

### Description

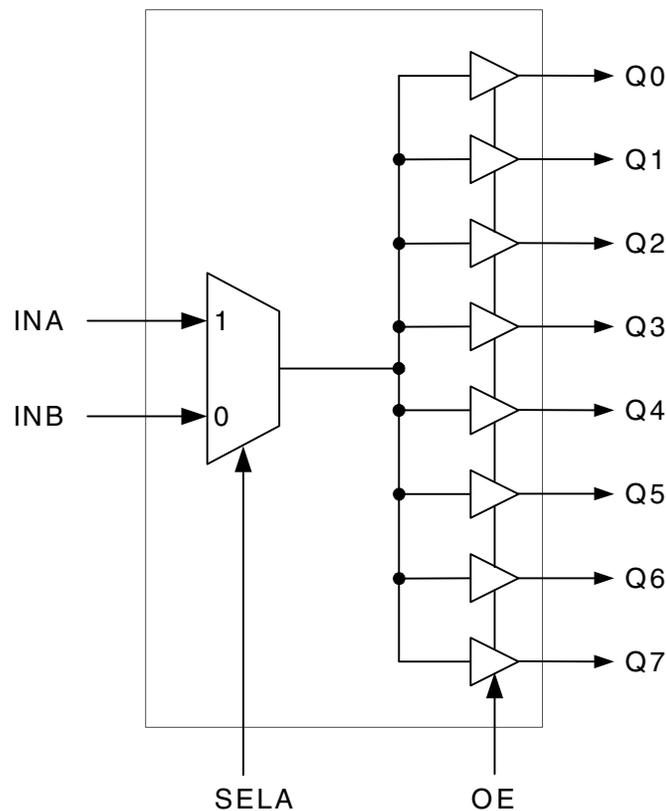
The 552-02S is a low skew, single-input to eight- output clock buffer. The device offers a dual input with pin select for switching between two clock sources. It has best in class Additive Phase Jitter of sub 50fsec

IDT makes many non-PLL and PLL based low skew output devices as well as Zero Delay Buffers to synchronize clocks. Contact us for all of your clocking needs.

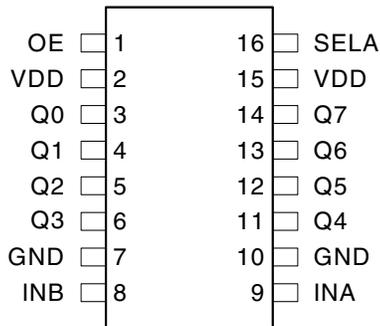
### Features

- Low RMS Additive Phase Jitter: 50fs
- Low output skew: 50ps
- Operating Voltages of 1.8V to 3.3V
- Packaged in 16-pin TSSOP and 16-pin VFQFN, Pb-free
- Input clock multiplexer simplifies clock selection
- Output Enable pin tri-states outputs
- Input/Output clock frequency up to 200 MHz
- Low power CMOS technology
- 3.3V tolerant inputs
- Extended temperature (-40°C to +105°C)

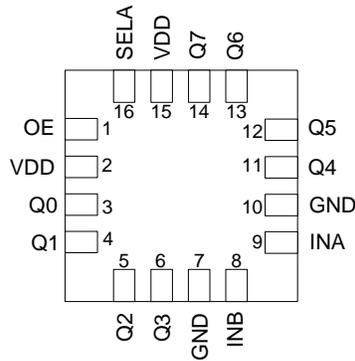
### Block Diagram



## Pin Assignments



16 Pin TSSOP



16-pin VFQFN

## Input Source Select

SELA	Input
0	INB
1	INA

## Pin Descriptions

Pin Number	Pin Name	Pin Type	Pin Description
1	OE	Input	Output Enable. Tri-states outputs when low. Internal pull-up resistor.
2	VDD	Power	Connect to +1.8V, +2.5V or +3.3V. Must be the same as pin 15.
3	Q0	Output	Clock Output 0.
4	Q1	Output	Clock Output 1.
5	Q2	Output	Clock Output 2.
6	Q3	Output	Clock Output 3.
7	GND	Power	Connect to ground.
8	INB	Input	Clock Input B. 3.3V tolerant.
9	INA	Input	Clock Input A. 3.3V tolerant.
10	GND	Power	Connect to ground.
11	Q4	Output	Clock Output 4.
12	Q5	Output	Clock Output 5.
13	Q6	Output	Clock Output 6.
14	Q7	Output	Clock Output 7.
15	VDD	Power	Connect to +1.8V, +2.5V or +3.3V. Must be the same as pin 2.
16	SELA	Input	Selects either INA or INB. Internal pull-up resistor.

## External Components

A minimum number of external components are required for proper operation. Decoupling capacitors of 0.01  $\mu$ F should be connected between VDD on pin 2 and GND on pin 7, and between VDD on pin 15 and GND on pin 10, as close to the device as possible. A 33  $\Omega$  series terminating resistor should be used on each clock output if the trace is longer than 1 inch.

To achieve the low output skews that the 552-02S is capable of, careful attention must be paid to board layout. Essentially, all 8 outputs must have identical terminations, identical loads, and identical trace geometries. If they do not, the output skew will be degraded. For example, using a 30 $\Omega$  series termination on one output (with 33 $\Omega$  on the others) will cause at least 15ps of skew.

## Absolute Maximum Ratings

Stresses above the ratings listed below can cause permanent damage to the 552-02S. These ratings, which are standard values for IDT commercially rated parts, are stress ratings only. Functional operation of the device at these or any other conditions above those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods can affect product reliability. Electrical parameters are guaranteed only over the recommended operating temperature range.

Item	Rating
Supply Voltage, VDD	3.465V
All Inputs and Outputs	-0.5 V to 3.465V
Ambient Operating Temperature, Extended	-40 to +105°C
Storage Temperature	-65 to +150 °C
Junction Temperature	175 °C
Soldering Temperature	260 °C

## Recommended Operation Conditions

Parameter	Min.	Typ.	Max.	Units
Ambient Operating Temperature, Extended	-40	–	+105	°C
Power Supply Voltage (measured in respect to GND)	+1.71		+3.465	V

## DC Electrical Characteristics

**VDD=1.8 V ±5%**, Ambient temperature -40°C to +105°C, unless stated otherwise

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Operating Voltage	VDD		1.71		1.89	V
Input High Voltage, INA, INB	V <sub>IH</sub>	Note 1	0.7xVDD		1.89	V
Input Low Voltage, INA, INB	V <sub>IL</sub>	Note 1			0.3xVDD	V
Input High Voltage, OE, SELA	V <sub>IH</sub>		0.7xVDD		VDD	V
Input Low Voltage, OE, SELA	V <sub>IL</sub>				0.3xVDD	V
Output High Voltage	V <sub>OH</sub>	I <sub>OH</sub> = -10 mA	1.3			V
Output Low Voltage	V <sub>OL</sub>	I <sub>OL</sub> = 10 mA			0.35	V
Operating Supply Current	IDD	No load, 135 MHz		32		mA

**VDD=2.5 V ±5%**, Ambient temperature -40°C to +105°C, unless stated otherwise

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Operating Voltage	VDD		2.375		2.625	V
Input High Voltage, INA, INB	V <sub>IH</sub>	Note 1	0.7xVDD		2.625	V
Input Low Voltage, INA, INB	V <sub>IL</sub>	Note 1			0.3xVDD	V
Input High Voltage, OE, SELA	V <sub>IH</sub>		0.7xVDD		VDD	V
Input Low Voltage, OE, SELA	V <sub>IL</sub>				0.3xVDD	V
Output High Voltage	V <sub>OH</sub>	I <sub>OH</sub> = -16 mA	1.8			V
Output Low Voltage	V <sub>OL</sub>	I <sub>OL</sub> = 16 mA			0.5	V
Operating Supply Current	IDD	No load, 135 MHz		43		mA

**VDD=3.3 V ±5%**, Ambient temperature -40°C to +105°C, unless stated otherwise

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Operating Voltage	VDD		3.135		3.465	V
Input High Voltage, INA, INB	V <sub>IH</sub>	Note 1	0.7xVDD		3.465	V
Input Low Voltage, INA, INB	V <sub>IL</sub>	Note 1			0.3xVDD	V
Input High Voltage, OE, SELA	V <sub>IH</sub>		0.7xVDD		VDD	V
Input Low Voltage, OE, SELA	V <sub>IL</sub>				0.3xVDD	V
Output High Voltage	V <sub>OH</sub>	I <sub>OH</sub> = -25 mA	2.2			V
Output Low Voltage	V <sub>OL</sub>	I <sub>OH</sub> = 25 mA			0.7	V
Operating Supply Current	IDD	No load, 135 MHz		55		mA

## AC Electrical Characteristics

**VDD = 1.8V ±5%**, Ambient Temperature -40°C to +105°C, unless stated otherwise

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Input Frequency			0		200	MHz
Output Rise Time	t <sub>OR</sub>	0.36 to 1.44 V, C <sub>L</sub> =5 pF		1	1.5	ns
Output Fall Time	t <sub>OF</sub>	1.44 to 0.36 V, C <sub>L</sub> =5 pF		1	1.5	ns
Start-up Time	t <sub>START-UP</sub>	Part start-up time for valid outputs after VDD ramp-up			2	ms
Propagation Delay	Note 1	135MHz	2	2.5	3	ns
Buffer Additive Phase Jitter, RMS		125MHz, Integration Range: 12KHz-20MHz		50	65	ps
Output to output skew	Note 2	Rising edges at VDD/2		0	65	ps
Input A to Input B skew	Note 3			0	50	ps

**VDD = 2.5V ±5%**, Ambient Temperature -40°C to +105°C, unless stated otherwise

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Input Frequency			0		200	MHz
Output Rise Time	t <sub>OR</sub>	0.5 to 2.0 V, C <sub>L</sub> =5 pF		0.6	1.0	ns
Output Fall Time	t <sub>OF</sub>	2.0 to 0.5 V, C <sub>L</sub> =5 pF		0.6	1.0	ns
Start-up Time	t <sub>START-UP</sub>	Part start-up time for valid outputs after VDD ramp-up			2	ms
Propagation Delay	Note 1	135MHz	2	2.7	3.5	ns
Buffer Additive Phase Jitter, RMS		125MHz, Integration Range: 12KHz-20MHz		50	65	ps
Output to output skew	Note 2	Rising edges at VDD/2		0	65	ps
Input A to Input B skew	Note 3			0	50	ps

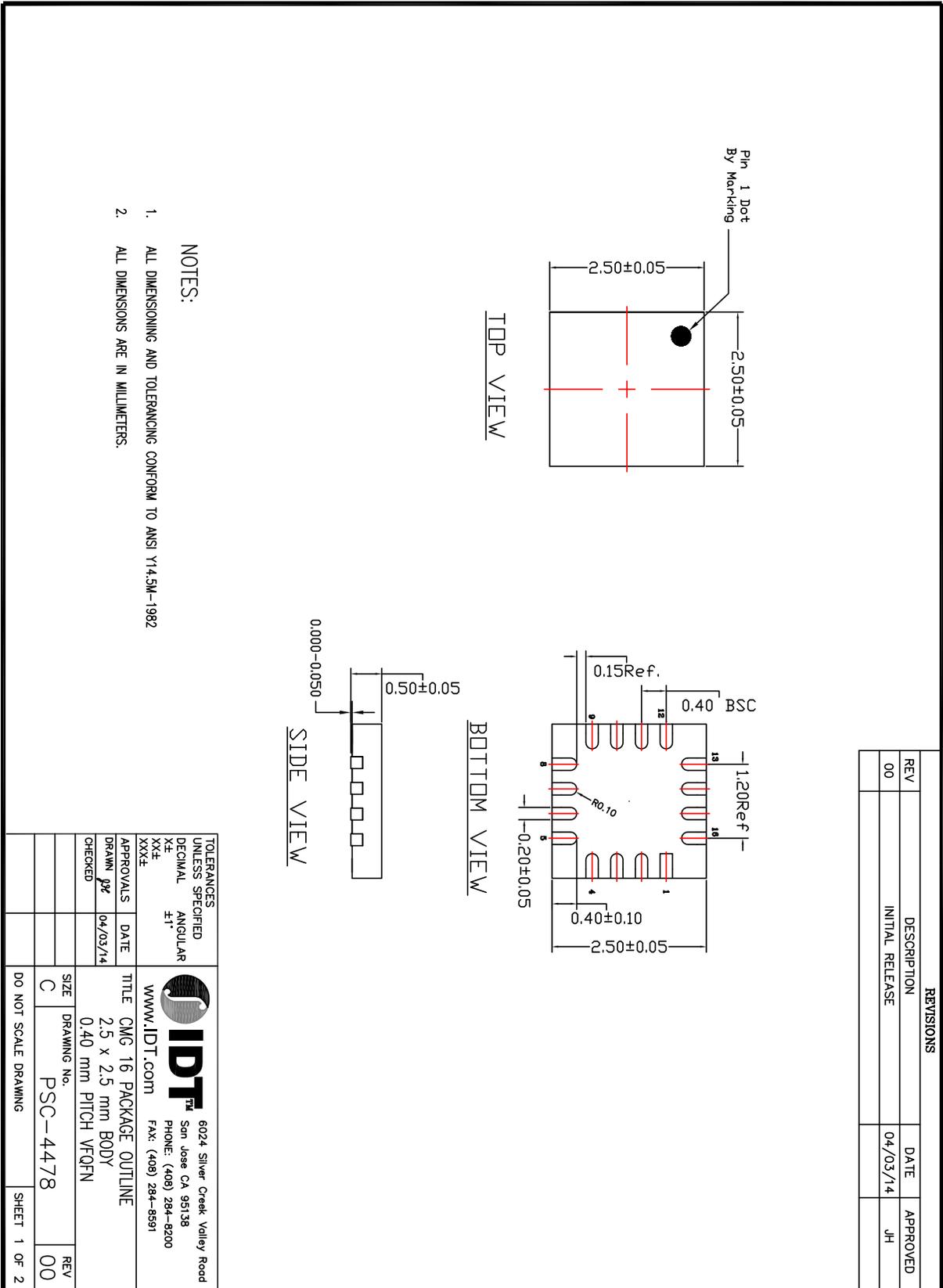
**VDD = 3.3V ±5%**, Ambient Temperature -40°C to +105°C, unless stated otherwise

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Input Frequency			0		200	MHz
Output Rise Time	t <sub>OR</sub>	0.66 to 2.64 V, C <sub>L</sub> =5 pF		0.6	1.0	ns
Output Fall Time	t <sub>OF</sub>	2.64 to 0.66 V, C <sub>L</sub> =5 pF		0.6	1.0	ns
Start-up Time	t <sub>START-UP</sub>	Part start-up time for valid outputs after VDD ramp-up			2	ms
Propagation Delay	Note 1	135MHz	2	2.5	3	ns
Buffer Additive Phase Jitter, RMS		125MHz, Integration Range: 12KHz-20MHz		50	65	ps
Output to output skew	Note 2	Rising edges at VDD/2		0	65	ps
Input A to Input B skew	Note 3			0	50	ps

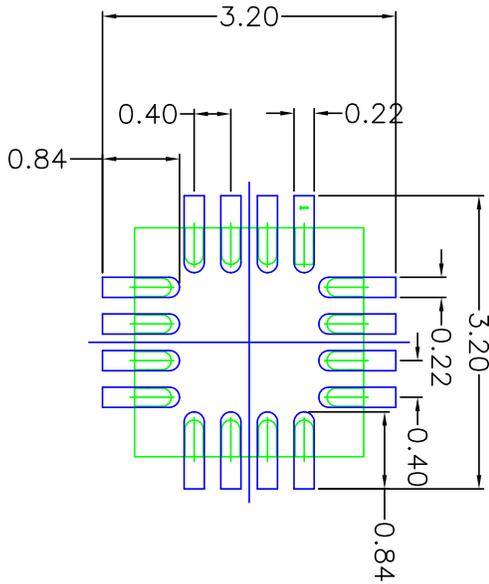
Notes:

1. With rail-to-rail input clock.
2. Between any two outputs with equal loading.
3. Propagation delay matching through the part.
4. Duty cycle on outputs will match incoming clock duty cycle. Consult IDT for tight duty cycle clock generators.

# Package Outline and Package Dimensions (16-pin VFQFN)



Package Outline and Package Dimensions, cont. (16-pin VFQFN)



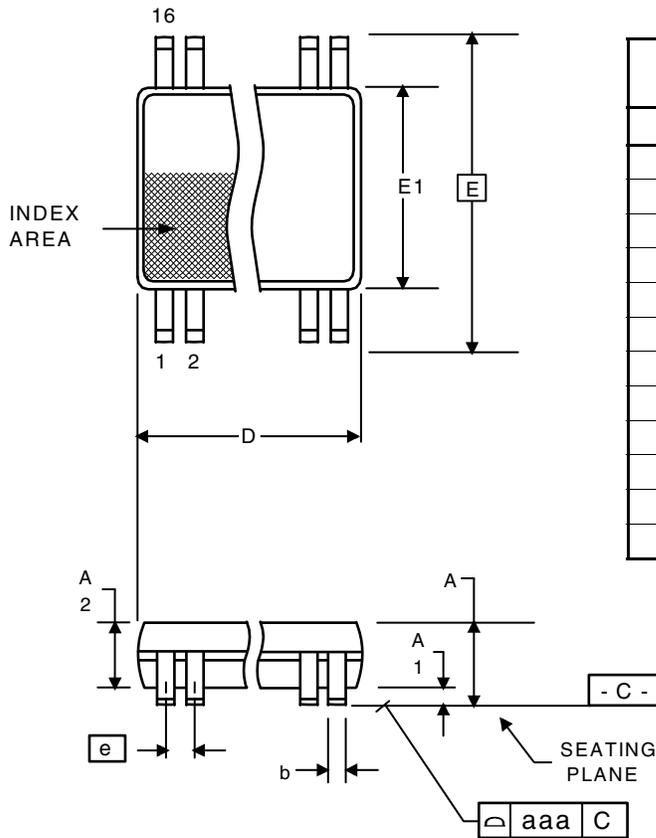
RECOMMENDED LAND PATTERN DIMENSION

- NOTES:
1. ALL DIMENSION ARE IN mm. ANGLES IN DEGREES.
  2. TOP DOWN VIEW. AS VIEWED ON PCB.
  3. COMPONENT OUTLINE SHOW FOR REFERENCE IN GREEN.
  4. LAND PATTERN IN BLUE. NSMD PATTERN ASSUMED.
  5. LAND PATTERN RECOMMENDATION PER IPC-7351B GENERIC REQUIREMENT FOR SURFACE MOUNT DESIGN AND LAND PATTERN.

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
00	INITIAL RELEASE	04/03/14	JH

TOLERANCES UNLESS SPECIFIED DECIMAL      ANGULAR ±.1              ±.1° XXX±            XXX±		 6024 Silver Creek Valley Road San Jose CA 95138 PHONE: (408) 284-8200 FAX: (408) 284-8591 www.IDT.com
APPROVALS	DATE	
DRAWN <i>gpc</i>	04/03/14	
CHECKED		
TITLE      CMG 16 PACKAGE OUTLINE 2.5 x 2.5 mm BODY 0.40 mm PITCH VFQFN		SIZE      C DRAWING No.      PSC-4478 DO NOT SCALE DRAWING
		REV      00 SHEET 2 OF 2

## Package Outline and Package Dimensions (16-pin TSSOP)



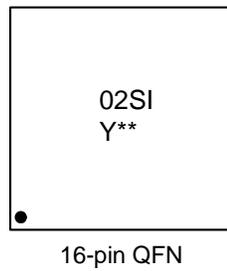
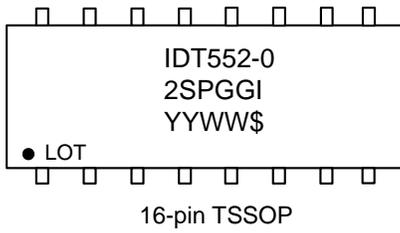
Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A	--	1.20	--	0.047
A1	0.05	0.15	0.002	0.006
A2	0.80	1.05	0.032	0.041
b	0.19	0.30	0.007	0.012
C	0.09	0.20	0.0035	0.008
D	4.90	5.1	0.193	0.201
E	6.40 BASIC		0.252 BASIC	
E1	4.30	4.50	0.169	0.177
e	0.65 Basic		0.0256 Basic	
L	0.45	0.75	0.018	0.030
a	0°	8°	0°	8°
aaa	--	0.10	--	0.004

## Ordering Information

Part / Order Number	Marking	Shipping Packaging	Package	Temperature
552-02SPGGI	TBD	Tubes	16-pin TSSOP	-40°C to +105°C
552-02SPGGI8		Tape and Reel	16-pin TSSOP	-40°C to +105°C
552-02SCMGI		Tubes	16-pin VFQFN	-40°C to +105°C
552-02SCMGI8		Tape and Reel	16-pin VFQFN	-40°C to +105°C

“G” after the two-letter package code denotes Pb-Free configuration, RoHS compliant.

## Marking Diagrams



### Notes:

1. “\*\*” is the lot sequence.
2. “YYWW” or “Y” is the last digit(s) of the year and week that the part was assembled.
3. “\$” denotes the mark code.
4. “LOT” denotes lot number.
5. “G” after the two-letter package code denotes RoHS compliant package.
6. “I” denotes extended temperature range device.
7. Bottom marking: country of origin (TSSOP only).

## Revision History

Rev.	Date	Originator	Description of Change
A	07/11/16	H.G.	Release to final.



**Corporate Headquarters**  
6024 Silver Creek Valley Road  
San Jose, CA 95138 USA  
[www.IDT.com](http://www.IDT.com)

**Sales**  
1-800-345-7015 or 408-284-8200  
Fax: 408-284-2775  
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