

### GENERAL DESCRIPTION

The M675S02 is a single frequency/single output SAW-based VCSO for low-jitter clock generation. The SAW (surface acoustic wave) delay line serves as a high-Q resonator and the low noise SiGe VCSO IC provides a low noise floor and low 1/f phase noise. The combination of the SAW delay line and the custom IC result in very low phase noise and jitter performance. The M675S02 is available in frequencies from 500 to 1000 MHz with a guaranteed minimum pull-range of  $\pm 120$  ppm. Industry-standard  $K_{vco}$  (VCO Gain) provides full replacement compatibility for most designs. The M675S02 is well suited for phase-locked loop applications, clock and data recovery circuits and other timing applications in telecom and optical fiber networking systems.

### FEATURES

- ◆ Integrated SAW device
- ◆ Low phase jitter 0.2ps rms typical for the M675S02 (50kHz to 80MHz) - Design Target
- ◆ Output frequencies from 500 to 1000 MHz (Specify center frequencies at time of order)
- ◆ Industry-standard  $K_{vco}$  for full compatibility
- ◆ Differential 3.3V LVPECL output
- ◆ Single 3.3V power supply
- ◆ Small 5 x 7.5mm SMT (surface mount) package
- ◆ Pb-free / Compliant to EC RoHS Directive (RoHS 5/6)

### BLOCK DIAGRAM

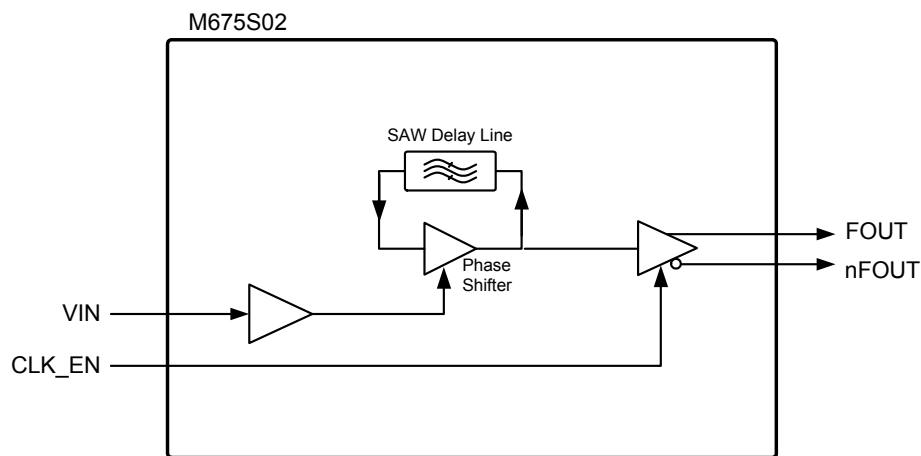


Figure 2: Block Diagram

### PIN ASSIGNMENT (5 x 7.5mm SMT)

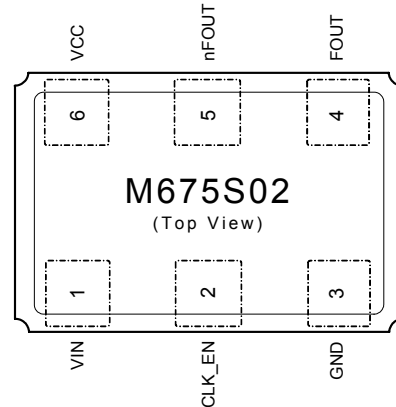


Figure 1: Pin Assignment

### Sample of Available Output Frequencies

VCSO Center Frequencies <sup>1</sup> (MHz)	Applications
622.0800	SONET/SDH
625.0000	Gigabit Ethernet
644.5313	GbE FEC
669.3266	SONET/SDH FEC

Table 1: Sample of Available Output Frequencies

Note 1: Specify VCSO center frequency at time of order

## PIN DESCRIPTIONS

Number	Name	I/O	Configuration	Description
1	VIN	Input		Frequency control input.
2	CLK_EN	Input	Internal pull-up resistor <sup>1</sup>	Clock Enable Logic 1 enables normal operation. Logic 0 stops the output clock; nFOUT is held high, FOUT is held low.
3	GND	Ground		Power supply ground connection.
4	FOUT	Output	No internal terminator	Clock output pair. Differential LVPECL.
5	nFOUT			
6	VCC	Power		Power supply connection, connect to +3.3V.

Table 2: Pin Descriptions

Note 1: See "Clock Enable Pull-up" in Table 5 (DC Characteristics for M675S02 on pg. 3).

## ABSOLUTE MAXIMUM RATINGS<sup>1</sup>

Symbol	Parameter	Rating	Unit
V <sub>I</sub>	Inputs	-0.5 to V <sub>CC</sub> +0.5	V
V <sub>O</sub>	Outputs	-0.5 to V <sub>CC</sub> +0.5	V
V <sub>CC</sub>	Power Supply Voltage	4.0	V
T <sub>S</sub>	Storage Temperature	-55 to +125	°C

Table 3: Absolute Maximum Ratings

Note 1: Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These ratings are stress specifications only. Functional operation of product at these conditions or any conditions beyond those listed in Recommended Conditions of Operation, DC Characteristics, or AC Characteristics is not implied. Exposure to absolute maximum rating conditions for extended periods may affect product reliability.

## RECOMMENDED CONDITIONS OF OPERATION

Symbol	Parameter	Min	Typ	Max	Unit
V <sub>CC</sub>	Positive Supply Voltage	2.97	3.3	3.63	V
T <sub>A</sub>	Ambient Operating Temperature	-40		+85	°C

Table 4: Recommended Conditions of Operation

## ELECTRICAL SPECIFICATIONS

### DC Characteristics for M675S02

Unless stated otherwise,  $V_{CC} = 3.3 \text{ Volts} \pm 10\%$ ,  $T_{CASE} = -40 \text{ to } 85^\circ\text{C}$ , VCSO Frequency = 622.08, Outputs terminated with  $50\Omega$  to  $V_{CC}-2.0\text{V}$  ground

	Symbol	Parameter	Pin	Min	Typ	Max	Unit
Power Supply	$V_{CC}$	Positive Supply Voltage	VCC	2.97	3.3	3.63	V
	$I_{CC}$	Power Supply Current			100	120	mA
Control Voltage	$V_{IN}$	Input Control Voltage Range	VIN	0		3.3	V
		$V_{IN}$ Input Impedence		20			k $\Omega$
Clock Enable Pull-up	$V_{IH}$	Input High Voltage		2		$V_{CC} + 0.3$	V
	$V_{IL}$	Input Low Voltage		-0.3		0.8	V
	$I_{IH}$	Input High Current	F_SEL			70	$\mu\text{A}$
	$I_{IL}$	Input Low Current		-150			$\mu\text{A}$
	$R_{pullup}$	Internal Pull-up Resistor			51		k $\Omega$
Differential Outputs	$V_{OH}$	Output High Voltage		$V_{CC} - 0.98$		$V_{CC} - 0.75$	V
	$V_{OL}$	Output Low Voltage		$V_{CC} - 1.95$		$V_{CC} - 1.63$	V
	$V_{P-P}$	Peak to Peak Output Voltage <sup>1</sup>	FOUT, nFOUT	0.45	0.625	0.85	$V_{P-P}$
	$I_{OUT}$	Output Current				20	mA

Note 1: Single-ended measurement. See Figure 3, Output Rise and Fall Time, on pg. 4.

Table 5: DC Characteristics for M675S02

### AC Characteristics for M675S02

Unless stated otherwise,  $V_{CC} = 3.3 \text{ Volts} \pm 10\%$ ,  $T_{CASE} = -40 \text{ to } 85^\circ\text{C}$ , VCSO Frequency = 622.08, Outputs terminated with  $50\Omega$  to  $V_{CC}-2.0\text{V}$  ground

	Symbol	Parameter	Pin	Min	Typ	Max	Unit	Notes
Control Voltage	$V_{IN}$	Modulation Bandwidth	VIN		600		kHz	
Output	$F_{OUT}$	Output Center Frequency Range		500		1000	MHz	
	APR	Absolute (Guaranteed) Pull-Range <sup>1</sup>		$\pm 120$			ppm	
	$f_{STAB}$	Frequency Stability			$\pm 120$		ppm p-p	At any given $V_{IN}$
	$L_{IN}$	Tuning Linearity			$\pm 10$		%	$V_{IN} = 0.3 \text{ to } 3.0\text{V}$
	$K_{VCO}$	VCO Gain	@622.08MHz		330		ppm/V	$V_{IN} = 0.3 \text{ to } 3.0\text{V}$
		Non-harmonic Spurious				-60	dBc	
	$\Phi_n$		100Hz Offset		-55		dBc/Hz	
	SSB (single sideband) Phase Noise, offset from carrier @622.08MHz		1kHz Offset		-85		dBc/Hz	
			10kHz Offset		-110		dBc/Hz	
			100kHz Offset		-130		dBc/Hz	
			1MHz Offset		-143		dBc/Hz	
			10MHz Offset		-147		dBc/Hz	
	J(t)	Jitter (rms)	12kHz to 20MHz		0.155		ps rms	
	@622.08MHz	50kHz to 80MHz		0.170		ps rms		
odc	Output Duty Cycle <sup>2</sup>			45		55	%	
$t_R$	Output Rise Time <sup>2</sup>	for FOUT, nFOUT			200	300	ps	20% to 80%
$t_F$	Output Fall Time <sup>2</sup>	for FOUT, nFOUT			200	300	ps	20% to 80%

Note 1: Also fully meets  $\pm 50$  ppm minimum pull-range specification that is commonly required.  
Note 2: See Parameter Measurement Information on pg. 4.

Table 6: AC Characteristics for M675S02

## PARAMETER MEASUREMENT INFORMATION

### Output Rise and Fall Time

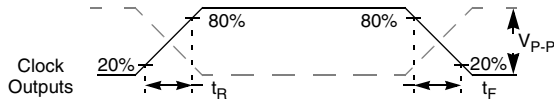


Figure 3: Output Rise and Fall Time

### Output Duty Cycle

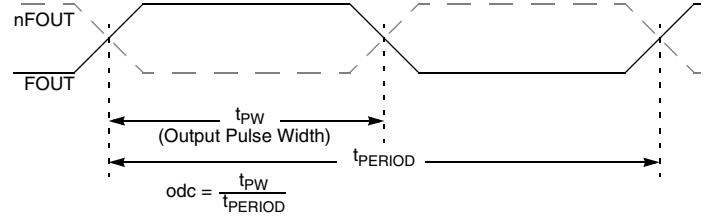
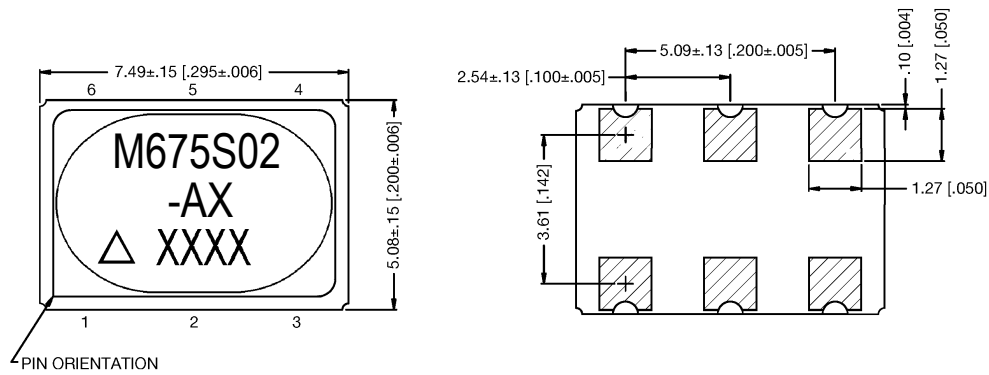


Figure 4: Output Duty Cycle

## DEVICE PACKAGE - 5 x 7.5mm SMT (Surface Mount) Package

### Mechanical Dimensions:

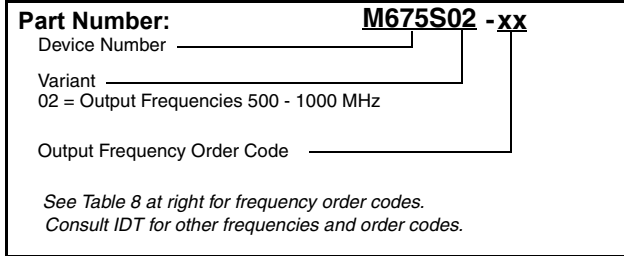


Dimensions are in mm;  
 dimensions in [ ] are in inches  
 Unless otherwise specified, all  
 dimensions are ±0.13 [0.005]

Figure 5: Device Package - 5 x 7.5mm SMT (Surface Mount) Package

## ORDERING INFORMATION

### Part Numbering Scheme



*Figure 6: Part Numbering Scheme*

### Example Order Numbers

For Output Frequencies (MHz) <i>Frequency</i>	Order Part Number <i>M675S02-xx</i>
622.0800	<b>M675S02-AA</b>
625.0000	<b>M675S02-AB</b>

Table 7: Example Order Numbers

*Consult IDT for the availability of other frequencies*

### M675S02 Standard Output Frequencies & Order Codes

500.0000 <b>CA</b>	693.4830 <b>AL</b>
622.0800 <b>AA</b>	657.4219 <b>AM</b>
625.0000 <b>AB</b>	614.4000 <b>AO</b>
627.3296 <b>AC</b>	475.0000 <b>AP</b>
644.5313 <b>AD</b>	707.3527 <b>AQ</b>
666.5143 <b>AE</b>	624.7048 <b>AR</b>
669.1281 <b>AF</b>	777.6000 <b>AS</b>
669.3120 <b>AG</b>	699.5175 <b>AT</b>
669.3266 <b>AH</b>	696.6149 <b>AU</b>
670.8386 <b>AI</b>	698.8123 <b>AV</b>
672.1627 <b>AJ</b>	873.5154 <b>AY</b>
690.5692 <b>AK</b>	873.8115 <b>AZ</b>

Table 8: M675S02 Standard Output Frequencies & Order Codes