Zener Voltage Regulators

500 mW SOD−123 Surface Mount

MMSZxxxT1G Series, SZMMSZxxxT1G Series

Three complete series of Zener diodes are offered in the convenient, surface mount plastic SOD−123 package. These devices provide a convenient alternative to the leadless 34−package style.

Features

- 500 mW Rating on FR−4 or FR−5 Board
- Wide Zener Reverse Voltage Range − 2.4 V to 56 V
- Package Designed for Optimal Automated Board Assembly
- Small Package Size for High Density Applications
- ESD Rating of Class 3 (> 16 kV) per Human Body Model
- AEC−Q101 Qualified and PPAP Capable
- SZ Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements
- Pb−Free Packages are Available*

Mechanical Characteristics

CASE: Void-free, transfer-molded, thermosetting plastic case
FINISH: Corrosion resistant finish, easily Solderable
MAXIMUM CASE TEMPERATURE FOR SOLDERING PURPOSES: 260°C for 10 Seconds
POLARITY: Cathode indicated by polarity band
FLAMMABILITY RATING: UL 94 V−0

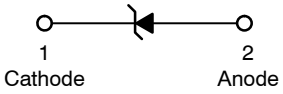
MAXIMUM RATINGS

Rating	Symbol	Max	Unit
Total Power Dissipation on FR−5 Board, (Note 1) @ T_L = 75°C Derated above 75°C	P_D	500 6.7	mW mW/°C
Thermal Resistance, Junction−to−Ambient (Note 2)	$R_{\theta JA}$	340	°C/W
Thermal Resistance, Junction−to−Lead (Note 2)	$R_{\theta JL}$	150	°C/W
Junction and Storage Temperature Range	T_J, T_{stg}	−55 to +150	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.
1. FR−5 = 3.5 X 1.5 inches.
2. Thermal Resistance measurement obtained via infrared Scan Method.

*For additional information on our Pb−Free strategy and soldering details, please download the **onsemi** Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

SOD−123
CASE 425
STYLE 1



MARKING DIAGRAM

xx = Device Code
M = Date Code
▪ = Pb−Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION

Device	Package	Shipping†
MMSZxxxT1G	SOD−123 (Pb−Free)	3,000 / Tape & Reel
SZMMSZxxxT1G	SOD−123 (Pb−Free)	3,000 / Tape & Reel
MMSZxxxT3G	SOD−123 (Pb−Free)	10,000 / Tape & Reel
SZMMSZxxxT3G	SOD−123 (Pb−Free)	10,000 / Tape & Reel

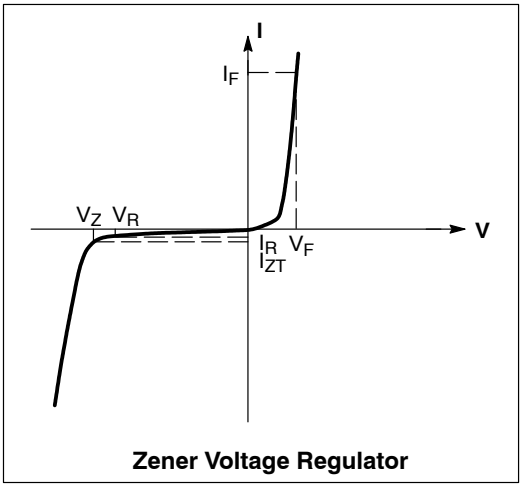
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

DEVICE MARKING INFORMATION

See specific marking information in the device marking column of the Electrical Characteristics table on page 2 of this data sheet.

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted, V_F = 0.95 V Max. @ I_F = 10 mA)

Symbol	Parameter
V_Z	Reverse Zener Voltage @ I_{ZT}
I_{ZT}	Reverse Current
Z_{ZT}	Maximum Zener Impedance @ I_{ZT}
I_R	Reverse Leakage Current @ V_R
V_R	Reverse Voltage
I_F	Forward Current
V_F	Forward Voltage @ I_F



Zener Voltage Regulator

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted, V_F = 0.9 V Max. @ I_F = 10 mA)

Device*	Device Marking	V_{Z1} (Volts) (Notes 3 and 4) @ I_{ZT1} = 5 mA			Z_{ZT1} (Note 5)	V_{Z2} (Volts) (Notes 3 and 4) @ I_{ZT2} = 1 mA		Z_{ZT2} (Note 5)	Max Reverse Leakage Current I_R @ V_R	
		Min	Nom	Max	Ω	Min	Max	Ω	μA	Volts
MMSZ2V4T1G	T1	2.28	2.4	2.52	100	1.7	2.1	600	50	1
MMSZ2V7T1G	T2	2.57	2.7	2.84	100	1.9	2.4	600	20	1
MMSZ3V0T1G	T3	2.85	3.0	3.15	95	2.1	2.7	600	10	1
MMSZ3V3T1G	T4	3.14	3.3	3.47	95	2.3	2.9	600	5	1
MMSZ3V6T1G	T5	3.42	3.6	3.78	90	2.7	3.3	600	5	1
MMSZ3V9T1G	U1	3.71	3.9	4.10	90	2.9	3.5	600	3	1
MMSZ4V3T1G	U2	4.09	4.3	4.52	90	3.3	4.0	600	3	1
MMSZ4V7T1G	U3	4.47	4.7	4.94	80	3.7	4.7	500	3	2
MMSZ5V1T1G	***U4***	***4.85***	***5.1***	***5.36***	***60***	***4.2***	***5.3***	***480***	***2***	***2***
MMSZ5V6T1G/T3G	***U5***	***5.32***	***5.6***	***5.88***	***40***	***4.8***	***6.0***	***400***	***1***	***2***
MMSZ6V2T1G	***V1***	***5.89***	***6.2***	***6.51***	***10***	***5.6***	***6.6***	***150***	***3***	***4***
MMSZ6V8T1G	V2	6.46	6.8	7.14	15	6.3	7.2	80	2	4
MMSZ7V5T1G	V3	7.13	7.5	7.88	15	6.9	7.9	80	1	5
MMSZ8V2T1G	V4	7.79	8.2	8.61	15	7.6	8.7	80	0.7	5
MMSZ9V1T1G	V5	8.65	9.1	9.56	15	8.4	9.6	100	0.5	6
MMSZ10T1G/T3G	A1	9.50	10	10.50	20	9.3	10.6	150	0.2	7
MMSZ11T1G	A2	10.45	11	11.55	20	10.2	11.6	150	0.1	8
MMSZ12T1G	A3	11.40	12	12.60	25	11.2	12.7	150	0.1	8
MMSZ13T1G	A4	12.35	13	13.65	30	12.3	14.0	170	0.1	8
MMSZ15T1G	A5	14.25	15	15.75	30	13.7	15.5	200	0.05	10.5
MMSZ16T1G	X1	15.20	16	16.80	40	15.2	17.0	200	0.05	11.2
MMSZ18T1G/T3G	***X2***	***17.10***	***18***	***18.90***	***45***	***16.7***	***19.0***	***225***	***0.05***	***12.6***
MMSZ20T1G	X3	19.00	20	21.00	55	18.7	21.1	225	0.05	14
MMSZ22T1G	X4	20.90	22	23.10	55	20.7	23.2	250	0.05	15.4
MMSZ24T1G	X5	22.80	24	25.20	70	22.7	25.5	250	0.05	16.8

3. The type numbers shown have a standard tolerance of ±5% on the nominal Zener Voltage.
4. Tolerance and Voltage Designation: Zener Voltage (V_Z) is measured with the Zener Current applied for PW = 1 ms.
5. Z_{ZT} and Z_{ZK} are measured by dividing the AC voltage drop across the device by the AC current applied. The specified limits are for $I_{Z(AC)}$ = 0.1 $I_{Z(DC)}$, with the AC frequency = 1 kHz.

*Include SZ-prefix devices where applicable.

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted, V_F = 0.9 V Max. @ I_F = 10 mA)

Device*	Device Marking	V_{Z1} (Volts) (Notes 6 and 7) @ I_{ZT1} = 2 mA			Z_{ZT1} (Note 8)	V_{Z2} (Volts) (Notes 6 and 7) @ I_{ZT2} = 0.1 mA		Z_{ZT2} (Note 8) @ I_{ZT2} = 0.5 mA	Max Reverse Leakage Current I_R @ V_R	
		Min	Nom	Max	Ω	Min	Max	Ω	μA	Volts
MMSZ27T1G/T3G	Y1	25.65	27	28.35	80	25	28.9	300	0.05	18.9
MMSZ30T1G	Y2	28.50	30	31.50	80	27.8	32	300	0.05	21
MMSZ33T1G	Y3	31.35	33	34.65	80	30.8	35	325	0.05	23.1
MMSZ36T1G	Y4	34.20	36	37.80	90	33.8	38	350	0.05	25.2
MMSZ39T1G	Y5	37.05	39	40.95	130	36.7	41	350	0.05	27.3
MMSZ43T1G	Z1	40.85	43	45.15	150	39.7	46	375	0.05	30.1
MMSZ47T1G	Z2	44.65	47	49.35	170	43.7	50	375	0.05	32.9
MMSZ51T1G	Z3	48.45	51	53.55	180	47.6	54	400	0.05	35.7
MMSZ56T1G/T3G	Z4	53.20	56	58.80	200	51.5	60	425	0.05	39.2

6. The type numbers shown have a standard tolerance of ±5% on the nominal Zener Voltage.
7. Tolerance and Voltage Designation: Zener Voltage (V_Z) is measured with the Zener Current applied for PW = 1 ms.
8. Z_{ZT} and Z_{ZK} are measured by dividing the AC voltage drop across the device by the AC current applied. The specified limits are for $I_{Z(AC)}$ = 0.1 $I_{Z(DC)}$, with the AC frequency = 1 kHz.

*Include SZ-prefix devices where applicable.

TYPICAL CHARACTERISTICS

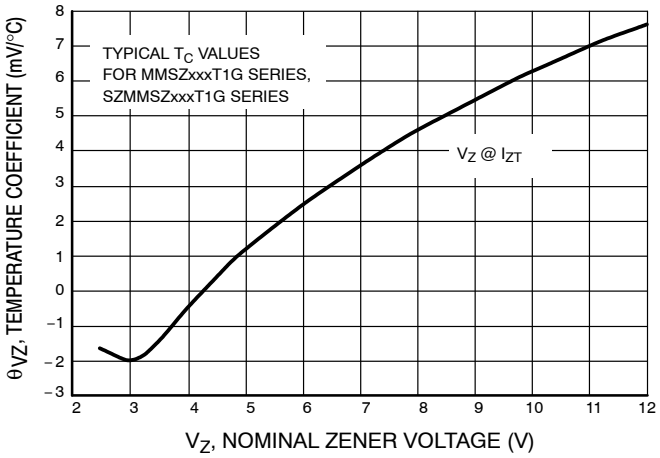


Figure 1. Temperature Coefficients (Temperature Range −55°C to +150°C)

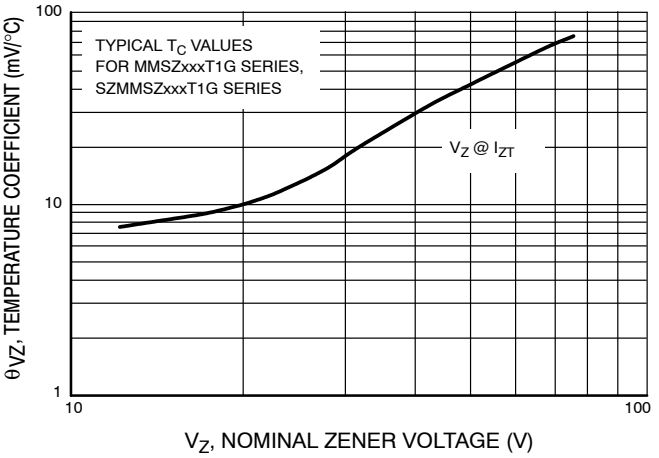


Figure 2. Temperature Coefficients (Temperature Range −55°C to +150°C)

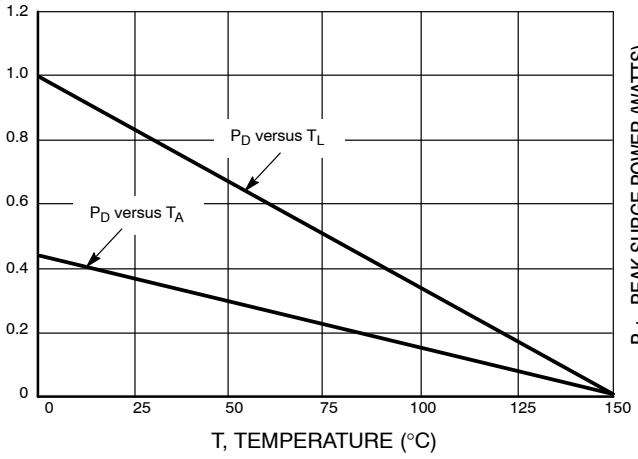


Figure 3. Steady State Power Derating

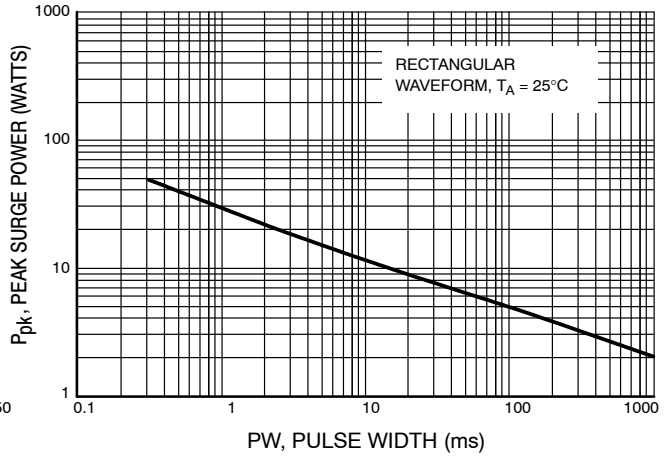


Figure 4. Maximum Nonrepetitive Surge Power

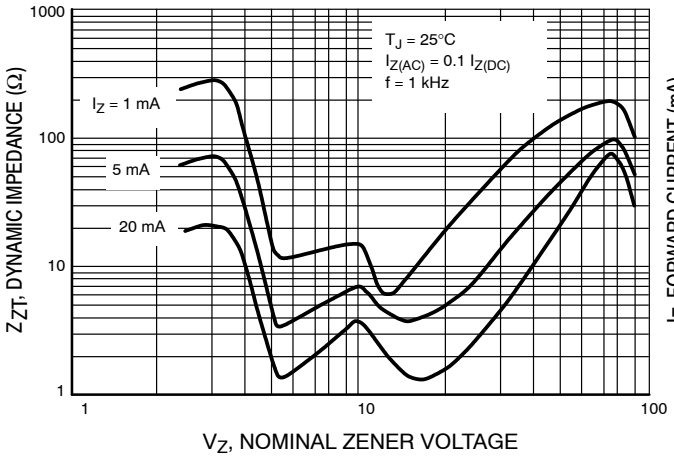


Figure 5. Effect of Zener Voltage on Zener Impedance

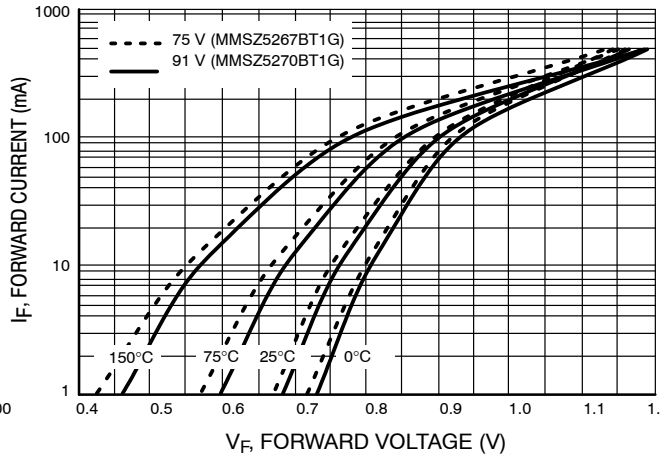


Figure 6. Typical Forward Voltage

TYPICAL CHARACTERISTICS

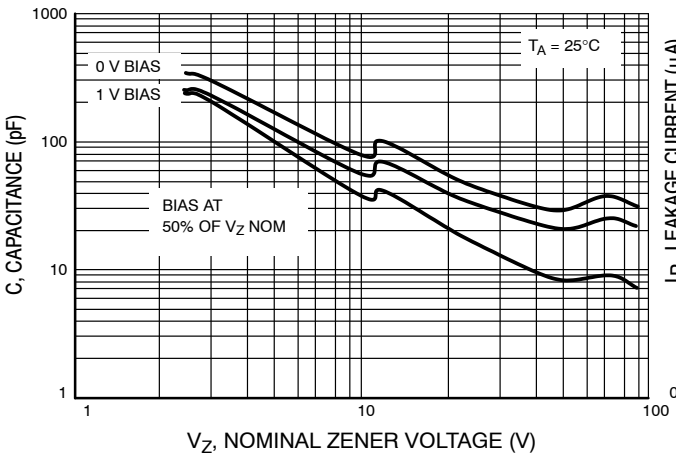


Figure 7. Typical Capacitance

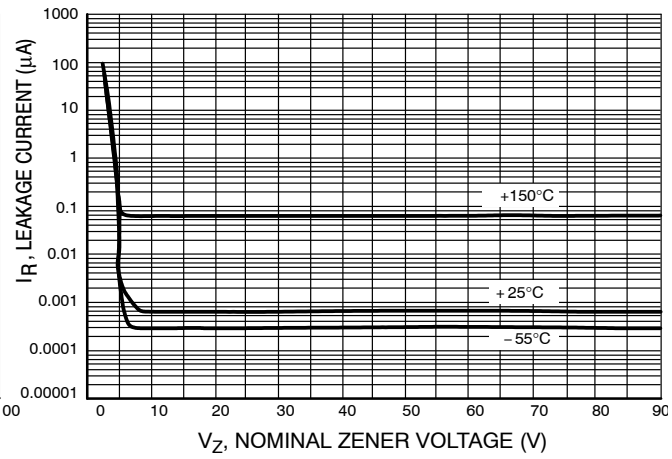


Figure 8. Typical Leakage Current

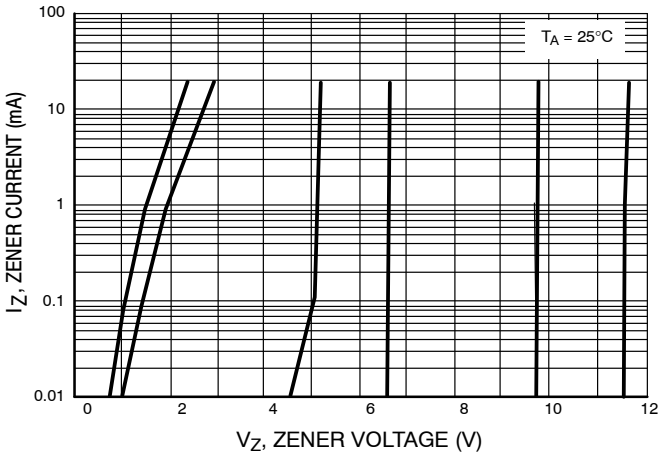


Figure 9. Zener Voltage versus Zener Current (V_Z Up to 12 V)

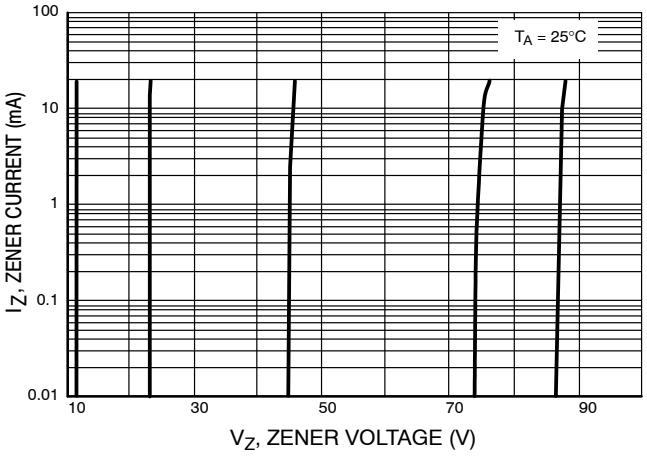
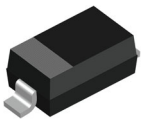
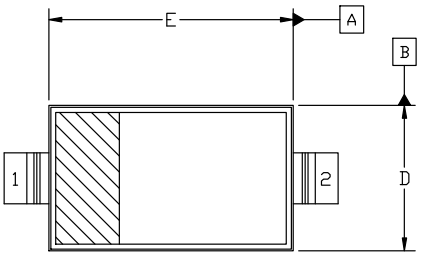


Figure 10. Zener Voltage versus Zener Current (12 V to 91 V)

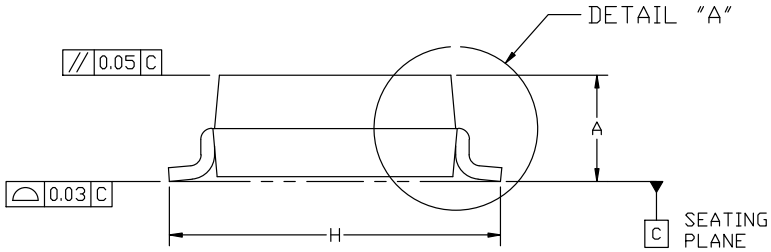


SOD−123 2−LEAD, 1.60x2.69x1.16
CASE 425
ISSUE H

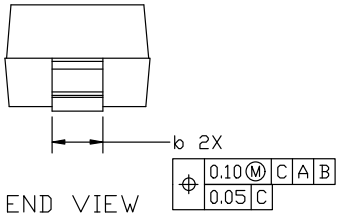
DATE 29 FEB 2024



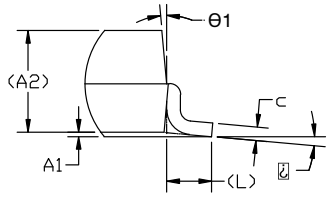
TOP VIEW



SIDE VIEW



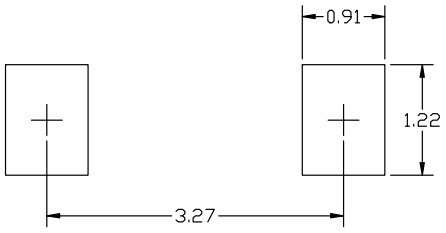
END VIEW



DETAIL "A"

NOTES:
1. DIMENSION AND TOLERANCING PER ASME Y14.5M, 2018
2. CONTROLLING DIMENSION: MILLIMETERS

	MILLIMETER		
DIM	MIN.	NOM.	MAX.
A	0.94	1.17	1.35
A1	0.00	0.05	0.10
A2		1.16 REF.	
b	0.51	0.61	0.71
c	–	–	0.15
D	1.40	1.60	1.80
E	2.54	2.69	2.84
H	3.56	3.68	3.86
L		0.25 REF.	
∠	0°		10°
θ1	0°		10°



RECOMMENDED MOUNTING FOOTPRINT

*For additional information on or Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference manual SOLDERRM/D.

GENERIC MARKING DIAGRAM*

XXX = Specific Device Code
M = Date Code
▪ = Pb−Free Package
(Note: Microdot may be in either location)

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

STYLE 1:
PIN 1. CATHODE
2. ANODE

DOCUMENT NUMBER:	**98ASB42927B**	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	**SOD−123 2−LEAD, 1.60x2.69x1.16**	**PAGE 1 OF 1**

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:
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MMSZ10T1 MMSZ10T1G MMSZ10T3G MMSZ11T1 MMSZ11T1G MMSZ12T1 MMSZ12T1G MMSZ12T3G MMSZ13T1 MMSZ13T1G MMSZ15T1 MMSZ15T1G MMSZ15T3G MMSZ16T1 MMSZ16T1G MMSZ18T1 MMSZ18T1G MMSZ18T3G MMSZ20T1G MMSZ22T1 MMSZ22T1G MMSZ24T1 MMSZ24T1G MMSZ27T1 MMSZ27T1G MMSZ27T3 MMSZ27T3G MMSZ2V4T1G MMSZ2V4T3G MMSZ2V7T1G MMSZ2V7T3G MMSZ30T1G MMSZ33T1G MMSZ33T3G MMSZ36T1 MMSZ36T1G MMSZ39T1 MMSZ39T1G MMSZ3V0T1G MMSZ3V3T1G MMSZ3V6T1G MMSZ3V6T3G MMSZ3V9T1 MMSZ3V9T1G MMSZ3V9T3G MMSZ43T1G MMSZ47T1G MMSZ47T3G MMSZ4V3T1 MMSZ4V3T1G MMSZ4V7T1 MMSZ4V7T1G MMSZ4V7T3G MMSZ51T1 MMSZ51T1G MMSZ56T1G MMSZ5V1T1 MMSZ5V1T1G MMSZ5V1T3G MMSZ5V6T1 MMSZ5V6T1G MMSZ5V6T3G MMSZ6V2T1G MMSZ6V8T1G MMSZ6V8T3G MMSZ7V5T1 MMSZ7V5T1G MMSZ8V2T1 MMSZ8V2T1G MMSZ8V2T3G MMSZ9V1T1G SZMMSZ10T1G SZMMSZ10T3G SZMMSZ11T1G SZMMSZ12T1G SZMMSZ15T1G SZMMSZ16T1G SZMMSZ20T1G SZMMSZ22T1G SZMMSZ27T3G SZMMSZ2V4T1G SZMMSZ33T1G SZMMSZ3V3T1G SZMMSZ3V9T1G SZMMSZ4V3T1G SZMMSZ6V2T1G SZMMSZ7V5T1G SZMMSZ8V2T1G SZMMSZ9V1T1G SZMMSZ2V7T1G SZMMSZ12T3G SZMMSZ39T1G SZMMSZ30T1G SZMMSZ24T3G SZMMSZ3V6T1G SZMMSZ6V8T1G SZMMSZ5V1T1G SZMMSZ18T1G SZMMSZ27T1G SZMMSZ4V7T1G