

High Performance ITVS, 4 I/Os, $C_{I/O-VSS} < 0.6\text{pF}$, V_{CC} with Blocking Diodes AT2140

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 the 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 AT2140 is a general purpose, high performance and low cost device suitable for protecting high speed data interfaces. The AT2140 is a unique design integrating low capacitance steering diodes and a clamping cell with associated blocking diodes, specially created to protect sensitive components connected to data transmission lines.

The AT2140 is available in SOT-23-6 package. This package allows simple and optimal placement in existing high-speed PCB layout.

Features

- Low Clamping Voltage:
Typical 8V 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
8.5V at 6A 8 μ s/20 μ s, I/O to VSS
- IEC 61000-4-2:
 $\pm 30\text{kV}$ (VCC to VSS, Air)
 $\pm 30\text{kV}$ (VCC to VSS, Contact)
- IEC 61000-4-2:
+28kV, -15kV (I/O to VSS, Air)
+24kV, -14kV (I/O to VSS, Contact)
- IEC 61000-4-5: $\pm 12\text{A}$ (VCC to VSS)
- IEC 61000-4-5: $\pm 6\text{A}$ (I/O to VSS)
- TLP Dynamic Resistance, I/O to VSS: 0.3 Ω
- Monolithic Silicon Technology

Applications

- HDMI 1.3, High Definition Multi Media
- IEEE 1394
- Laptop and Personal Computers
- Flat Panel Displays
- Video Graphics Cards
- SIM Ports

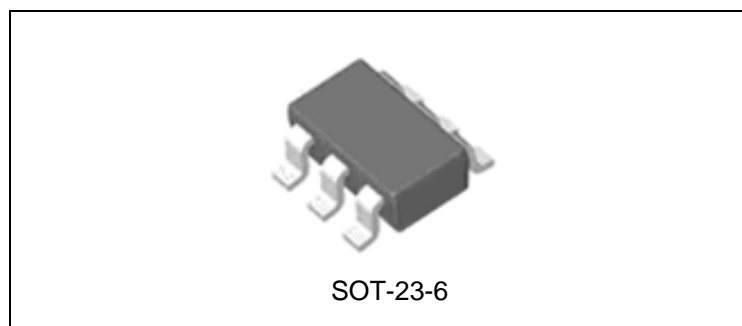


Figure 1. Package Type of AT2140

Pin Configuration

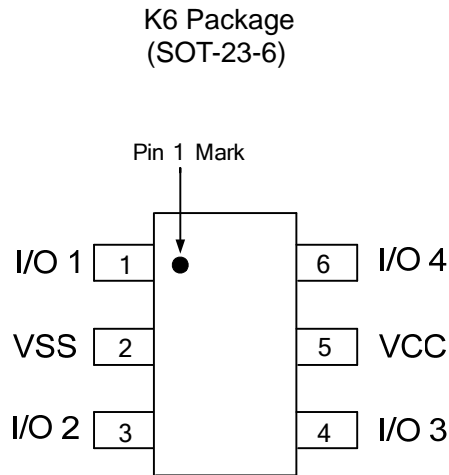


Figure 2. Pin Configuration of AT2140 (Top View)

Circuit Diagram

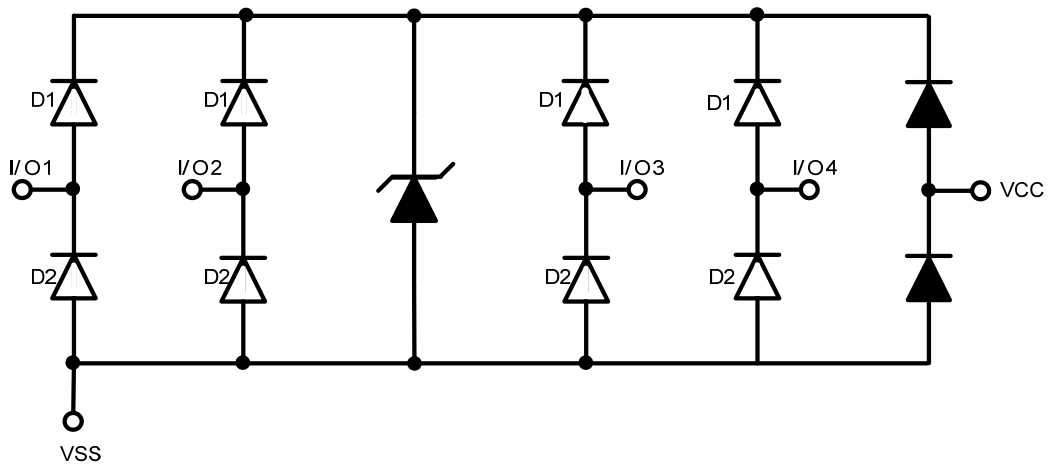
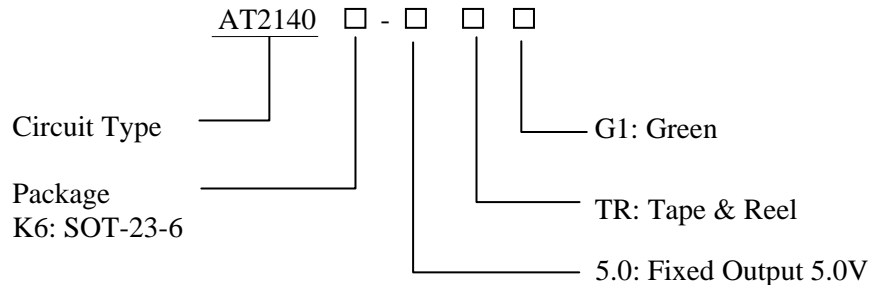


Figure 3. Circuit Diagram of AT2140

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Ordering Information



Package	Temperature Range	Part Number	Marking ID	Packing Type
SOT-23-6	-55 to 85°C	AT2140K6-5.0TRG1	GJQ	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/-15	
IEC61000-4-2 ESD (Contact)	VCC to VSS	±30	kV
	I/O to VSS, VCC Floating	+24/-14	
IEC61000-4-5 (Lightning)	VCC to VSS	12	A
		120	W
	I/O to VSS	6	A
		54	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.



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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	$V_{CC}=5\text{V}, V_{SS}=0\text{V}$			1	μA
Reverse Breakdown Voltage, VCC to VSS	V_{BR}	$I_{BV}=1\text{mA}$	6			V
Holding Voltage	V_H		5.5			V
Clamping Voltage (Lightning) (IEC61000-4-5)	VCC to VSS	At 12A		9.5		V
	I/O to VSS	At 6A		8.5		V
Trigger Voltage	VCC to VSS	V_{TRIG}		8.5	9.5	V
	I/O to VSS			8.5	9.5	V
ESD Clamping Voltage	VCC to VSS	At 10A, TLP, 100ns		8		V
	I/O to VSS			9		V
Dynamic Resistance	VCC to VSS			0.2		Ω
	I/O to VSS			0.3		Ω
Channel Input Capacitance	I/O to VSS	$C_{I/O}$	$V_{I/O}=2.5\text{V}, V_{CC}=5\text{V}, V_{SS}=0\text{V}, f=1\text{MHz}$	0.525	0.6	pF

Typical Performance Characteristics

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

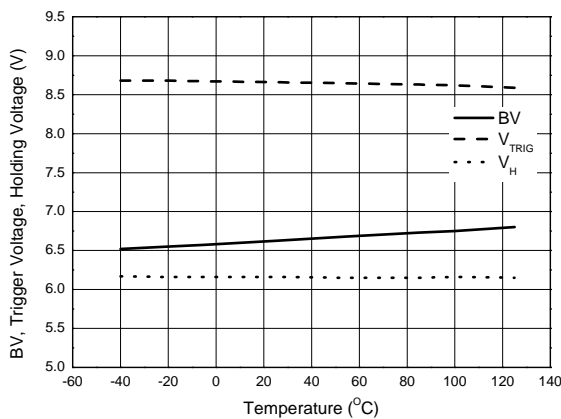


Figure 4. BV, Trigger Voltage, Holding Voltage vs. Temperature

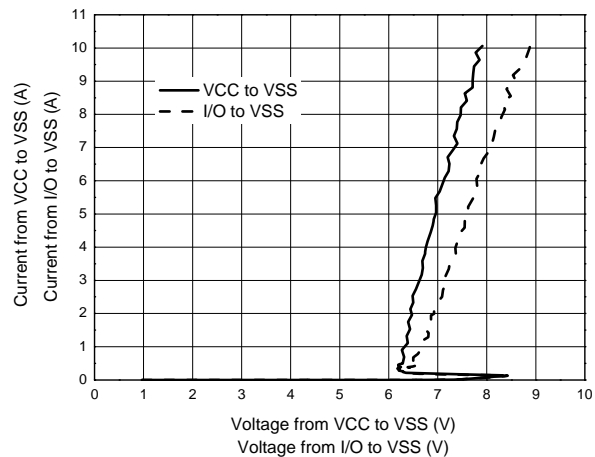


Figure 5. Current vs. Voltage

Typical Performance Characteristics (Continued)

$T_A = 25^\circ C$, unless otherwise specified.

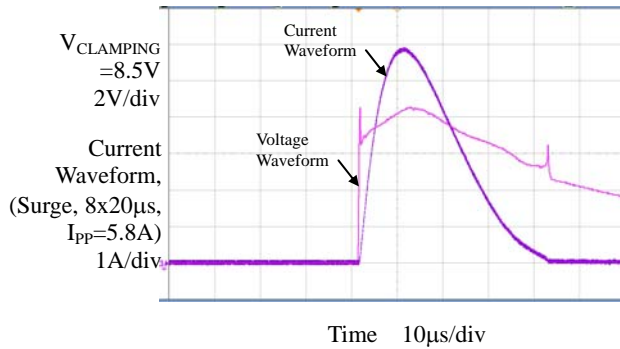


Figure 6. Waveform of I/O to GND (Positive)

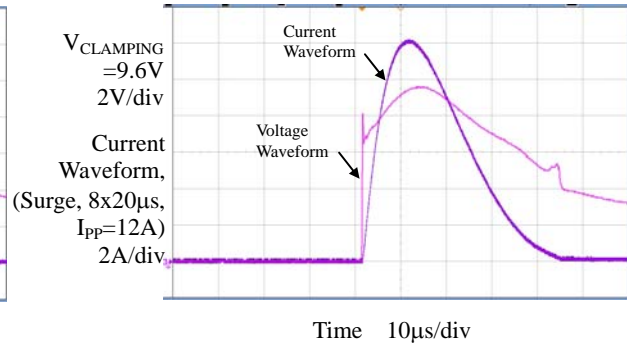


Figure 7. Waveform of VCC to VSS (Positive)

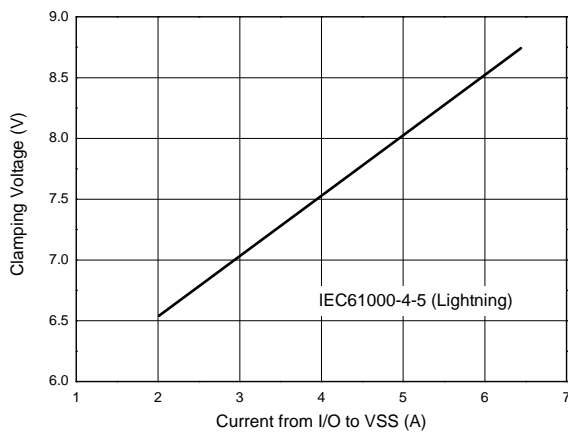
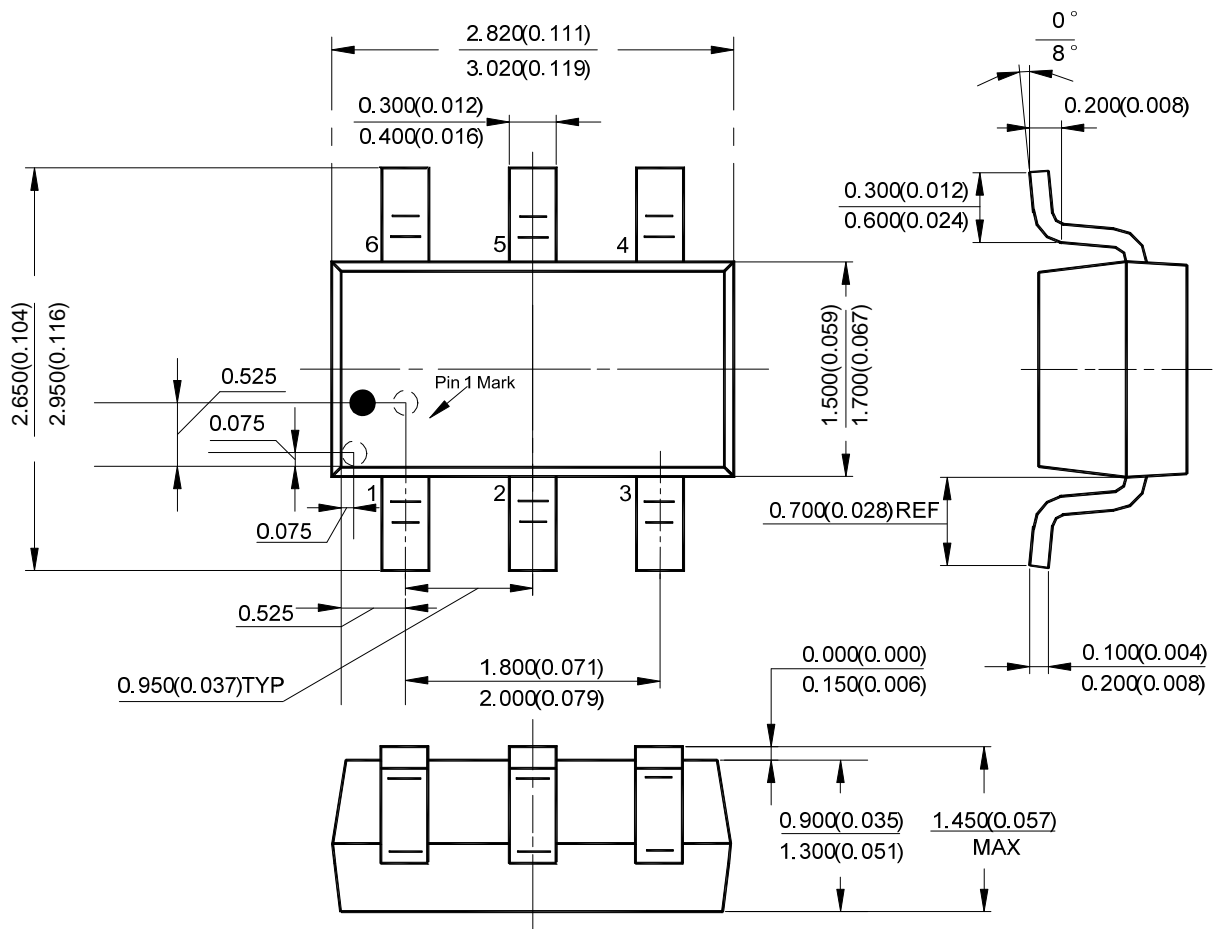


Figure 8. Clamping Voltage vs. Current from I/O to VSS (8µs/20µs)

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MAX

Note: Pin1 Dot \varnothing 0.15mm
Pin1 Dot area 0.6mm*0.6mm



BCD Semiconductor Manufacturing Limited

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