QMQF326 Series Temperature Compensated Crystal Oscillators (TCXOs)
QVMQF326 Series TCXOs with Voltage Control Function (VCTCXOs)

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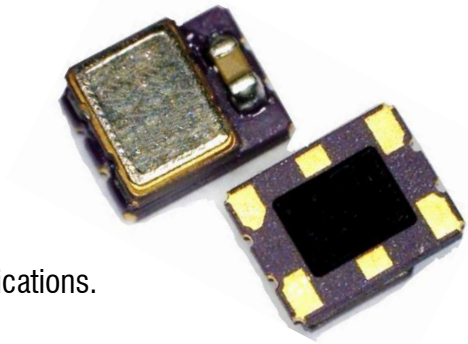
Since 1973

QMQF326 and **QVMQF326** are quick-turn delivery versions of the MQF326 (a TCXO) and VMQF326 (a VCTCXO) series, respectively. quick-turn delivery products, either standard or custom frequencies are produced and shipped from Taiwan in 10 days and available at Mercury eCommerce. They are 3.2 x 2.5 x 1.6 mm miniature SMD, the supply voltage can be either 2.5 V or 3.3 V and output logics include CMOS (up to 250 MHz), differential LVEPCL or LVDS (up to 1.5 GHz). 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:

- For lower cost with regular lead time, please refer to the non- quick-turn delivery equivalent, the **MQF326,** and the **VMQF326** series.
- 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 **QMQF574, QVMQF574** (CMOS; 4-pad), and **QMQF576, QVMQF576** (LVPECL or LVDS; 6-pad) series.

General Specifications: at Ta = +25°C

Output Logic Type	CMOS (code "**T**")		LVPECL (code "**P**")		LVDS (code "**D**")	
TCXO Models	**QMQF326T25**	**QMQF326T33**	**QMQF326P25**	**QMQF326P33**	**QMQF326D25**	**QMQF326D33**
VCTCXO Models	**QVMQF326T25**	**QVMQF326T33**	**QVMQF326P25**	**QVMQF326P33**	**QVMQF326D25**	**QVMQF326D33**
Frequency Range	10 ~ 250 MHz		10 ~ 1500 MHz		10 ~ 1500 MHz	
Supply Voltage (V_{DD})	+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 45 MHz: 20 50 MHz: 21 125 MHz: 24 250 MHz: 25	10 MHz: 21 50 MHz: 24 77 MHz: 25 125 MHz: 29 250 MHz: 34	18 MHz: 28 156 MHz: 30 622 MHz: 33 1289 MHz: 37 1500 MHz: 43	18 MHz: 35 156 MHz: 38 622 MHz: 43 1289 MHz: 51 1500 MHz: 52	11 MHz: 19 190 MHz: 23 390 MHz: 24 1289 MHz: 31 1500 MHz: 34	11 MHz: 22 155.5 MHz: 26 250 MHz: 26 1080 MHz: 32 1500 MHz: 35
Load; typical	15 pF		50 Ω into Vcc - 2.0 V or Thevenin equivalent		100 Ω across the outputs	
Output "High" Voltage; (V_{OH})	90% V_{DD} min.		V_{DD}-1.03 V min.; V_{DD}-0.6 V max.		1.4 V typical; 1.6 V max.	
Output "Low" Voltage; V_{OL}	10% V_{DD} max.		V_{DD}-1.85 V min.; V_{DD}-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)	

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Additional Output AC Characteristics for LVDS output (LVDS only)	Differential Output Voltage (V_{OD}): 175 mV min.; 350 mV typical V_{OD} Magnitude Change (ΔV_{OD}): 50 mV max. Offset Voltage (Vos): 1.25 V typical Vos Magnitude Change (ΔVos): 50 mV max.											
Frequency Stability vs	Operating Temperature	±2.0 ppm over -40 to +85°C. Spec. code: "**2.0A**".										
		±2.5 ppm over -30 to +85°C. Spec. code: "**2.5B**".										
		Custom specification: The 2.0A or 2.5B is replaced with a control number assigned by Mercury.										
	Voltage Change	±0.2 ppm max. for a ±5% input voltage change										
	Load Change	±0.2 ppm max. for a ±10% load condition change										
	Aging at Ta = +25°C	±2 ppm max. first-year; ±10 ppm max. over 10 years										
	Reflow	±1.0 ppm max., one reflow and measured 24 hours afterward.										
Initial Calibration Tolerance (Initial Frequency Accuracy)	±1.0 ppm typical; ±2.0 ppm. max. at +25°C±2°C.											
Duty Cycle	50% ±5%. At 50% V_{DD}.											
Current with Output Disabled	18 mA typical											
Start-up Time	5 m. sec. max.											
Output Enable Time	200 ns max.											
Output Disable Time	50 ns max.											
Single Side-band Phase Noise (dBc/Hz; typical)	Frequency (MHz)		**16**	**25**	**49.152**	**50**	**54**	**156.250**	**600**	**1030**	**1080**	**1270**	**1450**
	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	–
Integrated Phase Jitter, RMS 12 kHz to 20 MHz, picosecond			0.76	0.9	1.0	1.1	1.1	1.1	1.1	1.4	1.1	1.2	1.4
Control Voltage Function on Pad 1 (VCTCXOs only)													
Control Voltage ($V_{control}$)	V_{contol} center and range: +1.5 V ± 1.0 V. For both 2.5 V_{DD} and 3.3 V_{DD}												
Frequency Pulling Range	High pull: +8 ppm min. for V_{contol} from 1.5 V to +2.5V Low pull: - 8 ppm min. for V_{contol} from 0.5 V to +1.5V												
Linearity	±5% typical. ±10% max.												
Transfer Function	Positive Transfer												
Input Impedance	500 KΩ min.												
Bandwidth	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

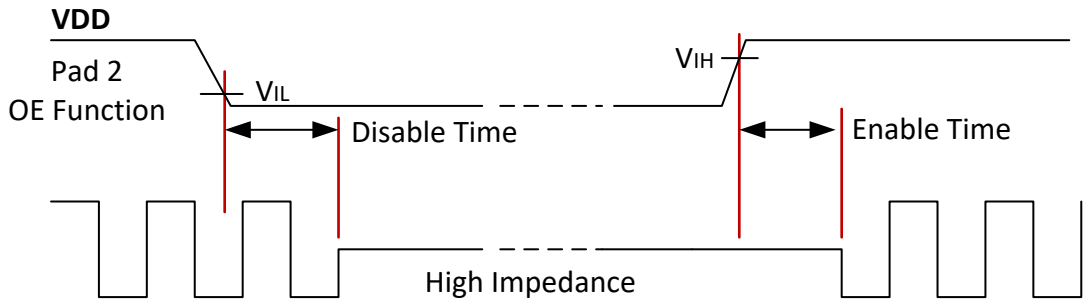
Green Requirement	RoHS compliant, Pb (lead) free per EU Directive 2002/95/EC 6/6 (2002/95/EC) and WEEE (2002/96/EC). Free of halide, cadmium, hexavalent chromium, lead, mercury, PBBs, and PBDEs.
Moisture Sensitivity Level	Level 2 per IPC/JEDEC J-STD-020D.1
Storage temperature range	-55 to +125°C
Humidity	85% RH, 85°C, 48 hours
Fine Leak / Gross Leak	MIL-Std-883, method 1014, condition A / MIL-Std-883, method 1014, condition C
Solderability	MIL-STD-202F method 208E
Reflow	260°C for 10 sec. 2X.
Vibration	MIL-STD-202F method 204, 35G, 50 to 2000 Hz
Shock	MIL-STD-202F method 213B, test condition. E, 1000GG ½ sine wave
Resistance to Solvent	MIL-STD-202, method 215
Temperature Cycling	MIL-STD-883, method 1010
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:

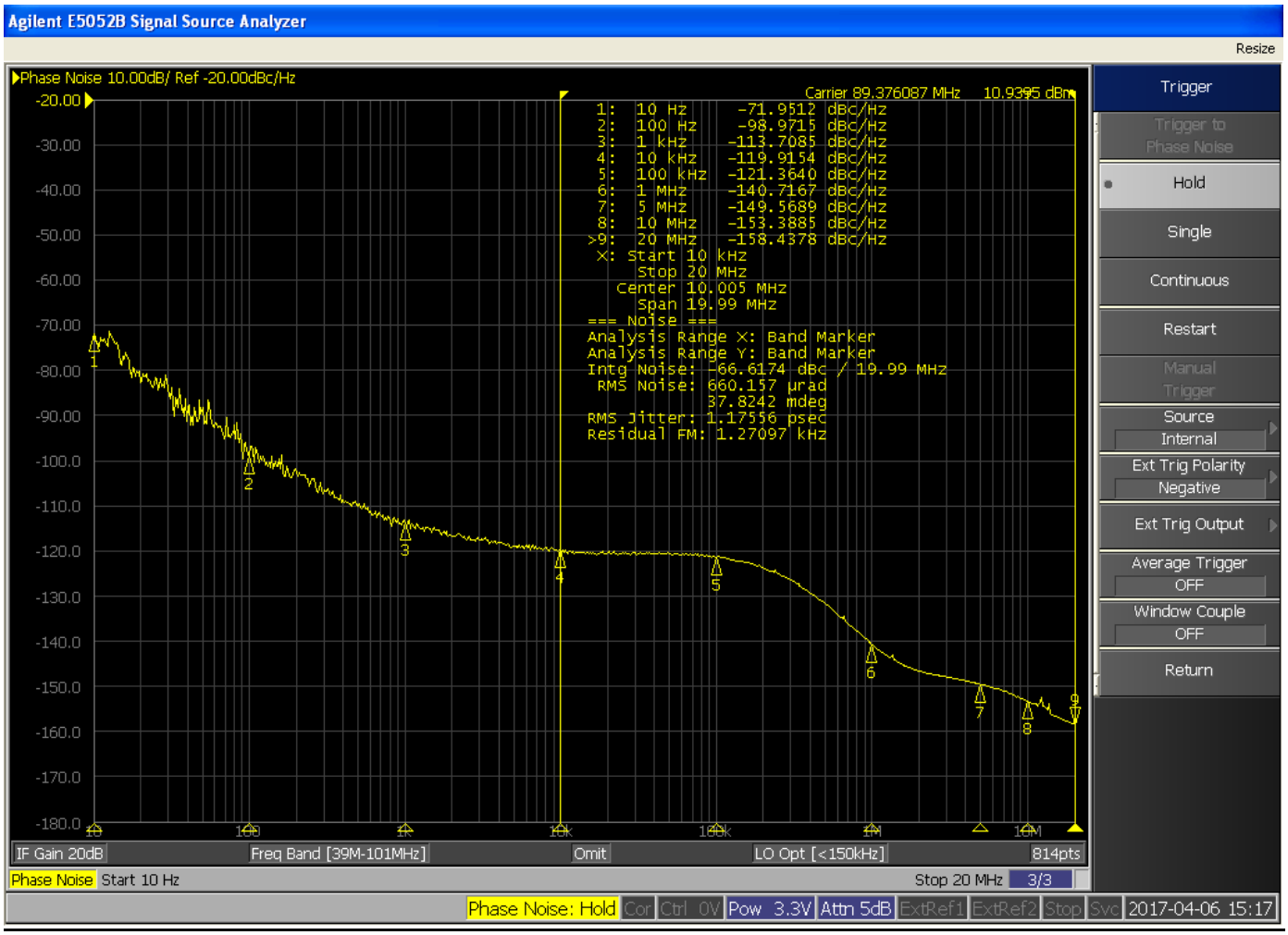
Example 1: QVMQF326D33-2.0A-622.080; Example 2: QMQF326T25-2.5B-148.500;
Example 3: QMQF326P33-xxxxx-155.520

QVMQF	326	D	33	-	2.0A	-	622.080
QMQF	326	T	25	-	2.5B	-	148.500
QMQF	326	P	33	-	xxxxx	-	155.520
Product Series "**QMQF**": TCXO "**QVMQF**": 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	-	"**2.5B**": The freq. stability is ±2.5 ppm over -30 to +85°C "**2.0A**": The freq. stability is ±2.0 ppm over -40 to +85°C "**xxxxx**": Custom frequency stability. A control number assigned by Mercury.	-	The nominal Frequency in MHz. 3 places or more after the decimal.

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

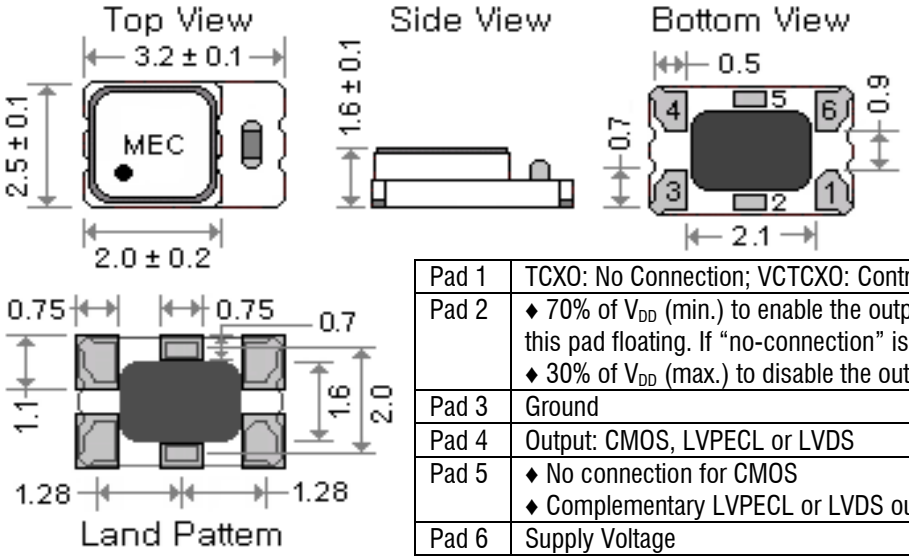


Phase Noise Plot of QMQF326T33-89.376 MHz, V_{DD} = +3.3V, CMOS



Package Dimensions and Recommended Solder Pad Layout

unit: (mm)

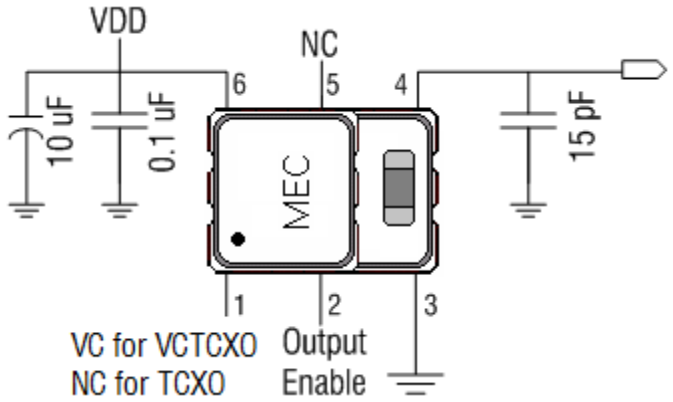


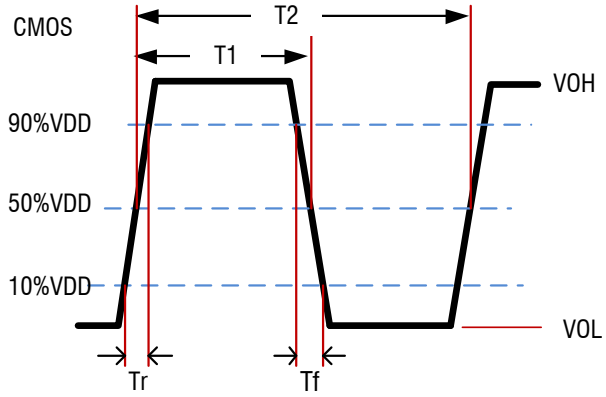
Pad 1	TCXO: No Connection; VCTCXO: Control Voltage
Pad 2	♦ 70% of V_{DD} (min.) to enable the output(s). CMOS level. Do not leave this pad floating. If "no-connection" is desired, please contact Mercury. ♦ 30% of V_{DD} (max.) to disable the output. Output is high impedance.
Pad 3	Ground
Pad 4	Output: CMOS, LVPECL or LVDS
Pad 5	♦ No connection for CMOS ♦ Complementary LVPECL or LVDS output
Pad 6	Supply Voltage

Test Circuits and Output Waveforms

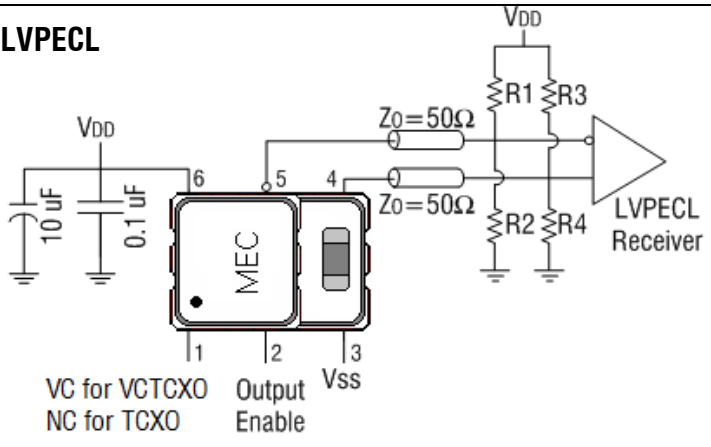
Duty cycle $= \left(\frac{T1}{T2}\right) * 100\%$. Measured at 50% V_{DD}

CMOS

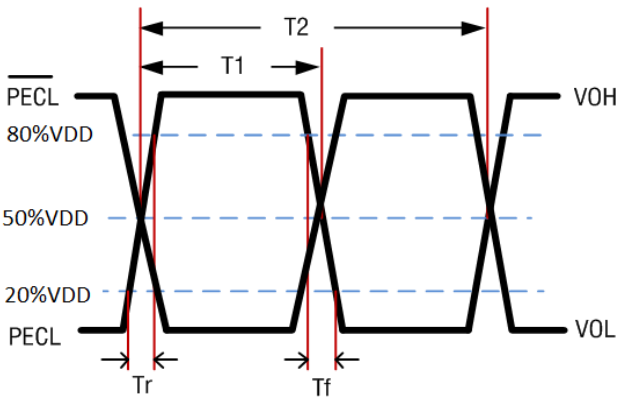




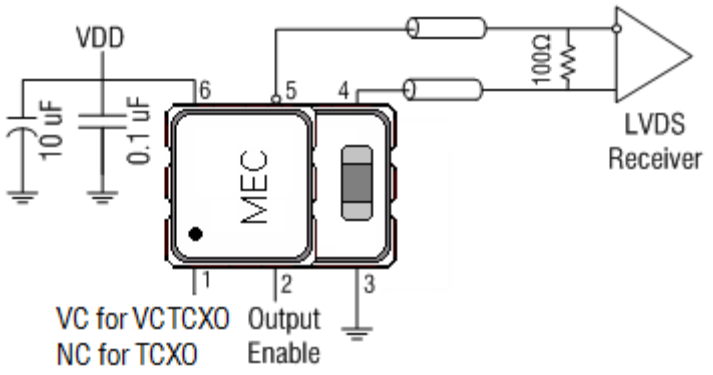
LVPECL

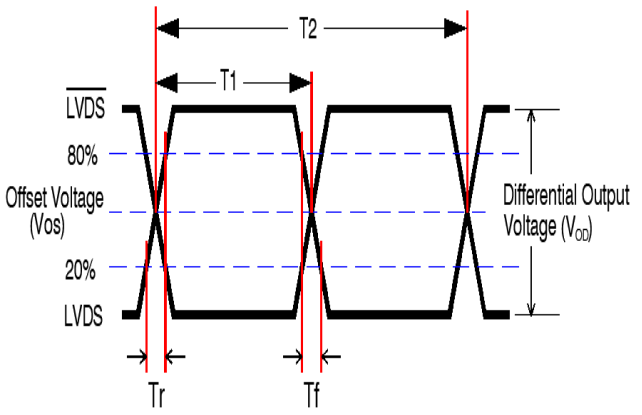


VDD=3.3V: R1=R3=127Ω; R2=R4=82.5Ω
VDD=2.5V: R1=R3=250Ω; R2=R4=62.5Ω

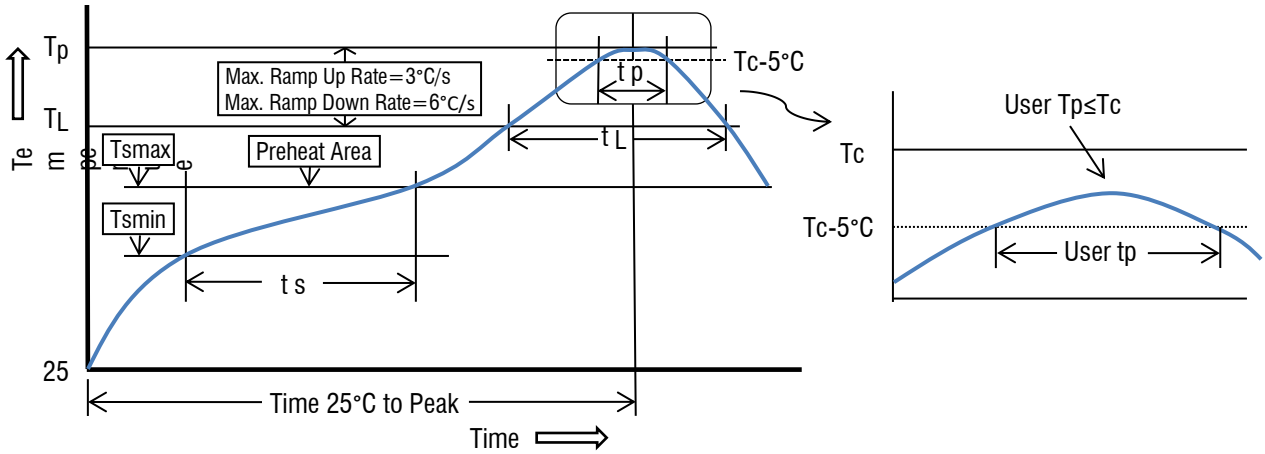


LVDS





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.) - Temperature max. (Ts max.) - Time (ts) (Ts min. to Ts max.)	 100ºC 150ºC 60 to 120 seconds	 150ºC 200ºC 60 to 180 seconds
Ramp-up rate (T_L to Tp)	3ºC / sec. max.	3ºC / sec. max.
Liquidous temperature (T_L) Time (t_L) maintained above T_L	183ºC 60 to 150 seconds	217ºC 60 to 150 seconds
Peak package body temperature (Tp)	235ºC	260ºC
Time (Tp) within 5ºC of the classification temperature Tc	10 to 30 seconds	20 to 40 seconds
Ramp-down rate (Tp to T_L)	6ºC / second max.	6ºC / second max.
Time 25ºC to peak temperature	6 minutes max.	8 minutes max.

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