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STP30NF20 STW30NF20

N-channel 200V - 0.065Ω - 30A - TO-220/TO-247
 Low gate charge STripFET™ Power MOSFET

General features

Type	V _{DSS}	R _{DS(on)}	I _D	P _{TOT}
STP30NF20	200V	0.075Ω	30A	125W
STW30NF20	200V	0.075Ω	30A	125W

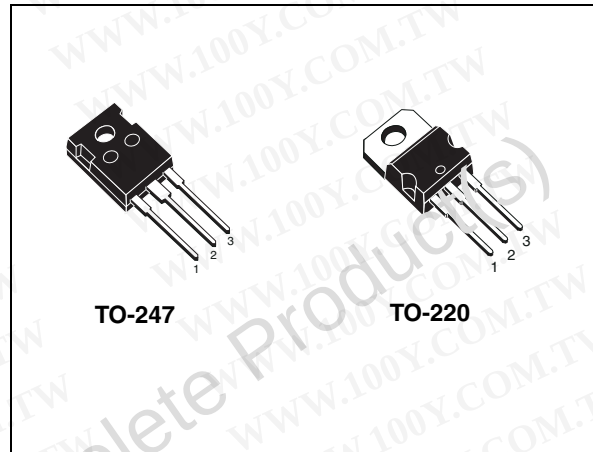
- Gate charge minimized
- 100% avalanche tested
- Excellent figure of merit (R_{DS}*Q_g)
- Very good manufacturing repeatability
- Very low intrinsic capacitances

Description

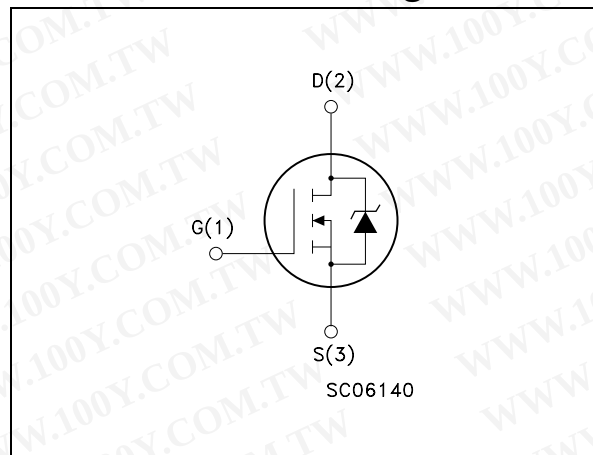
This Power MOSFET series realized with STMicroelectronics unique STripFET process has specifically been designed to minimize input capacitance and gate charge. It is therefore suitable as primary switch in advanced high-efficiency isolated DC-DC converters.

Applications

- Switching application



Internal schematic diagram



Order codes

Part number	Marking	Package	Packaging
STP30NF20	30NF20	TO-220	Tube
STW30NF20	30NF20	TO-247	Tube

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1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage ($V_{GS} = 0$)	200	V
V_{GS}	Gate-source voltage	± 20	V
I_D	Drain current (continuous) at $T_C = 25^\circ\text{C}$	30	A
I_D	Drain current (continuous) at $T_C = 100^\circ\text{C}$	19	A
$I_{DM}^{(1)}$	Drain current (pulsed)	120	A
P_{TOT}	Total dissipation at $T_C = 25^\circ\text{C}$	125	W
	Derating factor	1	W/ $^\circ\text{C}$
$dv/dt^{(2)}$	Peak diode recovery voltage slope	10	V/ns
T_J T_{stg}	Operating junction temperature Storage temperature	-55 to 150	$^\circ\text{C}$
T_l	Maximum lead temperature for soldering purpose	300	$^\circ\text{C}$

1. Pulse width limited by safe operating area

2. $I_{SD} \leq 30\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} = 80\%V_{(BR)D.S}$

Table 2. Thermal data

Symbol	Parameter	TO-220	TO-247	Unit
R_{thJC}	Thermal resistance junction-case max	1		$^\circ\text{C}/\text{W}$
R_{thJA}	Thermal resistance junction-ambient max	62.5	50	$^\circ\text{C}/\text{W}$

Table 3. Avalanche data

Symbol	Parameter	Value	Unit
I_{AR}	Avalanche current, repetitive or not repetitive (pulse width limited by T_{jmax})	30	A
E_{AS}	Single pulse avalanche energy (starting $T_J = 25^\circ\text{C}$, $I_D = I_{AR}$, $V_{DD} = 50\text{V}$)	140	mJ

2 Electrical characteristics

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

Table 4. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V _{(BR)DSS}	Drain-source breakdown voltage	I _D = 1mA, V _{GS} = 0	200			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 = 15A		0.065	0.075	Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
g _{fs} ⁽¹⁾	Forward transconductance	V _{DS} = 15V, I _D = 15A		20		S
C _{iss} C _{oss} C _{rss}	Input capacitance Output capacitance Reverse transfer capacitance	V _{DS} = 25V, f = 1 MHz, V _{GS} = 0		1597 320 43		pF pF pF
Q _g Q _g Q _{gd}	Total gate charge Gate-source charge Gate-drain charge	V _{DD} = 160V, I _D = 30A V _{GS} = 10V (see Figure 16)		38 8 18		nC nC nC

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

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on delay time Rise time	$V_{DD}=100V$, $I_D=15A$, $R_G=4.7\Omega$, $V_{GS}=10V$ (see Figure 15)		35 15.7		ns ns
$t_{d(off)}$ t_f	Turn-off delay time Fall time	$V_{DD}=100V$, $I_D=15A$, $R_G=4.7\Omega$, $V_{GS}=10V$ (see Figure 15)		38 8.8		ns ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD} $I_{SDM}^{(1)}$	Source-drain current Source-drain current (pulsed)				30 120	A A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD}=30A$, $V_{GS}=0$			1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	$I_{SD}=30A$, $di/dt = 100A/\mu s$, $V_{DD}=100V$, $T_j=25^\circ C$		155 0.96 12.4		ns μC A
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	$I_{SD}=30A$, $di/dt = 100A/\mu s$, $V_{DD}=100V$, $T_j=150^\circ C$		194 1.42 14.6		ns μC 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-247

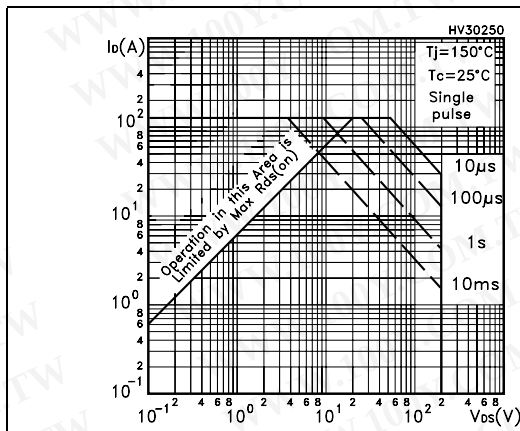


Figure 2. Thermal impedance for TO-247

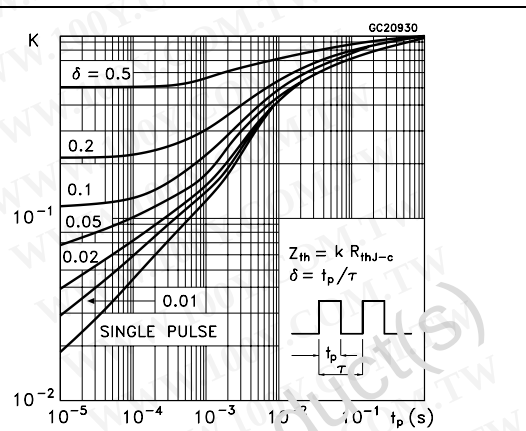


Figure 3. Safe operating area for TO-220

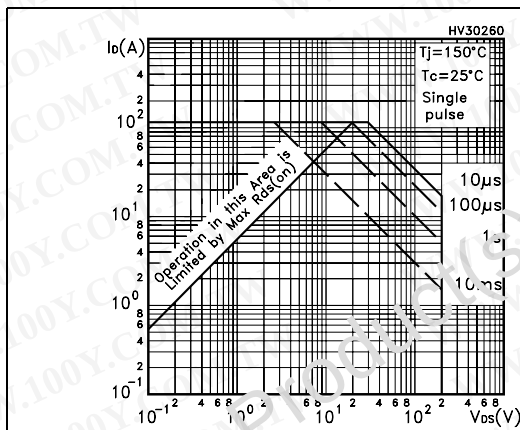


Figure 4. Thermal impedance for TO-220

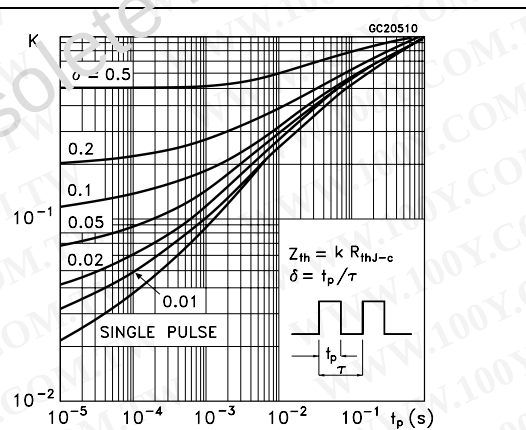


Figure 5. Output characteristics

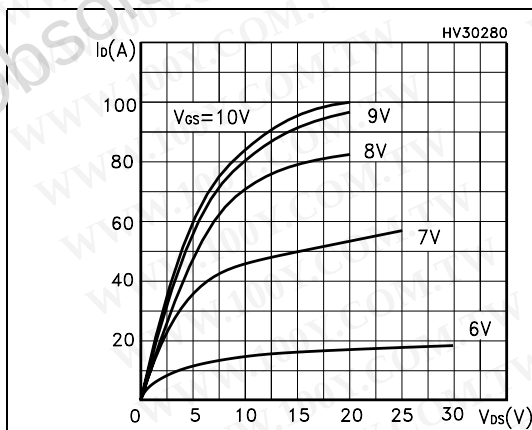


Figure 6. Transfer characteristics

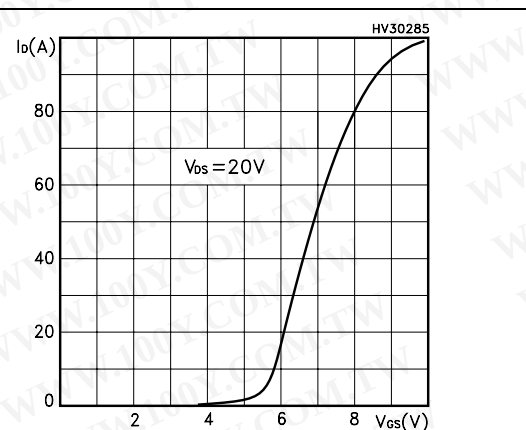


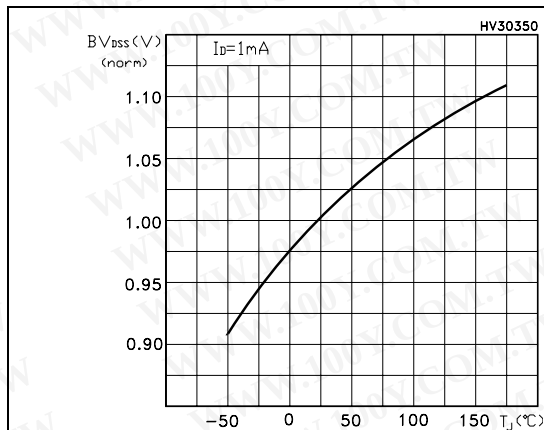
Figure 7. Normalized $B_{V_{DS}}$ vs temperature

Figure 8. Static drain-source on resistance

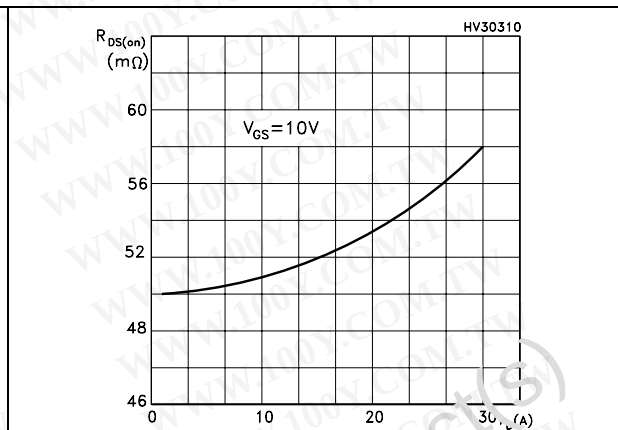


Figure 9. Gate charge vs gate-source voltage

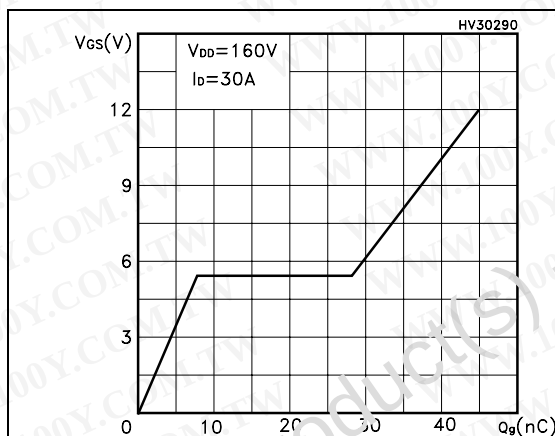


Figure 10. Capacitance variations

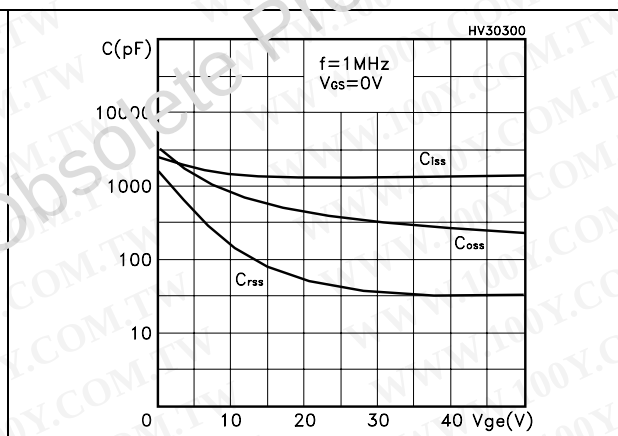


Figure 11. Normalized gate threshold voltage vs temperature

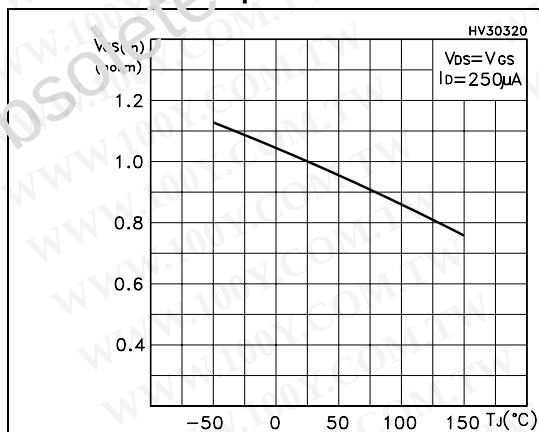


Figure 12. Normalized on resistance vs temperature

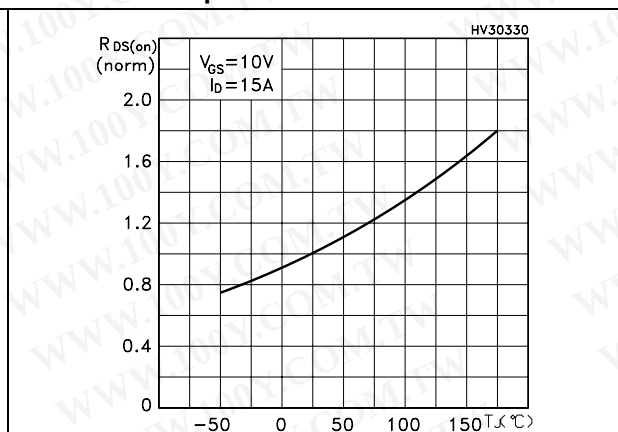
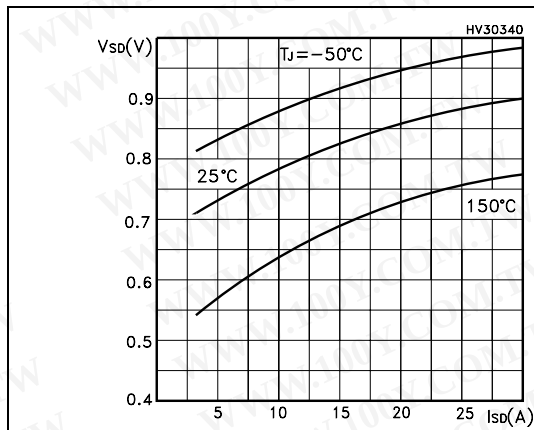
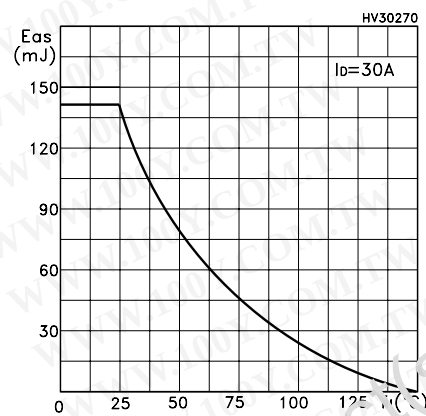


Figure 13. Source-drain diode forward characteristics**Figure 14. Maximum avalanche energy vs temperature**

3 Test circuit

Figure 15. Switching times test circuit for resistive load

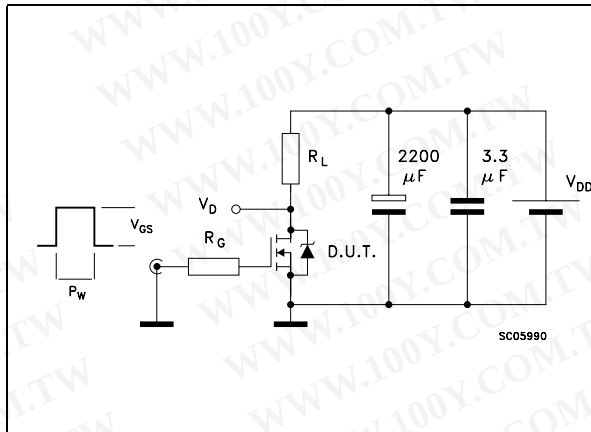


Figure 16. Gate charge test circuit

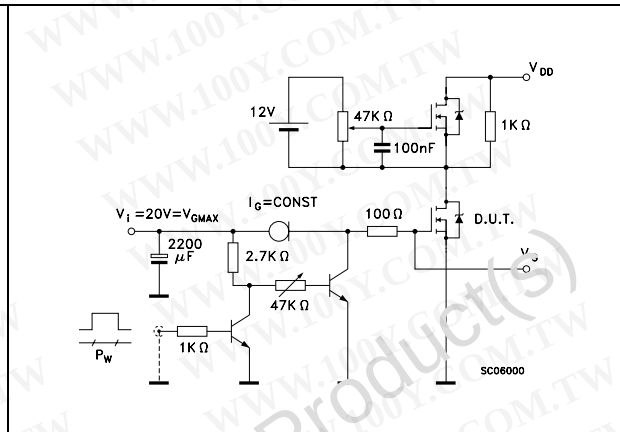


Figure 17. Test circuit for inductive load switching and diode recovery times

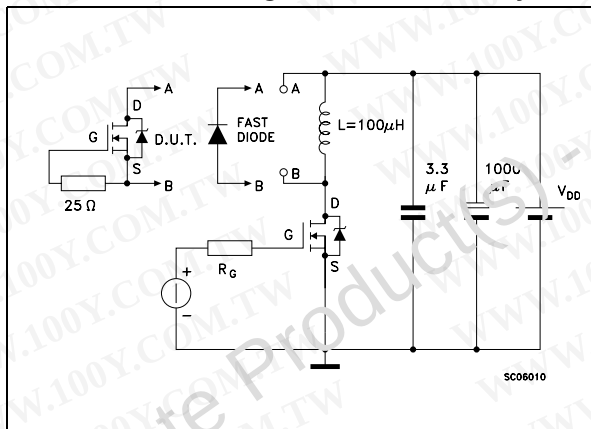


Figure 18. Unclamped inductive load test circuit

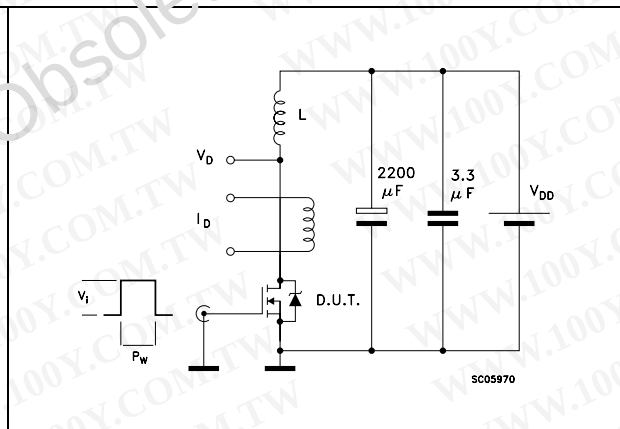


Figure 19. Unclamped inductive waveform

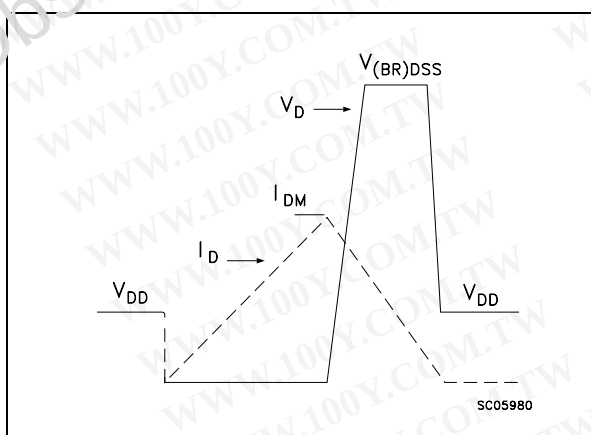
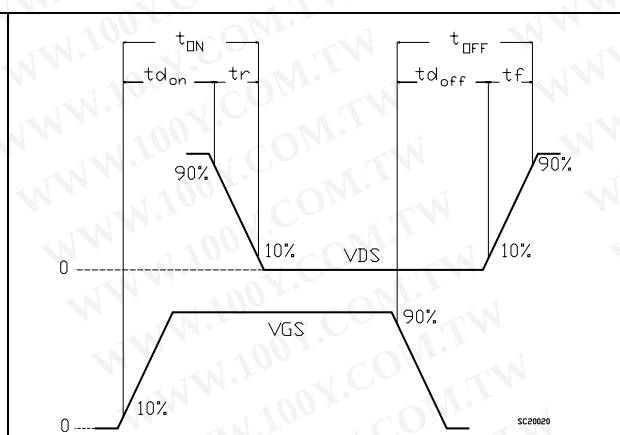


Figure 20. Switching time waveform

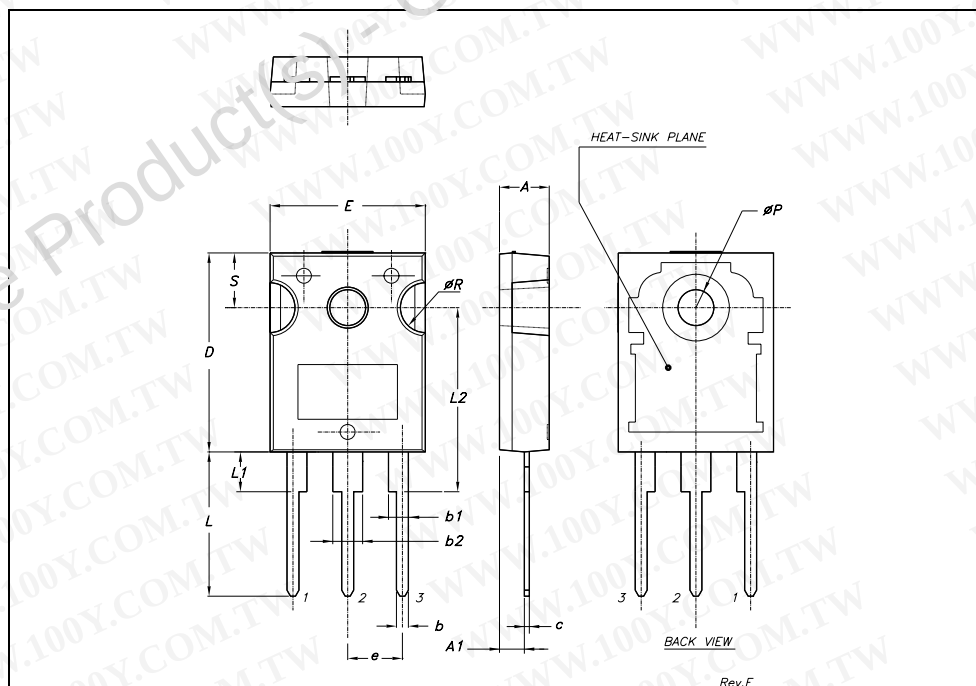


4 Package mechanical data

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

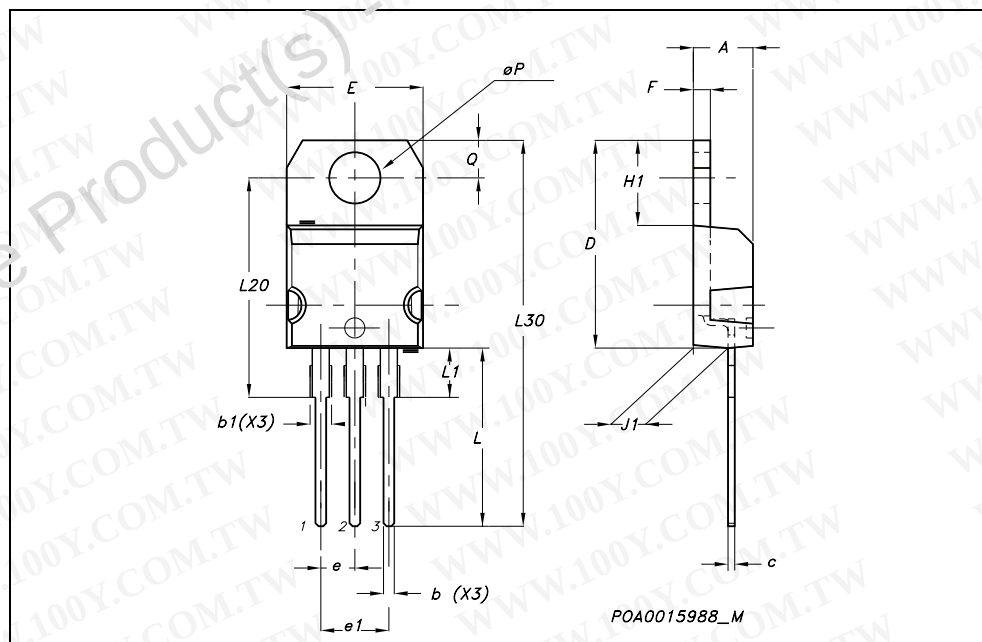
TO-247 MECHANICAL DATA

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	



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 8. Revision history

Date	Revision	Changes
06-Mar-2006	1	First Release
17-Nov-2006	2	Part number has been updated

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