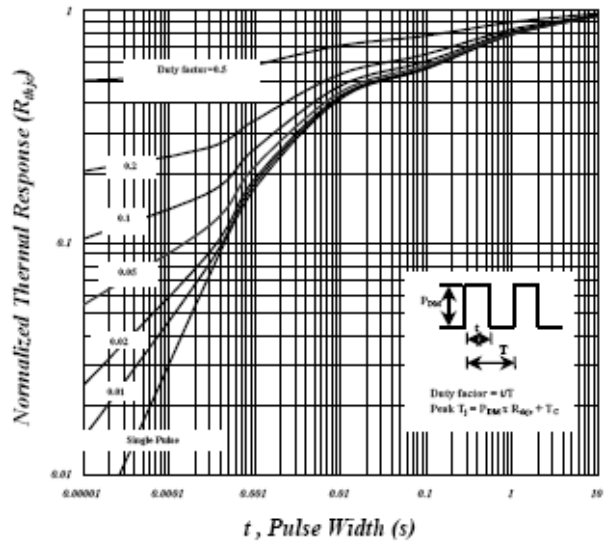


Fig 10. Effective Transient Thermal Impedance

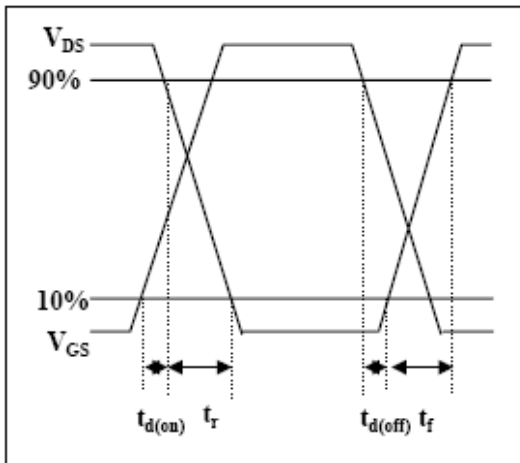


Fig 11. Switching Time Waveform

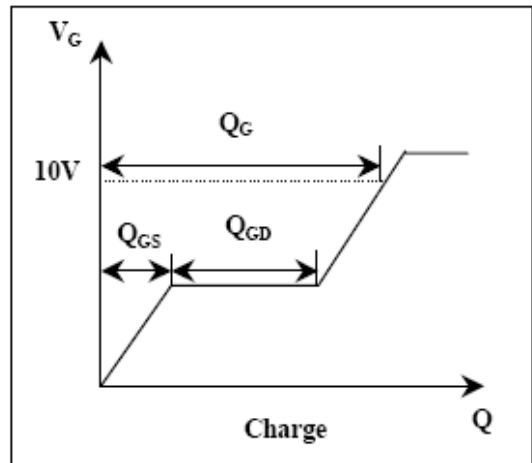


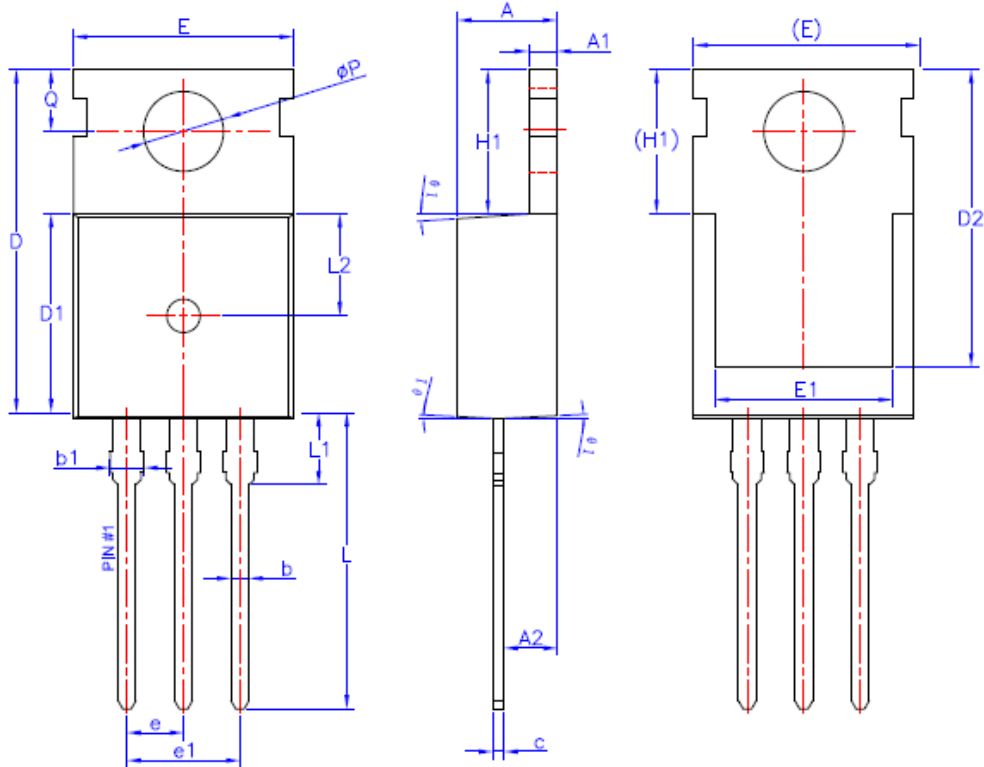
Fig 12. Gate Charge Waveform



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## N-Channel Enhancement Mode MOSFET

### TO-220 PACKAGE OUTLINE



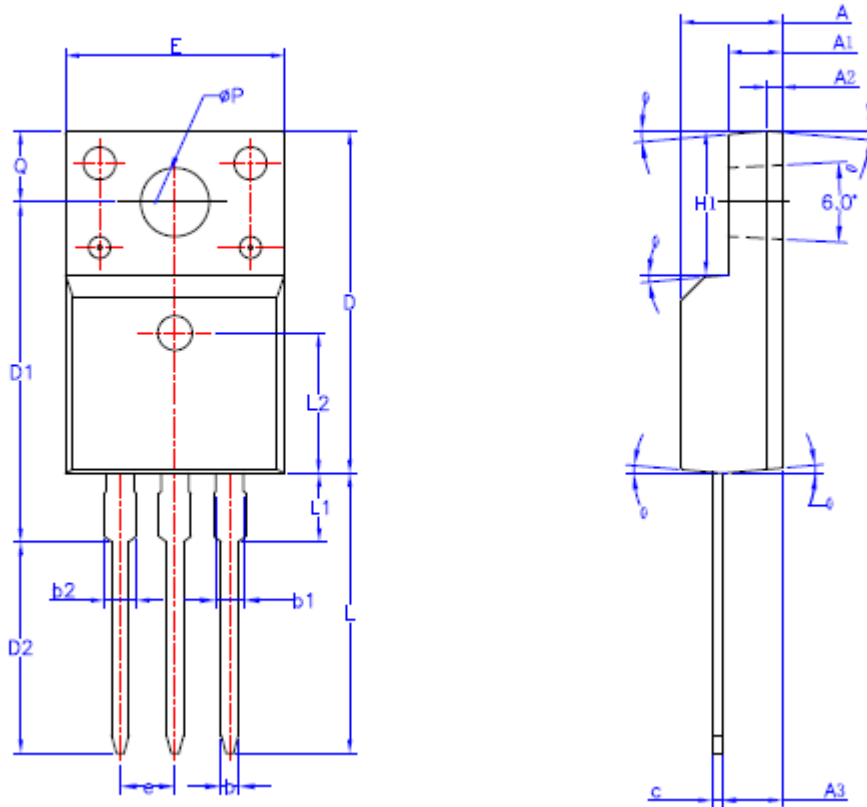
SYMBOL	MIN	NOM	MAX
A	4.40	4.50	4.60
A1	1.27	1.30	1.33
A2	2.30	2.40	2.50
b	0.70	—	0.90
b1	1.42	—	1.57
c	0.45	0.50	0.60
D	15.30	15.70	16.10
D1	9.10	9.20	9.30
D2	13.10	—	13.70
E	9.70	9.90	10.20
E1	7.80	8.00	8.20
e	2.54BSC		
e1	5.08BSC		
H1	6.30	6.50	6.70
L	12.78	13.08	13.38
L1	—	—	3.50
L2	4.60REF		
φP	3.55	3.60	3.65
Q	2.73	—	2.87
φ1	1°	3°	5°



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### TO-220F 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		
φP	3.08	3.18	3.28
Q	3.20	—	3.40
θ 1	1°	3°	5°





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