Description

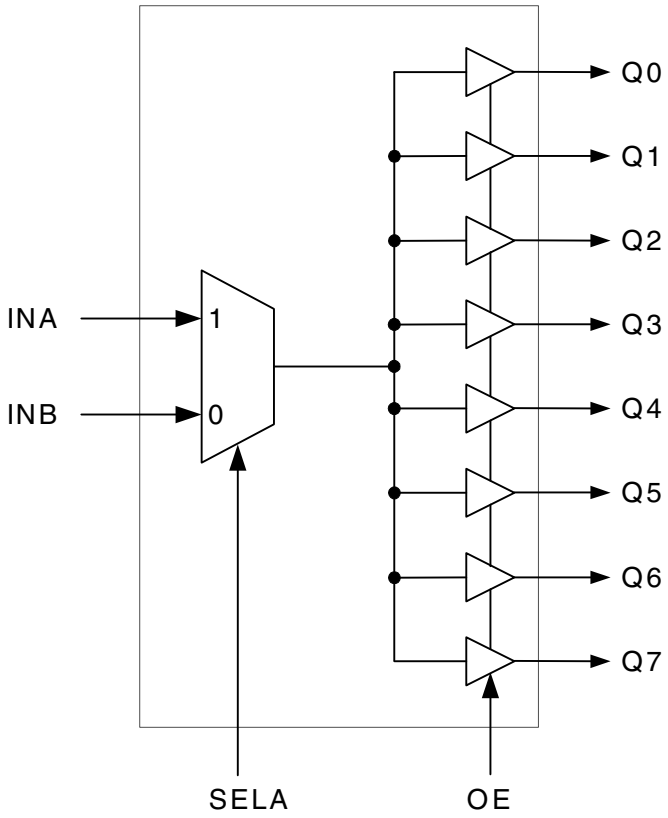
The 552-02S is a low skew, single-input to eight- output clock buffer. The device offers a dual input with pin select for switching between two clock sources. It has best in class Additive Phase Jitter of sub 50fsec

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.

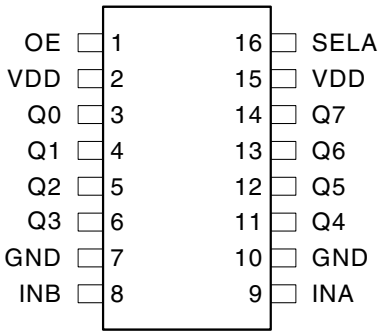
Features

- 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)

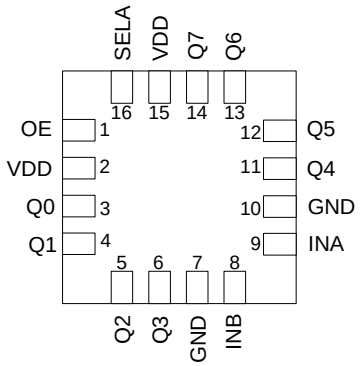
Block Diagram



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 µF 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 Ω 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 30Ω series termination on one output (with 33Ω 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_{IH}	Note 1	0.7xVDD		1.89	V
Input Low Voltage, INA, INB	V_{IL}	Note 1			0.3xVDD	V
Input High Voltage, OE, SELA	V_{IH}		0.7xVDD		VDD	V
Input Low Voltage, OE, SELA	V_{IL}				0.3xVDD	V
Output High Voltage	V_{OH}	I_{OH} = -10 mA	1.3			V
Output Low Voltage	V_{OL}	I_{OL} = 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_{IH}	Note 1	0.7xVDD		2.625	V
Input Low Voltage, INA, INB	V_{IL}	Note 1			0.3xVDD	V
Input High Voltage, OE, SELA	V_{IH}		0.7xVDD		VDD	V
Input Low Voltage, OE, SELA	V_{IL}				0.3xVDD	V
Output High Voltage	V_{OH}	I_{OH} = -16 mA	1.8			V
Output Low Voltage	V_{OL}	I_{OL} = 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_{IH}	Note 1	0.7xVDD		3.465	V
Input Low Voltage, INA, INB	V_{IL}	Note 1			0.3xVDD	V
Input High Voltage, OE, SELA	V_{IH}		0.7xVDD		VDD	V
Input Low Voltage, OE, SELA	V_{IL}				0.3xVDD	V
Output High Voltage	V_{OH}	I_{OH} = -25 mA	2.2			V
Output Low Voltage	V_{OL}	I_{OH} = 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_{OR}	0.36 to 1.44 V, C_L=5 pF		1	1.5	ns
Output Fall Time	t_{OF}	1.44 to 0.36 V, C_L=5 pF		1	1.5	ns
Start-up Time	$t_{START-UP}$	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_{OR}	0.5 to 2.0 V, C_L=5 pF		0.6	1.0	ns
Output Fall Time	t_{OF}	2.0 to 0.5 V, C_L=5 pF		0.6	1.0	ns
Start-up Time	$t_{START-UP}$	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

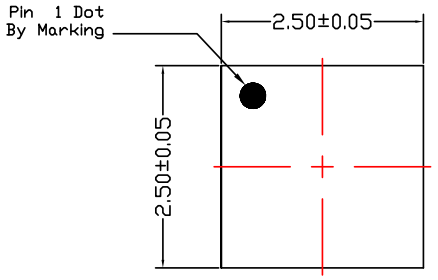
VDD = 3.3V ±5%, Ambient Temperature -40°C to +105°C, unless stated otherwise

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Input Frequency			0		200	MHz
Output Rise Time	t_{OR}	0.66 to 2.64 V, C_L=5 pF		0.6	1.0	ns
Output Fall Time	t_{OF}	2.64 to 0.66 V, C_L=5 pF		0.6	1.0	ns
Start-up Time	$t_{START-UP}$	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

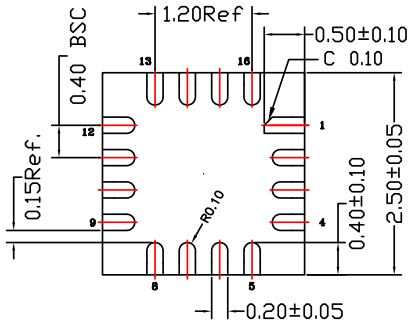
Notes:
1. With rail-to-rail input clock.
2. Between any two outputs with equal loading.
3. Propagation delay matching through the part.
4. Duty cycle on outputs will match incoming clock duty cycle. Consult IDT for tight duty cycle clock generators.

Package Outline and Dimensions (16-pin VFQFN)

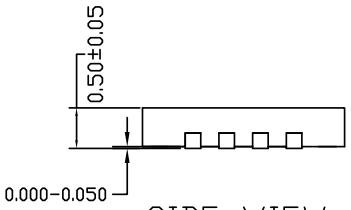
REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
00	INITIAL RELEASE	04/03/14	JH
01	ADD PIN1 CHAMFER	12/11/14	JH



TOP VIEW



BOTTOM VIEW



SIDE VIEW

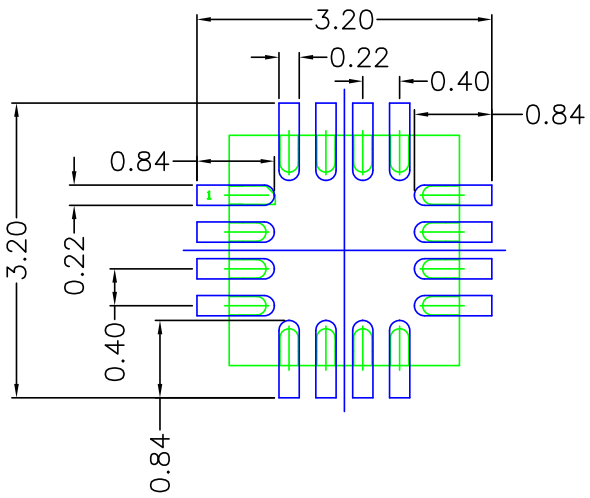
NOTES:

1. ALL DIMENSIONING AND TOLERANCING CONFORM TO ANSI Y14.5M-1982
2. ALL DIMENSIONS ARE IN MILLIMETERS.

TOLERANCES UNLESS SPECIFIED DECIMAL ANGULAR X± ±1° XX± XXX±	IDT™ www.IDT.com 6024 Silver Creek Valley Road San Jose CA 95138 PHONE: (408) 284-8200 FAX: (408) 284-8591
APPROVALS DATE DRAWN 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 · REV 01
	DO NOT SCALE DRAWING · SHEET 1 OF 2

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

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
00	INITIAL RELEASE	04/03/14	JH
01	ADD PIN1 CHAMFER	12/11/14	JH



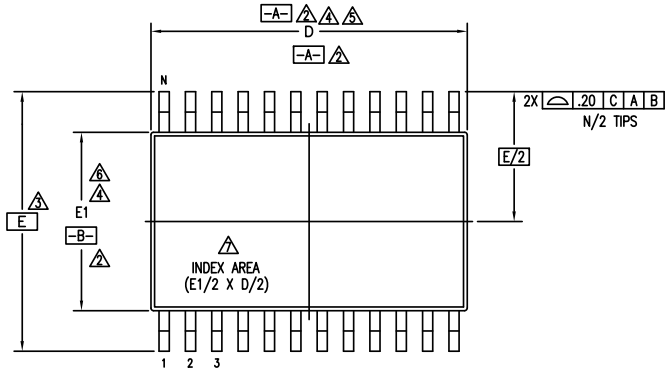
RECOMMENDED LAND PATTERN DIMENSION

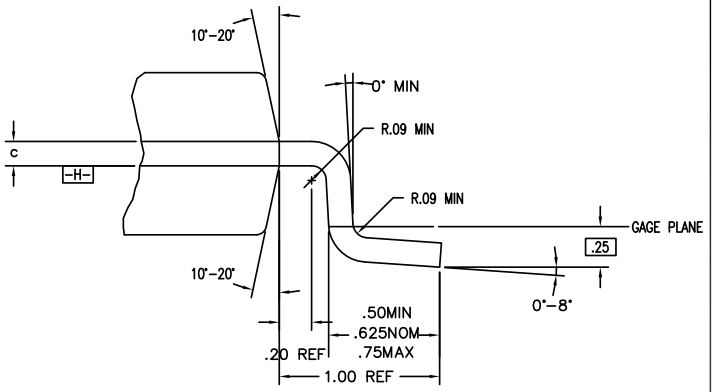
NOTES:
1. ALL DIMENSIONS ARE IN MM. ANGLES IN DEGREES.
2. TOP DOWN VIEW AS VIEWED ON PCB.
3. COMPONENT OUTLINE IS SHOWN FOR REFERENCE IN GREEN.
4. LAND PATTERN IN BLUE. NSMD PATTERN ASSUMED.
5. LAND PATTERN RECOMMENDATION PER IPC-7351B GENERIC REQUIREMENT FOR SURFACE MOUNT DESIGN AND LAND PATTERN.

TOLERANCES UNLESS SPECIFIED DECIMAL X± XX± XXX± ANGULAR ±1°		IDT™ www.IDT.com	6024 Silver Creek Valley Road San Jose CA 95138 PHONE: (408) 284-8200 FAX: (408) 284-8591
APPROVALS	DATE	TITLE	CMG 16 PACKAGE OUTLINE 2.5 x 2.5 mm BODY 0.40 mm PITCH VFQFN
DRAWN JM	04/03/14		
CHECKED			
		SIZE C	DRAWING No. PSC-4478 REV 01
		DO NOT SCALE DRAWING	SHEET 2 OF 2

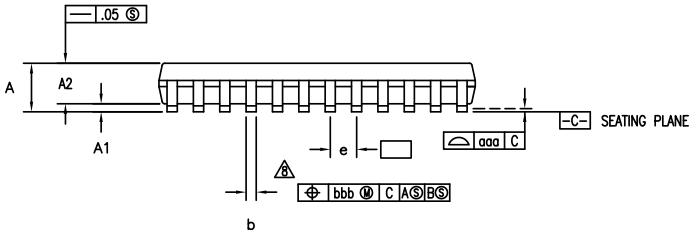
Package Outline and Dimensions (16-pin TSSOP)

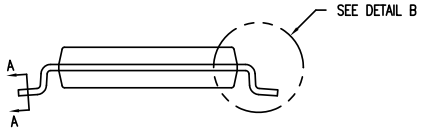
DATE CREATED	REVISIONS		
	REV	DESCRIPTION	AUTHOR
08/25/98	02	ADD 14 & 16 LD	T. VU
07/10/99	03	ADD 8 LD	T. VU
5/23/01	04	ADDED TOPMARK TO TITLE	
10/14/04	05	ADD "GREEN" PGG NOMENCLATURE	TU VU
3/8/13	06	ADDED PACKAGE CODE	RAC
9/3/14	07	ADD TOLERANCE FOR A, A1, E AND b	CK LEE
3/10/17	08	ADD OPTION T1	R.TANH
NOTE: REFER TO DCP FOR OFFICIAL RELEASE DATE			

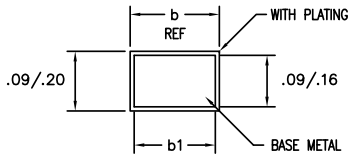




DETAIL B







SECTION A-A

TOLERANCES UNLESS SPECIFIED DECIMAL ANGULAR XX± ± XXX± XXXX±	IDT™ www.IDT.com	2975 Stender Way Santa Clara, CA 95054 PHONE: (408) 727-6116 FAX: (408) 492-8674
	TITLE: PG/PGG PACKAGE OUTLINE (PG OR PA TOPMARK CODE) 4.4 mm BODY WIDTH TSSOP .65 mm PITCH	
	SIZE: C / DRAWING No.: PSC-4056 / REV: 08	
	DO NOT SCALE DRAWING	SHEET 1 OF 3

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

DATE CREATED	REVISIONS		
	REV	DESCRIPTION	AUTHOR
08/25/98	02	ADD 14 & 16 LD	T. VU
07/10/99	03	ADD 8 LD	T. VU
5/23/01	04	ADDED TOPMARK TO TITLE	
10/14/04	05	ADD "GREEN" PGG NOMENCLATURE	TU VU
3/8/13	06	ADDED PACKAGE CODE	RAC
9/3/14	07	ADD TOLERANCE FOR A, A1, E AND b	CK LEE
3/10/17	08	ADD OPTION T1	R.TANH
NOTE: REFER TO DCP FOR OFFICIAL RELEASE DATE			

	PG/PGG8				PG/PGG14				PG/PGG16				PG/PGG20				PG/PGG24				PG/PGG28			
SYMBOL	JEDEC VARIATION AA			NOTE	JEDEC VARIATION AB–1			NOTE	JEDEC VARIATION AB			NOTE	JEDEC VARIATION AC			NOTE	JEDEC VARIATION AD			NOTE	JEDEC VARIATION AE			NOTE
	MIN	NOM	MAX		MIN	NOM	MAX		MIN	NOM	MAX		MIN	NOM	MAX		MIN	NOM	MAX		MIN	NOM	MAX	
A	.85	1.10	1.20		.85	1.10	1.20		.85	1.10	1.20		.85	1.10	1.20		.85	1.10	1.20		.85	1.10	1.20	
A1	.05	.10	.15		.05	.10	.15		.05	.10	.15		.05	.10	.15		.05	.10	.15		.05	.10	.15	
A2	.80	1.00	1.05		.80	1.00	1.05		.80	1.00	1.05		.80	1.00	1.05		.80	1.00	1.05		.80	1.00	1.05	
D	2.90	3.00	3.10	4,5	4.90	5.00	5.10	4,5	4.90	5.00	5.10	4,5	6.40	6.50	6.60	4,5	7.70	7.80	7.90	4,5	9.60	9.70	9.80	4,5
E	6.20	6.40	6.60	3	6.20	6.40	6.60	3	6.20	6.40	6.60	3	6.20	6.40	6.60	3	6.20	6.40	6.60	3	6.20	6.40	6.60	3
E1	4.30	4.40	4.50	4,6	4.30	4.40	4.50	4,6	4.30	4.40	4.50	4,6	4.30	4.40	4.50	4,6	4.30	4.40	4.50	4,6	4.30	4.40	4.50	4,6
e	.65 BSC				.65 BSC				.65 BSC				.65 BSC				.65 BSC				.65 BSC			
b	.19	.25	.30		.19	.25	.30		.19	.25	.30		.19	.25	.30		.19	.25	.30		.19	.25	.30	
b1	.19	.22	.25		.19	.22	.25		.19	.22	.25		.19	.22	.25		.19	.22	.25		.19	.22	.25	
aaa	–	–	.10		–	–	.10		–	–	.10		–	–	.10		–	–	.10		–	–	.10	
bbb	–	–	.10		–	–	.10		–	–	.10		–	–	.10		–	–	.10		–	–	.10	
N	8				14				16				20				24				28			

NOTES:

1. ALL DIMENSIONING AND TOLERANCING CONFORM TO ASME Y14.5M–1994
2. DATUMS –A– AND –B– TO BE DETERMINED AT DATUM PLANE –H–
3. DIMENSION E TO BE DETERMINED AT SEATING PLANE –C–
4. DIMENSIONS D AND E1 ARE TO BE DETERMINED AT DATUM PLANE –H–
5. DIMENSION D DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED .15 mm PER SIDE
6. DIMENSION E1 DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSIONS. INTERLEAD FLASH OR PROTRUSIONS SHALL NOT EXCEED .25 mm PER SIDE
7. DETAIL OF PIN 1 IDENTIFIER IS OPTIONAL BUT MUST BE LOCATED WITHIN THE ZONE INDICATED
8. LEAD WIDTH DIMENSION DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION IS .08 mm IN EXCESS OF THE LEAD WIDTH DIMENSION AT MAXIMUM MATERIAL CONDITION. DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OR THE FOOT
9. THESE DIMENSIONS APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN .10 AND .25 mm FROM THE LEAD TIP
10. ALL DIMENSIONS ARE IN MILLIMETERS
11. THIS OUTLINE CONFORMS TO JEDEC PUBLICATION 95 REGISTRATION MO–153, VARIATION AA, AB–1, AB, AC, AD & AE

	OPTION T1			
	PGG14T1			
SYMBOL	JEDEC VARIATION AB–1			NOTE
	MIN	NOM	MAX	
A	.90	1.10	1.20	
A1	.05	.10	.15	
A2	.80	1.00	1.05	
D	4.90	5.00	5.10	4,5
E	6.20	6.40	6.60	3
E1	4.30	4.40	4.50	4,6
e	.65 BSC			
b	.19	.25	.30	
b1	.19	.22	.25	
c	.09	–	.20	
aaa	–	–	.10	
bbb	–	–	.10	
N	14			

TOLERANCES UNLESS SPECIFIED
DECIMAL ANGULAR
XX± ±
XXX±
XXXX±

IDT™ www.IDT.com
2975 Stender Way
Santa Clara, CA 95054
PHONE: (408) 727–6116
FAX: (408) 492–8674

TITLE PG/PGG PACKAGE OUTLINE (PG OR PA TOPMARK CODE) 4.4 mm BODY WIDTH TSSOP .65 mm PITCH

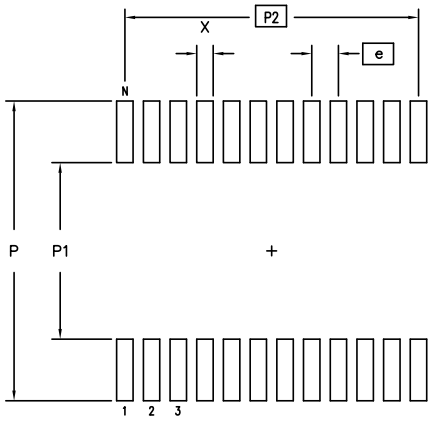
SIZE	DRAWING No.	REV
C	PSC–4056	08

DO NOT SCALE DRAWING | SHEET 2 OF 3

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

DATE CREATED	REVISIONS		
	REV	DESCRIPTION	AUTHOR
08/25/98	02	ADD 14 & 16 LD	T. VU
07/10/99	03	ADD 8 LD	T. VU
5/23/01	04	ADDED TOPMARK TO TITLE	
10/14/04	05	ADD "GREEN" PGG NOMENCLATURE	TU VU
3/8/13	06	ADDED PACKAGE CODE	RAC
9/3/14	07	ADD TOLERANCE FOR A, A1, E AND b	CK LEE
3/10/17	08	ADD OPTION T1	R.TANH
NOTE: REFER TO DCP FOR OFFICIAL RELEASE DATE			

LAND PATTERN DIMENSIONS



	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
P	7.20	7.40	7.20	7.40	7.20	7.40	7.20	7.40	7.20	7.40	7.20	7.40
P1	4.20	4.40	4.20	4.40	4.20	4.40	4.20	4.40	4.20	4.40	4.20	4.40
P2	1.95 BSC		3.90 BSC		4.55 BSC		5.85 BSC		7.15 BSC		8.45 BSC	
X	.30	.50	.30	.50	.30	.50	.30	.50	.30	.50	.30	.50
e	.65 BSC		.65 BSC		.65 BSC		.65 BSC		.65 BSC		.65 BSC	
N	8		14		16		20		24		28	

TOLERANCES UNLESS SPECIFIED
DECIMAL ANGULAR
XX± ±
XXX±
XXXX±

IDT™
www.IDT.com
2975 Stender Way
Santa Clara, CA 95054
PHONE: (408) 727-6116
FAX: (408) 492-8674

TITLE PG/PGG PACKAGE OUTLINE
(PG OR PA TOPMARK CODE)
4.4 mm BODY WIDTH TSSOP .65 mm PITCH

SIZE	DRAWING No.	REV
C	PSC-4056	08

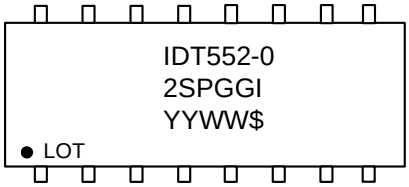
DO NOT SCALE DRAWING | SHEET 3 OF 3

Ordering Information

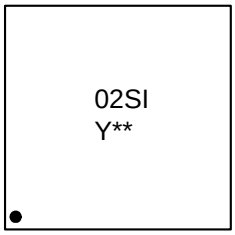
Part / Order Number	Marking	Shipping Packaging	Package	Temperature
552-02SPGGI	TBD	Tubes	16-pin TSSOP	-40°C to +105°C
552-02SPGGI8		Tape and Reel	16-pin TSSOP	-40°C to +105°C
552-02SCMGI		Tubes	16-pin VFQFN	-40°C to +105°C
552-02SCMGI8		Tape and Reel	16-pin VFQFN	-40°C to +105°C

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

Marking Diagrams



16-pin TSSOP



16-pin QFN

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
B	04/18/17	C.P.	1. Replaced package outline drawings with latest CMG16 and PGG16 versions. 2. Updated legal disclaimer.
A	07/11/16	H.G.	Release to final.