

## 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.

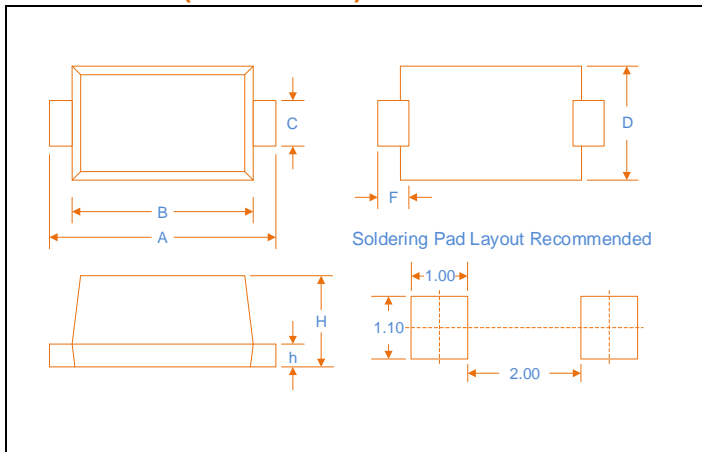
Rating	Symbol	Value	Units
Peak pulse power dissipation at 10/1000 $\mu$ s waveform (Note1, Note2, Fig.1)	P <sub>PPM</sub>	Minimum 200	Watts
Peak pulse power (tp=8/20 $\mu$ s waveform)	P <sub>PPM</sub>	Minimum 1000	Watts
Peak pulse current of at 10/1000 $\mu$ s waveform (Note 1, Fig.3)	I <sub>PPM</sub>	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)

 <p>Soldering Pad Layout Recommended</p>	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

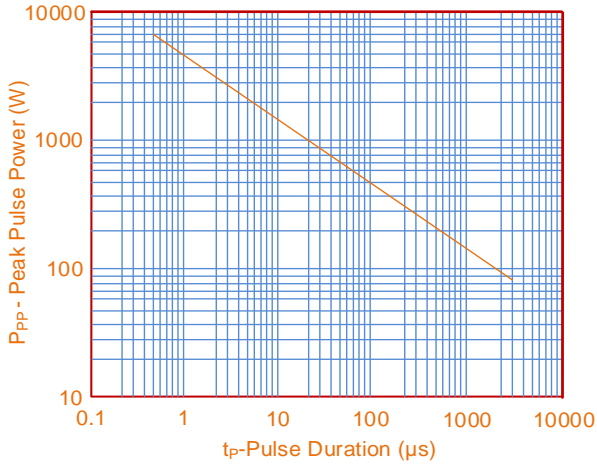


Figure 2. Pulse Derating Curve

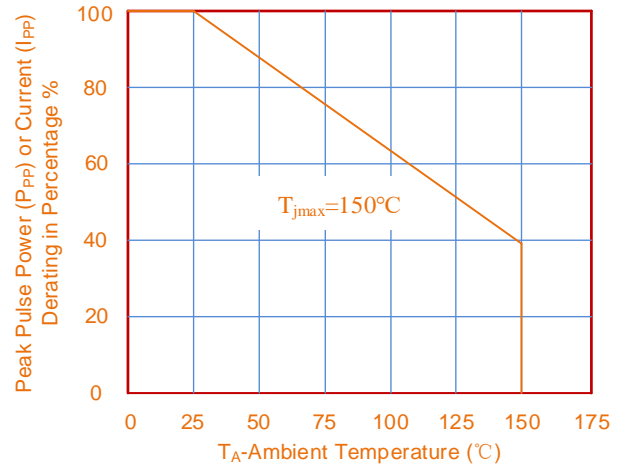


Figure 3. Pulse Waveform

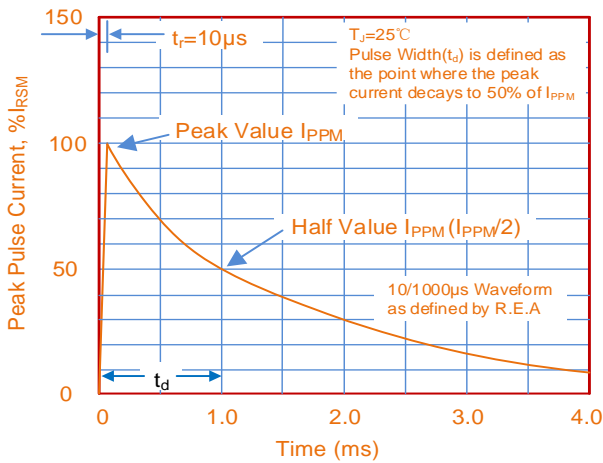


Figure 4. Typical Junction Capacitance

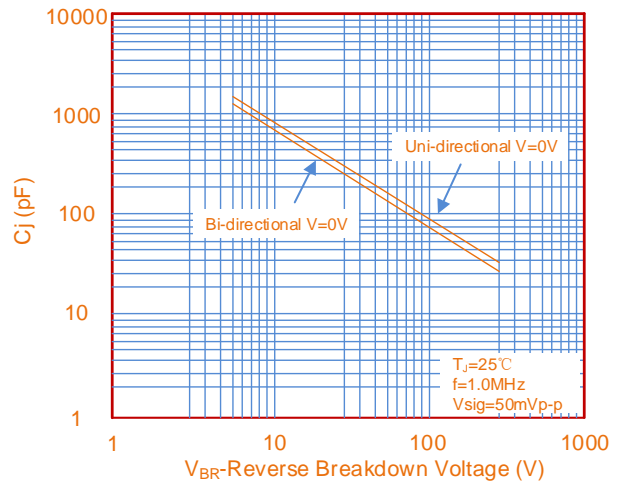


Figure 5. Steady State Power Dissipation Derating Curve

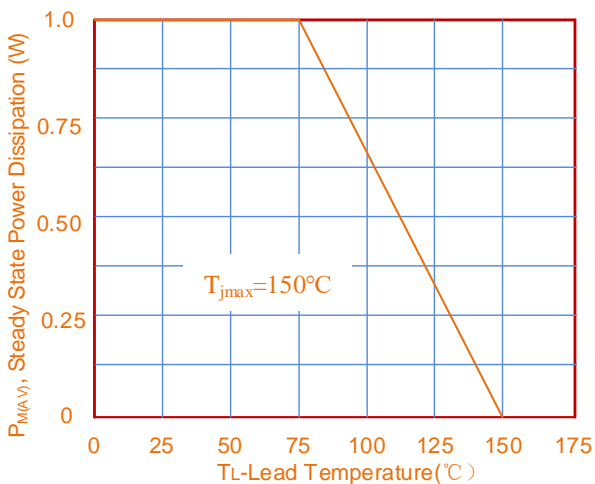
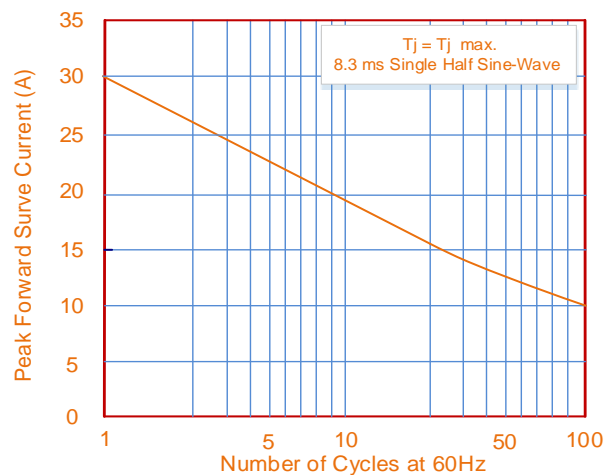
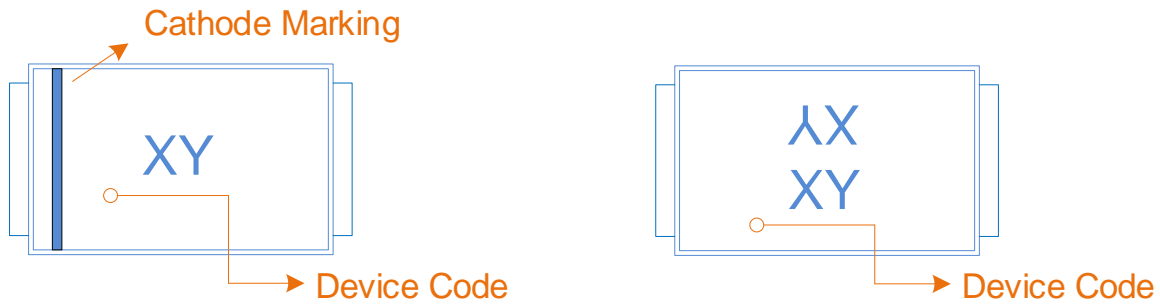


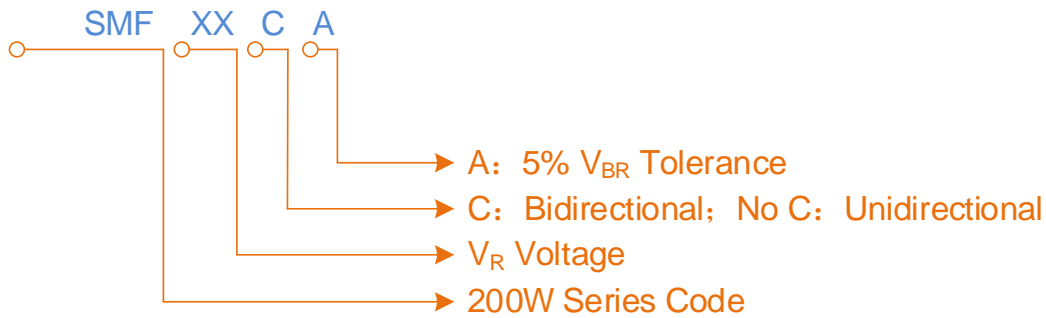
Figure 6. Maximum Non-Repetitive Forward Surge Current Uni-Directional Only



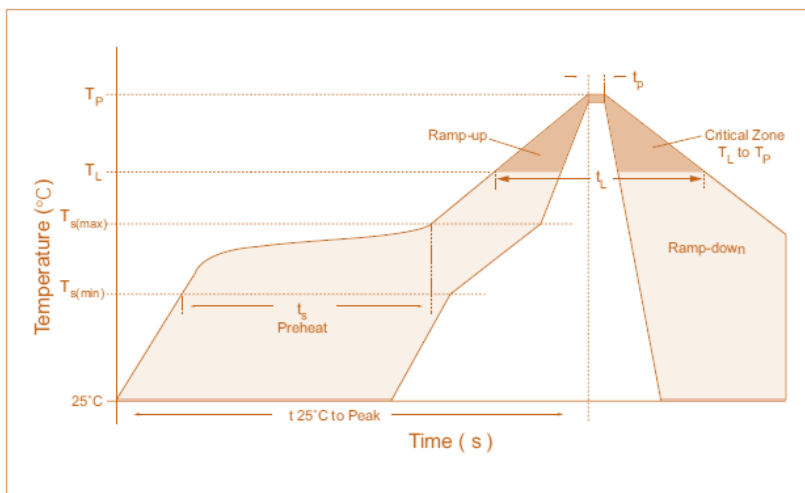
## Marking Code



## Part Number Code

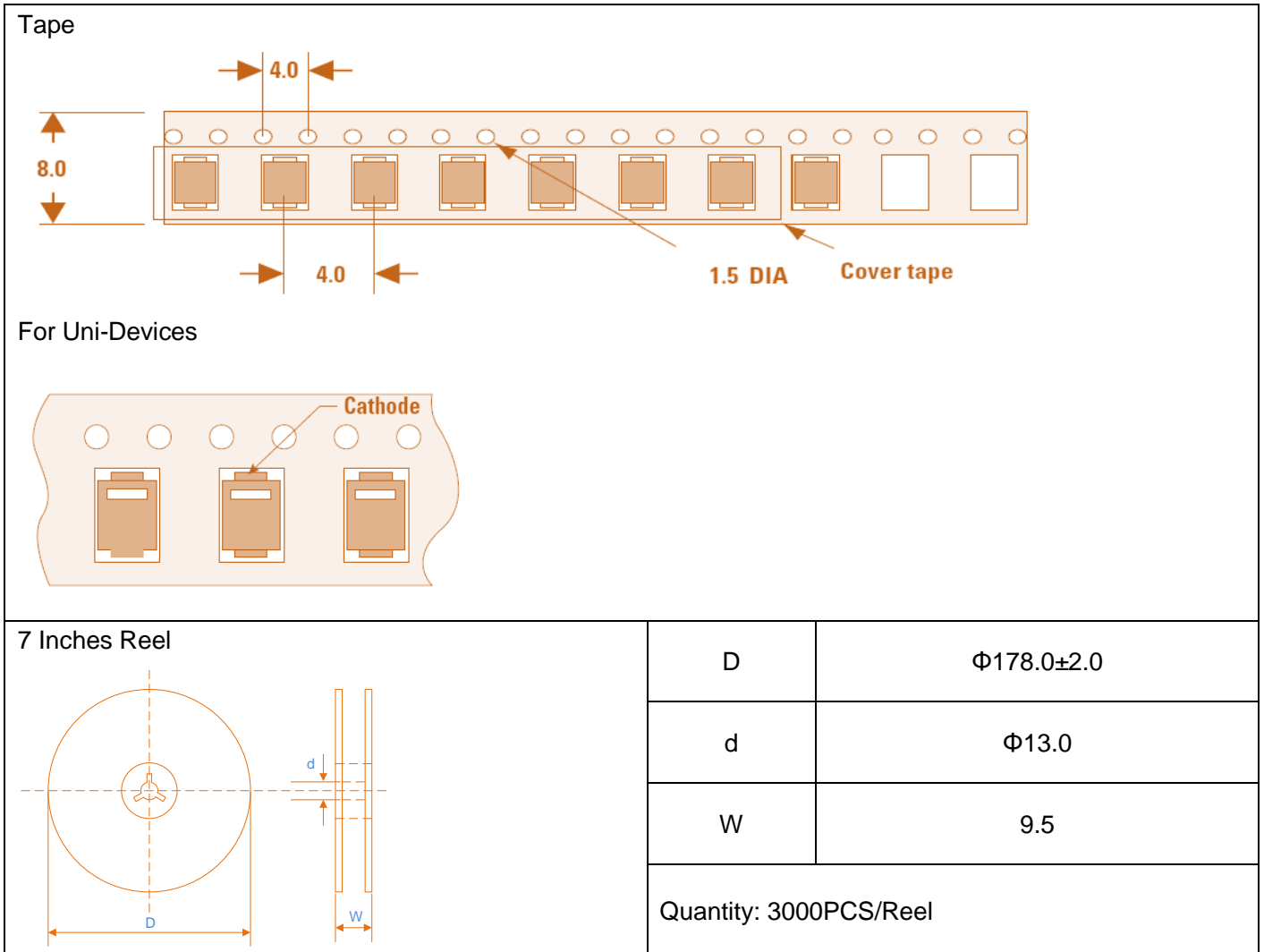


## Soldering Parameters



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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