

HIGH PERFORMANCE DIFFERENTIAL OSCILLATOR SERIES „DLPO-2“ 220.0—800.0 MHz

FEATURES

- + 100% pin-to-pin drop-in replacement to quartz and MEMS based XO
- + Differential Oscillator for Low Cost
- + LVCMOS, LVPECL, LVDS and CML output signal possible
- + Low Power Consumption
- + Excellent low RMS phase jitter
- + Excellent long time reliability
- + Very tight frequency stability as low as ± 10 ppm
- + Outstanding long term aging
- + Standard housings: 5.0x3.2; 7.0x5.0 mm
- + Pb-free, RoHS and REACH compliant / MSL1@260°C

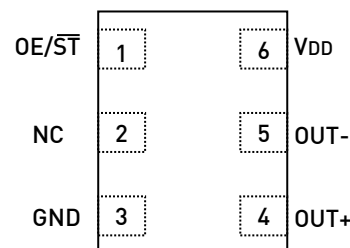
APPLICATIONS

- + Server, Router, RAID controller
- + Gigabit Ethernet, 10 Gigabit Ethernet, Fiber Channel
- + SATA / SAS, PCI-Express, Fully Buffered DIMM
- + System clock, Networking and computing,
- + etc.

PIN DESCRIPTION

PIN	SYMBOL		FUNCTIONALITY
1	OE/ST	Input	Standby or Output Enable pin for OUT+ and OUT-. OE: When High or Open : OUT+ and OUT- = active When Low : OUT+ and OUT- = High Impedance state ST: When High or Open : OUT+ and OUT- = active When Low : OUT+ and OUT- = High Impedance State
2	NC	NA	Do not connect pin, leave it floating.
3	GND	Power	VDD Power Supply Ground. Connect to Ground
4	OUT+	Output	220 to 800 MHz programmable clock output.
5	OUT-	Output	
6	VDD	Power	Power Supply Voltage

TOP VIEW



DC ELECTRICAL SPECIFICATIONS

LVCMOS input, OE or ST pin, 3.3V ±10% or 2.5V ±10% or 1.8V ±5%, -40 to 85°C

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITION
Input High Voltage	V _{IH}	70	-	-	%VDD	
Input Low Voltage	V _{IL}	-	-	30	%VDD	
Input High Current	I _{IH}	-	-	10	µA	OE or ST pin
Input Low Current	I _{IL}	-10	-	-	µA	OE or ST pin
Power Up Time	T _{pu}	-	-	10	ms	Time from minimum power supply voltage to the first cycle (Guaranteed no runt pulses)

LVPECL Output, 3.3V ±10% or 2.5V ±10%, -40 to 85°C

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITION
Supply Voltage	VDD	2.97	3.3	3.63	V	
		2.25	2.5	2.75	V	
Supply Current	IDD	-	68	74	mA	VDD = 3.3, Excluding Load Termination Current
		-	65	71	mA	VDD = 2.5, Excluding Load Termination Current
Output High Voltage	V _{OH}	VDD-1.1	-	VDD-0.7	V	50 Ohm termination to Vdd - 2.0V See Figure 1, 2.
Output Low Voltage	V _{OL}	VDD-2.0	-	VDD-1.4	V	
Pk-Pk Output Voltage Swing	V _{swing}	600	800	1000	mV	

LVDS Output, 3.3V ±10% or 2.5V ±10%, -40 to 85°C

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITION
Supply Voltage	VDD	2.97	3.3	3.63	V	
		2.25	2.5	2.75	V	
Supply Current	IDD	-	73	79	mA	VDD = 3.3, Excluding Load Termination Current
		-	70	76	mA	VDD = 2.5, Excluding Load Termination Current
Differential Output Voltage	V _{OD1}	250	350	450	mV	Swing Mode = Normal Single load termination. See Figure 4.
VOD Magnitude Change	ΔV _{OD1}	-	-	50	mV	
Offset Voltage	V _{OS1}	-	1.2	-	V	
VOS Magnitude Change	ΔV _{OS1}	-	-	50	mV	
Differential Output Voltage	V _{OD2}	500	700	900	mV	Swing Mode = High Single load termination. See Figure 4.
VOD Magnitude Change	ΔV _{OD2}	-	-	50	mV	
Offset Voltage	V _{OS2}	-	1.2	-	V	
VOS Magnitude Change	ΔV _{OS2}	-	-	50	mV	
Differential Output Voltage	V _{OD3}	250	350	450	mV	Swing Mode = High Double load termination. See Figure 5.
VOD Magnitude Change	ΔV _{OD3}	-	-	50	mV	
Offset Voltage	V _{OS3}	-	1.2	-	V	
VOS Magnitude Change	ΔV _{OS3}	-	-	50	mV	

DC ELECTRICAL SPECIFICATIONS

CML Output, 3.3V ±10% or 2.5V ±10% or 1.8V ±5%, -40 to 85°C

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITION
Supply Voltage	V _{DD}	2.97	3.3	3.63	V	
		2.25	2.5	2.75	V	
		1.71	1.8	1.89	V	
Supply Current	I _{DD}	–	48	51	mA	V _{DD} = 3.3V
		–	47	50	mA	V _{DD} = 2.5V
		–	38	41	mA	V _{DD} = 1.8V
Output High Voltage	V _{OH1}	V _{DD} -0.1	–	V _{DD}	V	Swing Mode = Normal Single Load Termination See Figure 6.
Output Low Voltage	V _{OL1}	V _{DD} -0.55	V _{DD} -0.425	V _{DD} -0.3	V	
Pk-Pk Output Voltage Swing	V _{swing1}	300	425	550	mV	
Output High Voltage	V _{OH2}	V _{DD} -0.1	–	V _{DD}	V	Swing Mode = High Single Load Termination See Figure 6.
Output Low Voltage	V _{OL2}	V _{DD} -1.1	V _{DD} -0.85	V _{DD} -0.6	V	
Pk-Pk Output Voltage Swing	V _{swing2}	600	850	1100	mV	
Output High Voltage	V _{OH3}	V _{DD} -0.1	–	V _{DD}	V	Swing Mode = High Double Load Termination See Figure 7.
Output Low Voltage	V _{OL3}	V _{DD} -0.55	V _{DD} -0.425	V _{DD} -0.3	V	
Pk-Pk Output Voltage Swing	V _{swing3}	300	425	550	mV	

AC ELECTRICAL SPECIFICATIONS

LVPECL Output, 3.3V ±10%, -40 to 85°C

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITION	
Output Frequency	F _{out}	220	-	800	MHz		
Frequency Stability	F _{stab}	-10	-	+10	PPM	Inclusive of initial stability, operating temp., rated power supply voltage change, load change	0 to 70°C
		-15	-	+15	PPM		-20 to 70°C
		-20	-	+20	PPM		-40 to 85°C
		-25	-	+25	PPM		
		-50	-	+50	PPM		
Aging	F _{age}	-	-	1	PPM	First year @ 25°C	
Duty Cycle	DC	45	-	55	%	F _{out} = 220 - 460 MHz, 490 - 610 MHz or 750 - 800 MHz	
		35	-	65	%	F _{out} = 460.1 - 489.9 MHz or 610.1 - 749.9 MHz	
Output Rise/Fall Time	t _r /t _f	160	260	350	ps	20% to 80%	
RMS Phase Jitter (random)	PH _j	-	0.3	0.44	ps	F _{out} = 212.5MHz @ BW: 1.875M Hz to10 MHz	
		-	0.3	0.33	ps	F _{out} = 312.5 MHz @ BW: 1.875M Hz to10 MHz	
		-	0.3	0.34	ps	F _{out} = 600 MHz @ BW: 1.875M Hz to10 MHz	
RMS Period Jitter	P _J	-	1.4	1.8	ps	F _{out} = 212.5 MHz	
		-	1.4	1.8	ps	F _{out} = 312.5 MHz	
		-	1.5	2.2	ps	F _{out} = 600 MHz	
		-	1.2	1.6	ps	F _{out} = 800 MHz	

LVPECL Output, 2.5V ±10%, -40 to 85°C

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITION	
Output Frequency	F _{out}	220	-	800	MHz		
Frequency Stability	F _{stab}	-10	-	+10	PPM	Inclusive of initial stability, operating temp., rated power supply voltage change, load change	0 to 70°C
		-15	-	+15	PPM		-20 to 70°C
		-20	-	+20	PPM		-40 to 85°C
		-25	-	+25	PPM		
		-50	-	+50	PPM		
Aging	F _{age}	-	-	1	PPM	First year @ 25°C	
Duty Cycle	DC	45	-	55	%	F _{out} = 220 - 460 MHz, 490 - 610 MHz or 750 - 800 MHz	
		35	-	65	%	F _{out} = 460.1 - 489.9 MHz or 610.1 - 749.9 MHz	
Output Rise/Fall Time	t _r /t _f	160	260	350	ps	20% to 80%	
RMS Phase Jitter (random)	PH _j	-	0.3	0.44	ps	F _{out} = 212.5MHz @ BW: 1.875MHz to10 MHz	
		-	0.3	0.33	ps	F _{out} = 312.5 MHz @ BW: 1.875MHz to10 MHz	
		-	0.3	0.34	ps	F _{out} = 600 MHz @ BW: 1.875MHz to10 MHz	
RMS Period Jitter	P _J	-	1.4	1.8	ps	F _{out} = 212.5 MHz	
		-	1.4	1.8	ps	F _{out} = 312.5 MHz	
		-	1.5	2.2	ps	F _{out} = 600 MHz	
		-	1.2	1.6	ps	F _{out} = 800 MHz	

AC ELECTRICAL SPECIFICATIONS

LVDS Output, 3.3V ±10%, -40 to 85°C

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CoNdition
Output Frequency	F _{out}	220	-	800	MHz	
Frequency Stability	F _{stab}	-10	-	+10	PPM	Inclusive of initial stability, operating temp., rated power supply voltage change, load change
		-15	-	+15	PPM	
		-20	-	+20	PPM	
		-25	-	+25	PPM	
		-50	-	+50	PPM	
Aging	F _{age}	-	-	1	PPM	First year @ 25°C
Duty Cycle	DC	45	-	55	%	F _{out} = 220 - 460 MHz, 490 - 610 MHz or 750 - 800 MHz
		35	-	65	%	F _{out} = 460.1 - 489.9 MHz or 610.1- 749.9 MHz
Output Rise/Fall Time	t _r /t _f	240	310	420	ps	20% to 80%
RMS Phase Jitter (random)	PH _j	-	0.4	0.8	ps	F _{out} = 212.5MHz @ BW: 1.875M Hz to10 MHz
		-	0.3	0.6	ps	F _{out} = 312.5 MHz @ BW: 1.875M Hz to10 MHz
		-	0.2	0.4	ps	F _{out} = 600 MHz @ BW: 1.875M Hz to10 MHz
RMS Period Jitter	P _J	-	1.8	2.5	ps	F _{out} = 212.5 MHz
		-	1.7	2.4	ps	F _{out} = 312.5 MHz
		-	1.7	2.5	ps	F _{out} = 600 MHz
		-	1.5	2.2	ps	F _{out} = 800 MHz

LVDS Output, 2.5V ±10%, -40 to 85°C

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITION
Output Frequency	F _{out}	220	-	800	MHz	
Frequency Stability	F _{stab}	-10	-	+10	PPM	Inclusive of initial stability, operating temp., rated power supply voltage change, load change
		-15	-	+15	PPM	
		-20	-	+20	PPM	
		-25	-	+25	PPM	
		-50	-	+50	PPM	
Aging	F _{age}	-	-	1	PPM	First year @ 25°C
Duty Cycle	DC	45	-	55	%	F _{out} = 220 - 460 MHz, 490 - 610 MHz or 750 - 800 MHz
		35	-	65	%	F _{out} = 460.1 - 489.9 MHz or 610.1- 749.9 MHz
Output Rise/Fall Time	t _r /t _f	240	310	420	ps	20% to 80%
RMS Phase Jitter (random)	PH _j	-	0.4	0.8	ps	F _{out} = 212.5MHz @ BW: 1.875MHz to10 MHz
		-	0.3	0.6	ps	F _{out} = 312.5 MHz @ BW: 1.875MHz to10 MHz
		-	0.2	0.4	ps	F _{out} = 600 MHz @ BW: 1.875MHz to10 MHz
RMS Period Jitter	P _J	-	1.7	2.4	ps	F _{out} = 212.5 MHz
		-	1.7	2.5	ps	F _{out} = 312.5 MHz
		-	1.6	2.1	ps	F _{out} = 600 MHz
		-	1.4	1.8	ps	F _{out} = 800 MHz

AC ELECTRICAL SPECIFICATIONS

CML Output, 3.3V ±10%, -40 to 85°C

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITION	
Output Frequency	F _{out}	220	-	800	MHz		
Frequency Stability	F _{stab}	-10	-	+10	PPM	Inclusive of initial stability, operating temp., rated power supply voltage change, load change	0 to 70°C
		-15	-	+15	PPM		-20 to 70°C
		-20	-	+20	PPM		-40 to 85°C
		-25	-	+25	PPM		
		-50	-	+50	PPM		
Aging	F _{age}	-	-	1	PPM	First year @ 25°C	
Duty Cycle	DC	45	-	55	%	F _{out} = 220 - 460 MHz, 490 - 610 MHz or 750 - 800 MHz	
		35	-	65	%	F _{out} = 460.1 - 489.9 MHz or 610.1 - 749.9 MHz	
Output Rise/Fall Time	t _r /t _f	270	350	470	ps	20% to 80%	
RMS Phase Jitter (random)	PH _j	-	0.47	0.53	ps	F _{out} = 212.5MHz @ BW: 1.875M Hz to10 MHz	
		-	0.32	0.42	ps	F _{out} = 312.5 MHz @ BW: 1.875M Hz to10 MHz	
		-	0.26	0.34	ps	F _{out} = 600 MHz @ BW: 1.875M Hz to10 MHz	
RMS Period Jitter	P _J	-	1.7	2.1	ps	F _{out} = 212.5 MHz	
		-	1.7	2.1	ps	F _{out} = 312.5 MHz	
		-	1.7	2.2	ps	F _{out} = 600 MHz	
		-	1.4	1.8	ps	F _{out} = 800 MHz	

CML, 2.5V ± 10%, -40 to 85°C

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition	
Output Frequency	F _{out}	220	-	800	MHz		
Frequency Stability	F _{stab}	-10	-	+10	PPM	Inclusive of initial stability, operating temp., rated power supply voltage change, load change	0 to 70°C
		-15	-	+15	PPM		-20 to 70°C
		-20	-	+20	PPM		-40 to 85°C
		-25	-	+25	PPM		
		-50	-	+50	PPM		
Aging	F _{age}	-	-	1	PPM	First year @ 25°C	
Duty Cycle	DC	45	-	55	%	F _{out} = 220 - 460 MHz, 490 - 610 MHz or 750 - 800 MHz	
		35	-	65	%	F _{out} = 460.1 - 489.9 MHz or 610.1 - 749.9 MHz	
Output Rise/Fall Time	t _r /t _f	270	350	470	ps	20% to 80%	
RMS Phase Jitter (random)	PH _j	-	0.47	0.53	ps	F _{out} = 212.5MHz @ BW: 1.875MHz to10 MHz	
		-	0.32	0.38	ps	F _{out} = 312.5 MHz @ BW: 1.875MHz to10 MHz	
		-	0.26	0.34	ps	F _{out} = 600 MHz @ BW: 1.875MHz to10 MHz	
RMS Period Jitter	P _J	-	1.7	2.1	ps	F _{out} = 212.5 MHz	
		-	1.7	2.1	ps	F _{out} = 312.5 MHz	
		-	1.7	2.2	ps	F _{out} = 600 MHz	
		-	1.4	1.8	ps	F _{out} = 800 MHz	

AC ELECTRICAL SPECIFICATIONS

CML, 1.8V ± 5%, -40 to 85°C

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITION
Output Frequency	F _{out}	220	-	800	MHz	
Frequency Stability	F _{stab}	-15	-	+15	PPM	Inclusive of initial stability, operating temp., rated power supply voltage change, load change
		-20	-	+20	PPM	
		-25	-	+25	PPM	
		-50	-	+50	PPM	
Aging	F _{age}	-	-	1	PPM	First year @ 25°C
Duty Cycle	DC	45	-	55	%	F _{out} = 220 - 460 MHz, 490 - 610 MHz or 750 - 800 MHz
		35	-	65	%	F _{out} = 460.1 - 489.9 MHz or 610.1 - 749.9 MHz
Output Rise/Fall Time	t _R /t _F	270	350	470	ps	20% to 80%
RMS Phase Jitter (random)	PH _J	-	0.47	0.53	ps	F _{out} = 212.5MHz @ BW: 1.875MHz to10 MHz
		-	0.32	0.42	ps	F _{out} = 312.5 MHz @ BW: 1.875MHz to10 MHz
		-	0.26	0.34	ps	F _{out} = 600 MHz @ BW: 1.875MHz to10 MHz
RMS Period Jitter	P _J	-	1.9	2.3	ps	F _{out} = 212.5 MHz
		-	1.8	2.2	ps	F _{out} = 312.5 MHz
		-	1.7	2.3	ps	F _{out} = 600 MHz
		-	1.6	1.9	ps	F _{out} = 800 MHz

TERMINATION DIAGRAMS

FIGURE 1. LVPECL AC COUPLED TYPICAL TERMINATION (LVPECL-0)

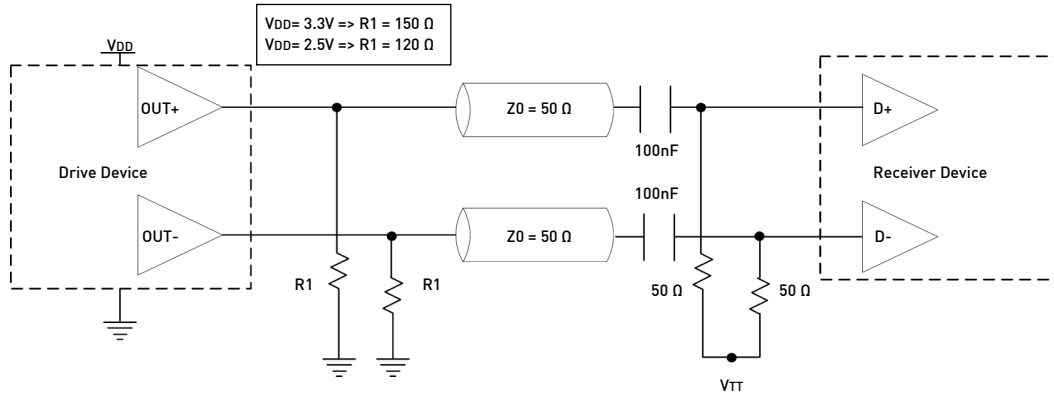


FIGURE 2. LVPECL DC COUPLED TYPICAL TERMINATION WITH TERMINATION VOLTAGE (LVPECL-1)

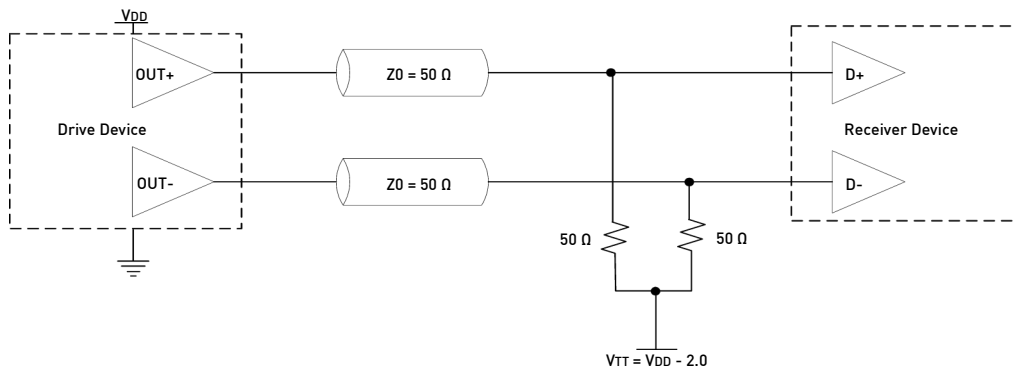
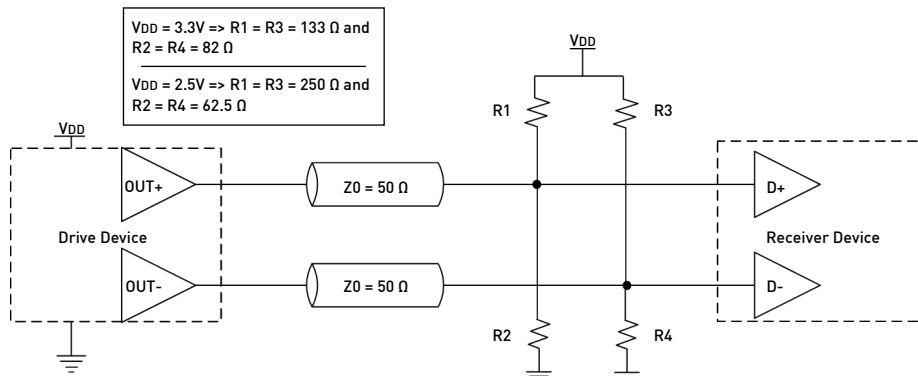


FIGURE 3. LVPECL DC COUPLED TYPICAL TERMINATION WITHOUT TERMINATION VOLTAGE (LVPECL-1)



TERMINATION DIAGRAMS

FIGURE 4. LVDS SINGLE TERMINATION (LOAD TERMINATED)

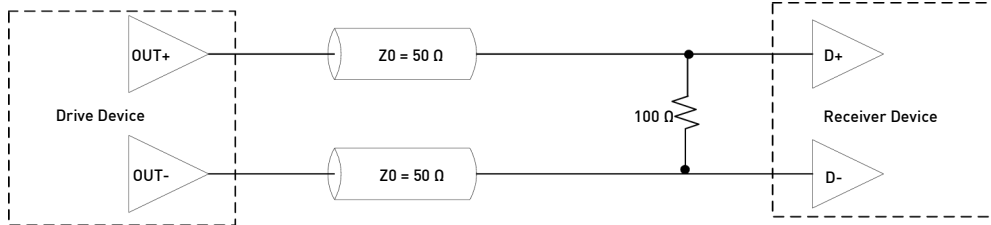
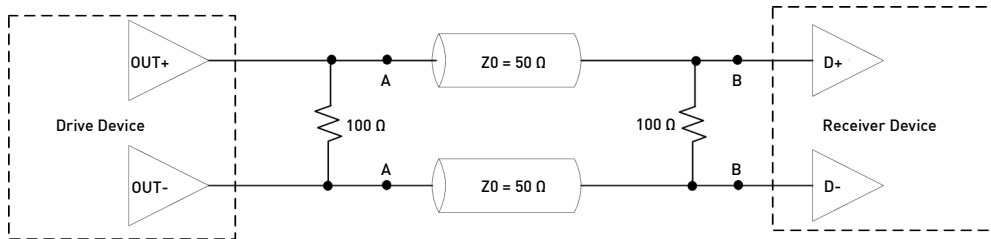
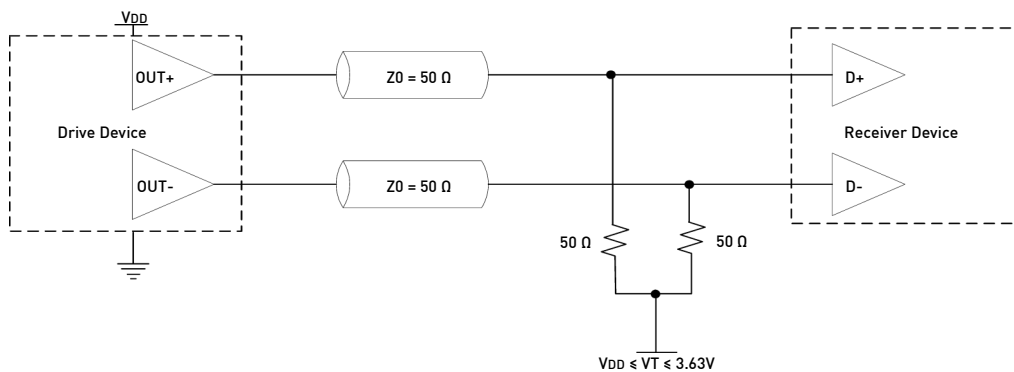


FIGURE 5. LVDS DOUBLE TERMINATION (SOURCE + LOAD TERMINATED)



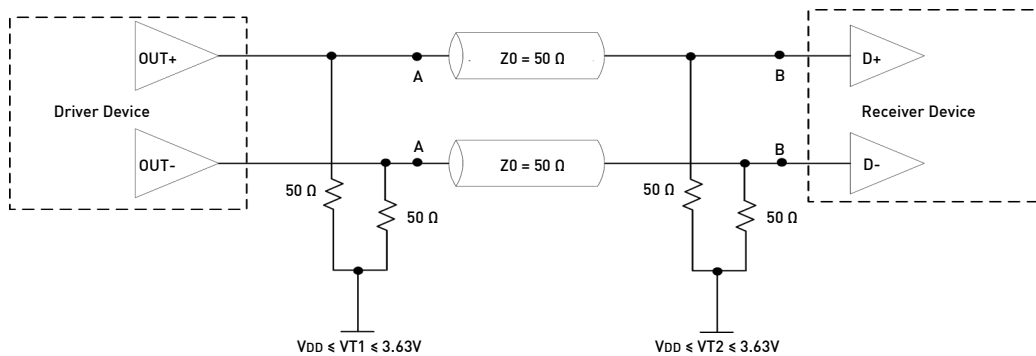
Note: For AC coupled operation, include/insert decoupling caps at points A or B

FIGURE 6. CML SINGLE LOAD TERMINATION



TERMINATION DIAGRAMS

FIGURE 7. CML DOUBLE LOAD TERMINATION



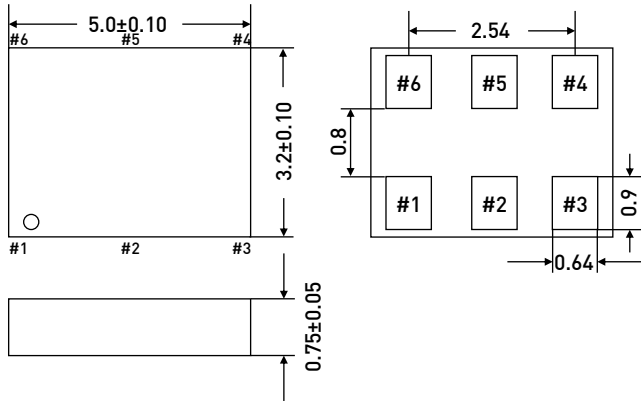
Notes:

1. For DC-coupled operation, $VT1 = VT2$
2. For AC coupled operation, include/insert decoupling caps at points A or B
3. For AC-coupled operation with capacitors placed at point A, $VT2$ sets the input common mode of Receiver Device and need not to be related to $VT1$

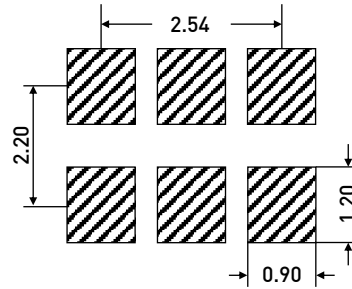
DIMENSIONS AND PATTERNS

PACKAGE SIZE – DIMENSIONS (UNIT:MM)

5.0X 3.2 X 0.75 MM

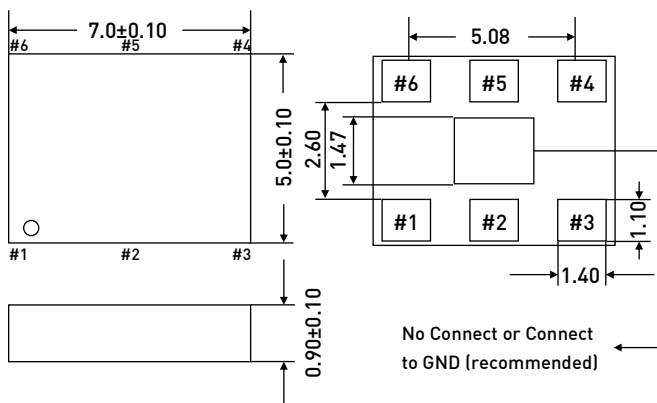


RECOMMENDED LAND PATTERN (UNIT:MM)

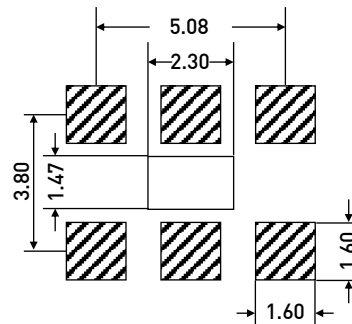


PACKAGE SIZE – DIMENSIONS (UNIT:MM)

7.0X 5.0 X 0.90 MM



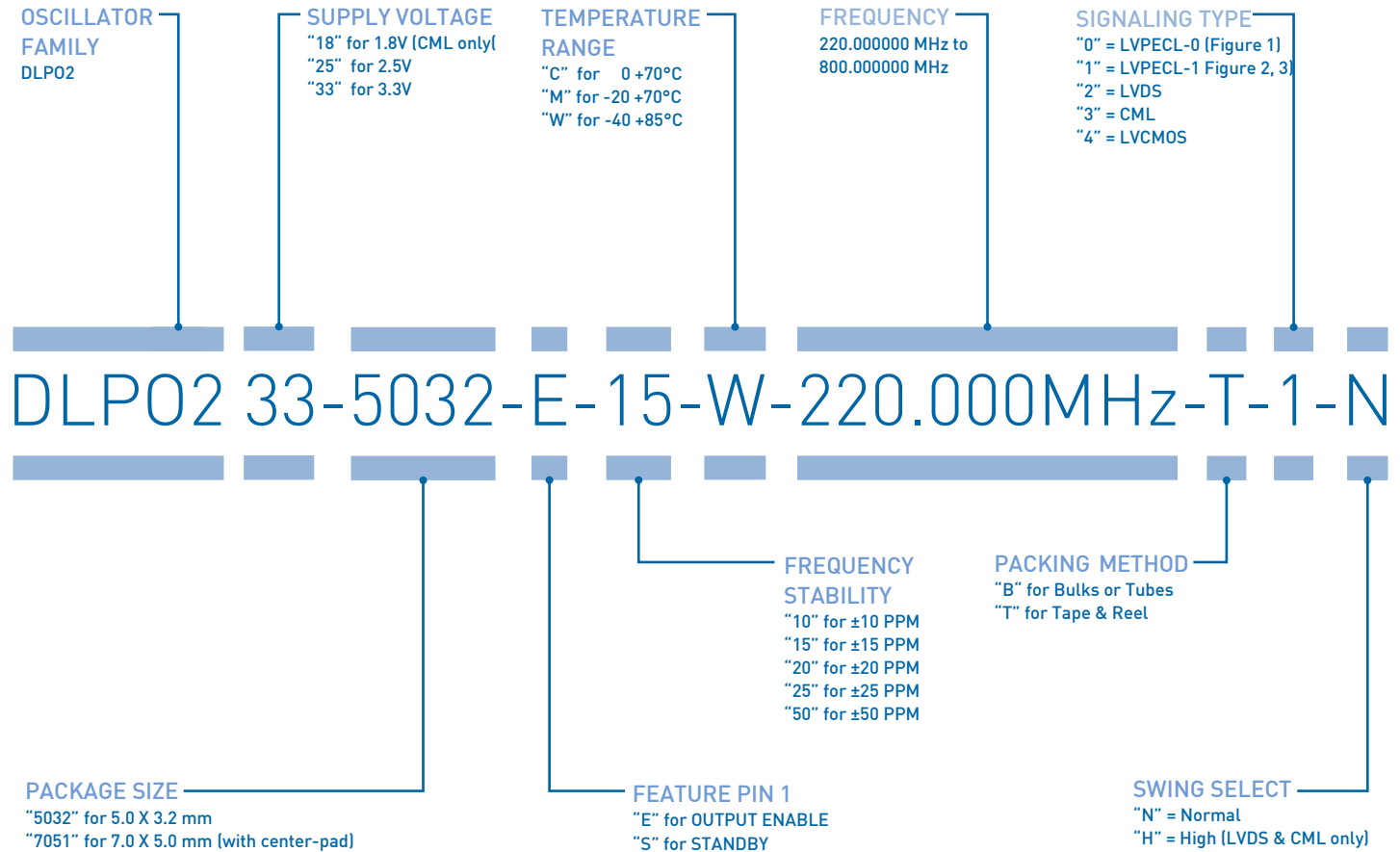
RECOMMENDED LAND PATTERN (UNIT:MM)



Note:

1. A capacitor value of 0.1 μ F between VDD and GND is recommended.

ORDERING INFORMATION



EXAMPLE: DLPO233-5032-E-15-W-220.000MHz-T-1-N

PLEASE INDICATE YOUR REQUIRED PARAMETERS

FREQUENCY STABILITY VS. TEMPERATURE RANGE OPTIONS

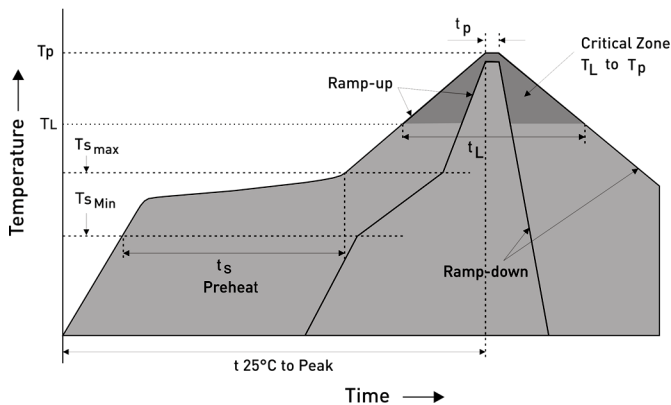
FREQUENCY STABILITY (PPM)	TEMPERATURE RANGE	SUPPLY VOLTAGE		
		1.8 V	2.5 V	3.3 V
±10	C (0 to +70°C)	-	✓	✓
	M (-20 to +70°C)	-	-	-
	W (-40 to +85°C)	-	-	-
±15	C (0 to +70°C)	✓	✓	✓
	M (-20 to +70°C)	-	✓	✓
	W (-40 to +85°C)	-	✓	✓
±20	C (0 to +70°C)	✓	✓	✓
	M (-20 to +70°C)	✓	✓	✓
	W (-40 to +85°C)	✓	✓	✓
±25	C (0 to +70°C)	✓	✓	✓
	M (-20 to +70°C)	✓	✓	✓
	W (-40 to +85°C)	✓	✓	✓
±50	C (0 to +70°C)	✓	✓	✓
	M (-20 to +70°C)	✓	✓	✓
	W (-40 to +85°C)	✓	✓	✓

SIGNALING TYPE VS. SWING SELECT OPTIONS

SIGNALING TYPE	SWING SELECT	SUPPLY VOLTAGE		
		1.8 V	2.5 V	3.3 V
LVPECL-0	Normal	-	✓	✓
	High	-	-	-
LVPECL-1	Normal	-	✓	✓
	High	-	-	-
LVDS	Normal	-	✓	✓
	High	-	✓	✓
CML	Normal	✓	✓	✓
	High	✓	✓	✓

SAMPLES ARE AVAILABLE WITHIN A SHORT DELIVERY PERIOD!

REFLOW SOLDER PROFILE



Profile Feature	Pb-Free Assembly
Average ramp-up rate (TL to TP)	3°C/second max.
Preheat:	
Temperature Min (T _{smin})	150°C
Temperature Max (T _{smax})	200°C
Time (min to max) (t _s)	60-180 seconds
Time maintained above:	
Temperature (TL)	217°C
Time (t _L)	60-150 seconds
Peak/Classification Temperature (T _p)	240°C
Time within 5°C of actual Peak Temperature (t _p)	20-40 seconds
Ramp-down Rate	6°C/second max.
Time 25°C to Peak Temperature	8 minutes max.



PREMIUM QUALITY BY PETERMANN-TECHNIK



OUR COMPANY IS CERTIFIED ACCORDING TO ISO 9001:2008 IN OCTOBER 2013 BY THE DMSZ CERTIFIKATION GMBH.

THIS IS FOR YOU TO ENSURE THAT THE PRINCIPLES OF QUALITY MANAGEMENT ARE FULLY IMPLEMENTED IN OUR QUALITY MANAGEMENT SYSTEM AND QUALITY CONTROL METHODS ALSO DOMINATE OUR QUALITY STANDARDS.

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