



GUARANTEED LOW SKEW CMOS CLOCK DRIVER/BUFFER

QS52807/A

FEATURES:

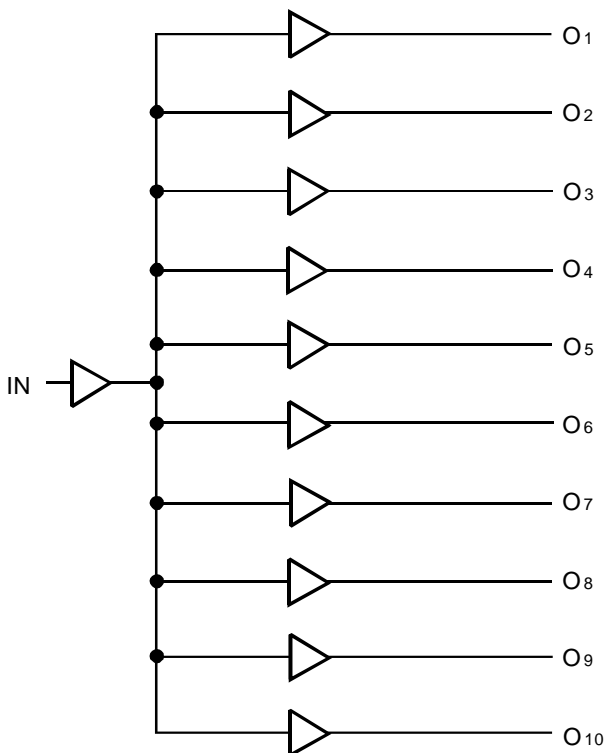
- 10 outputs
- Rail-to-rail output voltage swing
- 25Ω on-chip resistors available for low noise
- Input hysteresis for better noise margin
- Guaranteed low skew:
 - 0.3ns output skew (same bank)
 - 0.6ns output skew (different bank)
 - 1ns part-to-part skew
- Std. and A speed grades
- Available in QSOP and SOIC packages

DESCRIPTION

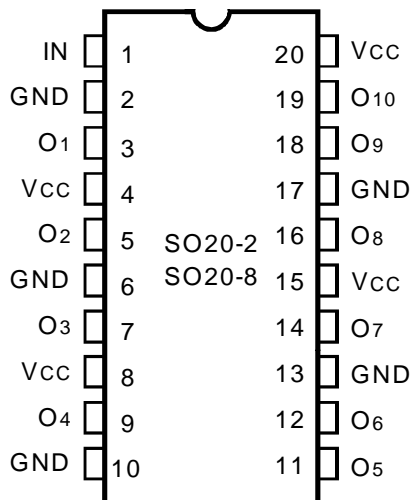
The QS52807 clock driver/buffer circuits can be used for clock buffering schemes where low skew is a key parameter. The QS52807 offers ten non-inverting outputs. Designed in IDT's proprietary QCMOS process, these devices provide low propagation delay buffering with on-chip skew of 0.3ns for same-transition signals. The QS52807 has on-chip series termination resistors for lower noise clock signals. The QS52807 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. Rail-to-rail output swing improves noise margin and allows easy interface with CMOS inputs.

The QS52807 is characterized for operation at -40°C to +85°C.

FUNCTIONAL BLOCK DIAGRAM



PIN CONFIGURATION



QSOP/ SOIC
 TOP VIEW

ABSOLUTE MAXIMUM RATINGS (1)

Symbol	Description	Max.	Unit
VTERM ⁽²⁾	Supply Voltage to Ground	- 0.5 to +7	V
	DC Output Voltage V _{OUT}	- 0.5 to +7	V
VTERM ⁽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:

- 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.
- V_{CC} Terminals.
- All terminals except V_{CC}.

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

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

NOTE:

- This parameter is guaranteed but not production tested.

PIN DESCRIPTION

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

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:

Industrial: $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$, $V_{CC} = 5.0\text{V} \pm 10\%$, $V_{HC} = V_{CC} - 0.2\text{V}$, $V_{LC} = 0.2\text{V}$

Symbol	Parameter	Test Conditions	Min.	Typ. ⁽¹⁾	Max.	Unit
V_{IH}	Input HIGH Voltage	Guaranteed Logic HIGH for All Inputs	2	—	—	V
V_{IL}	Input LOW Voltage	Guaranteed Logic LOW for All Inputs	—	—	0.8	V
V_{IC}	Clamp Diode Voltage ⁽³⁾	$V_{CC} = \text{Min.}$, $I_{IN} = -18\text{mA}$	—	-0.7	-1.2	V
V_{OH}	Output HIGH Voltage	$V_{CC} = \text{Min.}$, $V_{IN} = V_{IH}$ or V_{IL} , $I_{OH} = -12\text{mA}$	3.6	4.3	—	V
		$V_{CC} = \text{Min.}$, $V_{IN} = V_{IH}$ or V_{IL} , $I_{OH} = -24\text{mA}$	2.4	—	—	
V_{OL}	Output LOW Voltage	$V_{CC} = \text{Min.}$, $V_{IN} = V_{IH}$ or V_{IL} , $I_{OL} = 12\text{mA}$	—	—	0.5	V
I_{IN}	Input Leakage Current	$V_{CC} = \text{Max.}$, $V_{IN} = V_{CC}$ or GND	—	—	± 1	μA
I_{OFF}	Input Power Off Leakage	$V_{CC} = 0\text{V}$, $V_{IN} = V_{CC}$ or GND	—	—	± 1	μA
I_{OS}	Short Circuit Current ^(2,3)	$V_{CC} = \text{Max.}$, $V_{OUT} = \text{GND}$	-60	—	—	mA
ΔV_T	Input Hysteresis	$V_{TLH} - V_{THL}$ for All Inputs	—	0.2	—	V
R_{OUT}	Output Resistance ⁽⁴⁾	$V_{CC} = \text{Min.}$, $I_{OL} = 12\text{mA}$	—	28	—	Ω

NOTES:

- Typical values are at $V_{CC} = 5.0\text{V}$, $T_A = 25^{\circ}\text{C}$.
- Not more than one output should be used to test this high power condition. Duration is less than one second.
- Guaranteed by design but not tested.
- 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.	Max.	Unit	
I_{CC}	Quiescent Power Supply Current	$V_{CC} = \text{Max.}$, $V_{IN} = \text{GND}$ or V_{CC}	0.005	0.5	mA	
ΔI_{CC}	Supply Current per Input HIGH	$V_{CC} = \text{Max.}$, $V_{IN} = 3.4\text{V}$ Input toggling at 50% duty cycle	0.5	2.5	mA	
I_{CCD}	Dynamic Power Supply Current per Output ⁽¹⁾	$V_{CC} = \text{Max.}$, outputs Enabled	0.12	0.2	mA/MHz	
I_C	Total Power Supply Current Examples ⁽²⁾	$V_{CC} = \text{Max.}$, Input at 50% duty cycle $f_i = 10\text{MHz}$	$V_{IN} = \text{GND}$ or V_{CC}	12	21	mA
			$V_{IN} = \text{GND}$ or 3V	12	2.2	
		$V_{CC} = \text{Max.}$, Input at 50% duty cycle $f_i = 2.5\text{MHz}$	$V_{IN} = \text{GND}$ or V_{CC}	3	6	
			$V_{IN} = \text{GND}$ or 3V	3.5	7	

NOTES:

- Guaranteed by design but not tested. $C_L = 0\text{pF}$.
- $I_C = I_{CC} + (\Delta I_{CC})(D_H)(N_T) + I_{CCD}(f_o)(N_o)$
 where:
 D_H = Input Duty Cycle
 N_T = Number of TTL HIGH inputs at D_H
 f_o = Output Frequency
 N_o = Number of outputs at f_o

SWITCHING CHARACTERISTICS OVER OPERATING RANGE

T_A = -40°C to +85°C, V_{CC} = 5.0V ± 10%

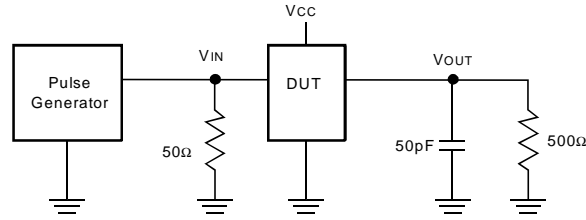
C_{LOAD} = 50pF (no resistor)

Symbol	Parameter ⁽¹⁾	QS52807		QS52807A		Unit
		Min.	Max.	Min.	Max.	
t _{SK(O1)}	Skew between all outputs, same transition	—	0.5	—	0.35	ns
t _{SK(P)}	Pulse Skew; skew between opposite transitions of the same output (t _{PHL} - t _{PLH})	—	1	—	1	ns
t _{SK(T)}	Part-to-part skew ⁽²⁾	—	1.5	—	1.5	ns
t _{PLH} t _{PHL}	Propagation Delay ⁽²⁾ IN to O _x	1.5	5.6	1.5	5.3	ns
t _R	Output Rise Time, 0.8V to 2V ⁽³⁾	—	1.5	—	1.5	ns
t _F	Output Fall Time, 0.2V _{CC} to 0.8V _{CC} ⁽³⁾	—	3	—	3	ns

NOTES:

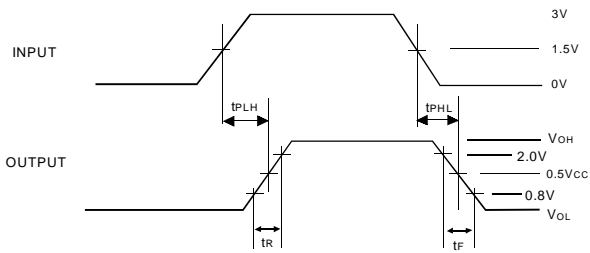
1. Skew parameters are guaranteed across temperature range, but not tested. Skew parameters are measured at 0.5V_{CC}.
2. t_{SK(T)} only applies to devices of the same transition, part type, temperature, power supply voltage, loading, package, and speed grade.
3. The propagation delay range indicated by Min. and Max. specifications results from process and environmental variables. These propagation delays do not imply limit skew.

TEST CIRCUITS AND WAVEFORMS

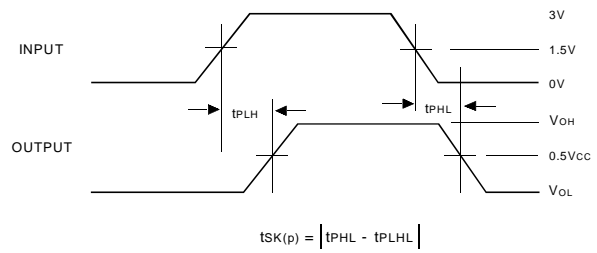


Pulse generator for all pulses: $f \leq 1.0\text{MHz}$; $t_F \leq 2.5\text{ns}$; $t_R \leq 2.5\text{ns}$

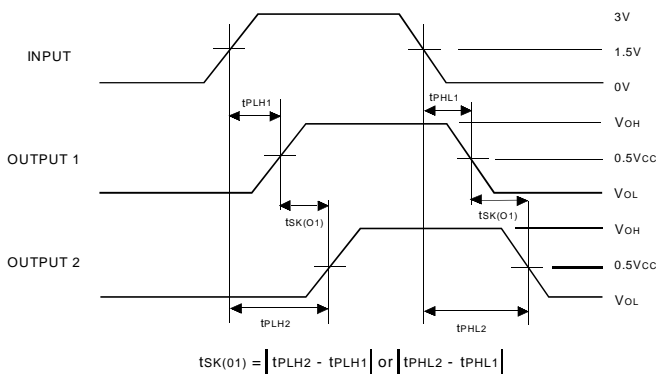
PROPAGATION DELAY



PULSE SKEW — $t_{SK(P)}$

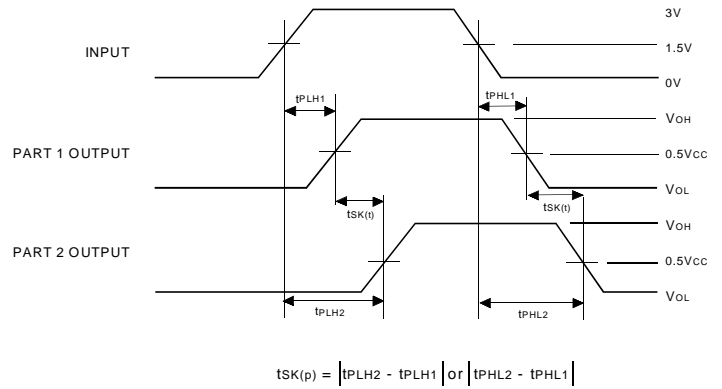


OUTPUT SKEW — $t_{SK(O1)}$



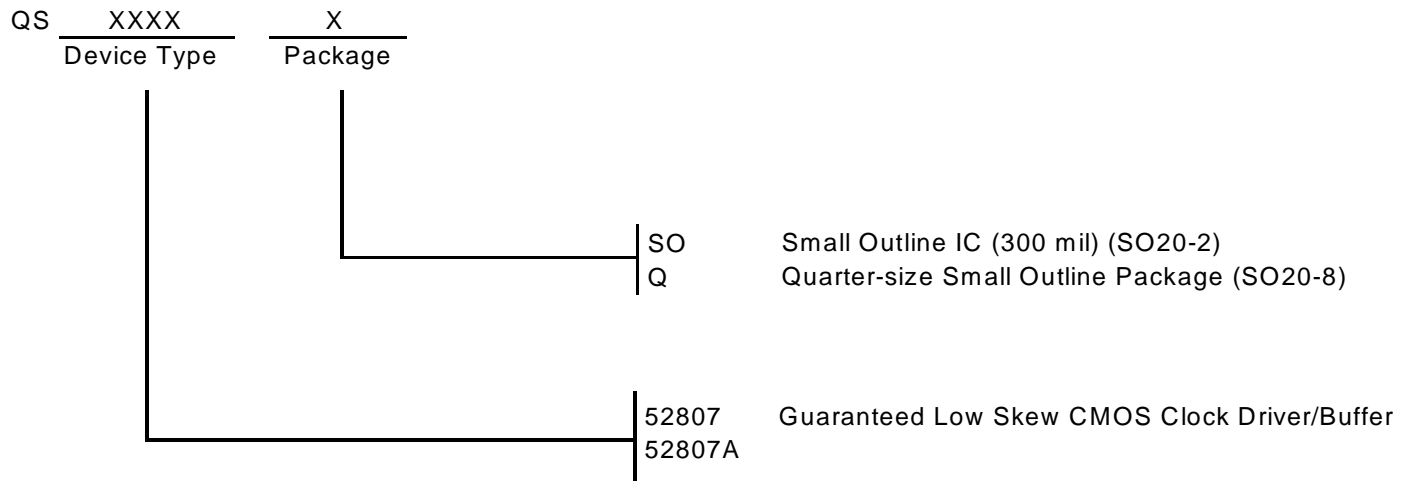
$$t_{SK(O1)} = |t_{PLH2} - t_{PLH1}| \text{ or } |t_{PHL2} - t_{PHL1}|$$

PART-TO-PART SKEW — $t_{SK(T)}$



$$t_{SK(p)} = |t_{PLH2} - t_{PLH1}| \text{ or } |t_{PHL2} - t_{PHL1}|$$

ORDERING INFORMATION



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