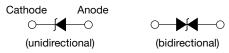


## Vishay General Semiconductor

# Surface-Mount TRANSZORB® Transient Voltage Suppressors



### **SMA (DO-214AC)**



### LINKS TO ADDITIONAL RESOURCES



PRIMARY CHARACTERISTICS					
V <sub>BR</sub> uni-directional	6.40 V to 231 V				
V <sub>BR</sub> bi-directional	6.40 V to 231 V				
$V_{WM}$	5.0 V to 188 V				
P <sub>PPM</sub>	400 W, 300 W				
P <sub>D</sub>	3.3 W				
I <sub>FSM</sub>	40 A				
T <sub>J</sub> max.	150 °C				
Polarity	Unidirectional, bidirectional				
Package	SMA (DO-214AC)				

### **DEVICES FOR BIDIRECTION APPLICATIONS**

For bidirectional use CA suffix (e.g. SMAJ10CA). Electrical characteristics apply in both directions.

### **TYPICAL APPLICATIONS**

Use in sensitive electronics protection against voltage transients induced by inductive load switching and lighting on ICs, MOSFET, signal lines of sensor units for consumer, computer, industrial, automotive, and telecommunication.

### **FEATURES**

- Low profile package
- Ideal for automated placement
- · Glass passivated chip junction
- · Available in unidirectional and bidirectional
- 400 W peak pulse power capability with a 10/1000 µs waveform, repetitive rate (duty cycle): 0.01 % (300 W above 78 V)



AUTOMOTIVE GRADE

- · Excellent clamping capability
- Very fast response time
- Low incremental surge resistance
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- AEC-Q101 qualified available
  - Automotive ordering code: base P/NHE3 or P/NHM3
- Material categorization: for definitions of compliance please see <a href="https://www.vishay.com/doc?99912"><u>www.vishay.com/doc?99912</u></a>

### **MECHANICAL DATA**

Case: SMA (DO-214AC)

Molding compound meets UL 94 V-0 flammability rating Base P/N-E3 - RoHS-compliant, commercial grade Base P/N-M3 - halogen-free, RoHS-compliant, commercial grade

Base P/NHE3\_X - RoHS-compliant and AEC-Q101 qualified Base P/NHM3\_X - halogen-free, RoHS-compliant, and AEC-Q101 qualified

("\_X" denotes revision code e.g. A, B, ...)

**Terminals:** matte tin plated leads, solderable per J-STD-002 and JESD 22-B102

E3, M3, HE3, and HM3 suffix meets JESD 201 class 2 whisker test

**Polarity:** for unidirectional types the band denotes cathode end, no marking on bidirectional types

MAXIMUM RATINGS (T <sub>A</sub> = 25 °C unless otherwise noted)							
PARAMETER	SYMBOL	VALUE	UNIT				
Peak pulse power dissipation with a 10/1000 µs waveform (1)(2) (fig. 1)	P <sub>PPM</sub>	400	W				
Peak pulse current with a waveform (1)	I <sub>PPM</sub>	See next table	Α				
Power dissipation on infinite heatsink at T <sub>A</sub> = 50 °C	$P_{D}$	3.3	W				
Peak forward surge current 8.3 ms single half sine-wave unidirectional only (2)	I <sub>FSM</sub>	40	Α				
Operating junction and storage temperature range	T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C				

### Note

- (1) Non-repetitive current pulse, per fig. 3 and derated above T<sub>A</sub> = 25 °C per fig. 2. Rating is 300 W above 78 V
- (2) Mounted on 0.2" x 0.2" (5.0 mm x 5.0 mm) copper pads to each terminal



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DEVICE TYPE   MARKING   CODE   Vis. AT   Vis.   TEST   Vis. AT   Vis.	<b>ELECTRICAL CHARACTERISTICS</b> (T <sub>A</sub> = 25 °C unless otherwise noted)										
HSMAJ6,0A   RE   WE   6.40   7.07   10   5.0   800   43.5   9.2   9.057   10   10   10   10   10   10   10   1	DEVICE TYPE	DEVICE MARKING		BREAKDOWN VOLTAGE V <sub>BR</sub> AT I <sub>T</sub> <sup>(1)</sup> (V)		TEST CURRENT I <sub>T</sub>	STAND-OFF VOLTAGE V <sub>WM</sub>	MAXIMUM REVERSE LEAKAGE	MAXIMUM PEAK PULSE SURGE CURRENT	CLAMPING VOLTAGE AT	MAXIMUM TEMPERATURE COEFFICIENT OF V <sub>BR</sub>
		UNI	BI	MIN.	MAX.	(112.4)	(•)	I <sub>D</sub> (μA) <sup>(3)</sup>	I <sub>PPM</sub> (A) ( <sup>2</sup> )	V <sub>C</sub> (V)	(%/°C)
HSMAJESA   AK   WK   7.22   7.98   10   6.5   500   35.7   11.2   0.061   HSMAJT.OA   AM   WM   7.78   8.60   10   7.0   200   33.3   12.0   0.065   MSMAJT.SA   AP   WP   8.33   9.21   1.0   7.5   100   31.0   12.9   0.067   MSMAJSOA   AR   WR   8.89   9.83   1.0   8.0   50   29.4   13.6   0.069   MSMAJSOA   AR   WR   8.89   9.83   1.0   8.0   50   29.4   13.6   0.069   MSMAJSOA   AV   WV   10.0   11.1   1.0   8.5   10   27.8   14.4   0.073   MSMAJSOA   AV   WV   10.0   11.1   1.0   9.0   5.0   26.0   15.4   0.074   MSMAJIOA   AV   WV   10.0   11.1   1.0   9.0   5.0   26.0   15.4   0.074   MSMAJIOA   AV   WV   10.0   11.1   1.0   9.0   5.0   26.0   15.4   0.074   MSMAJIOA   AV   WZ   12.2   13.5   1.0   11   1.0   22.0   18.2   0.080   MSMAJIOA   AV   WZ   12.2   13.5   1.0   11   1.0   22.0   18.2   0.080   MSMAJIOA   BE   XE   13.3   14.7   1.0   12   1.0   20.1   19.9   0.083   MSMAJIOA   BE   XE   13.3   14.7   1.0   12   1.0   20.1   19.9   0.083   MSMAJIOA   BE   XE   13.3   14.7   1.0   14   1.0   17.2   23.2   0.087   MSMAJIOA   BF   XF   18.5   1.0   14   1.0   17.2   23.2   0.087   MSMAJIOA   BF   XF   18.9   20.9   1.0   15   1.0   16.4   24.4   0.088   MSMAJIOA   BF   XF   18.9   20.9   1.0   17   1.0   14.5   27.6   0.090   MSMAJIOA   BF   XF   20.2   2.1   1.0   18   1.0   13.7   29.2   0.092   MSMAJIOA   BF   XF   20.0   22.1   1.0   18   1.0   13.3   32.4   0.094   MSMAJIOA   BF   XF   20.0   22.1   1.0   18   1.0   13.3   32.4   0.094   MSMAJIOA   BF   XF   20.0   22.1   1.0   18   1.0   13.3   32.4   0.094   MSMAJIOA   BF   XF   20.0   22.1   1.0   18   1.0   13.3   32.4   0.094   MSMAJIOA   BF   XF   20.0   22.1   1.0   13.3   32.4   0.094   MSMAJIOA   BF   XF   20.0   22.1   1.0   13.3   33.4   0.094   MSMAJIOA   CK   YK   33.3   36.8   1.0   20   1.0   12.3   32.4   0.094   MSMAJIOA   CK   YK   33.3   36.8   1.0   30   1.0   4.1   5.5   53.3   0.100   MSMAJIOA   CK   YK   33.3   36.8   1.0   30   1.0   4.6   87.1   0.103   MSMAJIOA   CK   YK   33.3   36.8   1.0   30   1.0   4.6   87.1   0	(+)SMAJ5.0A (5)	AE	WE	6.40	7.07	10	5.0	800	43.5	9.2	0.057
	(+)SMAJ6.0A	AG	WG	6.67	7.37	10	6.0	800	38.8	10.3	0.059
	(+)SMAJ6.5A	AK	WK	7.22	7.98	10	6.5	500	35.7	11.2	0.061
	(+)SMAJ7.0A	AM	WM	7.78	8.60	10	7.0	200	33.3	12.0	0.065
□SMAJ8.5A   AT   WT   9.44   10.4   1.0   8.5   10   27.8   14.4   0.073     □SMAJ9.0A   AV   WV   10.0   11.1   1.0   9.0   5.0   26.0   15.4   0.074     □SMAJ10A   AX   WX   11.1   12.3   1.0   10   1.0   23.5   17.0   0.078     □SMAJ11A   AZ   WZ   12.2   13.5   1.0   11   1.0   22.0   18.2   0.080     □SMAJ13A   BG   XG   14.4   15.9   1.0   13   1.0   18.6   21.5   0.084     □SMAJ13A   BG   XG   14.4   15.9   1.0   13   1.0   18.6   21.5   0.084     □SMAJ13A   BK   XK   15.6   17.2   1.0   14   1.0   17.2   23.2   0.087     □SMAJ15A   BK   XK   15.6   17.2   1.0   14   1.0   17.2   23.2   0.087     □SMAJ15A   BF   XF   18.5   1.0   15   1.0   16.4   24.4   0.088     □SMAJ15A   BF   XF   17.8   19.7   1.0   16   1.0   15.4   26.0   0.089     □SMAJ15A   BF   XF   17.8   19.7   1.0   16   1.0   15.4   26.0   0.089     □SMAJ15A   BF   XF   17.8   19.7   1.0   18   1.0   13.7   29.2   0.092     □SMAJ16A   BF   XF   22.2   24.5   1.0   20   1.0   12.3   32.4   0.094     □SMAJ2AB   BT   XT   20.0   22.1   1.0   18   1.0   13.7   29.2   0.092     □SMAJ2AB   BT   XT   20.0   22.1   1.0   18   1.0   13.3   35.5   0.096     □SMAJ2AB   BT   XT   20.0   22.1   1.0   24   1.0   10.3   38.9   0.096     □SMAJ2AB   CF   YE   28.9   31.9   1.0   26   1.0   9.5   42.1   0.097     □SMAJ3AB   CF   YE   28.9   31.9   1.0   26   1.0   9.5   42.1   0.097     □SMAJ3AB   CF   YF   40.0   44.2   1.0   33   1.0   7.5   53.3   0.100     □SMAJ3AB   CF   YF   40.0   44.2   1.0   36   1.0   6.9   58.1   0.100     □SMAJ3AB   CF   YF   40.0   44.2   1.0   36   1.0   5.8   69.4   0.100     □SMAJ3AB   CF   YF   40.0   44.2   1.0   36   1.0   5.8   69.4   0.100     □SMAJ3AB   CF   YF   40.0   44.2   1.0   58   1.0   4.3   33.6   0.100     □SMAJ3AB   CF   YF   40.0   44.2   1.0   58   1.0   4.3   3.3   6.0   0.100     □SMAJ3AB   CF   YF   40.0   44.2   1.0   58   1.0   5.2   77.4   0.102     □SMAJ3BA   RG   ZG   64.4   71.2   1.0   58   1.0   4.3   33.6   0.100     □SMAJ3AB   RG   ZG   64.4   71.2   1.0   58   1.0   4.3   33.6   0.104     □	(+)SMAJ7.5A	AP	WP	8.33	9.21	1.0	7.5	100	31.0	12.9	0.067
	(+)SMAJ8.0A	AR	WR	8.89	9.83	1.0	8.0	50	29.4	13.6	0.069
High Majtoa	(+)SMAJ8.5A	AT	WT	9.44	10.4	1.0	8.5	10	27.8	14.4	0.073
(H)SMAJ11A AZ WZ 12.2 13.5 1.0 111 1.0 22.0 18.2 0.080 (H)SMAJ13A BE XE 13.3 14.7 1.0 12 1.0 20.1 19.9 0.083 (H)SMAJ13A BG XG 14.4 15.9 1.0 13 1.0 18.6 21.5 0.084 (H)SMAJ13A BK XK 15.6 17.2 1.0 14 1.0 17.2 23.2 0.087 (H)SMAJ13A BK XK 15.6 17.2 1.0 14 1.0 17.2 23.2 0.087 (H)SMAJ15A BK XK 15.6 17.2 1.0 14 1.0 17.2 23.2 0.087 (H)SMAJ15A BK XK 15.6 17.2 1.0 15 1.0 16.4 24.4 0.088 (H)SMAJ16A BP XP 17.8 19.7 1.0 16 1.0 15.4 26.0 0.089 (H)SMAJ16A BP XP 17.8 19.7 1.0 16 1.0 15.4 26.0 0.089 (H)SMAJ17A BR XR 18.9 20.9 1.0 17 1.0 14.5 27.6 0.090 (H)SMAJ18A BT XT 20.0 22.1 1.0 18 1.0 13.7 29.2 0.092 (H)SMAJ20A BV XV 22.2 24.5 1.0 20 1.0 12.3 32.4 0.094 (H)SMAJ20A BV XV 22.2 24.5 1.0 20 1.0 12.3 32.4 0.094 (H)SMAJ2A BZ XZ 26.7 29.5 1.0 22 1.0 11.3 35.5 0.096 (H)SMAJ26A CE YE 28.9 31.9 1.0 26 1.0 9.5 42.1 0.0 9.5 42.1 0.097 (H)SMAJ30A CK YK 33.3 36.8 1.0 26 1.0 9.5 42.1 0.099 (H)SMAJ30A CK YK 33.3 36.8 1.0 30 1.0 8.8 45.4 0.099 (H)SMAJ30A CK YK 33.3 36.8 1.0 30 1.0 8.3 48.4 0.099 (H)SMAJ30A CK YK 33.3 36.8 1.0 30 1.0 8.3 48.4 0.099 (H)SMAJ30A CK YK 33.3 56.8 1.0 30 1.0 8.8 45.4 0.099 (H)SMAJ30A CK YK 33.3 56.8 1.0 30 1.0 8.3 48.4 0.099 (H)SMAJ30A CK YK 33.3 56.8 1.0 30 1.0 8.3 48.4 0.099 (H)SMAJ30A CK YK 33.3 56.8 1.0 30 1.0 8.3 48.4 0.099 (H)SMAJ30A CK YK 33.3 56.8 1.0 30 1.0 8.3 48.4 0.099 (H)SMAJ30A CK YK 33.3 56.9 1.0 40 1.0 40 1.0 6.2 64.5 0.101 (H)SMAJ30A CK YX 53.3 58.9 1.0 40 1.0 40 1.0 6.2 64.5 0.101 (H)SMAJ30A CK YX 53.3 58.9 1.0 48 1.0 49 1.0 49 1.0 4.9 82.4 0.104 (H)SMAJ30A CK YX 53.3 58.9 1.0 48 1.0 5.2 77.4 0.103 (H)SMAJ30A CK YX 53.3 58.9 1.0 48 1.0 5.2 77.4 0.103 (H)SMAJ30A RE ZE 60.0 66.3 1.0 54 1.0 4.9 82.4 0.104 (H)SMAJ30A RE ZE 60.0 66.3 1.0 54 1.0 4.9 82.4 0.104 (H)SMAJ30A RE ZE 60.0 66.3 1.0 54 1.0 4.9 82.4 0.104 (H)SMAJ30A RE ZE 60.0 66.3 1.0 54 1.0 4.0 4.6 87.1 0.103 (H)SMAJ30A RE ZE 60.0 66.3 1.0 54 1.0 55 1.0 5.5 72.7 0.102 (H)SMAJ30A RE ZE 60.0 66.3 1.0 70 1.0 1.0 1.1 1.0 1.0 1.0 1.0 1.0 1.0 1.	(+)SMAJ9.0A	AV	WV	10.0	11.1	1.0	9.0	5.0	26.0	15.4	0.074
(i)SMAJ12A BE XE 13.3 14.7 1.0 12 1.0 20.1 19.9 0.083 (i)SMAJ13A BG XG 14.4 15.9 1.0 13 1.0 18.6 21.5 0.084 (i)SMAJ13A BK XK 15.6 17.2 1.0 14 1.0 17.2 23.2 0.087 (i)SMAJ13A BM XK 15.6 17.2 1.0 15 1.0 16.4 24.4 0.088 (i)SMAJ15A BM XK 15.6 17.2 1.0 15 1.0 16.4 24.4 0.088 (i)SMAJ15A BM XK 15.6 17.2 1.0 15 1.0 16.4 24.4 0.088 (i)SMAJ15A BP XP 17.8 19.7 1.0 16 1.0 15.4 26.0 0.089 (i)SMAJ17A BR XR 18.9 20.9 1.0 17 1.0 14.5 27.6 0.090 (i)SMAJ17A BR XR 18.9 20.9 1.0 17 1.0 14.5 27.6 0.090 (i)SMAJ18A BT XT 20.0 22.1 1.0 18 1.0 13.7 29.2 0.092 (i)SMAJ20A BV XV 22.2 24.5 1.0 20 1.0 12.3 32.4 0.094 (i)SMAJ22A BX XX 24.4 26.9 1.0 22 1.0 11.3 35.5 0.096 (i)SMAJ24A BZ XZ 26.7 29.5 1.0 22 1.0 11.3 35.5 0.096 (i)SMAJ26A CE YE 28.9 31.9 1.0 26 1.0 9.5 42.1 0.097 (i)SMAJ28A CG YG 31.1 34.4 1.0 28 1.0 8.8 45.4 0.098 (i)SMAJ30A CK YK 33.3 36.8 1.0 30 1.0 8.8 45.4 0.099 (i)SMAJ30A CK YK 33.3 36.8 1.0 30 1.0 8.3 48.4 0.099 (i)SMAJ30A CK YK 33.3 36.8 1.0 30 1.0 8.3 48.4 0.099 (i)SMAJ30A CK YK 33.3 5.5 1.0 40.6 1.0 35 1.0 5.8 69.4 0.100 (i)SMAJ30A CK YK 33.3 5.8 1.0 40.0 40 1.0 6.9 58.1 0.100 (i)SMAJ30A CK YK 33.3 58.9 1.0 40 1.0 36 1.0 6.9 58.1 0.100 (i)SMAJ30A CK YK 53.3 58.9 1.0 40 1.0 40 1.0 6.2 64.5 0.101 (i)SMAJ30A CK YK 53.3 58.9 1.0 40 1.0 40 1.0 6.2 64.5 0.101 (i)SMAJ40A CR YR 44.4 49.1 1.0 40 1.0 6.2 64.5 0.101 (i)SMAJ40A CR YR 44.4 49.1 1.0 40 1.0 6.2 64.5 0.101 (i)SMAJ40A CR YR 53.3 58.9 1.0 43 1.0 5.8 69.4 0.102 (i)SMAJ40A CR YK 53.3 58.9 1.0 48 1.0 5.2 77.4 0.103 (i)SMAJ40A CR YX 53.3 58.9 1.0 48 1.0 5.2 77.4 0.103 (i)SMAJ40A CR YX 53.3 58.9 1.0 48 1.0 5.2 77.4 0.103 (i)SMAJ40A RE ZE 60.0 66.3 1.0 54 1.0 4.9 82.4 0.104 (i)SMAJ50A RF ZE 60.0 66.3 1.0 54 1.0 4.9 82.4 0.104 (i)SMAJ50A RF ZE 60.0 66.3 1.0 54 1.0 4.9 82.4 0.104 (i)SMAJ50A RF ZE 60.0 66.3 1.0 54 1.0 4.9 82.4 0.104 (i)SMAJ50A RF ZE 60.0 66.3 1.0 54 1.0 4.9 82.4 0.104 (i)SMAJ50A RF ZE 60.0 66.3 1.0 54 1.0 4.0 4.6 87.1 0.104 (i)SMAJ50A RF ZE 60.0 66.3 1.0 70 1.0 3.5 113 0.105 (i)SMAJ50A RF ZF 60.0 66.3 1.0 70 1.0 1.0 1.1 1.0 1.0 1.0 1.0 1.0 1.0 1.	(+)SMAJ10A	AX	WX	11.1	12.3	1.0	10	1.0	23.5	17.0	0.078
(+)SMAJ13A BG XG 14.4 15.9 1.0 13 1.0 18.6 21.5 0.084 (+)SMAJ15A BK XK 15.6 17.2 1.0 14 1.0 17.2 23.2 0.087 (+)SMAJ15A BK XK 15.6 17.2 1.0 15 1.0 16.4 24.4 0.088 (+)SMAJ15A BP XM 16.7 18.5 1.0 15 1.0 16.4 24.4 0.088 (+)SMAJ15A BP XP 17.8 19.7 1.0 16 1.0 15.4 26.0 0.089 (+)SMAJ16A BP XP 17.8 19.7 1.0 16 1.0 15.4 26.0 0.089 (+)SMAJ18A BT XT 20.0 22.1 1.0 17 1.0 14.5 27.6 0.090 (+)SMAJ18A BT XT 20.0 22.1 1.0 18 1.0 13.7 29.2 0.092 (+)SMAJ20A BV XV 22.2 24.5 1.0 20 1.0 12.3 32.4 0.094 (+)SMAJ24A BZ XZ 26.7 29.5 1.0 22 1.0 11.3 35.5 0.096 (+)SMAJ26A CE YE 28.9 31.9 1.0 22 1.0 11.3 35.5 0.096 (+)SMAJ26A CE YE 28.9 31.9 1.0 26 1.0 10.3 38.9 0.096 (+)SMAJ26A CE YE 28.9 31.9 1.0 28 1.0 8.8 45.4 0.098 (+)SMAJ30A CK YK 33.3 36.8 1.0 30 1.0 8.8 45.4 0.099 (+)SMAJ30A CK YK 33.3 36.8 1.0 30 1.0 8.3 48.4 0.099 (+)SMAJ30A CK YK 33.3 36.8 1.0 30 1.0 8.3 48.4 0.099 (+)SMAJ30A CK YK 33.3 36.8 1.0 30 1.0 8.3 48.4 0.099 (+)SMAJ30A CK YK 33.3 36.8 1.0 30 1.0 6.9 58.1 0.100 (+)SMAJ40A CR YR 44.4 49.1 1.0 40 1.0 6.2 64.5 0.101 (+)SMAJ40A CR YR 44.4 49.1 1.0 40 1.0 6.2 64.5 0.101 (+)SMAJ46A CV YV 50.0 55.3 1.0 45 1.0 45 1.0 5.5 72.7 0.102 (+)SMAJ46A CX YX 53.3 58.9 1.0 48 1.0 5.5 72.7 0.102 (+)SMAJ56A RE ZE 60.0 66.3 1.0 45 1.0 5.5 72.7 0.102 (+)SMAJ56A RE ZE 60.0 66.3 1.0 51 1.0 4.9 82.4 0.104 (+)SMAJ56A RE ZE 60.0 66.3 1.0 54 1.0 4.9 82.4 0.104 (+)SMAJ56A RE ZE 60.0 66.3 1.0 54 1.0 4.9 82.4 0.104 (+)SMAJ56A RE ZE 60.0 66.3 1.0 54 1.0 4.9 82.4 0.104 (+)SMAJ56A RE ZE 60.0 66.3 1.0 54 1.0 4.9 82.4 0.104 (+)SMAJ56A RE ZE 60.0 66.3 1.0 55 1.0 4.3 93.6 0.106 (+)SMAJ56A RE ZE 60.0 66.3 1.0 56 1.0 57 7.7 0.102 (+)SMAJ56A RE ZE 60.0 66.3 1.0 56 1.0 4.3 93.6 0.106 (+)SMAJ56A RE ZE 60.0 66.3 1.0 56 1.0 4.3 93.6 0.106 (+)SMAJ56A RE ZE 60.0 66.3 1.0 56 1.0 57 7.7 0.102 (+)SMAJ56A RE ZE 60.0 66.3 1.0 56 1.0 57 7.7 0.102 (+)SMAJ56A RE ZE 60.0 66.3 1.0 56 1.0 57 7.7 0.102 (+)SMAJ56A RE ZE 60.0 66.3 1.0 56 1.0 57 7.7 0.102 (+)SMAJ56A RE ZE 60.0 66.3 1.0 56 1.0 57 7.7 0.106 (+)SMAJ56A RE ZE 60.0 66.3 1.0 56 1.0 57 7.7 0.106 (+)SMAJ56A RE ZE 60.0 66.3	(+)SMAJ11A	AZ	WZ	12.2	13.5	1.0	11	1.0	22.0	18.2	0.080
(+)SMAJ13A BG XG 14.4 15.9 1.0 13 1.0 18.6 21.5 0.084 (+)SMAJ15A BK XK 15.6 17.2 1.0 14 1.0 17.2 23.2 0.087 (+)SMAJ15A BK XK 15.6 17.2 1.0 15 1.0 16.4 24.4 0.088 (+)SMAJ15A BF XK 18.9 19.7 1.0 16 1.0 15.4 26.0 0.089 (+)SMAJ15A BF XR 18.9 20.9 1.0 17 1.0 14.5 27.6 0.090 (+)SMAJ18A BF XT 20.0 22.1 1.0 18 1.0 13.7 29.2 0.099 (+)SMAJ18A BF XT 20.0 22.1 1.0 18 1.0 13.7 29.2 0.099 (+)SMAJ20A BV XV 22.2 24.5 1.0 20 1.0 12.3 32.4 0.094 (+)SMAJ24A BZ XZ 26.7 29.5 1.0 22 1.0 11.3 35.5 0.096 (+)SMAJ24A BZ XZ 26.7 29.5 1.0 24 1.0 11.3 35.5 0.096 (+)SMAJ26A CE YE 28.9 31.9 1.0 26 1.0 9.5 42.1 0.097 (+)SMAJ20A CK YK 33.3 36.8 1.0 30 1.0 8.8 45.4 0.098 (+)SMAJ30A CK YK X 33.3 36.8 1.0 30 1.0 8.3 48.4 0.099 (+)SMAJ30A CK YK 33.3 36.8 1.0 30 1.0 8.3 48.4 0.099 (+)SMAJ30A CK YK 33.3 36.8 1.0 30 1.0 8.3 48.4 0.099 (+)SMAJ30A CK YK 33.3 58.9 1.0 40 1.0 5.5 53.3 0.100 (+)SMAJ40A CR YR 44.4 49.1 1.0 40 1.0 6.2 64.5 0.101 (+)SMAJ43A CT YT 47.8 52.8 1.0 43 1.0 40 1.0 6.2 64.5 0.101 (+)SMAJ43A CT YT 47.8 52.8 1.0 43 1.0 46 1.0 5.5 72.7 0.102 (+)SMAJ46A CR YR 44.4 49.1 1.0 40 1.0 6.2 64.5 0.101 (+)SMAJ46A CR YR 44.4 49.1 1.0 40 1.0 6.2 64.5 0.101 (+)SMAJ46A CR YR 44.4 49.1 1.0 40 1.0 6.2 64.5 0.101 (+)SMAJ46A CR YR 44.4 49.1 1.0 40 1.0 6.2 64.5 0.101 (+)SMAJ46A CR YR 44.4 49.1 1.0 40 1.0 6.2 64.5 0.101 (+)SMAJ46A CR YR 44.4 49.1 1.0 40 1.0 6.2 64.5 0.101 (+)SMAJ46A CR YR 44.4 49.1 1.0 40 1.0 6.2 64.5 0.101 (+)SMAJ46A CR YR 44.4 49.1 1.0 40 1.0 6.2 64.5 0.101 (+)SMAJ46A CR YR 44.4 49.1 1.0 40 1.0 6.2 64.5 0.101 (+)SMAJ46A CR YR 44.4 49.1 1.0 40 1.0 6.2 64.5 0.101 (+)SMAJ46A RR ZF 66.7 73.7 1.0 60 1.0 4.9 82.4 0.104 (+)SMAJ56A RR ZF 66.7 62.7 1.0 51 1.0 51 1.0 4.9 82.4 0.104 (+)SMAJ56A RR ZF 66.7 73.7 1.0 60 1.0 4.9 82.4 0.104 (+)SMAJ56A RR ZF 66.7 73.7 1.0 60 1.0 4.1 98.8 0.105 (+)SMAJ56A RR ZF 66.7 95.8 1.0 78 1.0 58 1.0 4.3 93.6 0.105 (+)SMAJ56A RR ZF 83.3 92.1 1.0 75 1.0 58 1.0 4.3 93.6 0.106 (+)SMAJ56A RR ZF 66.7 95.8 1.0 78 1.0 1.0 1.0 1.0 1.7 1.7 7.0 0.106 (+)SMAJ56A RR ZF 83.3 92.1 1.0 75 1.0 58 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.	(+)SMAJ12A	BE	XE	13.3	14.7	1.0	12	1.0	20.1	19.9	
(+)SMAJ14A BK XK 15.6 17.2 1.0 14 1.0 17.2 23.2 0.087 (+)SMAJ16A BM XM 16.7 18.5 1.0 15 1.0 16.4 24.4 0.088 (+)SMAJ16A BP XP 17.8 19.7 1.0 16 1.0 15.4 26.0 0.089 (+)SMAJ17A BR XR 18.9 20.9 1.0 17 1.0 14.5 27.6 0.090 (+)SMAJ17A BR XR 18.9 20.9 1.0 17 1.0 14.5 27.6 0.090 (+)SMAJ18A BT XT 20.0 22.1 1.0 18 1.0 13.7 29.2 0.092 (+)SMAJ20A BV XV 22.2 24.5 1.0 20 1.0 12.3 32.4 0.094 (+)SMAJ22A BX XX 24.4 26.9 1.0 22 1.0 11.3 35.5 0.096 (+)SMAJ24A BZ XZ 26.7 29.5 1.0 24 1.0 10.3 38.9 0.096 (+)SMAJ26A CE YE 28.9 31.9 1.0 26 1.0 9.5 42.1 0.099 (+)SMAJ26A CE YE 28.9 31.9 1.0 26 1.0 9.5 42.1 0.099 (+)SMAJ30A CK YK 33.3 36.8 1.0 30 1.0 8.8 45.4 0.098 (+)SMAJ36A CP YP 40.0 44.2 1.0 33 1.0 7.5 53.3 0.100 (+)SMAJ36A CP YP 40.0 44.2 1.0 36 1.0 9.5 53.3 0.100 (+)SMAJ36A CR YP 40.0 44.2 1.0 36 1.0 5.8 69.4 0.100 (+)SMAJ36A CT YT 47.8 52.8 1.0 43 1.0 5.8 69.4 0.102 (+)SMAJ36A CT YT 47.8 52.8 1.0 43 1.0 5.8 69.4 0.102 (+)SMAJ36A CT YT 47.8 52.8 1.0 43 1.0 5.8 69.4 0.102 (+)SMAJ36A CT YT 50.0 55.3 1.0 45 1.0 49 82.4 0.104 (+)SMAJ56A CT YT 50.0 55.3 1.0 45 1.0 5.5 72.7 0.102 (+)SMAJ56A CT YT 50.0 55.3 1.0 45 1.0 5.5 72.7 0.102 (+)SMAJ56A CT YT 50.0 55.3 1.0 45 1.0 5.8 69.4 0.104 (+)SMAJ56A CT YT 60.0 55.3 1.0 45 1.0 5.5 72.7 0.102 (+)SMAJ56A CT YT 50.0 55.3 1.0 45 1.0 5.2 77.4 0.103 (+)SMAJ56A RE ZE 60.0 66.3 1.0 54 1.0 5.2 77.4 0.103 (+)SMAJ56A RE ZE 60.0 66.3 1.0 54 1.0 5.2 77.4 0.103 (+)SMAJ56A RE ZE 60.0 66.3 1.0 58 1.0 43 1.0 5.8 69.4 0.106 (+)SMAJ56A RE ZE 60.0 66.3 1.0 56 1.0 4.1 96.8 0.106 (+)SMAJ56A RE ZE 60.0 66.3 1.0 56 1.0 56 1.0 4.1 96.8 0.106 (+)SMAJ56A RE ZE 60.0 66.3 1.0 58 1.0 56 1.0 4.3 99.1 103 0.105 (+)SMAJ56A RE ZE 60.0 66.3 1.0 56 1.0 56 1.0 4.1 96.8 0.106 (+)SMAJ56A RE ZE 60.0 66.3 1.0 56 1.0 56 1.0 4.1 96.8 0.106 (+)SMAJ56A RE ZE 60.0 66.3 1.0 56 1.0 56 1.0 4.1 96.8 0.106 (+)SMAJ56A RE ZE 60.0 66.3 1.0 56 1.0 56 1.0 5.2 77.4 0.103 (+)SMAJ56A RE ZE 60.0 66.3 1.0 56 1.0 70 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.	(+)SMAJ13A	BG	XG	14.4	15.9	1.0	13	1.0	18.6	21.5	
(+)SMAJ16A BP XP 17.8 19.7 1.0 16 1.0 15.4 26.0 0.089 (+)SMAJ17A BR XR 18.9 20.9 1.0 17 1.0 14.5 27.6 0.090 (+)SMAJ18A BT XT 20.0 22.1 1.0 18 1.0 13.7 29.2 0.092 (+)SMAJ20A BV XV 22.2 24.5 1.0 20 1.0 12.3 32.4 0.094 (+)SMAJ20A BX XX 24.4 26.9 1.0 22 1.0 11.3 35.5 0.096 (+)SMAJ24A BZ XZ 26.7 29.5 1.0 24 1.0 10.3 38.9 0.096 (+)SMAJ26A CE YE 28.9 31.9 1.0 26 1.0 9.5 42.1 0.097 (+)SMAJ28A CG YG 31.1 34.4 1.0 28 1.0 9.5 42.1 0.097 (+)SMAJ33A CM YM 36.7 40.6 1.0 30 1.0 8.8 45.4 0.098 (+)SMAJ33A CM YM 36.7 40.6 1.0 33 1.0 7.5 53.3 0.100 (+)SMAJ36A CP YP 40.0 44.2 1.0 36 1.0 6.9 58.1 0.100 (+)SMAJ40A CR YR 44.4 49.1 1.0 40 1.0 6.2 64.5 0.101 (+)SMAJ45A CT YT 47.8 52.8 1.0 43 1.0 5.8 69.4 0.102 (+)SMAJ48A CX YX 53.3 58.9 1.0 45 1.0 5.8 69.4 0.102 (+)SMAJ48A CX YX 53.3 58.9 1.0 45 1.0 5.5 72.7 0.102 (+)SMAJ56A RE ZE 60.0 66.3 1.0 51 1.0 4.9 82.4 0.104 (+)SMAJ56A RE ZE 60.0 66.3 1.0 51 1.0 4.9 82.4 0.104 (+)SMAJ56A RE ZE 60.0 66.3 1.0 51 1.0 4.9 82.4 0.104 (+)SMAJ56A RE ZE 60.0 66.3 1.0 51 1.0 4.9 82.4 0.104 (+)SMAJ56A RE ZE 60.0 66.3 1.0 51 1.0 4.9 82.4 0.104 (+)SMAJ56A RE ZE 60.0 66.3 1.0 54 1.0 4.9 82.4 0.104 (+)SMAJ56A RE ZE 60.0 66.3 1.0 55 1.0 4.0 4.9 82.4 0.104 (+)SMAJ56A RE ZE 60.0 66.3 1.0 58 1.0 4.3 93.6 0.105 (+)SMAJ66A RK ZK 66.7 73.7 1.0 60 1.0 4.1 96.8 0.105 (+)SMAJ66A RK ZK 66.7 73.7 1.0 60 1.0 4.1 96.8 0.105 (+)SMAJ56A RR ZE 80.0 66.3 1.0 70 1.0 58 1.0 4.3 93.6 0.106 (+)SMAJ56A RR ZE 83.3 92.1 1.0 75 1.0 51 1.0 4.9 82.4 0.104 (+)SMAJ56A RR ZE 80.0 66.3 1.0 70 1.0 51 1.0 4.9 82.4 0.104 (+)SMAJ56A RR ZE 83.3 92.1 1.0 75 1.0 51 1.0 3.2 126 0.106 (+)SMAJ66A RR ZR 83.3 92.1 1.0 75 1.0 51 1.0 3.2 126 0.106 (+)SMAJ66A RR ZR 83.3 92.1 1.0 75 1.0 51 1.0 3.2 126 0.106 (+)SMAJ66A RR ZR 83.3 92.1 1.0 75 1.0 3.2 126 0.106 (+)SMAJ66A RR ZR 83.3 92.1 1.0 75 1.0 75 1.0 3.2 126 0.106 (+)SMAJ66A RR ZR 83.3 92.1 1.0 75 1.0 1.0 1.0 1.0 1.1 1.0 1.0 1.0 1.0 1.0	(+)SMAJ14A	BK	XK	15.6	17.2	1.0	14	1.0	17.2	23.2	0.087
(+)SMAJ17A BR XR 18.9 20.9 1.0 17 1.0 14.5 27.6 0.090 (+)SMAJ18A BT XT 20.0 22.1 1.0 18 1.0 13.7 29.2 0.092 (+)SMAJ20A BV XV 22.2 24.5 1.0 20 1.0 12.3 32.4 0.094 (+)SMAJ22A BX XX 24.4 26.9 1.0 22 1.0 11.3 35.5 0.096 (+)SMAJ24A BZ XZ 26.7 29.5 1.0 22 1.0 11.3 35.5 0.096 (+)SMAJ24A BZ XZ 26.7 29.5 1.0 24 1.0 10.3 38.9 0.096 (+)SMAJ28A CE YE 28.9 31.9 1.0 26 1.0 9.5 42.1 0.097 (+)SMAJ30A CK YK 33.3 36.8 1.0 28 1.0 8.8 45.4 0.098 (+)SMAJ30A CK YK 33.3 36.8 1.0 30 1.0 8.3 48.4 0.099 (+)SMAJ33A CM YM 36.7 40.6 1.0 33 1.0 7.5 53.3 0.100 (+)SMAJ40A CR YR 44.4 49.1 1.0 36 1.0 6.9 58.1 0.100 (+)SMAJ40A CR YR 44.4 49.1 1.0 40 1.0 6.2 64.5 0.101 (+)SMAJ48A CV YV 50.0 55.3 1.0 43 1.0 5.8 69.4 0.102 (+)SMAJ48A CV YV 50.0 55.3 1.0 45 1.0 5.5 72.7 0.102 (+)SMAJ51A CZ YZ 56.7 62.7 1.0 51 1.0 49 82.4 0.104 (+)SMAJ51A CZ YZ 56.7 62.7 1.0 51 1.0 49 82.4 0.104 (+)SMAJ54A RE ZE 60.0 66.3 1.0 58 1.0 4.9 82.4 0.104 (+)SMAJ6A RK ZK 66.7 7.7.7 1.0 60 1.0 4.1 96.8 0.105 (+)SMAJ6A RK ZK 66.7 7.7.7 1.0 60 1.0 4.1 96.8 0.105 (+)SMAJ6A RK ZK 66.7 7.7.7 1.0 60 1.0 4.1 96.8 0.105 (+)SMAJ6A RK ZK 66.7 7.7.7 1.0 60 1.0 4.1 96.8 0.105 (+)SMAJ6A RK ZK 66.7 7.7.7 1.0 60 1.0 4.1 96.8 0.105 (+)SMAJ6A RK ZK 66.7 7.7.7 1.0 60 1.0 4.1 96.8 0.105 (+)SMAJ6A RK ZK 66.7 7.7.7 1.0 60 1.0 4.1 96.8 0.105 (+)SMAJ6A RK ZK 66.7 7.7.7 1.0 60 1.0 4.1 96.8 0.105 (+)SMAJ6A RK ZK 66.7 7.7.7 1.0 60 1.0 4.1 96.8 0.105 (+)SMAJ6A RK ZK 66.7 7.7.7 1.0 60 1.0 4.1 96.8 0.105 (+)SMAJ6A RK ZK 66.7 7.7.7 1.0 60 1.0 4.1 96.8 0.105 (+)SMAJ6A RK ZK 66.7 7.7.7 1.0 60 1.0 4.1 96.8 0.105 (+)SMAJ6A RK ZK 66.7 7.7.7 1.0 60 1.0 4.1 96.8 0.105 (+)SMAJ6A RK ZK 66.7 7.7.7 1.0 60 1.0 4.1 96.8 0.105 (+)SMAJ6A RK ZK 66.7 7.7.7 1.0 60 1.0 4.1 96.8 0.105 (+)SMAJ6A RK ZK 66.7 7.7.7 1.0 60 1.0 4.1 96.8 0.105 (+)SMAJ6A RK ZK 66.7 7.7.7 1.0 60 1.0 4.1 96.8 0.105 (+)SMAJ70A RP ZP 77.8 86.0 1.0 76 1.0 3.2 126 0.106 (+)SMAJ70A RR ZK 2X 100 111 1.0 90 1.0 1.0 1.0 1.0 1.7 177 0.106 (+)SMAJ100A RZ ZZ 111 123 1.0 100 1.0 1.0 1.0 1.0 1.7 177 0.107 (+)SMAJ100A RZ ZZ 111 123 1.0 100 1.0 1.0 1.0 1.0 1.0 1.0 1	(+)SMAJ15A	ВМ	XM	16.7	18.5	1.0	15	1.0	16.4	24.4	0.088
(+)SMAJ18A BT XT 20.0 22.1 1.0 18 1.0 13.7 29.2 0.092 (+)SMAJ20A BV XV 22.2 24.5 1.0 20 1.0 12.3 32.4 0.094 (+)SMAJ22A BX XX 24.4 26.9 1.0 22 1.0 11.3 35.5 0.096 (+)SMAJ24A BZ XZ 26.7 29.5 1.0 24 1.0 10.3 38.9 0.096 (+)SMAJ26A CE YE 28.9 31.9 1.0 26 1.0 9.5 42.1 0.097 (+)SMAJ28A CG YG 31.1 34.4 1.0 28 1.0 8.8 45.4 0.098 (+)SMAJ30A CK YK 33.3 36.8 1.0 30 1.0 8.3 48.4 0.099 (+)SMAJ30A CK YK 33.3 36.8 1.0 30 1.0 8.3 48.4 0.099 (+)SMAJ33A CM YM 36.7 40.6 1.0 33 1.0 7.5 53.3 0.100 (+)SMAJ36A CP YP 40.0 44.2 1.0 36 1.0 6.9 58.1 0.100 (+)SMAJ40A CR YR 44.4 49.1 1.0 40 1.0 6.2 64.5 0.101 (+)SMAJ43A CT YT 47.8 52.8 1.0 43 1.0 5.8 69.4 0.102 (+)SMAJ45A CV YV 50.0 55.3 1.0 45 1.0 5.5 72.7 0.102 (+)SMAJ46A CX YX 53.3 58.9 1.0 48 1.0 5.2 77.4 0.103 (+)SMAJ51A CZ YZ 56.7 62.7 1.0 51 1.0 4.9 82.4 0.104 (+)SMAJ54A RE ZE 60.0 66.3 1.0 54 1.0 4.9 82.4 0.104 (+)SMAJ54A RE ZE 60.0 66.3 1.0 58 1.0 4.3 93.6 0.104 (+)SMAJ64A RR ZE 60.0 66.3 1.0 58 1.0 4.3 93.6 0.104 (+)SMAJ64A RR ZE 60.0 66.3 1.0 58 1.0 4.3 93.6 0.104 (+)SMAJ64A RR ZE 60.0 66.3 1.0 58 1.0 4.3 93.6 0.104 (+)SMAJ64A RR ZE 60.0 66.3 1.0 58 1.0 4.3 93.6 0.104 (+)SMAJ64A RR ZE 60.0 66.3 1.0 58 1.0 4.3 93.6 0.104 (+)SMAJ64A RR ZE 60.0 66.3 1.0 58 1.0 4.3 93.6 0.104 (+)SMAJ64A RR ZE 60.0 66.3 1.0 58 1.0 4.3 93.6 0.104 (+)SMAJ64A RR ZE 60.0 66.3 1.0 58 1.0 4.3 93.6 0.104 (+)SMAJ64A RR ZE 60.0 66.3 1.0 58 1.0 4.3 93.6 0.104 (+)SMAJ64A RR ZE 60.0 66.3 1.0 58 1.0 4.3 93.6 0.104 (+)SMAJ64A RR ZE 60.0 66.3 1.0 58 1.0 4.3 93.6 0.106 (+)SMAJ64A RR ZE 60.0 66.3 1.0 58 1.0 4.3 93.6 0.106 (+)SMAJ64A RR ZE 60.0 66.3 1.0 58 1.0 58 1.0 4.3 93.6 0.106 (+)SMAJ64A RR ZE 60.0 66.3 1.0 58 1.0 58 1.0 4.3 93.6 0.106 (+)SMAJ64A RR ZE 60.0 66.3 1.0 58 1.0 58 1.0 4.3 93.6 0.106 (+)SMAJ64A RR ZE 60.0 66.3 1.0 70 1.0 3.5 113 0.105 (+)SMAJ64A RR ZE 60.0 66.3 1.0 70 1.0 3.5 113 0.105 (+)SMAJ64A RR ZE 60.0 66.3 1.0 70 1.0 3.5 113 0.105 (+)SMAJ64A RR ZE 60.0 66.3 1.0 70 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.	(+)SMAJ16A	BP	XP	17.8	19.7	1.0	16	1.0	15.4	26.0	0.089
(+)SMAJ18A BT XT 20.0 22.1 1.0 18 1.0 13.7 29.2 0.092 (+)SMAJ20A BV XV 22.2 24.5 1.0 20 1.0 12.3 32.4 0.094 (+)SMAJ22A BX XX 24.4 26.9 1.0 22 1.0 11.3 35.5 0.096 (+)SMAJ24A BZ XZ 26.7 29.5 1.0 24 1.0 10.3 38.9 0.096 (+)SMAJ26A CE YE 28.9 31.9 1.0 26 1.0 9.5 42.1 0.097 (+)SMAJ28A CG YG 31.1 34.4 1.0 28 1.0 8.8 45.4 0.099 (+)SMAJ30A CK YK 33.3 36.8 1.0 30 1.0 8.3 48.4 0.099 (+)SMAJ30A CK YK 33.3 36.8 1.0 30 1.0 8.3 48.4 0.099 (+)SMAJ33A CM YM 36.7 40.6 1.0 33 1.0 7.5 53.3 0.100 (+)SMAJ36A CP YP 40.0 44.2 1.0 36 1.0 6.9 58.1 0.100 (+)SMAJ40A CR YR 44.4 49.1 1.0 40 1.0 6.2 64.5 0.101 (+)SMAJ40A CR YT 47.8 52.8 1.0 43 1.0 5.8 69.4 0.102 (+)SMAJ45A CV YV 50.0 55.3 1.0 43 1.0 5.8 69.4 0.102 (+)SMAJ46A CX YX 53.3 58.9 1.0 48 1.0 5.2 77.4 0.103 (+)SMAJ51A CZ YZ 56.7 62.7 1.0 51 1.0 4.9 82.4 0.104 (+)SMAJ54A RE ZE 60.0 66.3 1.0 54 1.0 4.9 82.4 0.104 (+)SMAJ54A RE ZE 60.0 66.3 1.0 58 1.0 4.3 93.6 0.104 (+)SMAJ64A RR ZE 60.0 66.3 1.0 58 1.0 4.3 93.6 0.104 (+)SMAJ64A RR ZE 60.0 66.3 1.0 58 1.0 4.3 93.6 0.104 (+)SMAJ64A RR ZE 60.0 66.3 1.0 58 1.0 4.3 93.6 0.104 (+)SMAJ64A RR ZE 60.0 66.3 1.0 58 1.0 4.3 93.6 0.104 (+)SMAJ64A RR ZE 60.0 66.3 1.0 58 1.0 4.3 93.6 0.104 (+)SMAJ64A RR ZE 60.0 66.3 1.0 58 1.0 4.3 93.6 0.104 (+)SMAJ64A RR ZE 60.0 66.3 1.0 58 1.0 4.3 93.6 0.104 (+)SMAJ64A RR ZE 60.0 66.3 1.0 58 1.0 4.3 93.6 0.104 (+)SMAJ64A RR ZE 60.0 66.3 1.0 58 1.0 4.3 93.6 0.104 (+)SMAJ64A RR ZE 60.0 66.3 1.0 58 1.0 4.3 93.6 0.104 (+)SMAJ64A RR ZE 60.0 66.3 1.0 58 1.0 4.3 93.6 0.106 (+)SMAJ64A RR ZE 60.0 66.3 1.0 58 1.0 58 1.0 4.3 93.6 0.106 (+)SMAJ64A RR ZE 60.0 66.3 1.0 70 1.0 3.5 113 0.105 (+)SMAJ64A RR ZE 60.0 66.3 1.0 58 1.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4		BR	XR	18.9	20.9	1.0	17	1.0	14.5	27.6	
(+)SMAJ20A BV XV 22.2 24.5 1.0 20 1.0 12.3 32.4 0.094 (+)SMAJ22A BX XX 24.4 26.9 1.0 22 1.0 11.3 35.5 0.096 (+)SMAJ24A BZ XZ 26.7 29.5 1.0 24 1.0 10.3 38.9 0.096 (+)SMAJ26A CE YE 28.9 31.9 1.0 26 1.0 9.5 42.1 0.097 (+)SMAJ28A CG YG 31.1 34.4 1.0 28 1.0 8.8 45.4 0.098 (+)SMAJ30A CK YK 33.3 36.8 1.0 30 1.0 8.3 48.4 0.099 (+)SMAJ30A CK YK 33.3 36.8 1.0 30 1.0 8.3 48.4 0.099 (+)SMAJ30A CM YM 36.7 40.6 1.0 33 1.0 7.5 53.3 0.100 (+)SMAJ36A CP YP 40.0 44.2 1.0 36 1.0 6.9 58.1 0.100 (+)SMAJ40A CR YR 44.4 49.1 1.0 40 1.0 6.2 64.5 0.101 (+)SMAJ40A CR YR 44.4 49.1 1.0 40 1.0 6.2 64.5 0.101 (+)SMAJ48A CV YV 50.0 55.3 1.0 43 1.0 5.8 69.4 0.102 (+)SMAJ48A CV YV 50.0 55.3 1.0 45 1.0 5.5 72.7 0.102 (+)SMAJ48A CV YX 53.3 58.9 1.0 48 1.0 5.2 77.4 0.103 (+)SMAJ51A CZ YZ 56.7 62.7 1.0 51 1.0 4.9 82.4 0.104 (+)SMAJ54A RE ZE 60.0 66.3 1.0 54 1.0 4.9 82.4 0.104 (+)SMAJ60A RK ZK 66.7 73.7 1.0 60 1.0 4.9 82.4 0.104 (+)SMAJ60A RK ZK 66.7 73.7 1.0 60 1.0 4.3 93.6 0.104 (+)SMAJ60A RK ZK 66.7 73.7 1.0 60 1.0 4.1 96.8 0.105 (+)SMAJ60A RK ZK 66.7 73.7 1.0 60 1.0 4.1 96.8 0.105 (+)SMAJ60A RK ZK 66.7 73.7 1.0 60 1.0 4.1 96.8 0.105 (+)SMAJ60A RK ZK 66.7 73.7 1.0 60 1.0 4.1 96.8 0.105 (+)SMAJ60A RK ZK 66.7 73.7 1.0 60 1.0 4.1 96.8 0.105 (+)SMAJ60A RK ZK 66.7 73.7 1.0 60 1.0 4.1 96.8 0.105 (+)SMAJ60A RK ZK 66.7 73.7 1.0 60 1.0 4.1 96.8 0.105 (+)SMAJ60A RK ZK 66.7 93.7 1.0 60 1.0 4.1 96.8 0.105 (+)SMAJ60A RK ZK 66.7 93.7 1.0 60 1.0 4.1 96.8 0.105 (+)SMAJ60A RK ZK 66.7 93.7 1.0 60 1.0 4.1 96.8 0.105 (+)SMAJ60A RK ZK 66.7 93.7 1.0 60 1.0 4.1 96.8 0.105 (+)SMAJ60A RK ZK 66.7 93.7 1.0 60 1.0 4.1 1.0 96.8 0.105 (+)SMAJ60A RK ZK 66.7 93.7 1.0 60 1.0 4.1 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1		ВТ	XT	20.0	22.1	1.0	18	1.0	13.7	29.2	
(+)SMAJ22A BX XX 24.4 26.9 1.0 22 1.0 11.3 35.5 0.096 (+)SMAJ24A BZ XZ 26.7 29.5 1.0 24 1.0 10.3 38.9 0.096 (+)SMAJ26A CE YE 28.9 31.9 1.0 26 1.0 9.5 42.1 0.097 (+)SMAJ28A CG YG 31.1 34.4 1.0 28 1.0 8.8 45.4 0.098 (+)SMAJ30A CK YK 33.3 36.8 1.0 30 1.0 8.3 48.4 0.099 (+)SMAJ33A CM YM 36.7 40.6 1.0 33 1.0 7.5 53.3 0.100 (+)SMAJ33A CM YM 36.7 40.6 1.0 33 1.0 7.5 53.3 0.100 (+)SMAJ30A CR YR 44.4 49.1 1.0 40 1.0 6.9 58.1 0.100 (+)SMAJ40A CR YR 44.4 49.1 1.0 40 1.0 6.2 64.5 0.101 (+)SMAJ45A CT YT 47.8 52.8 1.0 43 1.0 5.8 69.4 0.102 (+)SMAJ48A CX YX 53.3 58.9 1.0 43 1.0 5.5 72.7 0.102 (+)SMAJ48A CX YX 53.3 58.9 1.0 48 1.0 5.2 77.4 0.103 (+)SMAJ54A RE ZE 60.0 66.3 1.0 54 1.0 4.9 82.4 0.104 (+)SMAJ58A RG CG 64.4 71.2 1.0 58 1.0 4.3 93.6 0.104 (+)SMAJ58A RG CG 64.4 71.2 1.0 58 1.0 4.3 93.6 0.104 (+)SMAJ60A RK ZK 66.7 73.7 1.0 60 1.0 4.1 96.8 0.105 (+)SMAJ75A RR ZR 83.3 92.1 1.0 75 1.0 3.9 103 0.105 (+)SMAJ75A RR ZR 83.3 92.1 1.0 75 1.0 3.5 113 0.105 (+)SMAJ75A RR ZR 83.3 92.1 1.0 75 1.0 3.2 126 0.106 (+)SMAJ75A RR ZR 83.3 92.1 1.0 75 1.0 3.2 126 0.106 (+)SMAJ75A RR ZR 83.3 92.1 1.0 75 1.0 3.2 126 0.106 (+)SMAJ75A RR ZR 83.3 92.1 1.0 75 1.0 3.2 126 0.106 (+)SMAJ75A RR ZR 83.3 92.1 1.0 75 1.0 3.2 126 0.106 (+)SMAJ75A RR ZR 83.3 92.1 1.0 75 1.0 3.2 126 0.106 (+)SMAJ75A RR ZR 83.3 92.1 1.0 75 1.0 3.2 126 0.106 (+)SMAJ75A RR ZR 83.3 92.1 1.0 75 1.0 3.2 126 0.106 (+)SMAJ75A RR ZR 83.3 92.1 1.0 75 1.0 3.2 126 0.106 (+)SMAJ75A RR ZR 83.3 92.1 1.0 75 1.0 3.2 126 0.106 (+)SMAJ90A RX ZX 100 111 1.0 90 1.0 1.0 1.7 177 0.107 (+)SMAJ100A RZ ZZ 111 123 1.0 100 1.0 1.0 1.7 177 0.107 (+)SMAJ100A RZ ZZ 111 123 1.0 110 1.0 1.0 1.0 1.7 177 0.107 (+)SMAJ100A RZ ZZ 111 123 1.0 110 1.0 1.0 1.0 1.7 177 0.107 (+)SMAJ100A VK VK 144 159 1.0 130 1.0 130 1.0 1.0 1.4 209 0.108 (+)SMAJ130A VK VK 144 159 1.0 130 1.0 1.0 1.0 1.4 209 0.108 (+)SMAJ130A VK VK 144 159 1.0 130 1.0 1.0 1.0 1.0 1.4 209 0.108 (+)SMAJ130A VK VK 144 159 1.0 130 1.0 130 1.0 1.0 1.0 1.4 209 0.108 (+)SMAJ130A VK VK 144 159 1.0 130 1.0 130 1.0 1.0 1.0 1.4 209 0.108 (+)SMAJ130A VK VK		BV	XV	22.2	24.5	1.0	20	1.0	12.3	32.4	
(+)SMAJ24A BZ XZ 26.7 29.5 1.0 24 1.0 10.3 38.9 0.096 (+)SMAJ26A CE YE 28.9 31.9 1.0 26 1.0 9.5 42.1 0.097 (+)SMAJ28A CG YG 31.1 34.4 1.0 28 1.0 8.8 45.4 0.098 (+)SMAJ30A CK YK 33.3 36.8 1.0 30 1.0 8.3 48.4 0.099 (+)SMAJ33A CM YM 36.7 40.6 1.0 33 1.0 7.5 53.3 0.100 (+)SMAJ36A CP YP 40.0 44.2 1.0 36 1.0 6.9 58.1 0.100 (+)SMAJ40A CR YR 44.4 49.1 1.0 40 1.0 6.2 64.5 0.101 (+)SMAJ43A CT YT 47.8 52.8 1.0 43 1.0 5.8 69.4 0.102 (+)SMAJ48A CV YV 50.0 55.3 1.0 45 1.0 5.5 72.7 0.102 (+)SMAJ48A CV YV 53.3 58.9 1.0 48 1.0 5.2 77.4 0.103 (+)SMAJ51A CZ YZ 56.7 62.7 1.0 51 1.0 4.9 82.4 0.104 (+)SMAJ58A RG ZG 64.4 71.2 1.0 58 1.0 4.3 93.6 0.104 (+)SMAJ68A RG ZG 64.4 71.2 1.0 58 1.0 4.3 93.6 0.104 (+)SMAJ68A RK ZK 66.7 73.7 1.0 60 1.0 4.1 96.8 0.105 (+)SMAJ64A RM ZK 71.1 78.6 1.0 64 1.0 3.9 103 0.105 (+)SMAJ75A RR ZR 83.3 92.1 1.0 75 1.0 3.3 121 0.106 (+)SMAJ75A RR ZR 83.3 92.1 1.0 75 1.0 3.2 126 0.106 (+)SMAJ75A RR ZR 83.3 92.1 1.0 75 1.0 3.3 121 0.106 (+)SMAJ75A RR ZR 83.3 92.1 1.0 75 1.0 3.2 126 0.106 (+)SMAJ75A RR ZR 83.3 92.1 1.0 75 1.0 3.2 126 0.106 (+)SMAJ75A RR ZR 83.3 92.1 1.0 75 1.0 3.2 126 0.106 (+)SMAJ75A RR ZR 83.3 92.1 1.0 75 1.0 3.2 126 0.106 (+)SMAJ75A RR ZR 83.3 92.1 1.0 75 1.0 3.2 126 0.106 (+)SMAJ75A RR ZR 83.3 92.1 1.0 75 1.0 3.2 126 0.106 (+)SMAJ75A RR ZR 83.3 92.1 1.0 75 1.0 3.2 126 0.106 (+)SMAJ75A RR ZR 83.3 92.1 1.0 75 1.0 3.2 126 0.106 (+)SMAJ75A RR ZR 83.3 92.1 1.0 75 1.0 3.2 126 0.106 (+)SMAJ75A RR ZR 27 111 123 1.0 106 (+)SMAJ75A RR ZR 27 111 123 1.0 106 (+)SMAJ75A RR ZR 27 111 123 1.0 106 (+)SMAJ76A RT ZT 86.7 95.8 1.0 78 1.0 1.0 1.0 1.7 177 0.107 (+)SMAJ100A RZ ZZ 111 123 1.0 100 1.0 1.0 1.7 177 0.107 (+)SMAJ100A RZ ZZ 111 123 1.0 100 1.0 1.0 1.7 177 0.107 (+)SMAJ110A VK VK 144 159 1.0 130 1.0 1.0 1.0 1.4 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0	(+)SMAJ22A	ВХ	XX	24.4	26.9	1.0	22	1.0	11.3	35.5	
(+)SMAJ26A CE YE 28.9 31.9 1.0 26 1.0 9.5 42.1 0.097 (+)SMAJ28A CG YG 31.1 34.4 1.0 28 1.0 8.8 45.4 0.098 (+)SMAJ30A CK YK 33.3 36.8 1.0 30 1.0 8.3 48.4 0.099 (+)SMAJ33A CM YM 36.7 40.6 1.0 33 1.0 7.5 53.3 0.100 (+)SMAJ36A CP YP 40.0 44.2 1.0 36 1.0 6.9 58.1 0.100 (+)SMAJ40A CR YR 44.4 49.1 1.0 40 1.0 6.2 64.5 0.101 (+)SMAJ40A CR YR 44.4 49.1 1.0 40 1.0 6.2 64.5 0.101 (+)SMAJ43A CT YT 47.8 52.8 1.0 43 1.0 5.8 69.4 0.102 (+)SMAJ45A CV YV 50.0 55.3 1.0 45 1.0 5.5 72.7 0.102 (+)SMAJ46A CX YX 53.3 58.9 1.0 48 1.0 5.2 77.4 0.103 (+)SMAJ51A CZ YZ 56.7 62.7 1.0 51 1.0 4.9 82.4 0.104 (+)SMAJ54A RE ZE 60.0 66.3 1.0 54 1.0 4.6 87.1 0.104 (+)SMAJ58A RG ZG 64.4 71.2 1.0 58 1.0 4.3 93.6 0.104 (+)SMAJ60A RK ZK 66.7 73.7 1.0 60 1.0 4.1 96.8 0.105 (+)SMAJ60A RK ZK 66.7 73.7 1.0 60 1.0 4.1 96.8 0.105 (+)SMAJ70A RP ZP 77.8 86.0 1.0 70 1.0 3.5 113 0.105 (+)SMAJ70A RP ZP 77.8 86.0 1.0 70 1.0 3.5 1.0 3.2 126 0.106 (+)SMAJ76A RT ZT 86.7 95.8 1.0 78 1.0 3.2 126 0.106 (+)SMAJ76A RT ZT 86.7 95.8 1.0 78 1.0 3.2 126 0.106 (+)SMAJ85A RV ZV 94.4 104 1.0 85 1.0 2.2 137 0.106 (+)SMAJ90A RX ZX 100 111 1.0 90 1.0 2.1 146 0.106 (+)SMAJ100A RZ ZZ 111 123 1.0 100 1.0 1.0 1.7 177 0.107 (+)SMAJ100A RZ ZZ 111 123 1.0 100 1.0 1.0 1.7 177 0.107 (+)SMAJ100A RZ ZZ 111 123 1.0 100 1.0 1.0 1.7 177 0.107 (+)SMAJ100A RX ZX 100 111 1.0 100 1.0 1.7 177 177 0.107 (+)SMAJ100A RX ZX 100 111 1.0 100 1.0 1.0 1.7 177 0.107 (+)SMAJ100A VK VK VK 144 159 1.0 130 1.0 1.0 1.0 1.4 209 0.108 (+)SMAJ130A VK VK VK 144 159 1.0 130 1.0 1.0 1.0 1.0 1.4 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0		BZ	XZ	26.7	29.5	1.0	24	1.0	10.3	38.9	
(+)SMAJ28A CG YG 31.1 34.4 1.0 28 1.0 8.8 45.4 0.098 (+)SMAJ30A CK YK 33.3 36.8 1.0 30 1.0 8.3 48.4 0.099 (+)SMAJ33A CM YM 36.7 40.6 1.0 33 1.0 7.5 53.3 0.100 (+)SMAJ36A CP YP 40.0 44.2 1.0 36 1.0 6.9 58.1 0.100 (+)SMAJ40A CR YR 44.4 49.1 1.0 40 1.0 6.2 64.5 0.101 (+)SMAJ43A CT YT 47.8 52.8 1.0 43 1.0 5.8 69.4 0.102 (+)SMAJ45A CV YV 50.0 55.3 1.0 45 1.0 5.5 72.7 0.102 (+)SMAJ48A CX YX 53.3 58.9 1.0 48 1.0 5.2 77.4 0.103 (+)SMAJ51A CZ YZ 56.7 62.7 1.0 51 1.0 4.9 82.4 0.104 (+)SMAJ54A RE ZE 60.0 66.3 1.0 54 1.0 4.6 87.1 0.104 (+)SMAJ58A RG ZG 64.4 71.2 1.0 58 1.0 4.3 93.6 0.104 (+)SMAJ60A RK ZK 66.7 73.7 1.0 60 1.0 4.1 96.8 0.105 (+)SMAJ60A RK ZK 66.7 73.7 1.0 60 1.0 4.1 96.8 0.105 (+)SMAJ75A RR ZR 33.3 92.1 1.0 75 1.0 3.5 113 0.105 (+)SMAJ75A RR ZR 77.8 86.0 1.0 70 1.0 3.5 113 0.105 (+)SMAJ75A RR ZR 83.3 92.1 1.0 75 1.0 3.2 126 0.106 (+)SMAJ75A RR ZR 83.3 92.1 1.0 75 1.0 3.2 126 0.106 (+)SMAJ75A RR ZR 83.3 92.1 1.0 75 1.0 3.2 126 0.106 (+)SMAJ75A RR ZR 83.3 92.1 1.0 75 1.0 3.2 126 0.106 (+)SMAJ75A RR ZR 83.3 92.1 1.0 75 1.0 3.2 126 0.106 (+)SMAJ75A RR ZR 83.3 92.1 1.0 75 1.0 3.2 126 0.106 (+)SMAJ75A RR ZR 83.3 92.1 1.0 75 1.0 3.2 126 0.106 (+)SMAJ75A RR ZR 33.3 92.1 1.0 75 1.0 3.2 126 0.106 (+)SMAJ90A RX ZX 100 111 1.0 90 1.0 2.1 146 0.106 (+)SMAJ90A RX ZX 100 111 1.0 90 1.0 1.0 1.0 1.7 177 0.107 (+)SMAJ10A RZ ZZ 111 123 1.0 100 1.0 1.0 1.0 1.7 177 0.107 (+)SMAJ10A RZ ZZ 111 123 1.0 100 1.0 1.0 1.0 1.7 177 0.107 (+)SMAJ10A RZ ZZ 111 123 1.0 100 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0		CE									
(+)SMAJ30A CK YK 33.3 36.8 1.0 30 1.0 8.3 48.4 0.099 (+)SMAJ33A CM YM 36.7 40.6 1.0 33 1.0 7.5 53.3 0.100 (+)SMAJ36A CP YP 40.0 44.2 1.0 36 1.0 6.9 58.1 0.100 (+)SMAJ40A CR YR 44.4 49.1 1.0 40 1.0 6.2 64.5 0.101 (+)SMAJ40A CT YT 47.8 52.8 1.0 43 1.0 5.8 69.4 0.102 (+)SMAJ45A CT YT 47.8 52.8 1.0 45 1.0 5.5 72.7 0.102 (+)SMAJ45A CV YV 50.0 55.3 1.0 45 1.0 5.5 72.7 0.102 (+)SMAJ45A CX YX 53.3 58.9 1.0 48 1.0 5.2 77.4 0.103 (+)SMAJ51A CZ YZ 56.7 62.7 1.0 51 1.0 4.9 82.4 0.104 (+)SMAJ54A RE ZE 60.0 66.3 1.0 54 1.0 4.6 87.1 0.104 (+)SMAJ58A RG ZG 64.4 71.2 1.0 58 1.0 4.3 93.6 0.104 (+)SMAJ60A RK ZK 66.7 73.7 1.0 60 1.0 4.1 96.8 0.105 (+)SMAJ60A RM ZM 71.1 78.6 1.0 64 1.0 3.9 103 0.105 (+)SMAJ70A RP ZP 77.8 86.0 1.0 70 1.0 3.5 113 0.105 (+)SMAJ78A RT ZT 86.7 95.8 1.0 78 1.0 3.2 126 0.106 (+)SMAJ78A RT ZT 86.7 95.8 1.0 75 1.0 3.2 126 0.106 (+)SMAJ86A RV ZV 94.4 104 1.0 85 1.0 2.2 137 0.106 (+)SMAJ80A RX ZX 100 111 1.0 90 1.0 2.1 146 0.106 (+)SMAJ90A RX ZX 100 111 1.0 90 1.0 1.0 1.9 162 0.107 (+)SMAJ100A RZ ZZ 111 123 1.0 100 1.0 1.0 1.9 162 0.107 (+)SMAJ100A RZ ZZ 111 123 1.0 100 1.0 1.0 1.7 177 0.107 (+)SMAJ100A RZ ZZ 111 123 1.0 110 1.0 1.0 1.0 1.7 177 0.107 (+)SMAJ100A VK VK VK 144 159 1.0 130 1.0 1.0 1.0 1.4 209 0.108			YG							45.4	
(+)SMAJ33A CM YM 36.7 40.6 1.0 33 1.0 7.5 53.3 0.100 (+)SMAJ36A CP YP 40.0 44.2 1.0 36 1.0 6.9 58.1 0.100 (+)SMAJ40A CR YR 44.4 49.1 1.0 40 1.0 6.2 64.5 0.101 (+)SMAJ43A CT YT 47.8 52.8 1.0 43 1.0 5.8 69.4 0.102 (+)SMAJ45A CV YV 50.0 55.3 1.0 45 1.0 5.5 72.7 0.102 (+)SMAJ48A CX YX 53.3 58.9 1.0 48 1.0 5.2 77.4 0.103 (+)SMAJ51A CZ YZ 56.7 62.7 1.0 51 1.0 4.9 82.4 0.104 (+)SMAJ54A RE ZE 60.0 66.3 1.0 54 1.0 4.6 87.1 0.104 (+)SMAJ58A RG ZG 64.4 71.2 1.0 58 1.0 4.3 93.6 0.104 (+)SMAJ60A RK ZK 66.7 73.7 1.0 60 1.0 4.1 96.8 0.105 (+)SMAJ64A RM ZM 71.1 78.6 1.0 64 1.0 3.9 103 0.105 (+)SMAJ70A RP ZP 77.8 86.0 1.0 70 1.0 3.5 113 0.105 (+)SMAJ78A RT ZT 86.7 95.8 1.0 78 1.0 3.2 126 0.106 (+)SMAJ78A RT ZT 86.7 95.8 1.0 78 1.0 3.2 126 0.106 (+)SMAJ8A RT ZT 86.7 95.8 1.0 78 1.0 3.2 126 0.106 (+)SMAJ90A RX ZX 100 111 1.0 85 1.0 2.2 137 0.106 (+)SMAJ90A RX ZX 100 111 1.0 90 1.0 2.1 146 0.106 (+)SMAJ90A RX ZX 100 111 1.0 90 1.0 1.0 1.7 177 0.107 (+)SMAJ10A SE VE 122 135 1.0 110 1.0 1.0 1.0 1.1 1.0 1.0 1.0 1.0		CK		33.3						48.4	
(+)SMAJ36A CP YP 40.0 44.2 1.0 36 1.0 6.9 58.1 0.100 (+)SMAJ40A CR YR 44.4 49.1 1.0 40 1.0 6.2 64.5 0.101 (+)SMAJ43A CT YT 47.8 52.8 1.0 43 1.0 5.8 69.4 0.102 (+)SMAJ45A CV YV 50.0 55.3 1.0 45 1.0 5.5 72.7 0.102 (+)SMAJ48A CX YX 53.3 58.9 1.0 48 1.0 5.2 77.4 0.103 (+)SMAJ51A CZ YZ 56.7 62.7 1.0 51 1.0 4.9 82.4 0.104 (+)SMAJ54A RE ZE 60.0 66.3 1.0 54 1.0 4.6 87.1 0.104 (+)SMAJ54A RE ZE 60.0 66.3 1.0 54 1.0 4.6 87.1 0.104 (+)SMAJ60A RK ZK 66.7 73.7 1.0 60 1.0 4.1 96.8 0.105 (+)SMAJ60A RK ZK 66.7 73.7 1.0 60 1.0 4.1 96.8 0.105 (+)SMAJ60A RM ZM 71.1 78.6 1.0 64 1.0 3.9 103 0.105 (+)SMAJ70A RP ZP 77.8 86.0 1.0 70 1.0 3.5 113 0.105 (+)SMAJ70A RP ZP 77.8 86.0 1.0 70 1.0 3.5 113 0.105 (+)SMAJ76A RT ZT 86.7 95.8 1.0 75 1.0 3.3 121 0.106 (+)SMAJ78A RT ZT 86.7 95.8 1.0 85 1.0 3.2 126 0.106 (+)SMAJ86A RV ZV 94.4 104 1.0 85 1.0 2.2 137 0.106 (+)SMAJ90A RX ZX 100 111 1.0 90 1.0 2.1 146 0.106 (+)SMAJ90A RX ZX 100 111 1.0 90 1.0 2.1 146 0.106 (+)SMAJ10A RZ ZZ 111 123 1.0 100 1.0 1.0 1.7 177 0.107 (+)SMAJ10A VK VK 144 159 1.0 130 1.0 1.0 1.0 1.4 209 0.108 (+)SMAJ10A VK VK 144 159 1.0 130 1.0 1.0 1.4 209 0.108	(+)SMAJ33A	СМ	YM	36.7	40.6	1.0		1.0	7.5	53.3	
(+)SMAJ40A CR YR 44.4 49.1 1.0 40 1.0 6.2 64.5 0.101 (+)SMAJ43A CT YT 47.8 52.8 1.0 43 1.0 5.8 69.4 0.102 (+)SMAJ45A CV YV 50.0 55.3 1.0 45 1.0 5.5 72.7 0.102 (+)SMAJ45A CX YX 53.3 58.9 1.0 48 1.0 5.2 77.4 0.103 (+)SMAJ51A CZ YZ 56.7 62.7 1.0 51 1.0 4.9 82.4 0.104 (+)SMAJ54A RE ZE 60.0 66.3 1.0 54 1.0 4.6 87.1 0.104 (+)SMAJ58A RG ZG 64.4 71.2 1.0 58 1.0 4.3 93.6 0.104 (+)SMAJ60A RK ZK 66.7 73.7 1.0 60 1.0 4.1 96.8 0.105 (+)SMAJ64A RM ZM 71.1 78.6 1.0 64 1.0 3.9 103 0.105 (+)SMAJ70A RP ZP 77.8 86.0 1.0 70 1.0 3.5 113 0.105 (+)SMAJ75A RR ZR 83.3 92.1 1.0 75 1.0 3.3 121 0.106 (+)SMAJ78A RT ZT 86.7 95.8 1.0 78 1.0 3.2 126 0.106 (+)SMAJ78A RT ZT 86.7 95.8 1.0 78 1.0 3.2 126 0.106 (+)SMAJ78A RY ZV 94.4 104 1.0 85 1.0 2.2 137 0.106 (+)SMAJ90A RX ZX 100 111 1.0 90 1.0 2.1 146 0.106 (+)SMAJ10A RZ ZZ 111 123 1.0 100 1.0 1.0 1.7 177 0.107 (+)SMAJ10A SE VE 122 135 1.0 110 1.0 1.0 1.0 1.7 177 0.107 (+)SMAJ10A VK VK 144 159 1.0 130 1.0 1.0 1.0 1.0 1.4 209 0.108 (+)SMAJ130A VK VK VK 144 159 1.0 130 1.0 1.0 1.0 1.4 209 0.108	(+)SMAJ36A	CP	ΥP	40.0	44.2	1.0	36	1.0	6.9	58.1	
(+)SMAJ43A         CT         YT         47.8         52.8         1.0         43         1.0         5.8         69.4         0.102           (+)SMAJ45A         CV         YV         50.0         55.3         1.0         45         1.0         5.5         72.7         0.102           (+)SMAJ48A         CX         YX         53.3         58.9         1.0         48         1.0         5.2         77.4         0.103           (+)SMAJ51A         CZ         YZ         56.7         62.7         1.0         51         1.0         4.9         82.4         0.104           (+)SMAJ54A         RE         ZE         60.0         66.3         1.0         54         1.0         4.6         87.1         0.104           (+)SMAJ58A         RG         ZG         64.4         71.2         1.0         58         1.0         4.3         93.6         0.104           (+)SMAJ60A         RK         ZK         66.7         73.7         1.0         60         1.0         4.1         96.8         0.105           (+)SMAJ64A         RM         ZM         71.1         78.6         1.0         64         1.0         3.9         103		CR	YR	44.4	49.1				6.2	64.5	
(+)SMAJ45A         CV         YV         50.0         55.3         1.0         45         1.0         5.5         72.7         0.102           (+)SMAJ48A         CX         YX         53.3         58.9         1.0         48         1.0         5.2         77.4         0.103           (+)SMAJ51A         CZ         YZ         56.7         62.7         1.0         51         1.0         4.9         82.4         0.104           (+)SMAJ54A         RE         ZE         60.0         66.3         1.0         54         1.0         4.6         87.1         0.104           (+)SMAJ58A         RG         ZG         64.4         71.2         1.0         58         1.0         4.3         93.6         0.104           (+)SMAJ60A         RK         ZK         66.7         73.7         1.0         60         1.0         4.1         96.8         0.105           (+)SMAJ60A         RK         ZK         66.7         73.7         1.0         64         1.0         3.9         103         0.105           (+)SMAJ70A         RP         ZP         77.8         86.0         1.0         70         1.0         3.5         113		CT	ΥT	47.8	52.8		43				
(+)SMAJ48A         CX         YX         53.3         58.9         1.0         48         1.0         5.2         77.4         0.103           (+)SMAJ51A         CZ         YZ         56.7         62.7         1.0         51         1.0         4.9         82.4         0.104           (+)SMAJ54A         RE         ZE         60.0         66.3         1.0         54         1.0         4.6         87.1         0.104           (+)SMAJ58A         RG         ZG         64.4         71.2         1.0         58         1.0         4.3         93.6         0.104           (+)SMAJ60A         RK         ZK         66.7         73.7         1.0         60         1.0         4.1         96.8         0.105           (+)SMAJ60A         RK         ZK         66.7         73.7         1.0         60         1.0         4.1         96.8         0.105           (+)SMAJ60A         RK         ZK         66.7         73.7         1.0         60         1.0         4.1         96.8         0.105           (+)SMAJ70A         RP         ZP         77.8         86.0         1.0         70         1.0         3.5         113		CV	ΥV	50.0	55.3					72.7	
(+)SMAJ51A         CZ         YZ         56.7         62.7         1.0         51         1.0         4.9         82.4         0.104           (+)SMAJ54A         RE         ZE         60.0         66.3         1.0         54         1.0         4.6         87.1         0.104           (+)SMAJ58A         RG         ZG         64.4         71.2         1.0         58         1.0         4.3         93.6         0.104           (+)SMAJ60A         RK         ZK         66.7         73.7         1.0         60         1.0         4.1         96.8         0.105           (+)SMAJ60A         RK         ZK         66.7         73.7         1.0         60         1.0         4.1         96.8         0.105           (+)SMAJ60A         RK         ZK         66.7         73.7         1.0         60         1.0         4.1         96.8         0.105           (+)SMAJ60A         RK         ZK         66.7         73.7         1.0         60         1.0         3.9         103         0.105           (+)SMAJ70A         RP         ZP         77.8         86.0         1.0         70         1.0         3.5         113		CX	YX	53.3							
(+)SMAJ54A         RE         ZE         60.0         66.3         1.0         54         1.0         4.6         87.1         0.104           (+)SMAJ58A         RG         ZG         64.4         71.2         1.0         58         1.0         4.3         93.6         0.104           (+)SMAJ60A         RK         ZK         66.7         73.7         1.0         60         1.0         4.1         96.8         0.105           (+)SMAJ64A         RM         ZM         71.1         78.6         1.0         64         1.0         3.9         103         0.105           (+)SMAJ70A         RP         ZP         77.8         86.0         1.0         70         1.0         3.5         113         0.105           (+)SMAJ75A         RR         ZR         83.3         92.1         1.0         75         1.0         3.3         121         0.106           (+)SMAJ78A         RT         ZT         86.7         95.8         1.0         78         1.0         3.2         126         0.106           (+)SMAJ85A         RV         ZV         94.4         104         1.0         85         1.0         2.2         137 <th< td=""><td></td><td></td><td>YZ</td><td>56.7</td><td></td><td></td><td></td><td></td><td>4.9</td><td>82.4</td><td></td></th<>			YZ	56.7					4.9	82.4	
(+)SMAJ58A         RG         ZG         64.4         71.2         1.0         58         1.0         4.3         93.6         0.104           (+)SMAJ60A         RK         ZK         66.7         73.7         1.0         60         1.0         4.1         96.8         0.105           (+)SMAJ64A         RM         ZM         71.1         78.6         1.0         64         1.0         3.9         103         0.105           (+)SMAJ70A         RP         ZP         77.8         86.0         1.0         70         1.0         3.5         113         0.105           (+)SMAJ75A         RR         ZR         83.3         92.1         1.0         75         1.0         3.3         121         0.106           (+)SMAJ78A         RT         ZT         86.7         95.8         1.0         78         1.0         3.2         126         0.106           (+)SMAJ85A         RV         ZV         94.4         104         1.0         85         1.0         2.2         137         0.106           (+)SMAJ90A         RX         ZX         100         111         1.0         90         1.0         1.9         162         0.	(+)SMAJ54A	RE	ZE	60.0			54	1.0	4.6	87.1	
(+)SMAJ60A         RK         ZK         66.7         73.7         1.0         60         1.0         4.1         96.8         0.105           (+)SMAJ64A         RM         ZM         71.1         78.6         1.0         64         1.0         3.9         103         0.105           (+)SMAJ70A         RP         ZP         77.8         86.0         1.0         70         1.0         3.5         113         0.105           (+)SMAJ75A         RR         ZR         83.3         92.1         1.0         75         1.0         3.3         121         0.106           (+)SMAJ78A         RT         ZT         86.7         95.8         1.0         78         1.0         3.2         126         0.106           (+)SMAJ85A         RV         ZV         94.4         104         1.0         85         1.0         2.2         137         0.106           (+)SMAJ90A         RX         ZX         100         111         1.0         90         1.0         2.1         146         0.106           (+)SMAJ100A         RZ         ZZ         111         123         1.0         100         1.0         1.7         177         0.1		RG	ZG	64.4	71.2		58	1.0	4.3	93.6	
(+)SMAJ64A         RM         ZM         71.1         78.6         1.0         64         1.0         3.9         103         0.105           (+)SMAJ70A         RP         ZP         77.8         86.0         1.0         70         1.0         3.5         113         0.105           (+)SMAJ75A         RR         ZR         83.3         92.1         1.0         75         1.0         3.3         121         0.106           (+)SMAJ78A         RT         ZT         86.7         95.8         1.0         78         1.0         3.2         126         0.106           (+)SMAJ85A         RV         ZV         94.4         104         1.0         85         1.0         2.2         137         0.106           (+)SMAJ90A         RX         ZX         100         111         1.0         90         1.0         2.1         146         0.106           (+)SMAJ100A         RZ         ZZ         111         123         1.0         100         1.0         1.9         162         0.107           (+)SMAJ110A         SE         VE         122         135         1.0         110         1.0         1.7         177         0.10	(+)SMAJ60A	RK	ZK	66.7	73.7	1.0	60	1.0	4.1	96.8	
(+)SMAJ70A         RP         ZP         77.8         86.0         1.0         70         1.0         3.5         113         0.105           (+)SMAJ75A         RR         ZR         83.3         92.1         1.0         75         1.0         3.3         121         0.106           (+)SMAJ78A         RT         ZT         86.7         95.8         1.0         78         1.0         3.2         126         0.106           (+)SMAJ85A         RV         ZV         94.4         104         1.0         85         1.0         2.2         137         0.106           (+)SMAJ90A         RX         ZX         100         111         1.0         90         1.0         2.1         146         0.106           (+)SMAJ100A         RZ         ZZ         111         123         1.0         100         1.0         1.9         162         0.107           (+)SMAJ110A         SE         VE         122         135         1.0         110         1.0         1.7         177         0.107           (+)SMAJ120A         VG         VG         133         147         1.0         120         1.0         1.6         193         0.10	(+)SMAJ64A		ZM	71.1							
(+)SMAJ75A         RR         ZR         83.3         92.1         1.0         75         1.0         3.3         121         0.106           (+)SMAJ78A         RT         ZT         86.7         95.8         1.0         78         1.0         3.2         126         0.106           (+)SMAJ85A         RV         ZV         94.4         104         1.0         85         1.0         2.2         137         0.106           (+)SMAJ90A         RX         ZX         100         111         1.0         90         1.0         2.1         146         0.106           (+)SMAJ100A         RZ         ZZ         111         123         1.0         100         1.0         1.9         162         0.107           (+)SMAJ110A         SE         VE         122         135         1.0         110         1.0         1.7         177         0.107           (+)SMAJ120A         VG         VG         133         147         1.0         120         1.0         1.6         193         0.108           (+)SMAJ130A         VK         VK         144         159         1.0         130         1.0         1.4         209         0.10		RP	ZP	77.8			70			113	
(+)SMAJ78A         RT         ZT         86.7         95.8         1.0         78         1.0         3.2         126         0.106           (+)SMAJ85A         RV         ZV         94.4         104         1.0         85         1.0         2.2         137         0.106           (+)SMAJ90A         RX         ZX         100         111         1.0         90         1.0         2.1         146         0.106           (+)SMAJ100A         RZ         ZZ         111         123         1.0         100         1.0         1.9         162         0.107           (+)SMAJ110A         SE         VE         122         135         1.0         110         1.0         1.7         177         0.107           (+)SMAJ120A         VG         VG         133         147         1.0         120         1.0         1.6         193         0.108           (+)SMAJ130A         VK         VK         144         159         1.0         130         1.0         1.4         209         0.108		RR	ZR	83.3	92.1		75				
(+)SMAJ85A         RV         ZV         94.4         104         1.0         85         1.0         2.2         137         0.106           (+)SMAJ90A         RX         ZX         100         111         1.0         90         1.0         2.1         146         0.106           (+)SMAJ100A         RZ         ZZ         111         123         1.0         100         1.0         1.9         162         0.107           (+)SMAJ110A         SE         VE         122         135         1.0         110         1.0         1.7         177         0.107           (+)SMAJ120A         VG         VG         133         147         1.0         120         1.0         1.6         193         0.108           (+)SMAJ130A         VK         VK         144         159         1.0         130         1.0         1.4         209         0.108											
(+)SMAJ90A         RX         ZX         100         111         1.0         90         1.0         2.1         146         0.106           (+)SMAJ100A         RZ         ZZ         111         123         1.0         100         1.0         1.9         162         0.107           (+)SMAJ110A         SE         VE         122         135         1.0         110         1.0         1.7         177         0.107           (+)SMAJ120A         VG         VG         133         147         1.0         120         1.0         1.6         193         0.108           (+)SMAJ130A         VK         VK         144         159         1.0         130         1.0         1.4         209         0.108											
(+)SMAJ100A         RZ         ZZ         111         123         1.0         100         1.0         1.9         162         0.107           (+)SMAJ110A         SE         VE         122         135         1.0         110         1.0         1.7         177         0.107           (+)SMAJ120A         VG         VG         133         147         1.0         120         1.0         1.6         193         0.108           (+)SMAJ130A         VK         VK         144         159         1.0         130         1.0         1.4         209         0.108											
(+)SMAJ110A         SE         VE         122         135         1.0         110         1.0         1.7         177         0.107           (+)SMAJ120A         VG         VG         133         147         1.0         120         1.0         1.6         193         0.108           (+)SMAJ130A         VK         VK         144         159         1.0         130         1.0         1.4         209         0.108											
(+)SMAJ120A VG VG 133 147 1.0 120 1.0 1.6 193 0.108 (+)SMAJ130A VK VK 144 159 1.0 130 1.0 1.4 209 0.108											
(+)SMAJ130A VK VK 144 159 1.0 130 1.0 1.4 209 0.108											
		-	-								
וווא בער	(+)SMAJ150A	VM	VM	167	185	1.0	150	1.0	1.2	243	0.108
(+)SMAJ160A SP VP 178 197 1.0 160 1.0 1.2 259 0.108											
(+)SMAJ170A SR VR 189 209 1.0 170 1.0 1.09 275 0.108											
(+)SMAJ188A SS VS 209 231 1.0 188 1.0 0.91 328 0.108											

### Notes

- <sup>(1)</sup> Pulse test:  $t_p \le 50 \text{ ms}$
- Surge current waveform per fig. 3 and derate per fig. 2
- $^{(3)}$  For bidirectional types having  $V_{WM}$  of 10 V and less, the  $I_D$  limit is doubled
- (4) All terms and symbols are consistent with ANSI/IEEE C62.35
- $^{(5)}$  For the bi-directional SMAJ5.0CA, the maximum  $V_{BR}$  is 7.25 V
- $^{(6)}$  V<sub>F</sub> = 3.5 V at I<sub>F</sub> = 25 A (unidirectional only)
- (+) Underwriters Laboratory Recognition for the classification of protectors (QVGQ2) under the UL standard for safety 497B and file number E136766 for both unidirectional and bidirectional device



## SMAJ5.0A thru SMAJ188CA

# Vishay General Semiconductor

THERMAL CHARACTERISTICS (T <sub>A</sub> = 25 °C unless otherwise noted)						
PARAMETER	SYMBOL	VALUE	UNIT			
Typical thermal resistance, junction to ambient (1)	$R_{ heta JA}$	120	°C/W			
Typical thermal resistance, junction to lead	$R_{ heta JL}$	30	°C/W			

#### Note

<sup>(1)</sup> Mounted on minimum recommended pad layout

ORDERING INFORMATION (Example)						
PREFERRED P/N	UNIT WEIGHT (g)	PREFERRED PACKAGE CODE	BASE QUANTITY	DELIVERY MODE		
SMAJ5.0A-E3/61	0.064	61	1800	7" diameter plactic tape and real		
SMAJ5.0A-M3/61	0.004	01	1600	7" diameter plastic tape and reel		
SMAJ5.0A-E3/5A	0.064	5A	7500	13" diameter plastic tape and reel		
SMAJ5.0A-M3/5A	0.004	SA .				
SMAJ5.0AHE3_A/H (1)	0.064	Н	1800	7" diameter plastic tape and reel		
SMAJ5.0AHM3_A/H (1)	0.004		1600	7 diameter plastic tape and reel		
SMAJ5.0AHE3_A/I (1)	0.064	I	7500	13" diameter plastic tape and reel		
SMAJ5.0AHM3_A/I (1)	0.004					

### Note

<sup>(1)</sup> AEC-Q101 qualified



## Vishay General Semiconductor

## RATINGS AND CHARACTERISTICS CURVES (T<sub>A</sub> = 25 °C unless otherwise noted)

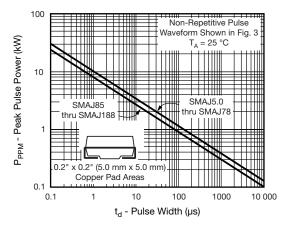


Fig. 1 - Peak Pulse Power Rating Curve

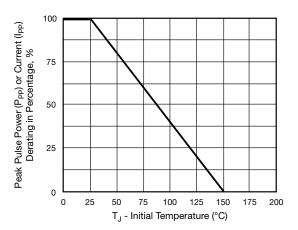


Fig. 2 - Pulse Power or Current vs. Initial Junction Temperature

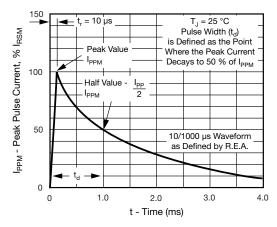


Fig. 3 - Pulse Waveform

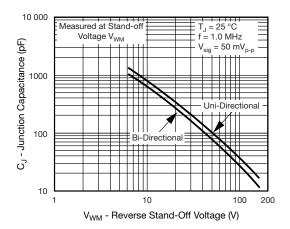


Fig. 4 - Typical Junction Capacitance

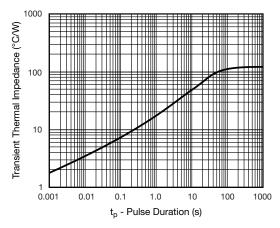


Fig. 5 - Typical Transient Thermal Impedance

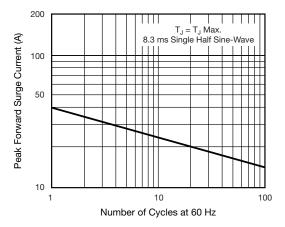


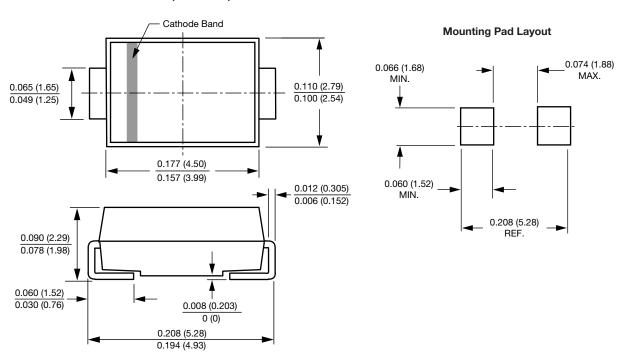
Fig. 6 - Maximum Non-Repetitive Forward Surge Current Unidirectional Only



## Vishay General Semiconductor

## **PACKAGE OUTLINE DIMENSIONS** in inches (millimeters)

## SMA (DO-214AC)





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