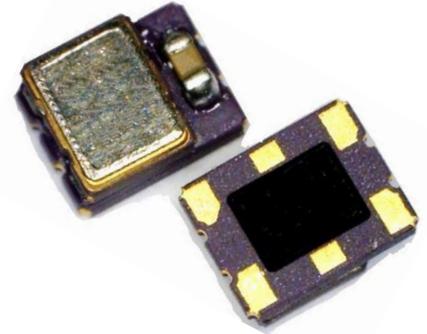


**MQF326 Series Temperature Compensated Crystal Oscillators (TCXOs)**  
**VMQF326 Series TCXOs with Voltage Control Function (VCTCXOs)**



**MERCURY**  
Since 1973

**MQF326** and **VMQF326** are 3.2 x 2.5 x 1.6 mm miniature SMD TCXOs and VCTCXOs, the supply voltage can be either 2.5 V or 3.3 V, and output logics include CMOS (up to 250 MHz), differential LVPECL or LVDS (up to 1.5 GHz). The product flexibility makes the custom (VC)TCXO frequencies more readily available than any other series, and a short lead time. The 0.8 ~ 1.6 ps typical phase jitter and lower current consumption (43 mA typical for LVPECL 622.080 MHz at 3.3 V) compared to competitions make the series ideal for multimedia, Ethernet, and networking applications.



**Relevant Categories:**

- **QMQF326** and **QVMQF326** are quick-turn delivery versions of the MQF326 and VMQF326 series respectively. quick-turn delivery products, either standard or custom frequencies, are produced and shipped from Taiwan in 10 days. Click to check our inventory and place your order online.
- For lower phase noise and phase jitter (0.6 p. sec. typical), please refer to the **MQN326** and **VMQN326** series.
- For 7.0 x 5.0 x 2.5 mm with the same electrical performance, please refer to the **MQF574** and **VMQF574** (CMOS; 4-pad) and the **MQF576** and **VMQF576** (LVPECL or LVDS; 6-pad) series.

**General Specifications:** at Ta= +25°C

Output Logic Type	CMOS (code "T")		LVPECL (code "P")		LVDS (code "D")	
	MQF326T25	MQF326T33	MQF326P25	MQF326P33	MQF326D25	MQF326D33
VCTCXO Models	VMQF326T25	VMQF326T33	VMQF326P25	VMQF326P33	VMQF326D25	VMQF326D33
Frequency Range	10 ~ 250 MHz		10 ~ 1500 MHz		10 ~ 1500 MHz	
Supply Voltage (V <sub>DD</sub> )	+2.5 V ±5%	+3.3 V ±5%	+2.5 V ±5%	+3.3 V ±5%	+2.5 V ±5%	+3.3 V ±5%
	Code "25"	Code "33"	Code "25"	Code "33"	Code "25"	Code "33"
Current Consumption (mA; typical)	25 MHz: 17	10 MHz: 21	18 MHz: 28	18 MHz: 35	11 MHz: 19	11 MHz: 22
	45 MHz: 20	50 MHz: 24	156 MHz: 30	156 MHz: 38	190 MHz: 23	155.5 MHz: 26
	50 MHz: 21	77 MHz: 25	622 MHz: 33	622 MHz: 43	390 MHz: 24	250 MHz: 26
	125 MHz: 24	125 MHz: 29	1289 MHz: 37	1289 MHz: 51	1289 MHz: 31	1080 MHz: 32
	250 MHz: 25	250 MHz: 34	1500 MHz: 43	1500 MHz: 52	1500 MHz: 34	1500 MHz: 35
Load; typical	15 pF		50 Ω into V <sub>CC</sub> - 2.0 V or Thevenin equivalent		100 Ω across the outputs	
Output "High" Voltage; (V <sub>OH</sub> )	90% V <sub>DD</sub> min.		V <sub>DD</sub> -1.03 V min.; V <sub>DD</sub> -0.6 V max.		1.4 V typical; 1.6 V max.	
Output "Low" Voltage; V <sub>OL</sub>	10% V <sub>DD</sub> max.		V <sub>DD</sub> -1.85 V min.; V <sub>DD</sub> -1.6 V max		1.1 V typical; 0.9 V min.	
Rise Time (Tr) / Fall Time (Tf)	1.5 nS. Typ.; 3.0 nS. max. (10% ↔ 90% waveform)		0.2 nS Typ.; 0.5 nS max. (20% ↔ 80% waveform)		0.2 nS Typ.; 0.4 nS max. (20% ↔ 80% waveform)	

**MERCURY** [www.mercury-crystal.com](http://www.mercury-crystal.com)

Taiwan: TEL(886)-2-2406-2779, e-mail: [sales-tw@mercury-crystal.com](mailto:sales-tw@mercury-crystal.com)

<b>Additional Output AC Characteristics for LVDS output (LVDS only)</b>	Differential Output Voltage ( $V_{OD}$ ): 175 mV min.; 350 mV typical $V_{OD}$ Magnitude Change ( $\Delta V_{OD}$ ): 50 mV max. Offset Voltage ( $V_{OS}$ ): 1.25 V typical $V_{OS}$ Magnitude Change ( $\Delta V_{OS}$ ): 50 mV max.												
<b>Frequency Stability</b>	Stability Temperature	$\pm 0.5$ ppm	$\pm 1.0$ ppm	$\pm 1.5$ ppm	$\pm 2.0$ ppm	$\pm 2.5$ ppm							
	0 to +55°C	Available	Available	Available	Available	Available							
	-10 to +60°C	Available	Available	Available	Available	Available							
	-20 to +70°C	Available	Available	Available	Available	Available							
	-30 to +85°C	Contact Mercury	Available	Available	Available	Available							
	-40 to +85°C	Contact Mercury	Available	Available	Available	Available							
	Voltage Change	$\pm 0.2$ ppm max. for a $\pm 5\%$ input voltage change											
	Load Change	$\pm 0.2$ ppm max. for a $\pm 10\%$ load condition change											
	Aging at $T_a = +25^\circ\text{C}$	$\pm 2$ ppm max. first-year; $\pm 10$ ppm max. over 10 years											
Reflow	$\pm 1.0$ ppm max., one reflow and measured 24 hours afterward.												
<b>Initial Calibration Tolerance (Initial Frequency Accuracy)</b>	$\pm 1.0$ ppm typical; $\pm 2.0$ ppm max. at $+25^\circ\text{C} \pm 2^\circ\text{C}$ .												
<b>Duty Cycle</b>	50% $\pm 5\%$ . At 50% $V_{DD}$ .												
<b>Current with Output Disabled</b>	18 mA typical												
<b>Start-up Time</b>	5 m. sec. max.												
<b>Output Enable Time</b>	200 ns max.												
<b>Output Disable Time</b>	50 ns max.												
<b>Single Side-band Phase Noise (dBc/Hz; typical)</b>	Frequency (MHz)	<b>16</b>	<b>25</b>	<b>49.152</b>	<b>50</b>	<b>54</b>	<b>156.250</b>	<b>600</b>	<b>1030</b>	<b>1080</b>	<b>1270</b>	<b>1450</b>	
	Supply Voltage	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	
	Output Logic	T	T	T	T	T	P	P	P	D	D	D	
	Offset	10 Hz	-92	-88	-85	-80	-77	-63	-59	-53	-49	-49	-52
		100 Hz	-116	-109	-108	-103	-106	-91	-81	-75	-81	-78	-78
		1 kHz	-131	-125	-121	-117	-119	-109	-96	-93	-93	-91	-89
		10 kHz	-139	-132	-126	-124	-125	-115	-102	-94	-98	-94	-92
		100 kHz	-140	-134	-127	-127	-126	-116	-104	-97	-99	-97	-94
		1 MHz	-158	-151	-146	-145	-145	-137	-125	-119	-120	-117	-118
		5 MHz	-163	-157	-154	-148	-153	-147	-132	-129	-128	-128	-129
10 MHz		-	-	-157	-150	-157	-150	-136	-133	-133	-133	-133	
20 MHz	-	-	-160	-152	-160	-155	-139	-	-142	-142	-		
<b>Integrated Phase Jitter, RMS 12 kHz to 20 MHz, picosecond</b>	0.76	0.9	1.0	1.1	1.1	1.1	1.1	1.1	1.4	1.1	1.2	1.4	
<b>Control Voltage Function on Pad 1 (VCTCXOs only)</b>													
<b>Control Voltage (<math>V_{control}</math>)</b>	$V_{control}$ center and range: $+1.5\text{ V} \pm 1.0\text{ V}$ . For both 2.5 $V_{DD}$ and 3.3 $V_{DD}$												
<b>Frequency Pulling Range</b>	High pull: +8 ppm min. for $V_{control}$ from 1.5 V to +2.5V Low pull: -8 ppm min. for $V_{control}$ from 0.5 V to +1.5V												
<b>Linearity</b>	$\pm 5\%$ typical. $\pm 10\%$ max.												
<b>Transfer Function</b>	Positive Transfer												
<b>Input Impedance</b>	500 K $\Omega$ min.												
<b>Bandwidth</b>	10 kHz min. Measured at -3 dB.												

Tri-State function on Pad 2	
Output Enable (OE) Control	70% of $V_{DD}$ (min.) to enable output. CMOS level. Do not leave this pin floating. If no connection is desired, please contact Mercury.
	30% of $V_{DD}$ (max.) to disable the output. Output is high impedance.
Output Enable Time	200 n. sec. max.
Output Disable Time	50 n. sec. max.

### Absolute Maximum Rating:

Input Voltage	-0.5 V to $V_{DD} + 0.5$ V
Output Voltage	-0.5 V to $V_{DD} + 0.5$ V
Positive Supply Voltage	4.2 V
Electrostatic Discharge (ESD)	Human Body Model (HBM): Exceeds 2000 V. Class 2 per MIL-STD-1686C
	Machine Model (MM): Exceeds 120 V. Class M2 per MIL-STD-1686C. Note: Power, ground, and outputs are 200 V.
	Charged-Device Model (CDM): Exceeds 2000 V. Class C6 per MIL-STD-1686C

### Environmental Performance Specifications

Green Requirement	RoHS compliant, Pb (lead) free per EU Directive 2002/95/EC 6/6 (2002/95/EC) and WEEE (2002/96/EC). Free of halide, cadmium, hexavalent chromium, lead, mercury, PBBs, and PBDEs.
Moisture Sensitivity Level	Level 1 (infinite) according to IPC/JEDEC J-STD-020D.1
Storage temperature range	-55 to +125°C
Humidity	85% RH, 85°C, 168 hours
Fine Leak / Gross Leak	MIL-Std-883, method 1014, condition A / MIL-Std-883, method 1014, condition C
Solderability	MIL-STD-202G method 210F
Reflow	260°C for 40 sec(MAX). 1X.
Vibration	MIL-STD-883F:2007.3, 20G, 20 to 2000 Hz
Shock	MIL-STD-883F:2002.4, 1500G for 0.5ms , 3cycles
Resistance to Solvent	MIL-STD-202, method 215
Temperature Cycling	MIL-STD-883F-1010.8 Condition B
Pad Surface Finish	Gold (0.3 um to 1.0 um) over nickel (1.27 um to 8.89 um)

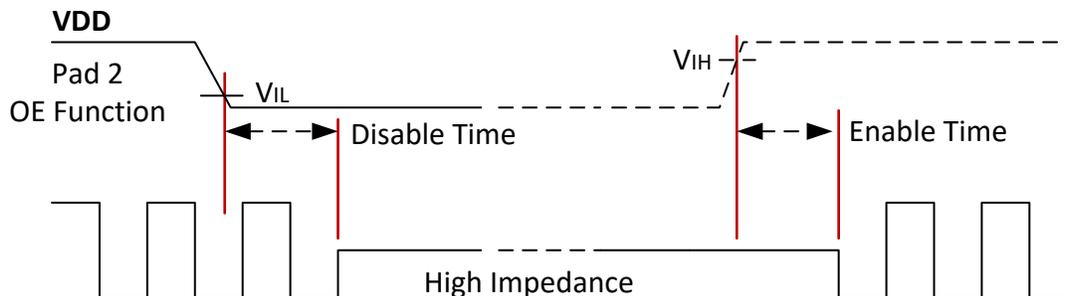
### Part Number Format and Examples:

Example 1: VMQF326D33-622.080-2.0/-40+85;

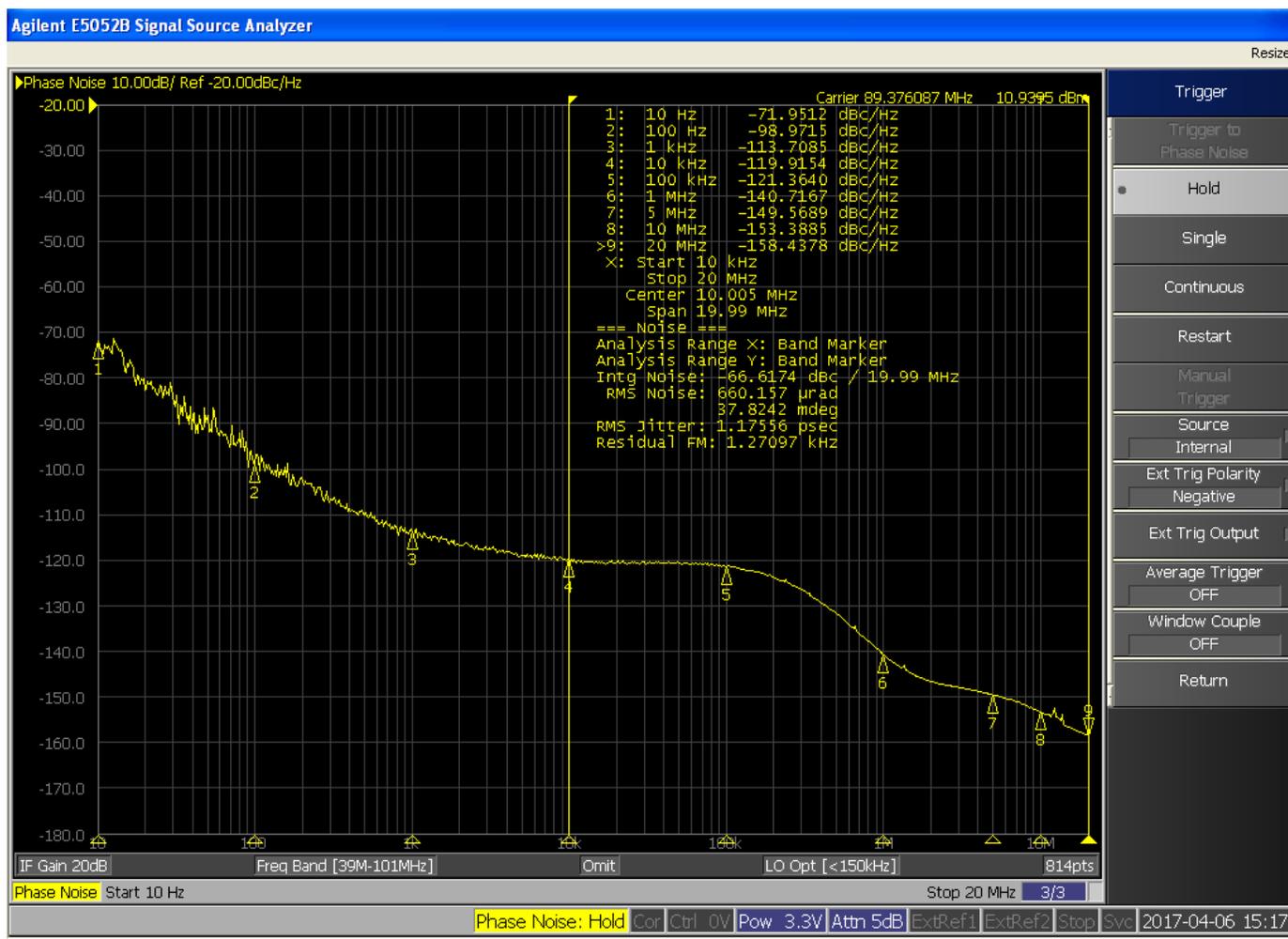
Example 2: MQF326T25-148.500-2.5/-30+85

VMQF	326	D	33	-	622.080	-	2.0	/	-40+85
MQF	326	T	23	-	148.500	-	2.5	/	-30+85
Main Series "MQF": TCXO "VMQF": VCTCXO	Package Code "326": 3.2x2.5 mm 6-pad SMD	Output Logic "T": CMOS "P": LVPECL "D": LVDS	Supply Voltage "33" for 3.3V "25" for 2.5V		The nominal Frequency in MHz. 3 places or more after the decimal.		Frequency Stability. One decimal place.		Operating Temperature Range (°C)

**Output OE Function on pad 2** Note: Do not leave this pad floating. If “no-connection” is desired, please contact Mercury.

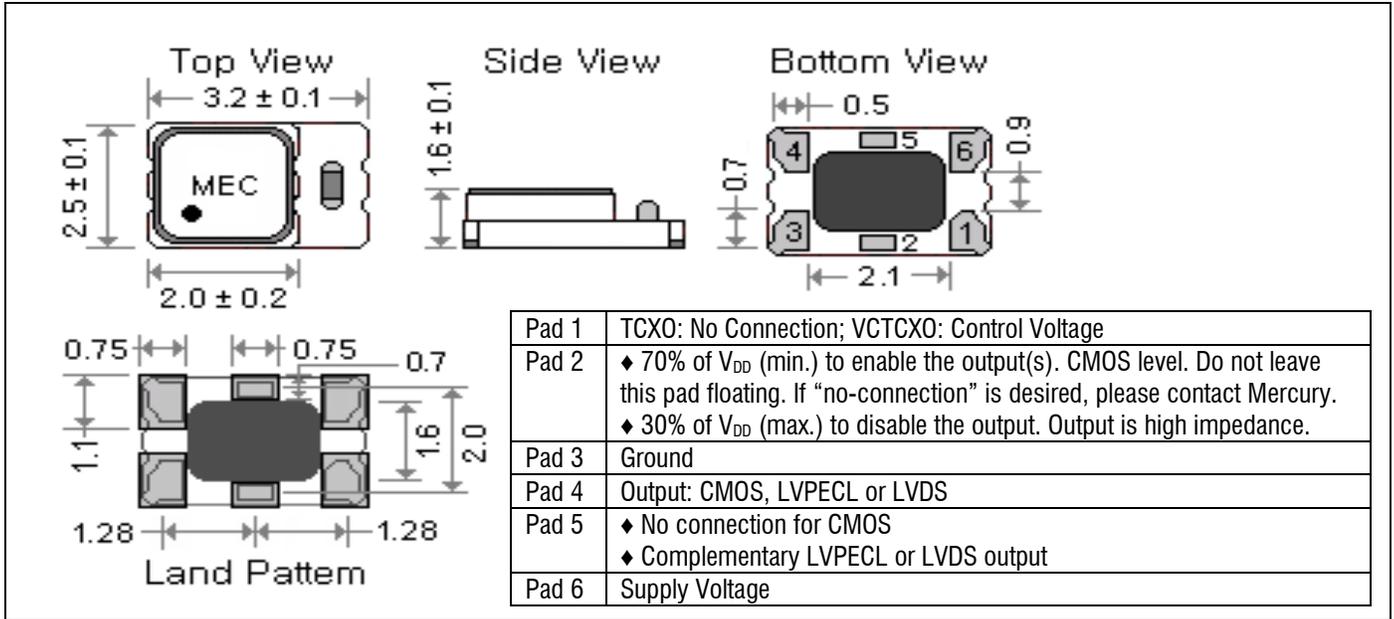


**Phase Noise Plot of MQF326T33-89.376 MHz, V<sub>DD</sub>= +3.3V, CMOS**



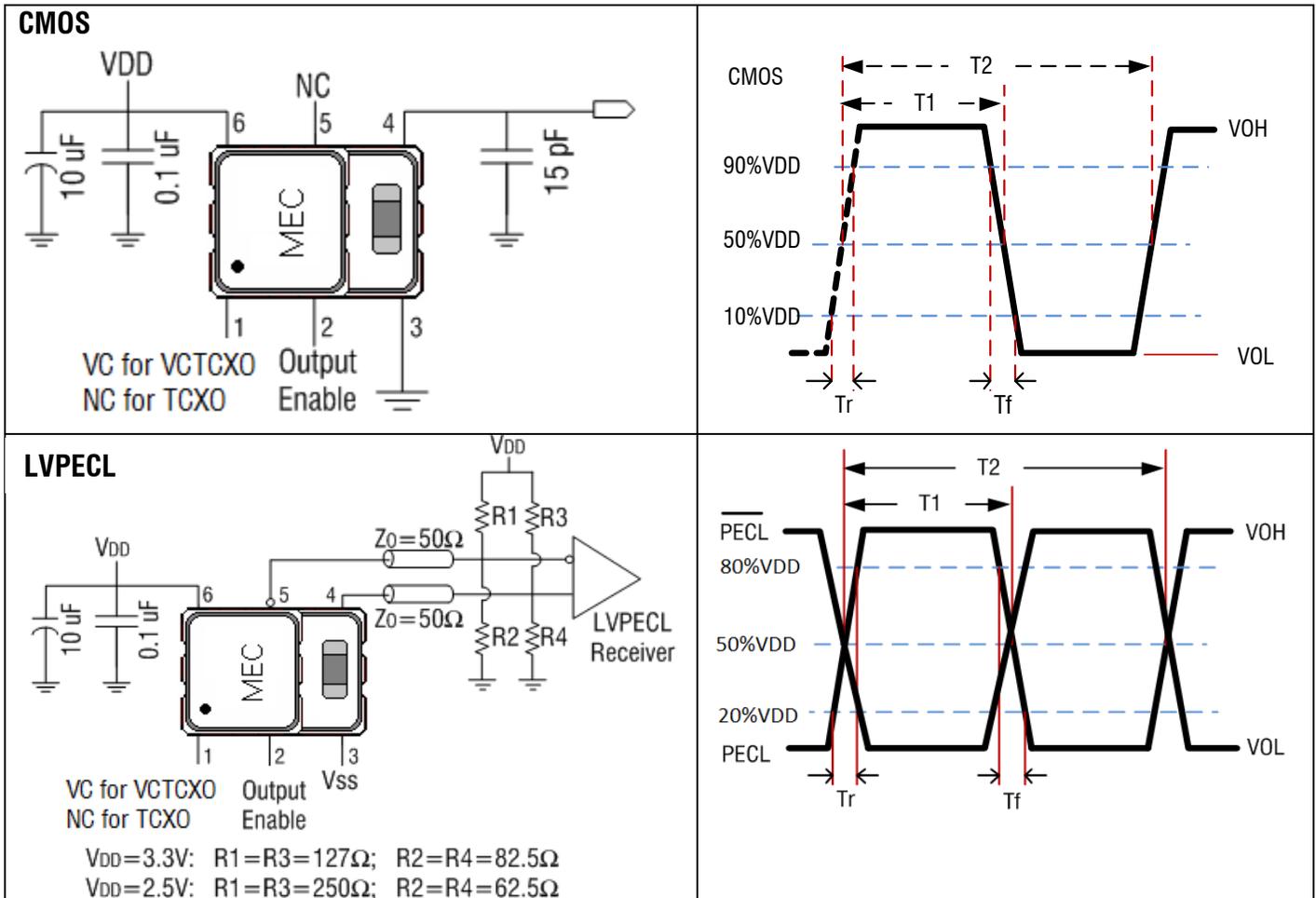
**Package Dimensions and Recommended Solder Pad Layout**

unit: (mm)

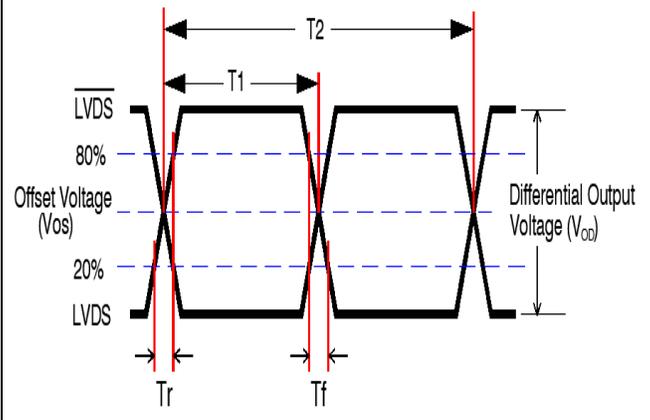
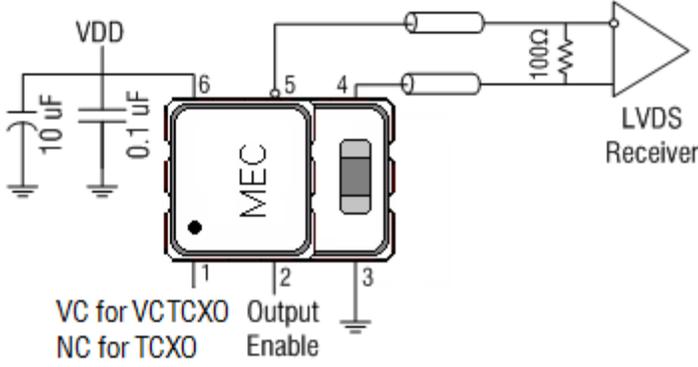


**Test Circuits and Output Waveforms**

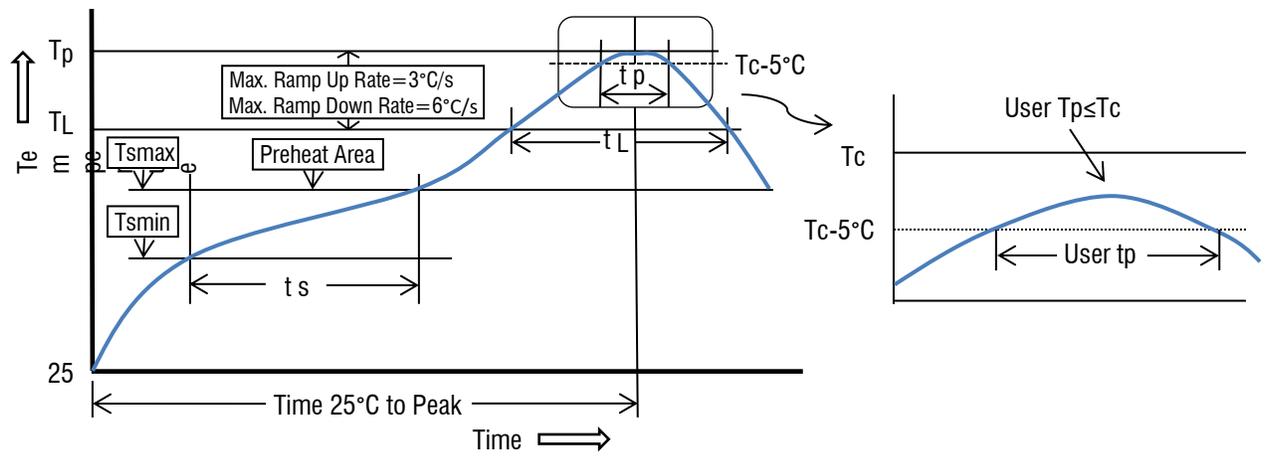
Duty cycle =  $\left(\frac{T_1}{T_2}\right) * 100\%$ . Measured at 50% V<sub>DD</sub>



### LVDS



### Recommended Solder Reflow Profile (per IPC/JEDEC J-STD-020D.1)



Profile Feature	Sn-Pb Eutectic Assembly	Pb-free Assembly
Preheat/Soak		
- Temperature min. (Ts min.)	100°C	150°C
- Temperature max. (Ts max.)	150°C	200°C
- Time (ts) (Ts min. to Ts max.)	60 to 120 seconds	60 to 180 seconds
Ramp-up rate (T <sub>L</sub> to T <sub>p</sub> )	3°C / sec. max.	3°C / sec. max.
Liquidous temperature (T <sub>L</sub> )	183°C	217°C
Time (t <sub>L</sub> ) maintained above T <sub>L</sub>	60 to 150 seconds	60 to 150 seconds
Peak package body temperature (T <sub>p</sub> )	235°C	260°C
Time (T <sub>p</sub> ) within 5°C of the classification temperature T <sub>c</sub>	10 to 30 seconds	20 to 40 seconds
Ramp-down rate (T <sub>p</sub> to T <sub>L</sub> )	6°C / second max.	6°C / second max.
Time 25°C to peak temperature	6 minutes max.	8 minutes max.

All temperatures refer to the topside of the package, measured on the package body surface.