GUARANTEED LOW SKEW CMOS CLOCK DRIVER/BUFFER

QS532807

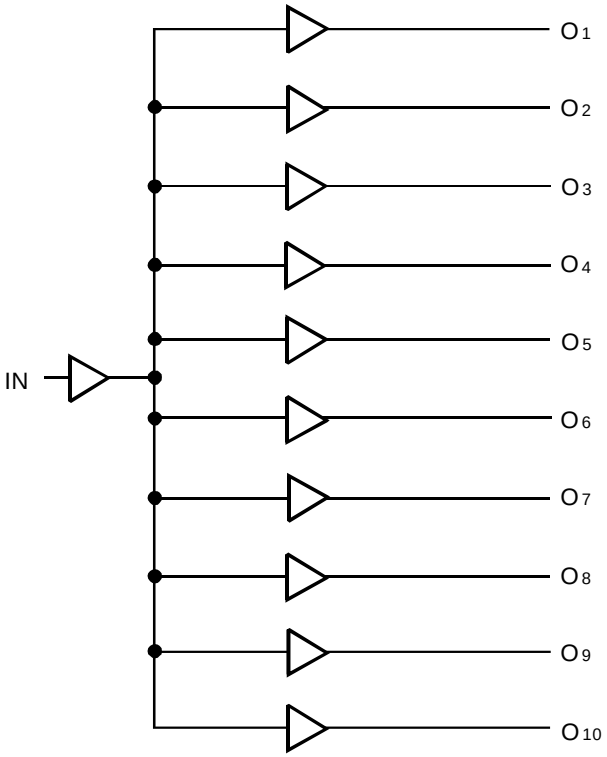
FEATURES:

- JEDEC compatible LVTTL level
- 10 low skew clock outputs
- Clock input is 5V tolerant
- Pinout and function compatible with QS5807
- 25Ω on-chip resistors available for low noise
- Input hysteresis for better noise margin
- Guaranteed low skew:
  - 0.35ns output skew (same bank)
  - 0.6ns output skew (different bank)
  - 0.75ns part-to-part skew
- Available in QSOP and SOIC packages

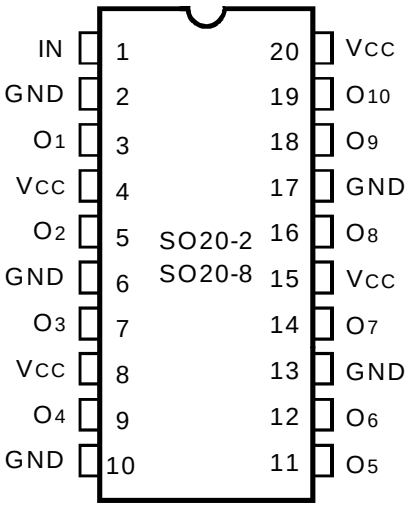
DESCRIPTION:

The QS532807 clock driver/buffer circuit can be used for clock buffering schemes where low skew is a key parameter. The QS532807 offers ten non-inverting outputs. Designed in IDT's proprietary QCMOS process, these devices provide low propagation delay buffering with on-chip skew of 0.35ns for same-transition, same bank signals. The QS532807 has on-chip series termination resistors for lower noise clock signals. The QS532807 series resistor version is recommended for driving unterminated lines with capacitive loading and other noise sensitive clock distribution circuits. These clock buffer products are designed for use in high-performance workstations, embedded and personal computing systems. Several devices can be used in parallel or scattered throughout a system for guaranteed low skew, system-wide clock distribution networks.

FUNCTIONAL BLOCK DIAGRAM



PIN CONFIGURATION



QSOP/ SOIC
TOP VIEW

ABSOLUTE MAXIMUM RATINGS (1)

Symbol	Description	Max.	Unit
V_{TERM}(2)	Supply Voltage to Ground	– 0.5 to +4.6	V
	DC Output Voltage V_{OUT}	– 0.5 to V_{CC}+0.5	V
V_{TERM}(3)	DC Input Voltage V_{IN}	– 0.5 to +7	V
V_{AC}	AC Input Voltage (pulse width ≤20ns)	-3	V
I_{OUT}	DC Output Current V_{IN} < 0	-20	mA
	DC Output Current Max. Sink Current/Pin	120	mA
T_{STG}	Storage Temperature	– 65 to +150	°C
T_J	Junction Temperature	150	°C

NOTES:
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.
2. Vcc Terminals.
3. All terminals except Vcc.

CAPACITANCE (T_A = +25°C, f = 1.0MHz, V_{IN} = 0V)

	QSOP		SOIC		
Pins	Typ.	Max. (1)	Typ.	Max. (1)	Unit
C_{IN}	3	6	5	7	pF

NOTE:
1. This parameter is guaranteed but not production tested.

PIN DESCRIPTION

Pin Names	I/O	Description
IN	I	Clock Input
Ox	O	Clock Outputs

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

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

Symbol	Parameter	Test Conditions	Min.	Typ.(1)	Max.	Unit
V_{IH}	Input HIGH Voltage	Guaranteed Logic HIGH for All Inputs	2	1.7	5.5	V
V_{IL}	Input LOW Voltage	Guaranteed Logic LOW for All Inputs	–0.5	—	0.8	V
V_{IC}	Clamp Diode Voltage (3)	Vcc = Min., I_{IN} = -18mA	—	–0.7	–1.2	V
V_{OH}	Output HIGH Voltage	Vcc = Min., I_{OH} = -100µA	Vcc - 0.2	—	—	V
		Vcc = Min., I_{OH} = -8mA	2.4	—	—	
V_{OL}	Output LOW Voltage	Vcc = Min., I_{OL} = 100µA	—	—	0.2	V
		Vcc = Min., I_{OL} = 6mA	—	—	0.4	
		Vcc = Min., I_{OL} = 8mA	—	—	0.5	
I_{IN}	Input Leakage Current	Vcc = Max., V_{IN} = V_{CC} or GND	—	—	±1	µA
I_{OFF}	Input Power Off Leakage	Vcc = 0V, V_{IN} = V_{CC} or GND	—	—	±1	µA
I_{OS}	Short Circuit Current (2,3)	Vcc = Max., V_{OUT} = GND	–60	–195	—	mA
I_{ODH}	Output HIGH Current	Vcc = 3.3V, V_{IN} = V_{IH} or V_{IL}, V_O = 1.5V	–50	–80	–200	mA
I_{ODL}	Output LOW Current	Vcc = 3.3V, V_{IN} = V_{IH} or V_{IL}, V_O = 1.5V	50	112	200	mA
ΔV_T	Input Hysteresis	V_{TLH} - V_{THL} for All Inputs	—	0.2	—	V
R_{OUT}	Output Resistance (4)	Vcc = Min., I_{OL} = 12mA	—	28	—	Ω

NOTES:
1. Typical values are at V_{CC} = 3.3V, T_A = 25°C.
2. Not more than one output should be used to test this high power condition. Duration is less than one second.
3. Guaranteed by design but not tested.
4. Output resistance represents the total output impedance of the logic device and includes added series termination resistance.

POWER SUPPLY CHARACTERISTICS

Symbol	Parameter	Test Conditions		Typ. (2)	Max.	Unit
I_{CC}	Quiescent Power Supply Current	V_{CC} = Max., V_{IN} = GND or Vcc		0.01	100	µA
ΔI_{CC}	Supply Current per Input HIGH	V_{CC} = Max., V_{IN} = 3V Input toggling at 50% duty cycle		0.1	30	µA
I_{CCD}	Dynamic Power Supply Current per Output (1)	V_{CC} = Max., outputs Enabled		60	90	µA/MHz
I_C	Total Power Supply Current Examples (1,3)	V_{CC} = Max., Input at 50% duty cycle f_I = 10MHz	V_{IN} = GND or Vcc	6	10	mA
		V_{CC} = Max., Input at 50% duty cycle f_I = 2.5MHz	V_{IN} = GND or Vcc	1.5	3	

NOTES:
1. Guaranteed by design but not tested. C_L = 0pF.
2. Typical values are for reference only. Conditions are V_{CC} = 3.3V, T_A = 25°C.
3. $I_C = I_{CC} + (\Delta I_{CC})(D_H)(N_T) + I_{CCD}(f_O)(N_O)$
   where:
   D_H = Input Duty Cycle
   N_T = Number of TTL HIGH inputs at D_H (one)
   f_O = Output Frequency
   N_O = Number of outputs at f_O (ten)

SWITCHING CHARACTERISTICS OVER OPERATING RANGE

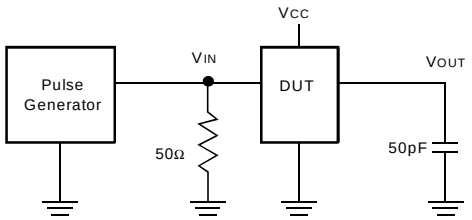
T_A = -40°C to +85°C, V_{CC} = 3.3V ± 0.3V

C_{LOAD} = 50pF (no resistor)

Symbol	Parameter [1]	Min.	Max.	Unit
$t_{SK(01)}$	Skew between all outputs, same transition	—	0.5	ns
$t_{SK(P)}$	Pulse Skew; skew between opposite transitions of the same output (t_{PHL} - t_{PLH})	—	0.5	ns
$t_{SK(T)}$	Part-to-part skew [2]	—	1	ns
t_{PLH} t_{PHL}	Propagation Delay [3] IN to Ox	1.5	5.2	ns
t_R	Output Rise Time, 0.8V to 2V	—	2	ns
t_F	Output Fall Time, 2V to 0.8V	—	2	ns

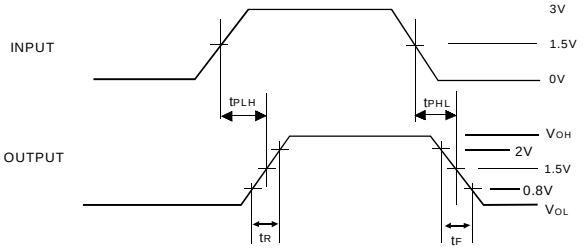
NOTES:
1. Skew parameters are guaranteed across temperature range, but not tested.
2. $t_{SK(T)}$ only applies to devices of the same transition, part type, temperature, power supply voltage, loading, and package.
3. The propagation delay range indicated by Min. and Max. specifications results from process and environmental variables. These propagation delays do not imply limit skew.

TEST CIRCUITS AND WAVEFORMS

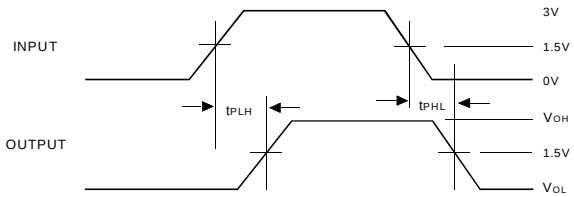


Pulse generator for all pulses: f ≤ 1.0MHz; t_F ≤ 2.5ns; t_R ≤ 2.5ns

PROPAGATION DELAY

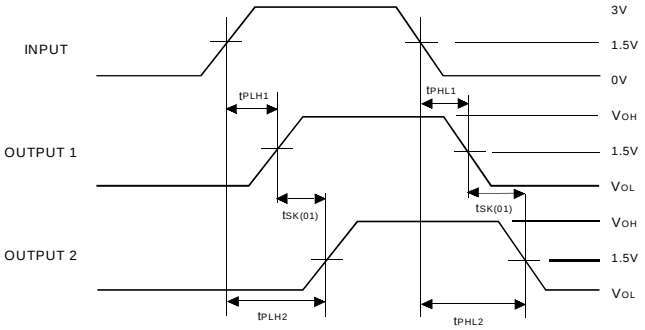


PULSE SKEW — $t_{SK(P)}$



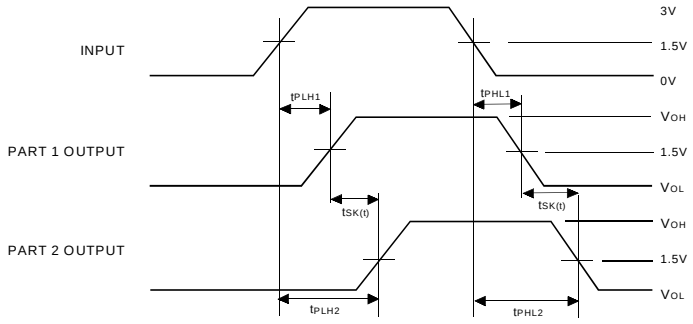
$t_{SK(p)} = |t_{PHL} - t_{PLHL}|$

OUTPUT SKEW — $t_{SK(O1)}$



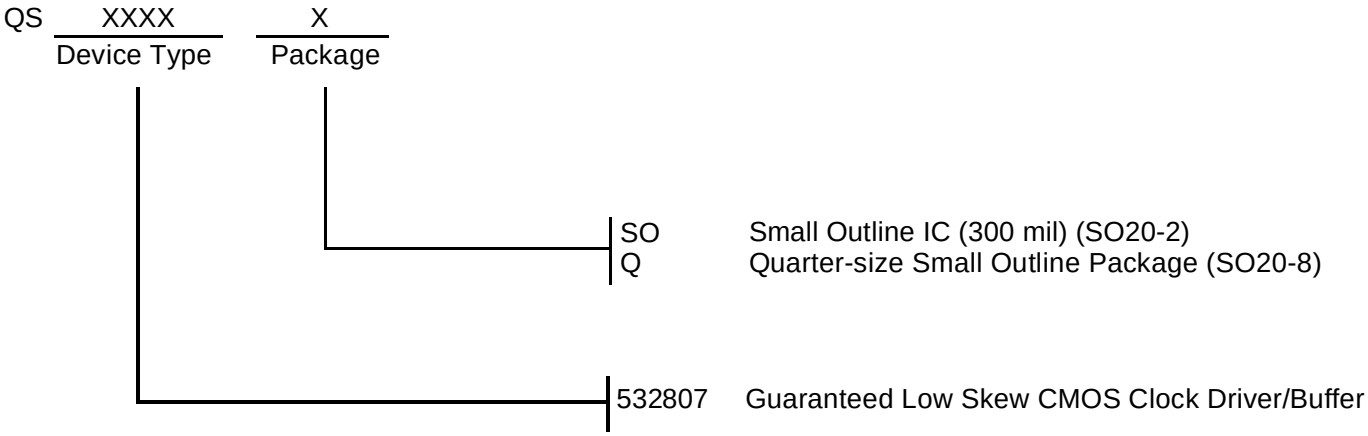
$t_{SK(01)} = |t_{PLH2} - t_{PLH1}|$ or $|t_{PHL2} - t_{PHL1}|$

PART-TO-PART SKEW — $t_{SK(T)}$



$t_{SK(t)} = |t_{PLH2} - t_{PLH1}|$ or $|t_{PHL2} - t_{PHL1}|$

ORDERING INFORMATION



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