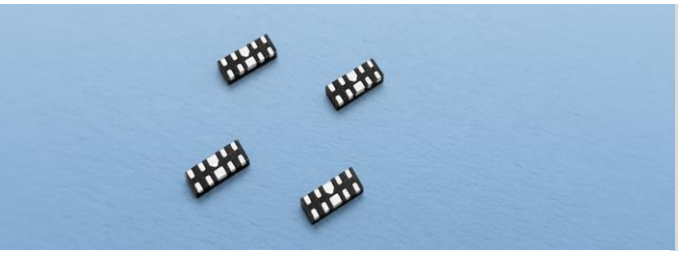
Together We Make It Safe!

DA TECHNOLOGY



TVS Protection Array (TPA)

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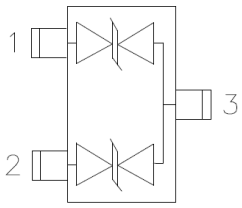
DCN: DA0018-00
Rev: A

TVS Protection Array TPA23C

- SOT23
- Ultra Low Leakage
- 300W

Features

- 300W peak pulse power (8/20μs)
- Protects two bi-directional lines
- Ultra low leakage: nA level
- Operating voltage: 5V, 12V, 15V, 24V, 36V
- Low clamping voltage
- Case Material: “Green” Molding Compound
- UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 3 per J-STD-020
- Complies with following standards:
  –IEC 61000-4-2 (ESD) immunity test
  Air discharge: ±30kV
  Contact discharge: ±30kV
  –IEC61000-4-4 (EFT) 40A (5/50ns)
- RoHS Compliant



Applications

- Cellular Handsets and Accessories
- Notebooks and Handhelds
- Portable Instrumentation
- Set Top Box
- Industrial Controls
- Server and Desktop PC

Maximum Ratings

Parameter	Symbol	Value	Unit
Peak Pulse Power (8/20μs)	P_{PP}	300	W
ESD per IEC 61000−4−2 (Air) ESD per IEC 61000−4−2 (Contact)	V_{ESD}	±30 ±30	KV
Junction Temperature Range	T_J	-55~125	℃
Storage Temperature Range	T_{STG}	-55~150	℃

Note: 1. Ratings at 25℃ ambient temperature unless otherwise specified.

Electrical Characteristics

TPA23C-SM05C

Parameter	Symbol	Min	Typ	Max	Unit	Test Condition
Reverse Stand-off Voltage	V_{RWM}			5.0	V	
Breakdown Voltage	V_{BR}	6			V	I_T = 1mA
Reverse Leakage Current	I_R			1	μA	V_{RWM} = 5V
Clamping Voltage	V_C			10	V	I_{PP} = 1A (8 x 20μs pulse)
Clamping Voltage	V_C			17	V	I_{PP} = 18A (8 x 20μs pulse)
Peak Pulse Current	I_{pp}			18	A	t_p = 8/20μs
Junction Capacitance	C_J		80		pF	V_R = 0V, f = 1MHz
Reverse Stand-off Voltage	V_{RWM}			5.0	V	
Breakdown Voltage	V_{BR}	6			V	I_T = 1mA

TPA23C-SM12C

Parameter	Symbol	Min	Typ	Max	Unit	Test Condition
Reverse Stand-off Voltage	V_{RWM}			12.0	V	
Breakdown Voltage	V_{BR}	13.3			V	I_T = 1mA
Reverse Leakage Current	I_R			0.5	μA	V_{RWM} = 12V
Clamping Voltage	V_C			20	V	I_{PP} = 1A (8 x 20μs pulse)
Clamping Voltage	V_C			30	V	I_{PP} = 10A (8 x 20μs pulse)
Peak Pulse Current	I_{pp}			10	A	t_p = 8/20μs
Junction Capacitance	C_J		32		pF	V_R = 0V, f = 1MHz
Reverse Stand-off Voltage	V_{RWM}			12.0	V	
Breakdown Voltage	V_{BR}	13.3			V	I_T = 1mA

TPA23C-SM15C

Parameter	Symbol	Min	Typ	Max	Unit	Test Condition
Reverse Stand-off Voltage	V_{RWM}			15.0	V	
Breakdown Voltage	V_{BR}	16.7			V	I_T = 1mA
Reverse Leakage Current	I_R			0.2	μA	V_{RWM} = 15V
Clamping Voltage	V_C			25	V	I_{PP} = 1A (8 x 20μs pulse)
Clamping Voltage	V_C			35	V	I_{PP} = 8A (8 x 20μs pulse)
Peak Pulse Current	I_{pp}			8	A	t_p = 8/20μs
Junction Capacitance	C_J		25		pF	V_R = 0V, f = 1MHz
Reverse Stand-off Voltage	V_{RWM}			15.0	V	
Breakdown Voltage	V_{BR}	16.7			V	I_T = 1mA

TPA23C-SM24C

Parameter	Symbol	Min	Typ	Max	Unit	Test Condition
Reverse Stand-off Voltage	V_{RWM}			24.0	V	
Breakdown Voltage	V_{BR}	27.0			V	I_T = 1mA
Reverse Leakage Current	I_R			0.2	μA	V_{RWM} = 24V
Clamping Voltage	V_C			42	V	I_{PP} = 1A (8 x 20μs pulse)
Clamping Voltage	V_C			70	V	I_{PP} = 4A (8 x 20μs pulse)
Peak Pulse Current	I_{pp}			4	A	t_p = 8/20μs
Junction Capacitance	C_J		20		pF	V_R = 0V, f = 1MHz
Reverse Stand-off Voltage	V_{RWM}			24.0	V	
Breakdown Voltage	V_{BR}	27.0			V	I_T = 1mA

TPA23C-SM36C

Parameter	Symbol	Min	Typ	Max	Unit	Test Condition
Reverse Stand-off Voltage	V_{RWM}			36.0	V	
Breakdown Voltage	V_{BR}	38.0			V	I_T = 1mA
Reverse Leakage Current	I_R			0.2	μA	V_{RWM} = 36V
Clamping Voltage	V_C			53	V	I_{PP} = 1A (8 x 20μs pulse)
Clamping Voltage	V_C			90	V	I_{PP} = 3A (8 x 20μs pulse)
Peak Pulse Current	I_{pp}			3	A	t_p = 8/20μs
Junction Capacitance	C_J		15		pF	V_R = 0V, f = 1MHz
Reverse Stand-off Voltage	V_{RWM}			36.0	V	
Breakdown Voltage	V_{BR}	38.0			V	I_T = 1mA

Symbol	Parameter	Explanation
(1) I_{PP}	**Peak pulse current**	The maximum surge current that flows though the TVS
(2) V_{BR}	**Breakdown voltage**	The Voltage that flows though the TVS at a specified test current (I_T)
(3) I_T	**Test current**	A specified test current that flows though the TVS
(4) V_{RWM}	**Stand-off voltage**	Maximum voltage that can be applied to the TVS without operation
(5) I_R	**Leakage current @ V_R**	Current measured at V_R
(6) V_C	**Clamping voltage**	Peak voltage measured across the suppressor at a specified Ipp (peak impulse current)

Fig1. Pulse Waveform (8/20us)

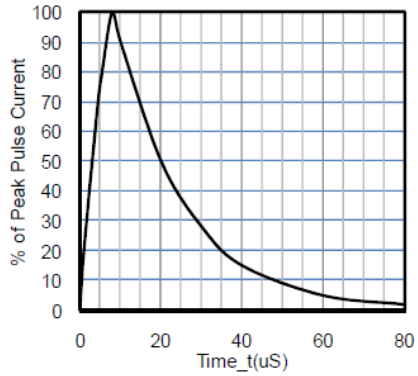


Fig2. Power Derating Curve

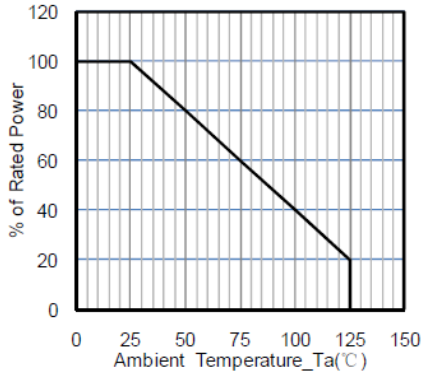
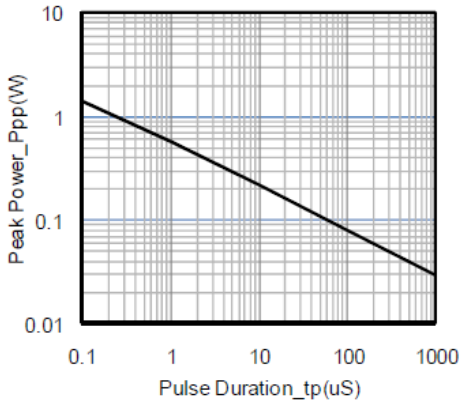
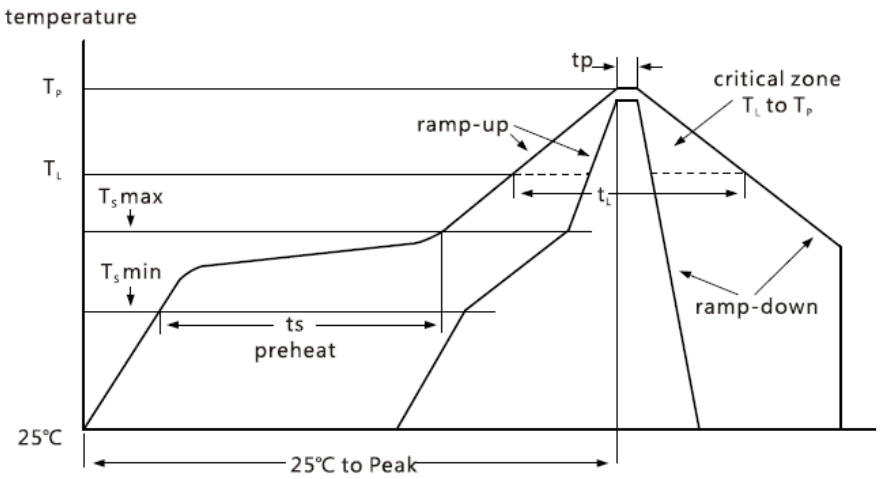


Figure 3. Peak Pulse Power Rating Curve

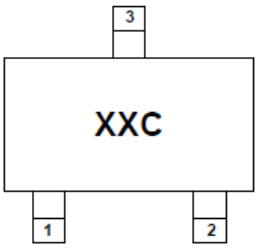


Reflow Soldering Profile



Reflow Profile Feature	SnPb eutectic assembly	Pb-free assembly
Average ramp-uprate ($T_s$max to T_p)	3°C/s maximum	3°C/s maximum
Preheat		
Temperature minimum ($T_s$min)	100°C	150°C
Temperature maximum ($T_s$max)	150°C	200°C
Time ($T_s$min to $T_s$max)	60 s to 120 s	60 s to 180 s
Time maintained above		
Temperature (T_L)	183°C	217°C
Time (t_L)	60 s to 150 s	60 s to 150 s
Peak/classification temperature (T_P)	235°C	260°C
Number of allowed reflow cycles	3	3
Time within 5 °C of actual peak temperature (tp)	10 s to 30 s	10 s to 30 s
Ramp-down rate	6°C/s maximum	6°C/s maximum
Time 25 °C to peak temperature	6 minutes maximum	8 minutes maximum

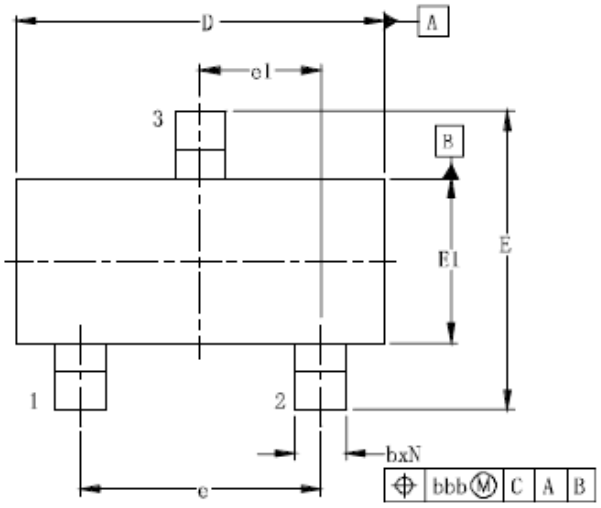
Product Marking

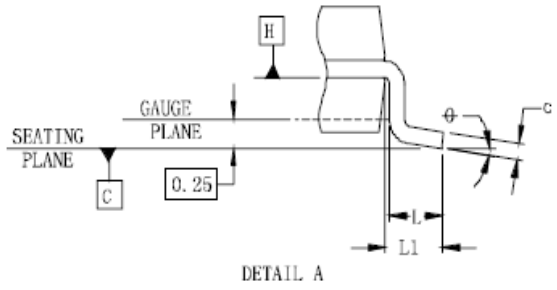


XXC = Device Marking

Part Number	Marking
SM05C	05C
SM12C	12C
SM15C	15C
SM24C	24C
SM36C	36C

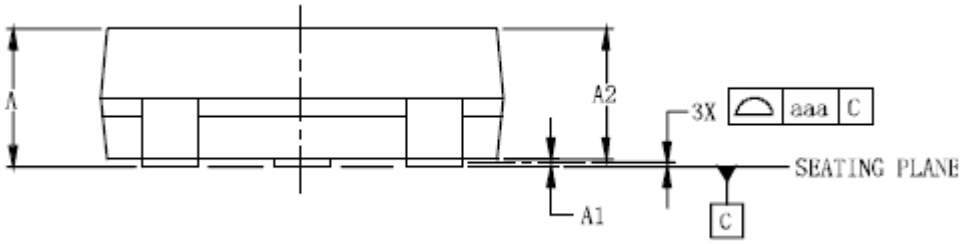
Package Dimension (SOT-23) Unit: mm





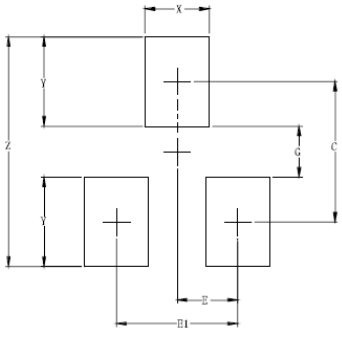
TVS Protection Array TPA23C

SOT23 Ultra Low Leakage 300W



DIMENSIONS						
DIM	INCHES			MILLIMETERS		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.035	–	0.044	0.089	–	1.12
A1	0.000	–	0.004	0.10	–	0.10
A2	0.035	0.037	0.040	0.88	0.95	1.02
b	0.012	–	0.020	0.30	–	0.51
c	0.003	–	0.007	0.08	–	0.18
D	0.110	0.114	0.120	2.80	2.90	3.04
E	0.082	0.093	0.104	2.10	2.37	2.64
E1	0.047	0.051	0.055	1.20	1.30	1.40
e	0.075			1.90 BSC		
e1	0037			0.95 BSC		
L	0.015	0.020	0.024	0.40	0.50	0.60
L1	0.022			(0.55)		
N	3			3		
ø	0°	–	8°	0°	–	8°
aaa	0. 004			0. 10		
bbb	0. 008			0. 20		

Layout Dimension Unit: mm



DIMENSIONS		
DIM	INCHES	MILLIMETERS
C	.087	2. 20
E	. 037	0. 95
E1	. 075	1. 90
G	. 031	0. 80
X	. 039	1. 00
Y	. 055	1. 40
Z	. 141	3. 60

Packaging

Part	Component Package	Quantity	Packaging Option
TPA23C	SOT-23	3kpcs	Tape & Reel