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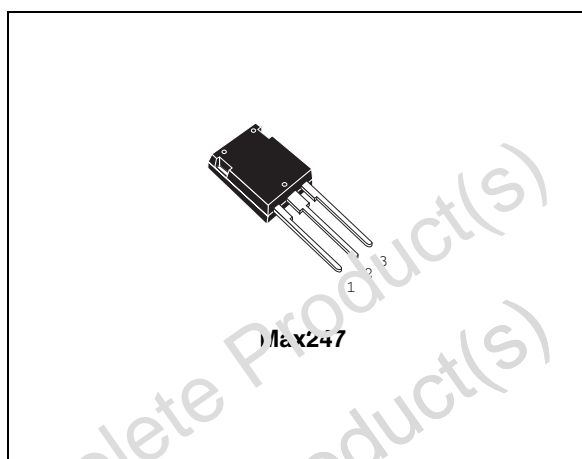
# STY100NS20FD

N-channel 200V - 0.022Ω - 100A - Max247  
 MESH OVERLAY™ Power MOSFET

## General features

Type	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STY100NS20FD	200V	<0.024Ω	100A

- Extremely high dv/dt capability
- 100% avalanche tested
- Gate charge minimized
- ± 20V gate to source voltage rating
- Low intrinsic capacitance
- Fast body-drain diode: low t<sub>rr</sub>, Q<sub>rr</sub>



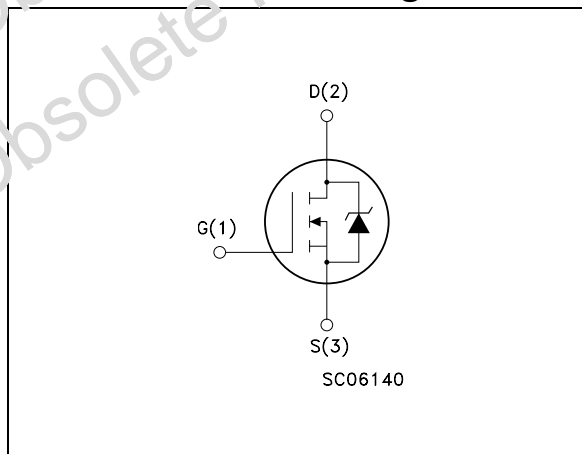
## Description

Using the latest high voltage MESH OVERLAY™ process, STMicroelectronics has designed an advanced family of Power MOSFETs with outstanding performances. The new patented STRIP layout coupled with the Company's proprietary edge termination structure, gives the lowest R<sub>DS(ON)</sub> per area, exceptional avalanche and dv/dt capabilities and unrivalled gate charge and switching characteristics.

## Applications

- Switching application

## Internal schematic diagram



## Order codes

Part number	Marking	Package	Packaging
STY100NS20FD	Y100NS20FD	Max247	Tube

## Contents

<b>1</b>	<b>Electrical ratings</b> .....	<b>3</b>
<b>2</b>	<b>Electrical characteristics</b> .....	<b>4</b>
	2.1 Electrical characteristics (curves) .....	6
<b>3</b>	<b>Test circuit</b> .....	<b>8</b>
<b>4</b>	<b>Package mechanical data</b> .....	<b>9</b>
<b>5</b>	<b>Revision history</b> .....	<b>11</b>

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Obsolete Product(s) - Obsolete Product(s)

# 1 Electrical ratings

**Table 1. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
V <sub>DS</sub>	Drain-source voltage (V <sub>GS</sub> = 0)	200	V
V <sub>DGR</sub>	Drain-gate voltage (R <sub>GS</sub> = 20 kΩ)	200	V
V <sub>GS</sub>	Gate- source voltage	±20	V
I <sub>D</sub>	Drain current (continuous) at T <sub>C</sub> = 25°C	100	A
I <sub>D</sub>	Drain current (continuous) at T <sub>C</sub> = 100°C	63	A
I <sub>DM</sub> <sup>(1)</sup>	Drain current (pulsed)	400	A
P <sub>TOT</sub>	Total dissipation at T <sub>C</sub> = 25°C	450	W
	Derating factor	3.6	W/°C
dv/dt <sup>(2)</sup>	Peak diode recovery voltage slope	25	V/ns
T <sub>stg</sub>	Storage temperature	-65 to 150	°C
T <sub>j</sub>	Max. operating junction temperature	150	°C

1. Pulse width limited by safe operating area
2. I<sub>SD</sub> ≤ 100A, di/dt ≤ 200A/μs, V<sub>DD</sub> = 80% V<sub>(BR)DVS</sub>

**Table 2. Thermal resistance**

Symbol	Parameter	Value	Unit
R <sub>thj-case</sub>	Thermal resistance junction-case Max	0.277	°C/W
R <sub>thj-amb</sub>	Thermal resistance junction-ambient Max	30	°C/W
T <sub>l</sub>	Maximum lead temperature for soldering purpose	300	°C

**Table 3. Avalanche data**

Symbol	Parameter	Value	Unit
I <sub>AR</sub>	Avalanche current, repetitive or not-repetitive (pulse width limited by T <sub>j</sub> max)	110	A
E <sub>AS</sub>	Single pulse avalanche energy (starting T <sub>j</sub> = 25 °C, I <sub>D</sub> = I <sub>AR</sub> , V <sub>DD</sub> = 50 V)	750	mJ

Electrical characteristics

STY100NS20FD

## 2 Electrical characteristics

(T<sub>CASE</sub>=25°C unless otherwise specified)

**Table 4. On/off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V <sub>(BR)DSS</sub>	Drain-source breakdown voltage	I <sub>D</sub> = 250 μA, V <sub>GS</sub> = 0	200			V
I <sub>DSS</sub>	Zero gate voltage drain current (V <sub>GS</sub> = 0)	V <sub>DS</sub> = Max rating V <sub>DS</sub> = Max rating, @125°C			10 100	μA μA
I <sub>GSS</sub>	Gate body leakage current (V <sub>DS</sub> = 0)	V <sub>GS</sub> = ± 20V			± 100	nA
V <sub>GS(th)</sub>	Gate threshold voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA	2	3	4	V
R <sub>DS(on)</sub>	Static drain-source on resistance	V <sub>GS</sub> = 10V, I <sub>D</sub> = 50A		0.022	0.024	Ω

**Table 5. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
g <sub>fs</sub> <sup>(1)</sup>	Forward transconductance	V <sub>DS</sub> = I <sub>D(on)</sub> × R <sub>DS(on)max</sub> , I <sub>D</sub> = 50A		30		S
C <sub>iss</sub> C <sub>oss</sub> C <sub>rss</sub>	Input capacitance Output capacitance Reverse transfer capacitance	V <sub>DS</sub> = 25V, f = 1 MHz, V <sub>GS</sub> = 0		7900 1500 460		pF pF pF
Q <sub>g</sub> Q <sub>gs</sub> Q <sub>gd</sub>	Total gate charge Gate-source charge Gate-drain charge	V <sub>DD</sub> = 100V, I <sub>D</sub> = 100A, V <sub>GS</sub> = 10V (see Figure 13)		360 35 135		nC nC nC

<sup>(1)</sup> Pulsed: pulse duration=300μs, duty cycle 1.5%

STY100NS20FD

Electrical characteristics

**Table 6. Switching times**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 100V, I_D = 50A$ $R_G = 4.7\Omega, V_{GS} = 10V$ (see Figure 12)		42		ns
$t_r$	Rise time			140		ns
$t_{r(Voff)}$	Off-voltage rise time	$V_{DD} = 100V, I_D = 100A,$ $R_G = 4.7\Omega, V_{GS} = 10V$ (see Figure 12)		245		ns
$t_f$	Fall time			140		ns
$t_c$	Cross-over time				220	

**Table 7. Source drain diode**

Symbol	Parameter	Test conditions	Min	Typ.	Max	Unit
$I_{SD}$	Source-drain current				100	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)				400	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 100A, V_{GS} = 0$			1.6	V
$t_{rr}$	Reverse recovery time	$I_{SD}=100A, T_j=150^\circ C$ $di/dt = 100A/\mu s$ $V_{DD}=160V,$ (see Figure 17)		225		ns
$Q_{rr}$	Reverse recovery charge			1.35		$\mu C$
$I_{RRM}$	Reverse recovery current			12		A

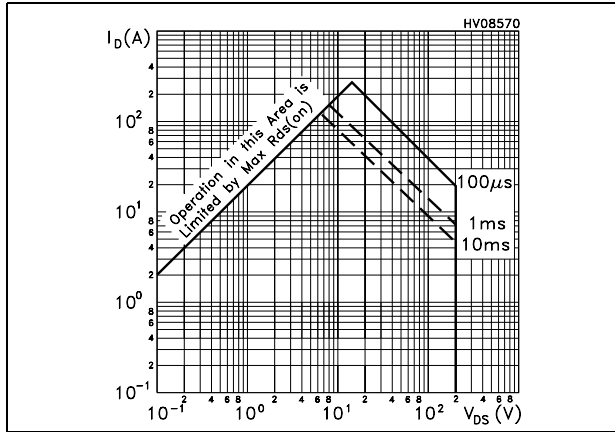
1. Pulse width limited by safe operating area
2. Pulsed: pulse duration=300 $\mu s$ , duty cycle .5%

**Electrical characteristics**

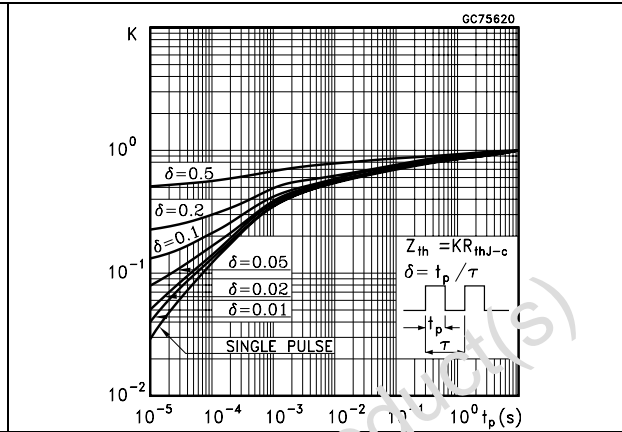
**STY100NS20FD**

**2.1 Electrical characteristics (curves)**

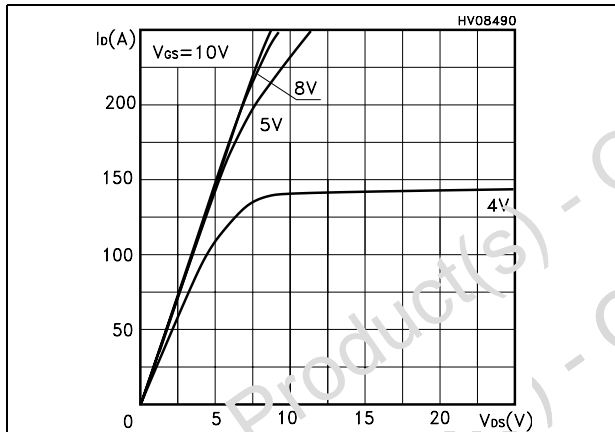
**Figure 1. Safe operating area**



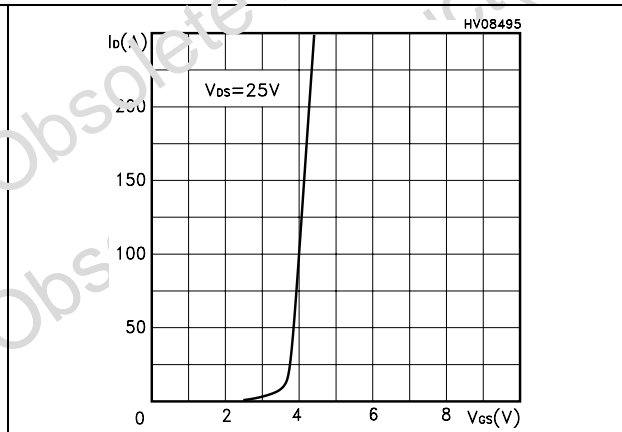
**Figure 2. Thermal impedance**



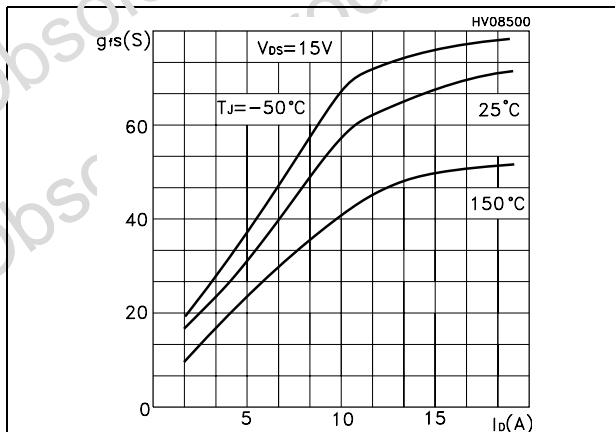
**Figure 3. Output characteristics**



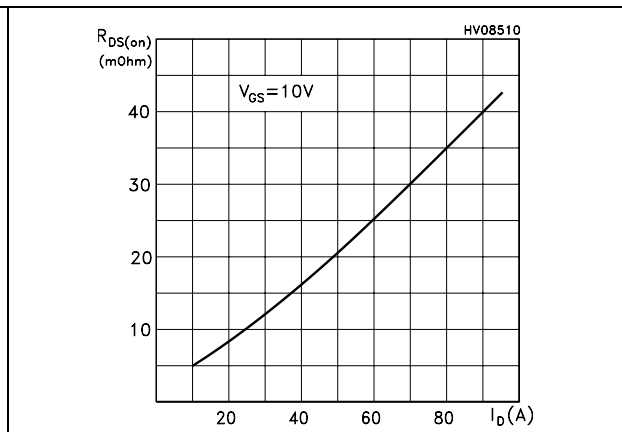
**Figure 4. Transfer characteristics**



**Figure 5. Transconductance**



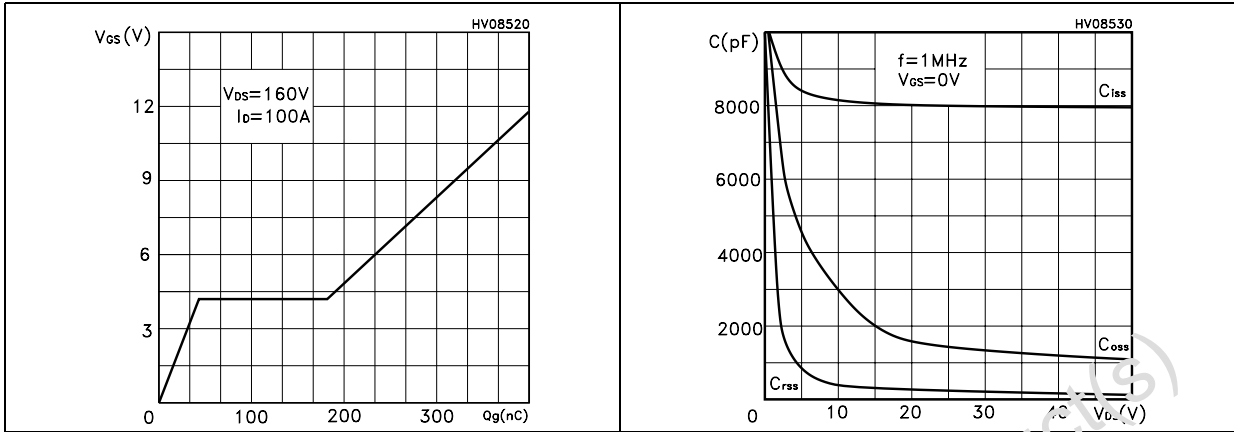
**Figure 6. Static drain-source on resistance**



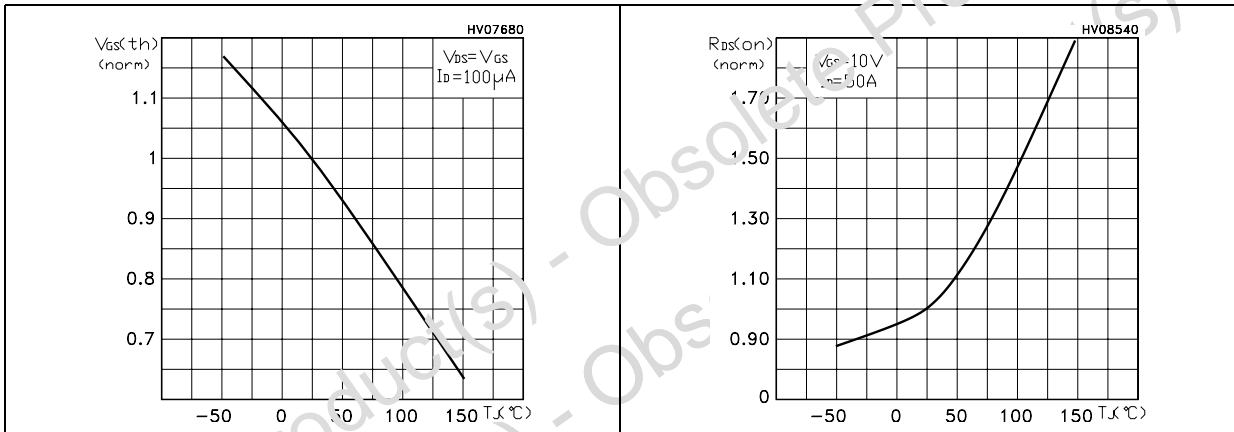
**STY100NS20FD**

**Electrical characteristics**

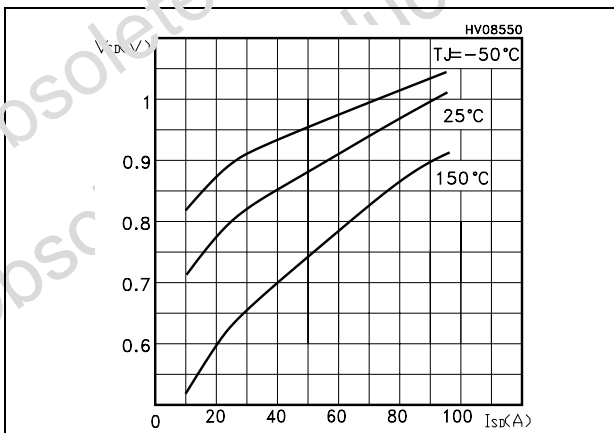
**Figure 7. Gate charge vs gate-source voltage** **Figure 8. Capacitance variations**



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



**Figure 11. Source-drain diode forward characteristics**



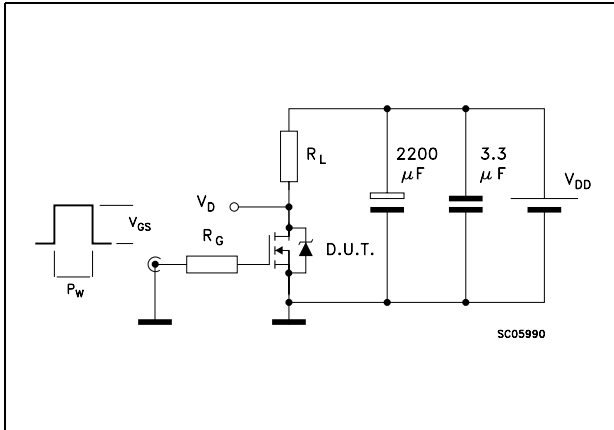


Test circuit

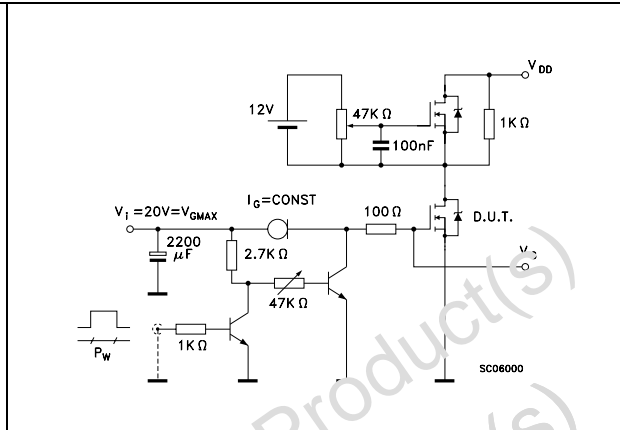
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**3 Test circuit**

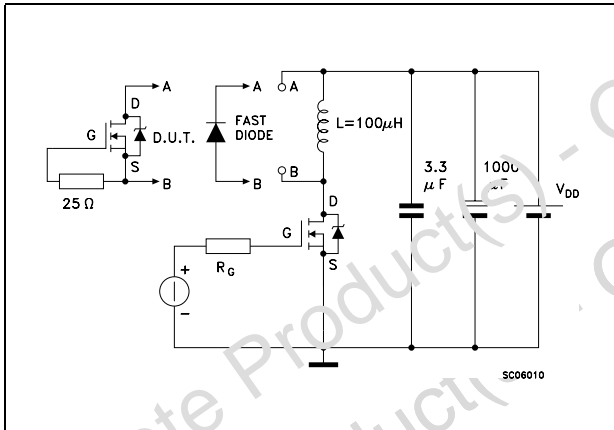
**Figure 12. Switching times test circuit for resistive load**



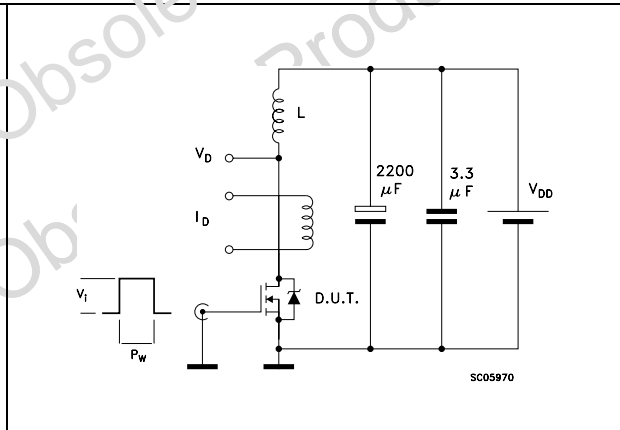
**Figure 13. Gate charge test circuit**



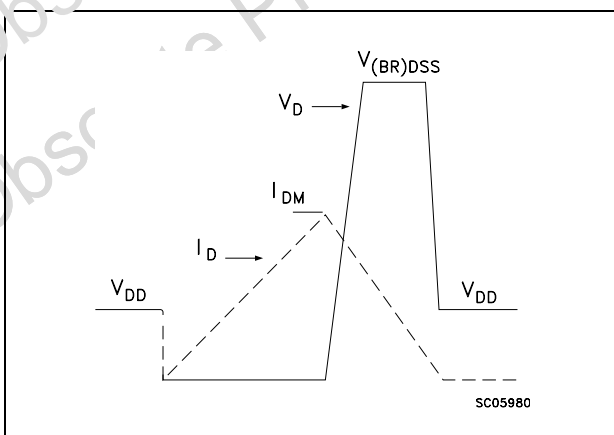
**Figure 14. Test circuit for inductive load switching and diode recovery times**



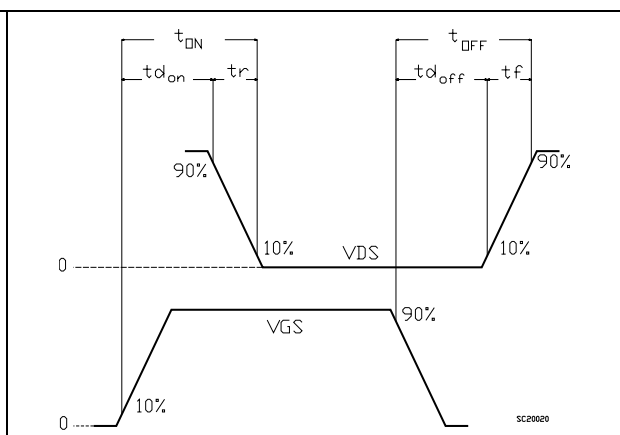
**Figure 15. Unclamped inductive load test circuit**



**Figure 16. Unclamped inductive waveform**



**Figure 17. 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](http://www.st.com)

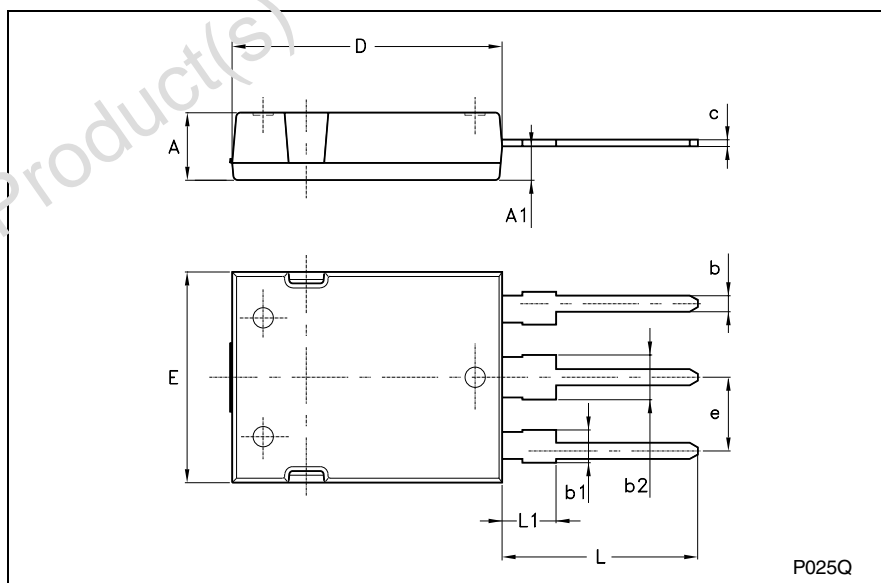
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**Package mechanical data**

**STY100NS20FD**

**Max247 MECHANICAL DATA**

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.70		5.30			
A1	2.20		2.60			
b	1.00		1.40			
b1	2.00		2.40			
b2	3.00		3.40			
c	0.40		0.80			
D	19.70		20.30			
e	5.35		5.55			
E	15.30		15.90			
L	14.20		15.20			
L1	3.70		4.30			



## 5 Revision history

Table 8. Revision history

Date	Revision	Changes
15-May-2006	3	New template

Obsolete Product(s) - Obsolete Product(s)  
Obsolete Product(s) - Obsolete Product(s)

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**STY100NS20FD**

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