

## SMF Series Datasheet

### Description

The SMF series is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events. SMF package is 50% smaller in footprint when compare to SMA package and delivering one of the low height profiles (1.1mm) in the industry.

### Features

- IEC61000-4-2 ESD 15KV Air, 8KV contact compliance
- SOD-123FL surface mount package
- Protects one I/O line
- Peak power dissipation of 1000W under 8/20 $\mu$ s waveform
- Low leakage current
- Solid-state silicon avalanche technology
- RoHS compliant
- Solder reflow temperature: Pure Tin-Sn, 260~270 $^{\circ}$ C
- Flammability rating UL 94V-0
- Meets MSL level 1, per J-STD-020



### Applications

SMF devices are ideal for the protection of I/O interfaces, VCC bus and other vulnerable circuit used in cellular phones, portable devices, business machines, power supplies and other consumer applications.

### Maximum Ratings and Characteristics

Ratings at 25 $^{\circ}$ C ambient temperature unless otherwise specified.

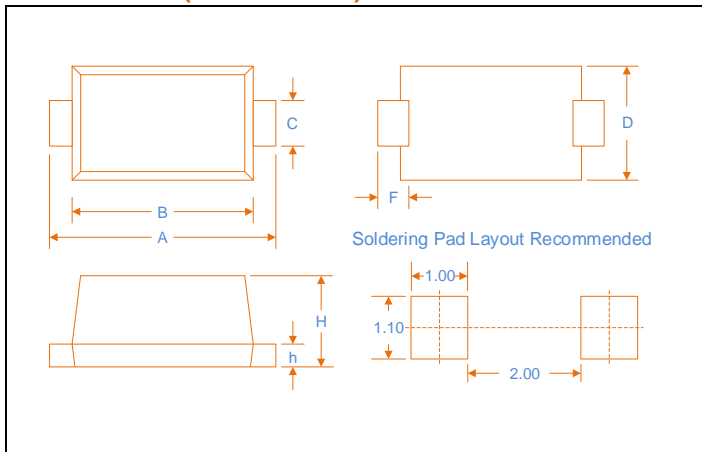
Rating	Symbol	Value	Units
Peak pulse power dissipation at 10/1000 $\mu$ s waveform (Note1, Note2, Fig.1)	P <sub>PPM</sub>	Minimum 200	Watts
Peak pulse power (tp=8/20 $\mu$ s waveform)	P <sub>PPM</sub>	Minimum 1000	Watts
Peak pulse current of at 10/1000 $\mu$ s waveform (Note 1, Fig.3)	I <sub>PPM</sub>	See Table	Amps
Steady state power dissipation at T <sub>L</sub> =75 $^{\circ}$ C (Fig.5)	P <sub>M(AV)</sub>	1.0	Watts
Maximum Instantaneous Forward Voltage at 12A for Unidirectional Only	V <sub>F</sub>	3.5	V
Peak forward surge current, 8.3ms single half sine-wave superimposed on rated load, (JEDEC Method) (Note3, Fig.6)	I <sub>FSM</sub>	20	Amps
Operating junction and Storage Temperature Ranges.	T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	$^{\circ}$ C
Typical thermal resistance junction to lead	R <sub><math>\theta</math>JL</sub>	100	$^{\circ}$ C/W
Typical thermal resistance junction to ambient	R <sub><math>\theta</math>JA</sub>	220	$^{\circ}$ C/W

Notes: 1. Non-repetitive current pulse, per Fig.3 and Derating above T<sub>A</sub>=25 $^{\circ}$ C per Fig.2.

2. Each terminal is surface Mounted on the 5.0mm $\times$ 5.0mm (0.03mm thick) copper pads.

3. 8.3ms single half sine-wave or equivalent square wave, duty cycle=4 pulses per minutes maximum.

### Dimensions (SOD123FL)



Dimensions	Inches		Millimeters	
	Min.	Max.	Min.	Max.
A	0.138	0.154	3.50	3.90
B	0.102	0.118	2.60	3.00
C	0.030	0.043	0.75	1.10
D	0.063	0.079	1.60	2.00
F	0.031Typ.		0.80Typ.	
H	0.035	0.053	0.90	1.35
h	0.005	0.009	0.12	0.22

### Electrical Characteristics (TA=25°C)

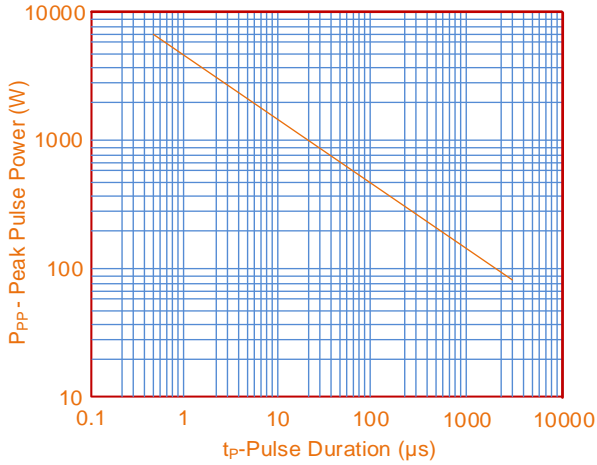
Part Number		Device Marking Code		Reverse Stand-Off Voltage	Breakdown Voltage @I <sub>T</sub>		Test Current	Maximum Clamping Voltage @I <sub>PP</sub>	Peak Pulse Current	Reverse Leakage @V <sub>R</sub>
Uni	Bi	UNI	BI	V <sub>R</sub> (V)	Min(V)	Max(V)	I <sub>T</sub> (mA)	V <sub>C</sub> (V)	I <sub>PP</sub> (A)	I <sub>R</sub> (μA)
SMF5.0A	SMF5.0CA	KE	AE	5	6.4	7	10	9.2	21.8	500
SMF6.0A	SMF6.0CA	KG	AG	6	6.67	7.37	10	10.3	19.4	400
SMF6.5A	SMF6.5CA	KK	AK	6.5	7.22	7.98	10	11.2	17.9	350
SMF7.0A	SMF7.0CA	KM	AM	7	7.78	8.6	10	12.0	16.7	200
SMF7.5A	SMF7.5CA	KP	AP	7.5	8.33	9.21	1	12.9	15.5	100
SMF8.0A	SMF8.0CA	KR	AR	8	8.89	9.83	1	13.6	14.7	50
SMF8.5A	SMF8.5CA	KT	AT	8.5	9.44	10.4	1	14.4	13.9	20
SMF9.0A	SMF9.0CA	KV	AV	9	10	11.1	1	15.4	13.0	10
SMF10A	SMF10CA	KX	AX	10	11.1	12.3	1	17.0	11.8	5
SMF11A	SMF11CA	KZ	AZ	11	12.2	13.5	1	18.2	11.0	3
SMF12A	SMF12CA	LE	BE	12	13.3	14.7	1	19.9	10.1	1
SMF13A	SMF13CA	LG	BG	13	14.4	15.9	1	21.5	9.3	1
SMF14A	SMF14CA	LK	BK	14	15.6	17.2	1	23.2	8.6	1
SMF15A	SMF15CA	LM	BM	15	16.7	18.5	1	24.4	8.2	1
SMF16A	SMF16CA	LP	BP	16	17.8	19.7	1	26.0	7.7	1
SMF17A	SMF17CA	LR	BR	17	18.9	20.9	1	27.6	7.3	1
SMF18A	SMF18CA	LT	BT	18	20	22.1	1	29.2	6.9	1
SMF20A	SMF20CA	LV	BV	20	22.2	24.5	1	32.4	6.2	1
SMF22A	SMF22CA	LX	BX	22	24.4	26.9	1	35.5	5.7	1
SMF24A	SMF24CA	LZ	BZ	24	26.7	29.5	1	38.9	5.2	1
SMF26A	SMF26CA	ME	CE	26	28.9	31.9	1	42.1	4.8	1
SMF28A	SMF28CA	MG	CG	28	31.1	34.4	1	45.4	4.4	1
SMF30A	SMF30CA	MK	CK	30	33.3	36.8	1	48.4	4.2	1
SMF33A	SMF33CA	MM	CM	33	36.7	40.6	1	53.3	3.8	1

### Electrical Characteristics (TA=25°C)

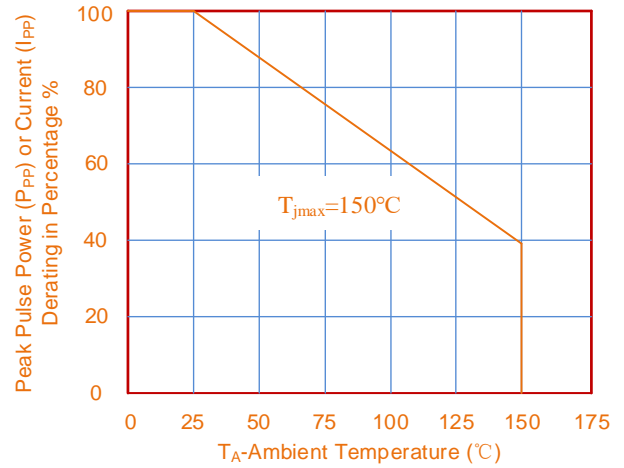
Part Number		Device Marking Code		Reverse Stand-Off Voltage	Breakdown Voltage @I <sub>T</sub>		Test Current	Maximum Clamping Voltage @I <sub>PP</sub>	Peak Pulse Current	Reverse Leakage @V <sub>R</sub>
Uni	Bi	UNI	BI	V <sub>R</sub> (V)	Min(V)	Max(V)	I <sub>T</sub> (mA)	V <sub>C</sub> (V)	I <sub>PP</sub> (A)	I <sub>R</sub> (μA)
SMF36A	SMF36CA	MP	CP	36	40	44.2	1	58.1	3.5	1
SMF40A	SMF40CA	MR	CR	40	44.4	49.1	1	64.5	3.1	1
SMF43A	SMF43CA	MT	CT	43	47.8	52.8	1	69.4	2.9	1
SMF45A	SMF45CA	MV	CV	45	50	55.3	1	72.7	2.8	1
SMF48A	SMF48CA	MX	CX	48	53.3	58.9	1	77.4	2.6	1
SMF51A	SMF51CA	MZ	CZ	51	56.7	62.7	1	82.4	2.5	1
SMF54A	SMF54CA	NE	DE	54	60	66.3	1	87.1	2.3	1
SMF58A	SMF58CA	NG	DG	58	64.4	71.2	1	93.6	2.2	1
SMF60A	SMF60CA	NK	DK	60	66.7	73.7	1	96.8	2.1	1
SMF64A	SMF64CA	NM	DM	64	71.1	78.6	1	103.0	2.0	1
SMF70A	SMF70CA	NP	DP	70	77.8	86	1	113.0	1.8	1
SMF75A	SMF75CA	NR	DR	75	83.3	92.1	1	121.0	1.7	1
SMF78A	SMF78CA	NT	DT	78	86.7	95.8	1	126.0	1.6	1
SMF85A	SMF85CA	NV	DV	85	94.4	104	1	137.0	1.5	1
SMF90A	SMF90CA	NX	DX	90	100	111	1	146.0	1.4	1
SMF100A	SMF100CA	NZ	DZ	100	111	123	1	162.0	1.3	1
SMF110A	SMF110CA	PE	EE	110	122	135	1	177.0	1.2	1
SMF120A	SMF120CA	PG	EG	120	133	147	1	193.0	1.1	1
SMF130A	SMF130CA	PK	EK	130	144	159	1	209.0	1.0	1
SMF150A	SMF150CA	PM	EM	150	167	185	1	243.0	0.8	1
SMF160A	SMF160CA	PP	EP	160	178	197	1	259.0	0.8	1
SMF170A	SMF170CA	PR	ER	170	189	209	1	275.0	0.8	1

**Ratings and Characteristic Curves (Ta=25°C unless otherwise noted)**

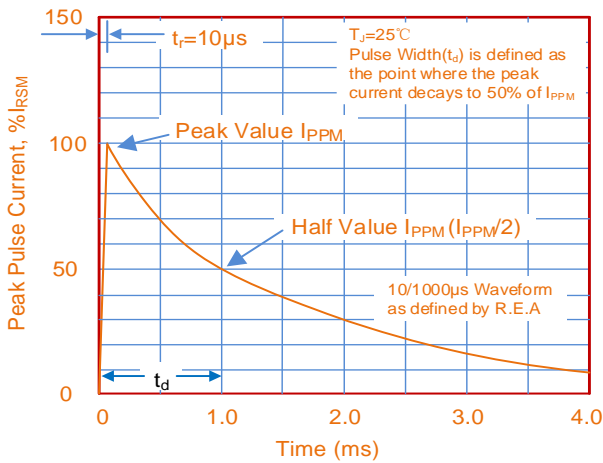
**Figure 1. Peak Pulse Power Rating Curve**



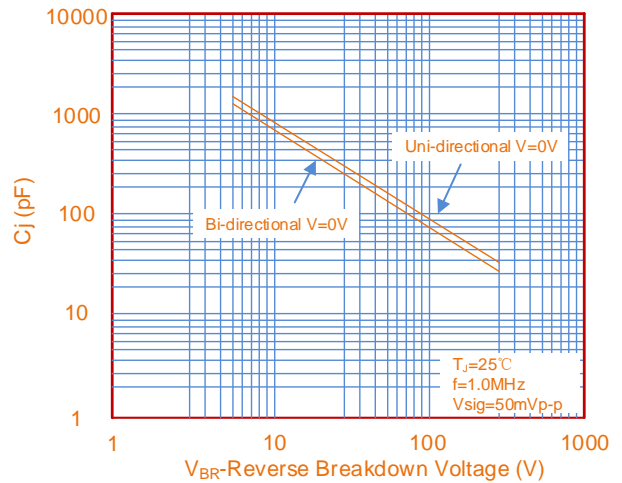
**Figure 2. Pulse Derating Curve**



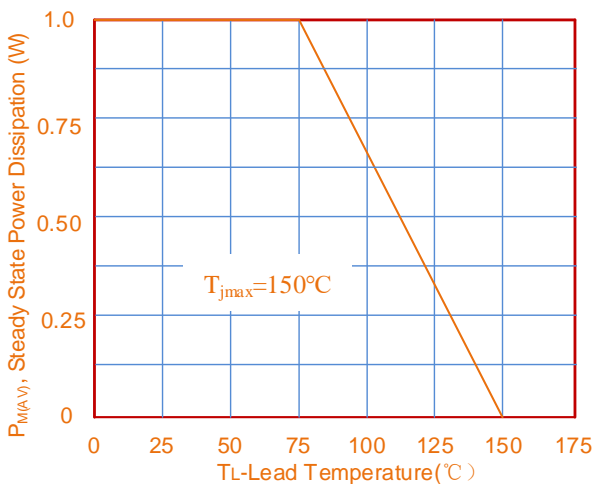
**Figure 3. Pulse Waveform**



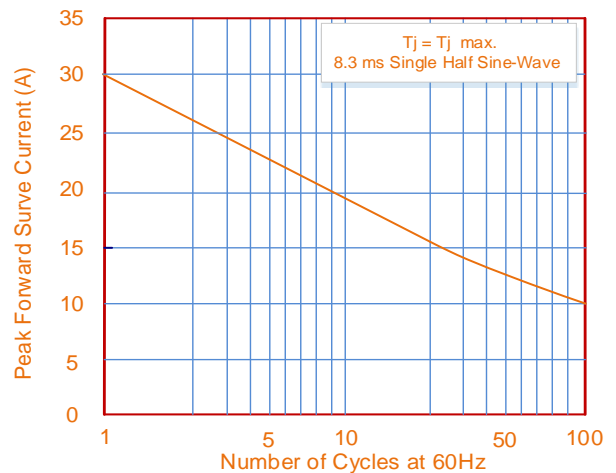
**Figure 4. Typical Junction Capacitance**



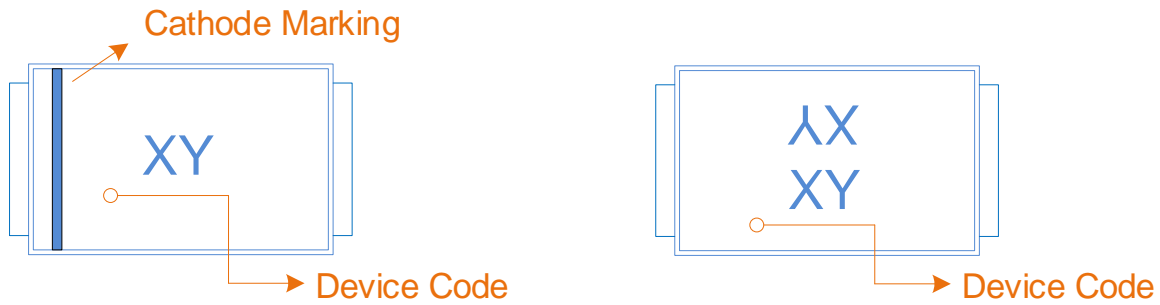
**Figure 5. Steady State Power Dissipation Derating Curve**



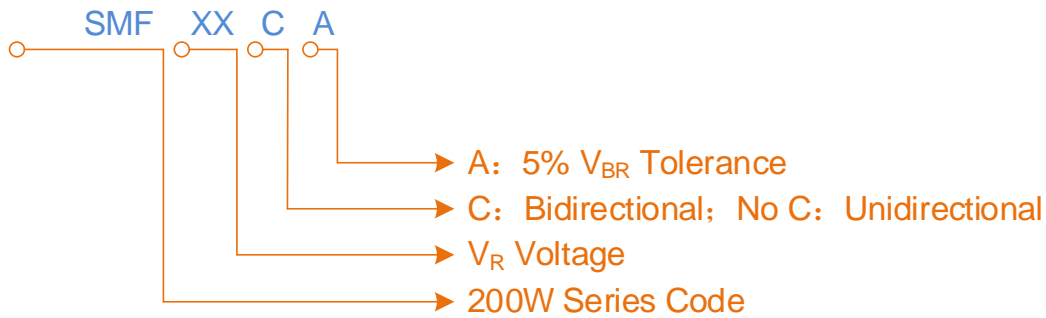
**Figure 6. Maximum Non-Repetitive Forward Surge Current Uni-Directional Only**



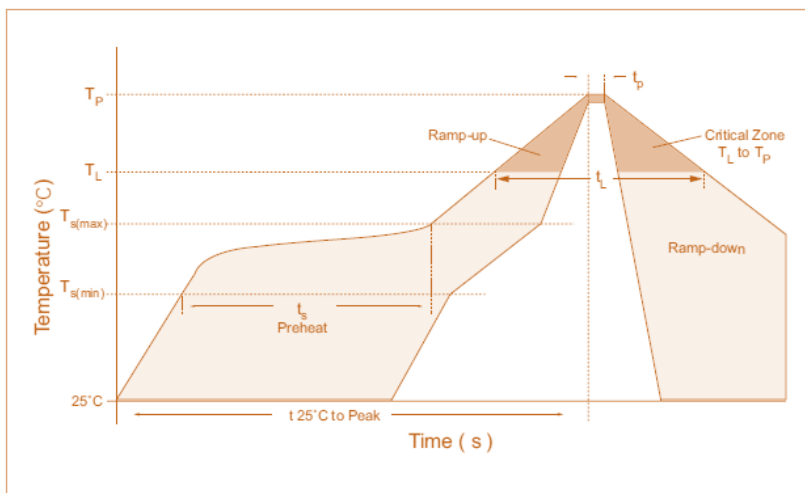
## Marking Code



## Part Number Code

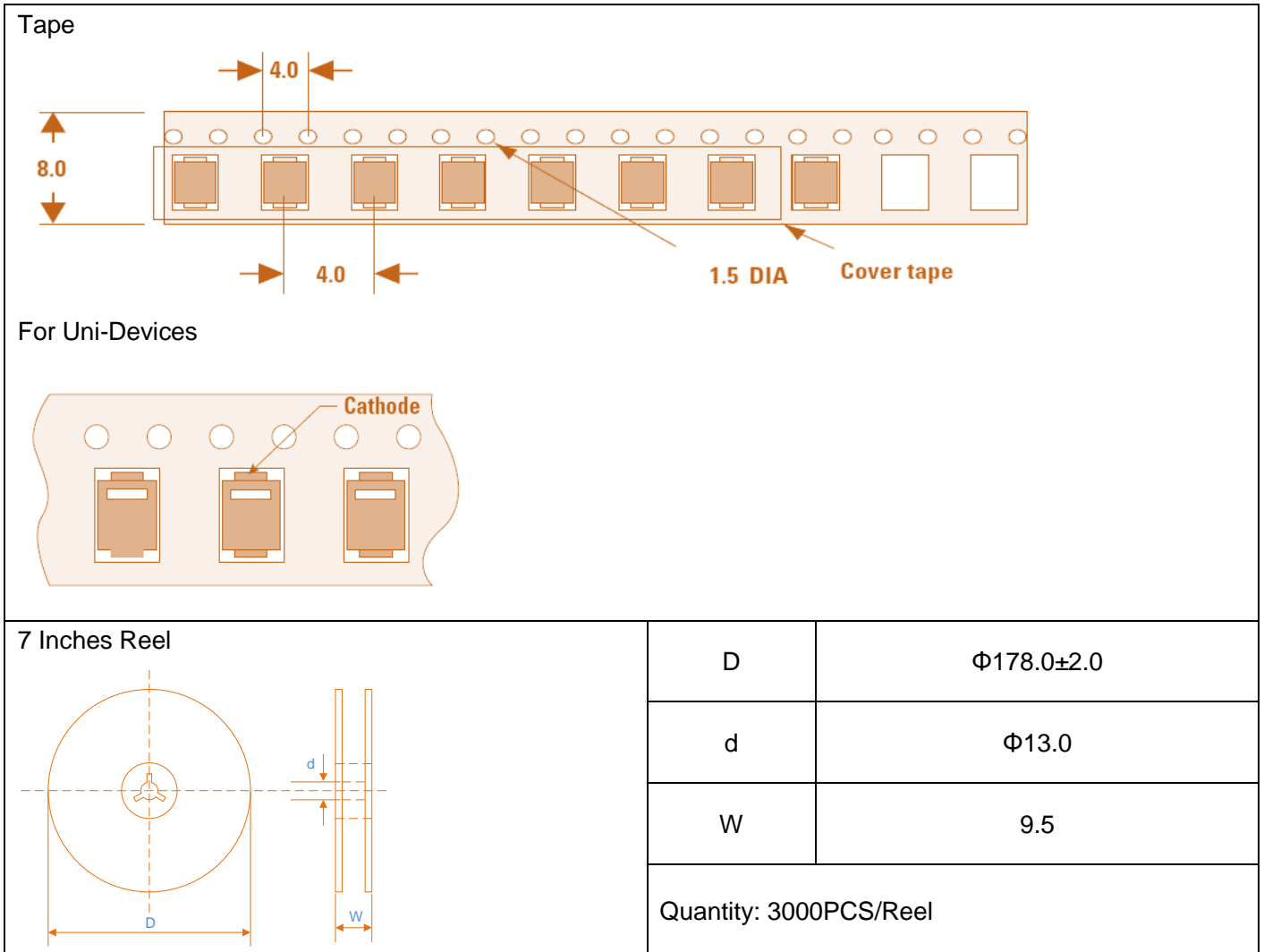


## Soldering Parameters



Reflow Condition		Lead-free Soldering
Pre Heat	- Temperature Min ( $T_{s(min)}$ )	150°C
	- Temperature Max ( $T_{s(max)}$ )	200°C
	- Time (min to max) ( $t_s$ )	60 – 180 secs
Average ramp up rate (Liquidus Temp ( $T_A$ ) to peak)		3°C/second max
$T_{s(max)}$ to $T_A$ - Ramp-up Rate		3°C/second max
Reflow	- Temperature ( $T_A$ )	217°C
	- Time (min to max) ( $t_r$ )	60 – 150 seconds
Peak Temperature ( $T_p$ )		260°C
Time within 5°C of actual peak Temperature ( $t_p$ )		20 – 40 seconds
Ramp-down Rate		6°C/second max
Time 25°C to peak Temperature ( $T_p$ )		8 minutes Max.
Do not exceed Temperature		260°C

## Packaging Specification



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