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STB30NF10 STP30NF10 - STP30NF10FP

N-channel 100V - 0.038Ω - 35A - D²PAK/TO-220/TO-220FP
Low gate charge STripFET™ II Power MOSFET

General features

Type	V _{DSS}	R _{DS(on)}	I _D
STB30NF10	100V	<0.045Ω	35A
STP30NF10	100V	<0.045Ω	35A
STP30NF10FP	100V	<0.045Ω	35A

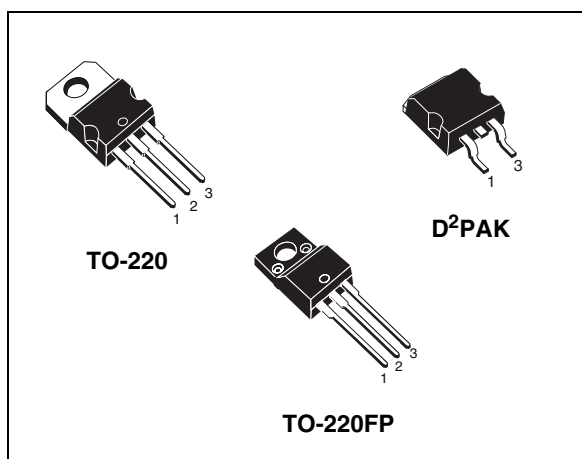
- Exceptional dv/dt capability
- 100% avalanche tested
- Application oriented characterization

Description

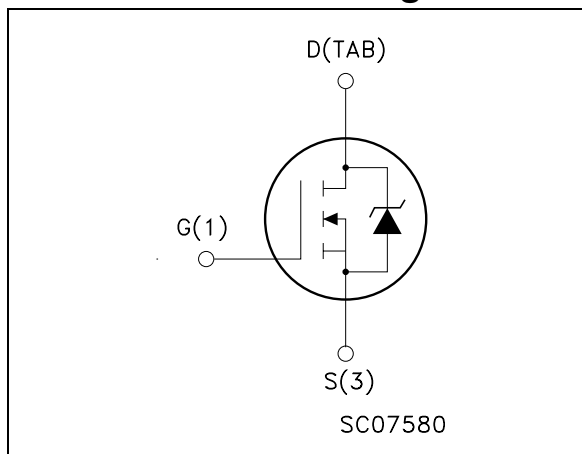
This Power MOSFET is the latest development of STMicroelectronics unique "Single Feature Size™" strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and less critical alignment steps therefore a remarkable manufacturing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

Applications

- Switching application



Internal schematic diagram



Order codes

Sales type	Marking	Package	Packaging
STB30NF10T4	B30NF10	D ² PAK	Tape & reel
STP30NF10	P30NF10	TO-220	Tube
STP30NF10FP	P30NF10FP	TO-220FP	Tube

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Electrical ratings

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value		Unit
		D ² PAK TO-220	TO-220FP	
V _{DS}	Drain-source voltage (V _{GS} = 0)	100		V
V _{DGR}	Drain-gate voltage (R _{GS} = 20 kΩ)	100		V
V _{GS}	Gate- source voltage	± 20		V
I _D	Drain current (continuous) at T _C = 25°C	35	18	A
I _D	Drain current (continuous) at T _C = 100°C	25	13	A
I _{DM} ⁽¹⁾	Drain current (pulsed)	140	72	A
P _{tot}	Total dissipation at T _C = 25°C	115	30	W
	Derating Factor	0.77	0.2	W/°C
dv/dt ⁽²⁾	Peak diode recovery voltage slope	28		V/ns
E _{AS} ⁽³⁾	Single pulse avalanche energy	275		mJ
V _{ISO}	Insulation withstand voltage (DC)	--	2500	V
T _{stg}	Storage temperature	-55 to 175		°C
T _j	Max. operating junction temperature			

1. Pulse width limited by safe operating area.
2. I_{SD} ≤ 30A, di/dt ≤ 400A/μs, V_{DD} ≤ V_{(BR)DSS}, T_j ≤ T_{JMAX}
3. Starting T_j = 25 °C, I_D = 15A, V_{DD} = 30V

Table 2. Thermal data

		D ² PAK TO-220	TO-220FP	
R _{thj-case}	Thermal resistance junction-case max	1.30	5	°C/W
R _{thj-amb}	Thermal resistance junction-ambient max	62.5		°C/W
T _J	Maximum lead temperature for soldering purpose	300		°C

Electrical characteristics

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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	100			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	3	4	V
R _{DS(on)}	Static drain-source on resistance	V _{GS} = 10V, I _D = 15A		0.038	0.045	Ω

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
g _{fs} (1)	Forward transconductance	V _{DS} = 15V, I _D = 15A		10		S
C _{iss} C _{oss} C _{rss}	Input capacitance Output capacitance Reverse transfer capacitance	V _{DS} = 25V, f = 1MHz, V _{GS} = 0		1180 180 80		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} = 50V, I _D = 15A R _G = 4.7Ω V _{GS} = 10V (see Figure 15)		15 40 45 10		ns ns ns ns
Q _g Q _{gs} Q _{gd}	Total gate charge Gate-source charge Gate-drain charge	V _{DD} = 80V, I _D = 12A, V _{GS} = 10V (see Figure 16)		40 8 15	55	nC nC nC

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

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Electrical characteristics

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)				35 140	A A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 30A$, $V_{GS} = 0$			1.3	V
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	$I_{SD} = 30A$, $di/dt = 100A/\mu s$, $V_{DD} = 55V$, $T_J = 150^\circ C$ (see Figure 17)		110 390 7.5		ns nC A

1. Pulse width limited by safe operating area.

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

Electrical characteristics

STB30NF10 - STP30NF10 - STP30NF10FP

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area for TO-220/D²PAK

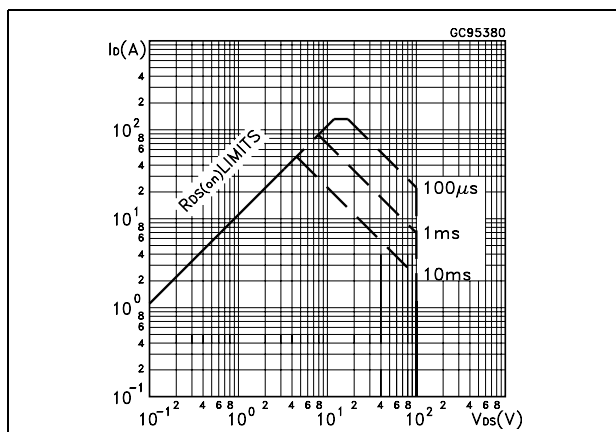


Figure 2. Thermal impedance for TO-220/D²PAK

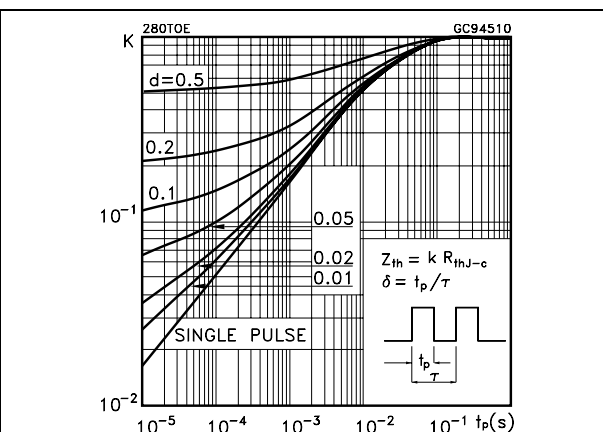


Figure 3. Safe operating area for TO-220FP

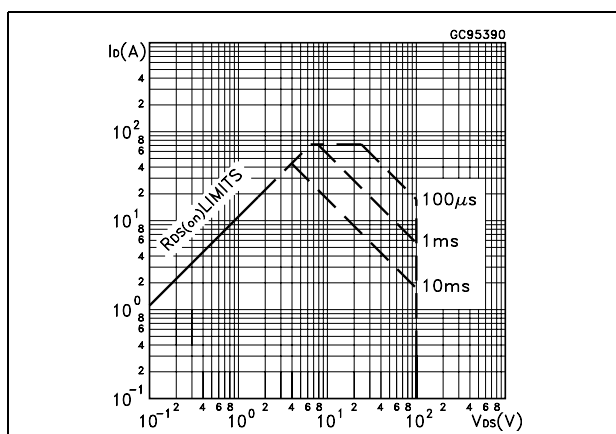


Figure 4. Thermal impedance for TO-220FP

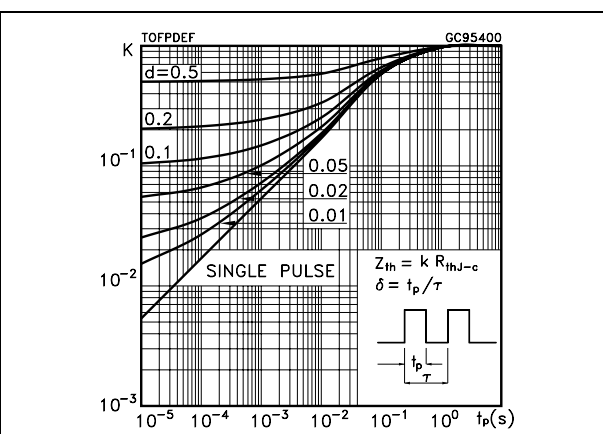


Figure 5. Output characteristics

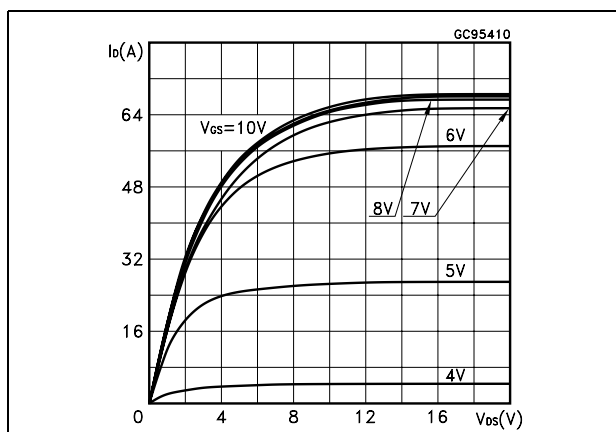
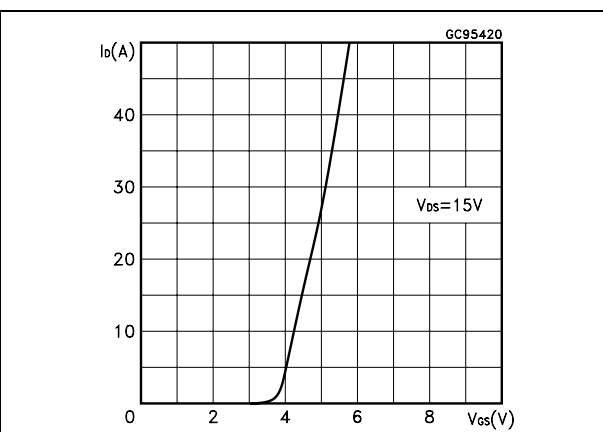


Figure 6. Transfer characteristics



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Electrical characteristics

Figure 7. Transconductance

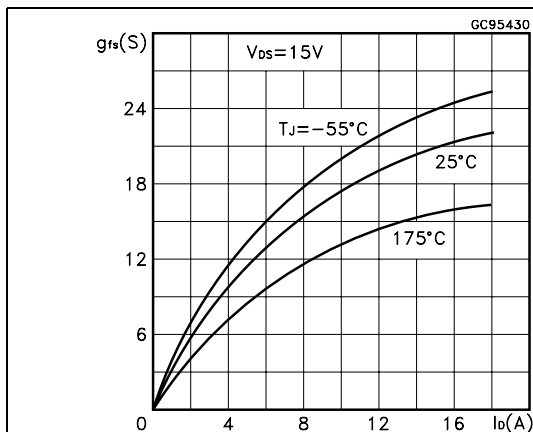


Figure 8. Static drain-source on resistance

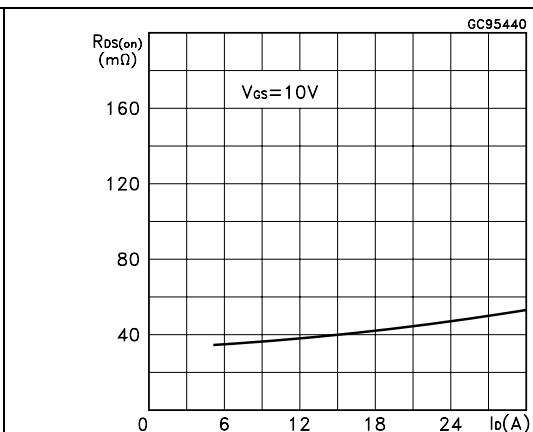


Figure 9. Gate charge vs gate-source voltage **Figure 10. Capacitance variations**

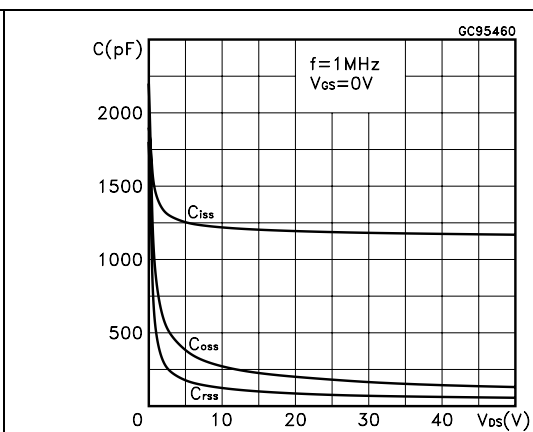
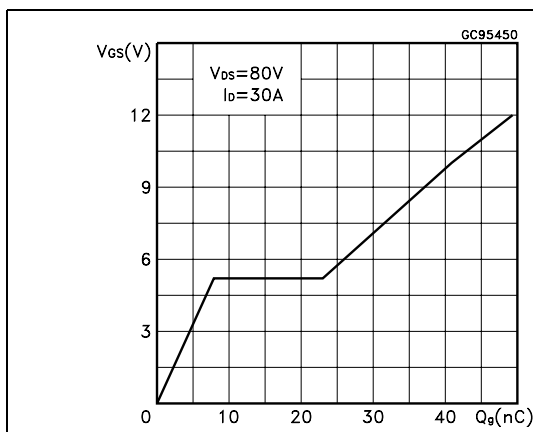


Figure 11. Normalized gate threshold voltage vs temperature

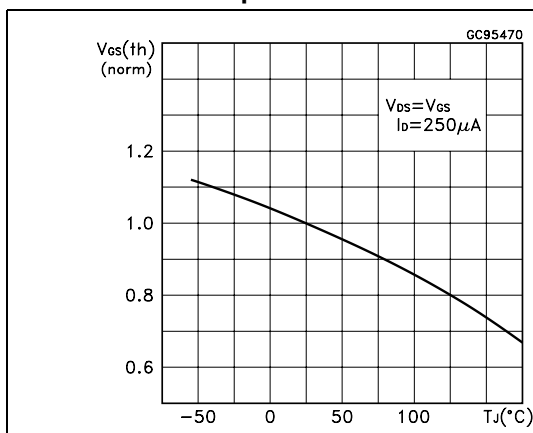
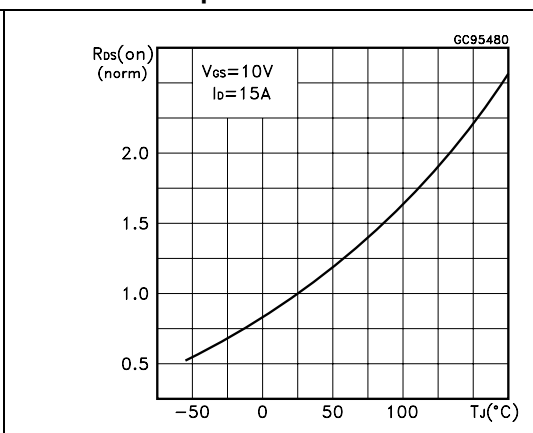


Figure 12. Normalized on resistance vs temperature



Electrical characteristics

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Figure 13. Source-drain diode forward characteristics

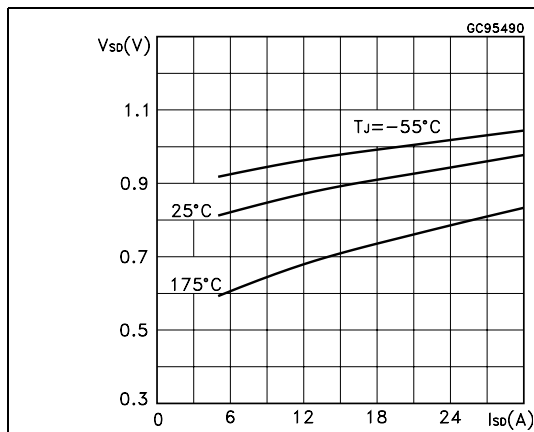
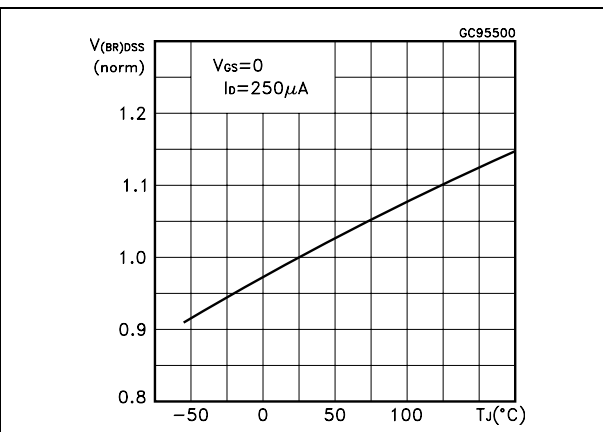


Figure 14. Normalized $B_{V_{DS}}$ vs temperature



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Test circuit

3 Test circuit

Figure 15. Switching times test circuit for resistive load

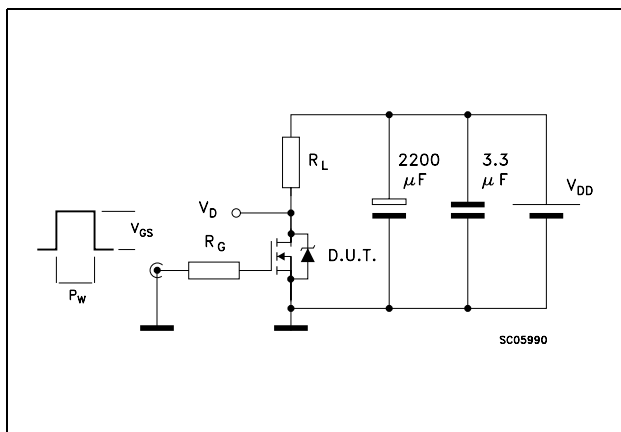


Figure 16. Gate charge test circuit

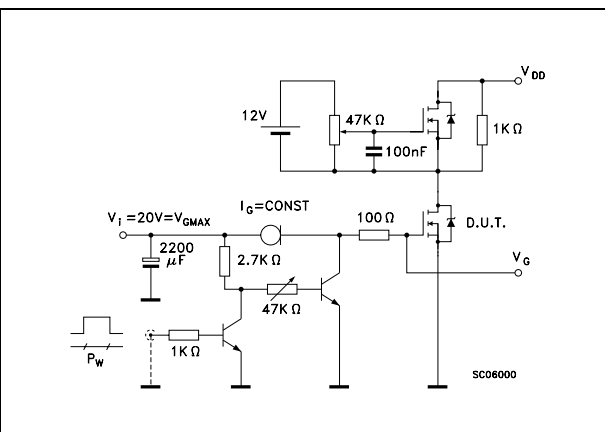


Figure 17. Test circuit for inductive load switching and diode recovery times

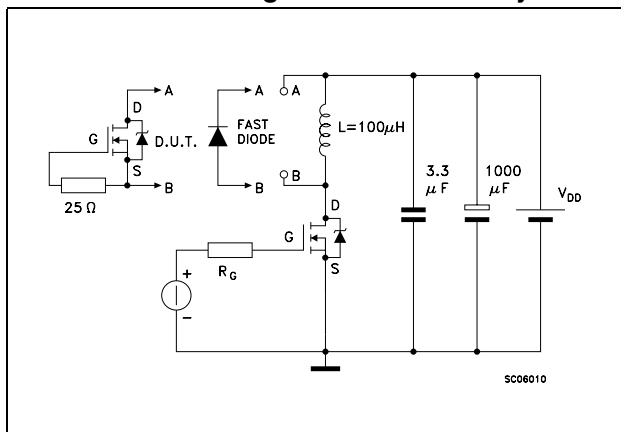


Figure 18. Unclamped Inductive load test circuit

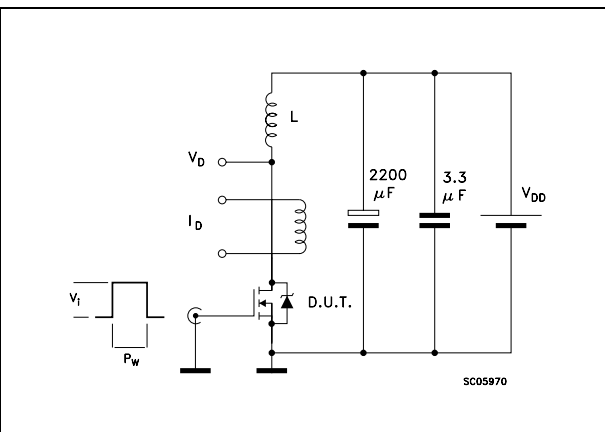


Figure 19. Unclamped inductive waveform

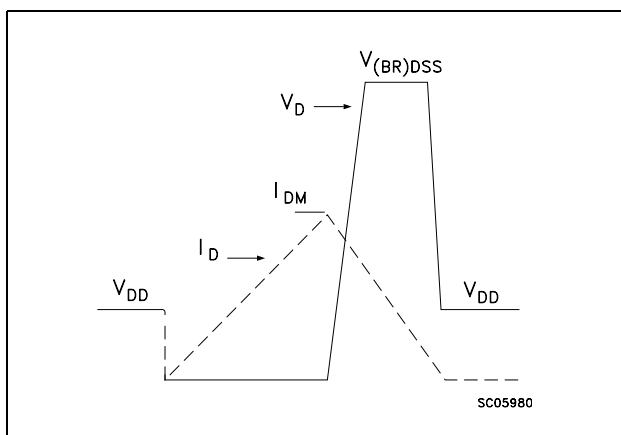
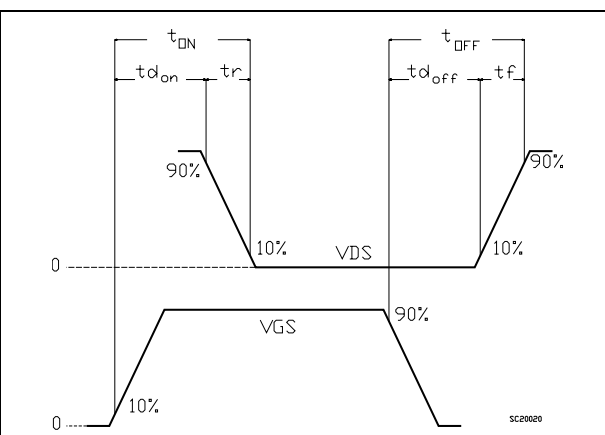


Figure 20. Switching time waveform



Package mechanical data**STB30NF10 - STP30NF10 - STP30NF10FP**

4 Package mechanical data

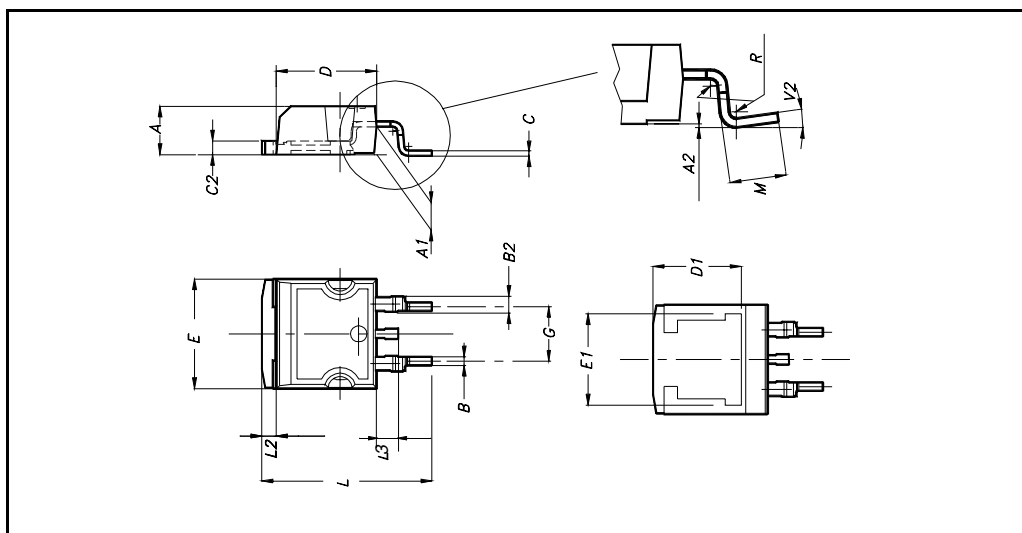
In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect . The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings 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

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Package mechanical data

D²PAK MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
A1	2.49		2.69	0.098		0.106
A2	0.03		0.23	0.001		0.009
B	0.7		0.93	0.027		0.036
B2	1.14		1.7	0.044		0.067
C	0.45		0.6	0.017		0.023
C2	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
D1		8			0.315	
E	10		10.4	0.393		
E1		8.5			0.334	
G	4.88		5.28	0.192		0.208
L	15		15.85	0.590		0.625
L2	1.27		1.4	0.050		0.055
L3	1.4		1.75	0.055		0.068
M	2.4		3.2	0.094		0.126
R		0.4			0.015	
V2	0°		4°			

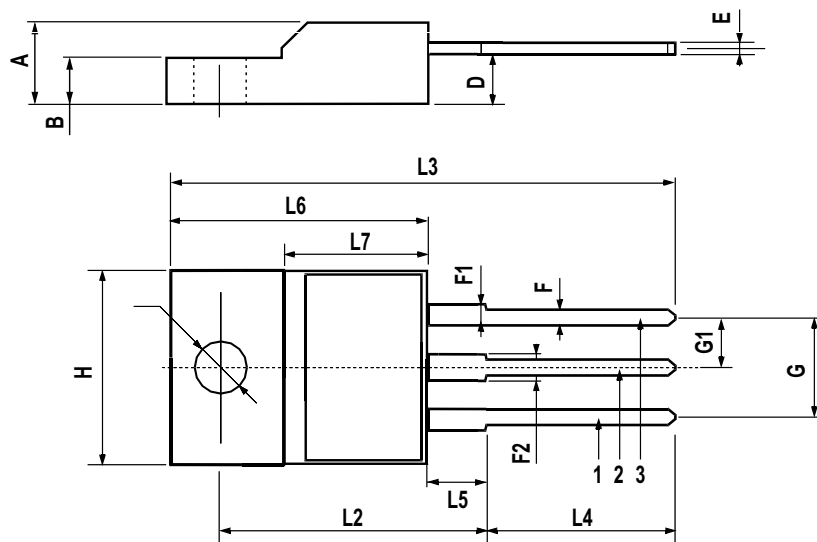


Package mechanical data

STB30NF10 - STP30NF10 - STP30NF10FP

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

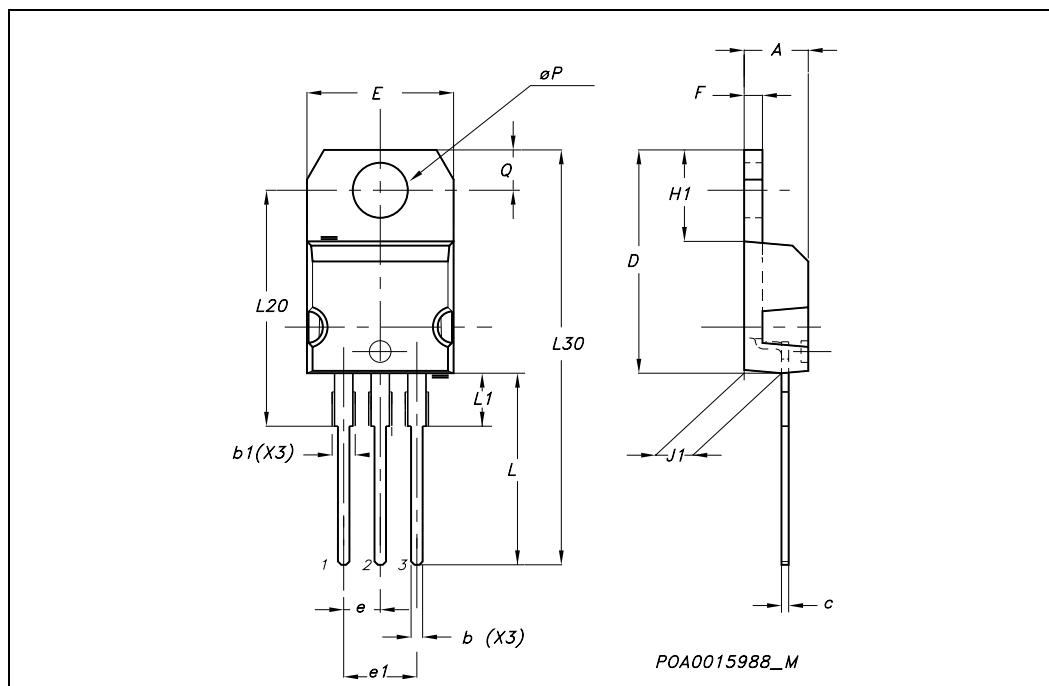


STB30NF10 - STP30NF10 - STP30NF10FP

Package mechanical data

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

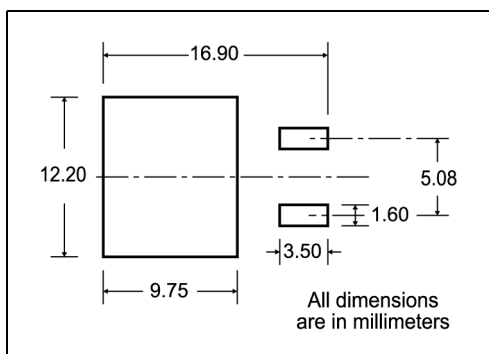


Packaging mechanical data

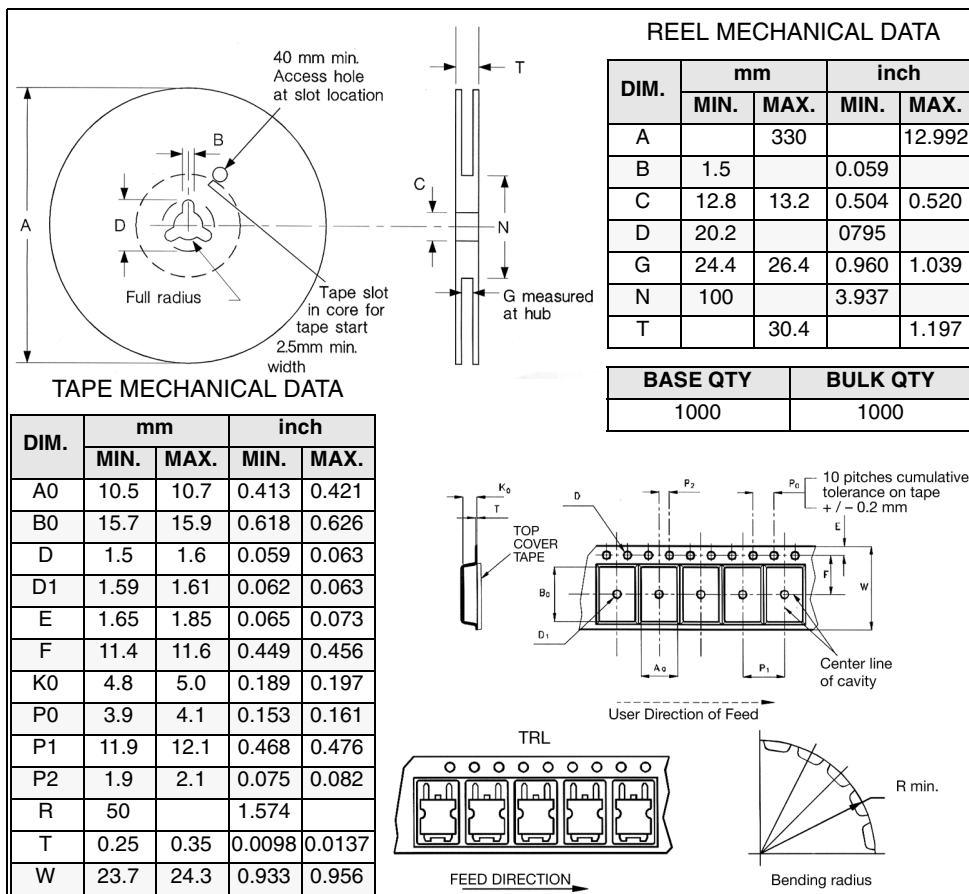
STB30NF10 - STP30NF10 - STP30NF10FP

5 Packaging mechanical data

D²PAK FOOTPRINT



TAPE AND REEL SHIPMENT



6 Revision history

Table 6. Revision history

Date	Revision	Changes
21-Jun-2004	1	First version
26-Jun-2006	2	New template, no content change

STB30NF10 - STP30NF10 - STP30NF10FP

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