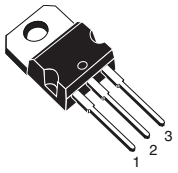
STP16NF06
STP16NF06FP

N-channel 60V - 0.08Ω - 16A - TO-220/TO-220FP
STripFET™ II Power MOSFET

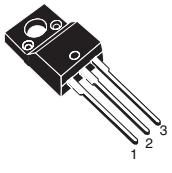
General features

Type	V_{DSS}	$R_{DS(on)}$	I_D
STP16NF06	60V	<0.1Ω	16A
STP16NF06FP	60V	<0.1Ω	11A

- Exceptional dv/dt capability
- Low gate charge at 100°C
- Application oriented characterization



TO-220

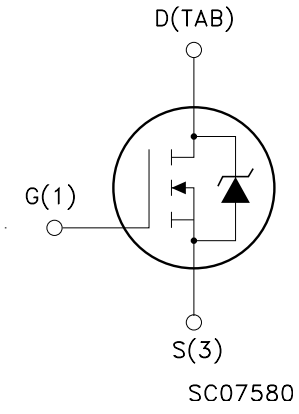


TO-220FP

Description

This Power MOSFET is the latest development of STMicroelectronics unique "Single Feature Size™" strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and less critical alignment steps therefore a remarkable manufacturing reproducibility.

Internal schematic diagram



Applications

- Switching application

Order codes

Part number	Marking	Package	Packaging
STP16NF06	P16NF06	TO-220	Tube
STP16NF06FP	P16NF06	TO-220FP	Tube

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2 Electrical characteristics 4

2.1 Electrical characteristics (curves) 6

3 Test circuit 9

4 Package mechanical data 10

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1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value		Unit
		TO-220	TO-220FP	
V_{DS}	Drain-source voltage (V_{GS} = 0)	60		V
V_{GS}	Gate- source voltage	± 20		V
I_D	Drain current (continuous) at T_C = 25°C	16	11(1)	A
I_D	Drain current (continuous) at T_C = 100°C	11	7.5(1)	A
I_{DM}(2)	Drain current (pulsed)	64	44(1)	A
P_{tot}	Total dissipation at T_C = 25°C	45	25	W
	Derating factor	0.3	0.17	W/°C
dv/dt (3)	Peak diode recovery voltage slope	20		V/ns
E_{AS} (4)	Single pulse avalanche energy	130		mJ
I_{AR}	Avalanche current, repetitive or not-repetitive	16		A
V_{ISO}	Insulation withstand voltage (DC)	--	2500	V
T_{stg}	Storage temperature	-55 to 175		°C
T_j	Max. operating junction temperature			

1. Current limited by package's thermal resistance
2. Pulse width limited by safe operating area.
3. I_{SD} ≤16A, di/dt ≤200A/µs, V_{DD} ≤$V_{(BR)DSS}$, Tj ≤T_{JMAX}
4. Starting T_j = 25 °C, I_D = 8A, V_{DD} = 30V

Table 2. Thermal data

		TO-220	TO-220FP	
Rthj-case	Thermal resistance junction-case max	3.33	6	°C/W
Rthj-amb	Thermal resistance junction-ambient max	62.5		°C/W
T_J	Maximum lead temperature for soldering purpose	300		°C

2 Electrical characteristics

(T_{CASE}=25°C unless otherwise specified)

Table 3. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	I_D = 250µA, V_{GS} =0	60			V
I_{DSS}	Zero gate voltage drain current (V_{GS} = 0)	V_{DS} = max ratings V_{DS} = max ratings, T_C = 125°C			1 10	µA µA
I_{GSS}	Gate-body leakage current (V_{DS} = 0)	V_{GS} = ± 20V			±100	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 250µA	2		4	V
$R_{DS(on)}$	Static drain-source on resistance	V_{GS} = 10V, I_D = 8A		0.08	0.1	Ω

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
g_{fs} (1)	Forward transconductance	V_{DS} = 15V, I_D = 8A		6.5		S
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	V_{DS} = 25V, f = 1MHz, V_{GS} = 0		315 70 30		pF pF pF
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on delay time Rise time Turn-off delay time Fall time	V_{DD} = 30V, I_D = 8A R_G = 4.7Ω V_{GS} = 10V (see *Figure 15*)		7 18 17 6		ns ns ns ns
Q_g Q_{gs} Q_{gd}	Total gate charge Gate-source charge Gate-drain charge	V_{DD} = 48V, I_D = 16A, V_{GS} = 10V (see *Figure 16*)		10 3.5 3.5	13	nC nC nC

1. Pulsed: Pulse duration = 300 µs, duty cycle 1.5%.

Table 5. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM} (1)	Source-drain current Source-drain current (pulsed)				16 64	A A
V_{SD} (2)	Forward on voltage	I_{SD} = 16A, V_{GS} = 0			1.3	V
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_{SD} = 15A, di/dt = 100A/µs, V_{DD} = 30V, T_j = 150°C (see *Figure 17*)		50 88 3.5		ns nC A

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

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area for TO-220

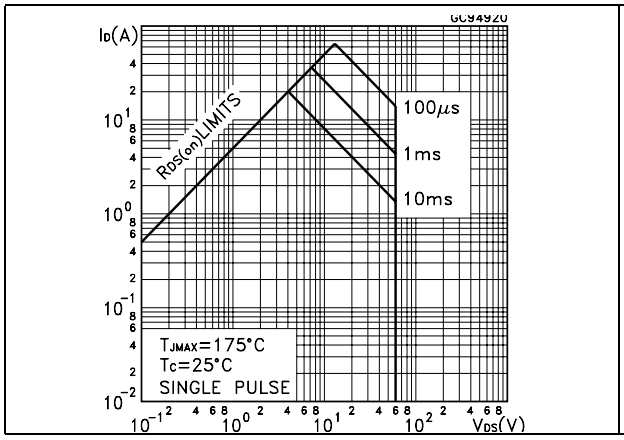


Figure 2. Thermal impedance for TO-220

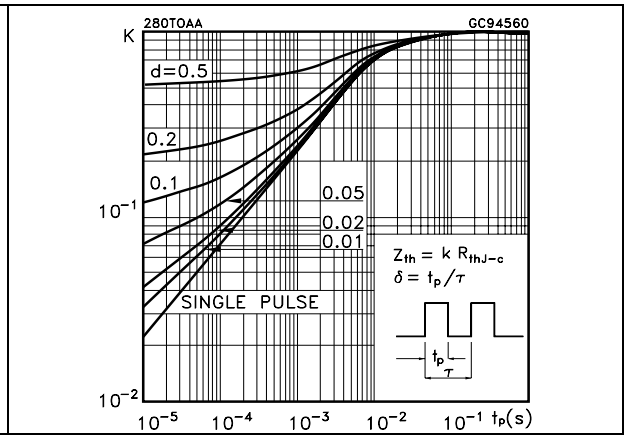


Figure 3. Safe operating area for TO-220FP

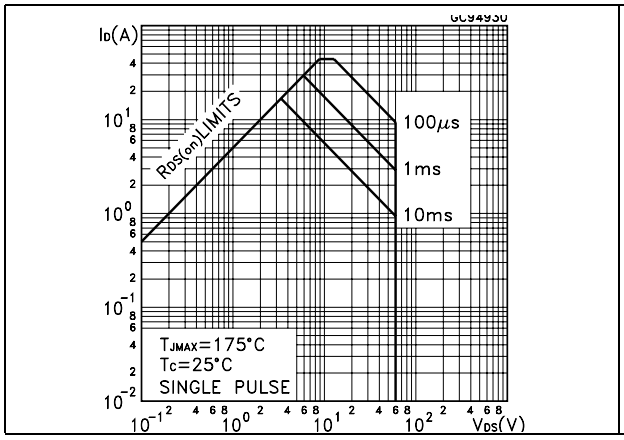


Figure 4. Thermal impedance for TO-220FP

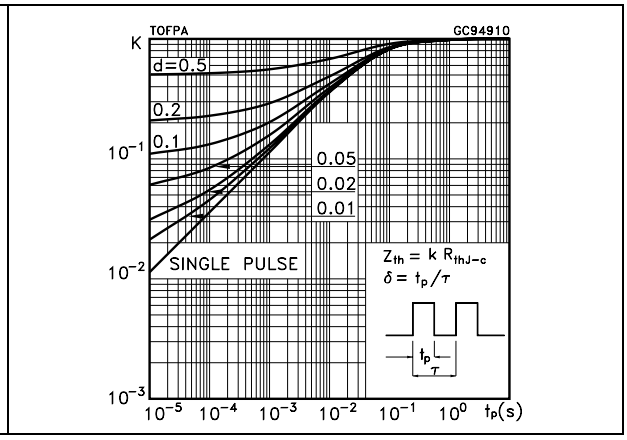


Figure 5. Output characteristics

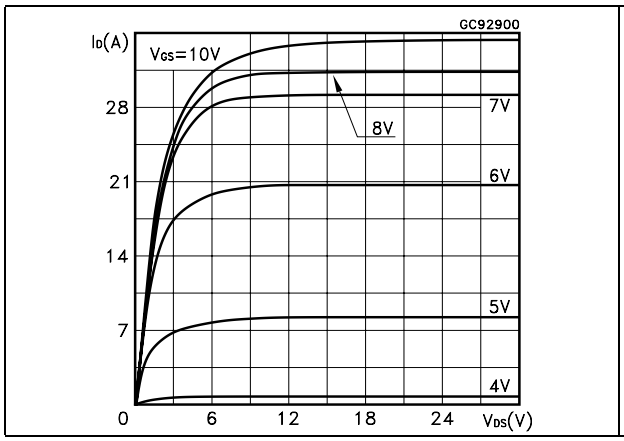


Figure 6. Transfer characteristics

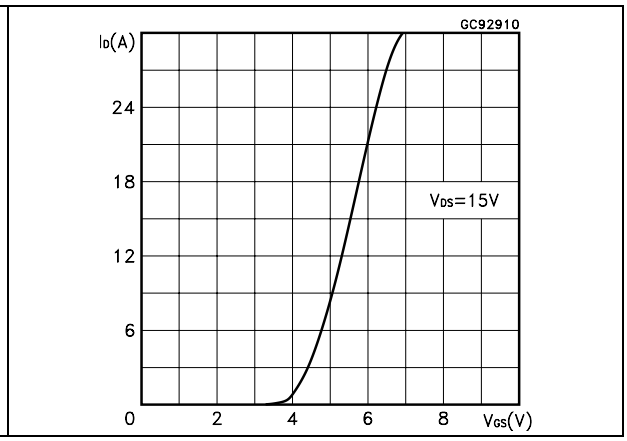


Figure 7. Transconductance

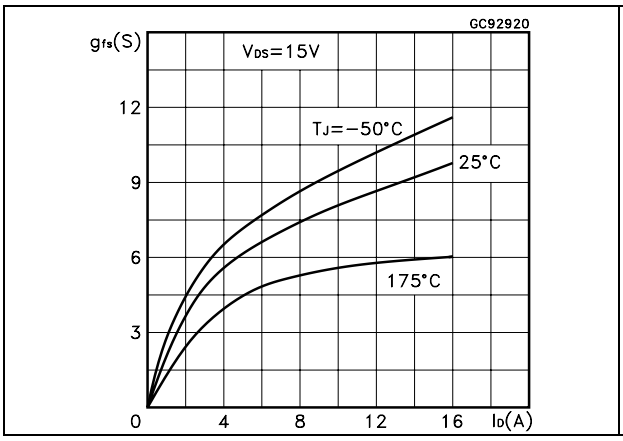


Figure 8. Static drain-source on resistance

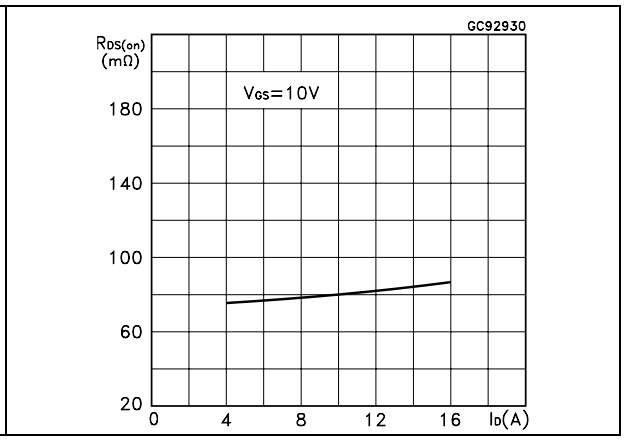


Figure 9. Gate charge vs. gate-source voltage

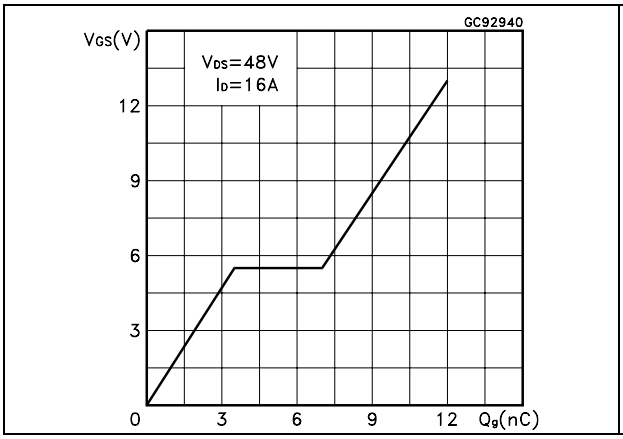


Figure 10. Capacitance variations

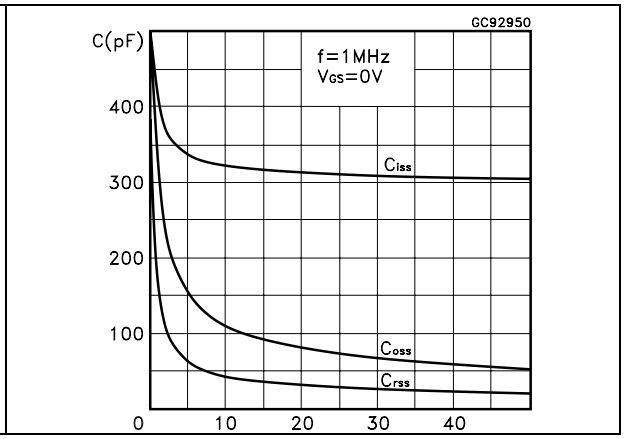


Figure 11. Normalized gate threshold voltage vs. temperature

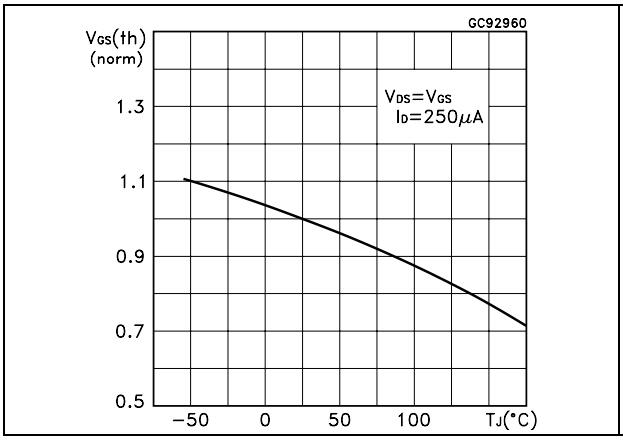


Figure 12. Normalized on resistance vs. temperature

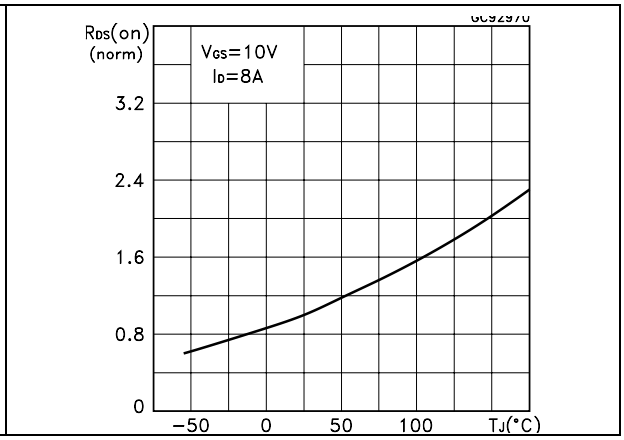


Figure 13. Source-drain diode forward characteristics

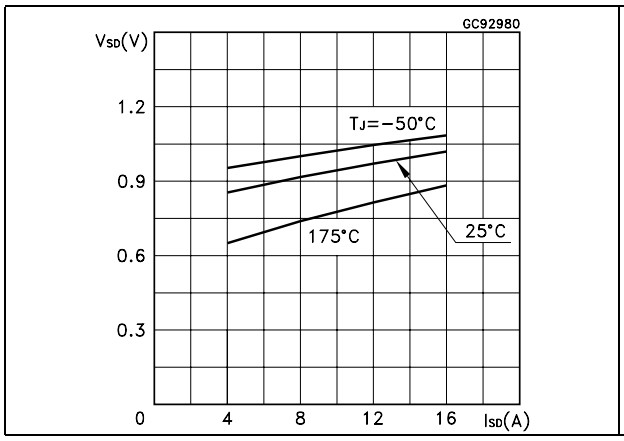
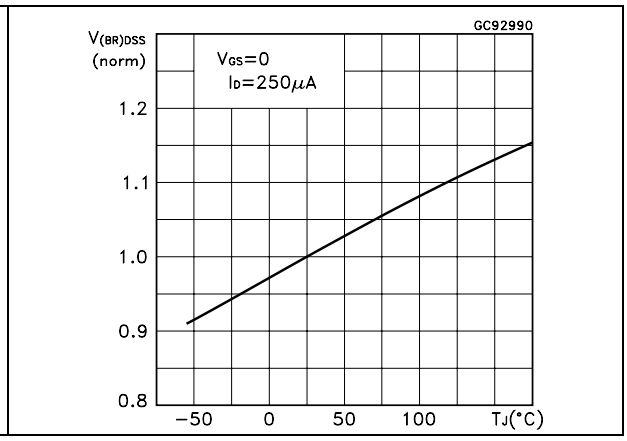


Figure 14. Normalized B_{VDSS} vs. temperature



3 Test circuit

Figure 15. Switching times test circuit for resistive load

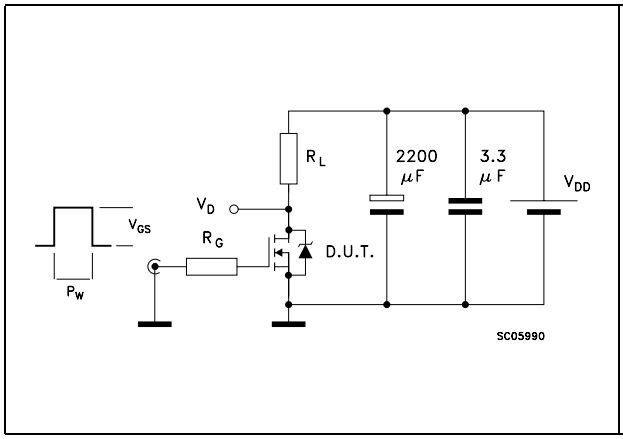


Figure 16. Gate charge test circuit

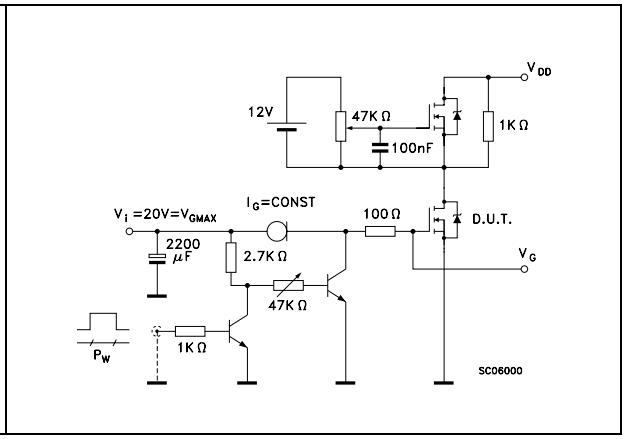


Figure 17. Test circuit for inductive load switching and diode recovery times

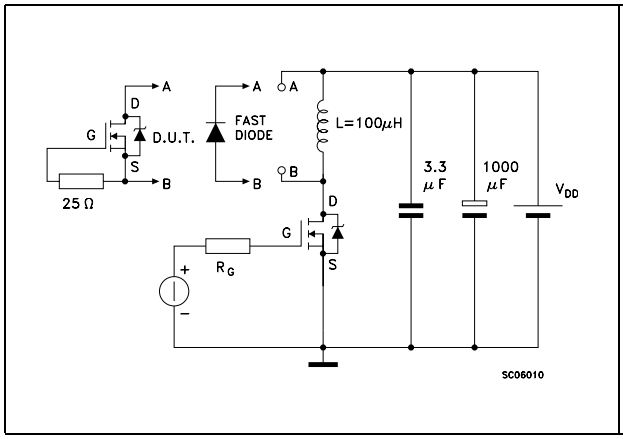


Figure 18. Unclamped Inductive load test circuit

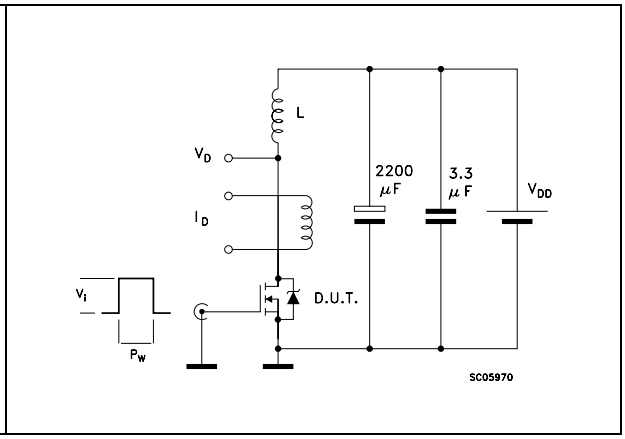


Figure 19. Unclamped inductive waveform

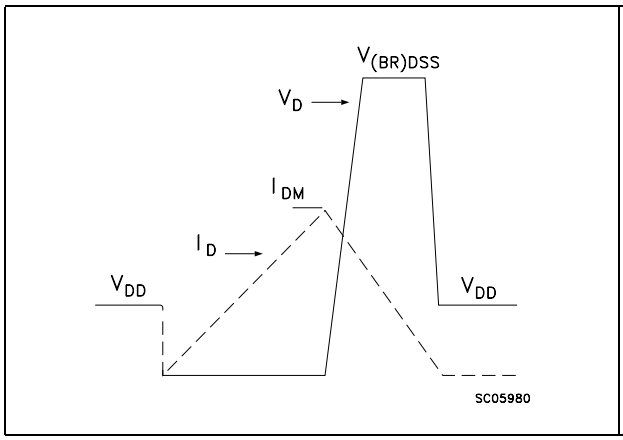
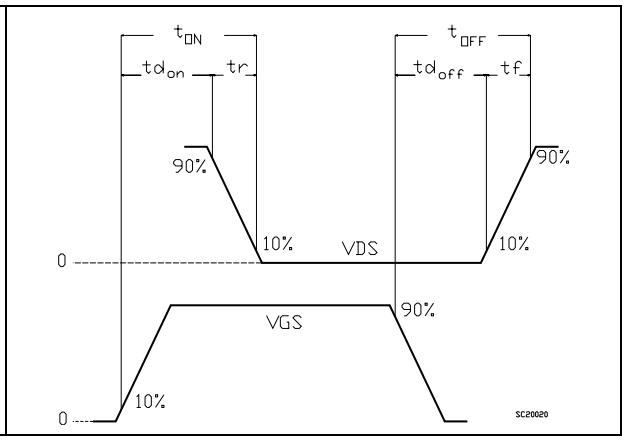


Figure 20. Switching time waveform

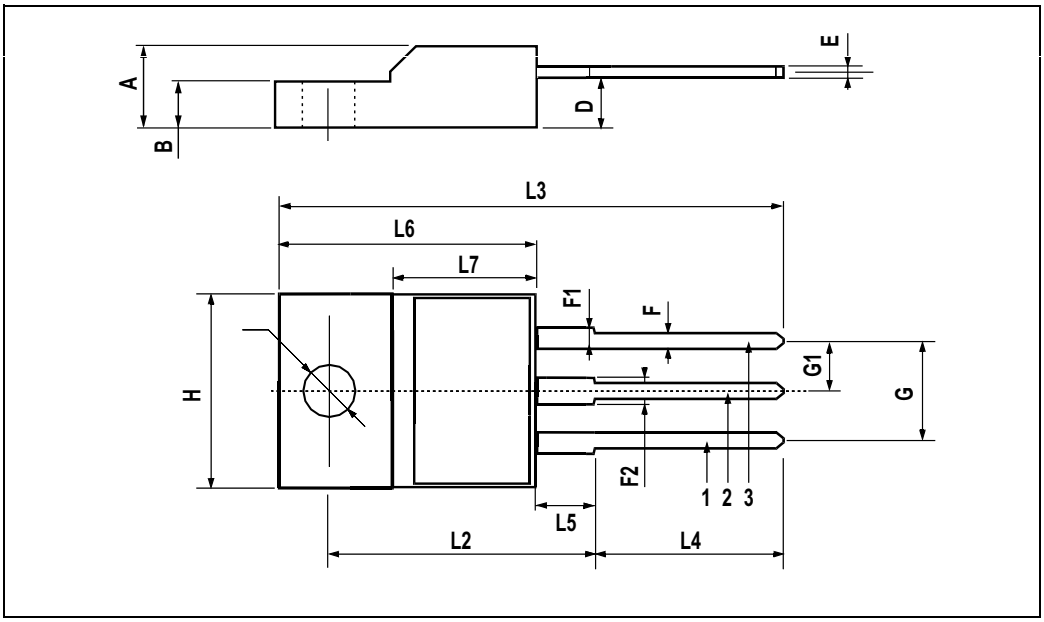


4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com

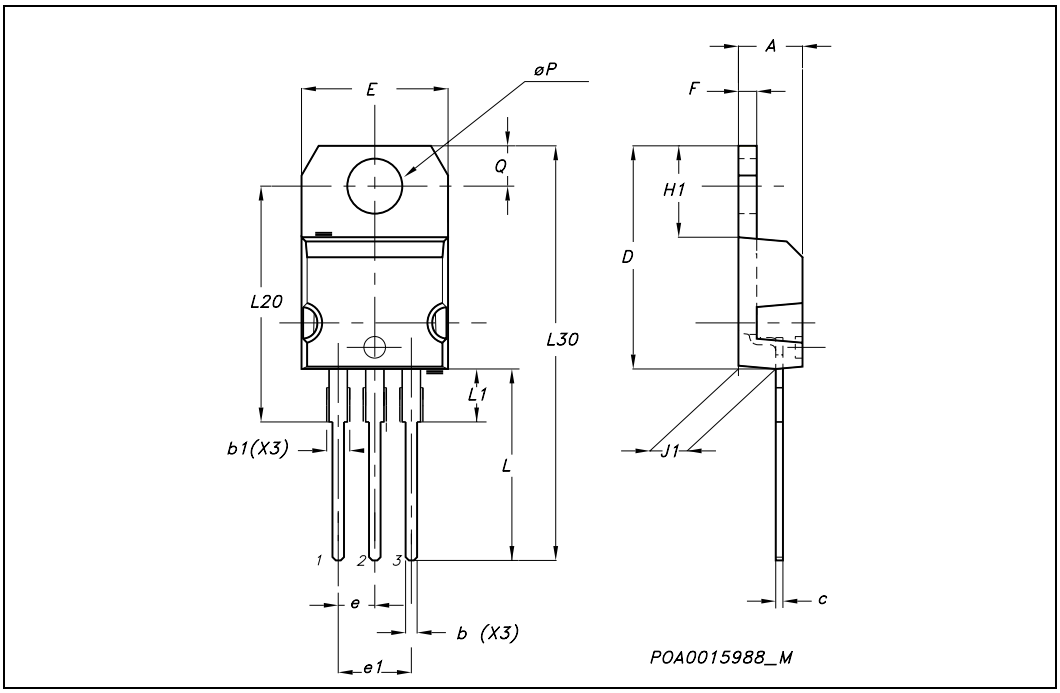
TO-220FP MECHANICAL DATA

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	.0385		0.417
L5	2.9		3.6	0.114		0.141
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



TO-220 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
b	0.61		0.88	0.024		0.034
b1	1.15		1.70	0.045		0.066
c	0.49		0.70	0.019		0.027
D	15.25		15.75	0.60		0.620
E	10		10.40	0.393		0.409
e	2.40		2.70	0.094		0.106
e1	4.95		5.15	0.194		0.202
F	1.23		1.32	0.048		0.052
H1	6.20		6.60	0.244		0.256
J1	2.40		2.72	0.094		0.107
L	13		14	0.511		0.551
L1	3.50		3.93	0.137		0.154
L20		16.40			0.645	
L30		28.90			1.137	
øP	3.75		3.85	0.147		0.151
Q	2.65		2.95	0.104		0.116



5 Revision history

Table 6. Revision history

Date	Revision	Changes
09-Sep-2004	4	Preliminary version
28-Jun-2005	5	Complete version
21-Jul-2005	6	ECOPACK label inserted
09-Aug-2006	7	New template, no content change
20-Feb-2007	8	Typo mistake on page 1

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