

General Description

BCD ITVS (Integrated Transient Voltage Suppression) devices are designed and built using a BCD proprietary process based on BCD standard technology. These devices integrate various diodes, transistors and resistors required to build these ITVS products. These diodes and transistors feature low parasitic resistance and the diodes also exhibit low capacitance. Using these devices, BCD is able to design voltage clamping products where low capacitance associated with low dynamic resistance is required.

The BCD AT1020 is a general purpose, high performance and low cost device suitable for protecting high speed data interfaces. The AT1020 is a unique design integrating low capacitance steering diodes and a clamping cell, specially created to protect sensitive components connected to data and transmission lines.

The AT1020 is available in SOT-23-5 package. This package allows simple and optimal placement in existing high-speed PCB layout.

Features

- Low Clamping Voltage:
Typical 7V at 10A 100ns, TLP, VCC to VSS
Typical 9V at 10A 100ns, TLP, I/O to VSS
9.5V at 12A 8 μ s/20 μ s, VCC to VSS
9.6V at 6A 8 μ s/20 μ s, I/O to VSS
- IEC 61000-4-2:
±30kV (VCC to VSS, Air)
±30kV (VCC to VSS, Contact)
- IEC 61000-4-2:
+28kV, -20kV (I/O to VSS, Air)
+25kV, -16kV (I/O to VSS, Contact)
- IEC 61000-4-5: ±12A (VCC to VSS)
- IEC 61000-4-5: ±6A (I/O to VSS)
- Input Capacitance from I/O to VSS: 0.65pF
- TLP Dynamic Resistance, VCC to VSS: 0.1 Ω
- TLP Dynamic Resistance, I/O to VSS: 0.25 Ω
- Monolithic Silicon Technology

Application

- USB 2.0 Power/Data Lines Protection
- HDMI 1.3, High Definition Multi Media
- IEEE 1394
- Laptop and Personal Computers
- Flat Panel Displays
- Video Graphics Cards
- SIM Ports

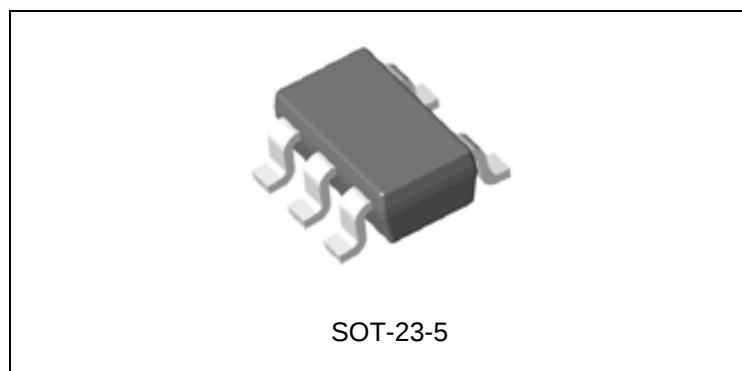


Figure 1. Package Type of AT1020

Pin Configuration

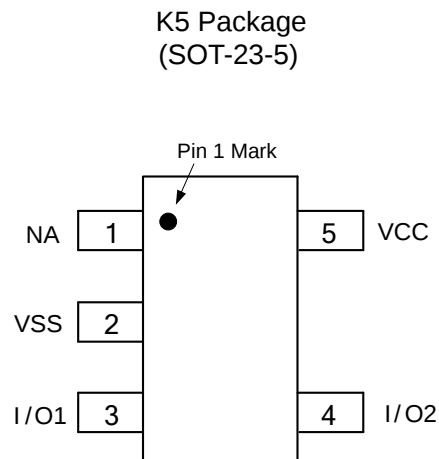


Figure 2. Pin Configuration of AT1020 (Top View)

Circuit Diagram

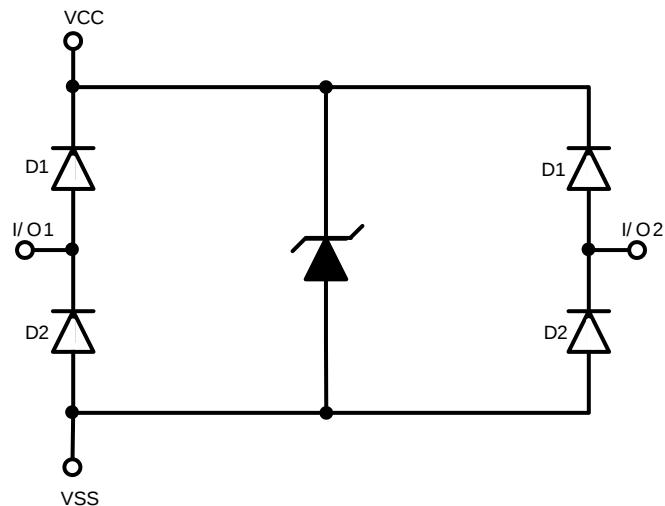
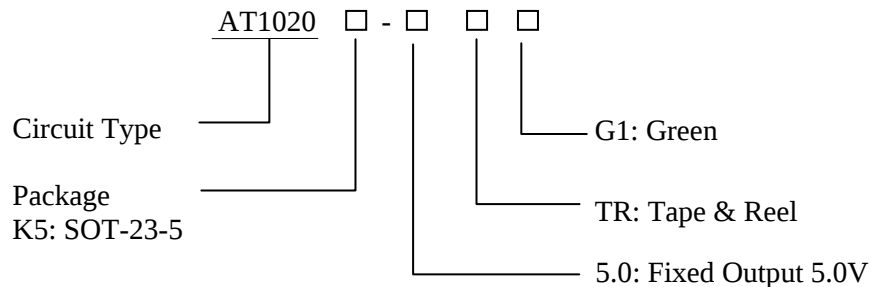


Figure 3. Circuit Diagram of AT1020

**General Purpose ITVS, 2 I/Os, $C_{I/O-VSS} < 1.1\text{pF}$, with V_{CC}** **AT1020****Ordering Information**

Package	Temperature Range	Part Number	Marking ID	Packing Type
SOT-23-5	-55 to 85°C	AT1020K5-5.0TRG1	GFO	Tape & Reel

BCD Semiconductor's Pb-free products, as designated with "G1" suffix in the part number, are RoHS compliant and green.

Absolute Maximum Ratings (Note 1)

Parameter	Symbol	Value	Unit
Peak Pulse Current (tp 8μs/20μs), VCC to VSS	$I_{PP(VCC-VSS)}$	±12	A
Peak Pulse Current (tp 8μs/20μs), I/O to VSS	$I_{PP(I/O-VSS)}$	±6	A
Operating Voltage (DC)		5.5	V
IEC61000-4-2 ESD (Air)	VCC to VSS	±30	kV
	I/O to VSS, VCC Floating	+28/-20	
IEC61000-4-2 ESD (Contact)	VCC to VSS	±30	kV
	I/O to VSS, VCC Floating	+25/-16	
IEC61000-4-5 (Lightning)	VCC to VSS	12	A
		120	W
	I/O to VSS	6	A
		60	W
Lead Temperature (Soldering, 10sec)	T_{LEAD}	260	°C
Operating Temperature		-55 to 85	°C
Storage Temperature		-55 to 150	°C

Note 1: Stresses greater than those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “Recommended Operating Conditions” is not implied. Exposure to “Absolute Maximum Ratings” for extended periods may affect device reliability.

**General Purpose ITVS, 2 I/Os, $C_{I/O-VSS} < 1.1\text{pF}$, with V_{CC}** **AT1020****Electrical Characteristics** $T_A = 25^\circ\text{C}$, unless otherwise specified.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Working Voltage, VCC to VSS		Pin 5 to Pin 2	-0.7		5.0	V
Channel Leakage Current	I_{R-CH}	$V_{CC}=5\text{V}, V_{SS}=0\text{V}$			1	μA
Reverse Leakage Current	I_R	$V_{CC}=5\text{V}$, Pin 2 to Pin 5			2	μA
Reverse Breakdown Voltage, VCC to VSS	V_{BR}	$I_{BV}=1\text{mA}$	5.5			V
Holding Voltage	V_H		5.25			V
Clamping Voltage (Lightning) (IEC61000-4-5)	VCC to VSS	At 12A		9.5		V
	I/O to VSS	At 6A		9.6		V
Trigger Voltage	VCC to VSS	V_{TRIG}		8		V
	I/O to VSS			9		V
ESD Clamping Voltage	VCC to VSS	At 10A, TLP, 100ns		7		V
	I/O to VSS			9		V
Differential Clamping Resistance	VCC to VSS	R_{DIFF-F}		0.1		Ω
	I/O to VSS			0.25		Ω
Channel Input Capacitance	I/O to VSS	$V_{I/O}=2.5\text{V}, V_{CC}=5\text{V},$ $V_{SS}=0\text{V}, f=1\text{MHz}$		0.65	1.1	pF

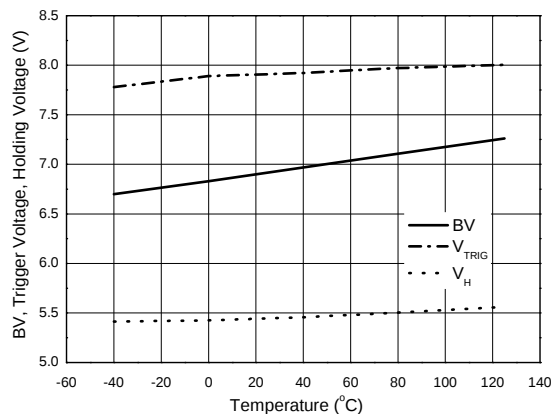
Typical Performance Characteristics $T_A = 25^\circ\text{C}$, unless otherwise specified.

Figure 4. BV, Trigger Voltage, Holding Voltage vs. Temperature

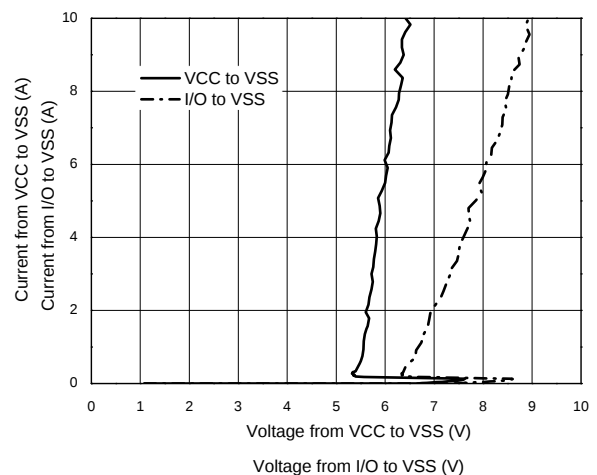


Figure 5. Current vs. Voltage

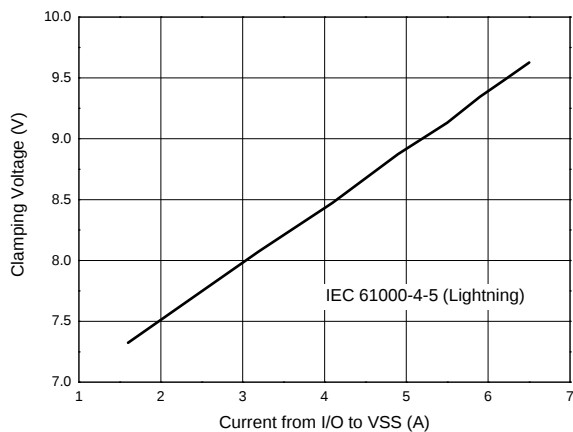
**Typical Performance Characteristics (Continued)** $T_A = 25^\circ\text{C}$, unless otherwise specified.

Figure 6. Clamping Voltage
vs. Current from I/O to VSS ($8\mu\text{s}/20\mu\text{s}$)

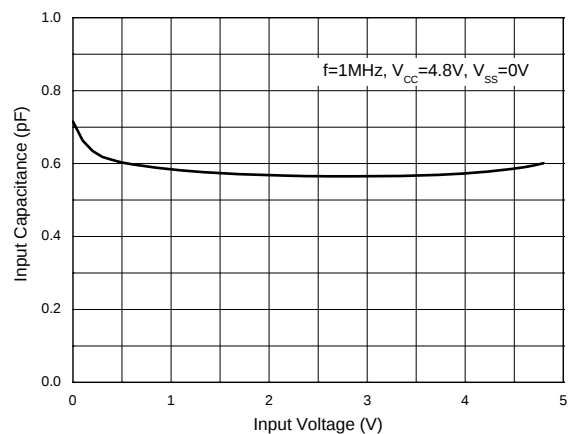


Figure 7. Input Capacitance vs. Input Voltage

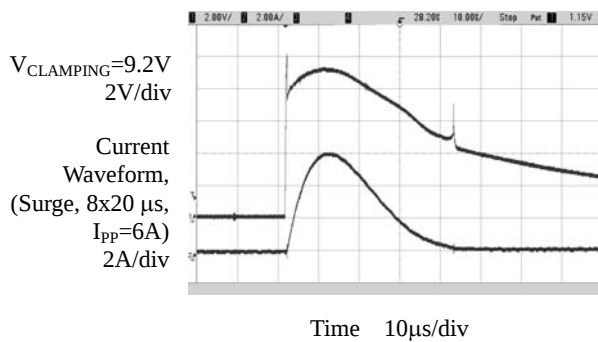


Figure 8. Waveform of I/O to GND (Positive)

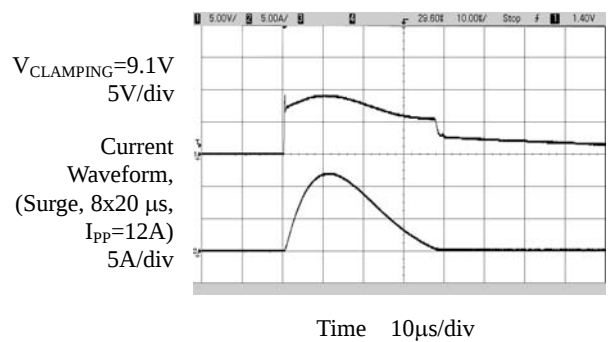
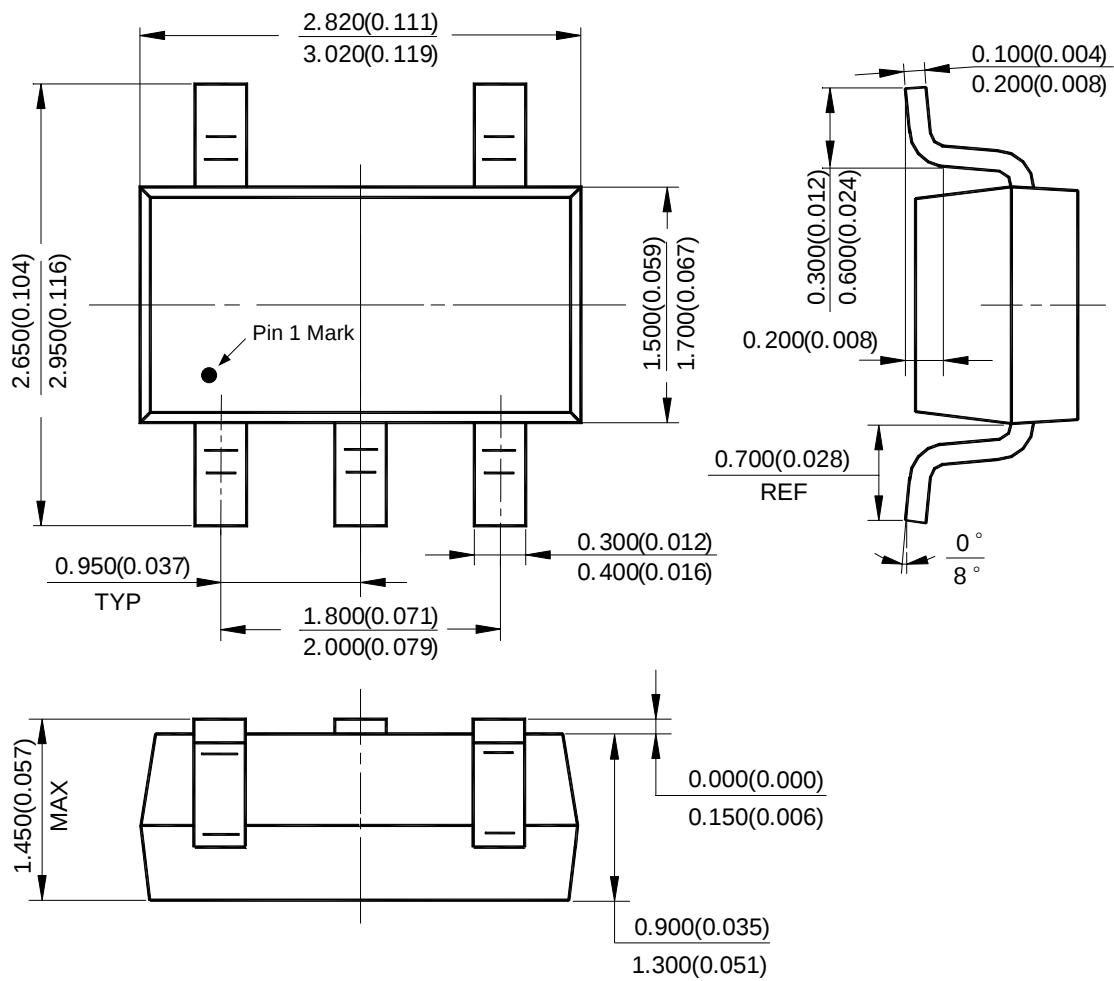


Figure 9. Waveform of VCC to VSS (Positive)

Mechanical Dimensions

SOT-23-5

Unit: $\frac{\text{mm}(\text{inch})}{\text{mm}(\text{inch})}$ MIN
MAX




BCD Semiconductor Manufacturing Limited

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