AQHVxx-01LTG Series 250W Discrete Unidirectional TVS Diode

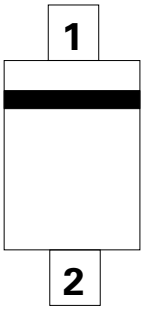
AUTOMOTIVE GRADE HF RoHS Pb GREEN

Description

The AQHVxx-01LTG series is designed to provide an option for very fast acting, high performance over-voltage protection components. This series is ideally suited for power interfaces, passenger charging interfaces, and well as LED lighting modules, and low speed I/Os. It will protect sensitive equipment from damage due to electrostatic discharge (ESD) and other overvoltage transients.

It can safely absorb repetitive ESD strikes above the maximum level of the IEC 61000-4-2 international standard (Level 4, ±8kV contact discharge) without performance degradation and safely conduct up to 10A (AQHV12) of induced surge current (IEC 61000-4-5 2nd edition, t_P=8/20µs) with very low clamping voltages.

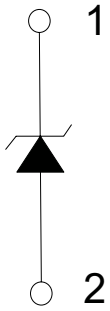
Pinout



Features

- ESD, IEC 61000-4-2, ±30kV contact, ±30kV air
- EFT, IEC 61000-4-4, 40A (5/50ns)
- Lightning, 10A (8/20µs as defined in IEC 61000-4-5 2nd edition) for AQHV12
- Low clamping voltage
- PPAP capable
- Low leakage current
- AEC-Q101 qualified
- Moisture Sensitivity Level (MSL -1)
- Halogen free, lead free and RoHS compliant

Functional Block Diagram



Applications

- LED Lighting Modules
- Portable Instrumentation
- General Purpose I/O
- RS232 / RS485
- CAN and LIN Bus
- Automotive application

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.

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Absolute Maximum Ratings

Symbol	Parameter	Value	Units
P_{pk}	Peak Pulse Power (t_p=8/20µs)	250	W
T_{OP}	Operating Temperature	-40 to 150	°C
T_{STOR}	Storage Temperature	-55 to 150	°C

Notes:

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.

AQHV12 Electrical Characteristics (T_{OP}=25°C)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	V_{RWM}	I_R=1µA			12.0	V
Breakdown Voltage	V_{BR}	I_R=1mA	13.3	14.3		V
Reverse Leakage Current	I_{LEAK}	V_R=12V		5	50	nA
Clamp Voltage[1]	V_C	I_{PP}=1A, t_p=8/20µs, I/O to GND		16.5	20	V
		I_{PP}=10A, t_p=8/20µs, I/O to GND		23.5	26	V
Dynamic Resistance[2]	R_{DYN}	TLP, t_p=100ns, I/O to GND		0.22		Ω
Peak Pulse Current	I_{pp}	t_p=8/20µs			10.0	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]	$C_{I/O-GND}$	Reverse Bias=0V, f=1MHz		55.5	60	pF

AQHV15 Electrical Characteristics (T_{OP}=25°C)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	V_{RWM}	I_R=1µA			15	V
Breakdown Voltage	V_{BR}	I_R=1mA	16.7	18.7		V
Reverse Leakage Current	I_{LEAK}	V_R=15V		5	50	nA
Clamp Voltage[1]	V_C	I_{PP}=1A, t_p=8/20µs, I/O to GND		21.5	25	V
		I_{PP}=7A, t_p=8/20µs, I/O to GND		30	35	V
Dynamic Resistance[2]	R_{DYN}	TLP, t_p=100ns, I/O to GND		0.25		Ω
Peak Pulse Current	I_{pp}	t_p=8/20µs			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]	$C_{I/O-GND}$	Reverse Bias=0V, f=1MHz		43	46	pF

AQHV24 Electrical Characteristics (T_{OP}=25°C)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	V_{RWM}	I_R=1µA			24	V
Breakdown Voltage	V_{BR}	I_R=1mA	26.7	28.7		V
Reverse Leakage Current	I_{LEAK}	V_R=24V		5	50	nA
Clamp Voltage[1]	V_C	I_{PP}=1A, t_p=8/20µs, I/O to GND		33	38	V
		I_{PP}=5A, t_p=8/20µs, I/O to GND		46.5	52	V
Dynamic Resistance[2]	R_{DYN}	TLP, t_p=100ns, I/O to GND		0.35		Ω
Peak Pulse Current	I_{pp}	t_p=8/20µs			5	A
ESD Withstand Voltage[1]	V_{ESD}	IEC 61000-4-2 (Contact Discharge)	±25			kV
		IEC 61000-4-2 (Air Discharge)	±30			kV
Diode Capacitance[1]	$C_{I/O-GND}$	Reverse Bias=0V, f=1MHz		30	32	pF

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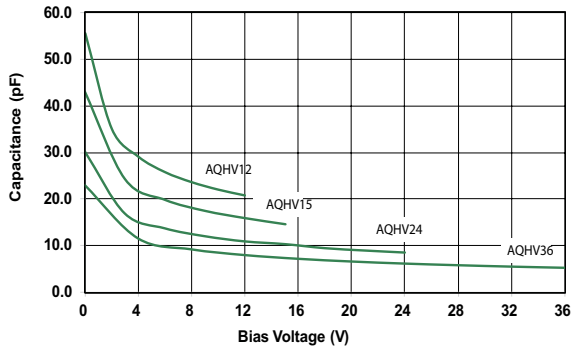
AQHV36 Electrical Characteristics (T_{OP}=25°C)

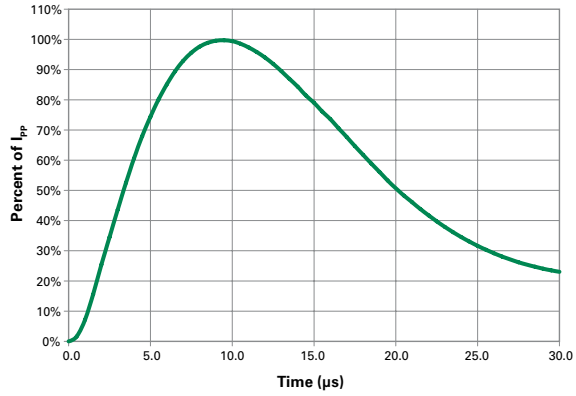
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	V_{RWM}	I_R=1µA			36	V
Breakdown Voltage	V_{BR}	I_R=1mA	40	42.4		V
Reverse Leakage Current	I_{LEAK}	V_R=36V		5	50	nA
Clamp Voltage[1]	V_C	I_{PP}=1A, t_p=8/20µs, I/O to GND		49.5	55	V
		I_{PP}=3A, t_p=8/20µs, I/O to GND		52.5	58	V
Dynamic Resistance[2]	R_{DYN}	TLP, t_p=100ns, I/O to GND		1.15		Ω
Peak Pulse Current	I_{pp}	t_p=8/20µs			3	A
ESD Withstand Voltage[1]	V_{ESD}	IEC 61000-4-2 (Contact Discharge)	±15			kV
		IEC 61000-4-2 (Air Discharge)	±20			kV
Diode Capacitance[1]	$C_{I/O-GND}$	Reverse Bias=0V, f=1MHz		23	25	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 t1=70ns to t2= 90ns

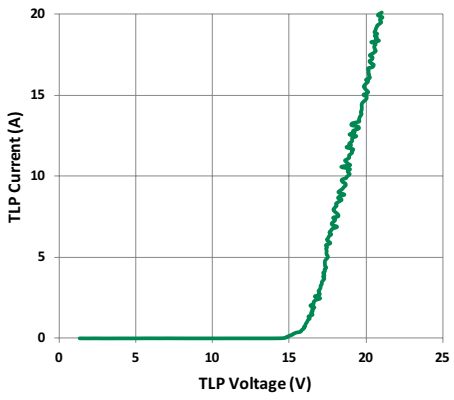
Capacitance vs. Reverse Bias



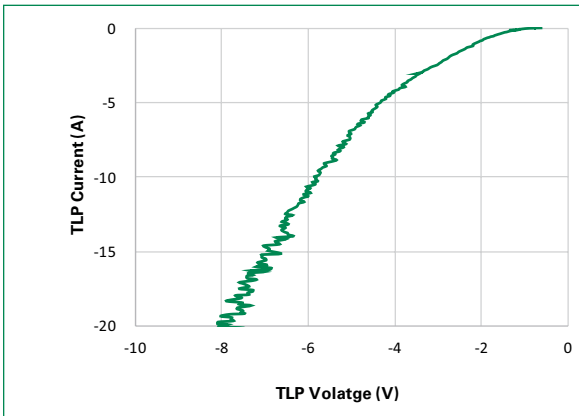
8/20µs Pulse Waveform



AQHV12 Positive Transmission Line Pulsing (TLP) Plot



AQHV12 Negative Transmission Line Pulsing(TLP) Plot



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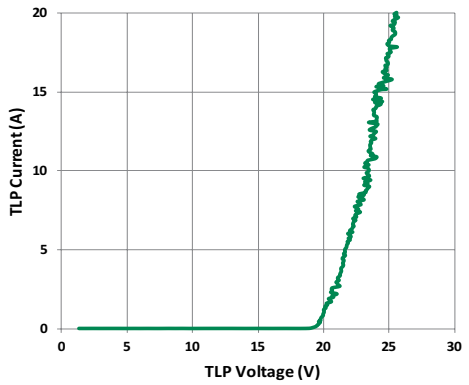
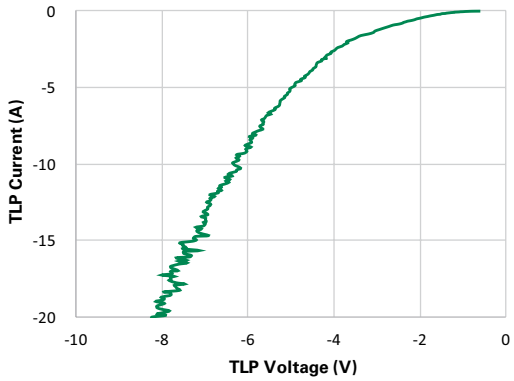
TVS Diode Arrays (SPA® Diodes)

General Purpose ESD Protection - AQHVxx-01LTG Series

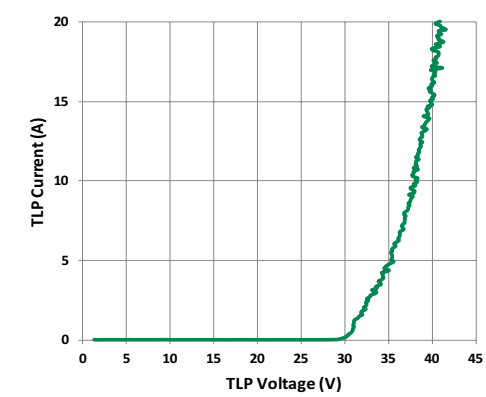
AQHV15 Positive Transmission Line Pulsing (TLP) Plot



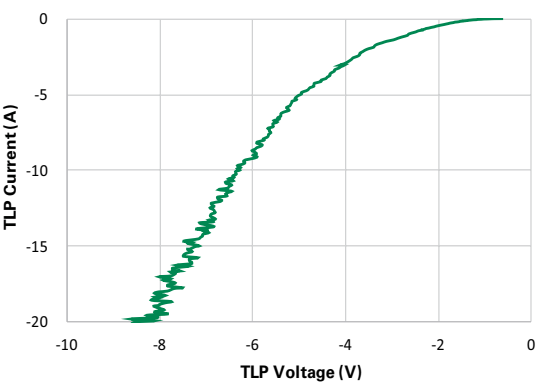
AQHV15 Negative Transmission Line Pulsing(TLP) Plot



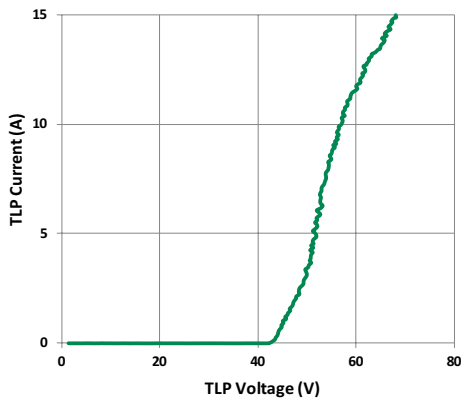
AQHV24 Positive Transmission Line Pulsing (TLP) Plot



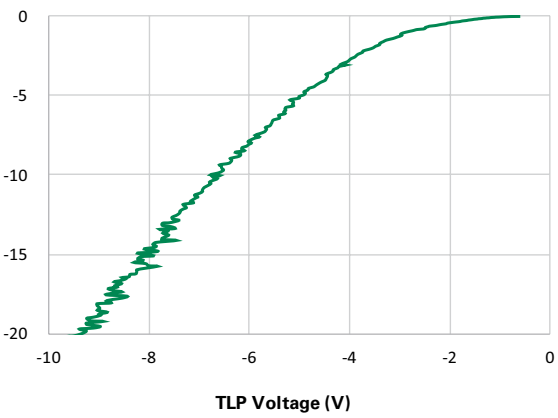
AQHV24 Negative Transmission Line Pulsing(TLP) Plot



AQHV36 Positive Transmission Line Pulsing(TLP) Plot



AQHV36 Negative Transmission Line Pulsing(TLP) Plot



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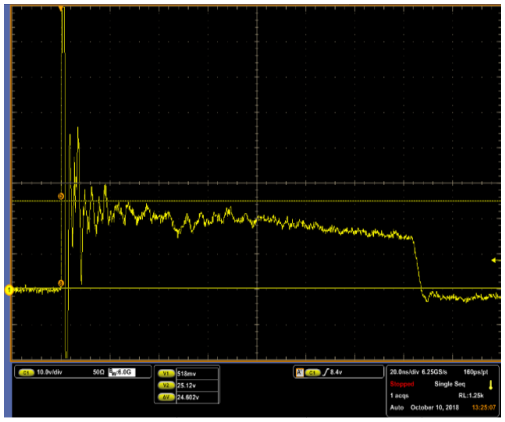
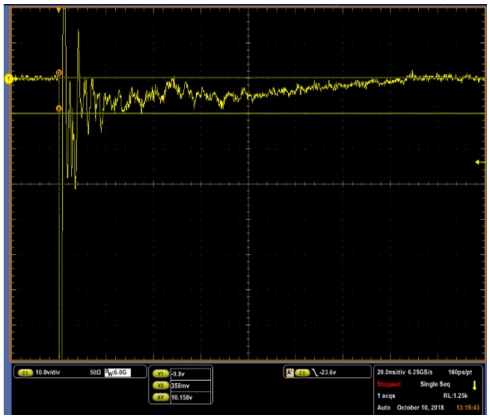
General Purpose ESD Protection - AQHVxx-01LTG Series

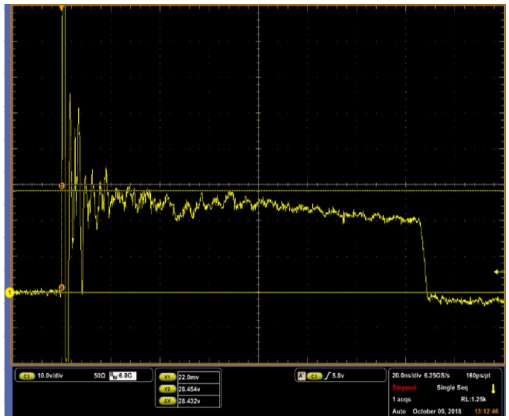
AQHV12 +8kV Contact ESD Clamping Voltage



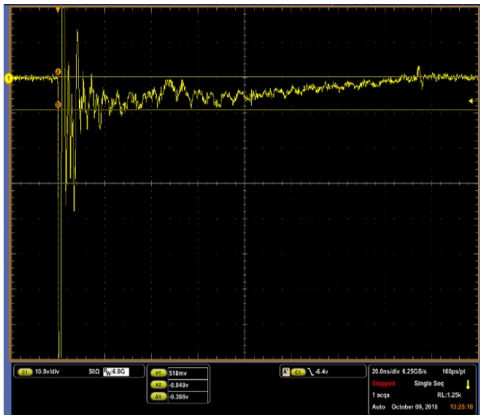
AQHV12 -8kV Contact ESD Clamping Voltage



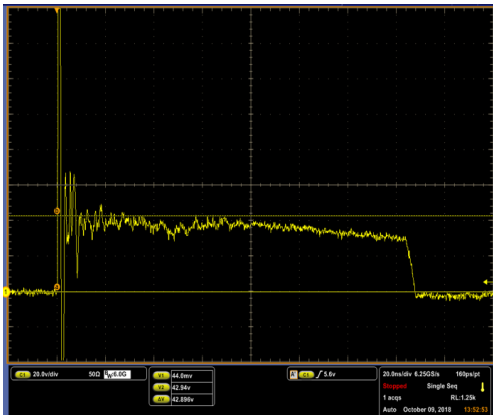
AQHV15 +8kV Contact ESD Clamping Voltage



AQHV15 -8kV Contact ESD Clamping Voltage



AQHV24 +8kV Contact ESD Clamping Voltage



AQHV24 -8kV Contact ESD Clamping Voltage

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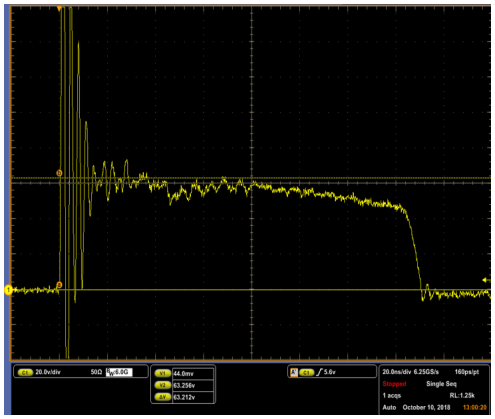
General Purpose ESD Protection - AQHVxx-01LTG Series

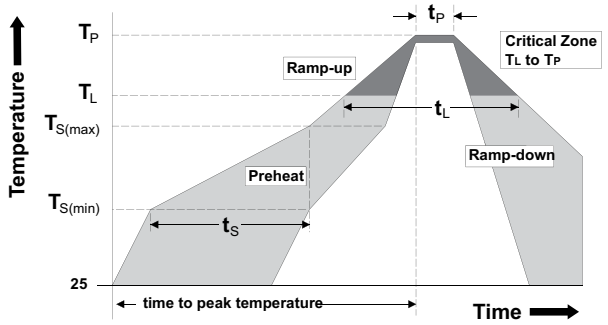
AQHV36 +8kV Contact ESD Clamping Voltage



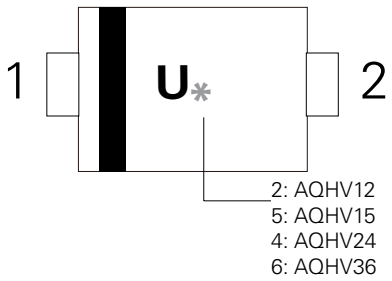
AQHV36 -8kV Contact ESD Clamping Voltage

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 – 180 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)		20 – 40 seconds
Ramp-down Rate		6°C/second max
Time 25°C to peak Temperature (T_P)		8 minutes Max.
Do not exceed		260°C



Part Marking System



Product Characteristics

Lead Plating	Matte Tin
Lead Material	Copper Alloy
Substrate Material	Silicon
Body Material	Molded Compound
Flammability	UL Recognized compound meeting flammability rating V-0

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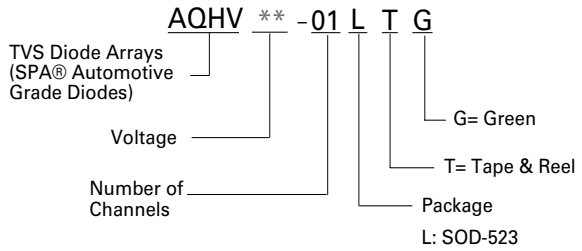
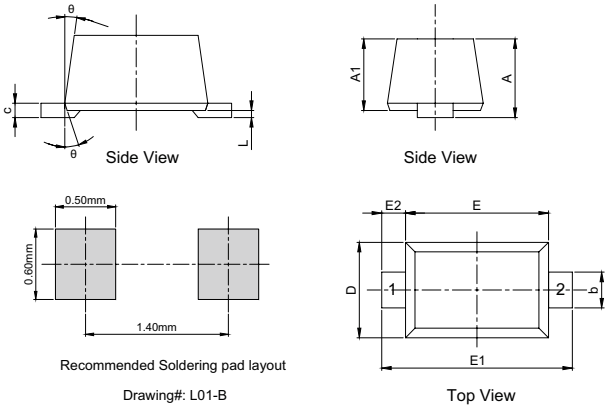
Part Numbering System



Ordering Information

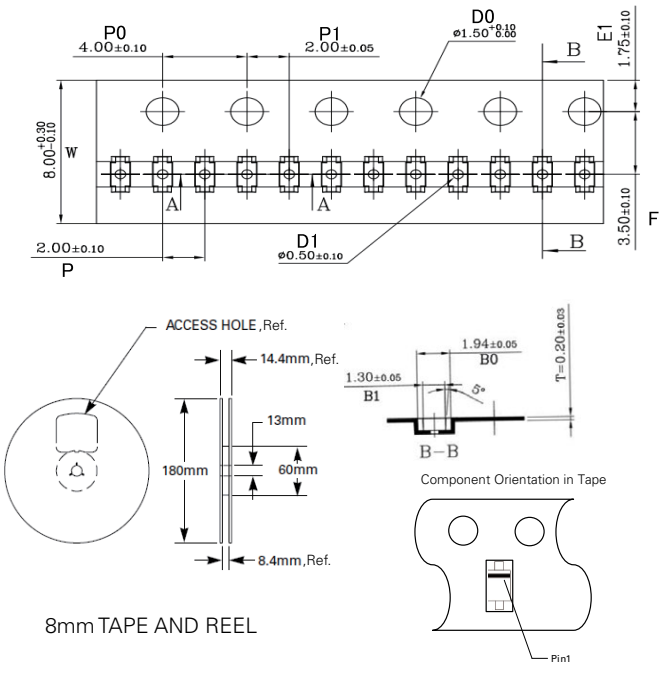
Part Number	Package	Min. Order Qty.
AQHV12-01LTG	SOD-523	5000
AQHV15-01LTG		
AQHV24-01LTG		
AQHV36-01LTG		

Package Dimensions — SOD-523



Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A	0.51	0.77	0.020	0.030
A1	0.50	0.70	0.020	0.028
b	0.25	0.35	0.010	0.014
c	0.08	0.15	0.003	0.006
D	0.70	0.90	0.028	0.035
E	1.10	1.30	0.043	0.051
E1	1.50	1.70	0.059	0.067
E2	0.20 REF		0.001 REF	
L	0.01	0.07	0.000	0.003
Θ	7° REF		7° REF	

Embossed Carrier Tape & Reel Specification — SOD-523



Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A0	0.91	1.01	0.036	0.040
B0	1.89	1.99	0.074	0.078
D0	1.50	1.60	0.059	0.063
D1	0.40	0.60	0.016	0.024
E1	1.65	1.85	0.065	0.073
F	3.40	3.60	0.134	0.142
P0	3.90	4.10	0.154	0.161
P	1.90	2.10	0.075	0.083
P1	1.95	2.05	0.077	0.081
K0	0.68	0.78	0.027	0.031
T	0.17	0.23	0.007	0.009
W	7.90	8.30	0.311	0.327

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