M55 Module Polymer Hermetic Seal

Overview

KEMET's M550 and M551 Modular Series are manufactured by placing T550 or T551 Polymer Hermetic Sealed Capacitors (PHS) in parallel. The T550 and T551 Series are manufactured utilizing KEMET's exclusive F-Tech process and are 100% tested per KEMET's patented Simulated Breakdown Screening process. This configuration provides high and stable capacitance (up to 8,200 µF), extremely low ESR (down to 15 mΩ) and extremely low and stable leakage current, all in a mechanically robust package.

The M55 Modules are available in two temperature offerings: 105°C (M550 Series) and 125°C (M551 Series). With reduced ESR and enhanced capacitance retention at higher frequencies and low temperatures, KEMET modules provide the highest total capacitance and the lowest total cost of ownership for high power applications.

Benefits

- Extremely low and stable ESR (as low as 15 mΩ)
- Voltage Ratings from 6 to 180 VDC
- High frequency capacitance retention
- Low temperature capacitance stability
- High ripple current capability (17,500 mA_{rms})
- High inrush current capability
- Excellent power dissipation capability
- Stackable packaging
- Mechanically robust assembly and epoxy housing
- Operates at up to 80% rated voltage
- Customized solutions available
- RoHS compliant terminations available

Applications

Designed for mission critical applications requiring high power, filtering, hold-up and current pulse generation.

Module 1

Module 2

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Ordering Information

M	550	B	108	M	060	A	A
Capacitor Class	Series	Case Size	Capacitance Code (pF)	Capacitance Tolerance	Rated Voltage (VDC)	Product Level	Termination Finish
M = Module	550= Capacitor Series (PHS 105°C) 551= Capacitor Series (PHS 125°C)	B	First two digits represent significant figures. Third digit specifies number of zeros.	K = ±10% M = ±20%	006 = 6 008 = 8 010 = 10 015 = 15 025 = 25 030 = 30 040 = 40 050 = 50 060 = 60 075 = 75 100 = 100 180 = 180	A = N/A B* = DLA 13030 standard reliability T* = DLA 13030 high reliability	A = 100% silver (Ag) T = 100% tin (Sn) plated H = Tin/lead (SnPb) solder coated (5% Pb minimum) S = Solder coated (60% Sn, 40% Pb) G = 100% gold (Au)

** Only available on DLA discrete part numbers. Refer to part number table for details.*

Performance Characteristics

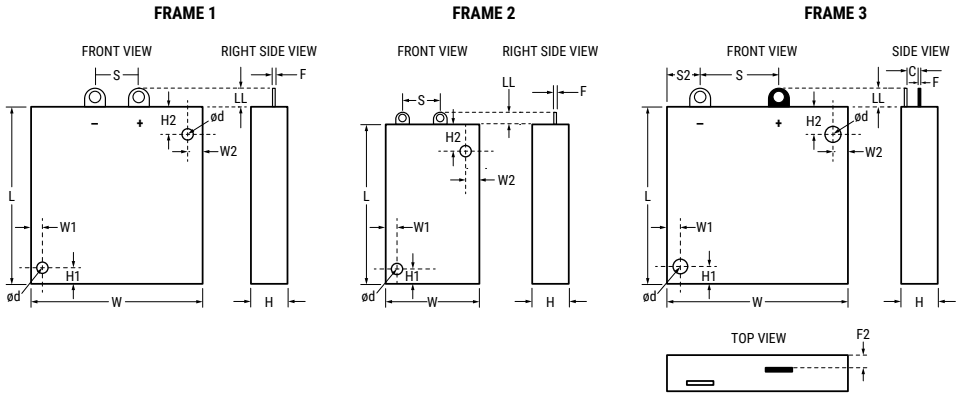
Item	Performance Characteristics
Operating Temperature	−55°C to 105°C/125°C*
Rated Capacitance Range	60 µF to 8,200 µF at 120 Hz/25°C
Capacitance Tolerance	K Tolerance (10%), M Tolerance (20%)
Rated Voltage Range	6 – 180 V
DF (120 Hz at 25°C)	Refer to Part Number Electrical Specification Table
ESR (100 kHz at 25°C)	Refer to Part Number Electrical Specification Table
Leakage Current	Refer to Part Number Electrical Specification Table

** Refer to the part number specification table.*

Qualification

Test Performed	Method Reference	Test Conditions
Reliability and Environmental Tests		
AC Ripple Life at 85˚C, 0.67 V_r	MIL–PRF–39006	85˚C, 40 kHz ripple current, 2,000 hours
Thermal Shock	MIL–PRF–39006	Condition A, –55°C to +105°C 5 cycles
Temperature Stability	MIL–PRF–39006	Extreme temperature exposure at a succession of continuous steps at +25°C, –55°C, +25°C, +85°C, +105, +25°C
Physical, Mechanical and Process Tests		
Mechanical Shock	KEMET Custom Test	Condition I
Vibration High Frequency	MIL–PRF–39006	Method 204, Test condition D, 20 g peak

Dimensions – Millimeters (Inches)



Dimensions mm (In)												
Frame Size	L ±0.38 (0.015)	W ±0.38 (0.015)	H ±0.20 (0.008)	S ref	LL ± 0.1 (0.004)	F ref	H1 ± 0.1 (0.004)	W1 ± 0.1 (0.004)	H2 ± 0.1 (0.004)	W2 ± 0.1 (0.004)	d ref	Weight per module (g)
1	52.1 (2.05)	50.6 (1.99)	11.1 (0.44)	12.71 (0.50)	5.6 (0.22)	0.81 (0.03)	4.5 (0.18)	3.2 (0.13)	8.2 (0.32)	4.4 (0.17)	3.2 (0.13)	80
2	48.4 (1.90)	28.2 (1.11)	11.1 (0.44)	11.50 (0.45)	3.2 (0.13)	0.81 (0.03)	4.5 (0.18)	3.2 (0.13)	8.2 (0.32)	4.4 (0.17)	3.2 (0.13)	50

Table 1 – Ratings & Part Number Reference

Rated Voltage (V) 85°C	Rated Capacitance (µF)	Frame Size	KEMET Module Part Number	DC Leakage µA at 25°C max/5min	DF% at 25°C 120 Hz Max	Maximum ESR mΩ at 25°C 100 kHz	Ripple Current mArms at 85°C/40 kHz	Maximum Operating Temperature (°C)
6	700	2	M550B707(1)006A(3)	32	5	40	7550	105
6	700	2	M551B707(1)006A(3)	32	5	40	7550	125
6	4100	2	M550B418(1)006A(3)	185	5	30	8750	105
6	4100	2	M551B418(1)006A(3)	185	5	30	8750	125
6	8200	1	M550B828(1)006A(3)	369	5	15	17500	105
6	8200	1	M551B828(1)006A(3)	369	5	15	17500	125
8	1100	2	M550B118(1)008A(3)	66	5	40	7550	105
8	1100	2	M551B118(1)008A(3)	66	5	40	7550	125
8	3400	2	M550B348(1)008A(3)	204	5	30	8750	105
8	3400	2	M551B348(1)008A(3)	204	5	30	8750	125
8	6800	1	M550B688(1)008A(3)	408	5	15	17500	105
8	6800	1	M551B688(1)008A(3)	408	5	15	17500	125
10	500	2	M550B507(1)010A(3)	38	5	50	7000	105
10	500	2	M551B507(1)010A(3)	38	5	50	7000	125
10	900	2	M550B907(1)010A(3)	68	5	40	7900	105
10	900	2	M551B907(1)010A(3)	68	5	40	7900	125
10	2200	2	M550B228(1)010A(3)	210	5	30	8750	105
10	2200	2	M551B228(1)010A(3)	210	5	30	8750	125
10	5600	1	M550B568(1)010A(3)	420	5	15	17500	105
10	5600	1	M551B568(1)010A(3)	420	5	15	17500	125
15	350	2	M550B357(1)015A(3)	40	5	50	7000	105
15	350	2	M551B357(1)015A(3)	40	5	50	7000	125
15	600	2	M550B607(1)015A(3)	68	5	40	7900	105
15	600	2	M551B607(1)015A(3)	68	5	40	7900	125
15	2000	2	M550B208(1)015A(3)	225	5	30	8750	105
15	2000	2	M551B208(1)015A(3)	225	5	30	8750	125
15	3900	1	M550B398(1)015A(3)	439	5	15	17500	105
15	3900	1	M551B398(1)015A(3)	439	5	15	17500	125
25	250	2	M550B257(1)025A(3)	47	5	50	6375	105
25	250	2	M551B257(1)025A(3)	47	5	50	6375	125
25	500	2	M550B507(1)025(2)(3) *	94	5	60	6000	105
25	500	2	M551B507(1)025(2)(3) *	94	5	60	6000	125
25	1000	1	M550B108(1)025(2)(3) *	188	5	30	12000	105
25	1000	1	M551B108(1)025A(3)	188	5	30	12000	125
30	200	2	M550B207(1)030A(3)	45	5	50	6375	105
30	200	2	M551B207(1)030A(3)	45	5	50	6375	125
30	340	2	M550B347(1)030A(3)	77	5	50	7000	105
30	340	2	M551B347(1)030A(3)	77	5	50	7000	125
30	680	1	M550B687(1)030A(3)	153	5	25	14000	105
30	680	1	M551B687(1)030A(3)	153	5	25	14000	125
40	500	2	M550B507(1)040(2)(3) *	150	5	50	6750	105
40	500	2	M551B507(1)040(2)(3) *	150	5	50	6750	125
40	600	2	M550B607(1)040(2)(3) *	180	5	40	6750	105
40	600	2	M551B607(1)040(2)(3) *	180	5	40	6750	125
40	1000	1	M550B108(1)040(2)(3) *	300	5	25	13500	105
40	1000	1	M551B108(1)040A(3)	300	5	25	13500	125
40	1200	1	M550B128(1)040(2)(3) *	360	5	20	15100	105
40	1200	1	M551B128(1)040A(3)	360	5	20	15100	125
50	120	2	M550B127(1)050A(3)	47	5	50	6375	105
50	120	2	M551B127(1)050A(3)	47	5	50	6375	125
50	240	2	M550B247(1)050A(3)	90	5	50	6750	105
50	240	2	M551B247(1)050A(3)	90	5	50	6750	125
50	500	2	M550B507(1)050(2)(3) *	188	5	40	7250	105
50	500	2	M551B507(1)050(2)(3) *	188	5	40	7250	125
50	600	2	M550B607(1)050(2)(3) *	225	5	30	8750	105

(1) To complete KEMET part number, insert M for ±20% or K for ±10%. Designates capacitance tolerance.
(2) To complete KEMET part number, insert B = standard reliability, or T = high reliability. See Ordering Information table for details.
(3) To complete KEMET part number, insert T = 100% matte tin (Sn) plated, H = standard solder coated (SnPb 5% Pb minimum), S = 60% tin (Sn) 40% lead (Pb) , G = 100% gold (Au) , A = 100% silver (Ag). Designates termination finish.

Table 1 – Ratings & Part Number Reference cont'd

Rated Voltage (V) 85°C	Rated Capacitance (µF)	Frame Size	KEMET Module Part Number	DC Leakage µA at 25°C max/5min	DF% at 25°C 120 Hz Max	Maximum ESR mΩ at 25°C 100 kHz	Ripple Current mArms at 85°C/40 kHz	Maximum Operating Temperature (°C)
50	600	2	M551B607(1)050(2)(3) *	225	5	30	8750	125
50	1000	1	M550B108(1)050(2)(3) *	375	5	20	14500	105
50	1000	1	M551B108(1)050A(3)	375	5	20	14500	125
50	1200	1	M550B128(1)050(2)(3) *	450	5	15	17500	105
50	1200	1	M551B128(1)050A(3)	450	5	15	17500	125
60	100	2	M550B107(1)060A(3)	45	5	60	5875	105
60	100	2	M551B107(1)060A(3)	45	5	60	5875	125
60	500	2	M550B507(1)060A(3)	225	5	50	8300	105
60	500	2	M551B507(1)060A(3)	225	5	50	8300	125
60	1000	1	M550B108(1)060(2)(3) *	450	5	25	16600	105
60	1000	1	M551B108(1)060A(3)	450	5	25	16600	125
75	370	2	M550B377(1)075A(3)	208	5	40	7900	105
75	750	1	M550B757(1)075(2)(3) *	422	5	20	15800	105
100	120	2	M550B127(1)100A(3)	90	5	60	6375	105
100	250	1	M550B257(1)100(2)(3) *	188	5	30	12750	105
108	250	3	M550B257(1)108(2)(3)	350	5	50	8300	105
108	250	3	M551B257(1)108(2)(3)	350	5	50	8300	125
135	180	3	M550B187(1)135(2)(3)	302	5	50	7900	105
180	60	3	M550B606(1)180(2)(3)	141	5	80	6000	105

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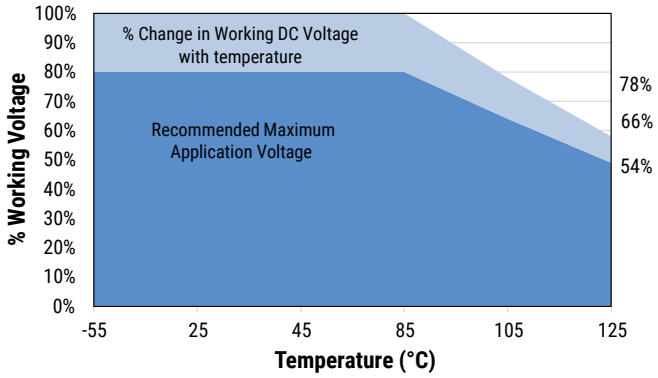
(3) To complete KEMET part number, insert T = 100% matte tin (Sn) plated, H = standard solder coated (SnPb 5% Pb minimum), S = 60% tin (Sn) 40% lead (Pb) , G = 100% gold (Au) , A = 100% silver (Ag). Designates termination finish.

Recommended Voltage Derating Guidelines

	−55°C to 105°C	105°C to 125°C
% Change in Working DC Voltage with Temperature	78% of V_R	66% of V_R
Recommended Maximum Application Voltage (As % of Rated Voltage)	63% of V_R	54% of V_R



Ripple Current/Ripple Voltage

Permissible AC ripple voltage and current are related to equivalent series resistance (ESR) and the power dissipation capabilities of the device. Permissible AC ripple voltage that may be applied is limited by two criteria:

1. The positive peak AC voltage plus the DC bias voltage, if any, must not exceed the DC voltage rating of the capacitor.
2. The negative peak AC voltage in combination with bias voltage, if any, must not exceed the allowable limits specified for reverse voltage.

The maximum power dissipation by case size can be determined using the below left table. The maximum power dissipation rating stated in the table must be reduced with increasing environmental operating temperatures. Refer to the below right table for temperature compensation requirements.

Case Code		Maximum Power Dissipation (P_{max}) mWatts at 25°C with +60°C Rise
KEMET	MIL–PRF–39006/22/ 25/30/31 Case Size	
B	T2	715

Temperature Compensation Multipliers for Maximum Power Dissipation (P_{max})		
T ≤ 45°C	45°C < T ≤ 85°C	85°C < T ≤ 125°C
1.00	0.70	0.10

T= Environmental Temperature

Using the P_{max} of the device, the maximum allowable rms ripple current or voltage may be determined.

$$I(max) = \sqrt{P_{max}/R}$$
$$E(max) = Z\sqrt{P_{max}/R}$$

I = rms ripple current (amperes)
E = rms ripple voltage (volts)
P_{max} = maximum power dissipation (watts)
R = ESR at specified frequency (ohms)
Z = Impedance at specified frequency (ohms)

The maximum power dissipation rating must be reduced with increasing environmental operating temperatures. Refer to the Temperature Compensation Multiplier table for details.

Reverse Voltage

Solid tantalum polymer capacitors are polar devices and may be permanently damaged or destroyed if connected with the wrong polarity. A small reverse voltage is permissible for time periods per the table at right. KEMET can offer lower capacitance in this voltage with higher reverse voltage capability. In addition, we continue to improve our capability for this characteristic.

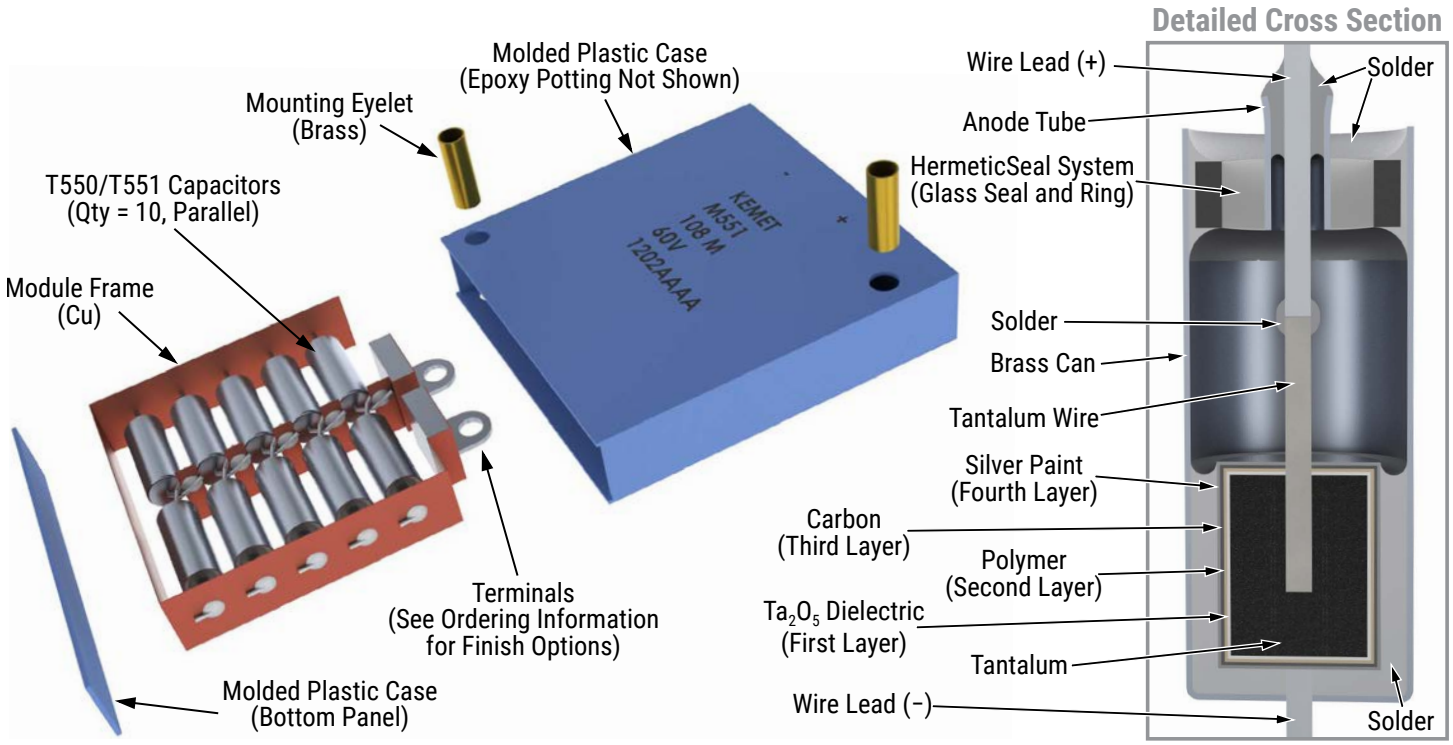
Temperature	Permissible Reverse Voltage
25°C	1 V for 8 hours Maximum
70ºC	1 V for 2 hours Maximum

Mounting

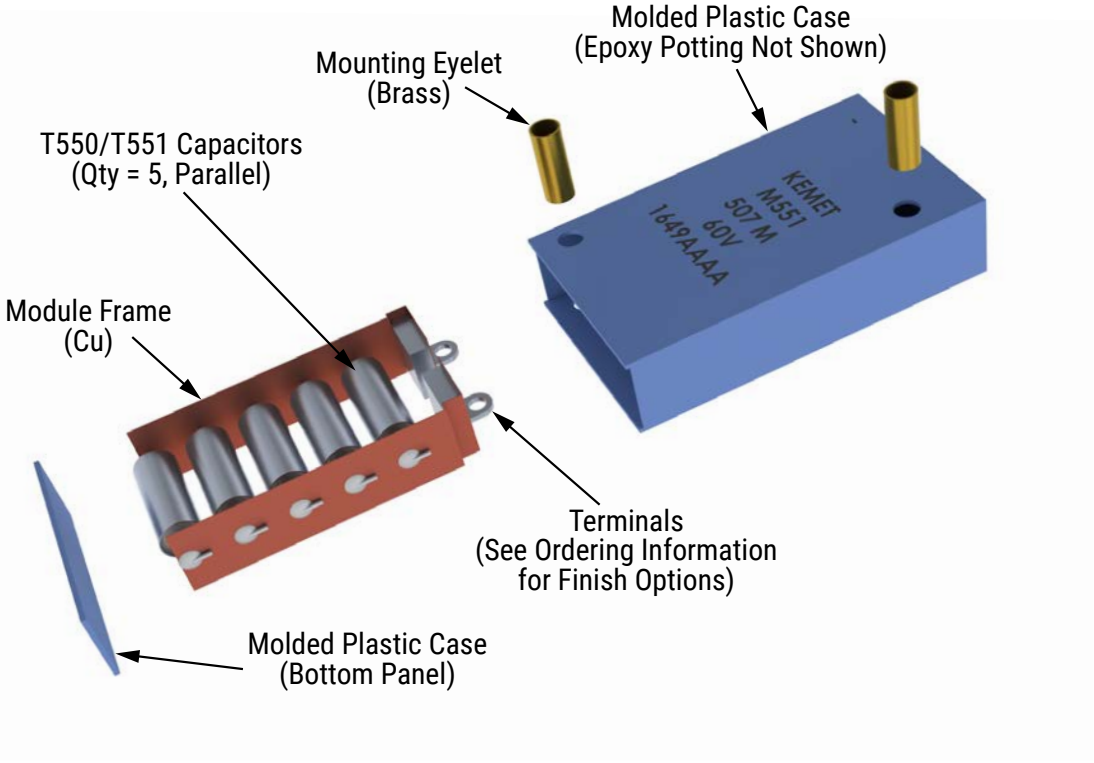
The M550 and M551 Modular Series are suitable for stacking to the board. The use of a heat sink is recommended. These products are not suitable for reflow soldering. For manual-soldering process with soldering iron, the maximum recommended temperature is 350°C for no more than 3 seconds. Care should be taken to avoid contact of the soldering iron to the epoxy housing. The iron should be used to heat the solder pad, applying solder between the pad and the terminal of the module, until reflow occurs.

Construction

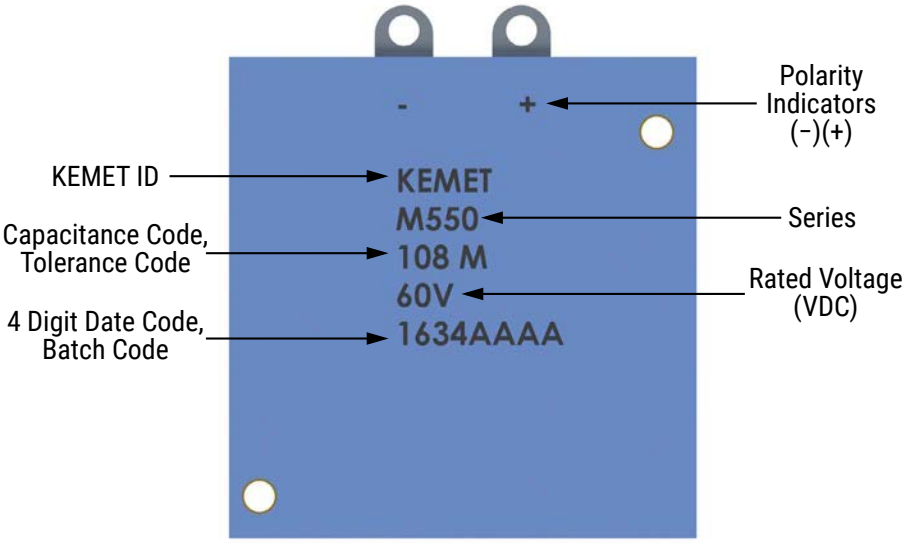
Module 1



Module 2



Capacitor Marking



Storage

Polymer Hermetic Seal Modules should be stored in normal working environments. KEMET recommends that maximum storage temperature not exceed 40°C and maximum storage humidity not exceed 90% RH. For optimal solderability, module stock should be used promptly, preferably within three years of receipt.

Packaging

Modules shall be packaged in carton boxes. Packaging methods and materials used shall prevent degradation of physical and mechanical characteristics. MSL 1

Series	Carton Box Qty
M55	10 max

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