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[Alpha & Omega Semiconductor Inc.](#)  
[AOZ8040DI](#)

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# AOZ8040

## 8-Line EMI Filter with Integrated ESD Protection

### General Description

The AOZ8040 is an 8-line device integrating EMI filtering with ESD protection for each line. It is designed to suppress unwanted EMI/RFI signals and provide electrostatic discharge (ESD) protection in portable electronic equipment. This state-of-the-art device utilizes AOS leading edge Trench Vertical Structure [TVS]<sup>2</sup>™ technology for superior clamping performance and filter attenuation over the full operating display range. The AOZ8040 has been optimized for protection of color LCD displays and CCD camera lines in cellular phones and other portable consumer electronic devices.

The AOZ8040 consists of eight identical circuits comprised of TVS diodes for ESD protection, and a resistor–capacitor network for EMI/RFI filtering. A series resistor value of  $100\Omega$  and a capacitance value of  $9\text{pF}$  are used to achieve -20dB minimum attenuation from 1.0GHz to 3.0GHz. The TVS diodes provide effective suppression of ESD voltages in excess of  $\pm 20\text{kV}$  (air discharge) and  $\pm 20\text{kV}$  (contact discharge). This exceeds IEC 61000-4-2, level 4 ESD immunity test.

The AOZ8040 comes in an RoHS compliant, 1.2mm x 3.5mm, 0.4mm pitch DFN package and is rated over a  $-40^\circ\text{C}$  to  $+85^\circ\text{C}$  ambient temperature range.

### Typical Application

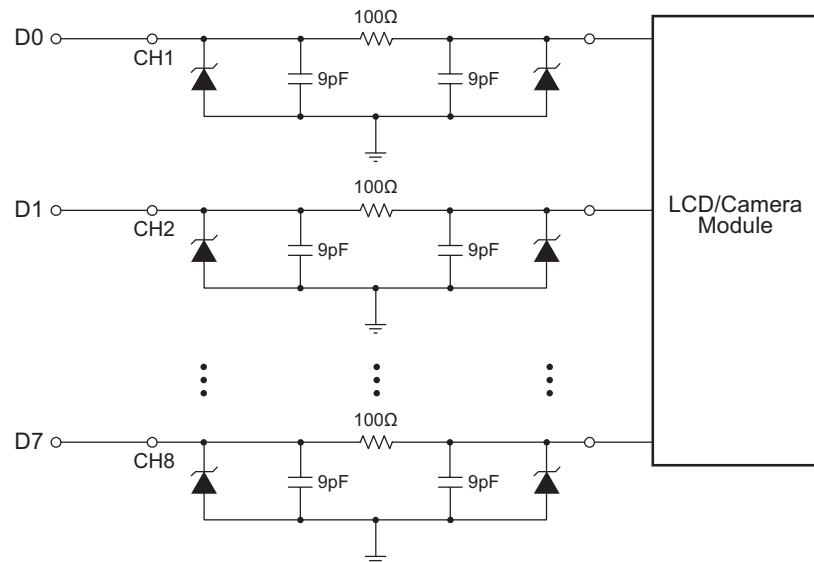


Figure 1.

### Features

- 8 lines for EMI filtering and ESD protection:
  - Exceeds IEC 61000-4-2, level 4 (ESD) immunity test
  - $\pm 20\text{kV}$  (air discharge) and  $\pm 20\text{kV}$  (contact discharge)
- Trench Vertical Structure [TVS]<sup>2</sup>™ based technology used to achieve excellent ESD clamping & filter performance over the full operating display range
- Filter performance: -20db attenuation from 1.0GHz to 3.0GHz
- Low operating voltage: 5.0V
- Capacitance stability over wide range of voltages and temperatures
- DFN package: 1.2mm x 3.5mm, 0.4mm pitch
- Pb-Free device
- Green product

### Applications

- EMI filtering and ESD protection for data lines
- LCD displays, camera interface, I/O interface
- Portable handheld devices, cell phones, PDA phones

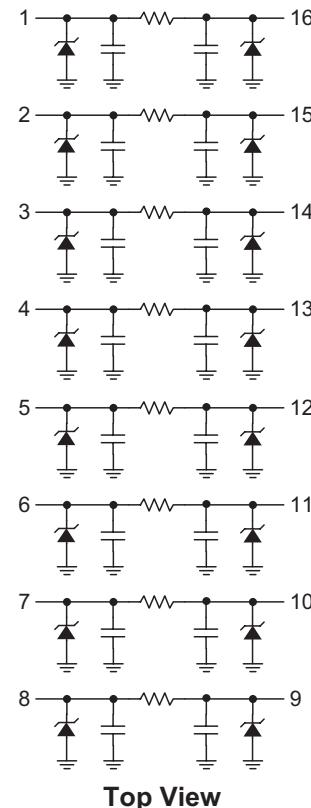
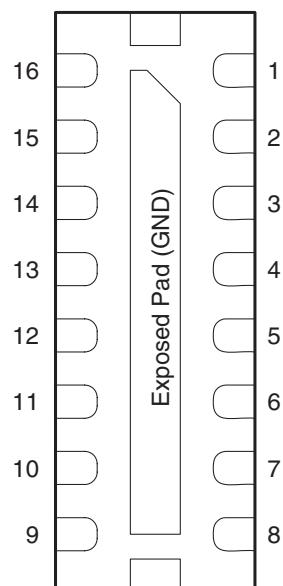


**Ordering Information**

Part Number	Ambient Temperature Range	Package	Environmental
AOZ8040DI	-40°C to +85°C	DFN-16	RoHS Compliant Green Product



AOS Green Products use reduced levels of Halogens, and are also RoHS compliant.

Please visit [www.aosmd.com/web/quality/rohs\\_compliant.jsp](http://www.aosmd.com/web/quality/rohs_compliant.jsp) for additional information.**Pin Configuration****Pin Description**

Pin Number	Pin Name	Pin Function
1,16	CH 1	Channel 1 Connections
2, 15	CH 2	Channel 2 Connections
3, 14	CH 3	Channel 3 Connections
4, 13	CH 4	Channel 4 Connections
5, 12	CH 5	Channel 5 Connections
6, 11	CH 6	Channel 6 Connections
7, 10	CH 7	Channel 7 Connections
8, 9	CH 8	Channel 8 Connections
Exposed Pad	GND	Common Ground Connection

## Absolute Maximum Ratings

Exceeding the Absolute Maximum ratings may damage the device.

Parameter	Rating
Storage Temperature ( $T_S$ )	-65°C to +150°C
ESD Rating per IEC61000-4-2, contact <sup>(1)</sup>	±20kV
ESD Rating per IEC61000-4-2, air <sup>(1)</sup>	±20kV
ESD Rating per Human Body Model <sup>(2)</sup>	±30kV

**Notes:**

1. IEC 61000-4-2 discharge with  $C_{\text{Discharge}} = 150\text{pF}$ ,  $R_{\text{Discharge}} = 330\Omega$ .
2. Human Body Discharge per MIL-STD-883, Method 3015  $C_{\text{Discharge}} = 100\text{pF}$ ,  $R_{\text{Discharge}} = 1.5\text{k}\Omega$ .

## Electrical Characteristics

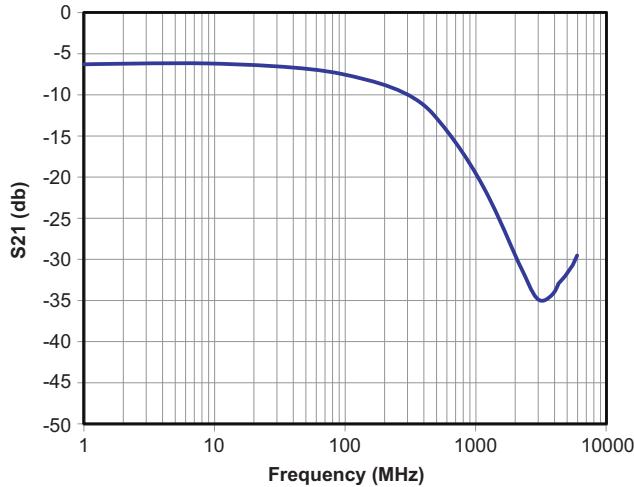
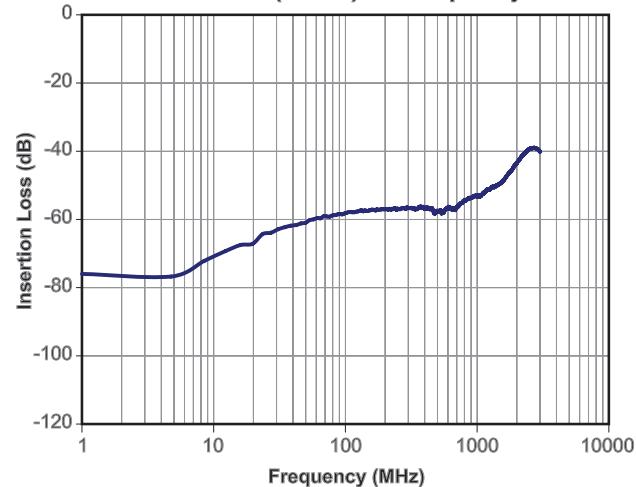
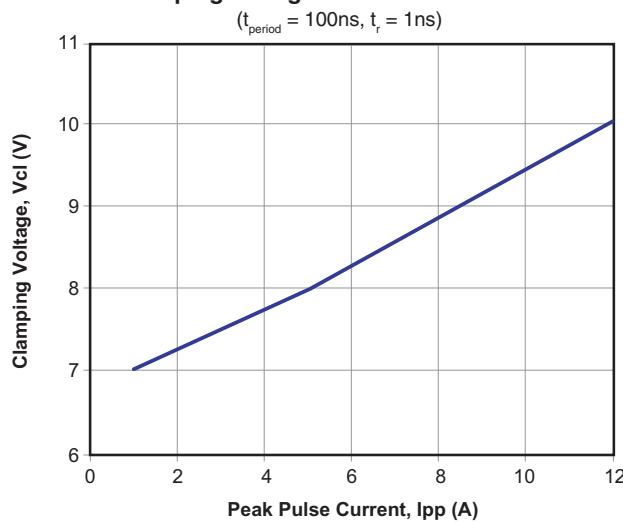
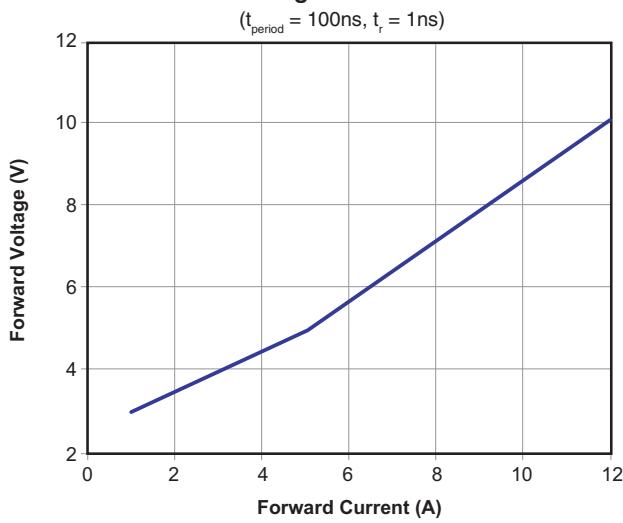
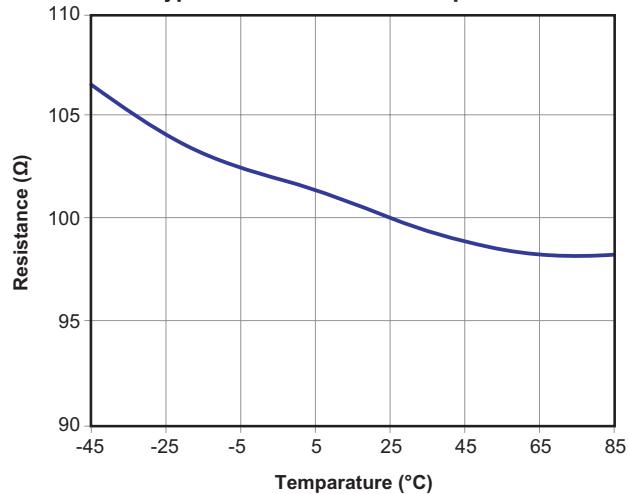
$T_A = 25^\circ\text{C}$  unless otherwise specified.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
$V_{\text{RWM}}$	Reverse Working Voltage	(3)			5.0	V
$V_{\text{BR}}$	Reverse Breakdown Voltage	$I_T = 1\text{mA}$ <sup>(4)</sup>	6	7	8	V
$I_R$	Reverse Leakage Current	$V_{\text{RWM}} = 3.3\text{V}$			0.1	$\mu\text{A}$
$V_{\text{CL}}$	Signal Clamp Voltage	$I_{\text{LOAD}} = 1\text{A}$ , positive clamp <sup>(5)(8)</sup>			7.0	V
		$I_{\text{LOAD}} = 1\text{A}$ , negative clamp <sup>(5)(8)</sup>			-3.0	
		$I_{\text{LOAD}} = 5\text{A}$ , positive clamp <sup>(5)(8)</sup>			8.0	
		$I_{\text{LOAD}} = 5\text{A}$ , negative clamp <sup>(5)(8)</sup>			-5.0	
		$I_{\text{LOAD}} = 12\text{A}$ , positive clamp <sup>(5)(8)</sup>			10.0	
		$I_{\text{LOAD}} = 12\text{A}$ , negative clamp <sup>(5)(8)</sup>			-10.0	
$R_{\text{CH}}$	Total Series Resistance	$I_R = 20\text{mA}$	90	100	110	$\Omega$
$C_{\text{CH}}$	Channel Capacitance	Input to Ground <sup>(6)(7)(8)</sup>	8	9	10	pF
$f_C$	Cut-off Frequency	Measured with $50\Omega$ source and $50\Omega$ load termination		250		MHz
	Attenuation from 1.0GHz to 3.0GHz	$V_R = 0\text{V}$ Measured with $50\Omega$ source and $50\Omega$ load termination		-20		dB

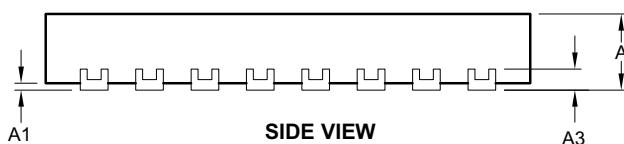
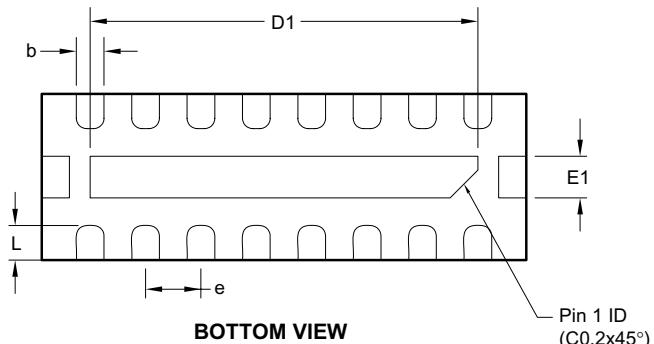
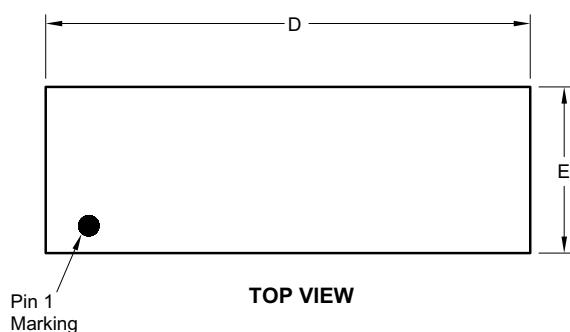
**Notes:**

3. The working peak reverse voltage,  $V_{\text{RWM}}$ , should be equal to or greater than the DC or continuous peak operating voltage level.
4.  $V_{\text{BR}}$  is measured at the pulse test current  $I_T$ .
5. Measurements performed using a 100ns Transmission Line Pulse (TLP) system.
6. Total capacitance is equal to  $2 \times C_{\text{CH}}$ .
7. Measured at  $25^\circ\text{C}$ ,  $V_R = 2.5\text{V}$ ,  $f = 1.0\text{MHz}$ .
8. Guaranteed by design.

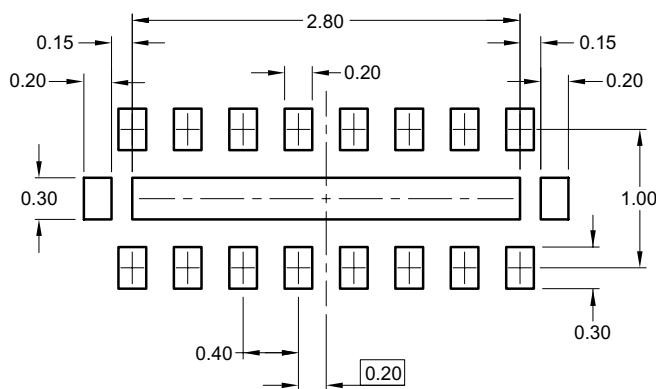
## Typical Performance Characteristics

**Insertion Loss Characteristics****Crosstalk (I/O-I/O) vs. Frequency****Clamping Voltage vs. Peak Pulse Current****Forward Voltage vs. Forward Current****Typical Resistance vs. Temperature**

## Package Dimensions, DFN 3.5 x 1.2, 16L



RECOMMENDED LAND PATTERN



Dimensions in millimeters

Symbols	Min.	Nom.	Max.
A	0.50	0.55	0.60
A1	0.00	—	0.05
A3	0.152 Ref.		
b	0.15	0.20	0.25
D	3.45	3.50	3.55
D1	2.75	2.80	2.85
E	1.15	1.20	1.25
E1	0.25	0.30	0.35
e	0.40 BSC		
L	0.20	0.25	0.30

Dimensions in inches

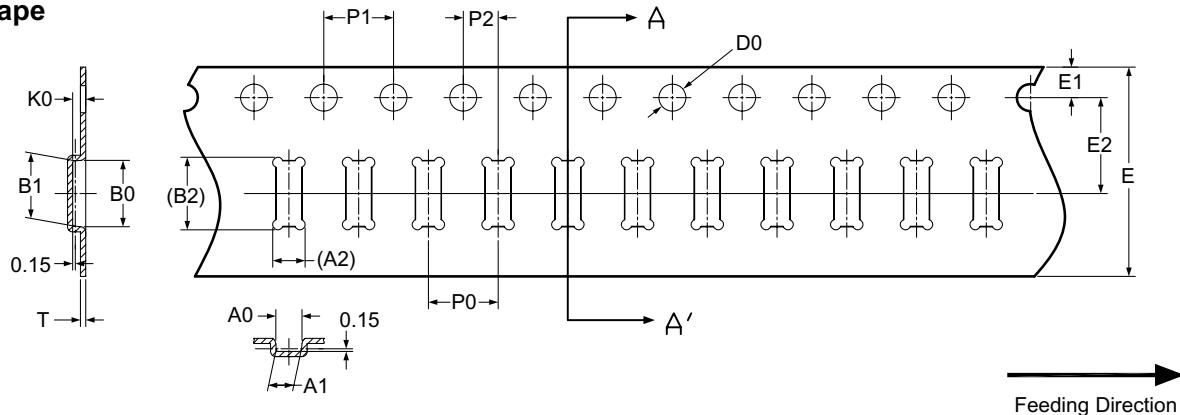
Symbols	Min.	Nom.	Max.
A	0.020	0.022	0.024
A1	0.000	—	0.002
A3	0.006 Ref.		
b	0.006	0.008	0.010
D	0.136	0.138	0.140
D1	0.108	0.110	0.112
E	0.045	0.047	0.049
E1	0.010	0.012	0.014
e	0.016 BSC		
L	0.008	0.010	0.012

## Notes:

1. All dimensions are in millimeters. Angles is degree.
2. Warpage shall not exceed 0.10mm.
3. Marking is for package orientation reference only.

## Tape &amp; Reel Dimensions, DFN 3.5 x 1.2, 16L

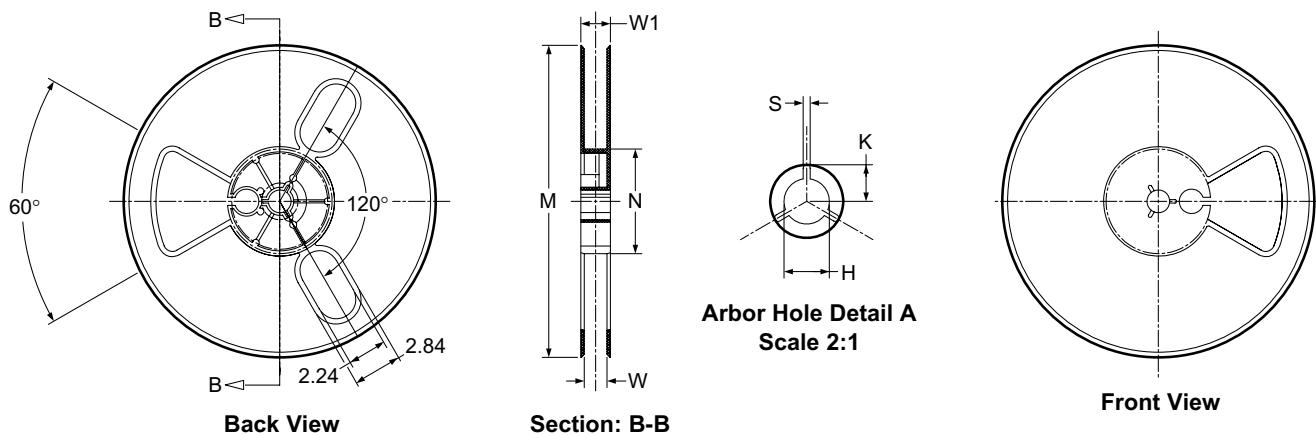
## Carrier Tape



UNIT: mm

Package	T	B0	B1	B2	A0	A1	A2	K0	D0	E	E1	E2	P0	P1	P2
DFN 3.5x1.2	0.30 ±0.05	3.80 ±0.1	3.75 ±0.1	4.16	1.50 ±0.1	1.45 ±0.1	1.86	0.75 ±0.1	ø1.55 ±0.05	12.00 ±0.3	1.75 ±0.1	5.50 ±0.05	4.00 ±0.10	4.0 ±0.1	2.00 ±0.05

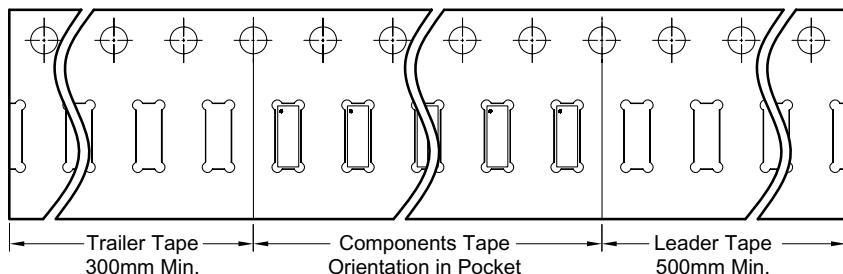
## Reel



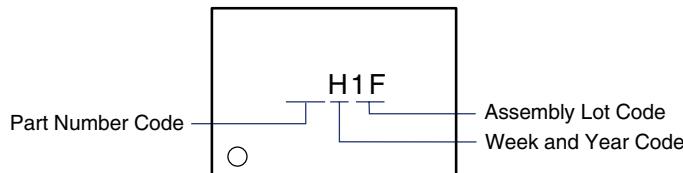
Unit: mm

Tape Size	Reel Size	M	N	W	W1	H	K	S
12mm	ø1800	ø179.0 +1.0	ø60.0 ±0.5	13.0 ±0.5	17.0	ø13.0 ±0.2	10.5 ±0.25	1.8 (Bottom)

## Leader/Trailer &amp; Orientation



## Package Marking



**Alpha & Omega Semiconductor reserves the right to make changes to this data sheet at any time without notice.**

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1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.
2. A critical component in any component of a life support, device, or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.