



## STT2PF60L

P-CHANNEL 60V - 0.20Ω - 2A - SOT-23-6L  
STripFET™ II Power MOSFET

### General features

Type	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STT2PF60L	60V	< 0.25Ω	2A

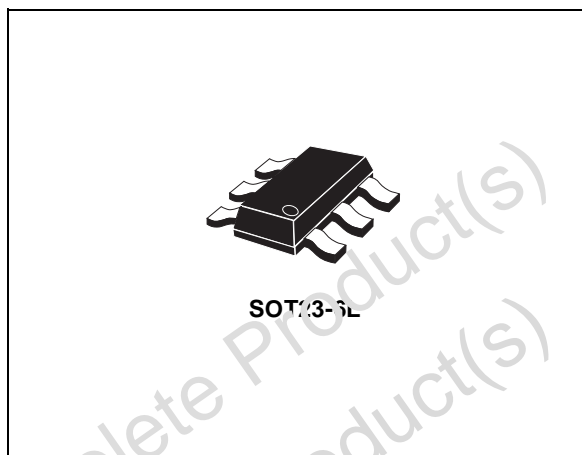
- Standard outline for easy automated surface mount assembly
- Low threshold drive

### Description

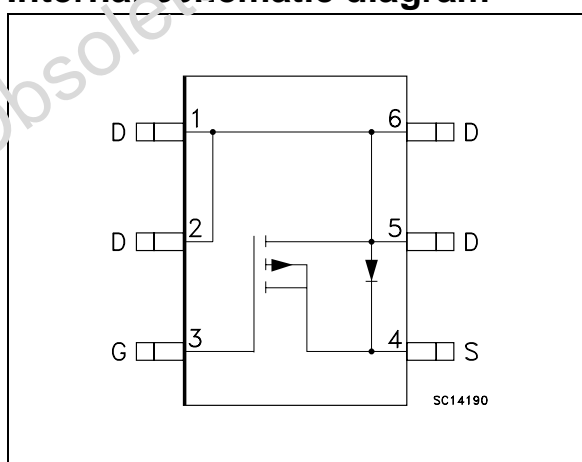
This Power MOSFET is the latest development of STMicroelectronics unique “Single Feature Size™” strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and less critical alignment steps therefore a remarkable manufacturing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

### Applications

- DC motor drive
- DC-DC converters
- Battery management in nomadic equipment
- Power management in portable/desktop PCs
- Cellular



### Internal schematic diagram



### Order codes

Sales Type	Marking	Package	Packaging
STT2PF60L	STP6	SOT23-6L	Tape & Reel

# 1 Electrical ratings

**Table 1. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-Source Voltage ( $V_{GS} = 0$ )	60	V
$V_{DGR}$	Drain-gate Voltage ( $R_{GS} = 20k\Omega$ )	60	V
$V_{GS}$	Gate-Source Voltage	$\pm 15$	V
$I_D$	Drain Current (continuous) at $T_C = 25^\circ\text{C}$	2	A
$I_D$	Drain Current (continuous) at $T_C = 100^\circ\text{C}$	1.3	A
$I_{DM}^{(1)}$	Drain Current (pulsed)	8	A
$P_{TOT}$	Total Dissipation at $T_C = 25^\circ\text{C}$	1.6	W

1. Pulse width limited by safe operating area

**Table 2. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thJ-amb}^{(1)}$	Thermal resistance junction-case Max	78	$^\circ\text{C/W}$
$T_j$	Maximum operating junction temperature	150	$^\circ\text{C}$
$T_{stg}$	Storage temperature	-55 to 150	$^\circ\text{C}$

1. Mounted on a 1 in<sup>2</sup> pad of 2 oz Cu in FR-4 board for  $t < 10\text{sec}$

**Note:** For the P-Channel MOSFET actual polarity of voltage and current has to be reversed

## 2 Electrical characteristics

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

**Table 3. On/off states**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$I_D = 250\mu A, V_{GS} = 0$	60			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 ( $V_{DS} = 0$ )	$V_{GS} = \pm 15V$			100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	1			V
$R_{DS(on)}$	Static Drain-Source On Resistance	$V_{GS} = 10V, I_D = 1A$ $V_{GS} = 4.5V, I_D = 1A$		0.20 0.24	0.25 0.30	$\Omega$ $\Omega$

**Table 4. Dynamic**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$g_{fs}^{(1)}$	Forward Transconductance	$V_{DS} = 10V, I_D = 1A$		3		S
$C_{iss}$	Input Capacitance	$V_{DS} = 25V, f = 1 \text{ MHz}, V_{GS} = 0$		313		pF
$C_{oss}$	Output Capacitance			67		pF
$C_{rss}$	Reverse Transfer Capacitance			25		pF
$Q_g$	Total Gate Charge	$V_{DD} = 30V, I_D = 24A$		5	7	nC
$Q_{gs}$	Gate-Source Charge	$V_{GS} = 10V$		0.5		nC
$Q_{gd}$	Gate-Drain Charge	(see Figure 14)		2.2		nC

<sup>(1)</sup> Pulsed: pulse duration=300 $\mu s$ , duty cycle 1.5%

**Note:** For the P-Channel MOSFET actual polarity of voltage and current has to be reversed

**Table 5. Switching times**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ $t_r$	Turn-on Delay Time Rise Time	$V_{DD}=30V$ , $I_D=1A$ , $R_G=4.7\Omega$ , $V_{GS}=4.5V$ (see Figure 13)		44 34		ns ns
$t_{d(off)}$ $t_f$	Turn-off Delay Time Fall Time	$V_{DD}=30V$ , $I_D=1A$ , $R_G=4.7\Omega$ , $V_{GS}=4.5V$ (see Figure 13)		42 15		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)				2 8	A A
$V_{SD}^{(2)}$	Forward on Voltage	$I_{SD}=2A$ , $V_{GS}=0$			1.2	V
$t_{rr}$ $Q_{rr}$ $I_{RRM}$	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$I_{SD}=2A$ , $di/dt = 100A/\mu s$ , $V_{DD}=30V$ , $T_j=150^\circ C$		38 36.3 2.5		ns nC A

1. Pulse width limited by safe operating area

2. Pulsed: pulse duration=300 $\mu s$ , duty cycle 1.5%

*Note: For the P-Channel MOSFET actual polarity of voltage and current has to be reversed*

## 2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

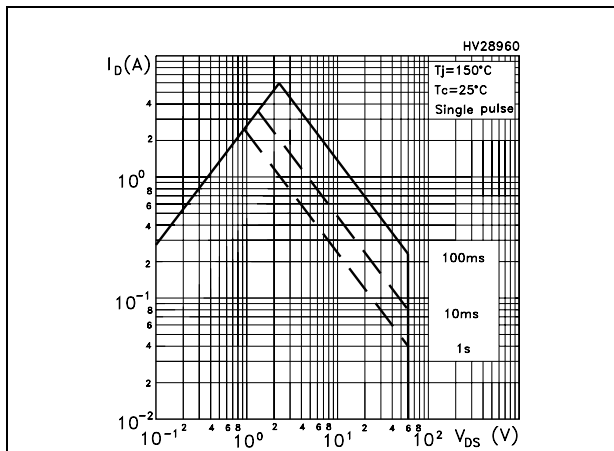


Figure 2. Thermal impedance

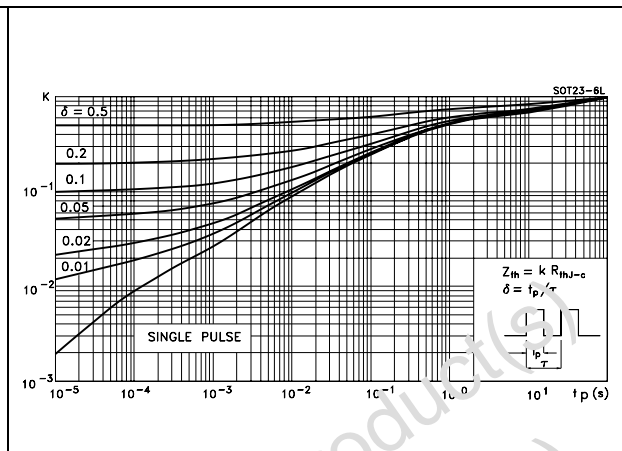


Figure 3. Output characteristics

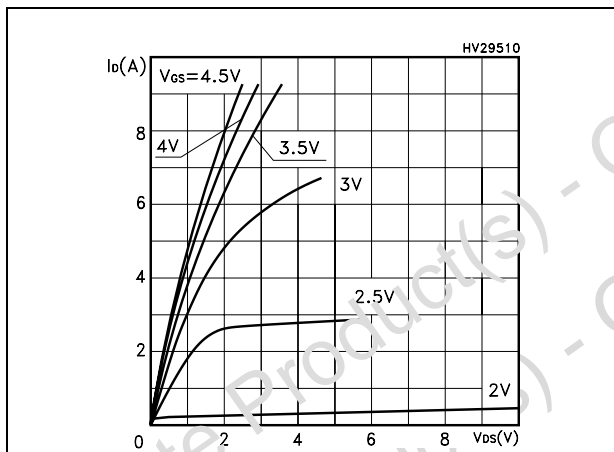


Figure 4. Transfer Characteristics

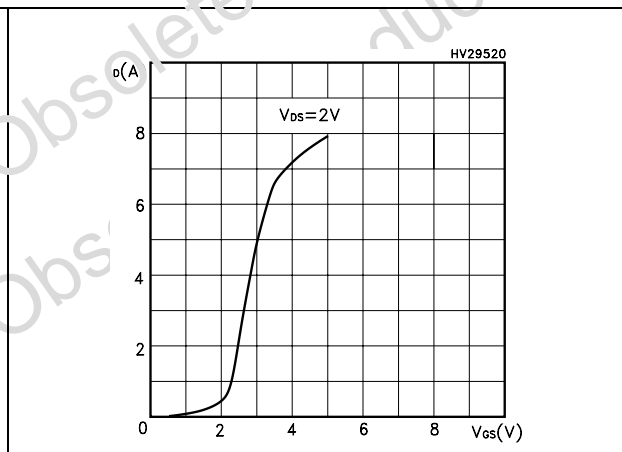


Figure 5. Transconductance

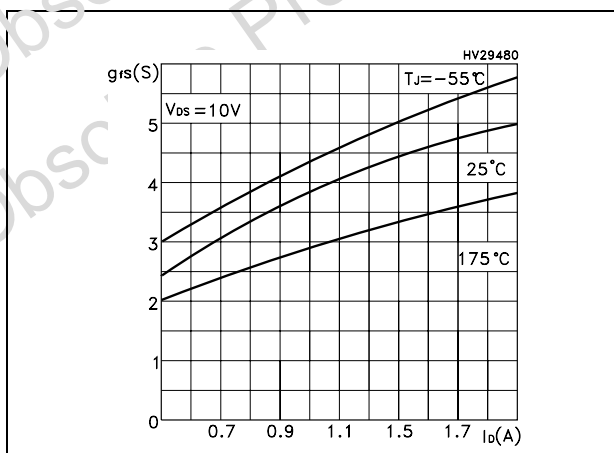


Figure 6. Static drain-source on resistance

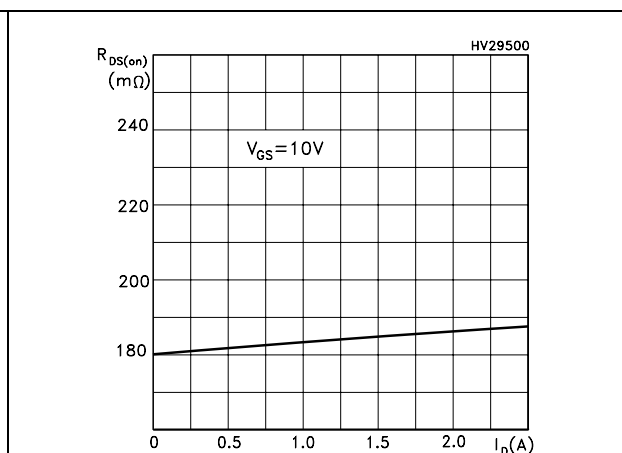


Figure 7. Gate charge vs gate-source voltage Figure 8. Capacitance variations

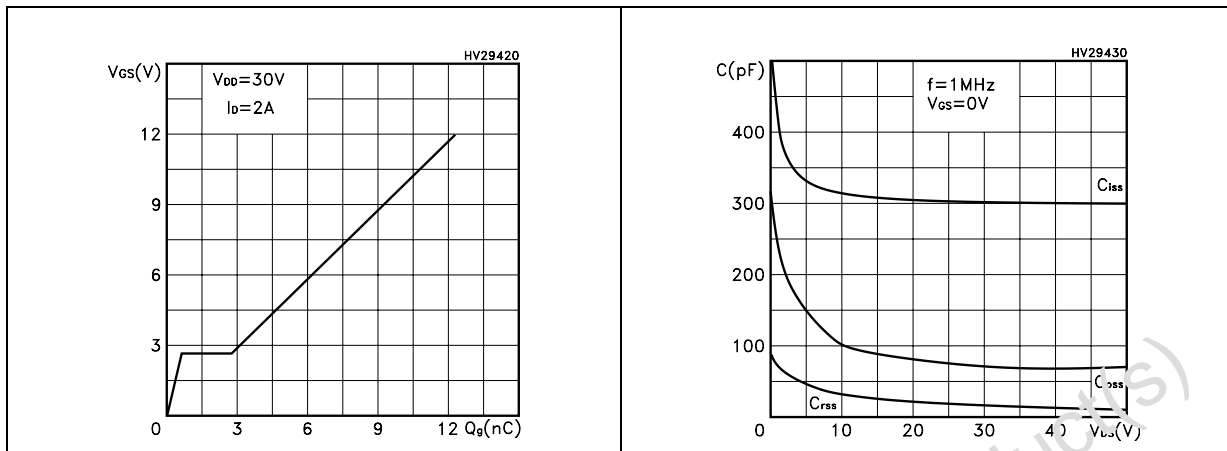


Figure 9. Normalized gate threshold voltage vs temperature Figure 10. Normalized on resistance vs temperature

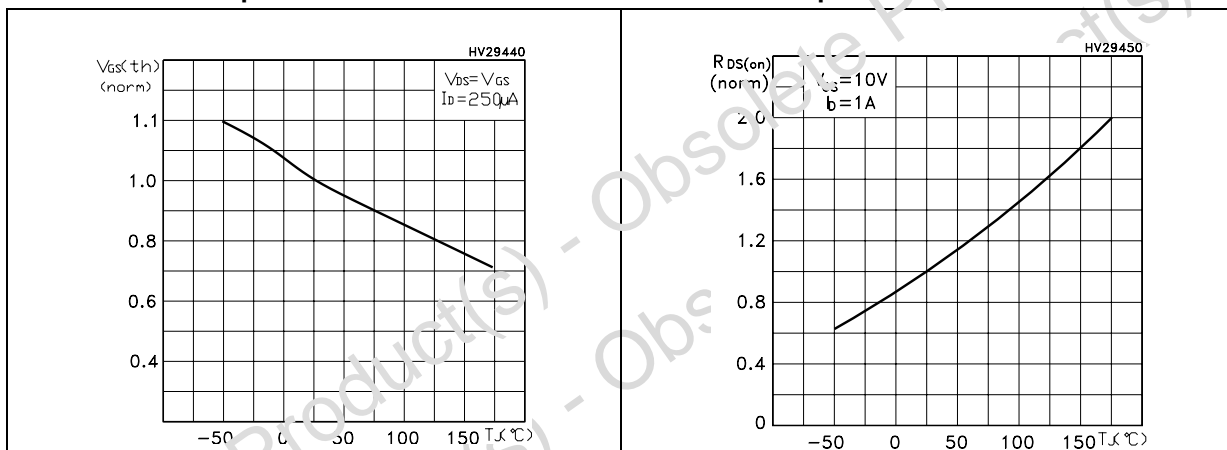
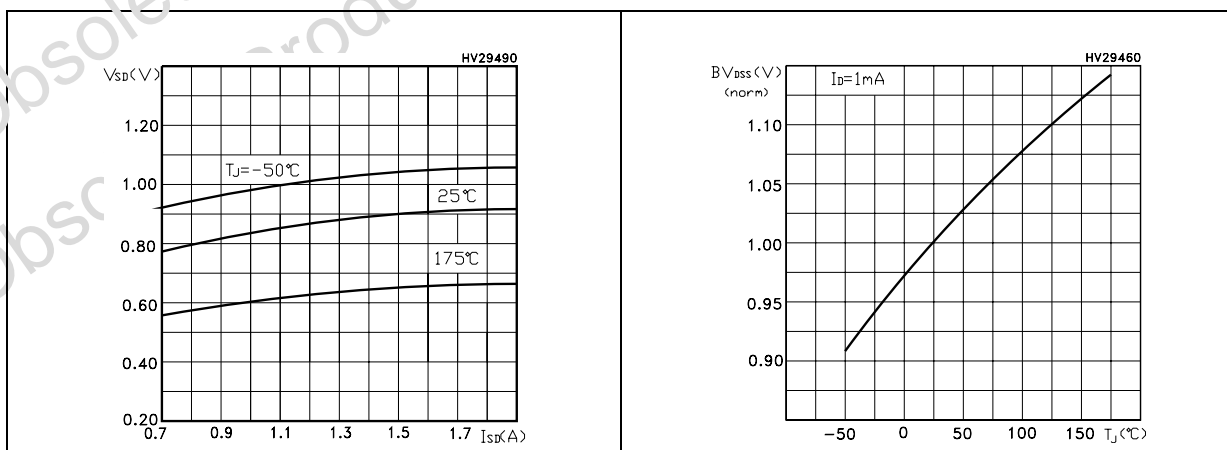


Figure 11. Source-drain diode forward characteristics Figure 12. Normalized  $B_{V_{DS}}$  vs temperature



### 3 Test circuit

Figure 13. Switching times test circuit for resistive load

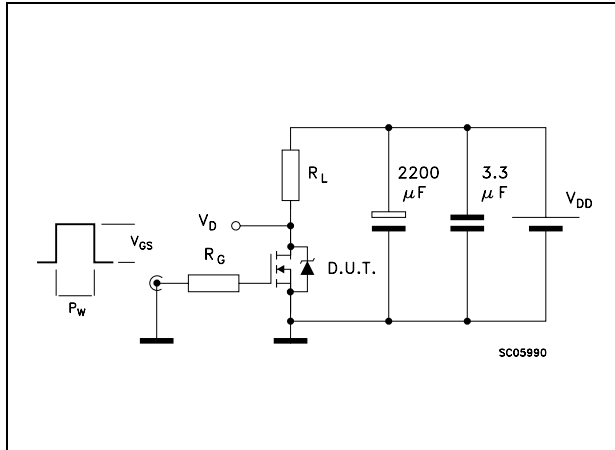


Figure 14. Gate charge test circuit

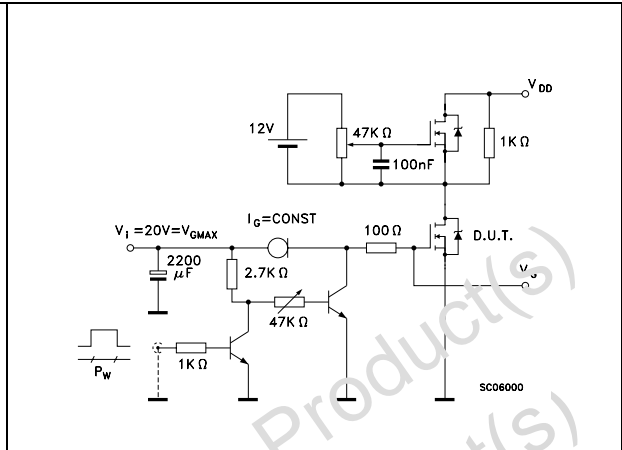


Figure 15. Test circuit for inductive load switching and diode recovery times

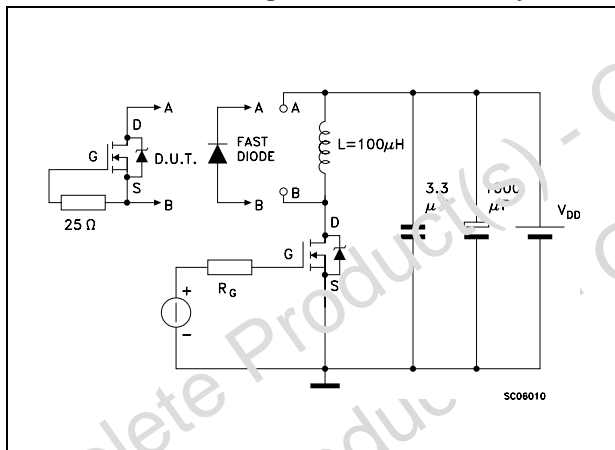


Figure 16. Unclamped Inductive load test circuit

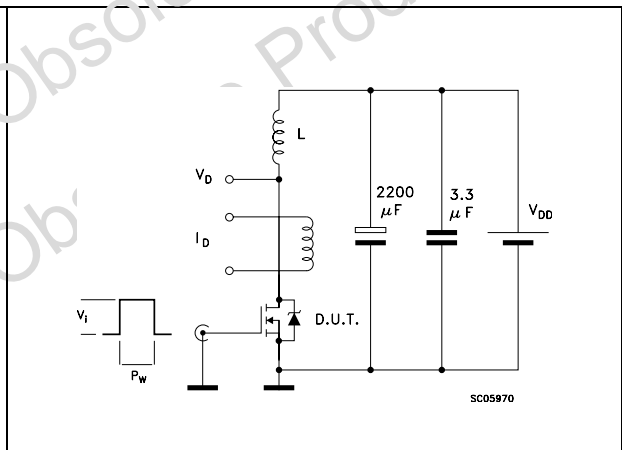
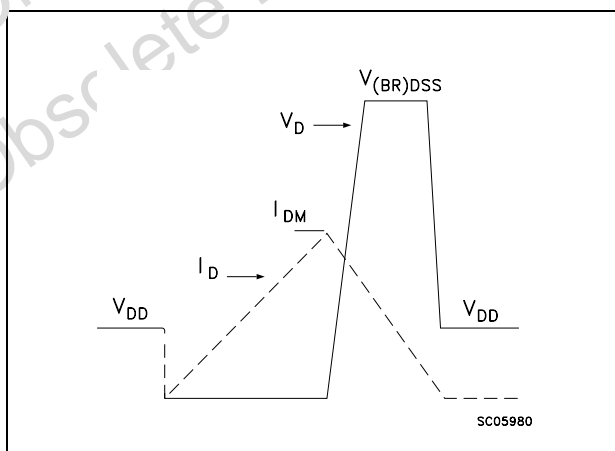


Figure 17. Unclamped inductive waveform



## 4 Package mechanical data

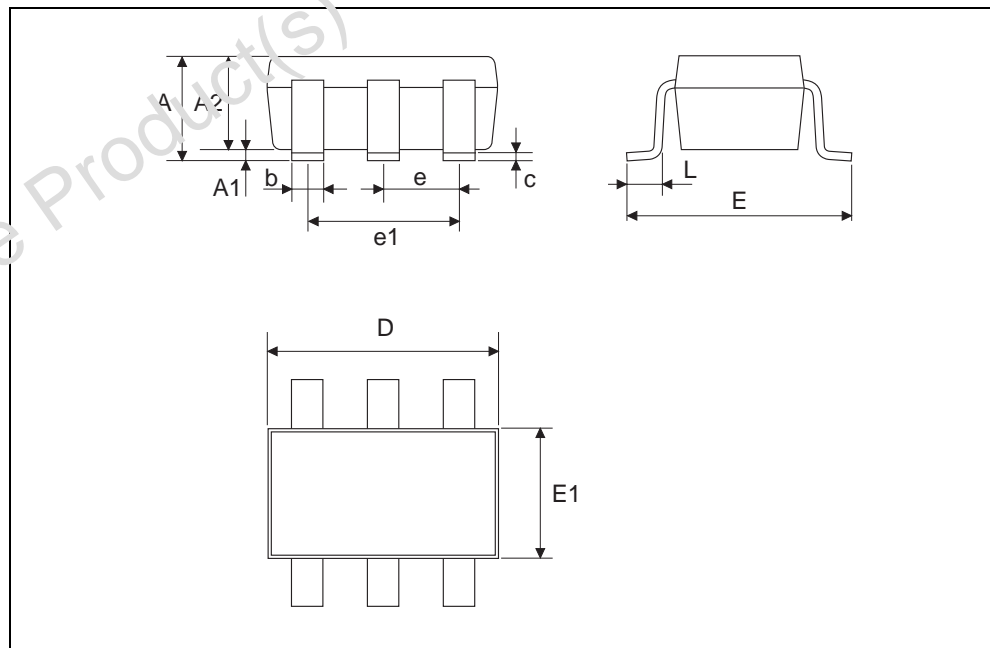
In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect . The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings 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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<b>TSOP-6 MECHANICAL DATA</b>
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DIM.	mm			mils		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	0.90		1.45	0.035		0.057
A1	0.00		0.15	0.000		0.006
A2	0.90		1.30	0.035		0.051
b	0.25		0.50	0.010		0.020
C	0.09		0.20	0.004		0.008
D	2.80		3.10	0.110		0.122
E	2.60		3.00	0.102		0.118
E1	1.50		1.75	0.059		0.069
L	0.35		0.55	0.014		0.022
e		0.95			0.037	
e1		1.90			0.075	



## 5 Revision history

**Table 7. Document revision history**

Date	Revision	Changes
07-May-2002	1	Initial release.
19-Apr-2003	2	Preliminary version
22-Dec-2005	3	Final version

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

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