QUAD OUTPUT CLOCK GENERATOR

IDT5V927

FEATURES:

- **3V to 3.6V operating voltage**
- **50MHz to 160MHz output frequency range**
- **Input from fundamental crystal oscillator or external source**
- **Internal PLL feedback (loading feedback output relative to other outputs, adjusts propagation delay between REF inputs and outputs)**
- **Select inputs ($S_{[1:0]}$) for FB divide selection (multiply ratio of 2, 3, 4, 4.25, 5, 6, 6.25, and 8)**
- **Low jitter**
- **PLL bypass for testing and power-down control (S1 = H, S0 = H, powers part down <500µA)**
- **Available in TSSOP package**

APPLICATIONS:

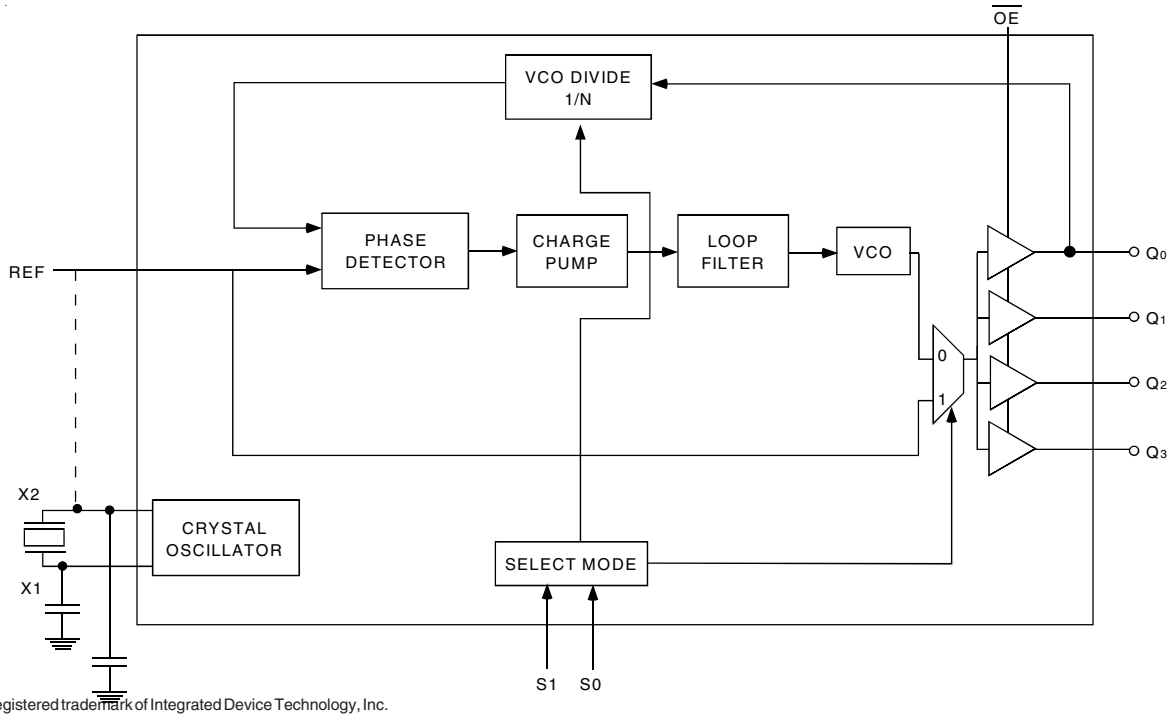
- **Gigabit ethernet**
- **Router**
- **Network switches**
- **SAN**
- **Instrumentation**
- **Fibre channel**

DESCRIPTION:

The IDT5V927 is a low-cost, low skew, low jitter, and high-performance clock synthesizer. It has been specially designed to interface with Gigabit Ethernet (125MHz), Fibre Channel (106.25MHz), and OC-3 (155.52MHz) applications. It can be programmed to provide output frequencies ranging from 50MHz to 160MHz, with input frequencies ranging from 6.25MHz to 80MHz.

The IDT5V927 includes an internal RC filter that provides excellent jitter characteristics and eliminates the need for external components. When using the optional crystal input, the chip accepts a 10 - 40MHz fundamental mode crystal with a maximum equivalent series resistance of 50Ω.

FUNCTIONAL BLOCK DIAGRAM



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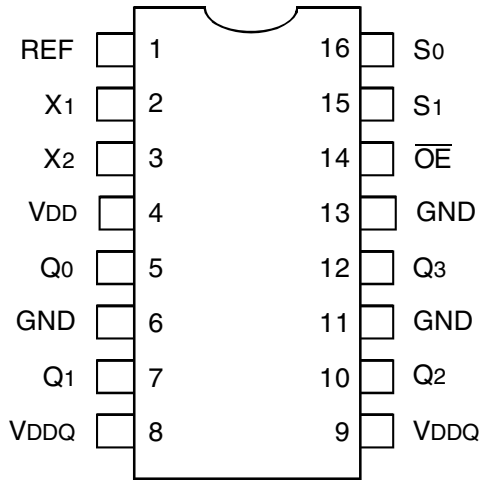
PIN CONFIGURATION



TSSOP
TOP VIEW

ABSOLUTE MAXIMUM RATINGS(1)

Symbol	Description	Max.	Unit
V_{DD}/V_{DDQ}	Supply Voltage to Ground	– 0.5 to +4.6	V
V_I	Input Voltage	– 0.5 to +4.6	V
I_O	Output Current	±50	mA
T_{STG}	Storage Temperature	– 65 to +150	° C
T_J	Junction Temperature	150	° C

NOTE:
1. Stresses greater than those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

PIN DESCRIPTION

Pin Name	Type	Description
$S_{[1:0]}$	I	Three level divider/mode select pins. Float to MID.
$\overline{OE}$	I	Output enable bar. $\overline{OE}$ has a pull-down. Output $Q_{[1:3]}$ tristated when HIGH. Output Q_0 remains running when in PLL mode and tri-states when in TEST mode.
X_1	I	Crystal oscillator input. Connect to GND if oscillator not required.
X_2	I	Crystal oscillator output. Leave unconnected for clock input.
REF	I	Input clock. Connect to X_2 if crystal oscillator is used.
$Q_{[1:3]}$	O	Output at N*REF frequency
Q_0	O	Output at N*REF internally connected for PLL feedback
V_{DDQ}	PWR	Power supply for the device outputs. Connect to V_{DD} on PCB.
V_{DD}	PWR	Power supply for the device core and inputs. Connect to V_{DD} on PCB.
GND	PWR	Ground supply

CRYSTAL SPECIFICATION

The crystal oscillators should be fundamental mode quartz crystals: overtone crystals are not suitable. Crystal frequency should be specified for parallel resonance with 50Ω maximum equivalent series resonance. Crystal tuning capacitors should be connected from X_2/REF to GND and from X_1 to GND.

DIVIDE SELECTION TABLE(1)

S1	S0	Divide-by-N Value	Mode
L	L	2	PLL
L	M	3	PLL
L	H	4	PLL
M	L	4.25	PLL
M	M	5	PLL
M	H	6	PLL
H	L	6.25	PLL
H	M	8	PLL
H	H	TEST	TEST(2)

NOTES:
1. H = HIGH
   M = MEDIUM
   L = LOW
2. Test mode for low frequency testing. In this mode, REF clock bypasses the VCO (VCO powered down) and the crystal oscillator is powered down.

COMMON OUTPUT FREQUENCY EXAMPLES (MHz)

Output	50	60	64	72	75	80	90	100
Input	25	10	16	12	25	10	15	20
FB Divide Selection S[1:0]	LL	MH	LH	MH	LM	HM	MH	MM

Output	106.25	106.25	120	125	125	125	150	155.52
Input	17	25	15	20	25	62.5	25	19.44
FB Divide Selection S[1:0]	HL	ML	HM	HL	MM	LL	MH	HM

OPERATING CONDITIONS

Symbol	Parameter	Min.	Typ.	Max.	Unit
V_{DD}/V_{DDQ}	Power Supply Voltage	3	3.3	3.6	V
T_A	Operating Temperature	-40	25	+85	°C
C_L	Output Load Capacitance	—	—	15	pF
C_{IN}	Input Capacitance, OE, F = 1MHz, V_{IN} = 0V, T_A = 25°C	—	5	7	pF

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:
Industrial: T_A = –40°C to +85°C, V_{DD}/V_{DDQ} = 3.3V ±0.3V

Symbol	Parameter	Test Conditions		Min.	Typ.	Max	Unit
V_{IL}	Input LOW Voltage			—	—	0.8	V
V_{IH}	Input HIGH Voltage			2	—	—	V
V_{IHH}	Input HIGH Voltage	3-level input only		V_{DD} - 0.6	—	—	V
V_{IMM}	Input MID Voltage	3-level input only		$V_{DD}/2$ - 0.3	—	$V_{DD}/2$ + 0.3	V
V_{ILL}	Input LOW Voltage	3-level input only		—	—	0.6	V
I_{IN}	Input Leakage Current (REF input only)	V_{IN} = V_{DD} or GND, V_{DD} = Max.		-5	—	+5	µA
I_3	3-Level Input DC Current, S[1:0]	V_{IN} = V_{DD}	HIGH Level	—	—	+200	µA
		V_{IN} = $V_{DD}/2$	MID Level	-50	—	+50	
		V_{IN} = GND	LOW Level	-200	—	—	
I_{IH}	Input HIGH Current	V_{IN} = V_{DD}	$\overline{OE}$	—	—	100	µA
		V_{IN} = V_{DD}, S[1:0] = HH	X_1	—	2	4	mA
V_{OL}	Output LOW Voltage	I_{OL} = 12mA		—	—	0.4	V
V_{OH}	Output HIGH Voltage	I_{OH} = -12mA		2.4	—	—	V

POWER SUPPLY CHARACTERISTICS

Symbol	Parameter	Test Conditions [1]	Min.	Typ.	Max	Unit
I_{DD_PD}	Power Down Current	V_{DD} = Max. $S_{[1:0]}$ = HH $\overline{OE}$ = L; REF = L; X_1 = L All outputs unloaded	—	—	500	µA
ΔI_{DD}	Supply Current per Input	V_{DD} = Max., V_{IN} = 3V	—	—	30	µA
I_{DD}	Dynamic Supply Current	V_{DD} = 3.6V $S_{[1:0]}$ = LL $\overline{OE}$ = L F_{OUT} = 150MHz All outputs unloaded	—	—	130	mA

NOTE:
1. For conditions shown as Min. or Max., use the appropriate values specified under DC Electrical Characteristics.

AC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
t_R, t_F	Rise Time, Fall Time	0.8V to 2V		—	0.7	1.5	ns
d_T	Output/Duty Cycle	$V_T = V_{DDQ}/2$		45	50	55	%
t_{PD}	REF to Q_0[1]	$V_T = V_{DDQ}/2$	$f_{OUT} \geq$ 100MHz, all N	-200	—	200	ps
			50 < f_{OUT} < 160MHz, N ≤ 4	-200	—	200	
			50 < f_{OUT} < 160MHz, N ≥ 4.25	-350	—	350	
t_{SK}	Output to Output Skew (Q_0 to $Q_{1:3}$)	Equal loads		—	—	150	ps
t_J	Cycle - Cycle Jitter	$f_{OUT} \geq$ 100MHz		-155	—	155	ps
f_{OUT}	Output Frequency			50	—	160	MHz

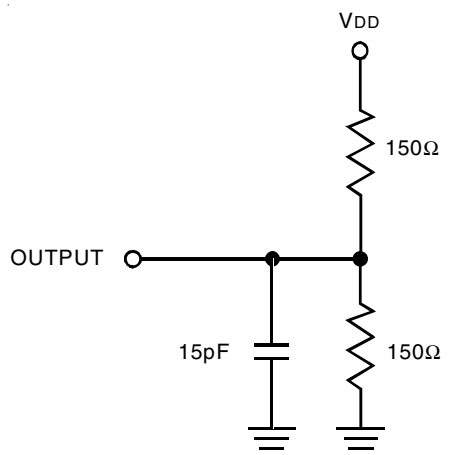
NOTE:
1. When using a clock input.

INPUT TIMING REQUIREMENTS

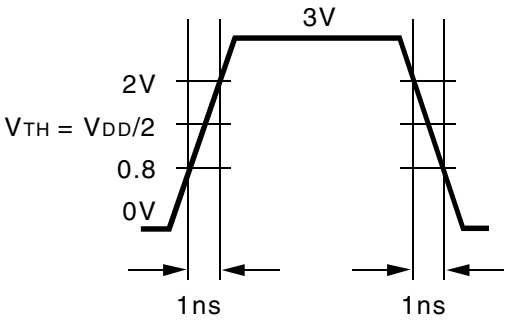
Symbol	Description[1]	Min.	Max.	Unit
t_R, t_F	Maximum input rise and fall time, 0.8V to 2V[2]	—	10	ns/V
t_{PWC}	Input clock pulse, HIGH or LOW[2]	2	—	ns
D_H	Input duty cycle[2]	10	90	%
f_{OSC}	XTAL oscillator frequency	—	40	MHz
f_{IN}	Input frequency[2]	50/N	160/N	MHz

NOTES:
1. Where pulse width implied by D_H is less than the t_{PWC} limit, t_{PWC} limit applies,
2. When using a clock input.

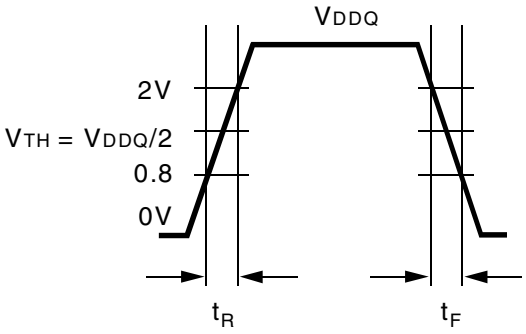
AC TEST LOADS AND WAVEFORMS



AC Test Load

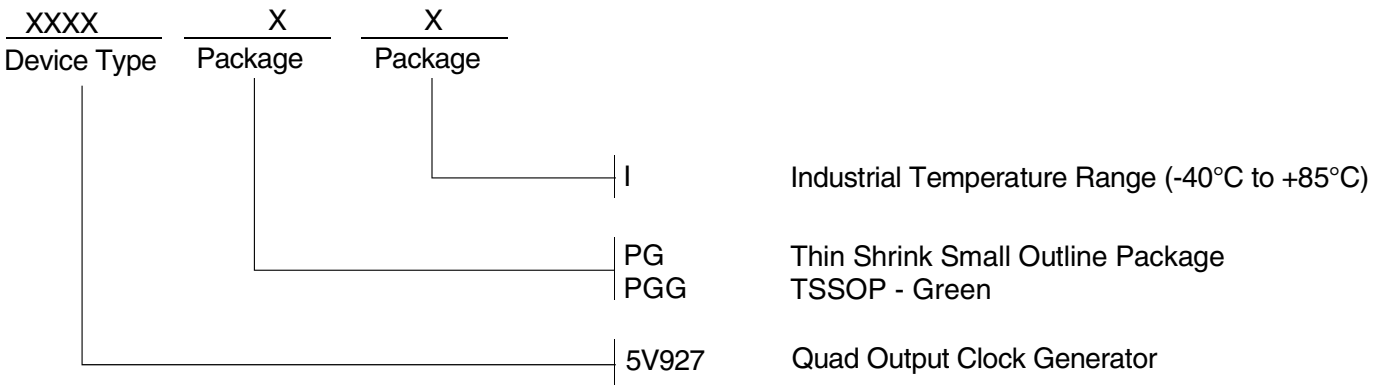


Input Test Waveform



Output Waveform

ORDERING INFORMATION



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