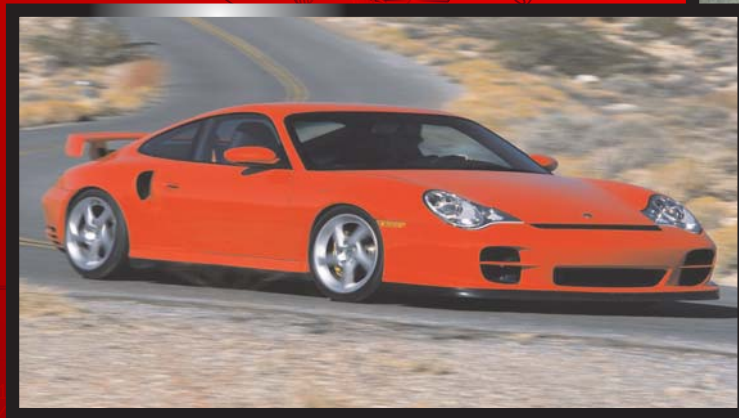
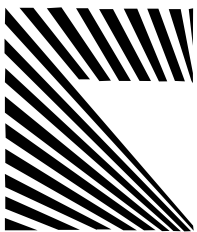


HI REL OSCILLATORS



Cardinal Components, Inc., 155 Rt. 46 W., Wayne, N.J. 07470
TEL: (973) 785-1333 FAX: (973) 785-0053
<http://www.cardinalxtal.com>
E-Mail: sales@cardinalxtal.com

Cardinal Components, Inc., provides a broad range of timing products, technical expertise, innovation, and commitment to quality. We have enjoyed long relationships with our customers who come back because they know that, no matter what the challenge, Cardinal will get the job done!

Certified ISO-9001:2000, Cardinal is committed to providing the best quality products, technical support, and superior service to our customers. Our engineering staff can answer your questions, as well as provide design aid for both new and existing products. Cardinal's pricing and delivery lead times are the most competitive in the crystal components industry. Sales representatives, distributors, and a dedicated in-house sales department focus on providing a high level of service to meet your needs.

MICROPROCESSOR CRYSTALS

SURFACE MOUNT CRYSTALS

WATCH CRYSTALS

CRYSTAL OSCILLATORS

SURFACE MOUNT OSCILLATORS

TCXO

VCXO

TCVCXO

NAME	DESCRIPTION	PAGE
CFE4	(XO, LVPECL, 4 PIN, FREQ. RANGE 38.0MHz-640.0MHz)	1
CFL4	(XO, LVDS, 4 PIN, FREQ. RANGE 38.0MHz-640.0MHz)	2
CFED	(XO, LVPECL, 6 PIN, FREQ. RANGE 38.0MHz-640.0MHz)	3
CFL	(XO, LVDS, 6 PIN, FREQ. RANGE 38.0MHz-640.0MHz)	4
CFVE	(VCXO, LVPECL, 6 PIN, FREQ. RANGE 38.0MHz-640MHz)	5
CFVED	(VCXO, LVPECL, 6 PIN, FREQ. RANGE 38.0MHz-640MHz)	6
CFVL	(VCXO, LVDS, 6 PIN, FREQ. RANGE 38.0MHz-640MHz)	7
CTED	(TCXO, LVPECL, 6 PIN, FREQ. RANGE 38.0MHz-640MHz)	8
CTL	(TCXO, LVDS, 6 PIN, FREQ. RANGE 38.0MHz-640MHz)	9
CTVED	(TCVCXO, LVPECL, 6 PIN, FREQ. RANGE 38.0MHz-640MHz)	10
CTVL	(TCVCXO, LVDS, 6 PIN, FREQ. RANGE 38.0MHz-640MHz)	11

- * LVPECL Output
- * Industry Standard Outline

Applications

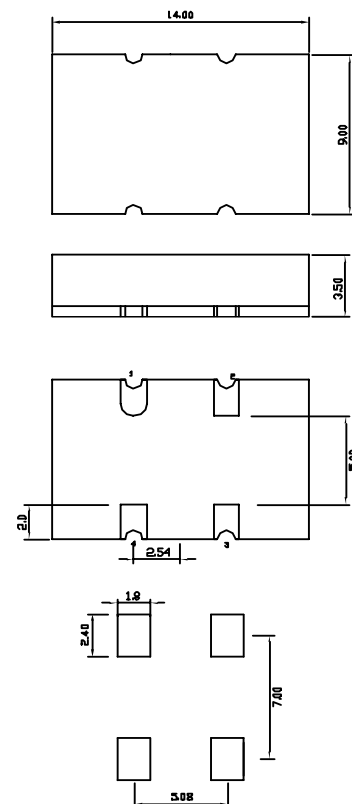
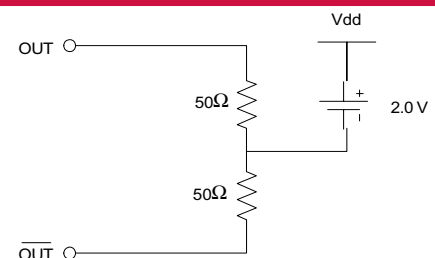
- * Serial Communications
- * Routers
- * Switches
- * WAN Interfaces
- * Test Equipment



Part Numbering Example: CFE4 Z - A5 BP - 222.5792

CFE4	Z	A5	BP	222.5792
SERIES	PACKAGING OPTIONS	OPERATING TEMP.	STABILITY	FREQUENCY
CFE4	Blank = Bulk Z = Tape and Reel	Blank = 0°C ~ +70°C A5 = -20°C ~ +70°C A7 = -40°C ~ +85°C	Blank = ±100 ppm BP = ±50 ppm	

Specifications:	Min	Typ	Max	Unit
Frequency Range:	38		640	MHz
Stability:	-50		+ 50	ppm
Supply Voltage:	3.135	3.3	3.465	V
Operating Temperature:	-40		+ 85	°C
Storage Temperature:	-55		+ 125	°C
Duty Cycle:	45		55	%
Start-Up Time:		3	10	mS
Aging: (ppm/1st Year) Ta=25C, Vdd=3.3V			5	ppm
Supply Current:			100	mA
Short Circuit Current:		± 50		mA
RMS Period Jitter:		5		pS
RMS Integrated Jitter: 12kHz to 20MHz		0.7		pS
Phase Noise @ 10kHz:			-120	dBc/Hz
Output Voltage: Voh Vol	Vdd - 1.025		Vdd - 1.62	V V
Rise/Fall Time:		0.4	0.8	nS
Output Level:	LVPECL			
Packaging:	Tape and Reel 1000 pcs per Reel			

CFE4**LVPECL Levels Test Circuit**

Cardinal Components, Inc., 155 Rt. 46 W, Wayne, NJ. 07470 TEL: (973)785-1333 FAX: (973)785-0053
http://www.cardinalxtal.com E-Mail: sales@cardinalxtal.com



- * LVDS Output
- * Industry Standard Outline

Applications

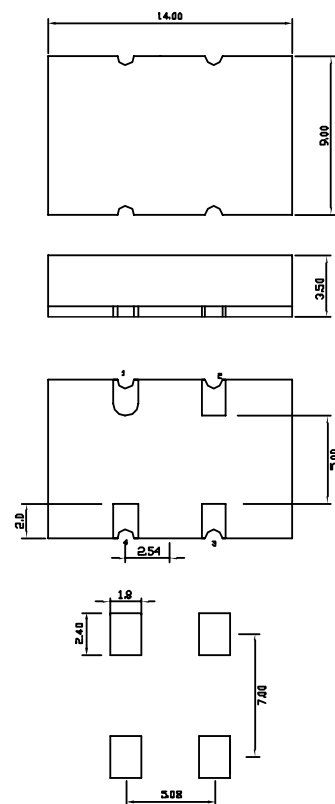
- * Serial Communications
- * Routers
- * Switches
- * WAN Interfaces
- * Test Equipment



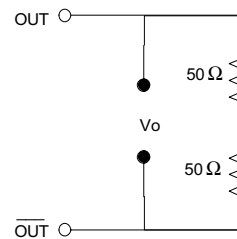
Part Numbering Example: CFL4 Z - A5 BP - 222.5792

CFL4	Z	A5	BP	222.5792
SERIES	PACKAGING OPTIONS	OPERATING TEMP.	STABILITY	FREQUENCY
CFL4	Blank = Bulk Z = Tape and Reel	Blank = 0°C ~ +70°C A5 = -20°C ~ +70°C A7 = -40°C ~ +85°C	Blank = ±100 ppm BP = ±50 ppm	

Specifications:	Min	Typ	Max	Unit
Frequency Range:	38		640	MHz
Stability:	-50		+ 50	ppm
Supply Voltage:	3.135	3.3	3.465	V
Operating Temperature:	-40		+ 85	°C
Storage Temperature:	-55		+ 125	°C
Duty Cycle:	45		55	%
Start-Up Time:		3	10	mS
Aging: (ppm/1st Year) Ta=25C, Vdd=3.3V			5	ppm
Supply Current:			100	mA
Short Circuit Current:		± 50		mA
RMS Period Jitter:		5		pS
RMS Integrated Jitter: 12kHz to 20MHz		0.7		pS
Phase Noise @ 10kHz:			-120	dBc/Hz
Output Voltage: Voh Vol	Vdd - 0.9		Vdd - 1.6	V V
Output Differential Voltage:	247	355	454	mV
Rise/Fall Time:		0.4	0.8	nS
Output Level:	LVDS			
Packaging:	Tape and Reel 1000 pcs per Reel			

CFL4

PIN Function
1 LVDSL-
2 Ground
3 LVDS+
4 VDD

LVDS Levels Test Circuit

- * LVPECL Output
- * Industry Standard Outline

Applications

- * Serial Communications
- * Routers
- * Switches
- * WAN Interfaces
- * Test Equipment



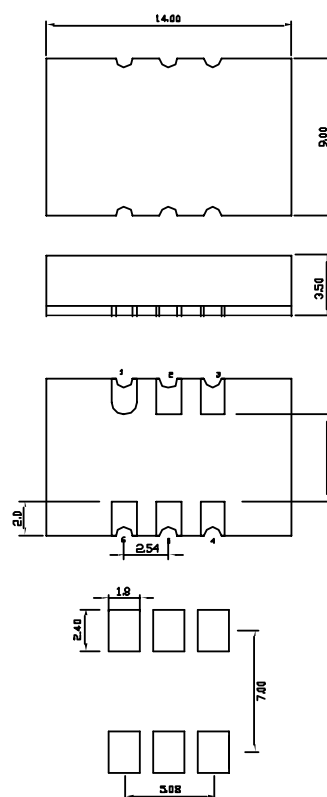
Part Numbering Example: CFED Z - A5 BP - 222.5792 TS

CFED	Z	A5	BP	222.5792	TS
SERIES	PACKAGING OPTIONS	OPERATING TEMP.	STABILITY	FREQUENCY	TRI-STATE
CFED	Blank = Bulk Z = Tape and Reel	Blank = 0°C ~ +70°C A5 = -20°C ~ +70°C A7 = -40°C ~ +85°C	Blank = ±100 ppm BP = ±50 ppm		TS = Tri-State

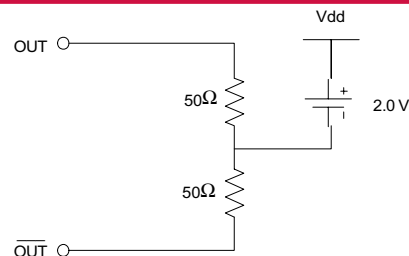
Specifications:	Min	Typ	Max	Unit
Frequency Range:	38		640	MHz
Stability:	-50		+ 50	ppm
Supply Voltage:	3.135	3.3	3.465	V
Operating Temperature:	-40		+ 85	°C
Storage Temperature:	-55		+ 125	°C
Duty Cycle:	45		55	%
Start-Up Time:		3	10	mS
Aging: (ppm/1st Year) Ta=25°C, Vdd=3.3V			5	ppm
Supply Current:			100	mA
Short Circuit Current:		± 50		mA
RMS Period Jitter:		5		pS
RMS Integrated Jitter: 12kHz to 20MHz		0.7		pS
Phase Noise @ 10kHz:			-120	dBc/Hz
Output Voltage:				
Voh	Vdd - 1.025			V
Vol			Vdd - 1.62	V
Rise/Fall Time:		0.4	0.8	nS
Output Level:	LVPECL			
Packaging:	Tape and Reel 1000 pcs per Reel			

CFED

Dimensions are in mm



- PIN Function
- 1 DISABLE
 - 2 NO CONNECT
 - 3 Ground
 - 4 LVPECL +
 - 5 LVPECL -
 - 6 Vdd

LVPECL Levels Test Circuit

- * LVDS Output
- * Industry Standard Outline

Applications

- * Serial Communications
- * Routers
- * Switches
- * WAN Interfaces
- * Test Equipment



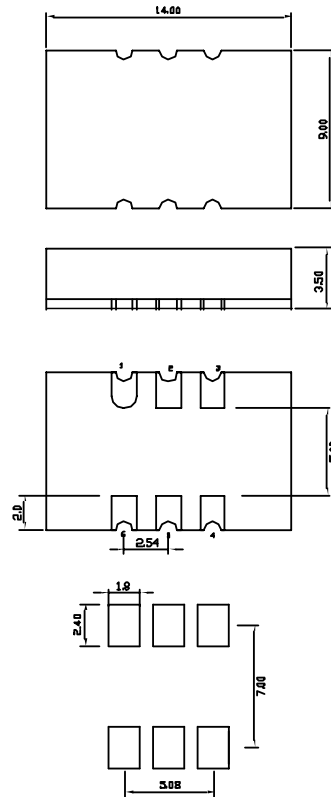
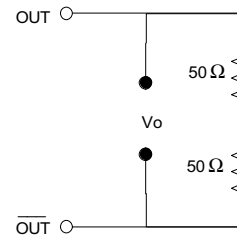
Part Numbering Example: CFL Z - A5 BP - 222.5792 TS

CFL	Z	A5	BP	222.5792	TS
SERIES	PACKAGING OPTIONS	OPERATING TEMP.	STABILITY	FREQUENCY	TRI-STATE
CFL	Blank = Bulk Z = Tape and Reel	Blank = 0°C ~ +70°C A5 = -20°C ~ +70°C A7 = -40°C ~ +85°C	Blank = ±100 ppm BP = ±50 ppm		TS = Tri-State

Specifications:	Min	Typ	Max	Unit
Frequency Range:	38		640	MHz
Stability:	-50		+ 50	ppm
Supply Voltage:	3.135	3.3	3.465	V
Operating Temperature:	-40		+ 85	°C
Storage Temperature:	-55		+ 125	°C
Duty Cycle:	45		55	%
Start-Up Time:		3	10	mS
Aging: (ppm/1st Year) Ta=25°C, Vdd=3.3V			5	ppm
Supply Current:			100	mA
Short Circuit Current:		± 50		mA
RMS Period Jitter:		5		pS
RMS Integrated Jitter: 12kHz to 20MHz		0.7		pS
Phase Noise @ 10kHz:			-120	dBc/Hz
Output Voltage: Voh Vol	Vdd - 0.9		Vdd - 1.6	V V
Output Differential Voltage:	247	355	454	mV
Rise/Fall Time:		0.4	0.8	nS
Output Level:	LVDS			
Packaging:	Tape and Reel 1000 pcs per Reel			

CFL

Dimensions are in mm

**LVDS Levels Test Circuit**

- * LVPECL Output
- * Industry Standard Outline

Applications

- * Serial Communications
- * Routers
- * Switches
- * WAN Interfaces
- * Test Equipment

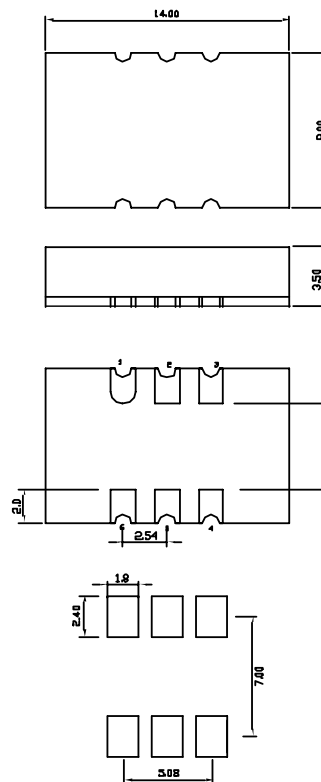
**Part Numbering Example: CFVE Z - A5 BP - 222.5792 TS**

CFVE	Z	A5	BP	222.5792	TS
SERIES	PACKAGING OPTIONS	OPERATING TEMP.	STABILITY	FREQUENCY	TRI-STATE
CFVE	Blank = Bulk Z = Tape and Reel	Blank = 0°C ~ +70°C A5 = -20°C ~ +70°C A7 = -40°C ~ +85°C	Blank = ±100 ppm BP = ±50 ppm		TS = Tri-State

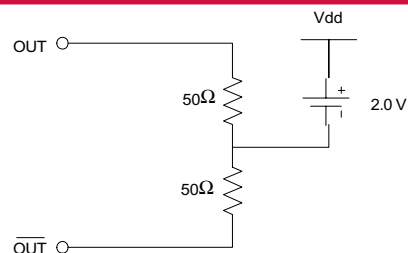
Specifications:	Min	Typ	Max	Unit
Frequency Range:	38		640	MHz
Stability:	-50		+ 50	ppm
Supply Voltage:	3.135	3.3	3.465	V
Frequency Tuning Range:		±100		ppm
External Control Voltage:	0.35		3.0	V
Operating Temperature:	-40		+ 85	°C
Storage Temperature:	-55		+ 125	°C
Duty Cycle:	45		55	%
Start-Up Time:		3	10	mS
Aging: (ppm/1st Year) Ta=25°C, Vdd=3.3V			5	ppm
Supply Current:			100	mA
Short Circuit Current:		± 50		mA
RMS Period Jitter:		5		pS
RMS Integrated Jitter: 12kHz to 20MHz		0.7		pS
Phase Noise @ 10kHz:			-120	dBc/Hz
Output Voltage:				
Voh	Vdd - 1.025			V
Vol			Vdd - 1.62	V
Rise/Fall Time:		0.4	0.8	nS
Output Level:	LVPECL			
Packaging:	Tape and Reel 1000 pcs per Reel			

CFVE

Dimensions are in mm



PIN Function
 1 VCONTROL
 2 ENABLE
 3 Ground
 4 LVPECL +
 5 LVPECL -
 6 Vdd

LVPECL Levels Test Circuit

- * LVPECL Output
- * Industry Standard Outline

Applications

- * Serial Communications
- * Routers
- * Switches
- * WAN Interfaces
- * Test Equipment



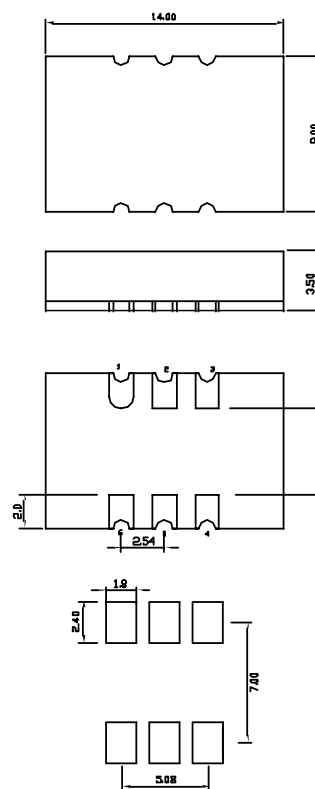
Part Numbering Example: CFVED Z - A5 BP - 222.5792 TS

CFVED	Z	A5	BP	222.5792	TS
SERIES	PACKAGING OPTIONS	OPERATING TEMP.	STABILITY	FREQUENCY	TRI-STATE
CFVED	Blank = Bulk Z = Tape and Reel	Blank = 0°C ~ +70°C A5 = -20°C ~ +70°C A7 = -40°C ~ +85°C	Blank = ±100 ppm BP = ±50 ppm		TS = Tri-State

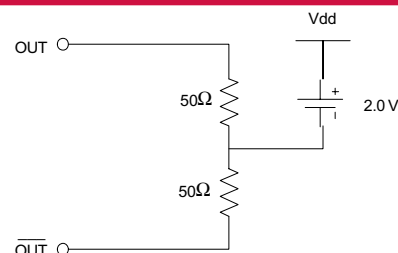
Specifications:	Min	Typ	Max	Unit
Frequency Range:	38		640	MHz
Stability:	-50		+ 50	ppm
Supply Voltage:	3.135	3.3	3.465	V
Frequency Tuning Range:		±100		ppm
External Control Voltage:	0.35		3.0	V
Operating Temperature:	-40		+ 85	°C
Storage Temperature:	-55		+ 125	°C
Duty Cycle:	45		55	%
Start-Up Time:		3	10	mS
Aging: (ppm/1st Year) Ta=25°C, Vdd=3.3V			5	ppm
Supply Current:			100	mA
Short Circuit Current:		± 50		mA
RMS Period Jitter:		5		pS
RMS Integrated Jitter: 12kHz to 20MHz		0.7		pS
Phase Noise @ 10kHz:			-120	dBc/Hz
Output Voltage:				
Voh	Vdd - 1.025			V
Vol			Vdd - 1.62	V
Rise/Fall Time:		0.4	0.8	nS
Output Level:	LVPECL			
Packaging:	Tape and Reel 1000 pcs per Reel			

CFVED

Dimensions are in mm



PIN Function
 1 VCONTROL
 2 DISABLE
 3 Ground
 4 LVPECL +
 5 LVPECL -
 6 Vdd

LVPECL Levels Test Circuit

- * LVDS Output
- * Industry Standard Outline

Applications

- * Serial Communications
- * Routers
- * Switches
- * WAN Interfaces
- * Test Equipment



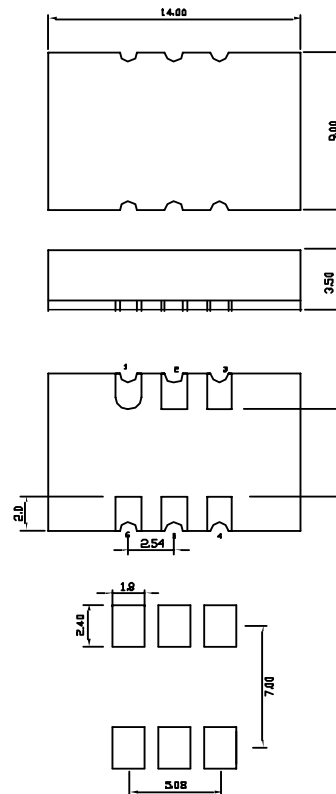
Part Numbering Example: CFVL Z - A5 BP - 222.5792 TS

CFVL	Z	A5	BP	222.5792	TS
SERIES	PACKAGING OPTIONS	OPERATING TEMP.	STABILITY	FREQUENCY	TRI-STATE
CFVL	Blank = Bulk Z = Tape and Reel	Blank = 0°C ~ +70°C A5 = -20°C ~ +70°C A7 = -40°C ~ +85°C	Blank = ±100 ppm BP = ±50 ppm		TS = Tri-State

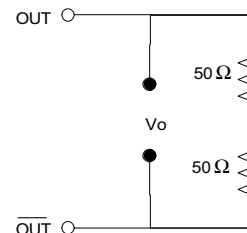
Specifications:	Min	Typ	Max	Unit
Frequency Range:	38		640	MHz
Stability:	-50		+ 50	ppm
Supply Voltage:	3.135	3.3	3.465	V
Frequency Tuning Range:		± 100		ppm
External Control Voltage:	0.35		3.0	V
Operating Temperature:	-40		+ 85	°C
Storage Temperature:	-55		+ 125	°C
Duty Cycle:	45		55	%
Start-Up Time:		3	10	mS
Aging: (ppm/1st Year) Ta=25C, Vdd=3.3V			5	ppm
Supply Current:			100	mA
Short Circuit Current:		± 50		mA
RMS Period Jitter:		5		pS
RMS Integrated Jitter: 12kHz to 20MHz		0.7		pS
Phase Noise @ 10kHz:			-120	dBc/Hz
Output Voltage: Voh Vol	Vdd - 0.9		Vdd - 1.6	V V
Output Differential Voltage:	247	355	454	mV
Rise/Fall Time:		0.4	0.8	nS
Output Level:	LVDS			
Packaging:	Tape and Reel 1000 pcs per Reel			

CFVL

Dimensions are in mm



PIN Function
1 VCONTROL
2 ENABLE
3 Ground
4 LVDS +
5 LVDS -
6 Vdd

LVDS Levels Test Circuit

- * LVPECL Output
- * Industry Standard Outline

Applications

- * Serial Communications
- * Routers
- * Switches
- * WAN Interfaces
- * Test Equipment



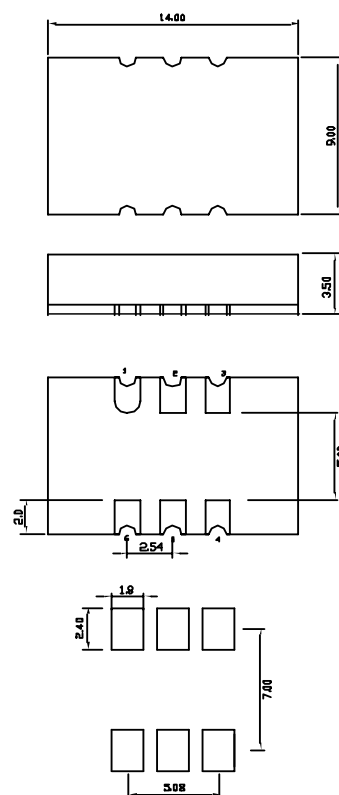
Part Numbering Example: CTED Z - A5 B3 - 222.5792 TS

CTED	Z	A5	B3	222.5792	TS
SERIES	PACKAGING OPTIONS	OPERATING TEMP.	STABILITY	FREQUENCY	TRI-STATE
CTED	Blank = Bulk Z = Tape and Reel	Blank = 0°C ~ +70°C A5 = -20°C ~ +70°C	B3 = ±2.5 ppm		TS = Tri-State

Specifications:	Min	Typ	Max	Unit
Frequency Range:	38		640	MHz
Stability:	- 2.5		+ 2.5	ppm
Supply Voltage:	3.135	3.3	3.465	V
Operating Temperature:	-30		+ 70	°C
Storage Temperature:	-40		+ 85	°C
Duty Cycle:	45		55	%
Start-Up Time:		3	10	mS
Aging: (ppm/1st Year) Ta=25C, Vdd=3.3V			1	ppm
Supply Current:			100	mA
Short Circuit Current:		± 50		mA
RMS Period Jitter:		5		pS
RMS Integrated Jitter: 12kHz to 20MHz		0.7		pS
Phase Noise @ 10kHz:			-120	dBc/Hz
Output Voltage: Voh Vol	Vdd - 1.025		Vdd - 1.62	V V
Rise/Fall Time:		0.4	0.8	nS
Output Level:	LVPECL			
Packaging:	Tape and Reel 1000 pcs per Reel			

CTED

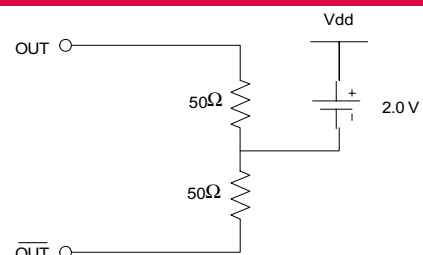
Dimensions are in mm



PIN Function

- 1 DISABLE
- 2 NO CONNECT
- 3 Ground
- 4 LVPECL +
- 5 LVPECL -
- 6 Vdd

LVPECL Levels Test Circuit



- * LVDS Output
- * Industry Standard Outline

Applications

- * Serial Communications
- * Routers
- * Switches
- * WAN Interfaces
- * Test Equipment



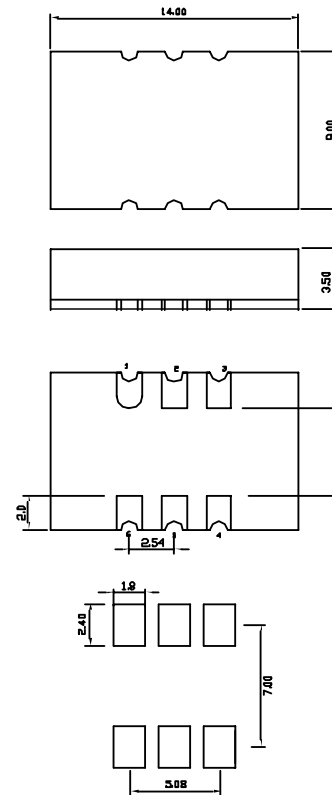
Part Numbering Example: CTL Z - A5 B3 - 222.5792 TS

CTL	Z	A5	B3	222.5792	TS
SERIES	PACKAGING OPTIONS	OPERATING TEMP.	STABILITY	FREQUENCY	TRI-STATE
CTL	Blank = Bulk Z = Tape and Reel	Blank = 0°C ~ +70°C A5 = -20°C ~ +70°C	B3 = ± 2.5 ppm		TS = Tri-State

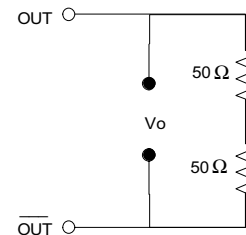
Specifications:	Min	Typ	Max	Unit
Frequency Range:	38		640	MHz
Stability:	- 2.5		+ 2.5	ppm
Supply Voltage:	3.135	3.3	3.465	V
Operating Temperature:	-30		+ 70	°C
Storage Temperature:	-40		+ 85	°C
Duty Cycle:	45		55	%
Start-Up Time:		3	10	mS
Aging: (ppm/1st Year) Ta=25°C, Vdd=3.3V			1	ppm
Supply Current:			100	mA
Short Circuit Current:		± 50		mA
RMS Period Jitter:		5		pS
RMS Integrated Jitter: 12kHz to 20MHz		0.7		pS
Phase Noise @ 10kHz:			-120	dBc/Hz
Output Voltage: Voh Vol	Vdd - 0.9		Vdd - 1.6	V
Output Differential Voltage:	247	355	454	mV
Rise/Fall Time:		0.4	0.8	nS
Output Level:	LVDS			
Packaging:	Tape and Reel 1000 pcs per Reel			

CTL

Dimensions are in mm



LVDS Levels Test Circuit



- * LVPECL Output
- * Industry Standard Outline

Applications

- * Serial Communications
- * Routers
- * Switches
- * WAN Interfaces
- * Test Equipment



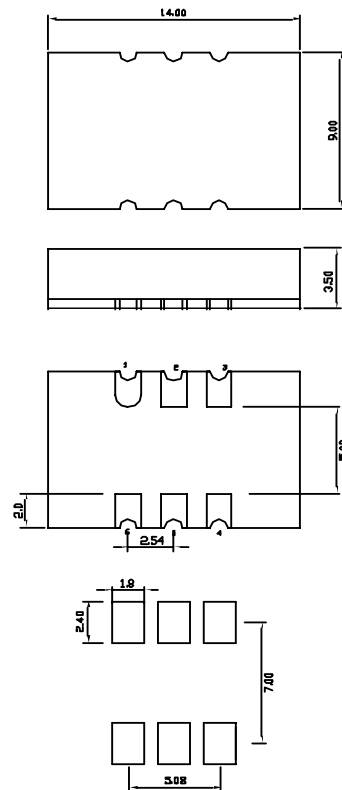
Part Numbering Example: CTVED Z - A5 B3 - 222.5792 TS

CTVED	Z	A5	B3	222.5792	TS
SERIES	PACKAGING OPTIONS	OPERATING TEMP.	STABILITY	FREQUENCY	TRI-STATE
CTVED	Blank = Bulk Z = Tape and Reel	Blank = 0°C ~ +70°C A5 = -20°C ~ +70°C	B3 = ±2.5 ppm		TS = Tri-State

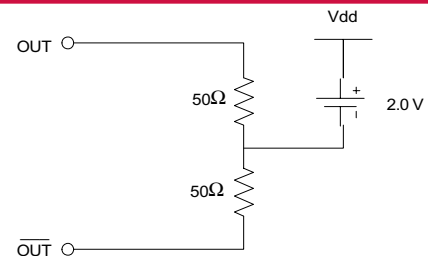
Specifications:	Min	Typ	Max	Unit
Frequency Range:	38		640	MHz
Stability:	- 2.5		+ 2.5	ppm
Supply Voltage:	3.135	3.3	3.465	V
Frequency Tuning Range:		+/- 8		ppm
External Control Voltage:	0.35		3.0	V
Operating Temperature:	-30		+ 70	°C
Storage Temperature:	-40		+ 85	°C
Duty Cycle:	45		55	%
Start-Up Time:		3	10	mS
Aging: (ppm/1st Year) Ta=25C, Vdd=3.3V			1	ppm
Supply Current:			100	mA
Short Circuit Current:		± 50		mA
RMS Period Jitter:		5		pS
RMS Integrated Jitter: 12kHz to 20MHz		0.7		pS
Phase Noise @ 10kHz:			-120	dBc/Hz
Output Voltage:				
Voh	Vdd - 1.025			V
Vol			Vdd - 1.62	V
Rise/Fall Time:		0.4	0.8	nS
Output Level:	LVPECL			
Packaging:	Tape and Reel 1000 pcs per Reel			

CTVED

Dimensions are in mm



PIN Function
1 VCONTROL
2 DISABLE
3 Ground
4 LVPECL +
5 LVPECL -
6 Vdd

LVPECL Levels Test Circuit

- * LVDS Output
- * Industry Standard Outline

Applications

- * Serial Communications
- * Routers
- * Switches
- * WAN Interfaces
- * Test Equipment



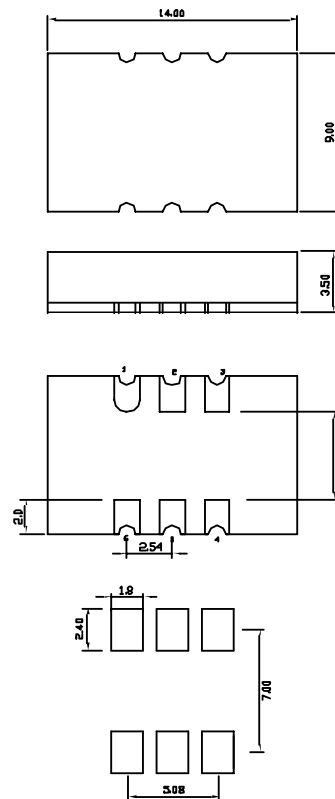
Part Numbering Example: CTVL Z - A5 B3 - 222.5792 TS

CTVL	Z	A5	B3	222.5792	TS
SERIES	PACKAGING OPTIONS	OPERATING TEMP.	STABILITY	FREQUENCY	TRI-STATE
CTVL	Blank = Bulk Z = Tape and Reel	Blank = 0°C ~ +70°C A5 = -20°C ~ +70°C	B3 = ±2.5 ppm		TS = Tri-State

Specifications:	Min	Typ	Max	Unit
Frequency Range:	38		640	MHz
Stability:	- 2.5		+ 2.5	ppm
Supply Voltage:	3.135	3.3	3.465	V
Frequency Tuning Range:		+/- 8		ppm
External Control Voltage:	0.35		3.0	V
Operating Temperature:	-30		+ 70	°C
Storage Temperature:	-40		+ 85	°C
Duty Cycle:	45		55	%
Start-Up Time:		3	10	mS
Aging: (ppm/1st Year) Ta=25°C, Vdd=3.3V			1	ppm
Supply Current:			100	mA
Short Circuit Current:		± 50		mA
RMS Period Jitter:		5		pS
RMS Integrated Jitter: 12kHz to 20MHz		0.7		pS
Phase Noise @ 10kHz:			-120	dBc/Hz
Output Voltage: Voh Vol	Vdd - 0.9		Vdd - 1.6	V V
Output Differential Voltage:	247	355	454	mV
Rise/Fall Time:		0.4	0.8	nS
Output Level:	LVDS			
Packaging:	Tape and Reel 1000 pcs per Reel			

CTVL

Dimensions are in mm



- PIN Function
- 1 VCONTROL
 - 2 ENABLE
 - 3 Ground
 - 4 LVDS +
 - 5 LVDS -
 - 6 Vdd

LVDS Levels Test Circuit