

Helping Customers Innovate, Improve & Grow

Features

- Any frequency between 1 MHz and 220 MHz with 6 decimal places of accuracy
- < 1ps RMS phase jitter over 12 kHz to 20 MHz bandwidth
- LVPECL and LVDS output options
- Industrial and extended commercial temperature ranges
- Industry-standard packages: 5.0 mm x 3.2 mm and 7.0 mm x 5.0 mm

Applications

- SONET, Video, Instrumentation, Satellite Telecom, networking, broadband

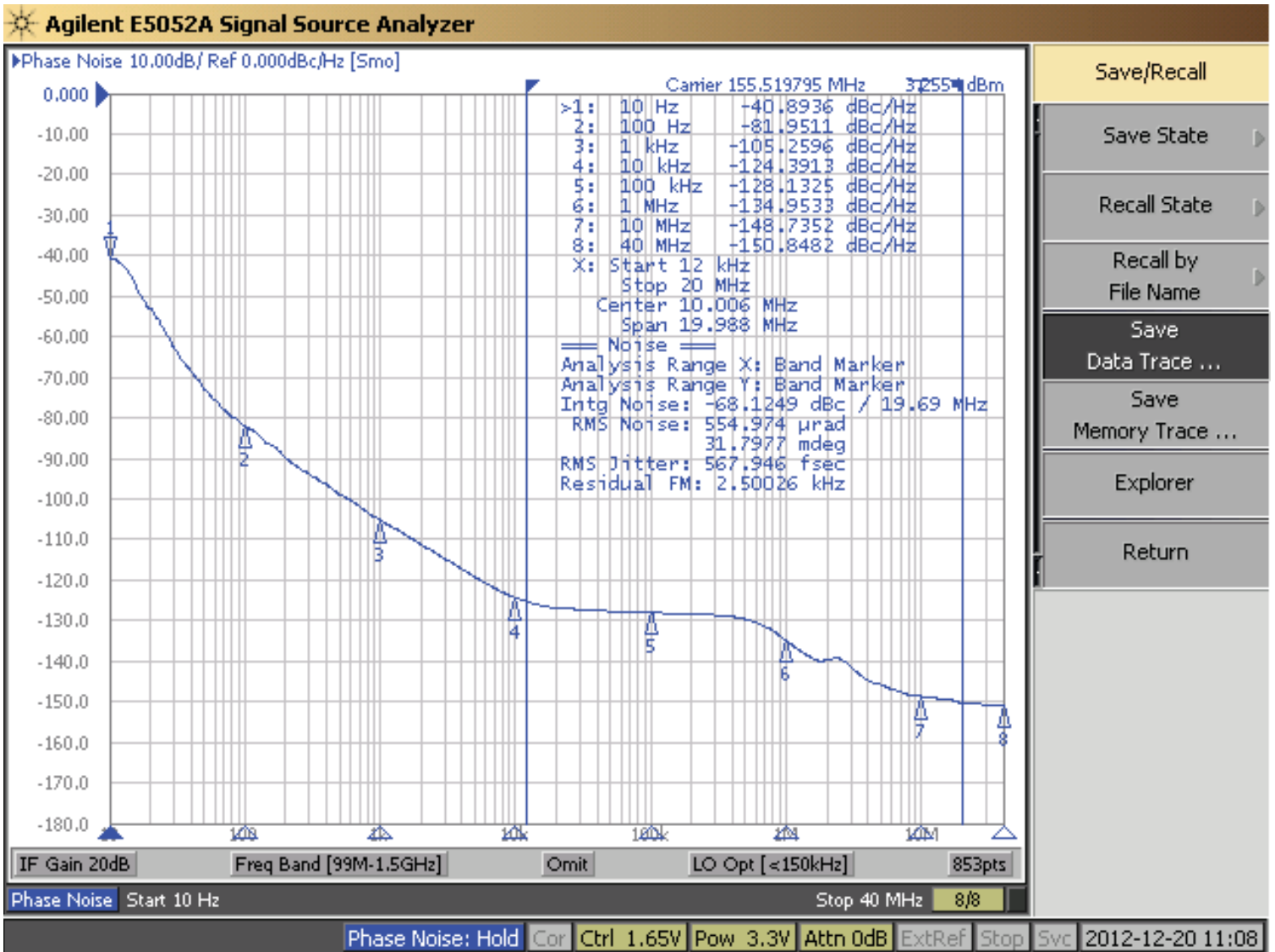
Performance Specifications

Parameter and Conditions	Symbol	Min.	Typ.	Max.	Unit	Condition
LVPECL and LVDS, Common AC Characteristics						
Output Frequency Range	f	1	–	220	MHz	
Frequency Stability	F_stab	-20	–	+20	PPM	Inclusive of Initial tolerance at 25 °C, and variations over operating temperature, aging, supply voltage and load
		-50	–	+50	PPM	
1-year Aging		-1	–	+1	PPM	First year @ 25°C
10-year Aging		-5	–	+5	PPM	@ 85°C
Operating Temperature Range	T_use	-40	–	+85	°C	Industrial
		-20	–	+70	°C	Extended Commercial
Start-up Time	T_start	–	–	10	ms	
Duty Cycle	DC	45	–	55	%	Contact Vectron for tighter duty cycle
Pull Range	PR	±50, ±80, ±100			PPM	
Upper Control Voltage	VC_U	3	–	3.1	V	Vdd = 3.3V, Voltage at which maximum deviation is guaranteed
		2.25	–	2.3	V	Vdd = 2.5V, Voltage at which maximum deviation is guaranteed
Lower Control Voltage	VC_L	0	–	0.1	V	Voltage at which maximum deviation is guaranteed
Linearity	Lin	–	0.2	1	%	
Frequency Change Polarity	–	Positive Slope	–			
Control Voltage Bandwidth (-3dB)	V_BW	–	8	–	kHz	Contact Vectron for 16 kHz bandwidth
LVPECL, DC and AC Characteristics						
Supply Voltage	Vdd	2.97	3.3	3.63	V	
		2.25	2.5	2.75	V	
Current Consumption	Idd	–	61	69	mA	Excluding Load Termination Current, Vdd = 3.3V or 2.5V
OE Disable Supply Current	I_OE	–	–	35	mA	OE = GND
Output Disable Leakage Current	I_leak	–	–	1	µA	OE = GND
Maximum Output Current	I-driver	–	–	30	mA	Maximum average current drawn from OUT+ or OUT-
Output High Voltage	VOH	Vdd-1.1	–	Vdd-0.7	V	See Figure 1
Output Low Voltage	VOL	Vdd-1.9	–	Vdd-1.5	V	See Figure 1
Output Differential Voltage Swing	V_Swing	1.2	1.6	2.0	V	See Figure 1
Rise/Fall Time	Tr, Tf	–	300	500	ps	20% to 80%
OE Enable/Disable Time	T_oe	–	–	105	ns	f = 220 MHz - For other frequencies, T_oe = 100ns + 3 period
RMS Period Jitter	T_jitt	–	1.2	1.7	ps	f = 100 MHz, VDD = 3.3V or 2.5V
		–	1.2	1.7	ps	f = 156.25 MHz, VDD = 3.3V or 2.5V
		–	1.2	1.7	ps	f = 212.5 MHz, VDD = 3.3V or 2.5V
RMS Phase Jitter (random)	T_phj	–	0.6	1.0	ps	f = 156.25 MHz, Integration bandwidth = 12 kHz to 20 MHz, all Vdds

Performance Specifications (Continued)

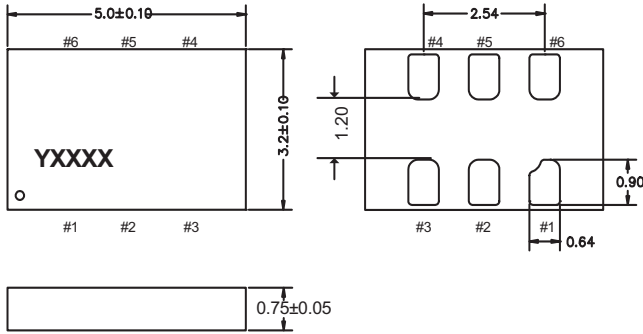
Parameter and Conditions	Symbol	Min.	Typ.	Max.	Unit	Condition
LVDS, DC, and AC Characteristics						
Supply Voltage	Vdd	2.97	3.3	3.63	V	
		2.25	2.5	2.75	V	
Current Consumption	I _{dd}	–	47	55	mA	Excluding Load Termination Current, V _{dd} = 3.3V or 2.5V
OE Disable Current	I _{OE}	–	–	35	mA	OE = V _{dd}
Output Disable Leakage Current	I _{leak}	–	–	1	µA	OE = V _{dd}
Differential Output Voltage	VOD	200	350	500	mV	See Figure 4
VOD Magnitude Change	ΔVOD	–	–	50	mV	See Figure 4
Offset Voltage	VOS	1.125	1.2	1.375	V	See Figure 4
VOS Magnitude Change	ΔVOS	–	–	50	mV	See Figure 4
Rise/Fall Time	T _r , T _f	360	495	600	ps	20% to 80%
OE Enable/Disable Time	T _{oe}	–	–	105	ns	f = 220 MHz - For other frequencies, T _{oe} = 100ns + 3 period
RMS Period Jitter	T _{jitt}	–	1.2	1.7	ps	f = 100 MHz, VDD = 3.3V or 2.5V
		–	1.2	1.7	ps	f = 156.25 MHz, VDD = 3.3V or 2.5V
		–	1.2	1.7	ps	f = 212.5 MHz, VDD = 3.3V or 2.5V
RMS Phase Jitter (random)	T _{phj}	–	0.6	1.0	ps	f = 156.25 MHz, Integration bandwidth = 12 kHz to 20 MHz, all Vdds

Typical Phase Noise Data

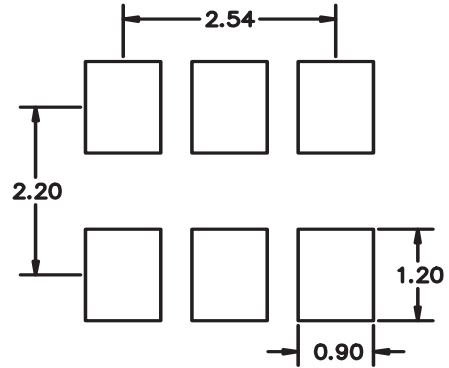


Package Outline & Dimensions (Unit: mm)

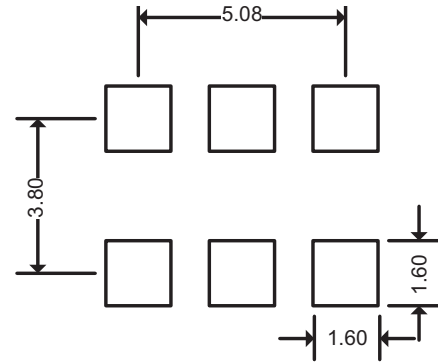
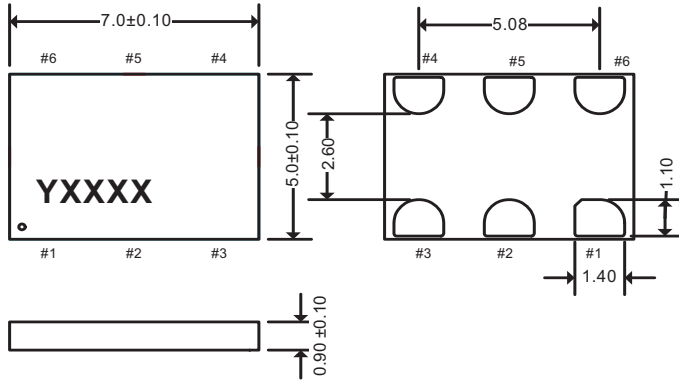
5.0 x 3.2 x 0.75 mm



Recommended Land Pattern (Unit: mm)



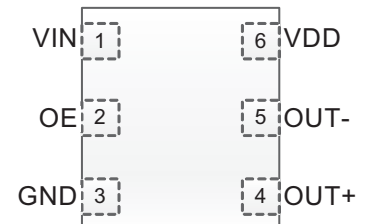
7.0 x 5.0 x 0.90 mm



6 pin package: Pin Connections

Pin	Symbol	Functionality
1	VIN	Input Control Voltage
2	OE	Input H or Open: specified frequency output L: output is high impedance
3	GND	Power VDD Power Supply Ground
4	OUT+	Output Oscillator output
5	OUT-	Output Complementary oscillator output
6	VDD	Power Power supply voltage

Top View



Termination Circuit Examples

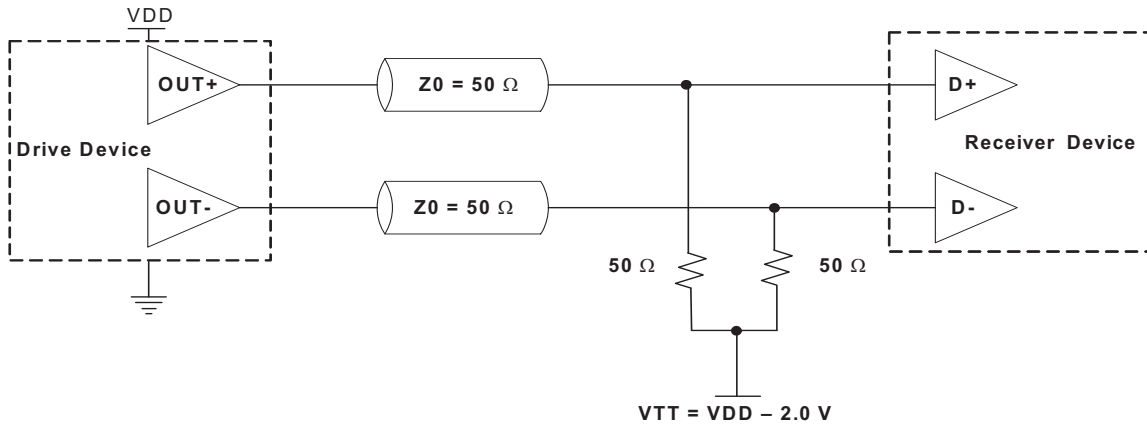


Figure 1. LVPECL Typical Termination

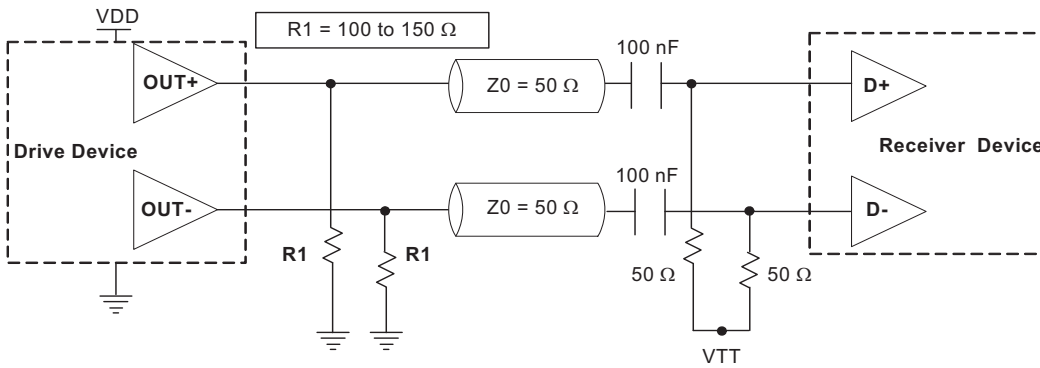


Figure 2. LVPECL AC Coupled Termination

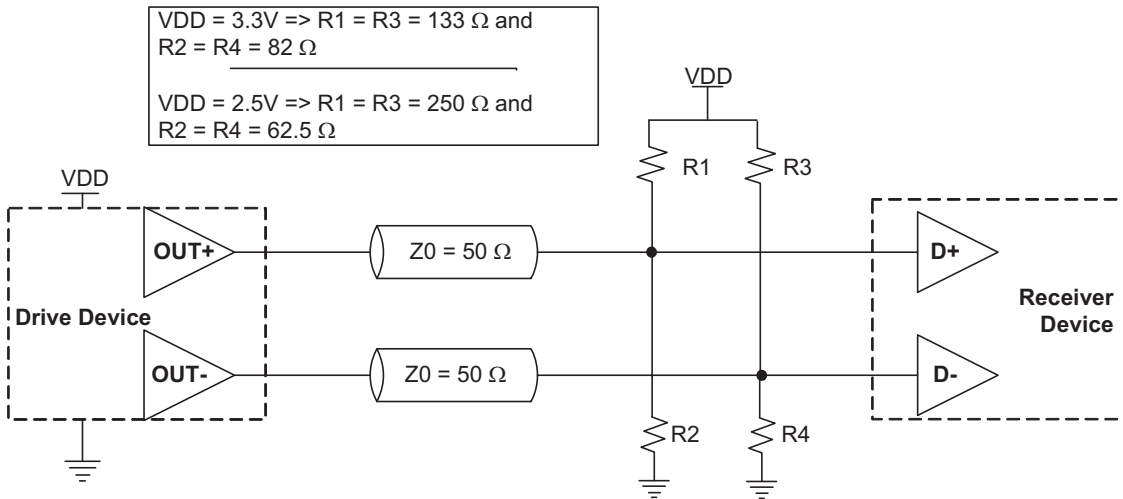


Figure 3. LVPECL with Thevenin Typical Termination

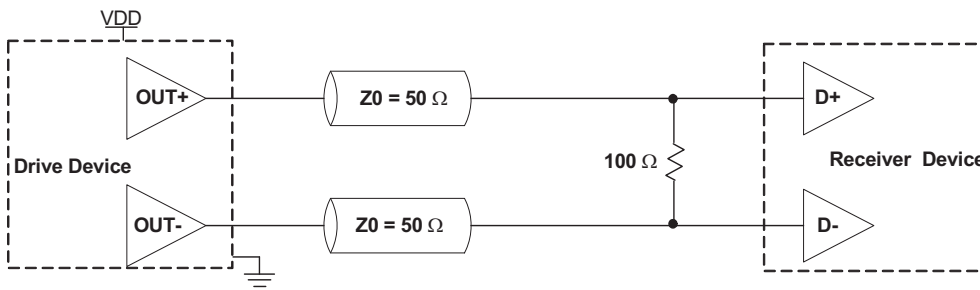


Figure 4. LVDS Single Termination (Load Terminated)

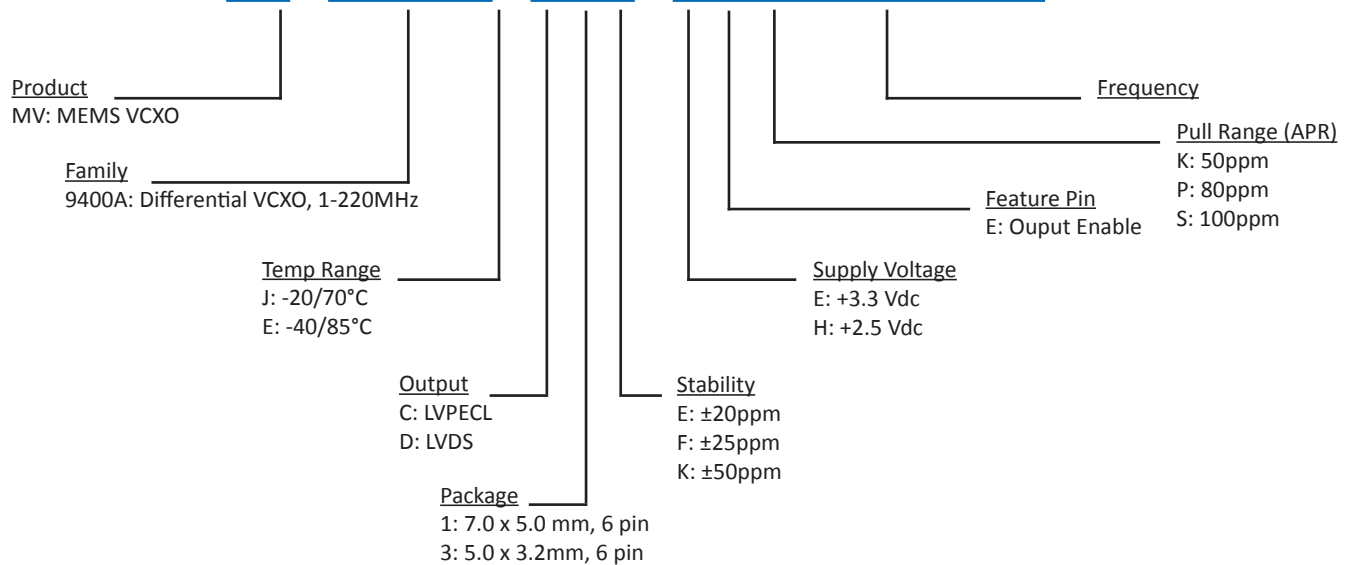
Absolute Maximum Ratings and Test Compliance

Maximum Ratings			
Parameter	Min.	Max.	Unit
Storage Temperature	-65	150	°C
VDD	-0.5	4	V
Electrostatic Discharge	-	2000	V
Soldering Temperature (follow standard Pb free soldering guidelines)	-	260	°C
Program Retention over -40 to 125°C, Process, Vdd (0 to 3.65 V)	1,000+	-	Years

Environmental Compliance	
Parameter	Condition/Test Method
Mechanical Shock	MIL-STD-883F, Method 2002
Mechanical Vibration	MIL-STD-883F, Method 2007
Temperature Cycle	JESD22, Method A104
Solderability	MIL-STD-883F, Method 2003
Moisture Sensitivity Level	MSL1 @ 260°C

Ordering Information

MV - 9400A E - C 3 F - E E K 156M250000



Notes:

1. Not all options and codes are available at all frequencies.
2. Unless otherwise stated all values are valid after warm-up time and refer to typical conditions for supply voltage, frequency control voltage, load, temperature (25°C).
3. Subject to technical modification.
4. Contact factory for availability.

Revision History

Revision	Change Summary	Date
1.0	Product Release	June 2013
1.1	Knowles logo and address change	Feb 2014
1.2	Add ± 20 ppm temperature stability	Aug 2014

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