AOZ6184

High-Speed USB 2.0 (480 Mbps) DPDT Switch

General Description

The AOZ6184 is a low-voltage high-speed Double-Pole, Double-Throw (DPDT) switch for switching between two USB 2.0 (480 Mbps) sources. The device features very low on capacitance (3.6 pF typ.) and is designed to operate from a single 1.65 V to 4.5 V supply. The AOZ6184 features an ultra-low on resistance (8 Ω typ.), and low power consumption. The device also features fast switching and guaranteed Break-Before-Make (BBM) switching, assuring the switches never short the driver.

Features

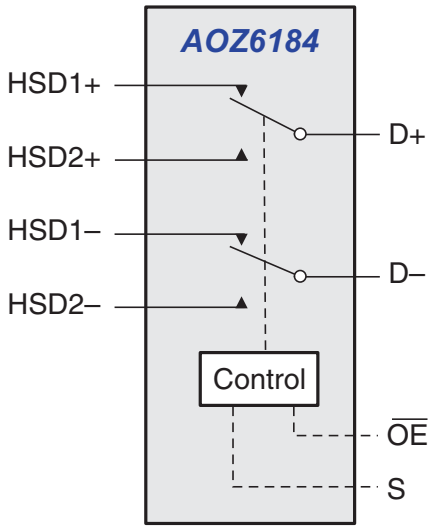
- Low On Resistance (R_{ON}) for 3.6 V supply (8 Ω)
- Low On Capacitance (C_{ON}) for 3.6 V supply (3.6 pF)
- Over-voltage tolerance (OVT) on all data ports up to 5.5 V
- QFN-10: 1.8 mm x 1.4 mm x 0.55 mm
- Broad 1.65 V to 4.50 V V_{CC} operating range
- Wide –3 dB bandwidth: 1.1 GHz typ.

Applications

- Cell phone
- PDA
- Portable media player

Green Product

Typical Application

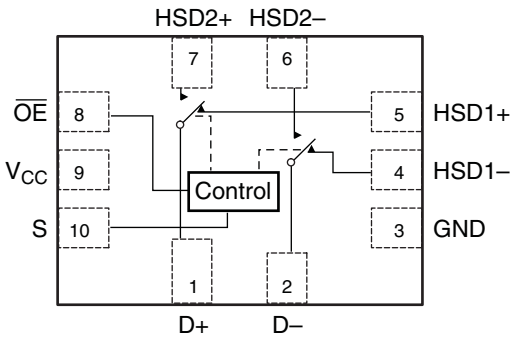


Ordering Information

Part Number	Ambient Temperature Range	Package	Environmental
AOZ6184QT	-40 °C to +85 °C	QFN-10	Green Product

AOS Green Products use reduced levels of Halogens, and are also RoHS compliant.
Please visit www.aosmd.com/media/AOSGreenPolicy.pdf for additional information.

Pin Configuration



QFN-10
(Top Thru View)

Pin Description

Pin Name	Function
S	Control Input
$\overline{OE}$	Output Enable
HSD1+, HSD1–, HSD2+, HSD2–, D+, D-	Data Ports

Truth Table

$\overline{OE}$	S	HSD1+, HSD1–	HSD2+, HSD2–
1	X	Off	Off
0	0	On	Off
0	1	Off	On

Absolute Maximum Ratings

Exceeding the Absolute Maximum Ratings may damage the device.

Symbol	Parameter		Rating
V_{CC}	Supply Voltage		-0.5 V to +5.5 V
V_S	Switch Voltage		-0.5 V to V_{CC} + 0.3 V
V_{IN}	Input Voltage		-0.5 V to +4.6 V
I_{IK}	Minimum Input Diode Current		-50 mA
I_{SW}	Switch Current		100 mA
T_{STG}	Storage Temperature Range		-65 °C to +150 °C
T_J	Maximum Junction Temperature		+150 °C
T_L	Lead Temperature (Soldering, 10 seconds)		+260 °C
ESD	Human Body Model	All Pins	3000 V
		I/O to GND	5000 V
		Power to GND	5000 V

Recommended Operating Conditions

The device is not guaranteed to operate beyond the Recommended Operating Conditions.

Symbol	Parameter	Rating
V_{CC}	Supply Voltage	1.65 V to 4.5 V
V_{IN}	Control Input Voltage[1]	0 V to V_{CC}
V_{SW}	Switch Input Voltage	0 V to V_{CC}
T_A	Operating Temperature	-40 °C to +85 °C

Note:
1. Unused inputs must be held HIGH or LOW. They may not float.

DC Electrical Characteristics

Unless otherwise indicated, specifications indicate a temperature range of -40 °C to +85 °C.
All typical values are at 25 °C unless otherwise specified.

Symbol	Parameter	Conditions	V_{CC} (V)	Min.	Typ.	Max.	Units
V_{CL}	Clamp Voltage	I_{IN} = -18 mA	3.0			-1.2	V
V_{IH}	Input Voltage HIGH		4.3	1.4			V
			2.7 to 3.6	1.3			
			2.3 to 2.7	1.1			
			1.65 to 1.95	0.9			
V_{IL}	Input Voltage LOW		4.3			0.7	V
			2.7 to 3.6			0.5	
			2.3 to 2.7			0.4	
			1.65 to 1.95			0.4	
I_{IN}	Control Input Leakage	V_{IN} = 0 V to V_{CC}	1.65 to 4.5	-1.0		1.0	µA
I_{OZ}	Off State Leakage	V_{IN} = 0 V to V_{CC}	1.65 to 4.5	-1.0		1.0	µA
I_{OFF}	Power OFF Leakage Current (I/O ports)	V_{IN} = 0 V to V_{CC}	0	-1.0		1.0	µA
R_{ON}	On−Resistance	I_{ON} = 8 mA, V_{IN} = 0 V to 0.4 V	4.3		7	10	Ω
			2.7 to 3.6		10	13	
			2.3 to 2.7		13	16	
Δ R_{ON}	On−Resistance Matching	I_{ON} = 8 mA, V_{IN} = 0 V to 0.4 V	4.3		0.6		Ω
			2.7 to 3.6		0.6		
			2.3 to 2.7		0.6		
$R_{FLAT (ON)}$	On−Resistance Flatness	I_{ON} = 8mA, V_{IN} = 0 V to 0.4 V	4.3		0.4		Ω
			2.7 to 3.6		1.5		
			2.3 to 2.7		1.8		
I_{CC}	Quiescent Supply Current	I_{OUT} = 0 mA	4.3			1.0	µA
I_{CCT}	Increase in I_{CC} per Input Control Voltage	$V_{Control}$ = 2.6 V	4.3		3.0	7.0	µA
		$V_{Control}$ = 1.8 V			7.0	15.0	

AC Electrical Characteristics

Unless otherwise indicated, specifications indicate a temperature range of -40 °C to +85 °C.
All typical values are at 25 °C unless otherwise specified.

Symbol	Parameter	Conditions	V_{CC} (V)	Min.	Typ.	Max.	Units
t_{ON}	Turn-On Time	R_L = 50 Ω, C_L = 5 pF	3.6 to 4.3		18	28	ns
			2.7 to 3.6		21	31	
			2.3 to 2.7		36	46	
			1.65 to 1.95		80	90	
t_{OFF}	Turn-Off Time	R_L = 50 Ω, C_L = 5 pF	3.6 to 4.3		11	21	ns
			2.7 to 3.6		11	21	
			2.3 to 2.7		14	25	
			1.65 to 1.95		59	70	
t_{PD}	Propagation Delay	R_L = 50 Ω, C_L = 5 pF	1.65 to 4.5		0.25		ns
t_{BBM}	Break-Before-Make	R_L = 50 Ω, C_L = 5 pF	1.65 to 4.5		6.2		ns
O_{IRR}	Off Isolation	R_L = 50 Ω, f = 240 MHz	1.65 to 4.5		-36		dB
X_{TALK}	Crosstalk	R_L = 50 Ω, f = 240 MHz	1.65 to 4.5		-40		dB
BW	-3 dB Bandwidth	R_L = 50 Ω, C_L = 0 pF	1.65 to 4.5		1.1		GHz

USB Hi-Speed AC Electrical Characteristics

Unless otherwise indicated, specifications indicate a temperature range of -40 °C to +85 °C.
All typical values are at 25 °C unless otherwise specified.

Symbol	Parameter	Conditions	V_{CC} (V)	Min.	Typ.	Max.	Units
t_{SK}	Skew of Opposite Transitions of the Same Output	R_L = 50 Ω, C_L = 5 pF	1.65 to 4.5		20		ps
t_J	Total Jitter	R_L = 50 Ω, C_L = 5 pF, $t_r = t_f$ = 500 ps (10% to 90%), f = 480MHz, PRBS = $2^{15} - 1$	1.65 to 4.5		200		ps

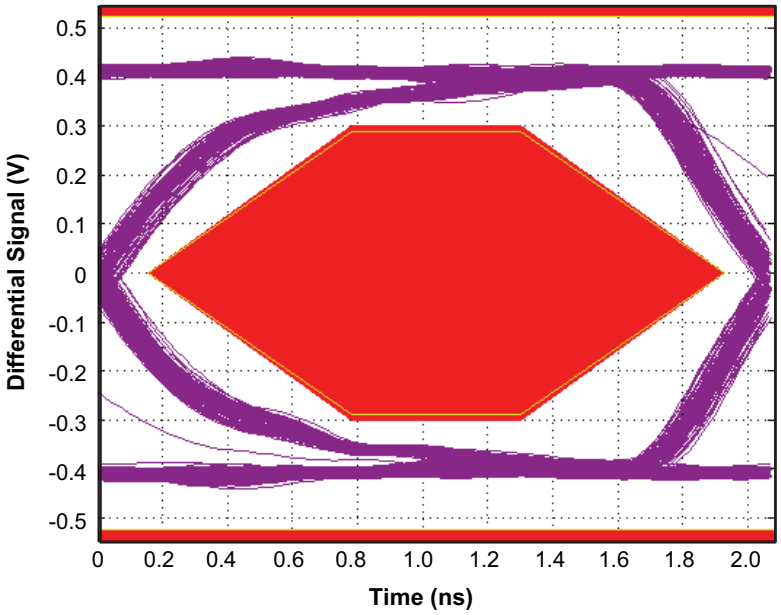
Capacitance

Unless otherwise indicated, specifications indicate a temperature range of -40 °C to +85 °C.
All typical values are at 25 °C unless otherwise specified.

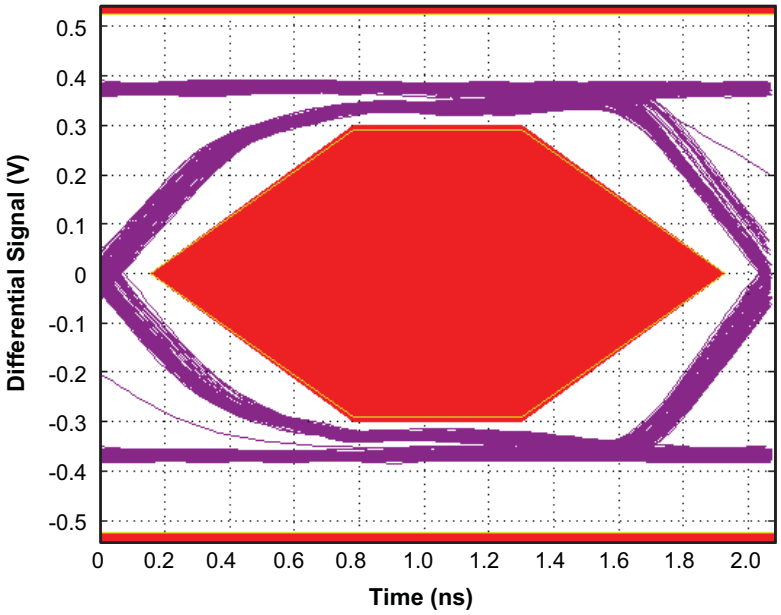
Symbol	Parameter	Conditions	V_{CC} (V)	Min.	Typ.	Max.	Units
C_{IN}	Control Pin Input Capacitance	1 MHz	3.3		1.7		pF
		10 MHz			1.7		
C_{ON}	D+/D- On Capacitance	$\overline{OE}$ = 0V, f = 1 MHz	3.3		3.6		
		$\overline{OE}$ = 0V, f = 10 MHz			3.8		
C_{OFF}	HSD1n/HSD2n Off Capacitance	$\overline{OE}$ = V_{CC}, f = 1 MHz	3.3		1.7		
		$\overline{OE}$ = 0V, f = 10 MHz			1.8		

Eye Patterns

480-Mbps USB Signal Without AOZ6184QT

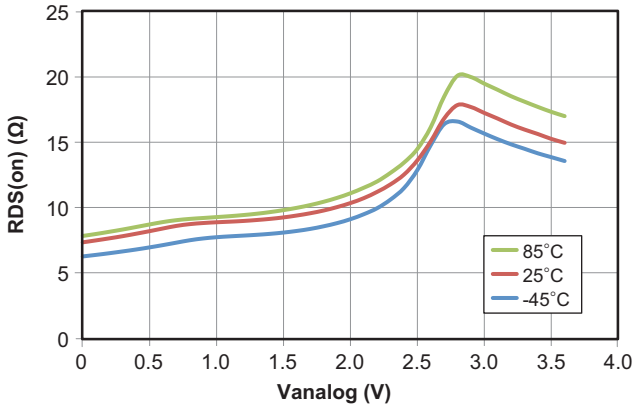


480-Mbps USB Signal With AOZ6184QT

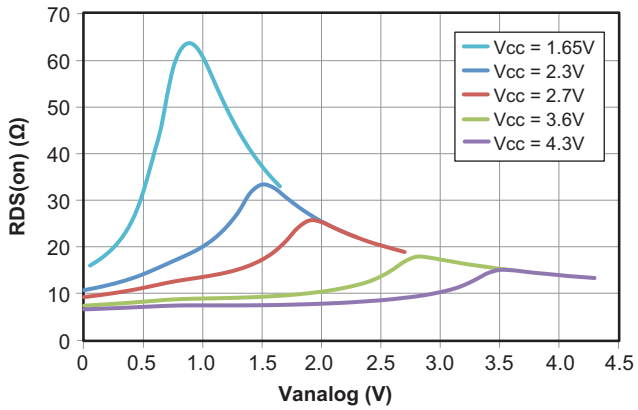


Typical Performance Characteristics

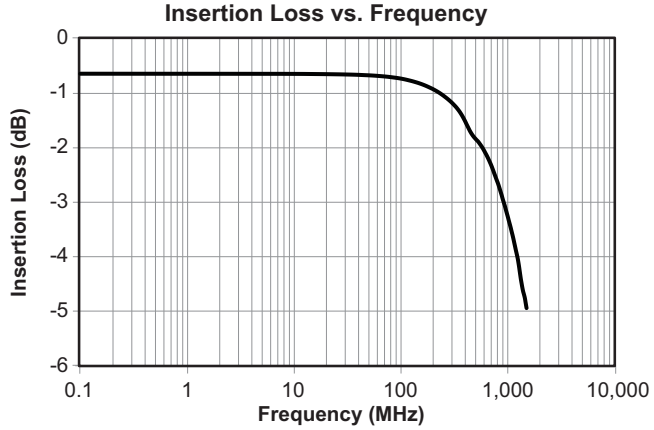
RDS(on) vs. Analog Voltage
(Vcc = 3.6V)



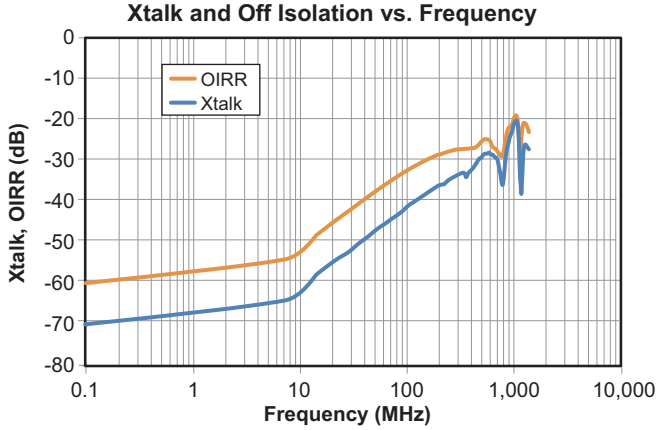
RDS(on) vs. Analog Voltage
(at 25°C)



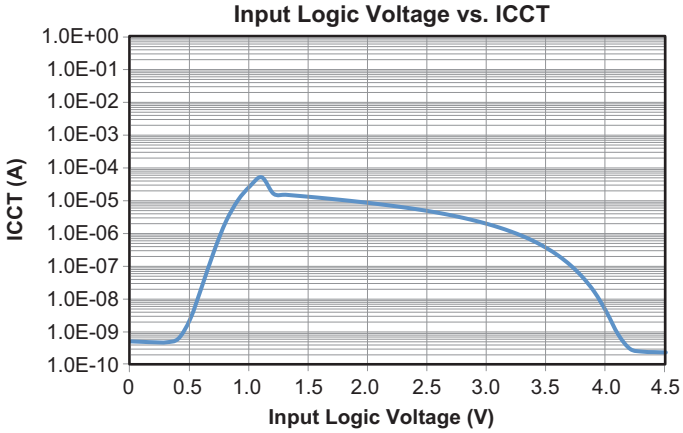
Insertion Loss vs. Frequency



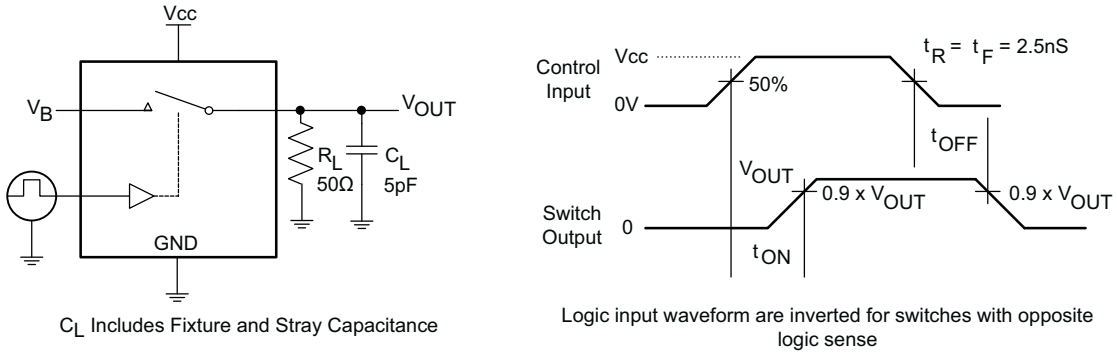
Xtalk and Off Isolation vs. Frequency



Input Logic Voltage vs. ICCT



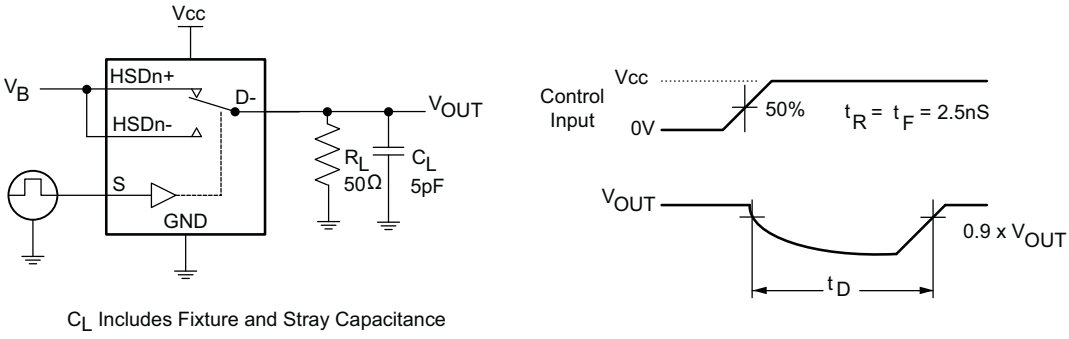
AC Loading and Waveforms



C_L Includes Fixture and Stray Capacitance

Logic input waveform are inverted for switches with opposite logic sense

Figure 1. Turn-On/Turn-Off Timing



C_L Includes Fixture and Stray Capacitance

Figure 2. Break-Before-Make Timing

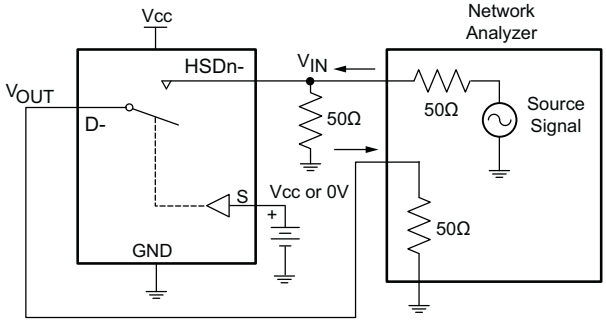


Figure 3. Off Isolation

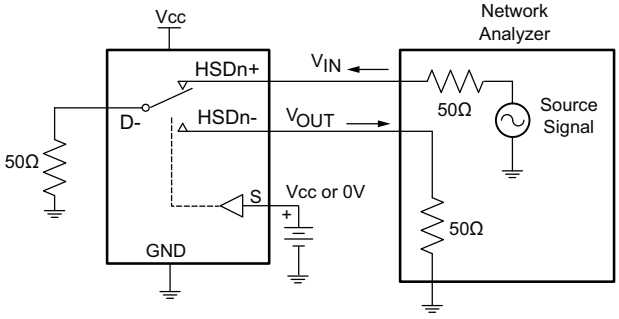


Figure 4. Crosstalk

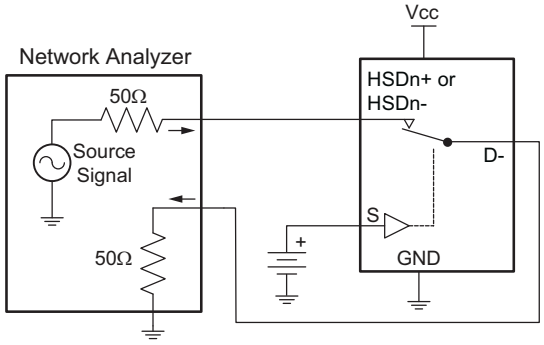


Figure 5. Bandwidth

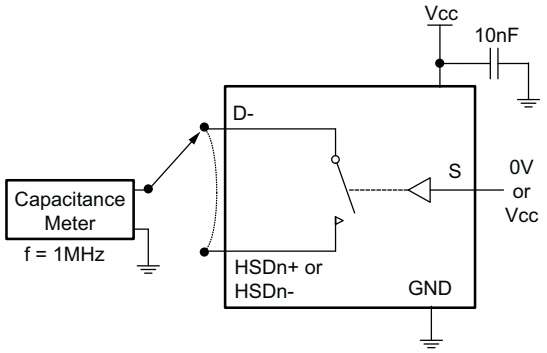
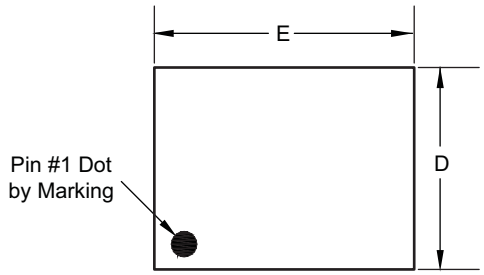
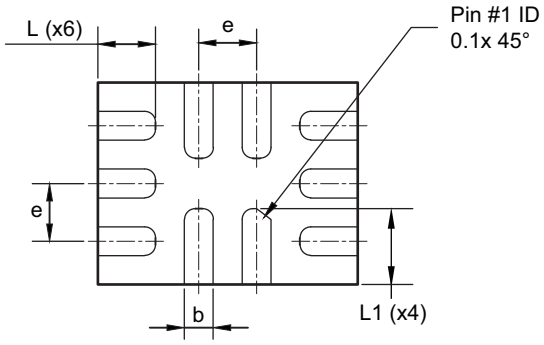


Figure 6. ON/Off Capacitance Measurement

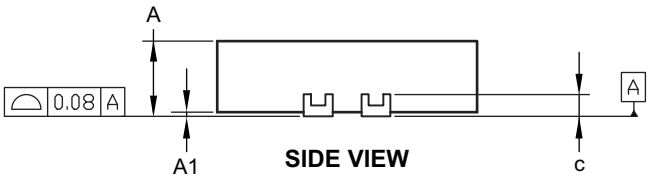
Package Dimensions, QFN 1.8x1.4, 10L



TOP VIEW

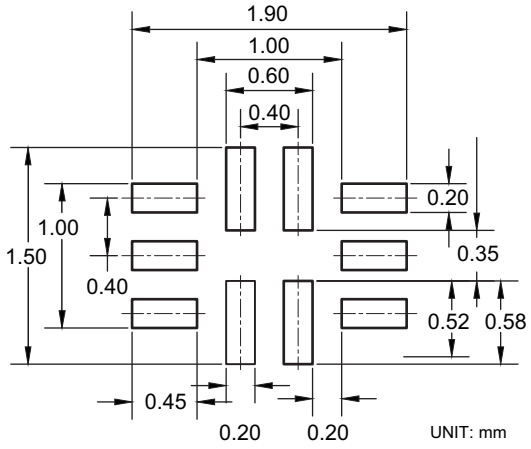


Bottom View



SIDE VIEW

RECOMMENDED LAND PATTERN



Dimensions in millimeters

Symbols	Min.	Nom.	Max.
A	0.50	0.55	0.60
A1	0.00	—	0.05
b	0.15	0.20	0.25
c	0.152 REF.		
D	1.35	1.40	1.45
E	1.75	1.80	1.85
e	0.40 BSC		
L	0.35	0.40	0.45
L1	0.475	0.525	0.575

Dimensions in inches

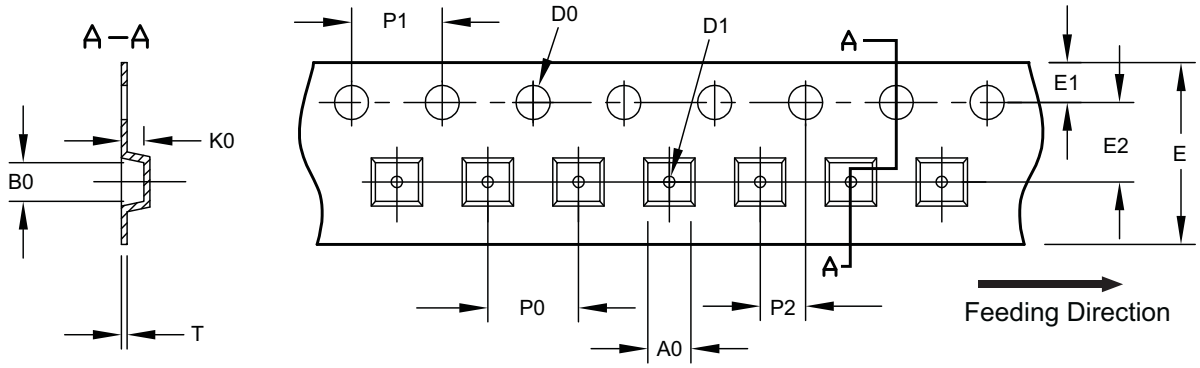
Symbols	Min.	Nom.	Max.
A	0.020	0.022	0.024
A1	0.000	—	0.002
b	0.006	0.008	0.010
c	0.006 REF.		
D	0.053	0.055	0.057
E	0.069	0.071	0.073
e	0.016 BSC		
L	0.014	0.016	0.018
L1	0.019	0.021	0.023

Notes:

1. Controlling dimension is millimeter. Converted inch dimensions are not necessarily exact.

Tape and Reel Dimensions, QFN 1.8x1.4, 10L

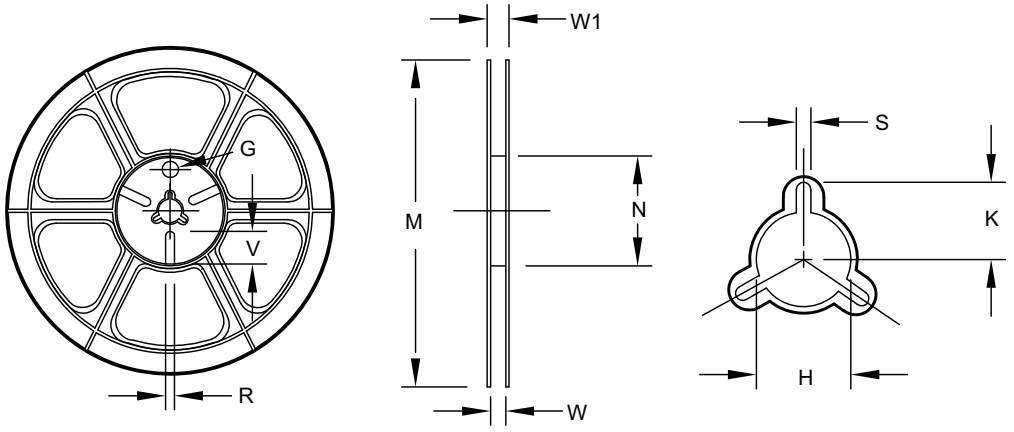
Carrier Tape



UNIT: mm

Package	A0	B0	K0	D0	D1	E	E1	E2	P0	P1	P2	T
QFN 1.8 x 1.4	1.90 ±0.05	1.70 ±0.05	1.00 ±0.05	1.50 +0.10/-0	0.50 ±0.05	8.00 +0.20/-0.10	1.75 ±0.10	3.50 ±0.05	4.00 ±0.10	4.00 ±0.10	2.00 ±0.05	0.254 ±0.02

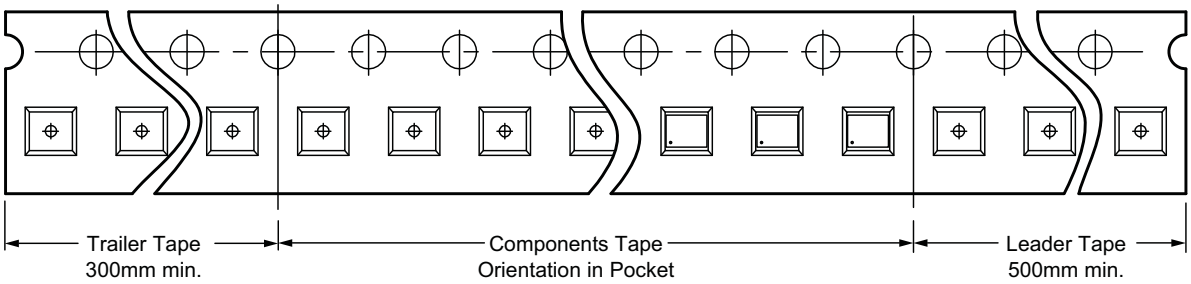
Reel



UNIT: mm

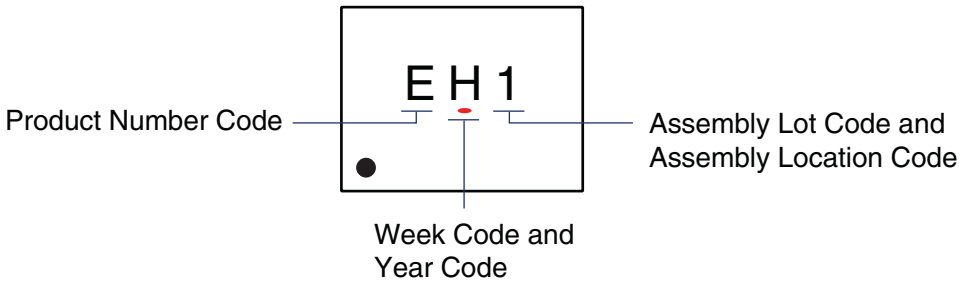
Tape Size	Reel Size	M	N	W	W1	H	K	S	G	R	V
8mm	ø178	ø178.0 ±1.0	ø70.5 ±1.0	9.0 ±0.5	11.8 ±1.1	ø13.0 +0.5/-0.2	10.25 ±0.1	2.4 ±0.1	ø9.8	N/A	N/A

Leader/Trailer and Orientation



Part Marking

AOZ6184QT
(QFN-10)



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