



## STN1NF10

N-channel 100V - 0.7 $\Omega$  - 1A SOT-223  
STripFET™ II Power MOSFET

### General features

Type	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STN1NF10	100V	<0.8 $\Omega$	1A

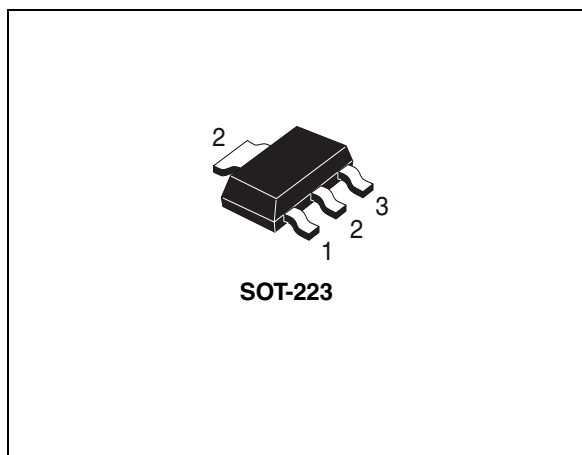
- Exceptional dv/dt capability

### Description

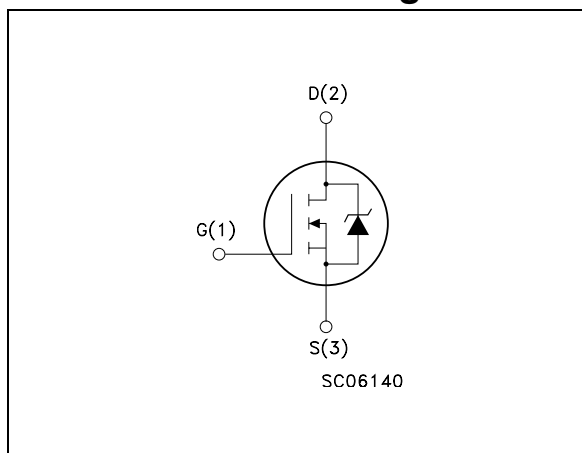
This Power MOSFET is the latest development of STMicroelectronics unique "Single Feature Size™" strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and less critical alignment steps therefore a remarkable manufacturing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

### Applications

- Switching application



### Internal schematic diagram



### Order codes

Part number	Marking	Package	Packaging
STN1NF10	N1NF10	SOT-223	Tape & reel

# Contents

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# 1 Electrical ratings

**Table 1. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source voltage ( $V_{GS} = 0$ )	100	V
$V_{GS}$	Gate-source voltage	$\pm 20$	V
$I_D$	Drain current (continuous) at $T_C = 25^\circ\text{C}$	1	A
$I_D$	Drain current (continuous) at $T_C = 100^\circ\text{C}$	0.6	A
$I_{DM}^{(1)}$	Drain current (pulsed)	4	A
$P_{TOT}$	Total dissipation at $T_C = 25^\circ\text{C}$	2.5	W
	Derating factor	0.02	W/ $^\circ\text{C}$
$dv/dt^{(2)}$	Peak diode recovery voltage slope	20	V/ns
$E_{AS}^{(3)}$	Single pulse avalanche energy	35	mJ
$T_J$ $T_{stg}$	Operating junction temperature Storage temperature	-55 to 150	$^\circ\text{C}$

1. Pulse width limited by safe operating area
2.  $I_{SD} \leq 1\text{A}$ ,  $di/dt \leq 350\text{A}/\mu\text{s}$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $T_J \leq T_{JMAX}$
3. Starting  $T_j = 25^\circ\text{C}$ ,  $I_D = 1\text{A}$ ,  $V_{DD} = 70\text{V}$

**Table 2. Thermal data**

$R_{thj-pcb}$	Thermal Resistance Junction-PCB (1 inch <sup>2</sup> copper board)	50	$^\circ\text{C}/\text{W}$
$R_{thj-pcb}$	Thermal Resistance Junction-PCB (min. footprint)	90	$^\circ\text{C}/\text{W}$
$T_l$	Maximum Lead Temperature For Soldering Purpose	260	$^\circ\text{C}$

## 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	$I_D = 250 \mu A, V_{GS} = 0$	100			V
$I_{DSS}$	Zero gate voltage drain current ( $V_{GS} = 0$ )	$V_{DS} = \text{Max rating},$ $V_{DS} = \text{Max rating} @ 125^{\circ}C$			1 10	$\mu A$ $\mu A$
$I_{GSS}$	Gate body leakage current ( $V_{DS} = 0$ )	$V_{GS} = \pm 20V$			$\pm 100$	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250 \mu A$	2	3	4	V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10V, I_D = 0.5A$		0.7	0.8	$\Omega$

**Table 4. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$g_{fs}^{(1)}$	Forward transconductance	$V_{DS} = 15A, I_D = 1A$		1		S
$C_{iss}$ $C_{oss}$ $C_{rss}$	Input capacitance Output capacitance Reverse transfer capacitance	$V_{DS} = 25V, f = 1 \text{ MHz}, V_{GS} = 0$		105 20 9		pF pF pF
$Q_g$ $Q_{gs}$ $Q_{gd}$	Total gate charge Gate-source charge Gate-drain charge	$V_{DD} = 50V, I_D = 1A$ $V_{GS} = 10V$		4 1 1.5	6	nC nC 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	$V_{DD} = 50V, I_D = 0.5A,$ $R_G = 4.7\Omega, V_{GS} = 10V$ (see Figure 13)		4 5.5		ns ns
$t_{d(off)}$ $t_f$	Turn-off-delay time Fall time	$V_{DD} = 50V, I_D = 0.5A,$ $R_G = 4.7\Omega, V_{GS} = 10V$ (see Figure 13)		13 6.5		ns ns

**Table 6. Source drain diode**

Symbol	Parameter	Test conditions	Min.	Typ.	Max	Unit
$I_{SD}$	Source-drain current				1	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)				4	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD}=1A, V_{GS}=0$			1.2	V
$t_{rr}$	Reverse recovery time	$I_{SD}=1A,$ $di/dt = 100A/\mu s,$ $V_{DD}=20V, T_j=150^\circ C$ (see Figure 15)		45		ns
$Q_{rr}$	Reverse recovery charge			60		nC
$I_{RRM}$	Reverse recovery current			2.7		A

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

## 2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

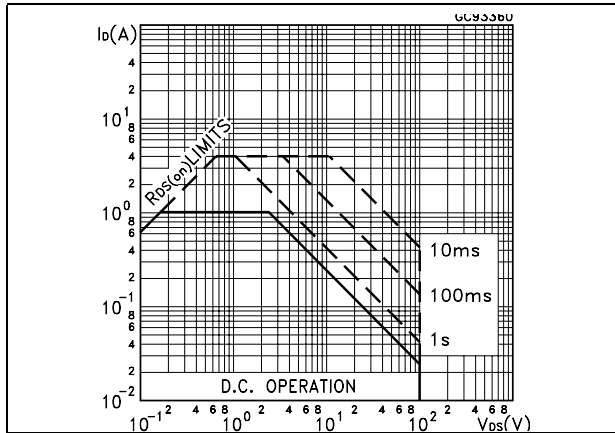


Figure 2. Thermal impedance

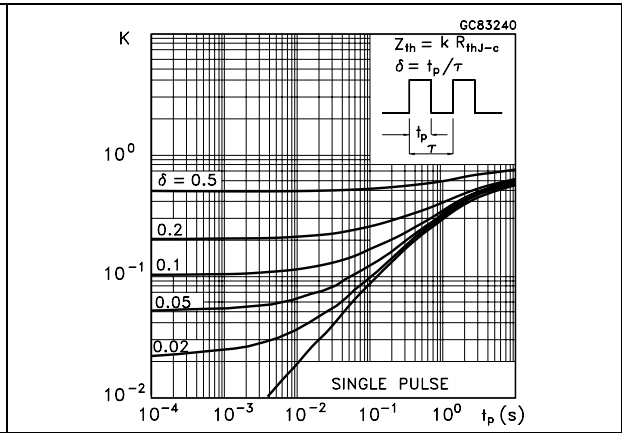


Figure 3. Output characteristics

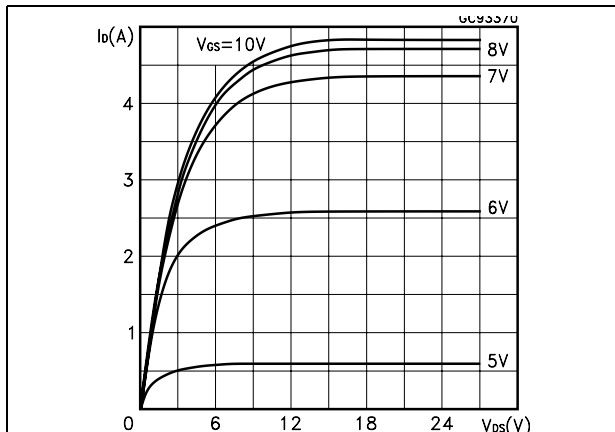


Figure 4. Transfer characteristics

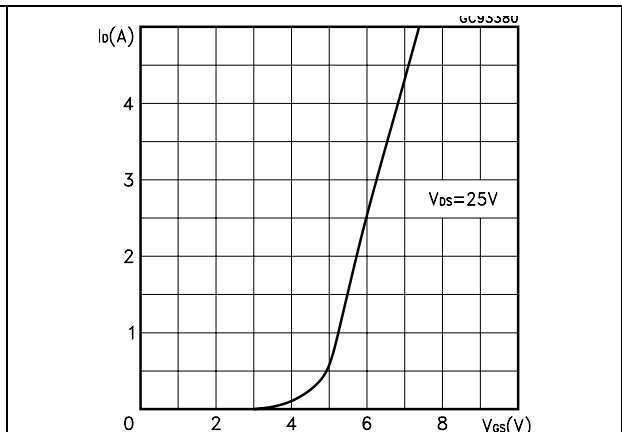


Figure 5. Transconductance

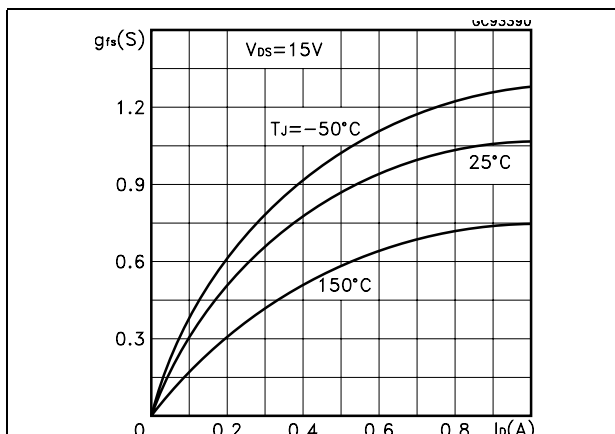


Figure 6. Static drain-source on resistance

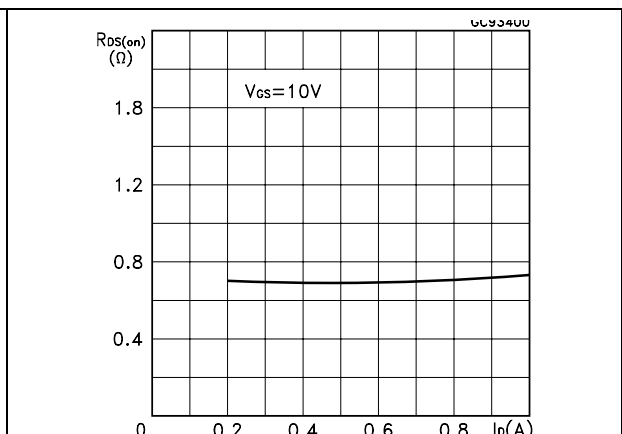


Figure 7. Gate charge vs. gate-source voltage Figure 8. Capacitance variations

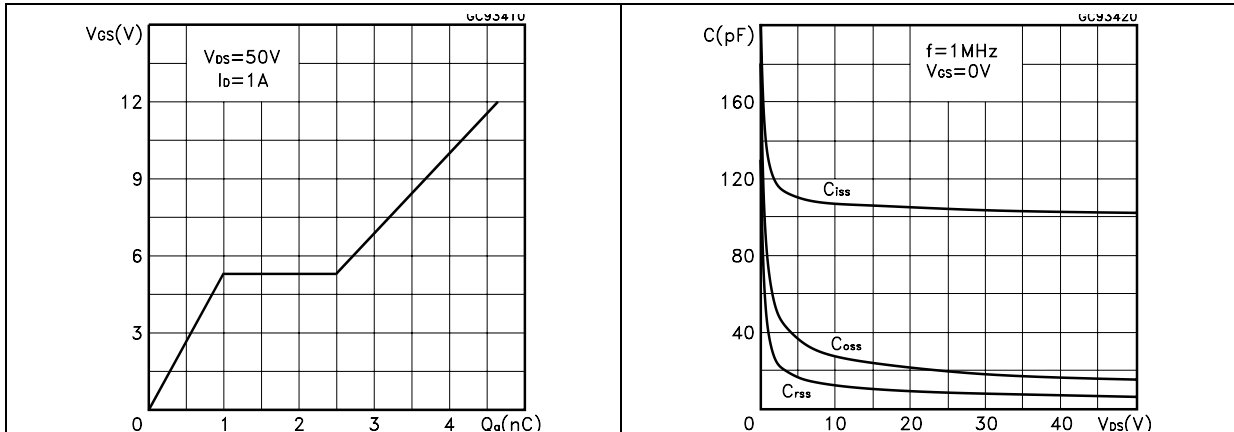


Figure 9. Normalized gate threshold voltage vs. temperature Figure 10. Normalized on resistance vs. temperature

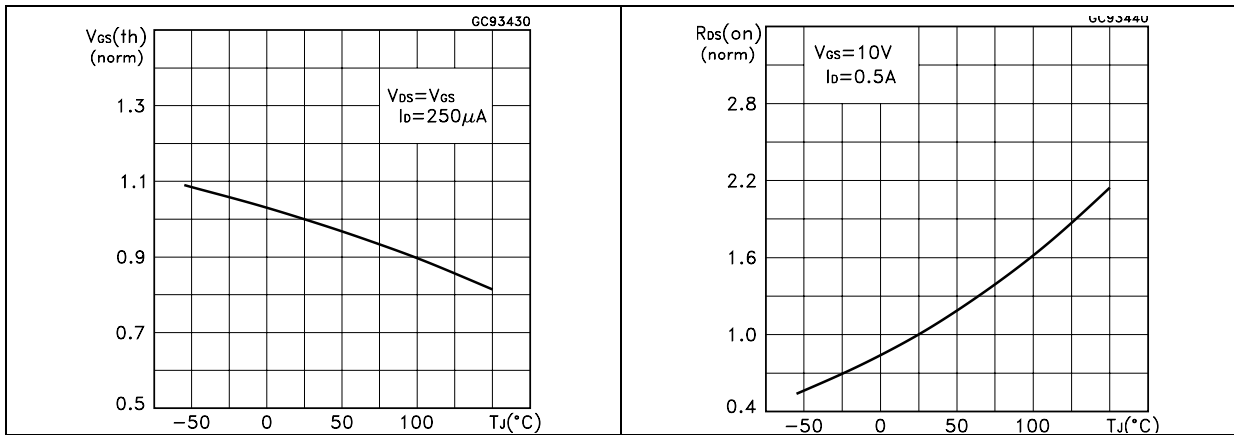
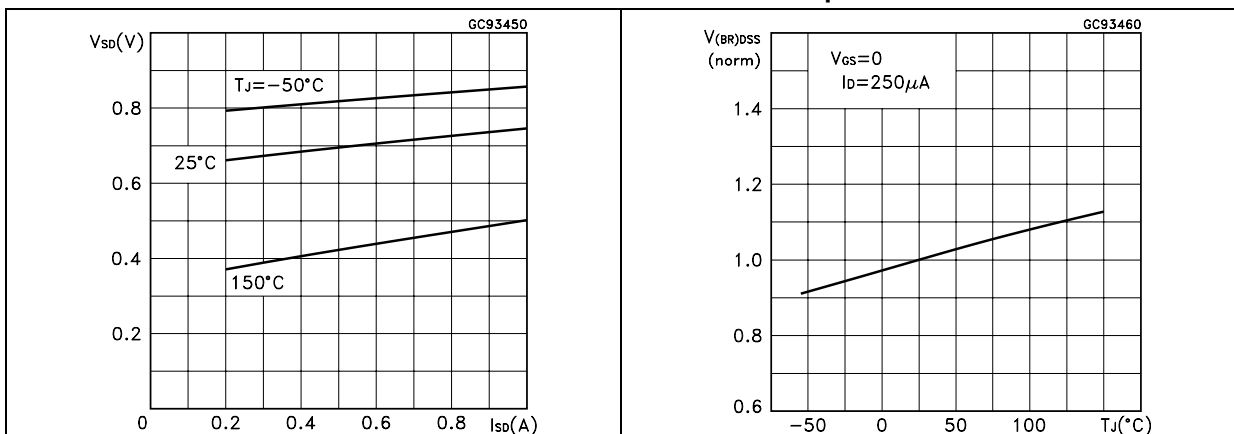


Figure 11. Source-drain diode forward characteristics Figure 12. Normalized breakdown voltage temperature



### 3 Test circuit

Figure 13. Switching times test circuit for resistive load

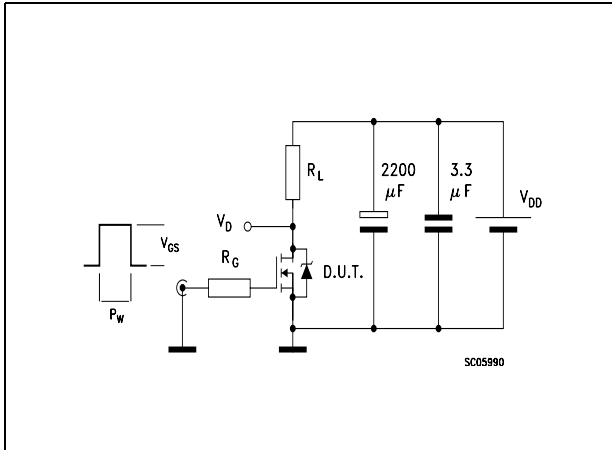


Figure 14. Gate charge test circuit

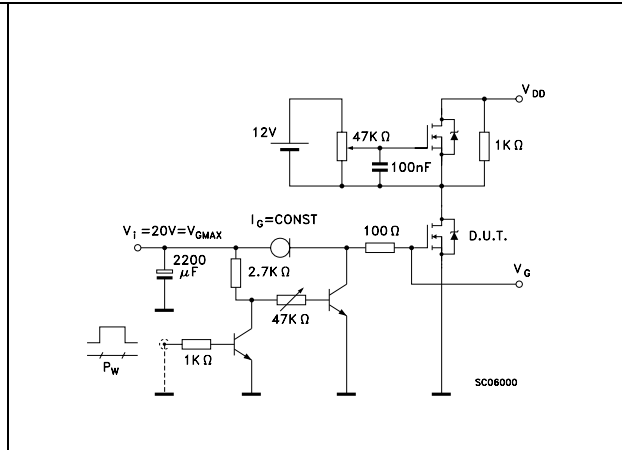


Figure 15. Test circuit for inductive load switching and diode recovery times

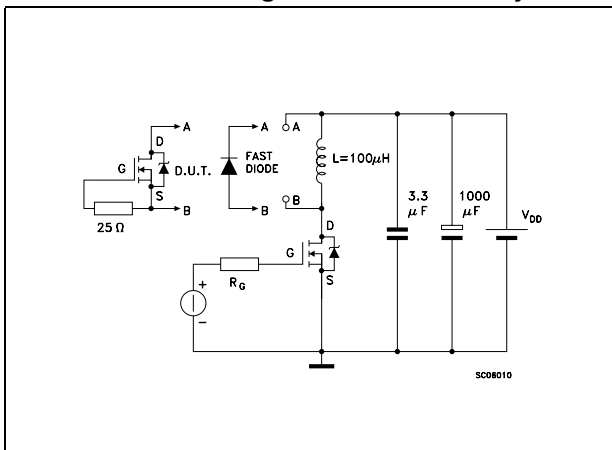


Figure 16. Unclamped Inductive load test circuit

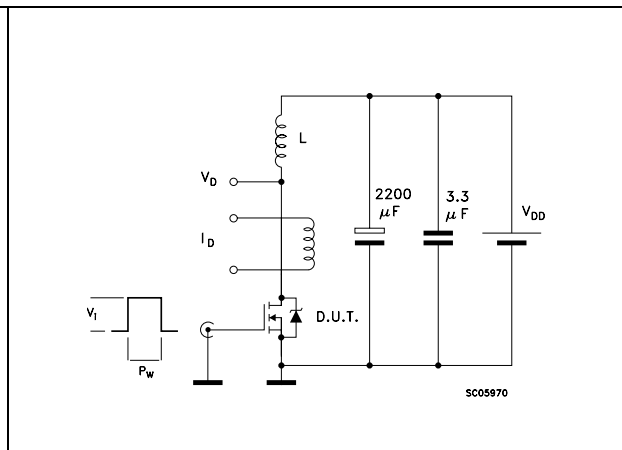


Figure 17. Unclamped inductive waveform

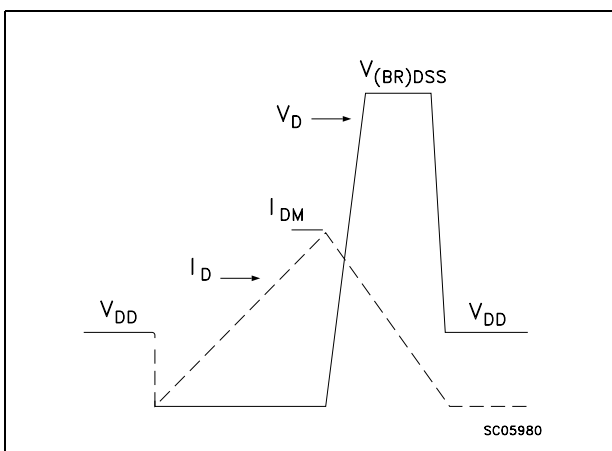
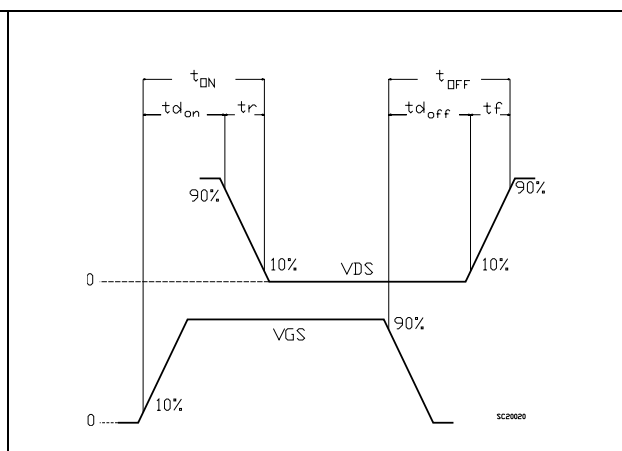


Figure 18. Switching time waveform



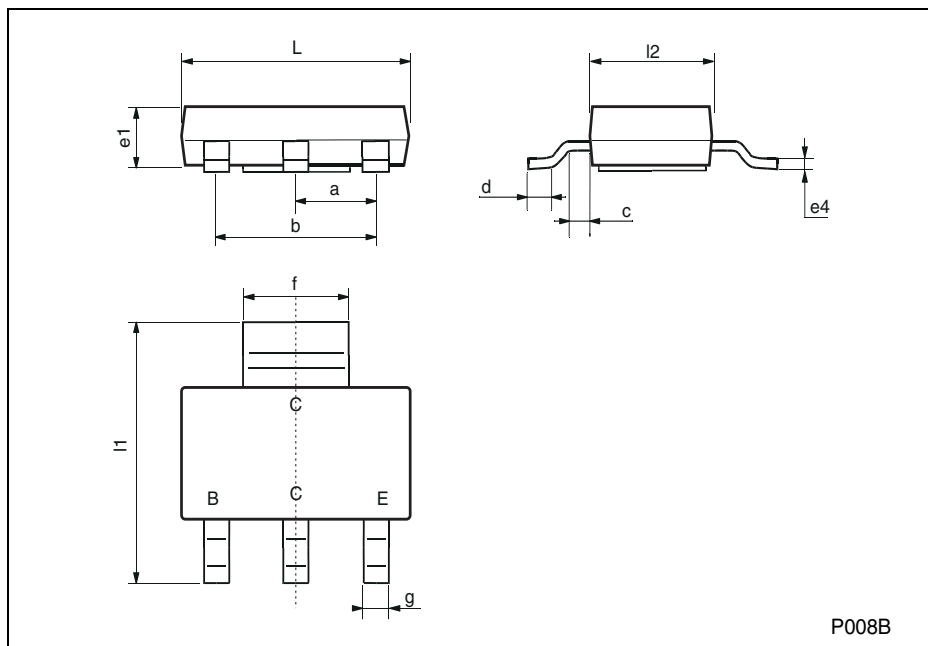


## 4 Package mechanical data

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)

**SOT-223 MECHANICAL DATA**

DIM.	mm			mils		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
a	2.27	2.3	2.33	89.4	90.6	91.7
b	4.57	4.6	4.63	179.9	181.1	182.3
c	0.2	0.4	0.6	7.9	15.7	23.6
d	0.63	0.65	0.67	24.8	25.6	26.4
e1	1.5	1.6	1.7	59.1	63	66.9
e4			0.32			12.6
f	2.9	3	3.1	114.2	118.1	122.1
g	0.67	0.7	0.73	26.4	27.6	28.7
l1	6.7	7	7.3	263.8	275.6	287.4
l2	3.5	3.5	3.7	137.8	137.8	145.7
L	6.3	6.5	6.7	248	255.9	263.8



P008B

## 5 Revision history

**Table 7. Revision history**

<b>Date</b>	<b>Revision</b>	<b>Changes</b>
21-Jun-2004	1	New document
19-Sep-2006	2	New template, no content change
01-Feb-2007	3	Typo mistake on <a href="#">Table 1</a> .

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