

AQxxC-01FTG Series

450W Bidirectional TVS Diode

 **AUTOMOTIVE GRADE** **HF**  **RoHS**  **Pb**  **GREEN**



Additional Information



Resources

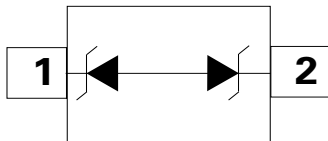


Accessories



Samples

Pinout and Functional Block Diagram



Description

The bidirectional AQxxC-01FTG Series is designed to replace multilayer varistors (MLVs) in electronic equipment for low speed and DC applications. It will protect any sensitive equipment from damage due to electrostatic discharge (ESD) and other transient events.

The AQxxC-01FTG series can safely absorb repetitive ESD strikes of ± 30 kV (contact and air discharge as defined in IEC 61000-4-2) without any performance degradation. Additionally, the AQ05C can safely conduct a 30A 8/20 surge event as defined in IEC 61000-4-5 2nd Edition.

Features & Benefits

- ESD, IEC 61000-4-2, ± 30 kV contact, ± 30 kV air
- EFT, IEC 61000-4-4, 40A (5/50ns)
- Lightning, 30A (8/20 as defined in IEC 61000-4-5 2nd edition) for the AQ05C
- Low clamping voltage
- PPAP capable
- Low leakage current
- Small SOD323 package fits 0805 footprints
- AEC-Q101 qualified
- Moisture Sensitivity Level (MSL -1)
- Halogen free, lead free and RoHS compliant

Applications

- Switches / Buttons
- Test Equipment / Instrumentation
- Point-of-Sale Terminals
- Medical Equipment
- Notebooks / Desktops / Servers
- Computer Peripherals
- CAN Bus protection
- Automotive applications

Life Support Note:

Not Intended for Use in Life Support or Life Saving Applications

The products shown herein are not designed for use in life sustaining or life saving applications unless otherwise expressly indicated.

AQxxC-01FTG Series

450W Bidirectional TVS Diode

Absolute Maximum Ratings

Symbol	Parameter	Value	Units
P_{pk}	Peak Pulse Power ($t_p=8/20\mu s$)	450	W
T_{OP}	Operating Temperature	-40 to 150	°C
T_{STOR}	Storage Temperature	-55 to 150	°C

Caution: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the component. This is a stress only rating and operation of the component at these or any other conditions above those indicated in the operational sections of this specification is not implied.

AQ05C Electrical Characteristics ($T_{OP}=25^{\circ}C$)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	V_{RWM}	$I_R=1\mu A$			5.0	V
Breakdown Voltage	V_{BR}	$I_R=1mA$	6.0			V
Reverse Leakage Current	I_{LEAK}	$V_R=5V$			1.0	μA
Clamp Voltage ¹	V_C	$I_{PP}=1A, t_p=8/20\mu s, Fwd$			10.0	V
		$I_{PP}=10A, t_p=8/20\mu s, Fwd$			14.5	V
Dynamic Resistance ²	R_{DYN}	TLP, $t_p=100ns$, I/O to Ground		0.31		Ω
Peak Pulse Current	I_{PP}	$t_p=8/20\mu s$			30.0	A
ESD Withstand Voltage ¹	V_{ESD}	IEC 61000-4-2 (Contact Discharge)	± 30			kV
		IEC 61000-4-2 (Air Discharge)	± 30			kV
Diode Capacitance ¹	$C_{I/O-I/O}$	Reverse Bias=0V, $f=1MHz$			200	pF

AQ12C Electrical Characteristics ($T_{OP}=25^{\circ}C$)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	V_{RWM}	$I_R=1\mu A$			12.0	V
Breakdown Voltage	V_{BR}	$I_R=1mA$	13.3			V
Reverse Leakage Current	I_{LEAK}	$V_R=12V$			1.0	μA
Clamp Voltage ¹	V_C	$I_{PP}=1A, t_p=8/20\mu s, Fwd$			18.5	V
		$I_{PP}=10A, t_p=8/20\mu s, Fwd$			23.0	V
Dynamic Resistance ²	R_{DYN}	TLP, $t_p=100ns$, I/O to Ground		0.41		Ω
Peak Pulse Current	I_{PP}	$t_p=8/20\mu s$			17.0	A
ESD Withstand Voltage ¹	V_{ESD}	IEC 61000-4-2 (Contact Discharge)	± 30			kV
		IEC 61000-4-2 (Air Discharge)	± 30			kV
Diode Capacitance ¹	$C_{I/O-I/O}$	Reverse Bias=0V, $f=1MHz$			100	pF

AQxxC-01FTG Series

450W Bidirectional TVS Diode

AQ15C Electrical Characteristics ($T_{op}=25^{\circ}\text{C}$)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	V_{RWM}	$I_R=1\mu\text{A}$			15.0	V
Breakdown Voltage	V_{BR}	$I_R=1\text{mA}$	16.7			V
Reverse Leakage Current	I_{LEAK}	$V_R=15\text{V}$			1.0	μA
Clamp Voltage ¹	V_C	$I_{PP}=1\text{A}$, $t_p=8/20\mu\text{s}$, Fwd			24.0	V
		$I_{PP}=10\text{A}$, $t_p=8/20\mu\text{s}$, Fwd			31.0	V
Dynamic Resistance ²	R_{DYN}	TLP, $t_p=100\text{ns}$, I/O to Ground		0.46		Ω
Peak Pulse Current	I_{PP}	$t_p=8/20\mu\text{s}$			12.0	A
ESD Withstand Voltage ¹	V_{ESD}	IEC 61000-4-2 (Contact Discharge)	± 30			kV
		IEC 61000-4-2 (Air Discharge)	± 30			kV
Diode Capacitance ¹	$C_{I/O-I/O}$	Reverse Bias=0V, $f=1\text{MHz}$			75	pF

AQ24C Electrical Characteristics ($T_{op}=25^{\circ}\text{C}$)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	V_{RWM}	$I_R=1\mu\text{A}$			24.0	V
Breakdown Voltage	V_{BR}	$I_R=1\text{mA}$	26.7			V
Reverse Leakage Current	I_{LEAK}	$V_R=24\text{V}$			1.0	μA
Clamp Voltage ¹	V_C	$I_{PP}=1\text{A}$, $t_p=8/20\mu\text{s}$, Fwd			36.0	V
		$I_{PP}=5\text{A}$, $t_p=8/20\mu\text{s}$, Fwd			42.0	V
Dynamic Resistance ²	R_{DYN}	TLP, $t_p=100\text{ns}$, I/O to Ground		0.62		Ω
Peak Pulse Current	I_{PP}	$t_p=8/20\mu\text{s}$			7.0	A
ESD Withstand Voltage ¹	V_{ESD}	IEC 61000-4-2 (Contact Discharge)	± 30			kV
		IEC 61000-4-2 (Air Discharge)	± 30			kV
Diode Capacitance ¹	$C_{I/O-I/O}$	Reverse Bias=0V, $f=1\text{MHz}$			50	pF

AQ36C Electrical Characteristics ($T_{op}=25^{\circ}\text{C}$)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	V_{RWM}	$I_R=1\mu\text{A}$			36.0	V
Breakdown Voltage	V_{BR}	$I_R=1\text{mA}$	40.0			V
Reverse Leakage Current	I_{LEAK}	$V_R=36\text{V}$			1.0	μA
Clamp Voltage ¹	V_C	$I_{PP}=1\text{A}$, $t_p=8/20\mu\text{s}$, Fwd			52.0	V
		$I_{PP}=5\text{A}$, $t_p=8/20\mu\text{s}$, Fwd			62.0	V
Dynamic Resistance ²	R_{DYN}	TLP, $t_p=100\text{ns}$, I/O to Ground		0.68		Ω
Peak Pulse Current	I_{PP}	$t_p=8/20\mu\text{s}$			5.0	A
ESD Withstand Voltage ¹	V_{ESD}	IEC 61000-4-2 (Contact Discharge)	± 30			kV
		IEC 61000-4-2 (Air Discharge)	± 30			kV
Diode Capacitance ¹	$C_{I/O-I/O}$	Reverse Bias=0V, $f=1\text{MHz}$			30	pF

Note:

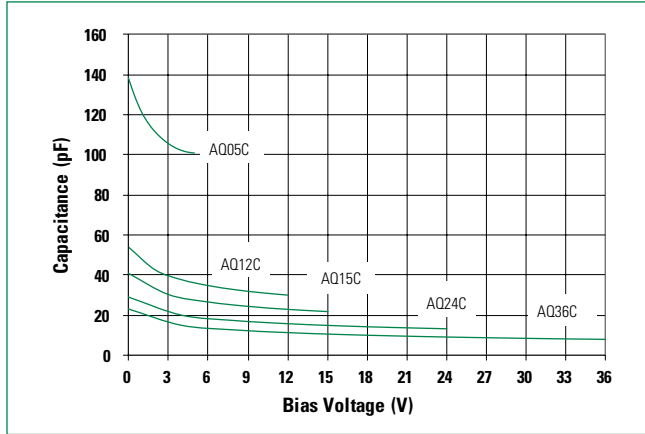
1. Parameter is guaranteed by design and/or component characterization.

2. Transmission Line Pulse (TLP) with 100ns width, 2ns rise time, and average window $t_1=70\text{ns}$ to $t_2=90\text{ns}$

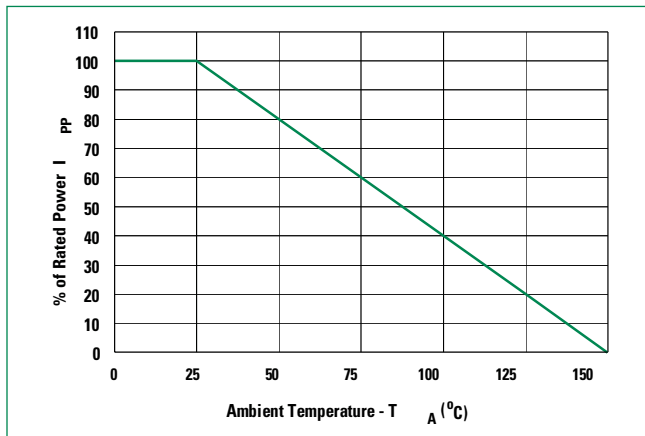
AQxxC-01FTG Series

450W Bidirectional TVS Diode

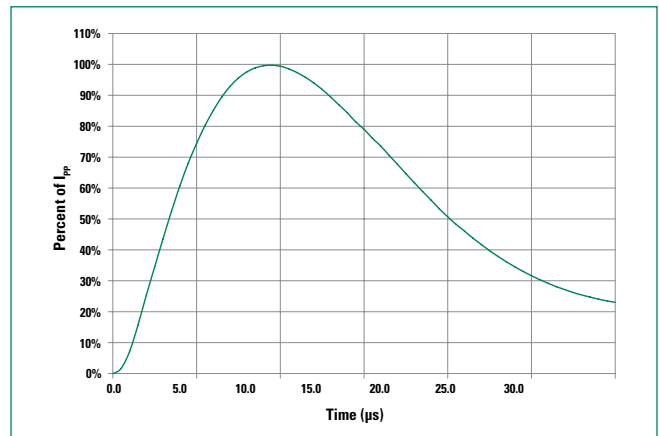
Capacitance vs. Bias



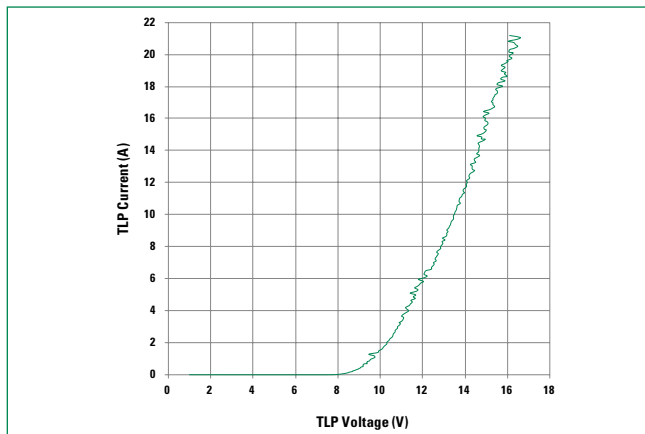
Power Derating Curve



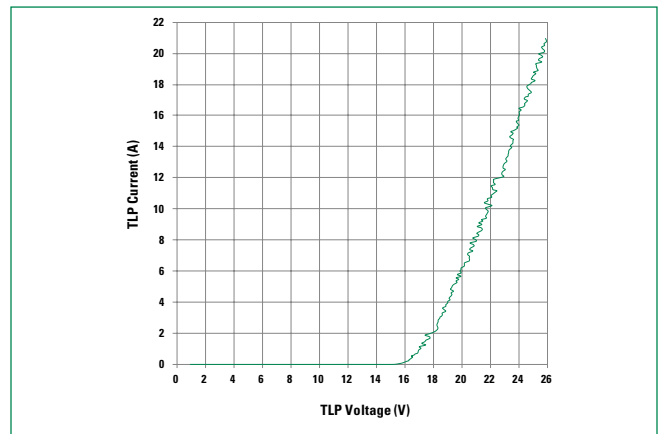
8/20μs Pulse Waveform



AQ05C Transmission Line Pulsing (TLP) Plot



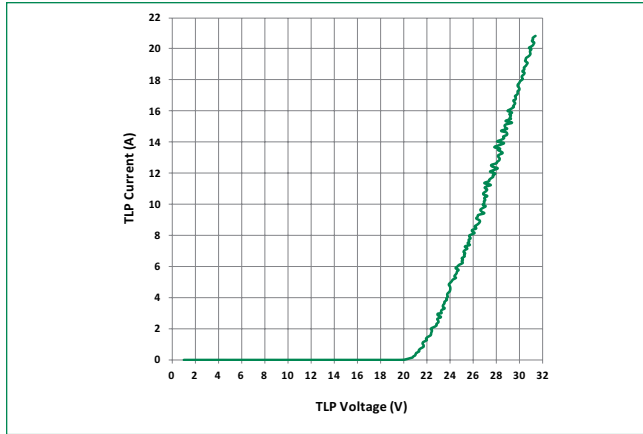
AQ12C Transmission Line Pulsing (TLP) Plot



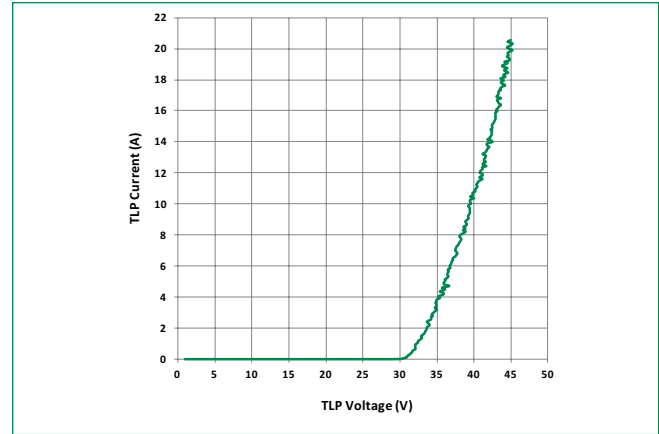
AQxxC-01FTG Series

450W Bidirectional TVS Diode

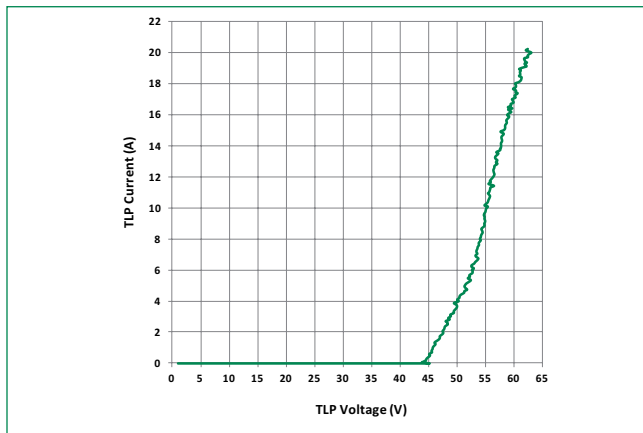
AQ15C Transmission Line Pulsing(TLP) Plot



AQ24C Transmission Line Pulsing(TLP) Plot



AQ36C Transmission Line Pulsing(TLP) Plot

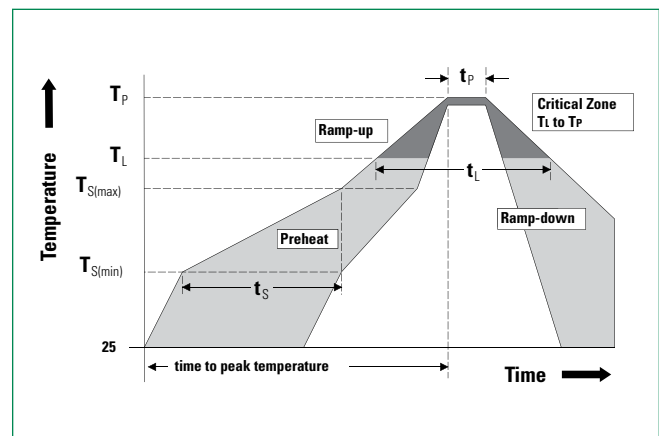


Product Characteristics

Lead Plating	Matte Tin
Lead Material	Copper Alloy
Lead Coplanarity	0.0004 inches (0.102mm)
Substrate material	Silicon
Body Material	Molded Compound
Flammability	UL Recognized compound meeting flammability rating V-0

Soldering Parameters

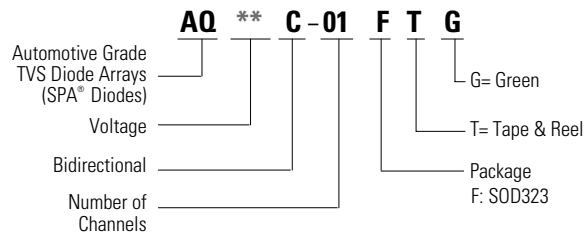
Reflow Condition		Pb – Free assembly
Pre Heat	- Temperature Min ($T_{s(min)}$)	150°C
	- Temperature Max ($T_{s(max)}$)	200°C
	- Time (min to max) (t_s)	60 – 120 secs
Average ramp up rate (Liquidus) Temp (T_L) to peak		3°C/second max
$T_{s(max)}$ to T_L - Ramp-up Rate		3°C/second max
Reflow	- Temperature (T_L) (Liquidus)	217°C
	- Temperature (t_L)	60 – 150 seconds
Peak Temperature (T_p)		260 ^{+0/-5} °C
Time within 5°C of actual peak Temperature (t_p)		30 seconds
Ramp-down Rate		6°C/second max
Time 25°C to peak Temperature (T_p)		8 minutes Max.
Do not exceed		260°C



AQxxC-01FTG Series

450W Bidirectional TVS Diode

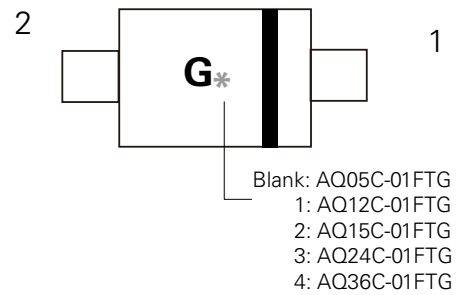
Part Numbering System



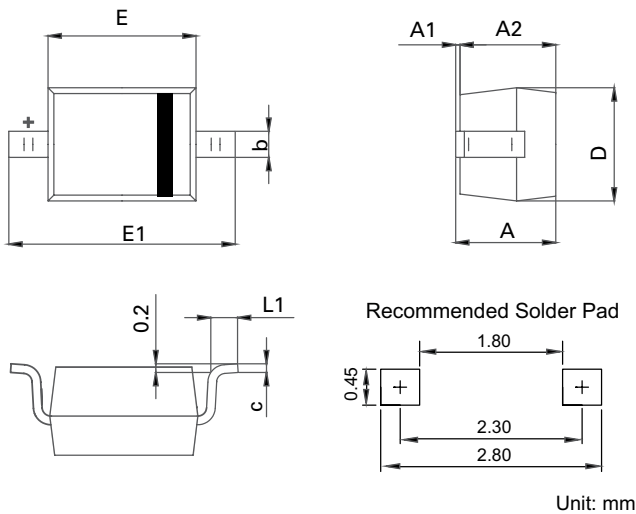
Ordering Information

Part Number	Package	Min. Order Qty.
AQ05C-01FTG	SOD323	3000
AQ12C-01FTG	SOD323	3000
AQ15C-01FTG	SOD323	3000
AQ24C-01FTG	SOD323	3000
AQ36C-01FTG	SOD323	3000

Part Marking System



Package Dimensions -SOD323

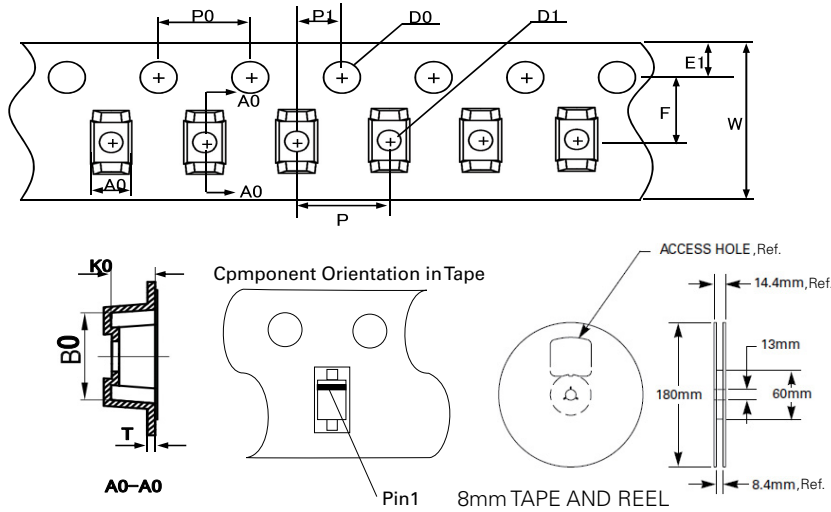


Symbol	SOD323			
	Millimeters		Inches	
	Min	Max	Min	Max
A	-	1.00	-	0.039
A1	0.00	0.10	0.000	0.004
A2	0.80	0.90	0.031	0.035
b	0.25	0.35	0.010	0.014
c	0.08	0.15	0.003	0.006
D	1.20	1.40	0.047	0.055
E	1.60	1.80	0.063	0.071
E1	2.50	2.70	0.098	0.106
L1	0.25	0.40	0.010	0.016

AQxxC-01FTG Series

450W Bidirectional TVS Diode

Embossed Carrier Tape & Reel Specification — SOD323



Symbol	Millimeters
A0	1.36min/1.62max
B0	2.90+/-0.10
W	8.0+0.3/-0.10
D0	1.50+0.10
D1	ø1.00min/ø1.25max
E1	1.75+/-0.10
F	3.50+/-0.05
P0	4.00+/-0.10
P	4.00+/-0.10
P1	2.00+/-0.05
K0	1.15min/1.45max
T	0.254+/-0.13

Disclaimer Notice - Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at <http://www.littelfuse.com/disclaimer-electronics>.