



STP80NF06 - STB80NF06 STW80NF06

N-channel 60V - 0.0065Ω - 80A TO-220/D²PAK/TO-247
STripFET II™ Power MOSFET

General features

Type	V _{DSS}	R _{DS(on)}	I _D
STB80NF06	60V	<0.010Ω	80A
STP80NF06	60V	<0.010Ω	80A
STW80NF06	60V	<0.010Ω	80A

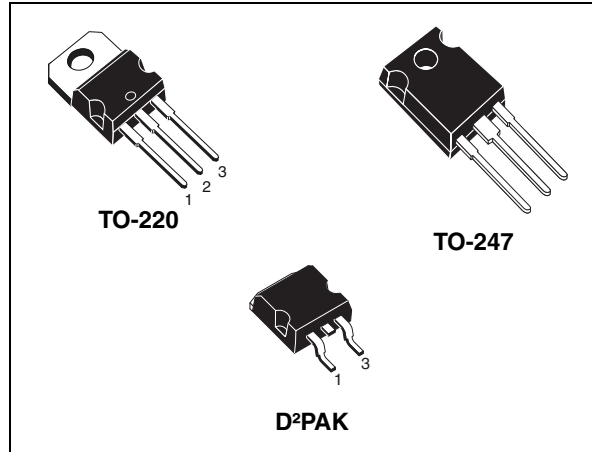
- Exceptional dv/dt capability
- 100% avalanche tested
- Low threshold drive

Description

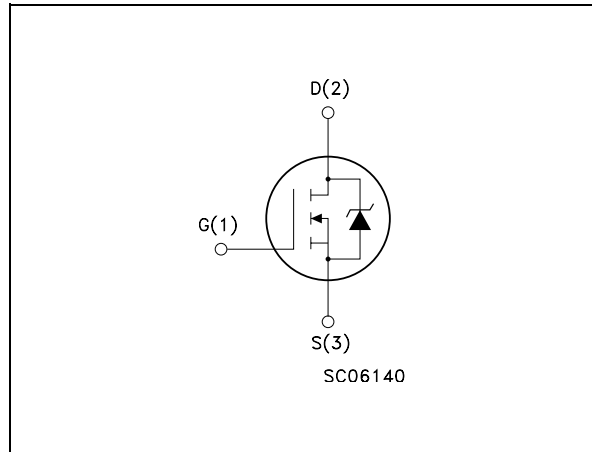
This Power MOSFET is the latest development of STMicroelectronics unique "Single Feature Size™" strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and less critical alignment steps therefore a remarkable manufacturing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

Applications

- Switching application



Internal schematic diagram



Order codes

Part number	Marking	Package	Packaging
STB80NF06T4	B80NF06	D ² PAK	Tape & reel
STP80NF06	P80NF06	TO-220	Tube
STW80NF06	W80NF06	TO-247	Tube

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1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage ($v_{gs} = 0$)	60	V
V_{GS}	Gate- source voltage	± 20	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25^\circ\text{C}$	80	A
I_D	Drain current (continuous) at $T_C = 100^\circ\text{C}$	80	A
$I_{DM}^{(2)}$	Drain current (pulsed)	320	A
P_{TOT}	Total dissipation at $T_C = 25^\circ\text{C}$	300	W
	Derating factor	2	W/ $^\circ\text{C}$
$E_{AS}^{(3)}$	Single pulse avalanche energy	870	mJ
T_{stg}	Storage temperature	– 65 to 175 175	$^\circ\text{C}$
T_j	Max. operating junction temperature		

1. Current limited by wire bonding
2. Pulse width limited by safe operating area
3. Starting $T_j = 25^\circ\text{C}$, $I_D = 40\text{A}$, $V_{DD} = 40\text{V}$

Table 2. Thermal data

$R_{thj-case}$	Thermal resistance junction-case Max	0.5	$^\circ\text{C/W}$
R_{thj-a}	Thermal resistance junction-ambient Max	62.5	$^\circ\text{C/W}$
T_l	Maximum lead temperature for soldering purpose	300	$^\circ\text{C}$

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 = 250 µA, V _{GS} = 0	60			V
I _{DSS}	Zero gate voltage Drain current (V _{GS} = 0)	V _{DS} = Max rating V _{DS} =Max rating, 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 = 40A		0.0065	0.010	Ω

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
g _{fs} ⁽¹⁾	Forward transconductance	V _{DS} = 2.5V, I _D =18A		20		S
C _{iss}	Input capacitance	V _{DS} = 25V, f = 1 MHz, V _{GS} = 0		3850		pF
C _{oss}	Output capacitance			800		pF
C _{rss}	Reverse transfer capacitance			250		pF
Q _g	Total gate charge	V _{DD} = 80V, I _D = 80A, V _{GS} = 10V		115	150	nC
Q _{gs}	Gate-source charge			24		nC
Q _{gd}	Gate-drain charge			46		nC

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

Table 5. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
t _{d(on)} t _r	Turn-on delay time Rise time	V _{DD} = 27V, I _D = 40A R _G = 4.7Ω V _{GS} = 10V (see Figure 13)		25 85		ns ns
t _{d(off)} t _f	Turn-off-delay time Fall time	V _{DD} = 27V, I _D = 40A, R _G = 4.7Ω, V _{GS} = 10V (see Figure 13)		70 25		ns ns
t _{d(off)} t _f t _c	Off-voltage Rise Time Fall Time Cross-over Time	V _{clamp} = 44V, I _D = 80A R _G = 4.7Ω, V _{GS} = 10V (see Figure 15)		85 75 110		ns ns ns

Table 6. Source drain diode

Symbol	Parameter	Test conditions	Min	Typ.	Max	Unit
I_{SD}	Source-drain current				80	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)				320	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 80A, V_{GS} = 0$			1.5	V
t_{rr}	Reverse recovery time	$I_{SD} = 80A, V_{DD} = 50V$ $di/dt = 100A/\mu s,$ $T_j = 150^\circ C$ (see Figure 15)		80		ns
Q_{rr}	Reverse recovery charge			250		nC
I_{RRM}	Reverse recovery current			6.4		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

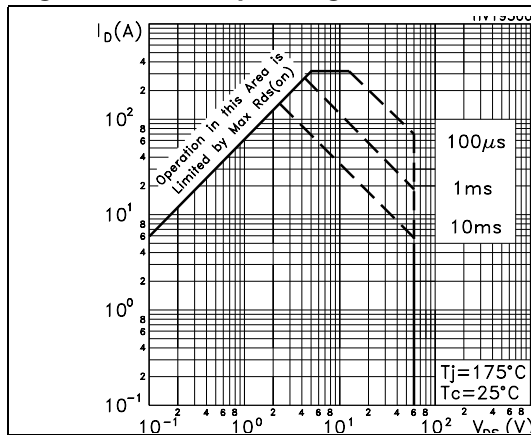


Figure 2. Thermal impedance

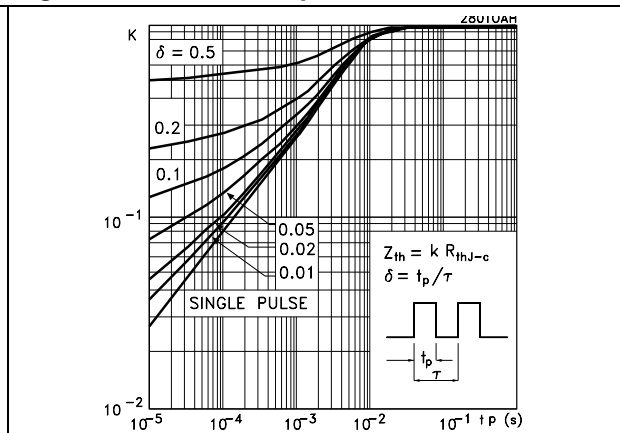


Figure 3. Output characteristics

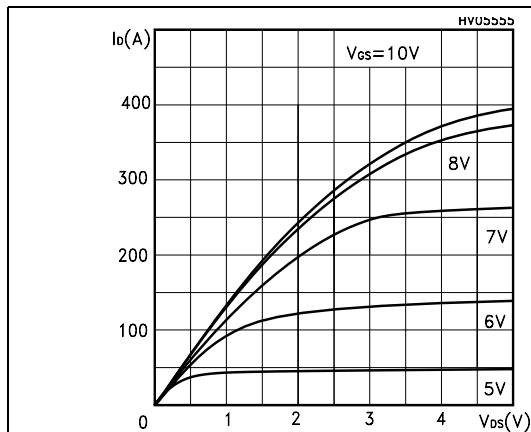


Figure 4. Transfer characteristics

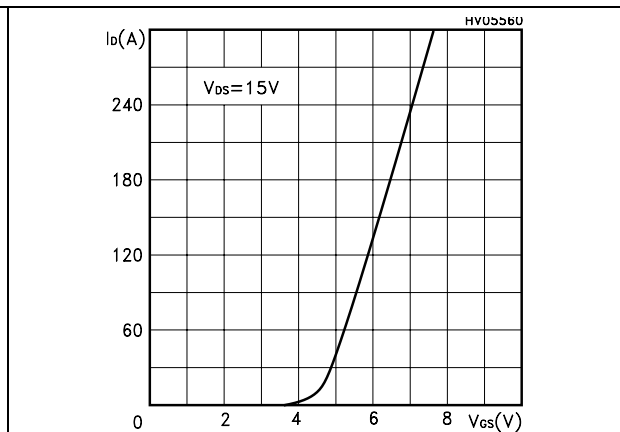


Figure 5. Transconductance

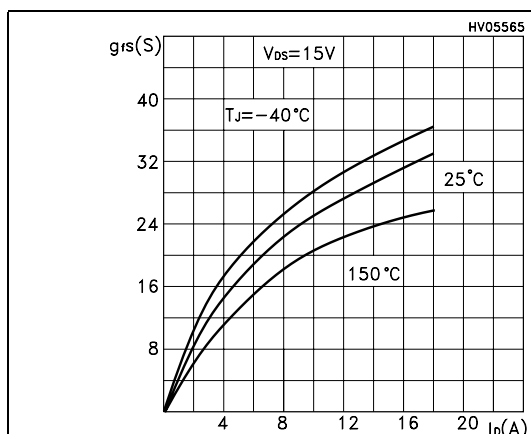


Figure 6. Static drain-source on resistance

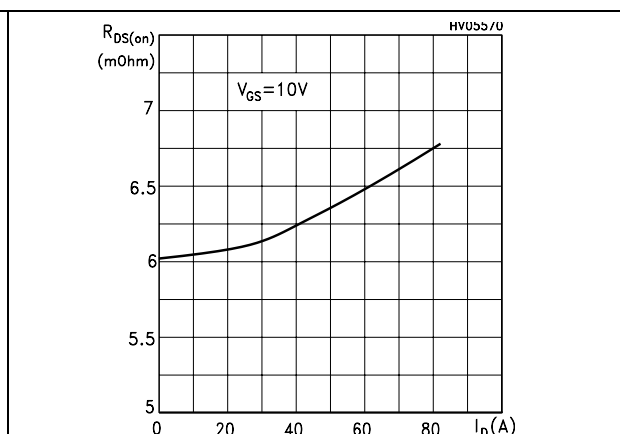


Figure 7. Gate charge vs gate-source voltage Figure 8. Capacitance variations

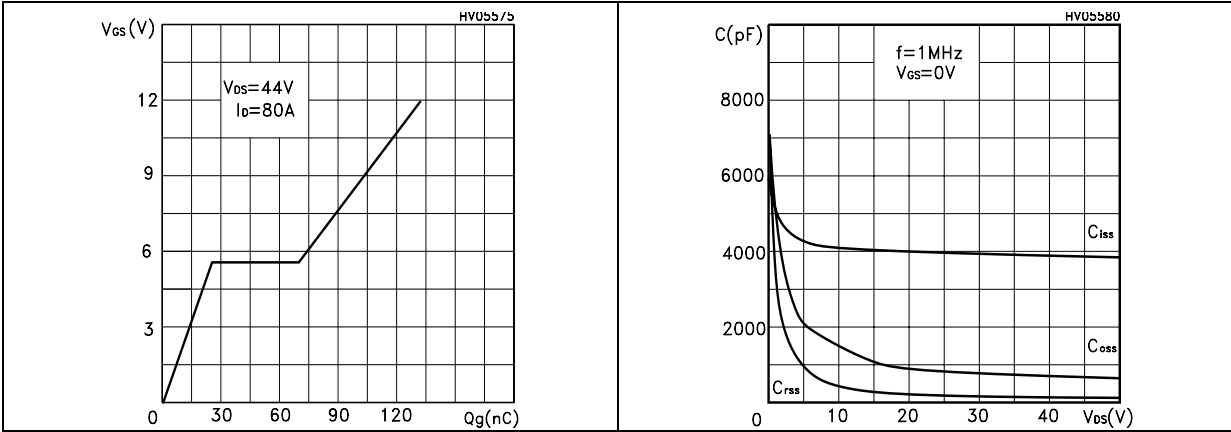


Figure 9. Normalized gate threshold voltage vs temperature Figure 10. Normalized on resistance vs temperature

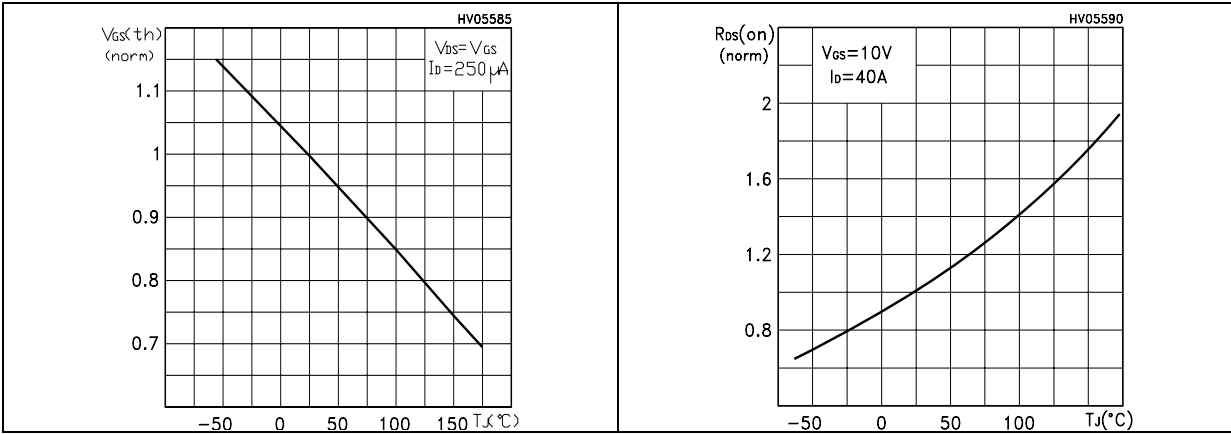
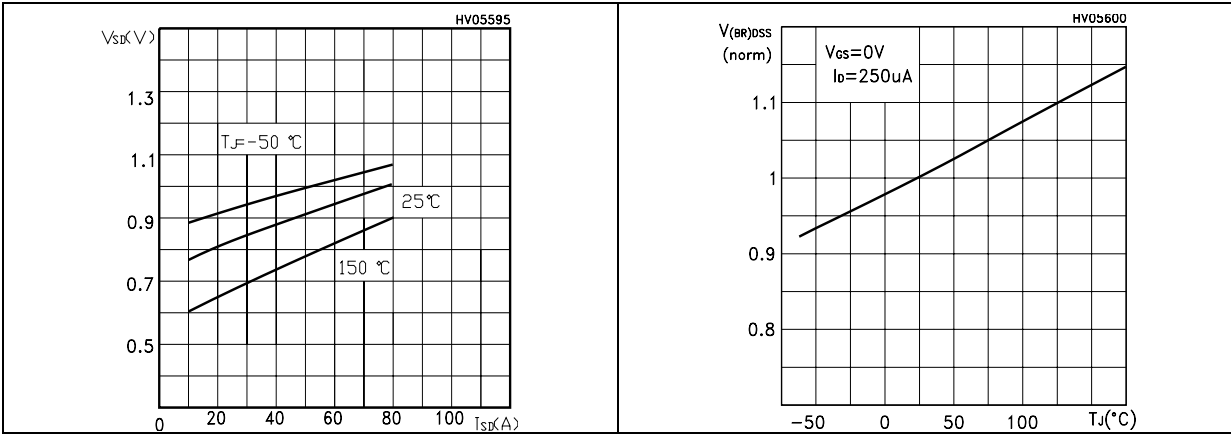


Figure 11. Source-drain diode forward characteristics Figure 12. Normalized breakdown voltage vs t_J



3 Test circuit

Figure 13. Switching times test circuit for resistive load

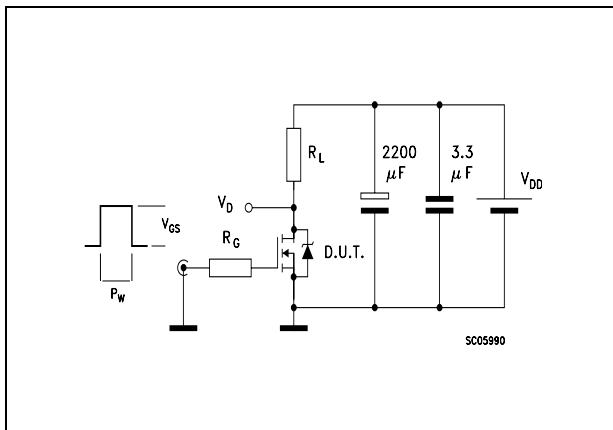


Figure 14. Gate charge test circuit

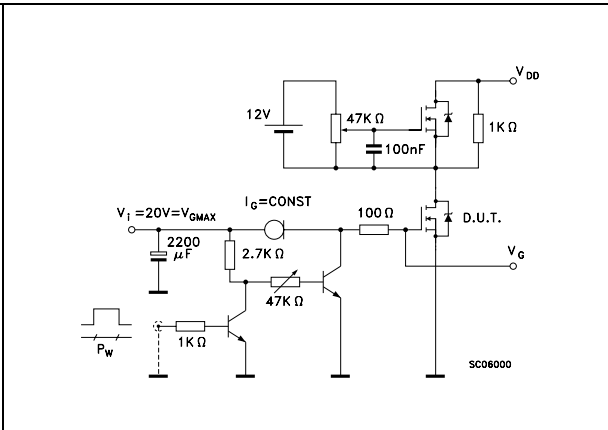


Figure 15. Test circuit for inductive load switching and diode recovery times

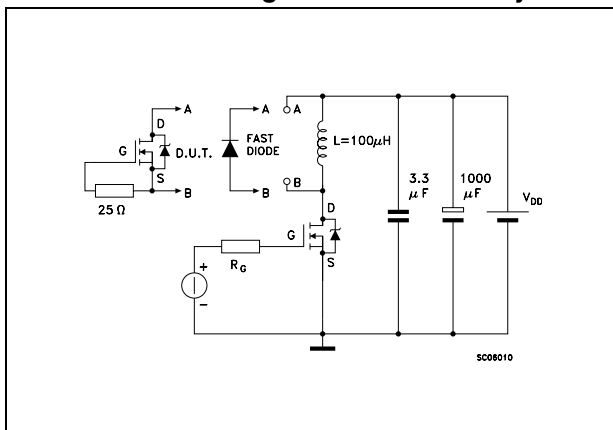


Figure 16. Unclamped Inductive load test circuit

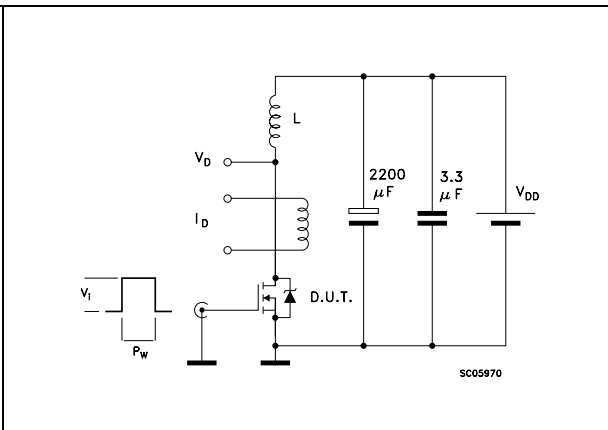


Figure 17. Unclamped inductive waveform

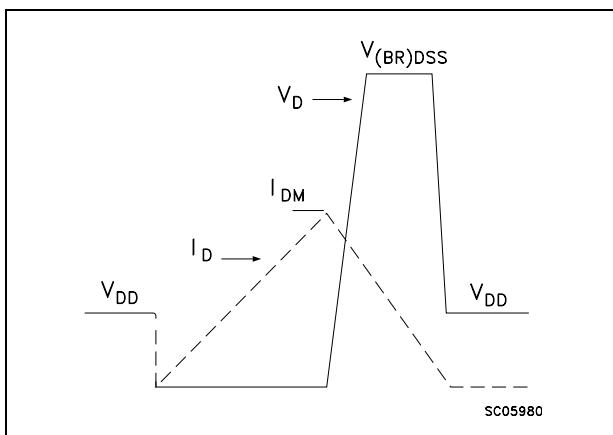
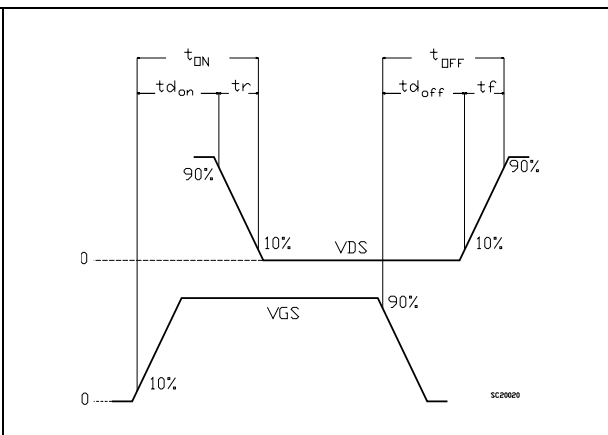


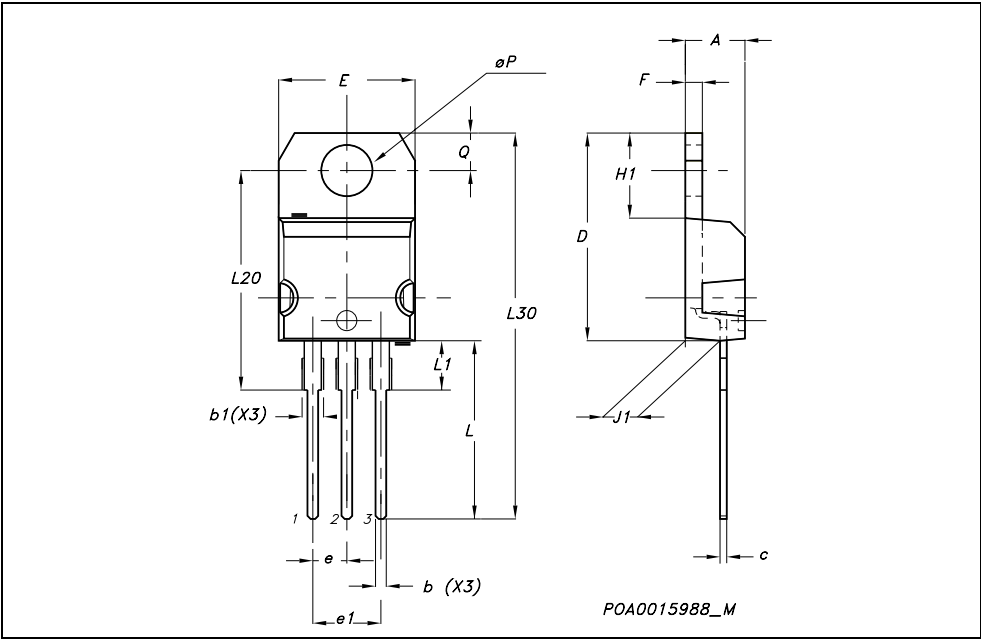
Figure 18. Switching time waveform



4 Package mechanical data

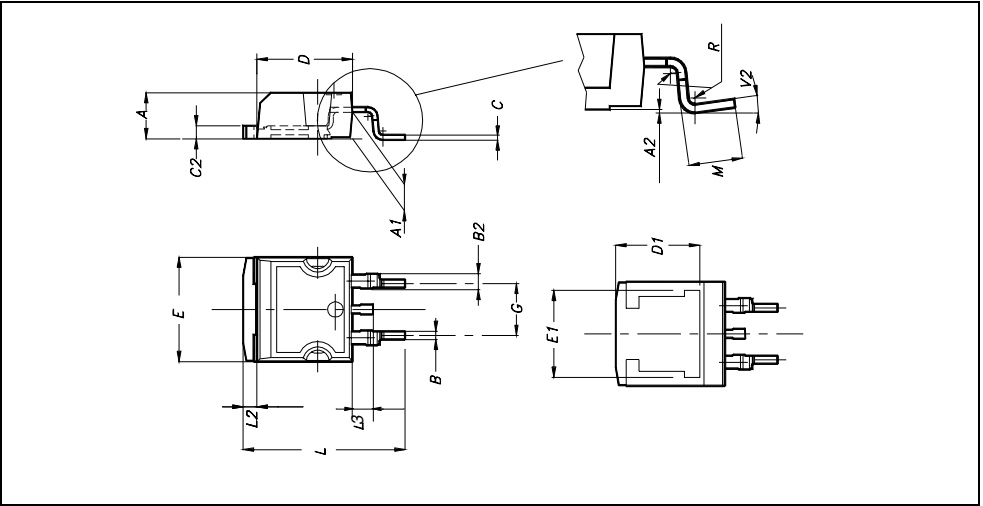
In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect . The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings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



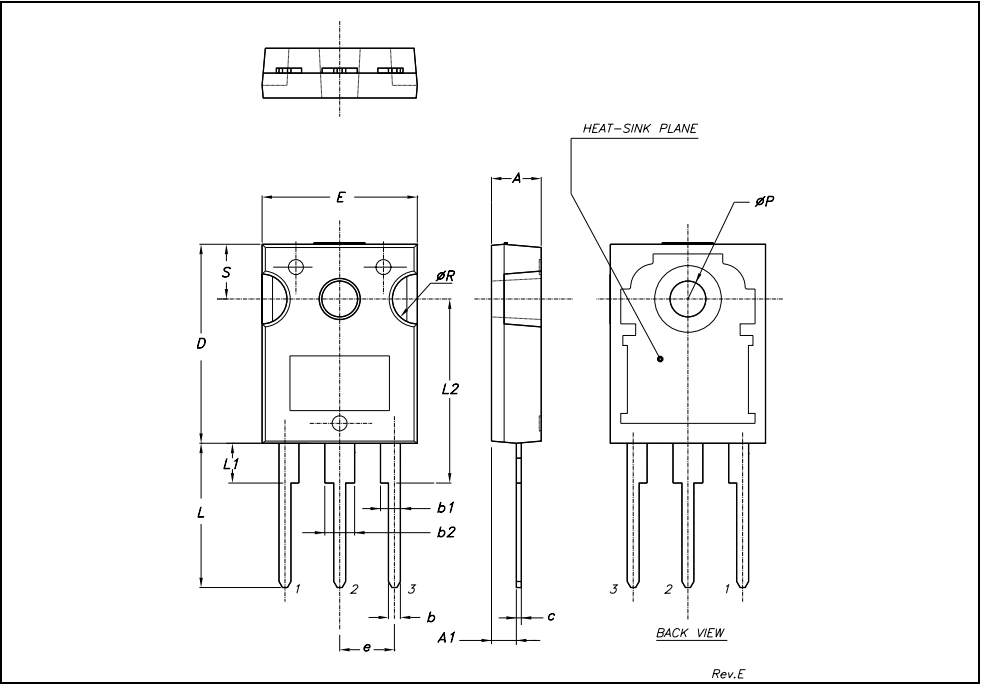
D²PAK MECHANICAL DATA

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°			



TO-247 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.85		5.15	0.19		0.20
A1	2.20		2.60	0.086		0.102
b	1.0		1.40	0.039		0.055
b1	2.0		2.40	0.079		0.094
b2	3.0		3.40	0.118		0.134
c	0.40		0.80	0.015		0.03
D	19.85		20.15	0.781		0.793
E	15.45		15.75	0.608		0.620
e		5.45			0.214	
L	14.20		14.80	0.560		0.582
L1	3.70		4.30	0.14		0.17
L2		18.50			0.728	
øP	3.55		3.65	0.140		0.143
øR	4.50		5.50	0.177		0.216
S		5.50			0.216	



5 Revision history

Table 7. Revision history

Date	Revision	Changes
09-Sep-2004	1	Complete version
21-Jun-2005	2	The word "STripFET" in the description title on the web was been corrected
17-Aug-2006	3	New template, no content change

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