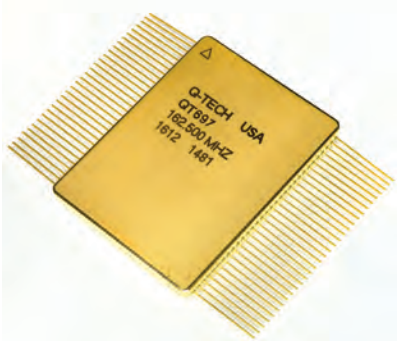
MULTIPLE OUTPUT LVDS SERIES

3.3Vdc, 1 to 12 Differential LVDS Pairs, Space Qualified Crystal Oscillators
15MHz to 162.5MHz

Description

Q-Tech QT625LW & QT697LW series Space Qualified, 100kRad(Si) Tolerant Hybrid Oscillators are Class 2 hybrids per MIL-PRF-55310, Muliple-Ouput LVDS, hermetically sealed in a 20-pin Flat-Pack .625" SQR or 1.25" x 1.65" 62-pin custom Flat-Pack, and operate at 3.3Vdc over full military -55°C to +125°C temperature range.

The products combine good shock and vibration resistant with superior low phase noise.



Features

- Made in USA
- Hermetically sealed packages
- Supply voltage 3.3Vdc
- Wide temperature range -55°C to +125°C
- Screened and Quality Conformance Inspection to MIL-PRF-38534, Class K (modified)
- LVDS differential outputs
- 100k(Si) Radiation tolerant
- Low phase noise and jitter

Ordering Information

(Sample part number)

QT 6254 LWD 9 M - 125.00MHz

QT	6254	LW	D	9	M	-	125.000MHz

Terminal Finish

QT =	Standard Gold Plated
QS =	Hot Solder Dip Sn60Pb40

Part Number

QT6251	= QT625 1 LVDS Pairs
QT6252	= QT625 2 LVDS Pairs
QT6253	= QT625 3 LVDS Pairs
QT6254	= QT625 4 LVDS Pairs
QT6976	= QT697 6 LVDS Pairs
QT6978	= QT697 8 LVDS Pairs
QT6972	= QT697 12 LVDS Pairs

Supply Voltage and Logic

+3.3V±5% LVDS

Frequency

15MHz to 162.5MHz

Screening Options

M =	Flight Units
E =	Engineering Model
B =	Breadboard Model

Stability/Temperature Options

2 =	±65ppm, -55°C to +125°C
9 =	±50ppm, -55°C to +125°C
6 =	±50ppm, -55°C to +105°C
11 =	±50ppm, -40°C to +85°C

Tristate (Enable/Disable)

Blank =	N/C
D =	Tristate E/D

Note: QT697LW has Tristate as a default option

Applications

- Satellites
- Aerospace
- Master clock for FPGA

Packaging Options

- Standard ESD packaging

1 PURPOSE

1.1 The purpose of this Specification Control Drawing (SCD) is to describe the design, construction, performance and specific quality and reliability requirements for hermetically sealed 20-pin or 62-pin flat packs, Space Level, Hybrid Crystal Oscillators intended for use in high-reliability spacecraft applications.

2 SCOPE

2.1 This specification establishes the minimum detail requirements for QT625LW and QT697LW intended for use in conjunction with the applicable documents.

3 PART PROTECTION AND SAFETY

3.1 These items are susceptible to breakdown damage resulting from electrostatic discharge. Every precaution shall be taken while handling, installing, and testing the parts to prevent static charge. Care should be exercised to not apply more than rated voltage or current to any terminal/pad during testing.

4 PART NUMBER

4.1 The Q-Tech Part Number shall be as specified in Ordering Information.

5 APPLICABLE DOCUMENTATION & REFERENCES

5.1 The following documents form a part of this drawing to the extent specified or modified herein.

5.2 **Military**

5.2.1 MIL-PRF-55310, Oscillator, Crystal Controlled, General Specification for

5.2.2 MIL-PRF-19500, Semiconductor Devices, General Specification for

5.2.3 MIL-PRF-38534, Microcircuit Manufacturing, General Specification for

5.2.4 MIL-PRF-38535, Integrated Circuits, (Microcircuits) Manufacturing, General Specification for

5.3 **Standards**

5.3.1 MIL-STD-202, Test Methods for Electronic and Electrical Component Parts

5.3.2 MIL-STD-750, Test Methods for Semiconductor Devices

5.3.3 MIL-STD-883, Test Methods and Procedures for Microelectronics

5.3.4 MIL-STD-1686, Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies and Equipment

5.3.5 MIL-STD-1285, Marking of Electrical and Electronic Parts

5.3.6 MIL-STD-1580, Destructive Physical Analysis for EEE parts

5.4 **American Society for Testing And Materials**

5.4.1 ASTM E 595, Standard Test Method for Total Mass Loss and Collected Volatile Condensable materials from Outgassing in a vacuum Environment

5.5 **Other Documents**

5.5.1 NASA Reference Publication 1124, Outgassing Data for Selecting Spacecraft Materials

5.6 **Order of Precedence**

In the event of conflict between this document and the references cited herein or other requirements, the requirements of this drawing shall take precedence.

5.6.1 **Customer Purchase Order Special Requirements**

Additional special requirements shall be specified in the applicable customer purchase order when additional requirements or modifications are needed for compliance to special programs or product line compliance. Unique identification of the items produced may be required.

6 REQUIREMENTS

6.1 **General Requirements**

The parts shall comply with the requirements of MIL-PRF-38534, Class K and MIL-PRF-55310, Level S except as modified or supplemented herein.

6.2 **Approved Source of Supply**

Hybrid crystal oscillators shall be supplied from the manufacturer specified in "Source of Supply" below.

6.3 **Design and Construction**

6.3.1 **Outline Dimensions and Terminal Connections**

The outline dimensions and terminal connections shall be as shown in Figure 1 or Figure 2 herein.

6.3.2 **Package Body and Lead Finish**

The package body and lead finish shall be gold in accordance with MIL-PRF-38534. Hot Solder dip can be added as an option.

6.3.3 **Circuit Design**

The circuit design analysis shall be performed to establish the electrical stresses for each element under the crystal oscillator nominal and maximum rated operating condition. The circuit design shall make allowances for worst-case variation, to compensate for manufacturing variations and End-Of- Life parameter limits in the following as a minimum, but not limited to: input and output voltages; input and output currents; power dissipation; propagation delay, frequency stability over temperature: frequency/voltage stability and operating junction temperature.

6.3.4 **Quartz Crystal**

The quartz crystal utilized in the design shall be Swept, grade 2.2 million or better, physically mounted on a three-point minimum.

6.3.5 **Crystal Mounting**

The crystal element shall be three-point minimum mounted in such a manner as to assure adequate crystal performance when the oscillator is subjected to the environmental conditions specified herein.

6.3.6 **Active Devices**

The microcircuit used in this part shall use LVDS technology and shall be from a wafer proven to be radiation tolerant to 100kRad(Si) total ionizing dose.

6.3.7 **Element Evaluation**

All piece parts shall be derived from lots that meet the element evaluation requirements of MIL-PRF- 38534, Class K.

6.3.8 **Package Elements**

a) Salt Spray Salt spray testing not required.

6.3.9 **Electrical and Thermal Derating**

The derating analysis shall be performed using the maximum operating temperature specified in Table I.

6.3.10 **Prohibited Finishes**

6.3.10.1 **Metals**

All metals (internal and external) shall be such that they will not promote the growth of whiskers, dentrites, in termetallic formation or Kirkendall voids, corrosion, and shall not sublime in the intended application conditions. Mercury, Zinc, Cadmium and Selenium are prohibited. Alloy and brazing materials containing Cadmium or Zinc shall not be used without over plating. Pure tin (greater than 97%) is prohibited. Tin shall be alloyed with a minimum of 3% lead (Pb) by weight.

6.3.10.2 **Metal Finishes**

Metal finishes (internal and external) shall be such that they will not promote the growth of whiskers, dentrites, intermetallic formation or Kirkendall voids, corrosion, and shall not sublime in the intended application conditions. Pure tin (greater than 97%) is prohibited. Tin shall be alloyed with a minimum of 3% lead (Pb) by weight.

6.4 **Performance Requirements**

6.4.1 **Materials**

Materials used in the device shall be in accordance with MIL-PRF-38534 and MIL-PRF-55310. The die inter connect materials, such as wires, shall be in accordance with MIL-PRF-38534, Class K.

6.4.2 **Bimetallic Wire Bonds**

Bimetallic wire bonds at the die are used. However, the following process steps are implemented:

a) 100% Non-Destructive Bond Pull.
b) Machine set-up, bond verification and in-process controls.

6.4.3 **Outgassing**
All nonmetallic and organic materials used shall meet outgassing requirements of ASTM E 595.

6.4.4 **Rework**
Rework and rework qualification shall be in accordance with MIL-PRF-38534, Class K.

6.4.5 **Weight**
The weight of the device shall be less than 5 grams for QT625LW or less than 25 grams for QT697LW.

6.4.6 **ESDS Classification**
The Q-Tech ESDS classification for this part is Class 1C

6.4.7 **Marking**
The marking shall be in accordance with Figure 1 or Figure 2 herein.

6.4.8 **Serialization**
Each unit shall have a unique serial number and be traceable to the specific date code, inspection lot and wafer lot as required in MIL-PRF-38534, Class K.

6.4.9 **Maximum Ratings**
The maximum ratings shall be as specified in Table I herein.

6.4.10 **Electrical Performance Characteristics and Limits**
The electrical performance requirements and limits shall be in accordance with Table III herein.

6.4.11 **Maximum Allowable Leak Rate**
The maximum allowable leakage rate shall be as specified by MIL-STD-883, method 1014 based on the internal free cavity volumne. The hermetic seal (fine and gross leak) tests shall be in accordance with MIL-STD-883, Method 1014.

6.4.12 **Total Dose Radiation Limits**
Hybrid crystal oscillators shall be capable of meeting the performance requirements after being exposed to 100kRad(Si) total dose radiation levels.

6.4.13 **Non-Flight Oscillators**
Following general requirements for non-flight hardware shall apply as minimums:

6.4.13.1 **Breadboard/Prototype (B) Oscillators**
The requirements for breadboard/prototype oscillators shall be as follows:
a) Breadboard oscillators need only meet the form, fit and function of the flight units.
b) Breadboard oscillators shall be suitable identified.

6.4.13.2 **Engineering Model (E) Oscillators**
The requiremetns for engineering model oscillators shall be as follows:
a) Design and manufacturing processes shall be identical to flight units.
b) Finished units shall be functional over the operating temperature range.
c) Screening test and/or Quality Conformance Inspection is not required.
d) Engineering model oscillators shall be suitably identified.

7 QUALITY ASSURANCE PROVISIONS

7.1 **Responsiblility for Inspection**
Unless otherwise specified in the contract or purchase order, the supplier shall be responsible for the performance of all inspection requirements as specified. Except as otherwise specified in the contract or purchase order, the supplier may use their own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by Customer. Customer reserves the right to

perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements, and to return any product failing to meet the specified requirements.

7.2 **Screening**

Hybrid crystal oscillators shall have been subjected to and successfully passed all the screening tests as specified in Table IV herein in order to be acceptable for delivery. All variables data shall be read and recorded. Devices which fail any test criteria in the screening sequence shall be removed from the lot at the time of observation or immediately at the conclusion of the test in which the failure was observed. Once rejected and verified as a device failure, rework and subsequent rescreening in accordance with the rework provisions may be performed. Devices which fail during screening may be used for Group B inspection, provided that they have completed screening through completion of the burn-in testing.

7.2.1 **Nondestructive Bond Pull**

Except for the wires connecting the crystal to the circuit (if available), 100 percent nondestructive bond pull, shall be performed on each hybrid crystal oscillator in accordance with MIL-STD-883, method 2023. The total number of failed wires and the total number of devices failed shall be recorded. The lot shall have a percent defective allowable (PDA) of 2 percent or less based on the total number of wires pulled in the production lot.

7.2.2 **Internal Visual Inspection**

Internal visual inspection shall be in accordance with the condition K (class S) requirements of MIL-STD-883, methods 2017 and 2032. During the time interval between final internal visual inspection and preparation for sealing, hybrid crystal oscillators shall be stored in a dry, controlled environment as defined in MIL-STD-883, method 2017 or in a vacuum bake oven. The following details shall apply:

a) The final internal visual inspection shall occur after crystal resonator installation and prior to cover seal. Hybrid crystal oscillator inspection and preparation for sealing shall be in a class 100 environment as defined in Federal Standard 209. Hybrid crystal oscillators shall be in a covered container when transferred from one controlled environment to another.

7.2.3 **Stabilization Bake**

Stabilization bake shall be performed prior to package seal. Stabilization bake shall be performed in a vacuum environment.

7.2.4 **Temperature Cycling**

Unless otherwise specified, temperature cycling shall be in accordance with Table IV herein.

7.2.5 **Constant Acceleration**

Constant acceleration shall be performed in the Y1 orientation.

7.2.6 **Particle Impact Noise Detection (PIND) Test**

PIND testing shall be performed in accordance with MIL-STD-883, method 2020, condition B. The PIND test shall be performed using five independent passes and all failures found at the end of each pass are rejected. The survivors of the last pass are acceptable. The cumulative number of defective devices shall not exceed 25 percent.

7.2.7 **Pre Burn-In Electrical Characteristics Test**

Unless otherwise specified, pre burn-in electrical testing shall consist of the tests listed in Table IX. Electrical performance limits shall be in accordance with Table III.

7.2.8 **Burn-In**

The burn-in period shall be 320 hours minimum. The 320 hour burn-in period shall be divided into two successive 160 hour minimum burn-in periods. Electrical testing shall be performed after the first burn-in to select acceptable devices for the second burn-in.

7.2.9 **Interim Electrical Testing**

Unless otherwise specified, interim electrical testing shall consist of the tests listed in Table IX. Electrical performance limits shall be in accordance with Table III.

7.2.10 **Final Electrical Testing**

Unless otherwise specified, final electrical testing shall consist of the tests listed in Table IX. Electrical performance limits shall be in accordance with Table III.

7.2.10.1 **Delta Limits Review**
Unless otherwise specified, delta limits shall be in accordance with Table II herein.

7.2.10.2 **Percent Defective Allowable (PDA)**
The percent defective allowable shall be 2 percent or one device, whichever is greater. PDA accountability shall be based on failures occurring during the second half of burn-in only. PDA shall be applicable to the +25 ºC of current test only.

7.2.11 **Seal Test**
The seal test may be performed in any sequence between the final electrical test and the external visual, but it shall be performed after all shearing and forming operations on the terminals. All hybrid crystal oscillators having any physical processing steps (e.g. solder dipping to the glass seal, etc.) performed following seal or external visual shall be retested for hermeticity and visual defects.

7.2.12 **Radiographic Inspection**
Radiographic inspection shall be performed in accordance with MIL-STD-883, method 2012. Views X, Y and Z axis.

7.2.13 **Frequency Aging**
The energized oscillator(s) shall be maintained at a temperature of 70 ± 3 °C for a continuous period of 30 days. Unless otherwise specified, the frequency of the oscillator shall be measured in accordance with MIL-PRF-55310. The measuring instrument's accuracy shall be commensurable with the required accuracy of the oscillator. The same measuring instruments shall be used throughout the aging test. If any condition develops that will change the temperature of the oscillator from the aging temperature for a time interval of more than one hour, no measurement shall be made until 24 hours after the temperature restoration and the specified test period shall be lengthened by the length of time that the temperature failed. Tests may be terminated after 15 days if the drifts do not exceed one-half of the specified Aging rate.

7.2.14 **External Visual**
The final external visual screen shall be conducted in accordance with MIL-STD-883, method 2009 after all other 100 percent screens have been performed to determine that no damage to or contamination of the package exterior has occurred.

7.3 **Quality Conformance Inspection (QCI)**
Quality conformance inspection shall be as specified herein. All records shall be traceable to the lot number and unit serial number.

7.3.1 **Oscillator Group A Inspection**
Group A testing shall be in accordance with Table V. Group A inspection shall be performed on units that have passed the screening tests. All electrical perfomance tests of this specification shall be performed during Group A with the exception of any tests performed as part of final electrical testing during 100 percent screening.

7.3.2 **Oscillator Group B Inspection**
Group B inspection shall be in accordance with Table VI. The screening test rejects may be used for this test.

7.3.3 **Oscillator Group C Inspection**
Group C inspection shall be in accordance with Table VII.

7.3.4 **Oscillator Group D Inspection**
Group D inspection shall be performed per Table VIII. The generic package evaluation data may be submitted to Customer for review in lieu of performing this test.

7.3.4.1 **Group D Samples**
Sealed empty packages that have been subjected to the handling and stress conditions may be used for Group D testing.

7.4 **Destructive Physical Analysis (DPA)**
A DPA may be performed on each lot of devices in accordance with MIL-STD-883, Method 5009. The DPA shall be performed by the Customer.

7.5 **Workmanship**

Devices shall be manufactured, processed, and tested in a careful and workmanlike manner in accordance with good engineering practice, with the requirements of this specification, and with the production practices, workmanship instructions and inspections and test procedures prepared by the manufacturer in fulfillment of the product assurance program.

7.6 **DATA**

7.6.1 **Design and Part Configuration Documentation**

The manufacturer shall establish baseline documentation sufficient to completely define and control the configuration of devices supplied to this specification. The documentation shall form the basis for defining the device qualified to this specification and all devices supplied on subsequent procurement shall be the same as those that qualified. No changes in construction, technology, or manufacturing processing shall occur without Customer approval.

7.6.2 **Design Documentation**

When required by the purchase order, design, topography, schematic circuit, process and flow charts for all assembly/inspection and test operation for devices to be supplied under this specification on the initial procurement shall be established and shall be available in-plant for review by the procuring activity upon request. This design documentation shall be sufficient to depict the physical and electrical construction of the devices supplied under the specification and shall be traceable to the specific parts, drawings or part type numbers to which it applies, and to the production lot(s) and inspection lot codes under which devices are manufactured and tested so that revisions can be identified.

7.6.2.1 **Technical Data Package**

When required by purchase order, the following design documentation and information is deliverable 30 days prior to the start of production. The Technical Data Package shall consist of the following:

a) Assembly drawing(s).
b) All electrical schematics and drawings not considered proprietary.
c) The assembly and screening travelers to be used on-line to manufacture the devices supplied to this specification.
d) Parts and materials list.

7.6.3 **Design Documentation Approval**

After the design documentation is approved by Customer, any changes or revisions to these documents must be submitted for review and approval to Customer prior to processing subsequent lots, or at the time of placement of subsequent purchase order.

7.7 **Test Report**

A test report shall be supplied with each shipment of oscillators and shall include the following information, as a minimum:

a) A Certificate of Conformance to all specifications and purchase order requirements. As a minimum, the Certificate of Conformance shall include the following information:
   1) Purchase order number.
   2) Applicable part number.
   3) Manufacturers lot number.
   4) Lot date code.
b) Parts and materials traceability information.
c) Certificate of crystal sweeping.
d) Manufacturing lot traveler.
e) Screening attributes and variables data as applicable.
f) Quality conformance inspection attributes and variables data as applicable.
g) Radiographic inspection negatives.

7.8 **Problem Reporting**

The manufacturer shall notify the Customer technical representative, within 24 hours, of the occurrence of the following:

a) Any failures detected during quality conformance inspection.
b) Delays resulting from test equipment breakdown, test error, or testing related problems that adversely affect the schedule.

7.9 **Customer Source Inspection**

Provisions for periodic in-process source inspection by Customer shall be included in the supplier's manufacturing plan. The supplier shall provide Customer 72 hours minimum notice when the deliverable devices are ready for an in-process source inspection. The inspection points shall, as a minimum, be:

a) Pre cap visual inspection.
b) Prior to shipment inspection.

7.10 **Retention of Records**

All records pertaining to the design, processes, incoming receiving, in-process inspections, screening and quality conformance inspection, product lot identification, product traceability, failure reports and analyses etc., shall be retained by the vendor for a period of 10 years from the date of product shipment.

8 PREPARATION FOR DELIVERY

8.1 **Packaging**

The requirements for packaging shall be in accordance with MIL-PRF-55310.

8.2 **Electrostatic Discharge Sensitivity**

The devices supplied to this drawing shall be considered to be electrostatic discharge sensitive and require further protection and shall use one of the packaging requirements in accordance with MIL-PRF-38534.

9 NOTES

9.1 **Ordering Data**

The contract or purchase order should specify the following:

a) Customer part number.
b) Quality Conformance Inspection requirements.
c) Requirements for special technical documentation Data Package.
d) Test data requirements.
e) Special packaging.
f) Requirement for source inspection and notification.

9.2 **Handling**

The devices used must be handled with certain precautions to avoid damage due to electrostatic discharge.

9.3 **Certificate of Conformance**

Certificate of conformance to this specification, signed by an authorized representative of the manufacturer, shall accompany each shipment.

9.4 **Approved Sources of Supply**

9.4.1 **Approved Manufacturer**

Q-Tech Corporation
10150 West Jefferson Boulevard
Culver City, CA 90232-3510 USA

TABLE I - MAXIMUM RATINGS

PARAMETER	SYMBOL	MINIMUM	MAXIMUM	UNITS
Supply voltage	V_{CC}	0	4	V
Operating Case Temperature	T_C	-55	+125	ºC
Storage Temperature	T_{STG}	-65	+150	ºC
Lead solder Temperature/Time			+250/10	ºC/s
Package Thermal Resistance	θ_{JC}		50	ºC/W

TABLE II - DELTA LIMITS

TEST	PARAMETER	SYMBOL	DELTA LIMITS
Burn-In (Second 160 Hour Burn-In Period)	Supply Current	I_{CC}	10% of Initial Reading
Frequency Aging After 30 Days at 70°C	Output Frequency	Fo	Refer to Table III or Ordering Information
Life Test After 1000 Hours at 125°C	Supply Current	I_{CC} (Life)	±10% of Initial Reading

TABLE III - ELECTRICAL PERFORMANCE CHARACTERISTICS

Supply Voltage (Vdd) = +3.3V±5%, unless otherwise specified

ELECTRICAL PARAMETERS	TEST CONDITIONS (NOTE 2 AND 3)	LIMITS				NOTES
		MIN.	TYP	MAX	UNIT	
Frequency/Temperature Stability	See Temp Code			See code	ppm	Note 1, 4
Supply Voltage		3.135	3.3	3.465	Vdc	
Input Current Icc	@3.465V	-	-	80 120	mA	QT625LW QT697LW
Load		90	100	110		Note 6
Output Voltage – Logic "0"		0.9	-	-	Vdc	Note 5
Output Voltage – Logic "1"		-	-	1.6	Vdc	Note 5
Differential voltage VOD		250	-	460	mV	
Output Waveform			SQUARE			
Rise Time and Fall Time	15MHz – 100MHz			1	ns	Note 7
	>100MHz – 162.5MHz			0.6		
Duty Cycle		45		55	%	
Frequency Aging (After 30 Days)	70°C ± 3°C			±1.5 ±2	ppm	15MHz to <150MHz 150MHz to 162.5 MHz
Frequency Aging (After 1 Year)	70°C ± 3°C			±10	ppm	
Frequency Aging (After 15 Years)	70°C ± 3°C			±45	ppm	
Start Up Time				10	msec	
Single side band phase noise	Frequency offset 100kHz 1MHz			-145 -150	dBc/Hz	
Integrated phase jitter (RMS)	Integrated over 12kHz to 20MHz	-	-	1	ps	
Frequency/voltage stability	RL=100ohms	-	-	±2	ppm	
Frequency/load stability	3.3Vdc	-	-	±1	ppm	
Skew between outputs		-	-	0.4	ns	

NOTES

1. The limit for Frequency temperature stability is referenced to the nominal output frequency F0.
2. Unless otherwise specified, the limits are over the full operating temperature range, and under specified load conditions and nominal Supply Voltage.
3. Unless otherwise specified, all measurements are in accordance with MIL-PRF-55310.
4. Reference to nominal frequency up to 30 days after shipment (does not include aging).
5. Voltage values are with respect to network ground terminal.
6. Load is 100ohms typical.
7. Measured between 20% and 80% and 80% to 20%.

TABLE IV - SCREENING TESTS

TEST DESCRIPTION	STANDARD	METHOD	CONDITION	COMMENTS
Nondestructive Bond Pull	883	2023		2.4-Gram Pull
Internal Visual	883	2017	K	Class S
Stabilization Bake	883	1008	C, 48 Hours at 150°C	
Temperature Cycling	883	1010	C , 10 Cycles	
Constant Acceleration	883	2001	A, Y1 Direction Only	
Particle Impact Noise Detection (PIND)	883	2020	B	5 Passes Note 1
Pre Burn-In Electrical Test				Note 2
Burn-In # 1	883	1015	125°C for 160 hours	Note 3
Interim Electrical Test				Note 2
Burn-In # 2	883	1015	125°C for 160 hours	Note 3
Final Electrical Test				Note 2
Percent Defective Allowance (PDA)	2% or 1 unit, whichever is greater			Note 4
Delta Limit	Refer to Table II herein			
Seal; Fine Leak	883	1014	B1	
Seal; Gross Leak	883	1014	B2	
Radiographic Inspection	883	2012		
Frequency Aging	MIL-PRF-55310	-	70 ± 3°C for 30 days	Note 5
External Visual	883	2009		

NOTES
1. PIND testing shall be performed using five (5) independent passes and all failures found at the end of each pass are rejected. The survivors of the last pass are acceptable.
2. Electrical performance characteristic and requirements shall be in accordance with Table III and Table IX herein.
3. Burn-in shall be under the specified load and nominal voltage conditions.
4. Percent defective allowable (PDA) accountability shall be based on failures occurring during the second half of burn-in only. PDA shall be applicable to the +25°C of current test only.
5. Frequency Aging tests may be terminated after 15 days if the drifts do not exceed one-half of the delta limits specified.

TABLE V - GROUP A INSPECTION

TEST DESCRIPTION	CONDITION
Supply Current	25°C and Temperature Extremes
Initial Accuracy	25°C
Frequency-Temperature Stability	Over specified operating temperature range, measures output frequency at minimum eleven equispaced points of the temperature. Test points shall include reading at room temperature.
Frequency-Voltage Tolerance	25°C and Temperature Extremes
Output Voltages	
Duty Cycle (Output Waveform Symmetry)	
Output Rise And Fall Times	
Start-Up Time	
Jitter	
Phase Noise	
Differential Voltage VOD	
Frequency/Load Stability	

NOTES
1. All electrical performance shall be performed during Group A with the exception of any tests performed as part of the final electrical testing during 100 percent screening.
2. Electrical performance characteristics and requirements shall be in accordance with Table III and Table IX herein.

TABLE VI - GROUP B INSPECTION

(Note 1)

SUBGROUP	TEST DESCRIPTION	MIL-STD-833		Quantity (Accept No.)
		METHOD	CONDITION	
1	Physical Dimension	2016		2 (0)
2	Resistance To Solvents	2015		3 (0)
3	Internal Visual And Mechanical	2014		1 (0)
4	Bond Strength (Note 2)	2011	C or D	2 (0)
5	Die Shear Strength (Note 3)	2019		2 (0)
6	Solderability (Note 4)	2003	Solder Temperature: +245 ±5°C	1 (0)

NOTES
1. Non catastrophic screening test rejects may be used for group B.
2. Bond Strength Test shall be performed in accordance requirements of MIL-PRF-38534. This test is may be per formed in-process any time prior to cover seal.
3. Die shear test samples shall not be the same units as subjected to bond pull. Die shear specimens shall not be ex posed to the 300°C preconditioning used for the Bond Strength test.
4. Solder temperature shall be 245 +5°C.

TABLE VII - GROUP C INSPECTION

(Note 1)

SUBGROUP	TEST DESCRIPTION	MIL-STD-833		Quantity (Accept No.)
		METHOD	CONDITION	
1	External visual	2009		5 (0)
	Temperature cycling	1010	C, 20 cycles	
	Constant acceleration	2001	A, Y1 Direction Only	
	Seal (fine & gross leak)	1014	B1 & B2	
	Radiographic inspection	2012		
	Visual exmination	2009		
	End point electricals			
2	End point electricals			5 (0)
	Steady state life test	1005	125°C, 1,000 hours min.	
	End point electricals			
3	Internal wator vapor content	1018		3 (0) or 5 (1)

NOTES

1. It is recommended to use 10 specimens for Group C Inspection - 5 units for Subgroups 1 and 3 and 5 units for Subgroup 2. 5 units may be used for Group C Inspection but the Customer procures this quantity at their own risk. Usage of specimens that have completed Subgroups 1 and 2 Testing for Subgroup 3 Testing is not recommended. This limited acquisition shall only be used if this risk is acceptable to the Customer, and the Customer assumes responsibility for Subgroup 3 failures if only five units are procured for Group C Inspection.
2. Subgroup 3 Testing shall only use specimens that have completed Subgroup 1 Testing.
3. End point electricals shall be as specified in accordance with Table III and Table IX herein.

TABLE VIII - GROUP D INSPECTION

(Note 1)

SUBGROUP	TEST DESCRIPTION	MIL-STD-833		Quantity (Accept No.)
		METHOD	CONDITION	
1	Thermal Shock	1011	C	5 (0)
	Stabilization Bake	1008	1 Hour at 150°C	5 (0)
	Lead Integrity	2004	B2 (Lead Fatigue)	1 (0)
	Seal; Fine Leak and Gross Leak	1014	B1 and B2	5 (0)

NOTES

1. This testing may be accomplished during package evaluation at incoming inspection and need not be repeated. Testing may also be perfomed on a sealed empty package.

TABLE IX - ELECTRICAL TEST MEASUREMENT REQUIREMENTS

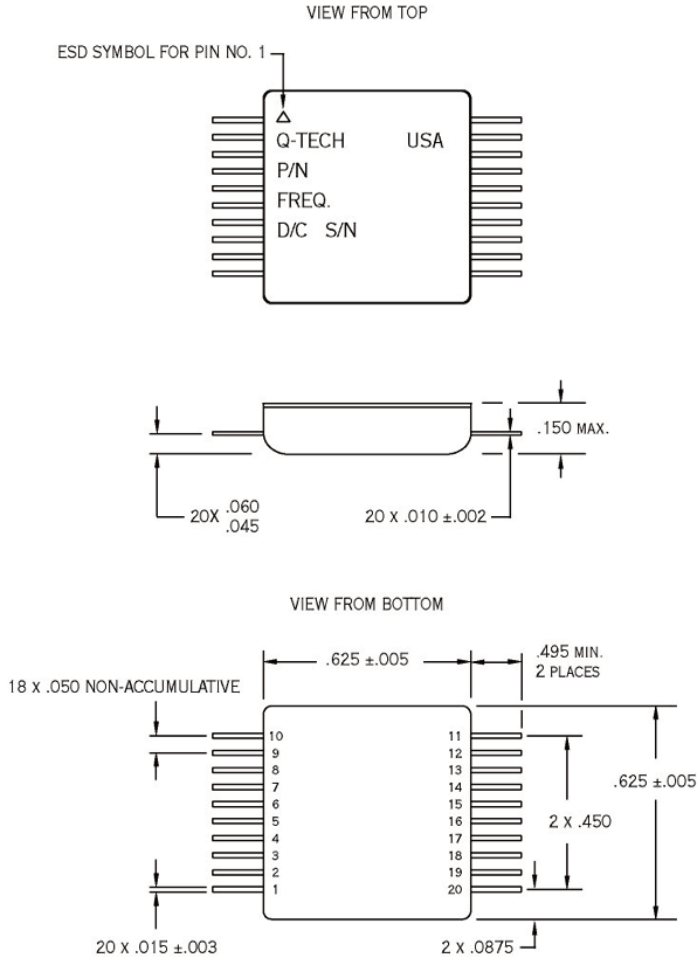
ELECTRICAL PARAMETERS	Test Step and Environmental Condition (Note 1)												
	Pre Burn-In			Interim Burn-In	Final Electrical Test			Group A			Group C (Note 3)		
	25°C	Low Temp	High Temp	25°C	25°C	Low Temp	High Temp	25°C	Low Temp	High Temp	25°C	Low Temp	High Temp
Output Frequency (Note 2)	X	X	X	X	X	X	X	X	X	X	X	X	X
Frequency-Temperature Stability								Note 2					
Frequency-Voltage Tolerance	X				X			X	X	X	X	X	X
Differential Voltage VOD	X	X	X	X	X	X	X	X	X	X	X	X	X
Input Current	X			X	X	X	X	X	X	X	X	X	X
Output Voltage	X	X	X	X	X	X	X	X	X	X	X	X	X
Waveform	X	X	X	X	X	X	X	X	X	X	X	X	X
Duty Cycle (Output Waveform Symmetry)	X	X	X	X	X	X	X	X	X	X	X	X	X
Rise And Fall Times	X			X	X	X	X	X	X	X	X	X	X
Start-Up Time	X			X	X			X	X	X	X	X	X
Phase Noise								X			X		
Phase Jitter (RMS)								X			X		
Frequency/Load Stability								X	X	X	X	X	X

X = Required Measurement

NOTES

1. Electrical performance characteristic shall be in accordance with Table III or Ordering Information whichever applicable.
2. Measure output frequency 100% at 25°C on all differential outputs and one differential output over temperature at 11 equi-spaced intervals (minimum of 12 readings, including at 25°C).
3. Frequency accuracy (and/or frequency/temperature stability) limits for post steady state life electrical testing shall be relaxed by six times the projected first year aging limit as specified in the this specification. If no such limit is specified, the limit shall be relaxed ± 60ppm. Notwithstanding, device performance that appears out-of-family shall be subjected to further evaluation.
4. Read and recorded all measurements.
5. Phase Noise and Phase Jitter will be measured on all differential outputs at 25°C at Group A tests for Flight and Final tests for Engineering and Breadboard models.

QT625LW



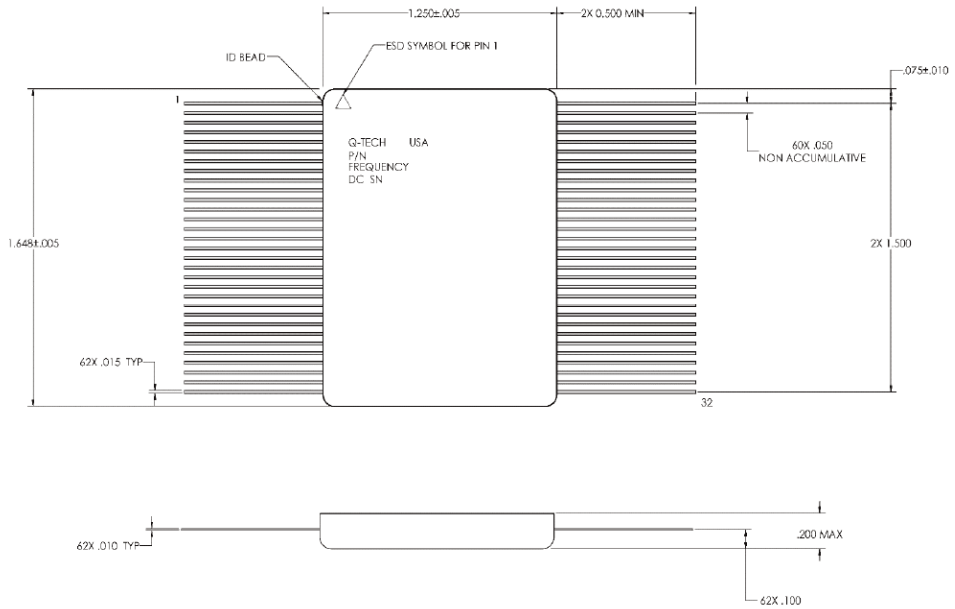
TERMINAL CONNECTIONS

PIN No.	CONNECTION (ALL)	PIN No.	CONNECTION (QT6251)	PIN No.	CONNECTION (QT6252)	PIN No.	CONNECTION (QT6253)	PIN No.	CONNECTION (QT6254)
1	N/C	**11**	DOUT1+	**11**	DOUT1+	**11**	DOUT1+	**11**	DOUT1+
2	N/C	**12**	DOUT1-	**12**	DOUT1-	**12**	DOUT1-	**12**	DOUT1-
3	N/C	**13**	Vcc	**13**	Vcc	**13**	Vcc	**13**	Vcc
4	N/C	**14**	N/C	**14**	DOUT2-	**14**	DOUT2-	**14**	DOUT2-
5	N/C	**15**	N/C	**15**	DOUT2+	**15**	DOUT2+	**15**	DOUT2+
6	N/C	**16**	N/C or Tristate	**16**	N/C or Tristate	**16**	N/C or Tristate	**16**	N/C or Tristate
7	N/C	**17**	N/C	**17**	N/C	**17**	DOUT3+	**17**	DOUT3+
8	N/C	**18**	N/C	**18**	N/C	**18**	DOUT3-	**18**	DOUT3-
9	N/C	**19**	N/C	**19**	N/C	**19**	N/C	**19**	DOUT4-
10	GND/CASE	**20**	N/C	**20**	N/C	**20**	N/C	**20**	DOUT4+

*Lead numbers are for reference only and not marked on units

FIGURE 1*

Dimensions are in Inches



TERMINAL CONNECTIONS

TERMINAL No.	CONNECTION	TERMINAL No.	CONNECTION (QT6976)	CONNECTION (QT6978)	CONNECTION (QT6972)
1	GND/CASE	**32**	DOUTA1+	DOUTA1+	DOUTA1+
2	GND/CASE	**33**	DOUTA1-	DOUTA1-	DOUTA1-
3	GND/CASE	**34**	ENABLE1	ENABLE1	ENABLE1
4	GND/CASE	**35**	DOUTB1-	DOUTB1-	DOUTB1-
5	GND/CASE	**36**	DOUTB1+	DOUTB1+	DOUTB1+
6	GND/CASE	**37**	GND/CASE	GND/CASE	GND/CASE
7	GND/CASE	**38**	DOUTC1+	DOUTC1+	DOUTC1+
8	GND/CASE	**39**	DOUTC1-	DOUTC1-	DOUTC1-
9	GND/CASE	**40**	DOUTD1-	DOUTD1-	DOUTD1-
10	GND/CASE	**41**	DOUTD1+	DOUTD1+	DOUTD1+
11	GND/CASE	**42**	DOUTA2+	DOUTA2+	DOUTA2+
12	GND/CASE	**43**	DOUTA2-	DOUTA2-	DOUTA2-
13	GND/CASE	**44**	ENABLE2	ENABLE2	ENABLE2
14	GND/CASE	**45**	DOUTB2+	DOUTB2+	DOUTB2+
15	GND/CASE	**46**	DOUTB2-	DOUTB2-	DOUTB2-
16	GND/CASE	**47**	GND/CASE	GND/CASE	GND/CASE
17	GND/CASE	**48**	GND/CASE	DOUTC2+	DOUTC2+
18	GND/CASE	**49**	GND/CASE	DOUTC2-	DOUTC2-
19	N/C	**50**	GND/CASE	DOUTD2-	DOUTD2-
20	GND/CASE	**51**	GND/CASE	DOUTD2+	DOUTD2+
21	N/C	**52**	GND/CASE	GND/CASE	DOUTA3+
22	GND/CASE	**53**	GND/CASE	GND/CASE	DOUTA3-
23	GND/CASE	**54**	GND/CASE	GND/CASE	ENABLE3
24	GND/CASE	**55**	GND/CASE	GND/CASE	DOUTB3+
25	GND/CASE	**56**	GND/CASE	GND/CASE	DOUTB3-
26	Vcc	**57**	GND/CASE	GND/CASE	GND/CASE
27	GND/CASE	**58**	GND/CASE	GND/CASE	DOUTC3+
28	Vcc	**59**	GND/CASE	GND/CASE	DOUTC3-
29	GND/CASE	**60**	GND/CASE	GND/CASE	DOUTD3-
30	GND/CASE	**61**	GND/CASE	GND/CASE	DOUTD3+
31	GND/CASE	**62**	GND/CASE	GND/CASE	GND/CASE

FIGURE 2*

Dimensions are in Inches