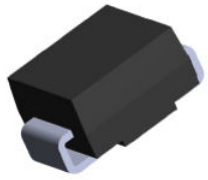
SMP100LC

Datasheet

Thyristor surge suppressor (TSS)



SMB
(JEDEC DO-214AA)

Product status link
SMP100LC

Features

- Bidirectional crowbar protection
- Voltage: range from 8 V to 400 V
- Low capacitance from 20 pF to 45 pF at 2 V
- Low leakage current: I_R = 2 µA max
- Holding current: I_H = 150 mA min.
- Repetitive peak pulse current:
  - I_{PP} = 100 A (10/1000 µs)
- **Benefits:**
  - TSS (Thyristor surge suppressor) are not subject to ageing and provide a fail safe mode in short circuit for better protection
  - Helps equipment meet main standards such as UL60950, IEC 950 / CSA C22.2 and UL1459
  - Epoxy meets UL94, V0
  - Package is JEDEC registered (DO-214AA)
- **Complies with the following standards:**
  - IEC 61000-4-5
  - IEC 61000-4-2 level 4
  - GR-1089 Core
  - ITU-T-K20/K21
  - TIA/EIA IS-968
  - UL497B recognized, UL file E136224

Applications

These devices protect sensitive equipment from lightning strikes and AC power faults. They are designed for industrial and telecom applications because they comply with the most stringent standards. Their low capacitance makes them suitable for data line protections.

Description

The SMP100LC series consists of low-capacitance transient surge arresters designed to protect high data rate communication equipment. The devices' low capacitance prevents signal distortion and ensures compatibility with digital transmission line cards, such as xDSL and Ethernet.

1 Characteristics

Table 1. In compliance with the following standards

Standard	Peak surge voltage (V)	Waveform voltage	Required peak current (A)	Current waveform	Minimum serial resistor to meet standard (Ω)
GR-1089 Core First level	2500 1000	2/10 µs 10/1000 µs	500 100	2/10 µs 10/1000 µs	0 0
GR-1089 Core Second level	5000	2/10 µs	500	2/10 µs	0
GR-1089 Core Intra-building	1500	2/10 µs	100	2/10 µs	0
ITU-T-K20/K21	6000 1500	10/700 µs	150 37.5	5/310 µs	0 0
ITU-T-K20 (IEC61000-4-2)	8000 15000	1/60 ns	ESD contact discharge ESD air discharge		0 0
IEC61000-4-5	4000 4000	10/700 µs 1.2/50 µs	100 100	5/310 µs 8/20 µs	0 0
TIA/EIA IS-968, lightning surge type A	1500 800	10/160 µs 10/560 µs	200 100	10/160 µs 10/560 µs	0 0
TIA/EIA IS-968, lightning surge Type B	1000	9/720 µs	25	5/320 µs	0

Table 2. Absolute ratings (T_{amb} = 25 °C)

Symbol	Parameter		Value	Unit
I_{PP}	Repetitive peak pulse current	10/1000 µs	100	A
		8/20 µs	400	
		10/560 µs	140	
		5/310 µs	150	
		10/160 µs	200	
		1/20 µs	400	
		2/10 µs	500	
I_{FS}	Fail-safe mode: maximum current (1)	8/20 µs	5	kA
I_{TSM}	Non repetitive surge peak on-state current (sinusoidal)	t = 0.2 s	24	A
		t = 1 s	15	
		t = 2 s	12	
		t = 15 mn	4	
I^2t	I^2t value for the fusing	t = 16.6 ms	20	A^2s
		t = 20 ms	21	
T_{stg}	Storage temperature range		-55 to +150	°C
T_j	Operating junction temperature range		-40 to +150	°C
T_L	Maximum lead temperature for soldering during 10 s		260	°C

1. *In fail safe mode that the device acts as a short circuit.*

Table 3. Thermal resistance parameter

Symbol	Parameter	Typ. value	Unit
$R_{th(j-a)}$	Junction to ambient (with recommended footprint)	100	°C/W
$R_{th(j-l)}$	Junction to leads	20	

Figure 1. Electrical characteristics - parameter definitions

Symbol	Parameter
V_{RM}	Stand-off voltage
V_{BO}	Breakover voltage
I_{RM}	Leakage current
I_{PP}	Peak pulse current
I_{BO}	Breakover current
I_H	Holding current
V_R	Continuous reverse voltage
I_R	Leakage current at V_R
C	Capacitance

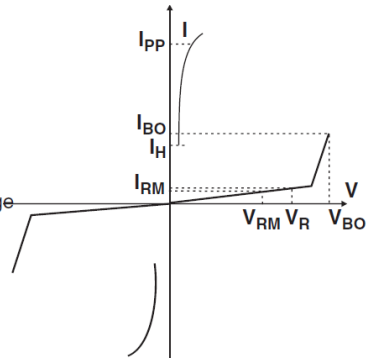


Figure 2. Pulse definition for electrical characteristics

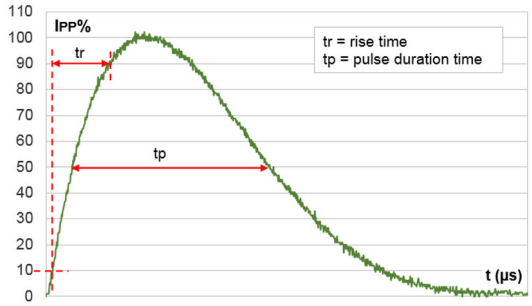


Table 4. Electrical characteristics - parameter values (T_{amb} = 25 °C, unless otherwise specified)

Type	I_{RM} max at V_{RM}		I_R at V_R		Dynamic V_{BO}	Static V_{BO} at I_{BO} (2)		I_H (3)	C (4)	C (5)
	Max.		Max.		Max.	Max.	Max.	Min.	Typ.	Typ
	µA	V	µA	V	V	V	mA	mA	pF	pF
SMP100LC-8	2	6	5	8	25	15	800	50 (typ.)	NA	75
SMP100LC-25		22		25	40	35		150	NA	65
SMP100LC-35		32		35	55	55			NA	55
SMP100LC-65		55		65	85	85			45	90
SMP100LC-90		81		90	120	125			40	80
SMP100LC-140		126		140	180	175			30	65
SMP100LC-160		144		160	205	200			30	65
SMP100LC-200		180		200	255	250			30	60
SMP100LC-230		207		230	295	285			30	60
SMP100LC-270		243		270	345	335			30	60
SMP100LC-400		360		400	540	530			20	45

1. *See Figure 10.*
2. *See Figure 11.*
3. *See Figure 12.*
4. *V_R = 50 V bias, V_{RMS} = 1 V, F = 1 MHz.*
5. *V_R = 2 V bias, V = 1 V, F =1 MHz.*

1.1 Characteristics (curves)

Figure 3. Non repetitive surge peak on-state current versus overload duration

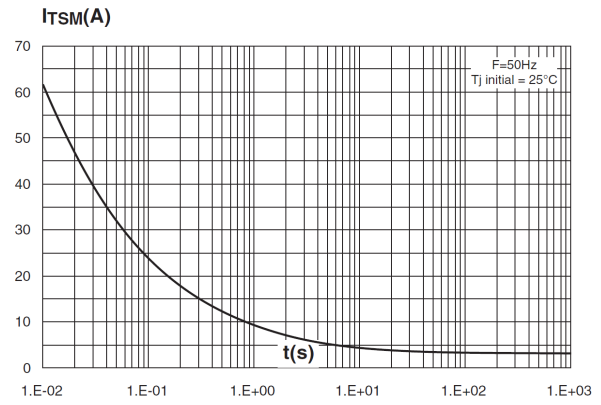


Figure 4. On-state voltage versus on-state current (typical values)

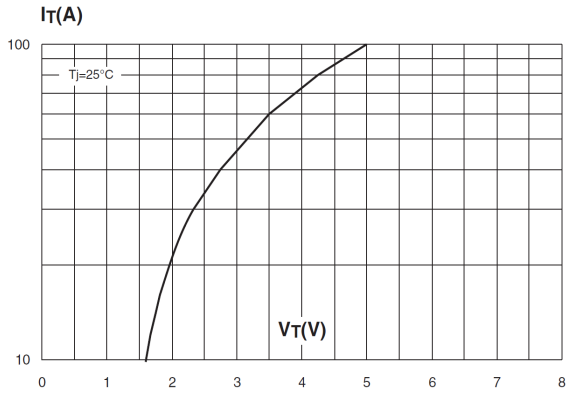


Figure 5. Relative variation of holding current versus junction temperature

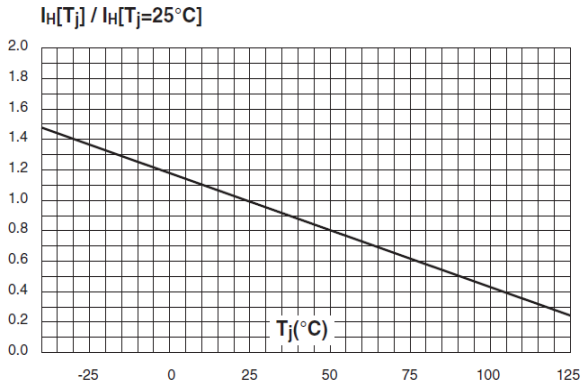


Figure 6. Relative variation of breakover voltage versus junction temperature

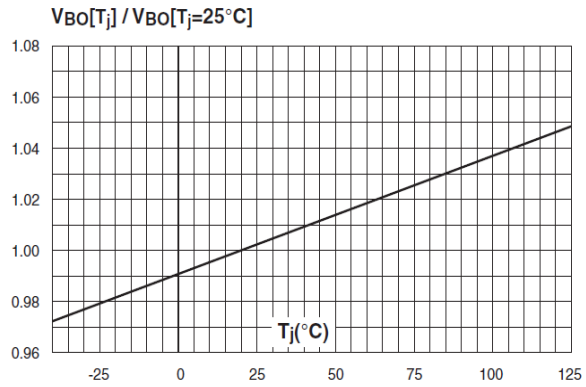


Figure 7. Relative variation of leakage current versus reverse voltage applied (typical values)

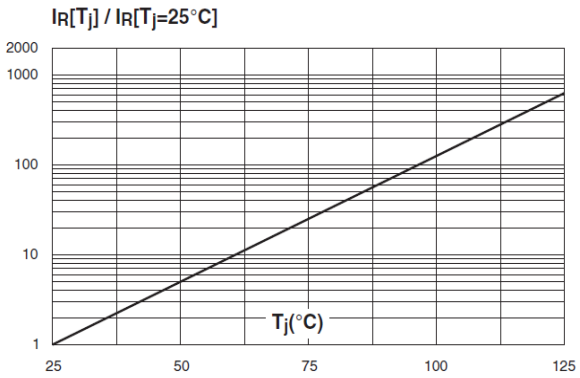


Figure 8. Variation of thermal impedance junction to ambient versus pulse duration

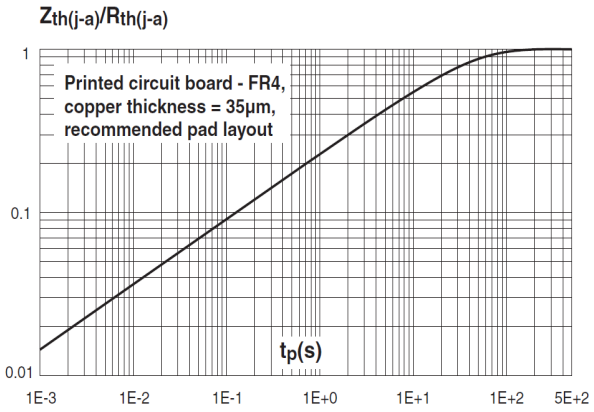
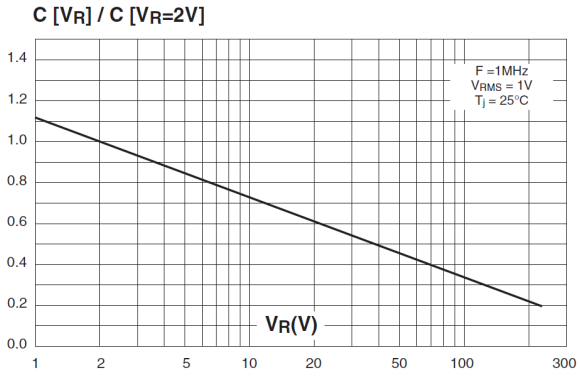


Figure 9. Relative variation of junction capacitance versus reverse voltage applied (typical values)



2 Measurement setups

Figure 10. Test circuit 1 for Dynamic I_{BO} and V_{BO} parameters

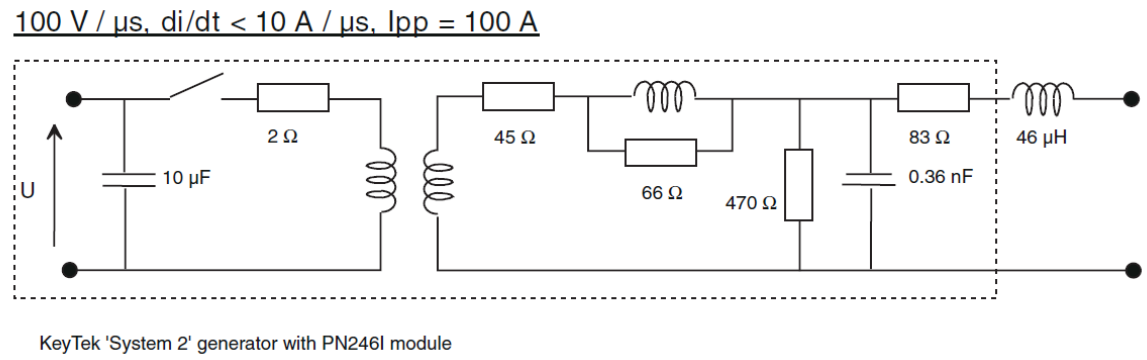
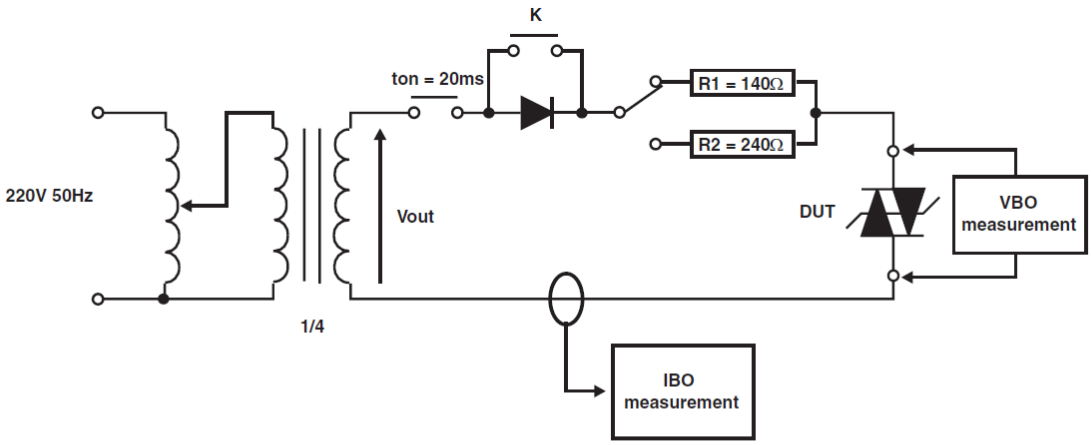


Figure 11. Test circuit 2 for I_{BO} and V_{BO} parameters



TEST PROCEDURE

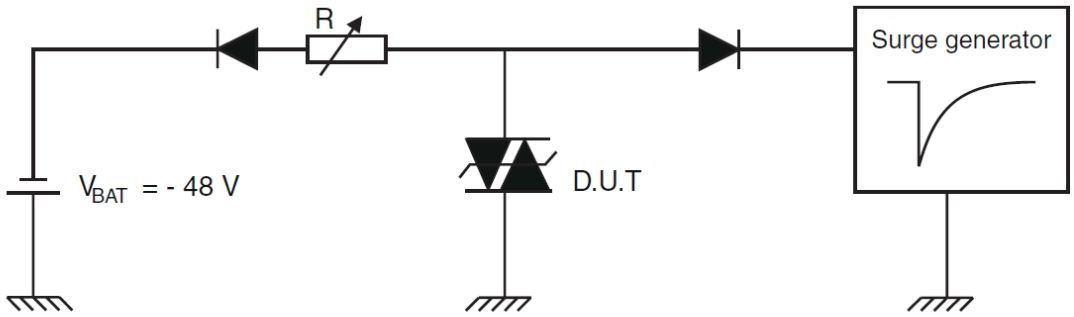
Pulse test duration (tp = 20ms):

- for Bidirectional devices = Switch K is closed
- for Unidirectional devices = Switch K is open

V_{OUT} selection:

- Device with V_{BO} < 200 V → V_{OUT} = 250 V_{RMS}, R1 = 140 Ω
- Device with V_{BO} ≥ 200 V → V_{OUT} = 480 V_{RMS}, R2 = 240 Ω

Figure 12. **Test circuit 3 for dynamic I_H parameter**



This is a GO-NOGO test which allows to confirm the holding current (I_H) level in a functional test circuit.

TEST PROCEDURE

1/ Adjust the current level at the I_H value by short circuiting the AK of the D.U.T.

2/ Fire the D.U.T. with a surge current → I_{PP} = 10 A, 10/1000 µs.

3/ The D.U.T. will come back off-state within 50 ms maximum.

3 Package information

To meet environmental requirements, ST offers these devices in different grades of ECOPACK packages, depending on their level of environmental compliance. ECOPACK specifications, grade definitions, and product status are available at: www.st.com. ECOPACK is an ST trademark.

3.1 SMB package information

- Epoxy meets UL94, V0
- Lead free plating + halogen-free molding resin

Figure 13. SMB package outline

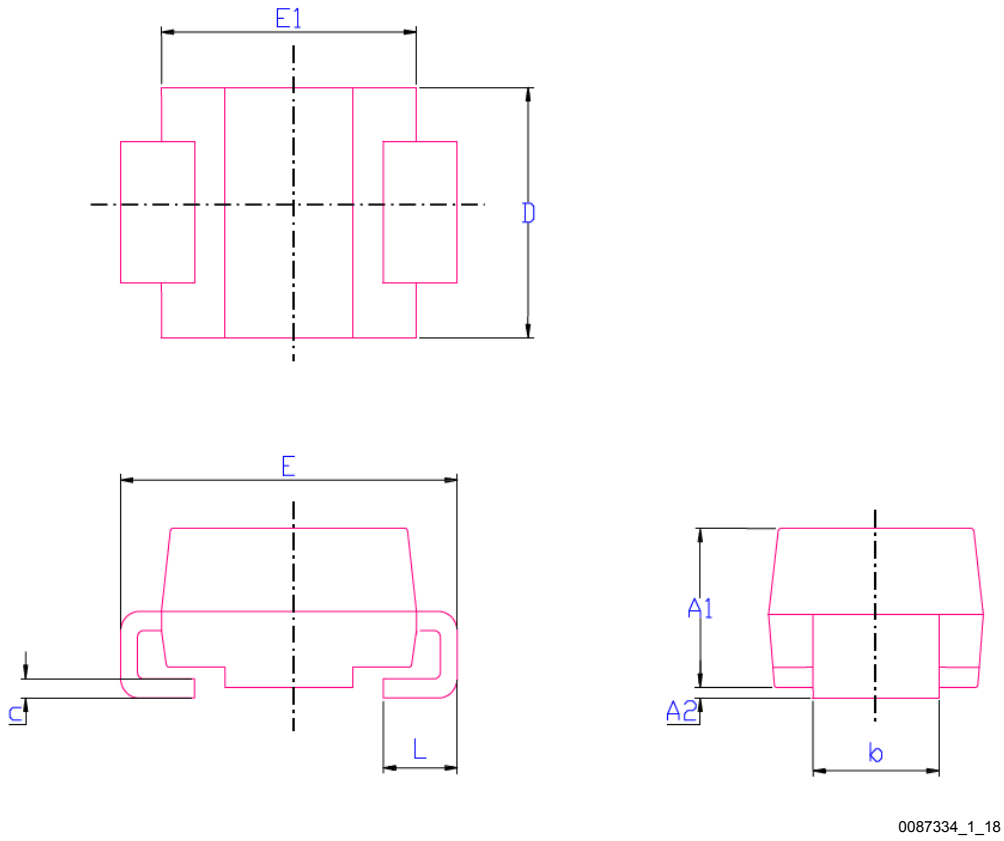


Table 5. SMB package mechanical data

Ref.	Dimensions					
	Millimeters			Inches[1]		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A1	1.90		2.45	0.075		0.096
A2	0.05		0.20	0.002		0.008
b	1.95		2.20	0.077		0.087
c	0.15		0.40	0.006		0.016
D	3.30		3.95	0.130		0.156
E	5.10		5.60	0.201		0.220
E1	4.05		4.60	0.159		0.181
L	0.75		1.50	0.030		0.059

1. *Inches only for reference*

Figure 14. SMB footprint

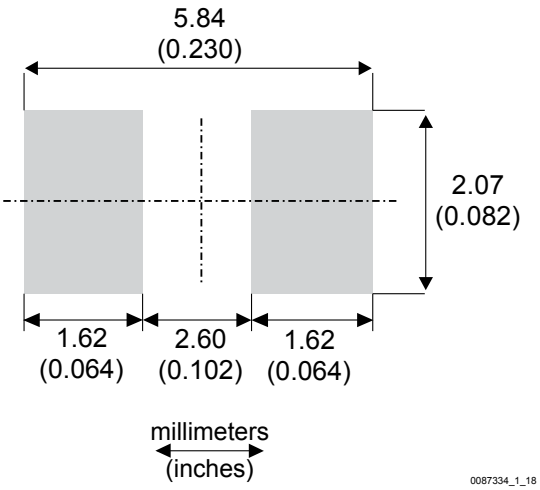
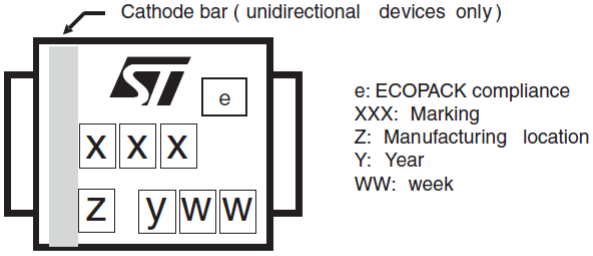


Figure 15. Marking layout



Note: Marking layout can vary according to assembly location.

4 Ordering information

Figure 16. **Ordering information scheme**

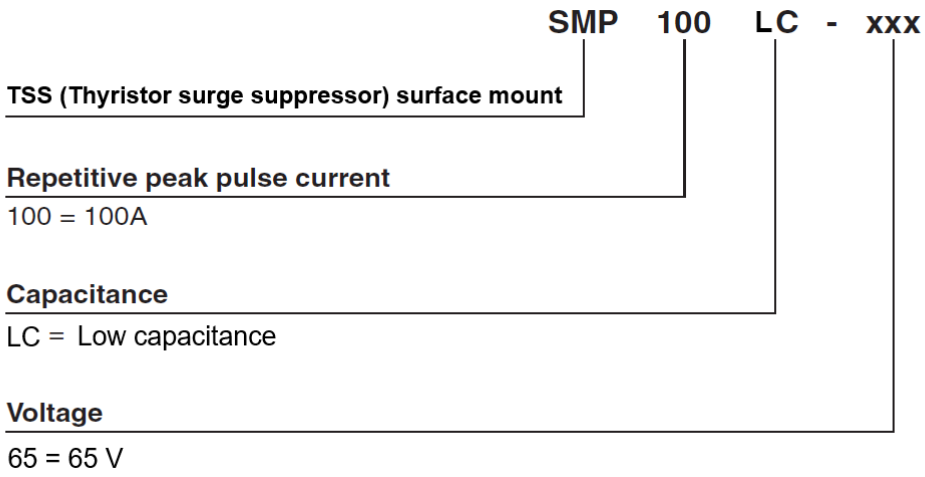


Table 6. **Ordering information**

Order code	Marking	Package	Weight	Base qty.	Delivery mode
SMP100LC-8	PL8	SMB	98 mg	2500	Tape and reel
SMP100LC-25	L25				
SMP100LC-35	L35				
SMP100LC-65	L06				
SMP100LC-90	L09				
SMP100LC-140	L14				
SMP100LC-160	L16				
SMP100LC-200	L20				
SMP100LC-230	L23				
SMP100LC-270	L27				
SMP100LC-400	L40				

Revision history

Table 7. **Document revision history**

Date	Version	Changes
09-Nov-2004	9	Absolute ratings values, table 3 on page 2, updated.
07-Dec-2004	10	SMP100LC-320, SMP100LC-360 and SMP100LC-400 addition.
20-Jun-2005	11	Telecom Circuit Protector added in *Description*.
05-Mar-2007	12	Reformatted to current standards. SMB *Package information* updated. Standards compliance paragraphs added to *Description*.
05-Jan-2010	13	Corrected vertical axis labelling in *Figure 8*.
09-Feb-2012	14	Added UL statement in *Complies with the following standards.*
17-Mar-2026	15	Updated Table 4, Table 6, and Section 3.1: SMB package information. Minor texte changes.