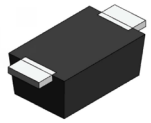
SMFE

Automotive grade 400 W Transient voltage suppressor



Applications

- Automotive chassis and safety systems
- Advanced driver assistance systems (ADAS)
- Communication and infotainment systems
- Network systems and body electronics
- Power Train controls
- xEV and battery systems

Product features

- Automotive grade (AEC-Q101 qualified)
- Low profile SOD-123FL package
- Excellent clamping capability
- High reliability application
- 400 W peak pulse power capability at 10/1000 µs waveform
- Typical I_R less than 1 µA above 10 V
- Fast response time: typically less than 1.0 ps from 0 V to V_{BR} minimum
- Plastic package meets UL 94 V-0 flammability rating
- Meets moisture sensitivity level (MSL) level 1
- Terminal: tin plated, solderable per J-STD-002

Environmental compliance and general specifications

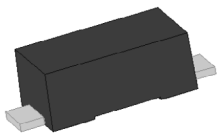
- AEC-Q101 qualified

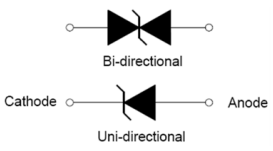
Ordering part number

SMFE 5-0 C A L H

- Family name
- V_R voltage ("-" indicates decimal point)
- Bi-/Uni-Directional (Blank=Uni, C=Bi)
- Voltage tolerance
- P_{PP} (400 W version)
- High reliability application

PIN configuration





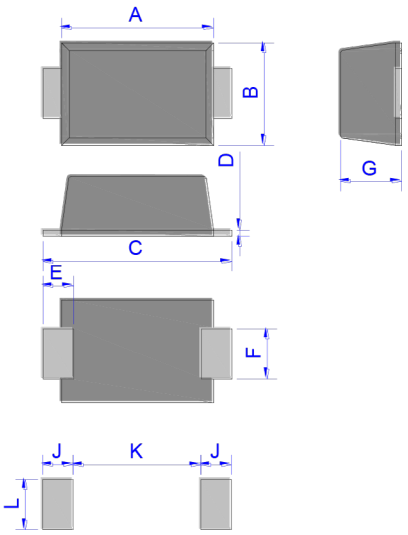
Powering Business Worldwide

Absolute maximum ratings

(+25 °C, RH=45%-75%, unless otherwise noted)

Parameter	Symbol	Value	Unit
Storage operating junction temperature range	T_{STG}/ T_J	-55 to +150	°C
Peak pulse power dissipation on 10/1000 µs waveform	P_{PP}	400	W
Maximum instantaneous forward voltage at 20 A for unidirectional	V_F	5.0	V
Typical thermal resistance junction to lead	$R_{\theta JL}$	100	°C/W
Typical thermal resistance junction to ambient	$R_{\theta JA}$	220	°C/W

Mechanical parameters, pad layout- mm/inches



	Millimeters		Inches	
Dimension	**Minimum**	**Maximum**	**Minimum**	**Maximum**
A	2.60	3.00	0.102	0.118
B	1.60	2.00	0.063	0.079
C	3.45	3.95	0.136	0.156
D	0.10	0.25	0.004	0.010
E	0.30	0.90	0.012	0.035
F	0.80	1.20	0.031	0.047
G	0.95	1.35	0.037	0.053
J	1.30	-	0.051	-
K	-	1.70	-	0.067
L	1.30	-	0.051	-

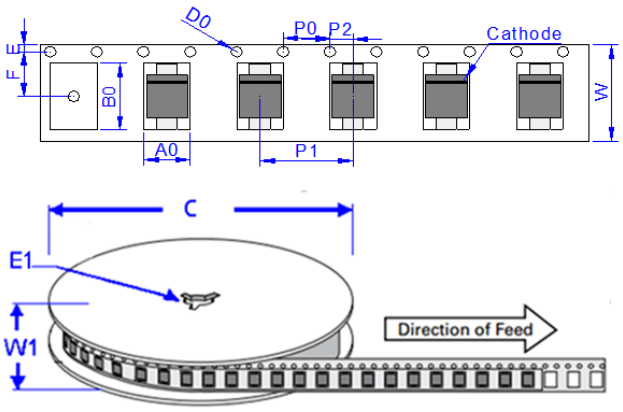
Part marking

Cathode band (uni-polar only)
Part marking:
yyyy= Placeholder- refer to "Marking" listed in Electrical characteristics table for actual marking

Packaging information - mm/inches

Drawing not to scale.

Supplied in tape and reel packaging, 3,000 parts per 7" diameter reel (EIA-481 compliant)



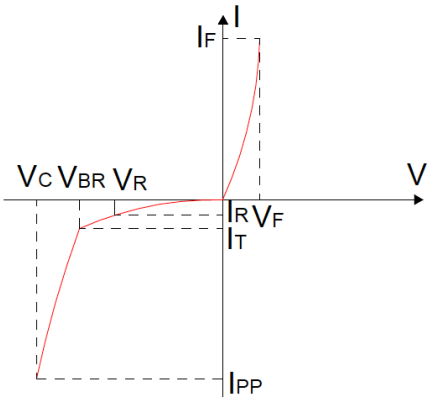
Dimensions	Millimeters	Inches
A0	1.95 ± 0.3	0.077 ± 0.012
B0	3.95 ± 0.3	0.156 ± 0.012
C	178.0	7.0
D0	1.55 ± 0.1	0.061 ± 0.004
E	1.75 ± 0.2	0.069 ± 0.008
E1	13.3 ± 0.3	0.524 ± 0.012
F	3.50 ± 0.2	0.138 ± 0.008
P0	4.00 ± 0.2	0.157 ± 0.008
P1	4.00 ± 0.2	0.157 ± 0.008
P2	2.00 ± 0.2	0.079 ± 0.008
W	8.0 ± 0.2	0.315 ± 0.008
W1	11.5 ± 1.0	0.453 ± 0.039

Electrical specifications (+25 °C)

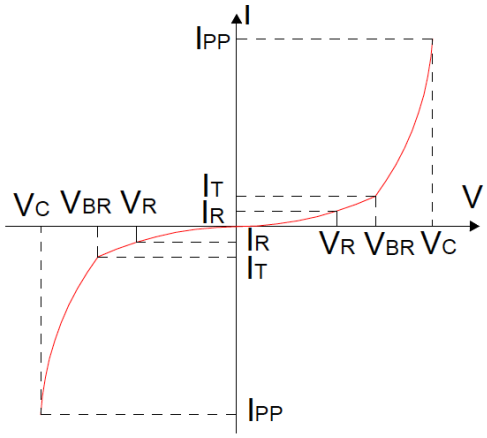
Part number		Marking		V_R	I_R @ V_R	V_{BR} @ I_T		I_T	V_C @ I_{PP}	I_{PP}
Uni-polar	**Bi-polar**	**Uni**	**Bi**	**(V)**	**max (µA)**	**min (V)**	**max (V)**	**(mA)**	**max (V)**	**(A)**
SMFE5-0ALH	/	AEH	/	5	40	6.4	7	10	9.2	40.1
SMFE6-0ALH	/	AGH	/	6	40	6.67	7.37	10	10.3	35.9
SMFE6-5ALH	/	AKH	/	6.5	30	7.22	7.98	10	11.2	33.1
SMFE7-0ALH	/	AMH	/	7	30	7.78	8.6	10	12	30.9
SMFE7-5ALH	/	APH	/	7.5	30	8.33	9.21	1	12.9	28.7
SMFE8-0ALH	/	ARH	/	8	20	8.89	9.83	1	13.6	27.2
SMFE9-0ALH	/	AVH	/	9	5	10	11.1	1	15.4	24.1
SMFE10ALH	SMFE10CALH	AXH	10CLH	10	2	11.1	12.3	1	17	23.5
SMFE11ALH	SMFE11CALH	AZH	11CLH	11	1	12.2	13.5	1	18.2	22
SMFE12ALH	SMFE12CALH	BEH	12CLH	12	1	13.3	14.7	1	19.9	20.1
SMFE13ALH	SMFE13CALH	BGH	13CLH	13	1	14.4	15.9	1	21.5	18.6
SMFE14ALH	SMFE14CALH	BKH	14CLH	14	1	15.6	17.2	1	23.2	17.2
SMFE15ALH	SMFE15CALH	BMH	15CLH	15	1	16.7	18.5	1	24.4	16.4
SMFE17ALH	/	BRH	/	17	1	18.9	20.9	1	27.6	14.5
SMFE18ALH	SMFE18CALH	BTH	18CLH	18	1	20	22.1	1	29.2	13.7
SMFE20ALH	SMFE20CALH	BVH	20CLH	20	1	22.2	24.5	1	32.4	12.3
SMFE22ALH	SMFE22CALH	BXH	22CLH	22	1	24.4	26.9	1	35.5	11.3
SMFE24ALH	SMFE24CALH	BZH	24CLH	24	1	26.7	29.5	1	38.9	10.3
SMFE26ALH	SMFE26CALH	CEH	26CLH	26	1	28.9	31.9	1	42.1	9.5
SMFE28ALH	SMFE28CALH	CGH	28CLH	28	1	31.1	34.4	1	45.4	8.8
SMFE30ALH	SMFE30CALH	CKH	30CLH	30	1	33.3	36.8	1	48.4	8.3
SMFE33ALH	SMFE33CALH	CMH	33CLH	33	1	36.7	40.6	1	53.3	7.5
SMFE36ALH	SMFE36CALH	CPH	36CLH	36	1	40	44.2	1	58.1	6.9
SMFE40ALH	SMFE40CALH	CRH	40CLH	40	1	44.4	49.1	1	64.5	6.2
SMFE43ALH	SMFE43CALH	CTH	43CLH	43	1	47.8	52.8	1	69.4	5.8
SMFE45ALH	SMFE45CALH	CVH	45CLH	45	1	50	55.3	1	72.7	5.5
SMFE48ALH	SMFE48CALH	CXH	48CLH	48	1	53.3	58.9	1	77.4	5.2
SMFE51ALH	/	CZH	/	51	1	56.7	62.7	1	82.4	4.9
SMFE58ALH	/	DEH	/	58	1	64.4	71.2	1	93.6	4.3
SMFE60ALH	/	DGH	/	60	1	66.7	73.7	1	96.8	4.1
SMFE64ALH	/	DMH	/	64	1	71.1	78.6	1	103	3.9
SMFE70ALH	/	DPH	/	70	1	77.8	86	1	113	3.5
SMFE75ALH	/	DRH	/	75	1	83.3	92.1	1	121	3.3
SMFE78ALH	/	DTH	/	78	1	86.7	95.8	1	126	3.2
SMFE85ALH	/	DVH	/	85	1	94.4	104	1	137	2.9

Ratings and V-I characteristic curves (+25 °C unless otherwise noted)

V- I curve characteristics (Uni-directional)



V- I curve characteristics (Bi-directional)



Surge waveform: 10/1000 µs

V_R: Stand-off voltage – Maximum voltage that can be applied

V_{BR}: Breakdown voltage

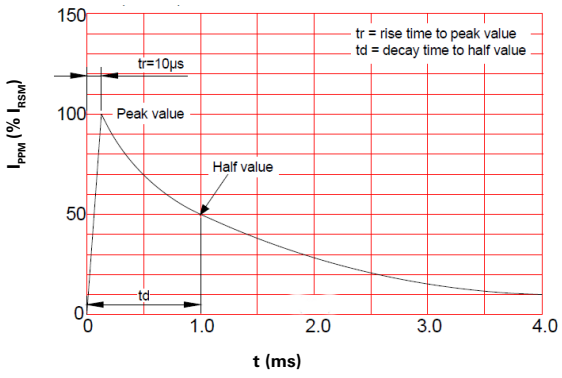
V_C: Clamping voltage – Peak voltage measured across the suppressor at a specified I_{PP}

I_R: Reverse leakage current

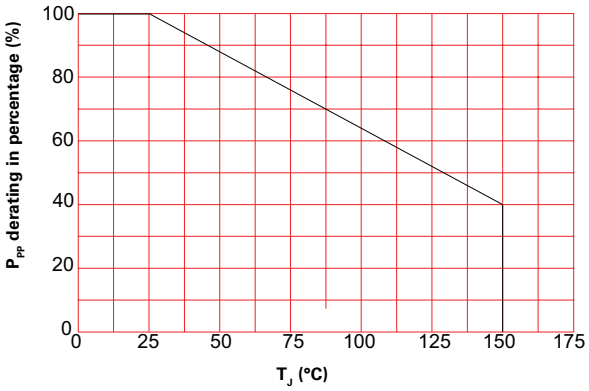
I_T: Test current

V_F: Forward voltage drop for Uni-directional

Pulse waveform



Pulse derating curve



Solder reflow profile

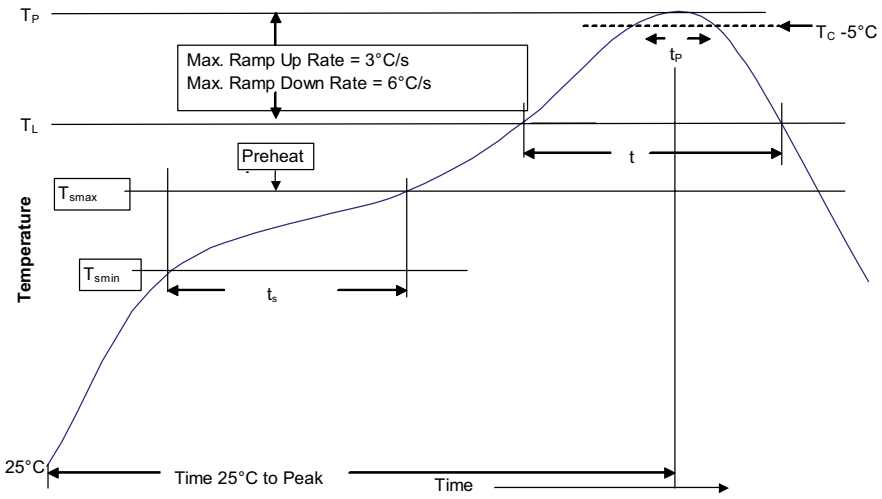


Table 1 - Standard SnPb solder (T_C)

Package thickness	Volume mm3 <350	Volume mm3 ≥350
<2.5 mm	235 °C	220 °C
≥2.5 mm	220 °C	220 °C

Table 2 - Lead (Pb) free solder (T_C)

Package thickness	Volume mm³ <350	Volume mm³ 350 - 2000	Volume mm³ >2000
<1.6 mm	260 °C	260 °C	260 °C
1.6 – 2.5 mm	260 °C	250 °C	245 °C
>2.5 mm	250 °C	245 °C	245 °C

Reference J-STD-020

Profile feature		Standard SnPb solder	Lead (Pb) free solder
Preheat and soak	• Temperature min. (T_{smin})	100 °C	150 °C
	• Temperature max. (T_{smax})	150 °C	200 °C
	• Time (T_{smin} to T_{smax}) (t_s)	60-120 seconds	60 - 180 seconds
Ramp up rate T_L to T_p		3 °C/ second max.	3 °C/ second max.
Liquidous temperature (T_L) Time (t_L) maintained above T_L		183 °C 60-150 seconds	217 °C 60-150 seconds
Peak package body temperature (T_P)*		Table 1	Table 2 (+0, -5 °C)
Time (t_p)* within 5 °C of the specified classification temperature (T_C)		20 seconds*	40 seconds*
Ramp-down rate (T_p to T_L)		6 °C/ second max.	6 °C/ second max.
Time 25 °C to peak temperature		6 minutes max.	8 minutes max.

* Tolerance for peak profile temperature (T_p) is defined as a supplier minimum and a user maximum.

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