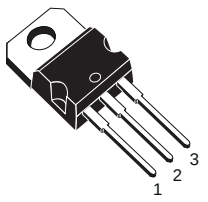
STP16NS25
STP16NS25FP

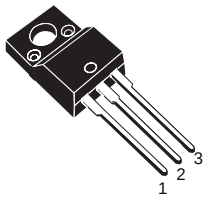
N-CHANNEL 250V - 0.23Ω - 16A TO-220 / TO-220FP
MESH OVERLAY™ MOSFET

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP16NS25	250 V	< 0.28 Ω	16 A
STP16NS25FP	250 V	< 0.28 Ω	16 A

- TYPICAL $R_{DS}(on)$ = 0.23 Ω
- EXTREMELY HIGH dv/dt CAPABILITY
- 100% AVALANCHE TESTED



TO-220

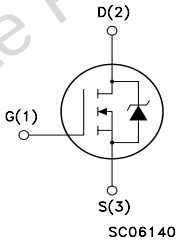


TO-220FP

DESCRIPTION

Using the latest high voltage MESH OVERLAY™ process, STMicroelectronics has designed an advanced family of power MOSFETs with outstanding performance. The new patented STrip layout coupled with the Company's proprietary edge termination structure, makes it suitable in coverters for lighting applications.

INTERNAL SCHEMATIC DIAGRAM



APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITH MODE POWER SUPPLIES (SMPS)
- DC-DC CONVERTERS FOR TELECOM, INDUSTRIAL, AND LIGHTING EQUIPMENT
- IDEAL FOR MONITOR's B+ FUNCTION

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP16NS25	STP16NS25FP	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	250		V
V_{DGR}	Drain-gate Voltage (R_{GS} = 20 kΩ)	250		V
V_{GS}	Gate- source Voltage	± 20		V
I_D	Drain Current (continuos) at T_C = 25°C	16	16(*)	A
I_D	Drain Current (continuos) at T_C = 100°C	11	11(*)	A
I_{DM} (•)	Drain Current (pulsed)	64	64(*)	A
P_{TOT}	Total Dissipation at T_C = 25°C	140	40	W
	Derating Factor	1	0.33	W/°C
dv/dt (1)	Peak Diode Recovery voltage slope	5		V/ns
V_{ISO}	Insulation Withstand Voltage (DC)	-	2500	V
T_{stg}	Storage Temperature	–65 to 150		°C
T_j	Max. Operating Junction Temperature			

(•)Pulse width limited by safe operating area

(1) I_{SD}≤ 16A, di/dt≤300 A/µs, V_{DD}≤ $V_{(BR)DSS}$, Tj≤T_{jMAX}
(*) Limited only by maximum temperature allowed

THERMAL DATA

		TO-220	TO-220FP	°C/W
Rthj-case	Thermal Resistance Junction-case Max	0.9	3	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	62.5		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose	300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max)	16	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 50 V)	600	mJ

ELECTRICAL CHARACTERISTICS (TCASE = 25 °C UNLESS OTHERWISE SPECIFIED)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA, V_{GS} = 0	250			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating			1	µA
		V_{DS} = Max Rating, T_C = 125 °C			10	µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			±100	nA

ON (1)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$, I_D = 250µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V, I_D = 8 A		0.23	0.28	Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (1)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$, I_D = 8 A		15		S
C_{iss}	Input Capacitance	V_{DS} = 25V, f = 1 MHz, V_{GS} = 0		1270		pF
C_{oss}	Output Capacitance			190		pF
C_{rss}	Reverse Transfer Capacitance			74		pF

ELECTRICAL CHARACTERISTICS (CONTINUED)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	V_{DD} = 125 V, I_D = 8 A		14.5		ns
t_r	Rise Time	R_G = 4.7Ω V_{GS} = 10 V (see test circuit, Figure 3)		26		ns
Q_g	Total Gate Charge	V_{DD} = 200V, I_D = 16 A,		59	83	nC
Q_{gs}	Gate-Source Charge	V_{GS} = 10V		7.9		nC
Q_{gd}	Gate-Drain Charge			22.3		nC

SWITCHING OFF

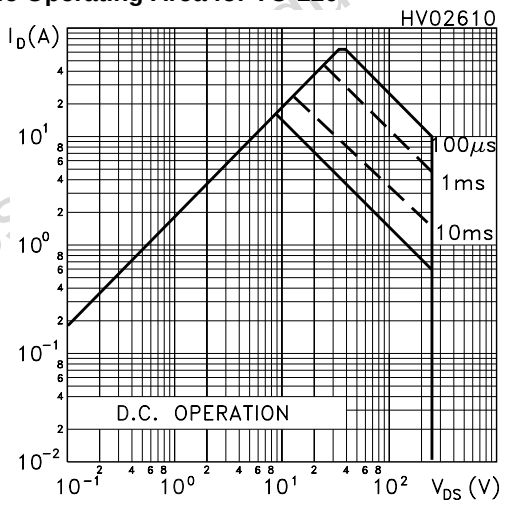
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(Voff)}$	Turn-off- Delay Time	V_{DD} = 125V, I_D = 8 A,		72		ns
t_f	Fall Time	R_G = 4.7Ω, V_{GS} = 10V (see test circuit, Figure 3)		32		ns
$t_{r(Voff)}$	Off-voltage Rise Time	V_{clamp} = 200V, I_D = 16 A,		24		ns
t_f	Fall Time	R_G = 4.7Ω, V_{GS} = 10V		28		ns
t_c	Cross-over Time	(see test circuit, Figure 5)		56		ns

SOURCE DRAIN DIODE

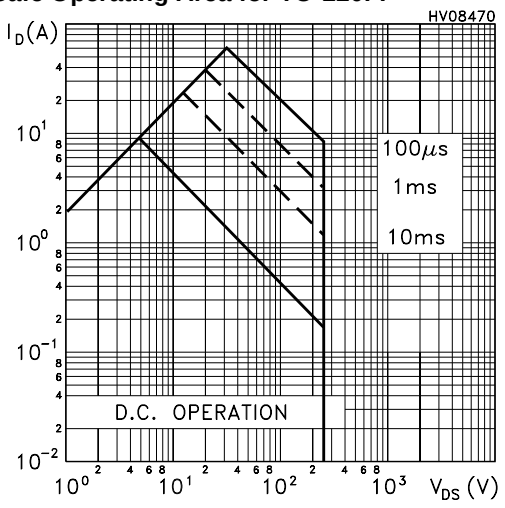
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				16	A
I_{SDM} (2)	Source-drain Current (pulsed)				64	A
V_{SD} (1)	Forward On Voltage	I_{SD} = 16 A, V_{GS} = 0			1.5	V
t_{rr}	Reverse Recovery Time	I_{SD} = 16 A, di/dt = 100A/µs		270		ns
Q_{rr}	Reverse Recovery Charge	V_{DD} = 30V, T_j = 150°C		1.5		µC
I_{RRM}	Reverse Recovery Current	(see test circuit, Figure 5)		11.4		A

Note: 1. Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %.
2. Pulse width limited by safe operating area.

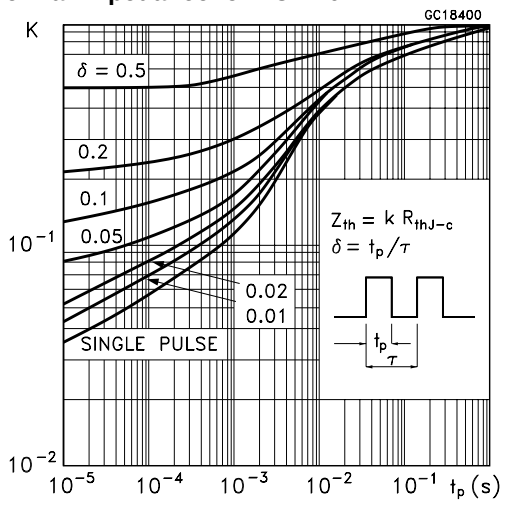
Safe Operating Area for TO-220



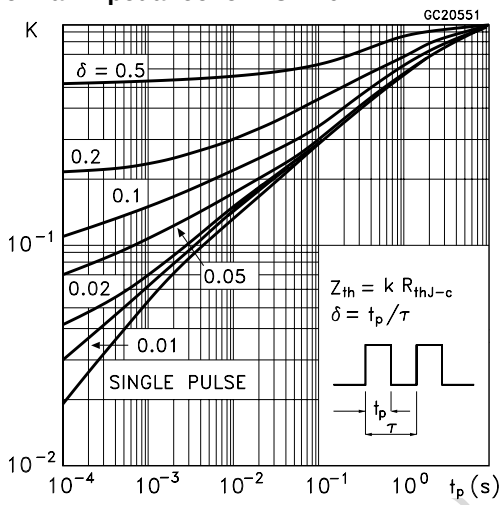
Safe Operating Area for TO-220FP



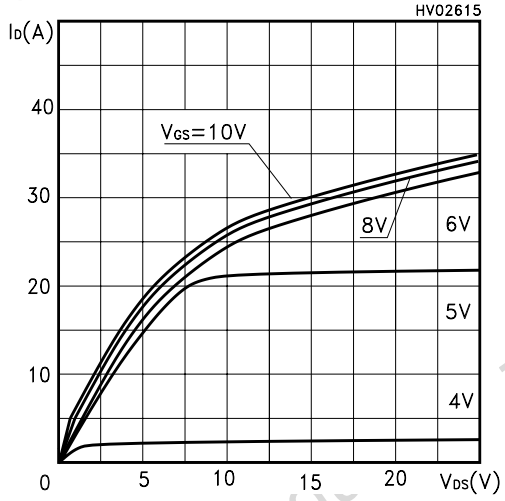
Thermal Impedance for TO-220



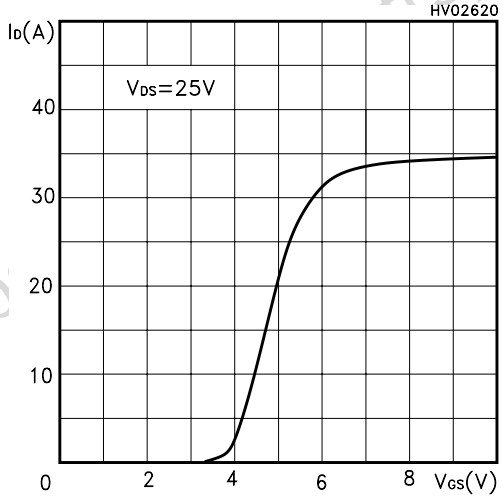
Thermal Impedance for TO-220FP



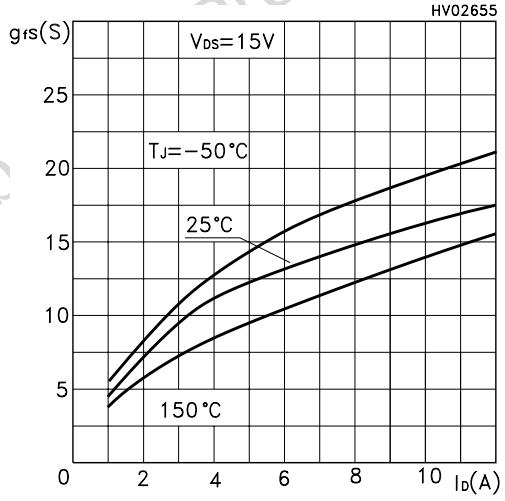
Output Characteristics



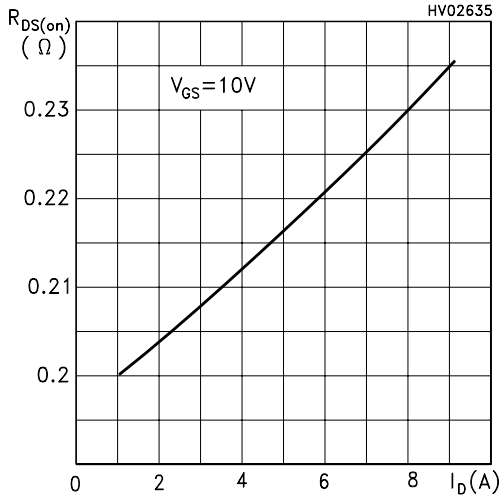
Transfer Characteristics



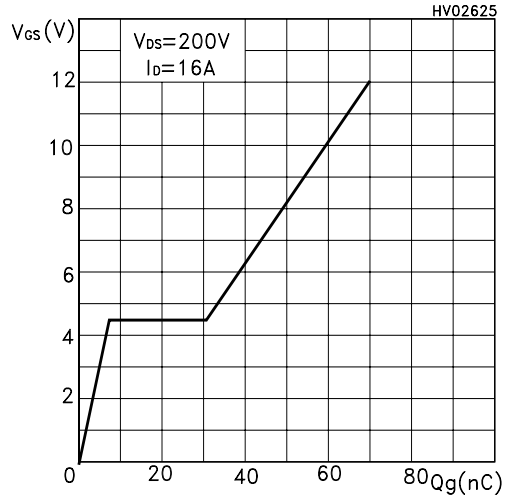
Transconductance



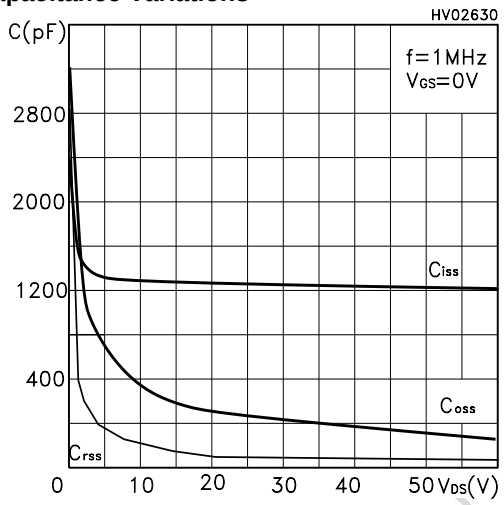
Static Drain-source On Resistance



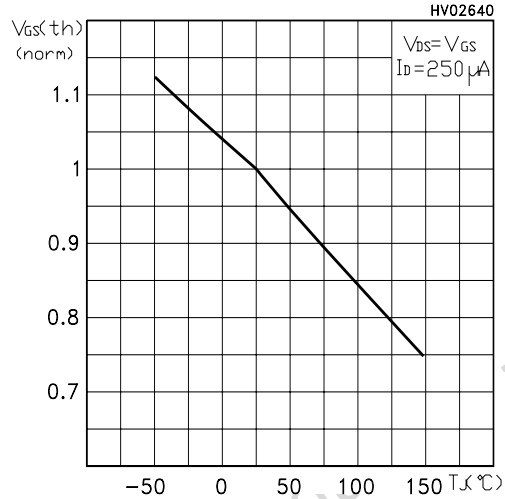
Gate Charge vs Gate-source Voltage



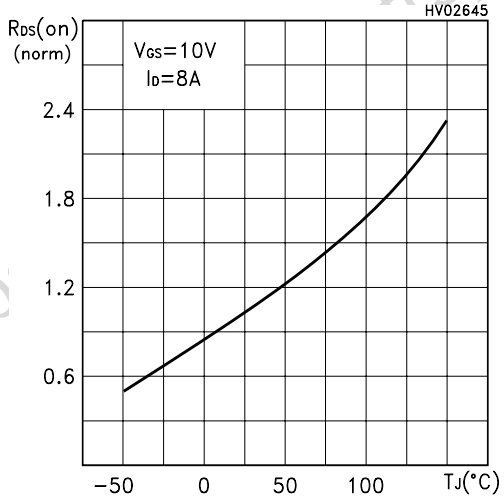
Capacitance Variations



Normalized Gate Thereshold Voltage vs Temp.



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics

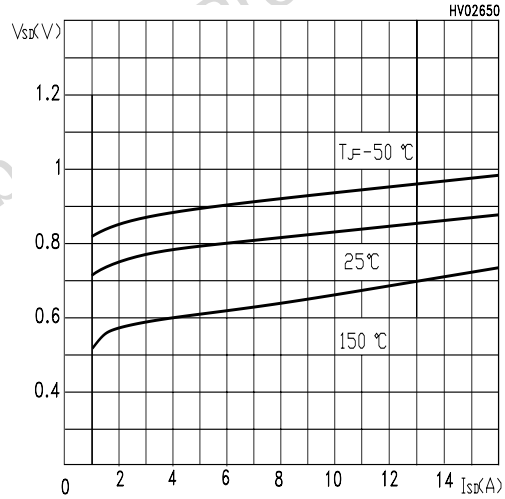


Fig. 1: Unclamped Inductive Load Test Circuit

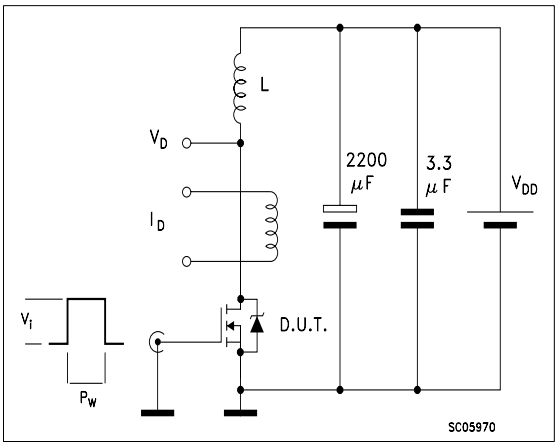


Fig. 2: Unclamped Inductive Waveform

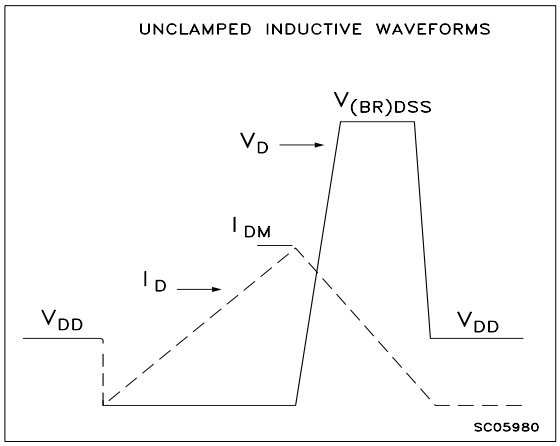


Fig. 3: Switching Times Test Circuit For Resistive Load

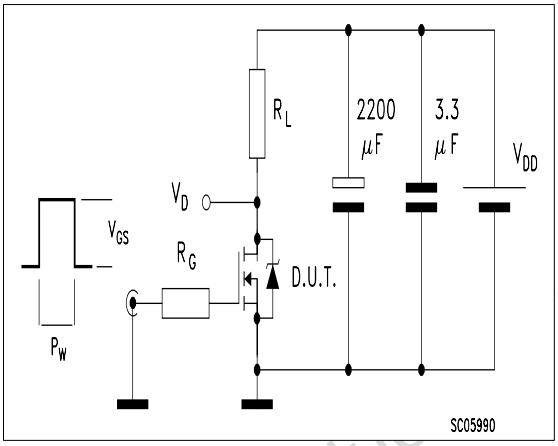


Fig. 4: Gate Charge test Circuit

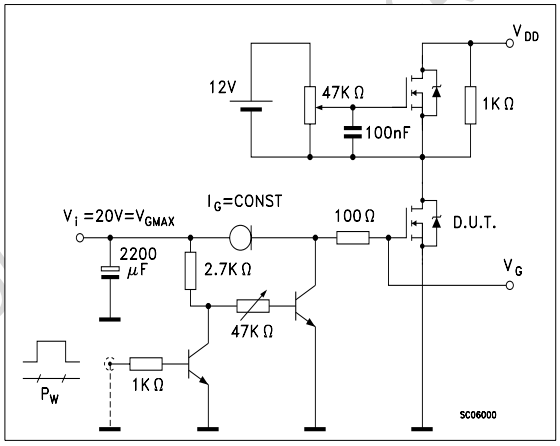
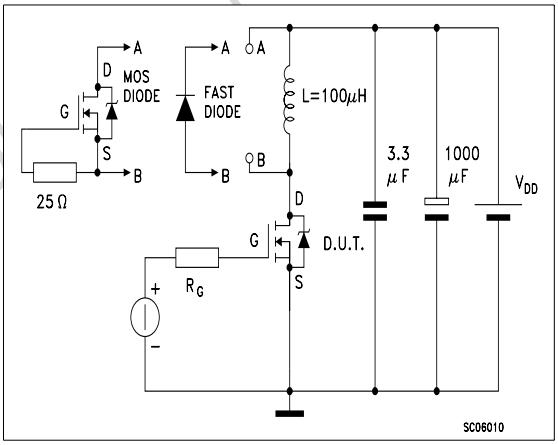
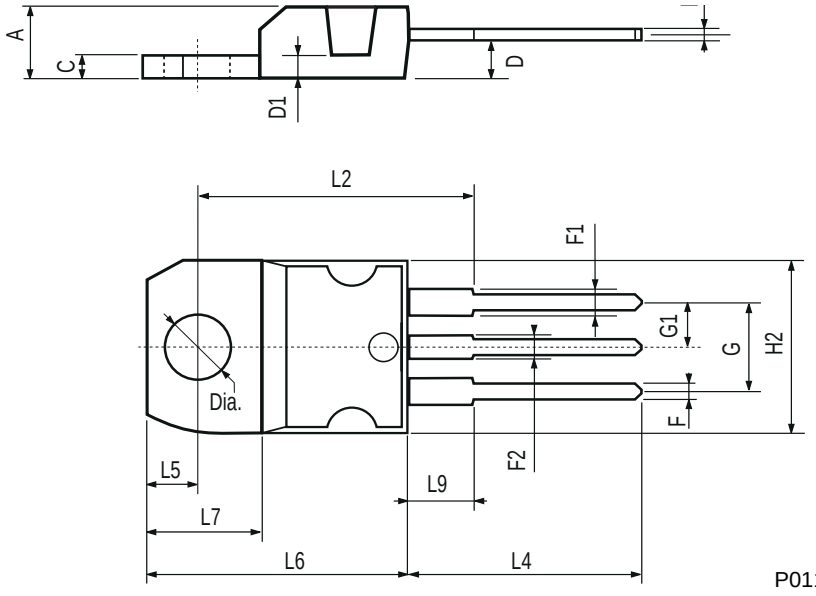


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



TO-220 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
C	1.23		1.32	0.048		0.051
D	2.40		2.72	0.094		0.107
D1		1.27			0.050	
E	0.49		0.70	0.019		0.027
F	0.61		0.88	0.024		0.034
F1	1.14		1.70	0.044		0.067
F2	1.14		1.70	0.044		0.067
G	4.95		5.15	0.194		0.203
G1	2.4		2.7	0.094		0.106
H2	10.0		10.40	0.393		0.409
L2		16.4			0.645	
L4	13.0		14.0	0.511		0.551
L5	2.65		2.95	0.104		0.116
L6	15.25		15.75	0.600		0.620
L7	6.2		6.6	0.244		0.260
L9	3.5		3.93	0.137		0.154
DIA.	3.75		3.85	0.147		0.151



TO-220FP MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
B	2.5		2.7	0.098		0.106
D	2.5		2.75	0.098		0.108
E	0.45		0.7	0.017		0.027
F	0.75		1	0.030		0.039
F1	1.15		1.7	0.045		0.067
F2	1.15		1.7	0.045		0.067
G	4.95		5.2	0.195		0.204
G1	2.4		2.7	0.094		0.106
H	10		10.4	0.393		0.409
L2		16			0.630	
L3	28.6		30.6	1.126		1.204
L4	9.8		10.6	0.385		0.417
L6	15.9		16.4	0.626		0.645
L7	9		9.3	0.354		0.366
Ø	3		3.2	0.118		0.126