



GUARANTEED LOW SKEW CMOS CLOCK DRIVER/BUFFER

QS52805T/AT

FEATURES:

- 10 output, low skew signal buffer
- Guaranteed low skew:
 - 0.7ns output skew (same bank)
 - 0.9ns output skew (different bank)
 - 1ns part-to-part skew
- 25Ω on-chip resistors available for low noise
- Input hysteresis for better noise margin
- Monitor output
- Undershoot clamp diodes on all inputs
- Std. and A speed grades
- Available in QSOP and SOIC packages

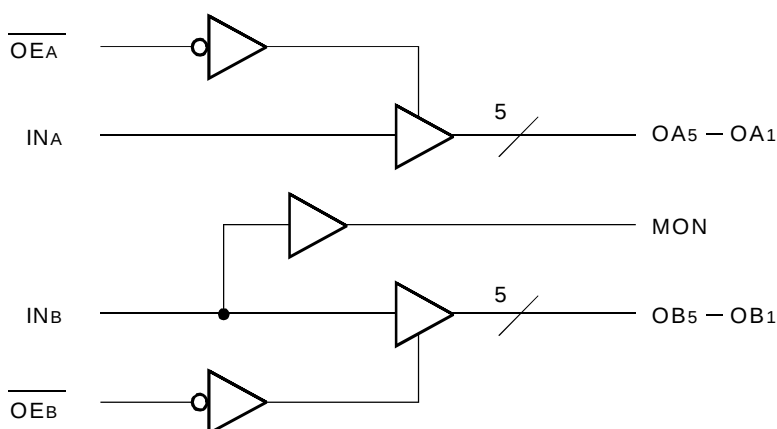
DESCRIPTION

The QS52805T clock buffer/driver circuits can be used for clock buffering schemes where low skew is a key parameter. This device offers two banks of five non-inverting outputs. This device provides low propagation delay buffering with on-chip skew of 0.7ns for same-transition, same-bank signals.

The QS52805T has on-chip series termination resistors for lower noise clock signals. The QS52805T 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 and in 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.

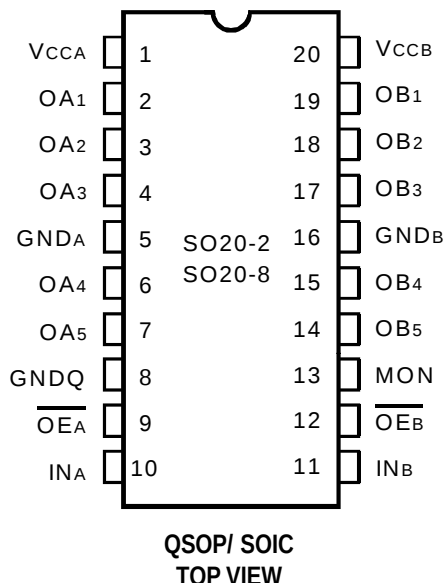
The QS52805T is characterized for operation at -40°C to +85°C.

FUNCTIONAL BLOCK DIAGRAM



NOTE: This device has 25Ω series termination resistors on each clock output including monitor.

PIN CONFIGURATION



ABSOLUTE MAXIMUM RATINGS ⁽¹⁾

Symbol	Description	Max.	Unit
V _{TERM} ⁽²⁾	Supply Voltage to Ground	– 0.5 to +7	V
	DC Output Voltage V _{OUT}	– 0.5 to +7	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 Input Diode 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	Typ.	Max. ⁽¹⁾	Unit
C _{IN}	4	6	pF
C _{OUT}	7	9	pF

NOTE:

- This parameter is guaranteed but not production tested.

PIN DESCRIPTION

Pin Names	I/O	Description
$\overline{OE}A$, $\overline{OE}B$	I	Output Enable Inputs
INA, INB	I	Clock Inputs
OAn, OBn	O	Clock Outputs
MON	O	Unbuffered Monitor Output

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:

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

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	$V_{CC} = \text{Min.}$, $I_{OH} = -12\text{mA}$	2.4	—	—	V
V_{OL}	Output LOW Voltage	$V_{CC} = \text{Min.}$, $I_{OL} = 12\text{mA}$	—	—	0.5	V
I_{IN}	Input Leakage Current	$V_{CC} = \text{Max.}$, $V_{IN} = V_{CC}$ or GND	—	—	± 1	μA
I_{OFF}	Input/Output Power Off Leakage	$V_{CC} = 0\text{V}$, V_{IN} or $V_{OUT} = V_{CC}$ or GND	—	—	± 1	μA
I_{OZ}	Output Leakage Current	$V_{CC} = \text{Max.}$, $V_{OUT} = V_{CC}$ or GND	—	—	± 1	μA
I_{OS}	Short Circuit Current ^(2,3)	$V_{CC} = \text{Max.}$, $V_{OUT} = \text{GND}$	-60	—	-250	mA
ΔV_T	Input Hysteresis	$V_{TLH} - V_{THL}$ for All Inputs	—	0.2	—	V
R_{OUT}	Output Resistance	$V_{CC} = \text{Min.}$, $I_{OL} = 12\text{mA}$	—	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.

POWER SUPPLY CHARACTERISTICS

Symbol	Parameter	Test Conditions ⁽¹⁾		Typ. ⁽³⁾	Max.	Unit
I _{CC}	Quiescent Power Supply Current	V _{CC} = Max., V _{IN} = GND or V _{CC}		0.005	0.5	mA
ΔI _{CC}	Supply Current per Input HIGH	V _{CC} = Max., V _{IN} = 3.4V, f _i = 0MHz		1	2.5	mA
I _{CCD}	Dynamic Power Supply Current per Output ⁽²⁾	V _{CC} = Max., V _{IN} = GND or V _{CC} Outputs Enabled, 50% duty cycle		0.08	0.18	mA/MHz
I _C	Total Power Supply Current Examples ^(2,4)	V _{CC} = Max., OEA = OEB = GND 50% duty cycle, f _i = 10MHz Five outputs toggling Unused inputs = GND or V _{CC}	V _{IN} = GND or V _{CC}	6.6	9.5	mA
			V _{IN} = GND or 3.4V	7.2	10.8	
		V _{CC} = Max., OEA = OEB = GND 50% duty cycle, f _i = 2.5MHz All outputs toggling	V _{IN} = GND or V _{CC}	4.3	5.5	
			V _{IN} = GND or 3.4V	5.6	8	

NOTES:

- For conditions shown as Min. or Max., use the appropriate values specified under DC Electrical Characteristics.
- Guaranteed by design but not tested. $C_L = 0\text{pF}$.
- Typical values are for reference only. Conditions are $V_{CC} = 5.0\text{V}$, $T_A = 25^{\circ}\text{C}$.
- $I_C = I_{CC} + (\Delta I_{CC})(D_H)(N_T) + I_{CCD}(f_o)(N_o)$
where:
 D_H = Input Duty Cycle
 N_T = Number of TTL HIGH inputs at D_H (one or two)
 f_o = Output Frequency
 N_o = Number of outputs at f_o

SKEW CHARACTERISTICS OVER OPERATING RANGE

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

$C_{LOAD} = 50\text{pF}$ (no resistor)

Symbol	Parameter ⁽¹⁾	QS52805T		QS52805AT		Unit
		Min.	Max.	Min.	Max.	
tsk(01)	Skew between two outputs, same transition, same bank	—	0.7	—	0.7	ns
tsk(02)	Skew between two outputs, same transition, different banks	—	0.9	—	0.9	ns
tsk(P)	Pulse Skew; opposite transition skew, same output ($t_{PHL} - t_{PLH}$)	—	1	—	1	ns
tsk(T)	Part-to-part skew ⁽²⁾	—	1.5	—	1	ns

NOTES:

1. Skew parameters are guaranteed across temperature range, but not tested. Skew parameters apply to propagation delays only.
2. tsk(T) only applies to devices of the same transition, part type, temperature, power supply voltage, loading, package, and speed grade.

SWITCHING CHARACTERISTICS OVER OPERATING RANGE

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

$C_{LOAD} = 50\text{pF}$ (no resistor)

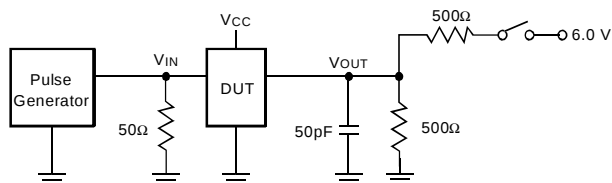
Symbol	Parameter ⁽¹⁾	QS52805T		QS52805AT		Unit
		Min.	Max.	Min.	Max.	
tPLH tPHL	Propagation Delay ⁽²⁾	1.5	6.5	1.5	5.8	ns
tPZL tPZH	Output Enable Time	1.5	8	1.5	8	ns
tPLZ tPHZ	Output Disable Time	1.5	7	1.5	7	ns
tR	Output Rise Time, 0.8V to 2V ⁽³⁾	—	1.5	—	1.5	ns
tF	Output Fall Time, 2V to 0.8V ⁽³⁾	—	1.5	—	1.5	ns

NOTES:

1. Minimums guaranteed but not production tested.
2. The propagation delay other range indicated by Min. and Max. specifications results from process and environmental variables. These propagation delays do not imply limit skew.
3. This parameter is guaranteed but not tested.

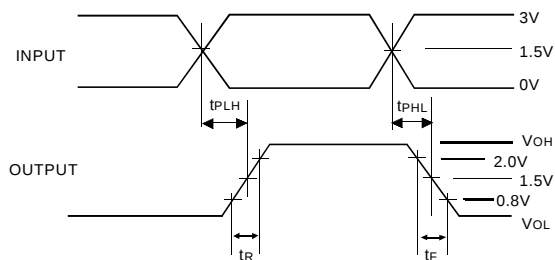
TEST CIRCUITS AND WAVEFORMS

Parameter Tested	Switch Position
t_{PLZ} , t_{PZL}	Closed
All Others	Open

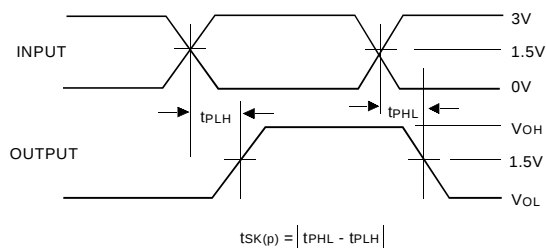


Pulse generator for all pulses: $f \leq 1.0\text{MHz}$; $t_f \leq 2.5\text{ns}$; $t_r \leq 2.5\text{ns}$

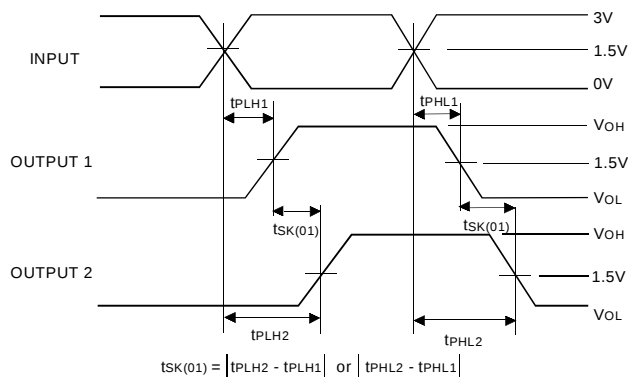
PROPAGATION DELAY



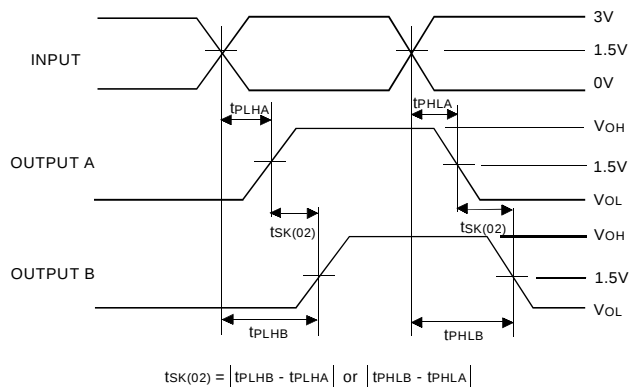
PULSE SKEW — $t_{SK(P)}$



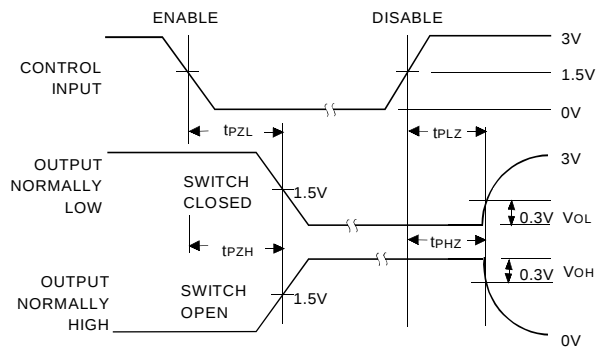
OUTPUT SKEW (SAME BANK) — $t_{SK(01)}$



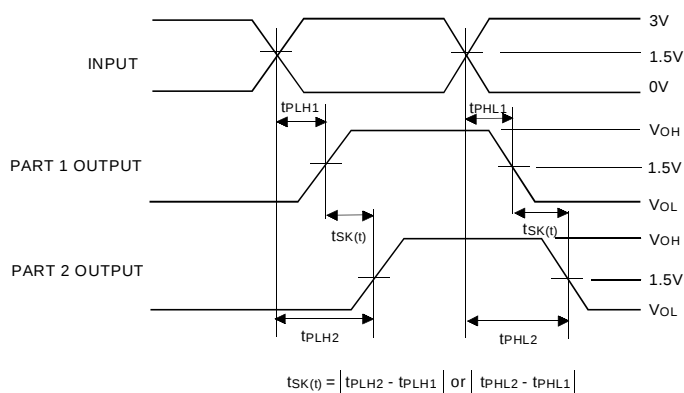
OUTPUT SKEW (DIFFERENT BANKS) — $t_{SK(02)}$



ENABLE AND DISABLE TIMES



PART-TO-PART SKEW — $t_{SK(T)}$

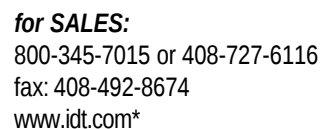


Decoding example:

Device Type	Package	Device
52	80	52805T
52	80	52805AT

Guaranteed Low Skew CMOS Clock Driver/Buffer

Quarter Size Small Outline Package (SO20-8)
Small Outline IC (SO20-2)



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