



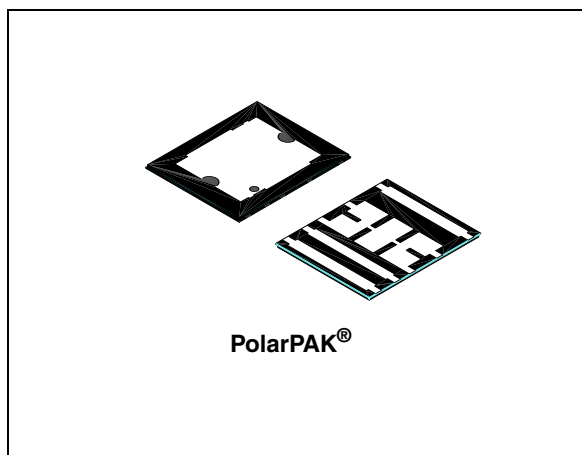
# STK850

N-channel 30V - 0.0024Ω - 30A - PolarPAK<sup>®</sup>  
STripFET<sup>™</sup> Power MOSFET

## General features

Type	V <sub>DSS</sub>	R <sub>DS(on)</sub>	R <sub>DS(on)</sub> *Q <sub>g</sub>	P <sub>TOT</sub>
STK800	30V	<0.0029Ω	71nC*mΩ	5.2W

- Ultra low top and bottom junction to case thermal resistance
- Very low capacitances
- 100% R<sub>g</sub> tested
- Fully encapsulated die
- In compliance with the 2002/95/EC european directive
- PolarPAK<sup>®</sup> is a trademark of VISHAY



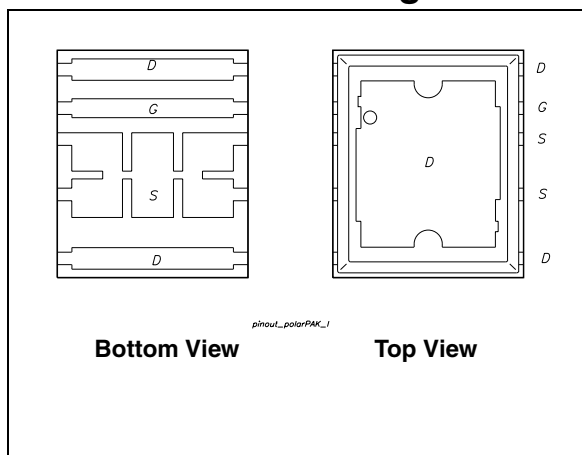
## Description

This Power MOSFET is the latest development of STMicroelectronics unique “Single Feature Size<sup>™</sup>” strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, moreover the double sides cooling package with ultra low junction to case thermal resistance allows to handle higher levels of current.

## Applications

- Switching application

## Internal schematic diagram



## Order codes

Part number	Marking	Package	Packaging
STK850	K850	PolarPAK <sup>®</sup>	Tape & reel

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# Contents

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# 1 Electrical ratings

**Table 1. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source voltage ( $V_{GS} = 0$ )	30	V
$V_{GS}^{(1)}$	Gate-source voltage	$\pm 16$	V
$V_{GS}^{(2)}$	Gate-source voltage	$\pm 18$	V
$I_D^{(4)}$	Drain current (continuous) at $T_C = 25^\circ\text{C}$	30	A
$I_D$	Drain current (continuous) at $T_C = 100^\circ\text{C}$	18.75	A
$I_{DM}^{(3)}$	Drain current (pulsed)	120	A
$P_{TOT}^{(4)}$	Total dissipation at $T_C = 25^\circ\text{C}$	5.2	W
	Derating factor	0.0416	W/ $^\circ\text{C}$
$T_j$ $T_{stg}$	Operating junction temperature Storage temperature	-55 to 150	$^\circ\text{C}$

1. Continuous mode
2. Guaranteed for test time  $\leq 15\text{ms}$
3. Pulse width limited by package
4. When mounted on FR-4 board of  $1\text{inch}^2$ , 2 oz Cu and  $\leq 10\text{sec}$

**Table 2. Thermal data**

Symbol	Parameter	Typ.	Max.	Unit
$R_{thj-amb}^{(1)}$	Thermal resistance junction-amb	20	24	$^\circ\text{C}/\text{W}$
$R_{thj-c}^{(2)}$	Thermal resistance junction-case (top drain)	0.8	1	$^\circ\text{C}/\text{W}$
$R_{thj-c}^{(3)}$	Thermal resistance junction-case (source)	2.2	2.7	$^\circ\text{C}/\text{W}$

1. When mounted on FR-4 board of  $1\text{inch}^2$ , 2 oz Cu and  $\leq 10\text{sec}$
2. Steady State
3. Measured at Source pin when the device is mounted on FR-4 board in steady state

## 2 Electrical characteristics

( $T_{CASE}=25^{\circ}C$  unless otherwise specified)

**Table 3. On/off**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 250\mu A, V_{GS} = 0$	30			V
$I_{DSS}$	Zero gate voltage drain current ( $V_{GS} = 0$ )	$V_{DS} = \text{Max rating},$ $V_{DS} = \text{Max rating}, T_c = 125^{\circ}C$			1 10	$\mu A$ $\mu A$
$I_{GSS}$	Gate body leakage current ( $V_{DS} = 0$ )	$V_{GS} = \pm 16V$			$\pm 100$	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	1		2.5	V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10V, I_D = 15A$ $V_{GS} = 4.5V, I_D = 15A$		0.0024 0.0029	0.0029 0.0035	$\Omega$ $\Omega$

**Table 4. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$g_{fs}^{(1)}$	Forward transconductance	$V_{DS} = 10V, I_D = 15A$		48		S
$C_{iss}$	Input capacitance	$V_{DS} = 25V, f = 1 \text{ MHz}, V_{GS} = 0$		3150		pF
$C_{oss}$	Output capacitance			940		pF
$C_{rss}$	Reverse transfer capacitance			90		pF
$Q_g$	Total gate charge	$V_{DD} = 15V, I_D = 30A$		24.5	32.5	nC
$Q_{gs}$	Gate-source charge	$V_{GS} = 4.5V$		8		nC
$Q_{gd}$	Gate-drain charge	(see Figure 14)		8.2		nC

1. Pulsed: pulse duration = 300 $\mu s$ , 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	$V_{DD}=15V$ , $I_D=15A$ , $R_G=4.7\Omega$ , $V_{GS}=4.5V$ (see Figure 13)		20 57		ns ns
$t_{d(off)}$ $t_f$	Turn-off delay time Fall time	$V_{DD}=15V$ , $I_D=15A$ , $R_G=4.7\Omega$ , $V_{GS}=4.5V$ (see Figure 13)		31 13		ns ns

**Table 6. 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	$I_{SD}=15A$ , $V_{GS}=0$			1.2	V
$t_{rr}$ $Q_{rr}$ $I_{RRM}$	Reverse recovery time Reverse recovery charge Reverse recovery current	$I_{SD}=30A$ , $di/dt=100A/\mu s$ , $V_{DD}=20V$ , $T_j=150^\circ C$ (see Figure 18)		39 39.8 2		ns nC A

1. Pulse width limited by package
2. Pulsed: pulse duration = 300 $\mu s$ , duty cycle 1.5%

## 2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

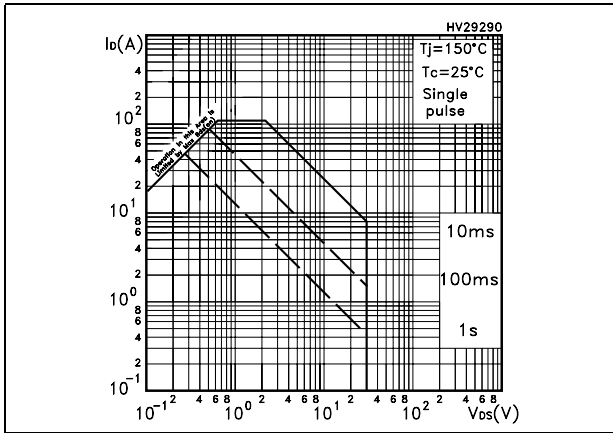


Figure 2. Thermal impedance

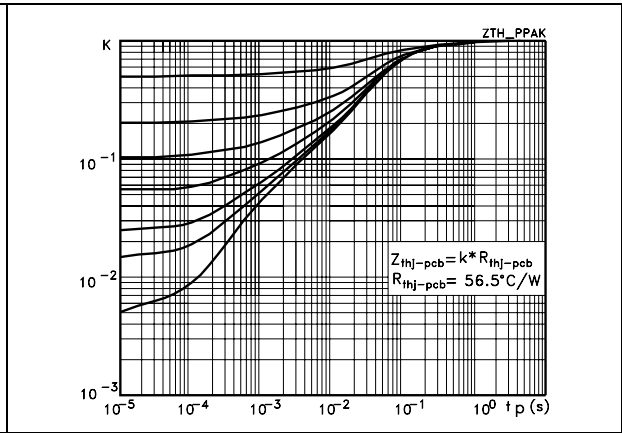


Figure 3. Output characteristics

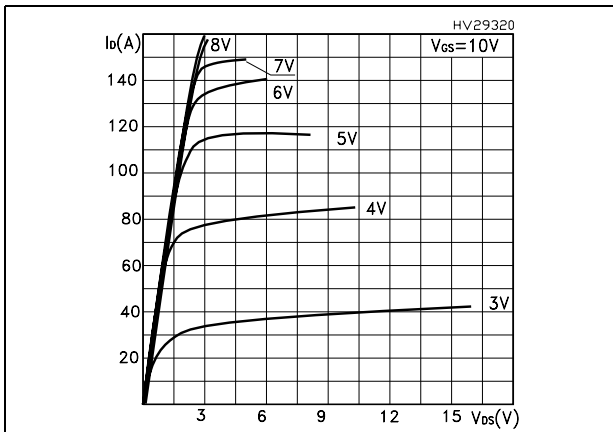


Figure 4. Transfer characteristics

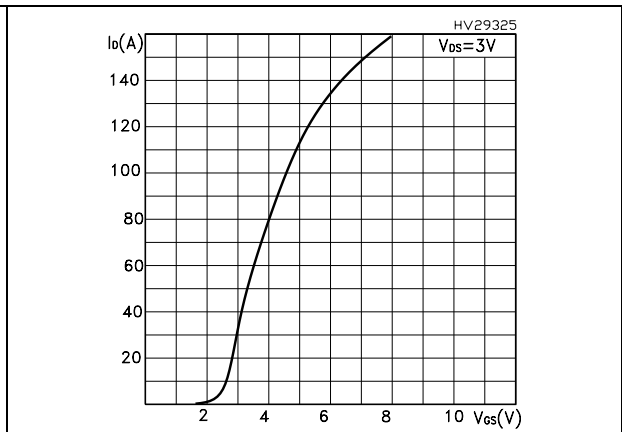


Figure 5. Transconductance

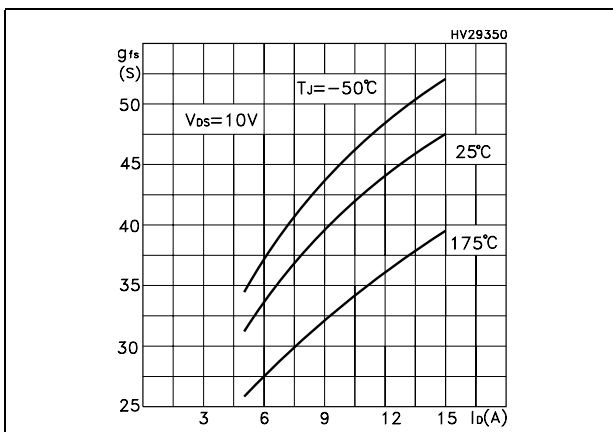


Figure 6. Static drain-source on resistance

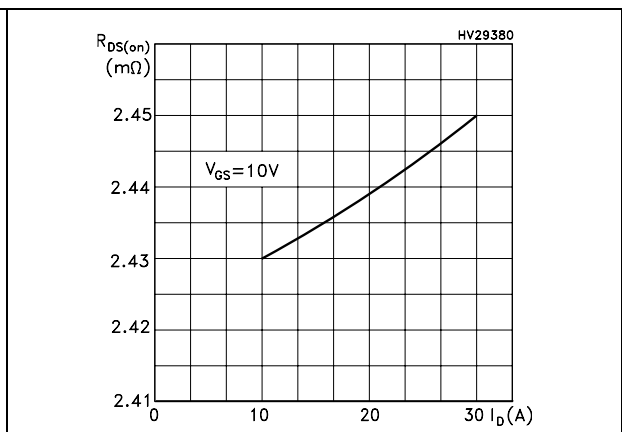


Figure 7. Gate charge vs gate-source voltage Figure 8. Capacitance variations

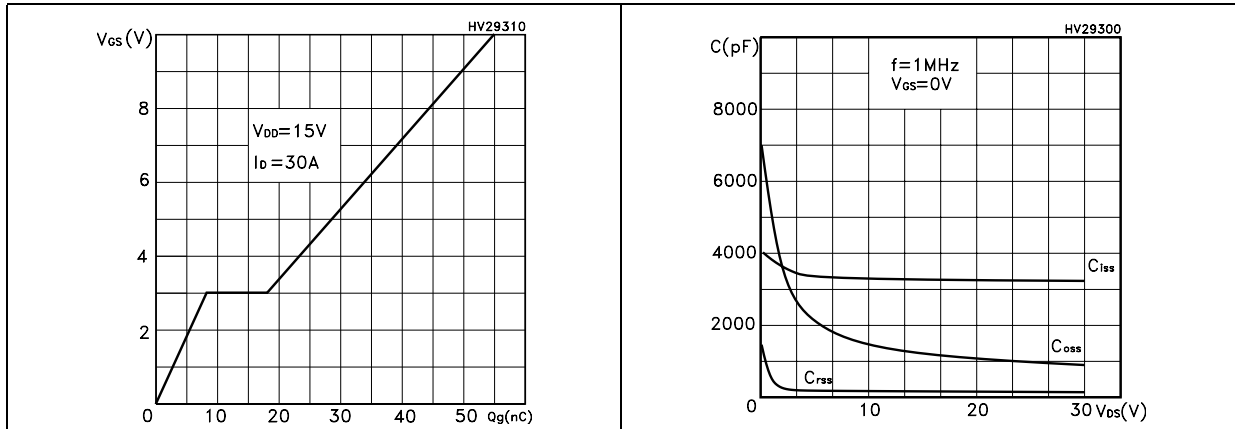


Figure 9. Normalized gate threshold voltage vs temperature Figure 10. Normalized on resistance vs temperature

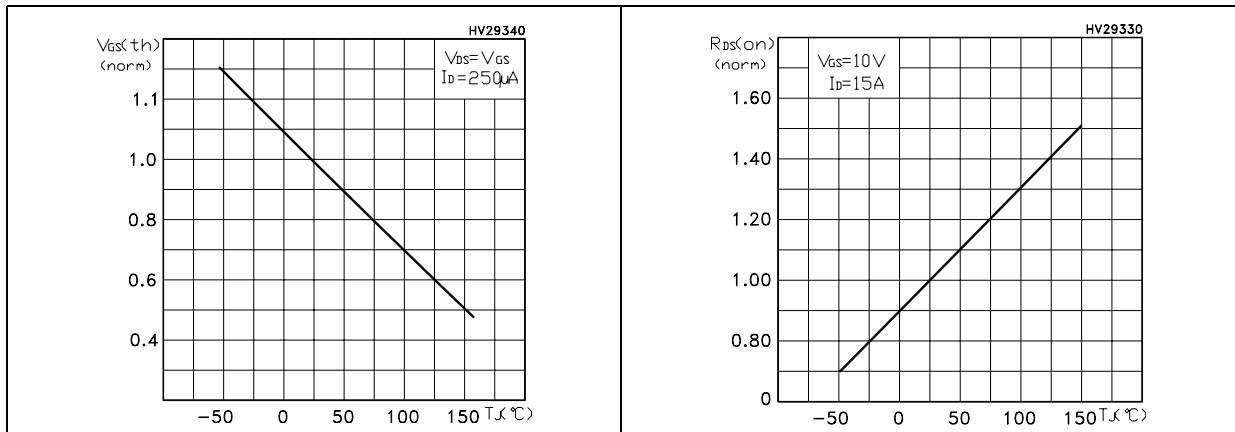
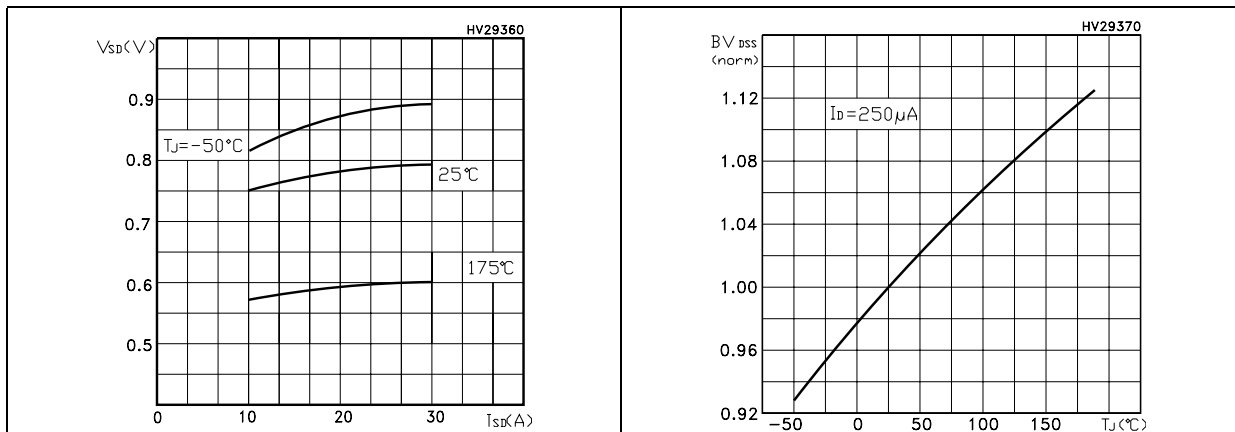
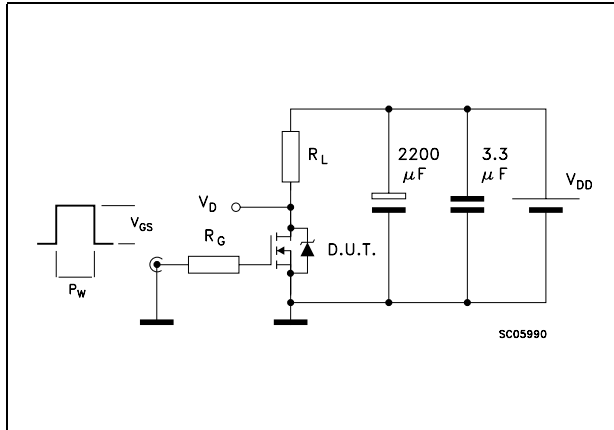


Figure 11. Source-drain diode forward characteristics Figure 12. Normalized  $B_{VDSS}$  vs temperature

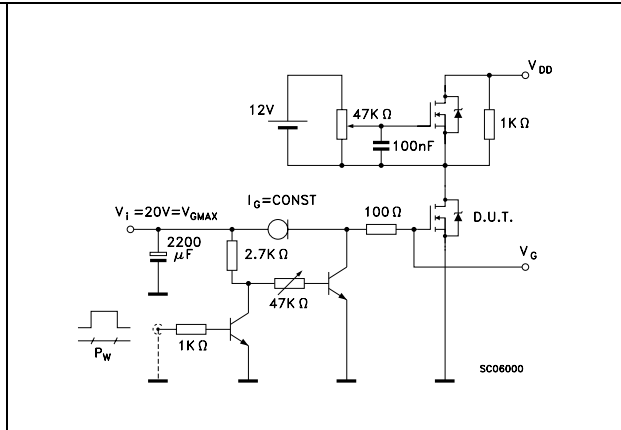


### 3 Test circuits

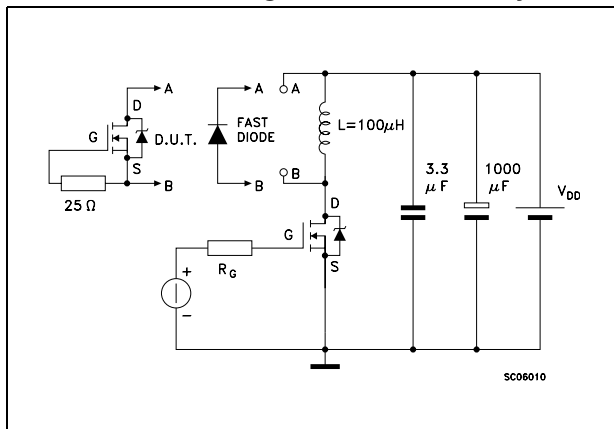
**Figure 13. Switching times test circuit for resistive load**



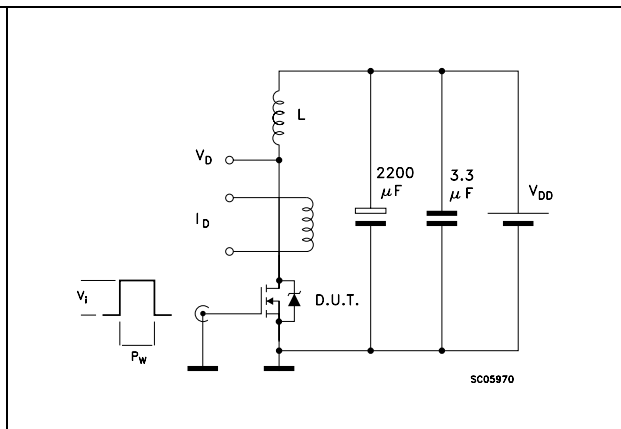
**Figure 14. Gate charge test circuit**



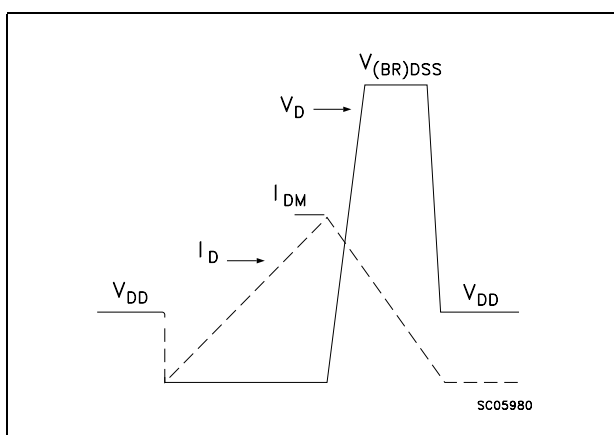
**Figure 15. Test circuit for inductive load switching and diode recovery times**



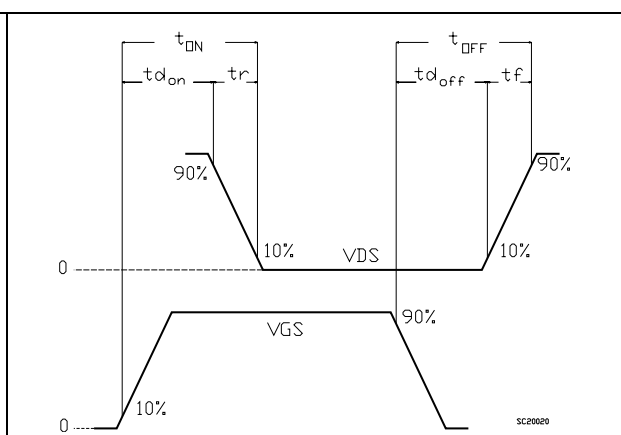
**Figure 16. Unclamped inductive load test circuit**



**Figure 17. Unclamped inductive waveform**



**Figure 18. Switching time waveform**



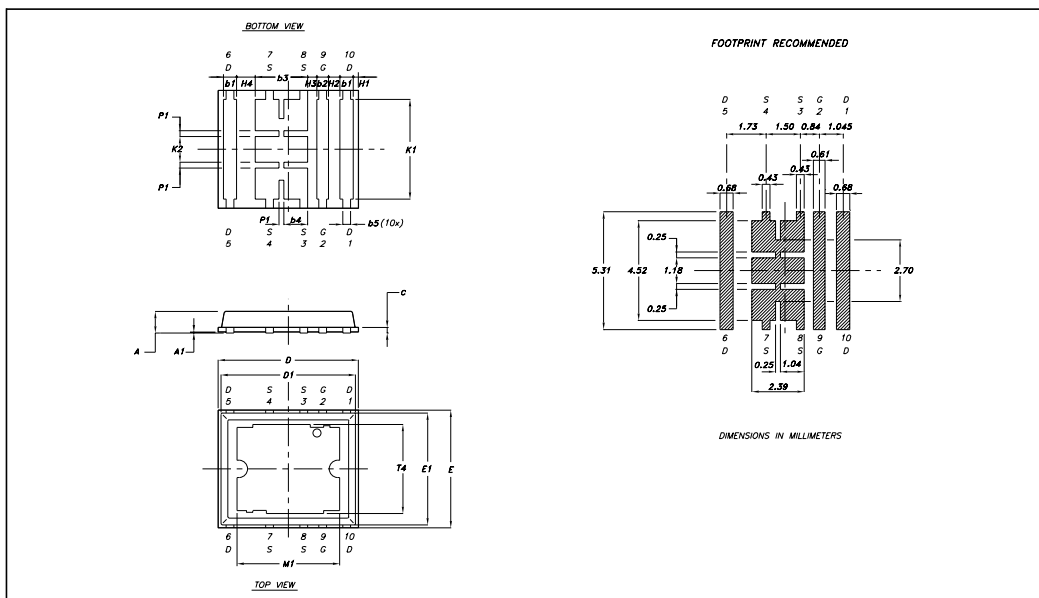


## 4 Package mechanical data

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](http://www.st.com)

**PolarPAK® (Option “L”) MECHANICAL DATA**

REF.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	0.75	0.80	0.85	0.030	0.031	0.033
A1			0.05			0.002
b1	0.48	0.58	0.68	0.019	0.023	0.027
b2	0.41	0.51	0.61	0.016	0.020	0.024
b3	2.19	2.29	2.39	0.086	0.090	0.094
b4	0.89	1.04	1.19	0.035	0.041	0.047
b5	0.23	0.33	0.43	0.009	0.013	0.017
c	0.20	0.25	0.30	0.008	0.010	0.012
D	6	6.15	6.30	0.236	0.242	0.248
D1	5.74	5.89	6.04	0.226	0.232	0.238
E	5.01	5.16	5.31	0.197	0.203	0.209
E1	4.75	4.90	5.05	0.187	0.193	0.199
H1	0.23			0.009		
H2	0.45		0.56	0.020		0.022
H3	0.31	0.41	0.51	0.012	0.016	0.020
H4	0.45		0.56	0.020		0.022
K1	4.22	4.37	4.52	0.166	0.172	0.178
K2	1.08	1.13	1.18	0.043	0.044	0.046
K3	1.37			0.054		
K4	0.24			0.009		
M1	4.30	4.50	4.70	0.169	0.177	0.185
M2	3.43	3.58	3.73	0.135	0.141	0.147
M3	0.22			0.009		
M4	0.05			0.002		
P1	0.15	0.20	0.25	0.006	0.008	0.010
T1	3.48	3.64	4.10	0.137	0.143	0.150
T2	0.56	0.76	0.95	0.22	0.030	0.037
T3	1.20			0.051		
T4	3.90			0.154		
T5		0.18	0.36		0.007	0.014
<	0°	10°	12°	0°	10°	12°



## 5 Revision history

**Table 7. Revision history**

<b>Date</b>	<b>Revision</b>	<b>Changes</b>
10-Nov-2005	1	First version
19-Dec-2005	2	Complete version
30-Jan-2006	3	Modified description on first page
21-Mar-2006	4	New template
25-May-2006	5	New note on page 1
10-Oct-2006	6	Modified general features

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