

256 Kilobit (32K x 8) SuperFlash MTP

SST27SF256



Preliminary Specifications

FEATURES:

- **5.0V Read Operation (4.5V to 5.5V)**
- **Superior Reliability**
 - Endurance: At least 1000 Cycles
 - Greater than 100 years Data Retention
- **Low Power Consumption**
 - Active Current: 20 mA (typical)
 - Standby Current: 10 μ A (typical)
- **Fast Access Time**
 - 70 and 90 ns
- **Fast Programming Operation**
 - 20 μ s per byte
 - 0.7 second for the entire chip
- **Features Electrical Erase**
 - Does Not Require UV Source
 - Chip Erase Time: 100 ms
- **TTL I/O Compatibility**
- **JEDEC Standard Byte-wide EPROM Pinouts**
- **12V Power Supply for Programming/Erase**
- **Packages Available**
 - 28-Pin PDIP
 - 32-Pin PLCC
 - 32-Pin TSOP (8mm x 14mm)

PRODUCT DESCRIPTION

The SST27SF256 is a 32K x 8 CMOS, many-time programmable (MTP) low cost flash, manufactured with SST's proprietary, high performance SuperFlash technology. The split-gate cell design and thick oxide tunneling injector attain better reliability and manufacturability compared with alternate approaches. The SST27SF256 can be electrically erased and programmed at least 1000 times using an external programmer with a 12 volt supply. The SST27SF256 has to be erased prior to programming. The SST27SF256 conforms to JEDEC standard pinouts for byte-wide memories.

Featuring high performance byte programming, the SST27SF256 provides a byte program time of 20 μ s. The entire memory can be programmed byte-by-byte in 0.7 seconds. Designed, manufactured, and tested for a wide spectrum of applications, the SST27SF256 is offered with an endurance of at least 1000 cycles. Data retention is rated at greater than 100 years.

The SST27SF256 is suited for applications that require infrequent writes and low power nonvolatile storage. The SST27SF256 will improve flexibility, efficiency, and performance while matching the low cost in nonvolatile applications that currently use UV-EPROMs, OTPs, and mask ROMs.

To meet surface mount and conventional through hole requirements, the SST27SF256 is offered in 28-pin PDIP, 32-pin PLCC and 32-pin TSOP packages. See Figures 1 and 2 for pinouts.

Device Operation

The SST27SF256 is a low cost flash solution that can be used to replace existing UV-EPROM, OTP, and mask ROM sockets. This device is functionally (read and program) and pin compatible with industry standard EPROM products. In addition to EPROM functionality, the device also supports electrical erase operation via an external programmer. The SST27SF256 does not require a UV source to erase, and therefore the packages do not have a window.

Read

The Read operation of the SST27SF256 is controlled by CE# and OE#. Both CE# and OE# have to be low for the system to obtain data from the outputs. Once the address is stable, the address access time is equal to the delay from CE# to output (T_{CE}). Data is available at the output after a delay of T_{OE} from the falling edge of OE#, assuming that CE# pin has been low and the addresses have been stable for at least $T_{CE} - T_{OE}$. When the CE# pin is high, the chip is deselected and a typical standby current of 10 μ A is consumed. OE# is the output control and is used to gate data from the output pins. The data bus is in high impedance state when either CE# or OE# is high.

Programming operation

The SST27SF256 is programmed by using an external programmer. The programming mode is activated by asserting 12V ($\pm 5\%$) on V_{PP} pin, $V_{CC} = 5V \pm 5\%$, V_{IL} on CE# pin, and V_{IH} on OE# pin. The device is programmed byte by byte with the desired data at the desired address using a single pulse (CE# pin low) of 20 μ s. Using the



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MTP programming algorithm, the byte programming process continues byte by byte until the entire chip (32 KByte) has been programmed.

Chip Erase Operation

The only way to change a data from a “0” to “1” is by electrical erase that changes every bit in the device to “1”. Unlike traditional EPROMs, which use UV light to do the chip erase, the SST27SF256 uses an electrical chip erase operation. This saves a significant amount of time (about 30 minutes for each erase operation). The entire chip can be erased in a single pulse of 100 ms (CE# pin low). In order to activate the erase mode, the 12V ($\pm 5\%$) is applied to V_{PP} and A₉ pins, V_{CC} = 5V $\pm 5\%$, V_{IL} on CE# pin, and V_{IH} on OE# pin. All other address and data pins are “don’t care”. The falling edge of CE# will start the Chip Erase operation. Once the chip has been erased, all bytes must be verified for FF. Refer to figure 8 for the flow chart.

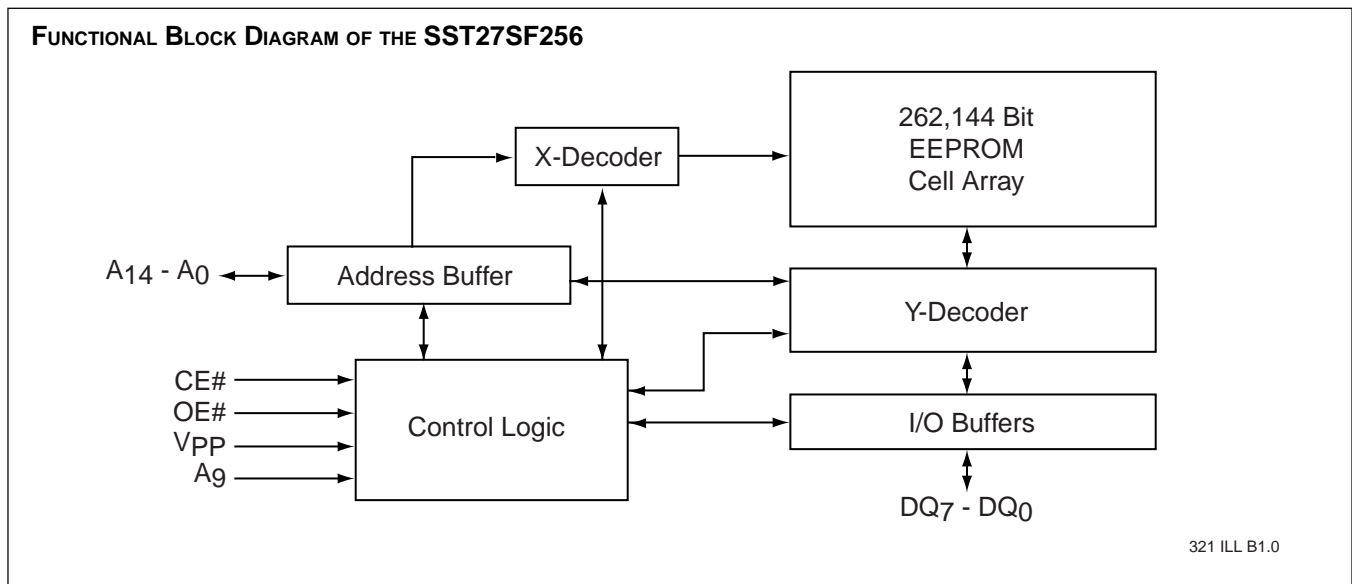
Product Identification Mode

The product identification mode identifies the device as the SST27SF256 and manufacturer as SST. This mode may be accessed by the hardware method. To activate this mode, the programming equipment must force V_H (12V $\pm 5\%$) on address A₉ with V_{PP} pin at V_{CC} (5V $\pm 10\%$) or V_{SS}. Two identifier bytes may then be sequenced from the device outputs by toggling address line A₀. For details, see Table 3 for hardware operation.

TABLE 1: PRODUCT IDENTIFICATION TABLE

	Byte	Data
Manufacturer's Code	0000 H	BF H
Device Code	0001 H	A3 H

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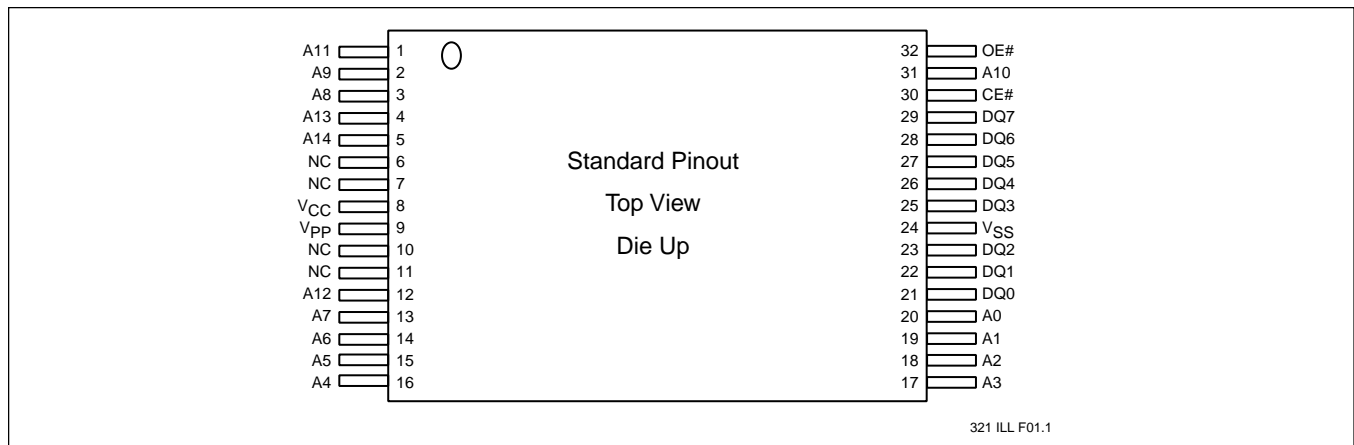


FIGURE 1: PIN ASSIGNMENTS FOR 32-PIN TSOP PACKAGES

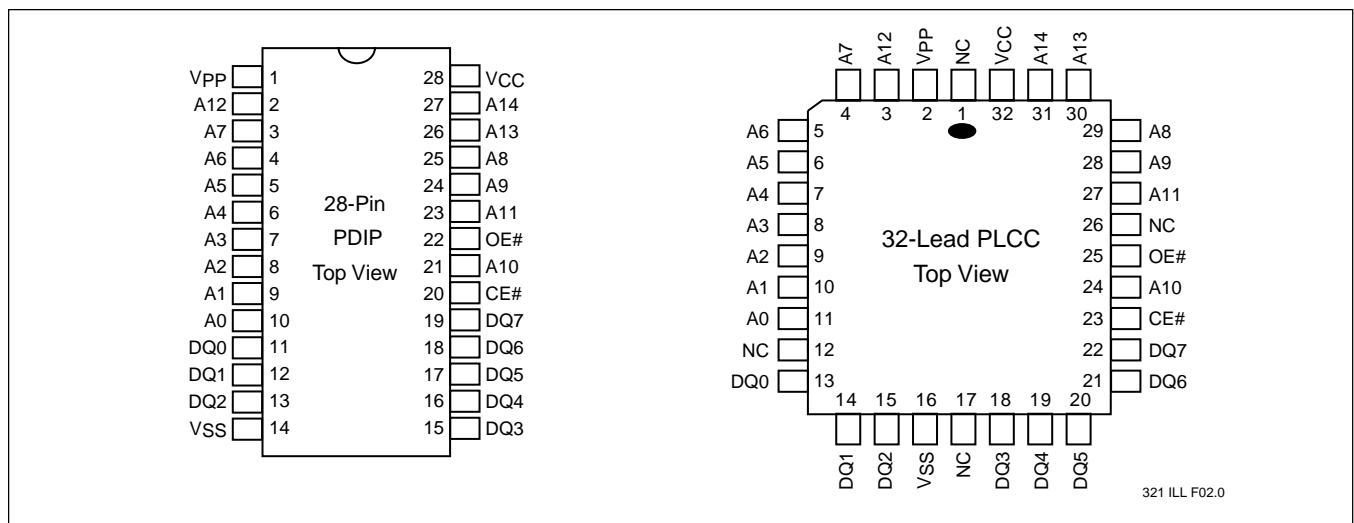


FIGURE 2: PIN ASSIGNMENTS FOR 28-PIN PLASTIC DIPs AND 32-LEAD PLCCs

TABLE 2: PIN DESCRIPTION

Symbol	Pin Name	Functions
A ₁₄ -A ₀	Address Inputs	To provide memory addresses
DQ ₇ -DQ ₀	Data Input/Output	To output data during read cycles and receive input data during program cycle, the outputs are in tri-state when OE# or CE# is high
CE#	Chip Enable	To activate the device when CE# is low
OE#	Output Enable	To gate the data output buffers during read operation and high voltage pin during chip erase and programming operation
V _{CC}	Power Supply	To provide 5-volt supply (±10%)
V _{PP}	Power Supply for Program or Erase	High voltage pin during chip erase and programming operation 12-volt (±5%)
V _{SS}	Ground	
NC	No Connection	Unconnected pins

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TABLE 3: OPERATION MODES SELECTION

Mode	CE#	OE#	V _{PP}	A ₉	DQ	Address
Read	V _{IL}	V _{IL}	V _{CC} or V _{SS}	A _{IN}	D _{OUT}	A _{IN}
Output Disable	V _{IL}	V _{IH}	V _{CC} or V _{SS}	X	High Z	X
Program	V _{IL}	V _{IH}	V _{PPH}	A _{IN}	D _{IN}	A _{IN}
Standby	V _{IH}	X	V _{CC} or V _{SS}	X	High Z	X
Chip Erase	V _{IL}	V _{IH}	V _{PPH}	V _H	High Z	X
Program/Erase Inhibit	V _{IH}	X	V _{PPH}	X	High Z	X
Product Identification	V _{IL}	V _{IL}	V _{CC} or V _{SS}	V _H	Manufacturer Code (BF) Device Code (A3)	A ₁₄ -A ₁ = V _{IL} , A ₀ = V _{IL} A ₁₄ -A ₁ = V _{IL} , A ₀ = V _{IH}

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Note: X = V_{IL} or V_{IH}
V_{PPH} = 12V±5%, V_H = 12V±5%

Absolute Maximum Stress Ratings (Applied conditions greater than those listed under “Absolute Maximum Stress Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these conditions or conditions greater than those defined in the operational sections of this data sheet is not implied. Exposure to absolute maximum stress rating conditions may affect device reliability.)

Temperature Under Bias	-55°C to +125°C
Storage Temperature	-65°C to +150°C
D. C. Voltage on Any Pin to Ground Potential	-0.5V to V _{CC} + 0.5V
Transient Voltage (<20 ns) on Any Pin to Ground Potential	-1.0V to V _{CC} + 1.0V
Voltage on A ₉ and V _{PP} Pin to Ground Potential	-0.5V to 14.0V
Package Power Dissipation Capability (T _A = 25°C)	1.0W
Through Hole Lead Soldering Temperature (10 Seconds)	300°C
Surface Mount Lead Soldering Temperature (3 Seconds)	240°C
Output Short Circuit Current ⁽¹⁾	100 mA

Note: ⁽¹⁾ Outputs shorted for no more than one second. No more than one output shorted at a time.

OPERATING RANGE

Range	Ambient Temp	V _{CC}	V _{PP}
Commercial	0°C to +70°C	5V±10%	12V±5%
Industrial	-40°C to +85°C	5V±10%	12V±5%

AC CONDITIONS OF TEST

Input Rise/Fall Time	10 ns
Output Load	C _L = 100 pF, for 90 ns
Output Load	C _L = 30 pF, for 70 ns
See Figures 6 and 7	



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TABLE 4: READ MODE DC OPERATING CHARACTERISTICS

$V_{CC} = 5 V \pm 10\%$, $V_{PP} = V_{CC}$ or V_{SS} , $T_A = 0^\circ C$ to $70^\circ C$ (Commercial) or $-40^\circ C$ to $+85^\circ C$ (Industrial)

Symbol	Parameter	Limits			Test Conditions
		Min	Max	Units	
I _{CC}	V _{CC} Read Current		30	mA	CE# = OE# = V _{IL} all I/Os open, Address Input = V _{IL} /V _{IH} at f = 1/T _{RC} Min, V _{CC} = V _{CC} Max
I _{PPR}	V _{PP} Read Current		100	μA	CE# = OE# = V _{IL} , all I/Os open, Address Input = V _{IL} /V _{IH} at f = 1/T _{RC} Min, V _{CC} = V _{CC} Max, V _{PP} = V _{CC}
I _{SB1}	Standby V _{CC} Current (TTL input)		3	mA	CE# = V _{IH} , V _{CC} = V _{CC} Max
I _{SB2}	Standby V _{CC} Current (CMOS input)		50	μA	CE# = V _{CC} - 0.3V V _{CC} = V _{CC} Max.
I _{LI}	Input Leakage Current		1	μA	V _{IN} = GND to V _{CC} , V _{CC} = V _{CC} Max
I _{LO}	Output Leakage Current		1	μA	V _{OUT} = GND to V _{CC} , V _{CC} = V _{CC} Max
V _{IL}	Input Low Voltage		0.8	V	V _{CC} = V _{CC} Min
V _{IH}	Input High Voltage	2.0	V _{CC} +0.5	V	V _{CC} = V _{CC} Max
V _{OL}	Output Low Voltage		0.4	V	I _{OL} = 2.1 mA, V _{CC} = V _{CC} Min
V _{OH}	Output High Voltage	2.4		V	I _{OH} = -400μA, V _{CC} = V _{CC} Min
I _H	Supervoltage Current for A ₉		100	μA	CE# = OE# = V _{IL} , A ₉ = V _H Max.

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TABLE 5: PROGRAM/ERASE DC OPERATING CHARACTERISTICS

$V_{CC} = 5 V \pm 10\%$, $V_{PP} = V_{PPH}$, $T_A = 25^\circ C \pm 5^\circ C$

Symbol	Parameter	Limits			Test Conditions
		Min	Max	Units	
I _{CP}	V _{CC} Erase or Program Current		30	mA	CE# = V _{IL} , OE# = V _{IH} , V _{PP} = 12V±5%, V _{CC} = V _{CC} Max
I _{PP}	V _{PP} Erase or Program Current		1	mA	CE# = V _{IL} , OE# = V _{IH} , V _{PP} = 12V±5%, V _{CC} = V _{CC} Max
I _{LI}	Input Leakage Current		1	µA	V _{IN} = GND to V _{CC} , V _{CC} = V _{CC} Max
I _{LO}	Output Leakage Current		1	µA	V _{OUT} = GND to V _{CC} , V _{CC} = V _{CC} Max
V _H	Supervoltage for A ₉	11.4	12.6	V	CE# = OE# = V _{IL}
I _H	Supervoltage Current for A ₉		100	µA	CE# = OE# = V _{IL} , A ₉ = V _H Max
V _{PPH}	High Voltage for V _{PP} Pin	11.4	12.6	V	

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TABLE 6: RECOMMENDED SYSTEM POWER-UP TIMINGS

Symbol	Parameter	Minimum	Units
T _{PU-READ}	Power-up to Read Operation	100	µs
T _{PU-WRITE}	Power-up to Write Operation	100	µs

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TABLE 7: CAPACITANCE (T_A = 25 °C, f=1 MHz, other pins open)

Parameter	Description	Test Condition	Maximum
C _{I/O} ⁽¹⁾	I/O Pin Capacitance	V _{I/O} = 0V	12 pF
C _{IN} ⁽¹⁾	Input Capacitance	V _{IN} = 0V	6 pF

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Note: ⁽¹⁾This parameter is measured only for initial qualification and after a design or process change that could affect this parameter.

TABLE 8: RELIABILITY CHARACTERISTICS

Symbol	Parameter	Minimum Specification	Units	Test Method
N _{END}	Endurance	1000	Cycles	JEDEC Standard A117
T _{DR} ⁽¹⁾	Data Retention	100	Years	JEDEC Standard A103
V _{ZAP_HBM} ⁽¹⁾	ESD Susceptibility Human Body Model	1000	Volts	JEDEC Standard A114
V _{ZAP_MM} ⁽¹⁾	ESD Susceptibility Machine Model	200	Volts	JEDEC Standard A115
I _{LTH} ⁽¹⁾	Latch Up	100	mA	JEDEC Standard 78

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Note: ⁽¹⁾ This parameter is measured only for initial qualification and after a design or process change that could affect this parameter.



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AC CHARACTERISTICS

TABLE 9: READ CYCLE TIMING PARAMETERS

Symbol	Parameter	SST27SF256-70		SST27SF256-90		Units
		Min	Max	Min	Max	
T _{RC}	Read Cycle Time	70		90		ns
T _{CE}	Chip Enable Access Time		70		90	ns
T _{AA}	Address Access Time		70		90	ns
T _{OE}	Output Enable Access Time		35		45	ns
T _{CLZ}	CE# Low to Active Output	0		0		ns
T _{OLZ}	OE# Low to Active Output	0		0		ns
T _{CHZ}	CE# High to High-Z Output		25		30	ns
T _{OHZ}	OE# High to High-Z Output		25		30	ns
T _{OH}	Output Hold from Address Change	0		0		ns

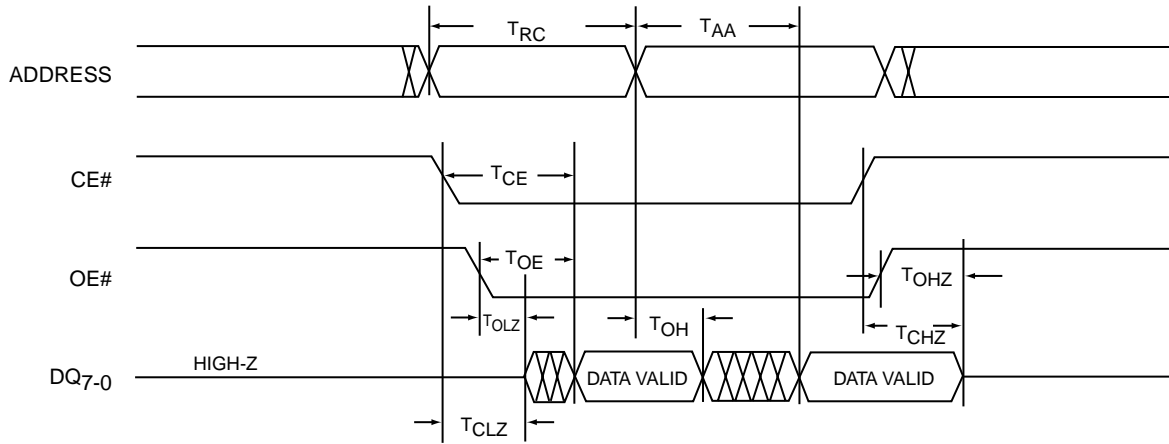
Note: C_L = 100 pF for 90ns, 30 pF for 70 ns

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TABLE 10: PROGRAMMING/ERASE CYCLE TIMING PARAMETERS

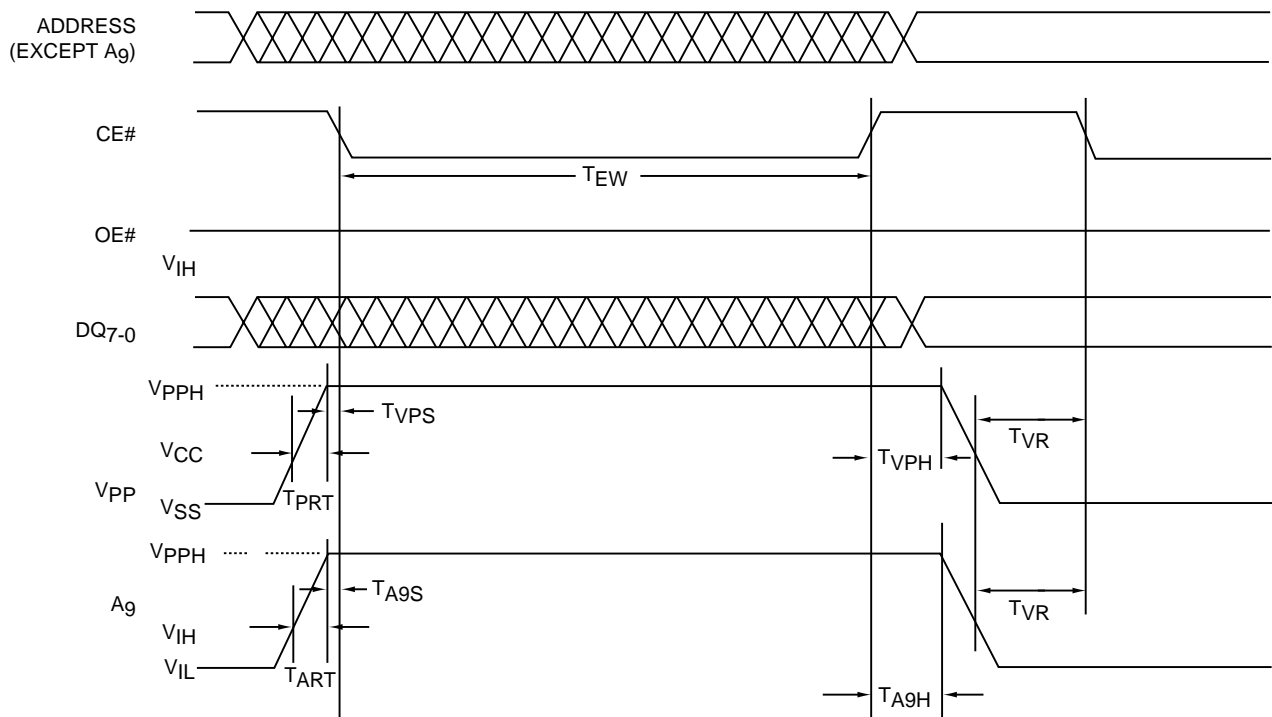
Symbol	Parameter	Min	Max	Units
T _{PRT}	V _{PP} Pulse Rise Time	50		ns
T _{AS}	Address Setup Time	1		μs
T _{AH}	Address Hold Time	1		μs
T _{VPS}	V _{PP} Setup Time	1		μs
T _{VPH}	V _{PP} Hold Time	1		μs
T _{PW}	CE# Program Pulse Width	20	30	μs
T _{EW}	CE# Erase Pulse Width	100	500	ms
T _{DS}	Data Setup Time	1		μs
T _{DH}	Data Hold Time	1		μs
T _{VR}	V _{PP} and A ₉ Recovery Time	1		μs
T _{ART}	A ₉ Rise Time to 12V during Erase	50		ns
T _{A9S}	A ₉ Setup Time during Erase	1		μs
T _{A9H}	A ₉ Hold Time during Erase	1		μs

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FIGURE 3: READ CYCLE TIMING DIAGRAM



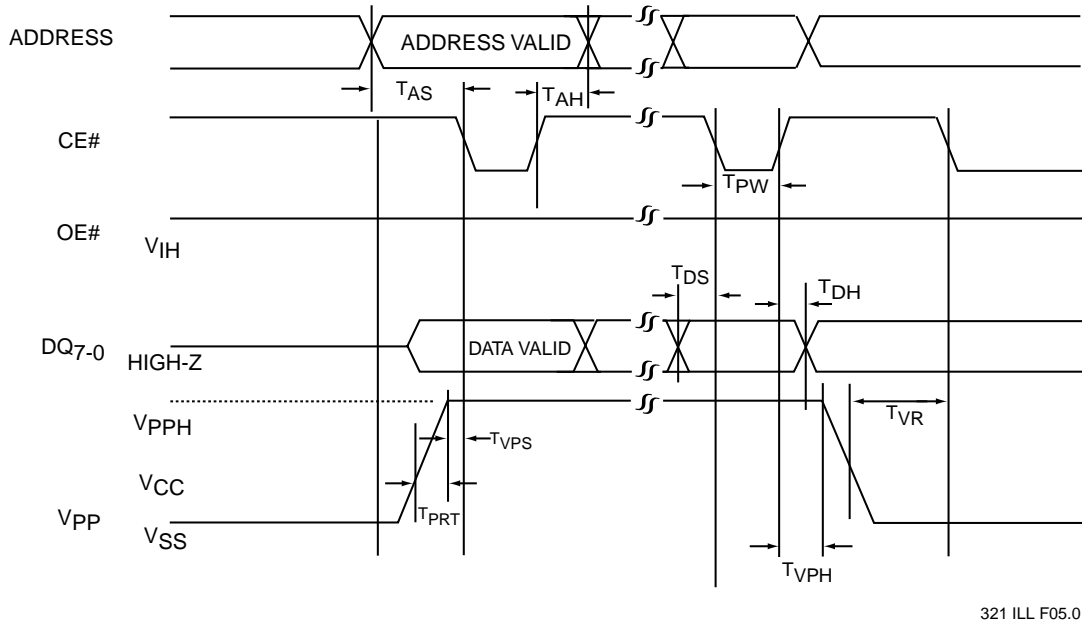
321 ILL F04.0

FIGURE 4: ERASE TIMING DIAGRAM



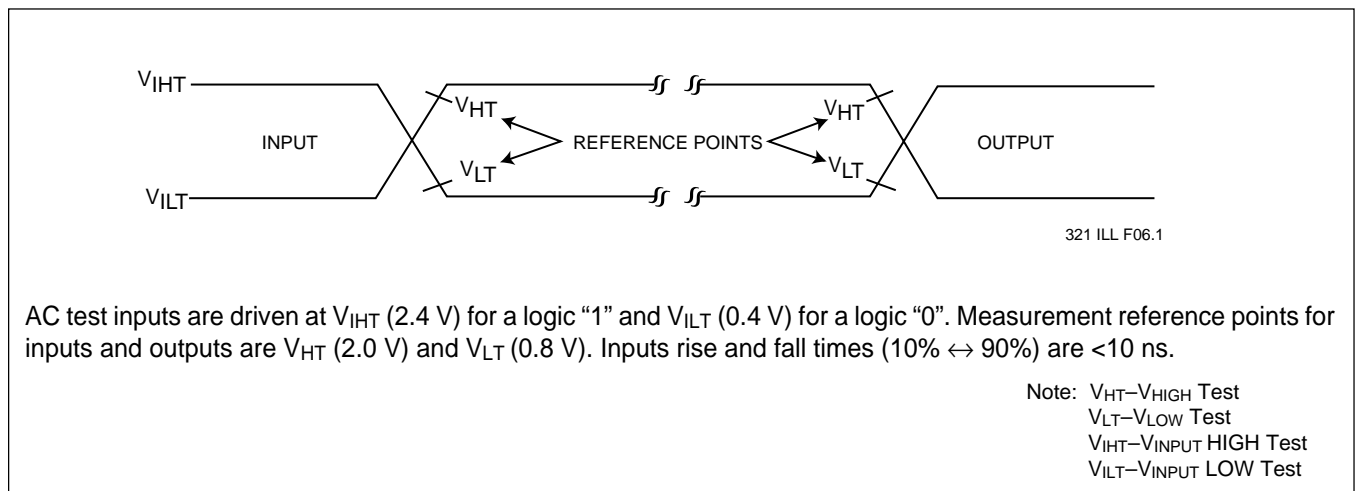
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FIGURE 5: PROGRAM TIMING DIAGRAM



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FIGURE 6: AC INPUT/OUTPUT REFERENCE WAVEFORMS

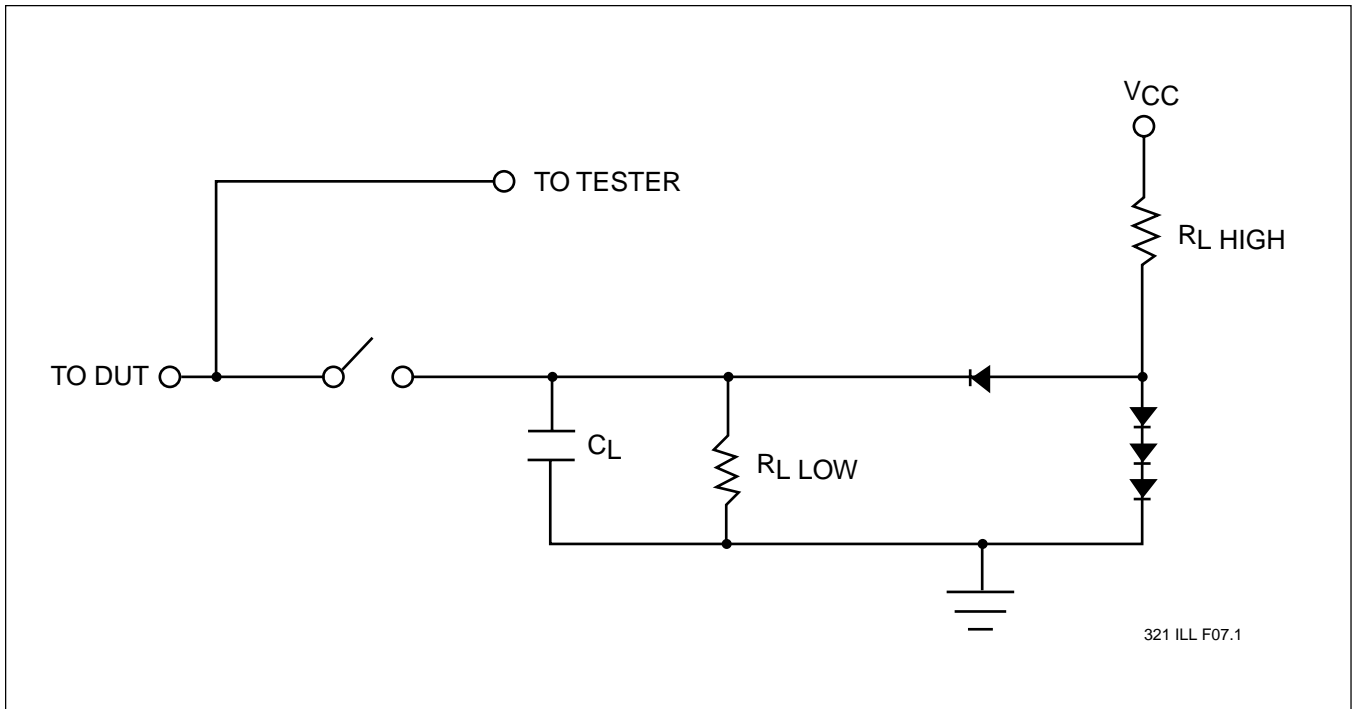
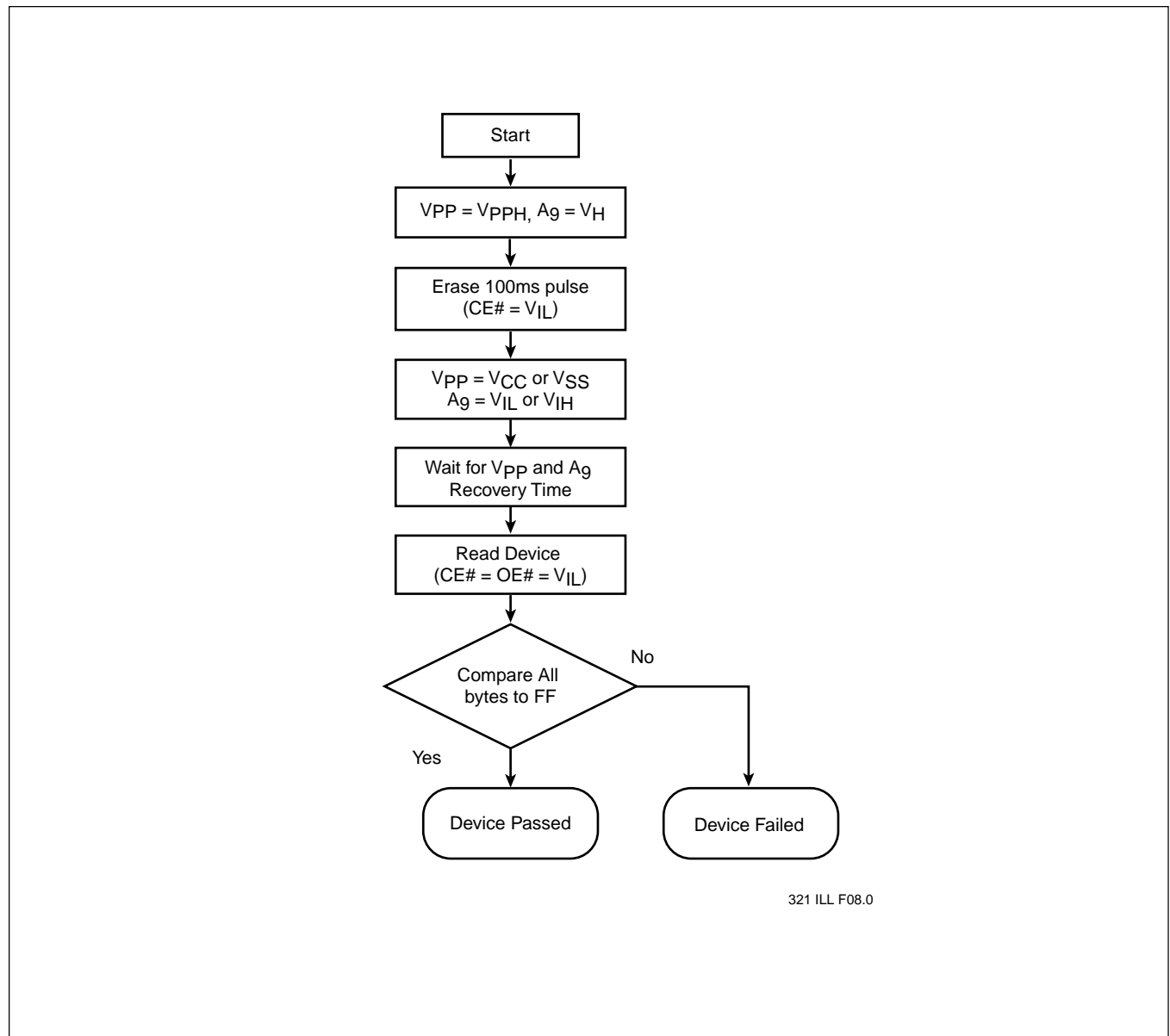


FIGURE 7: A TEST LOAD EXAMPLE



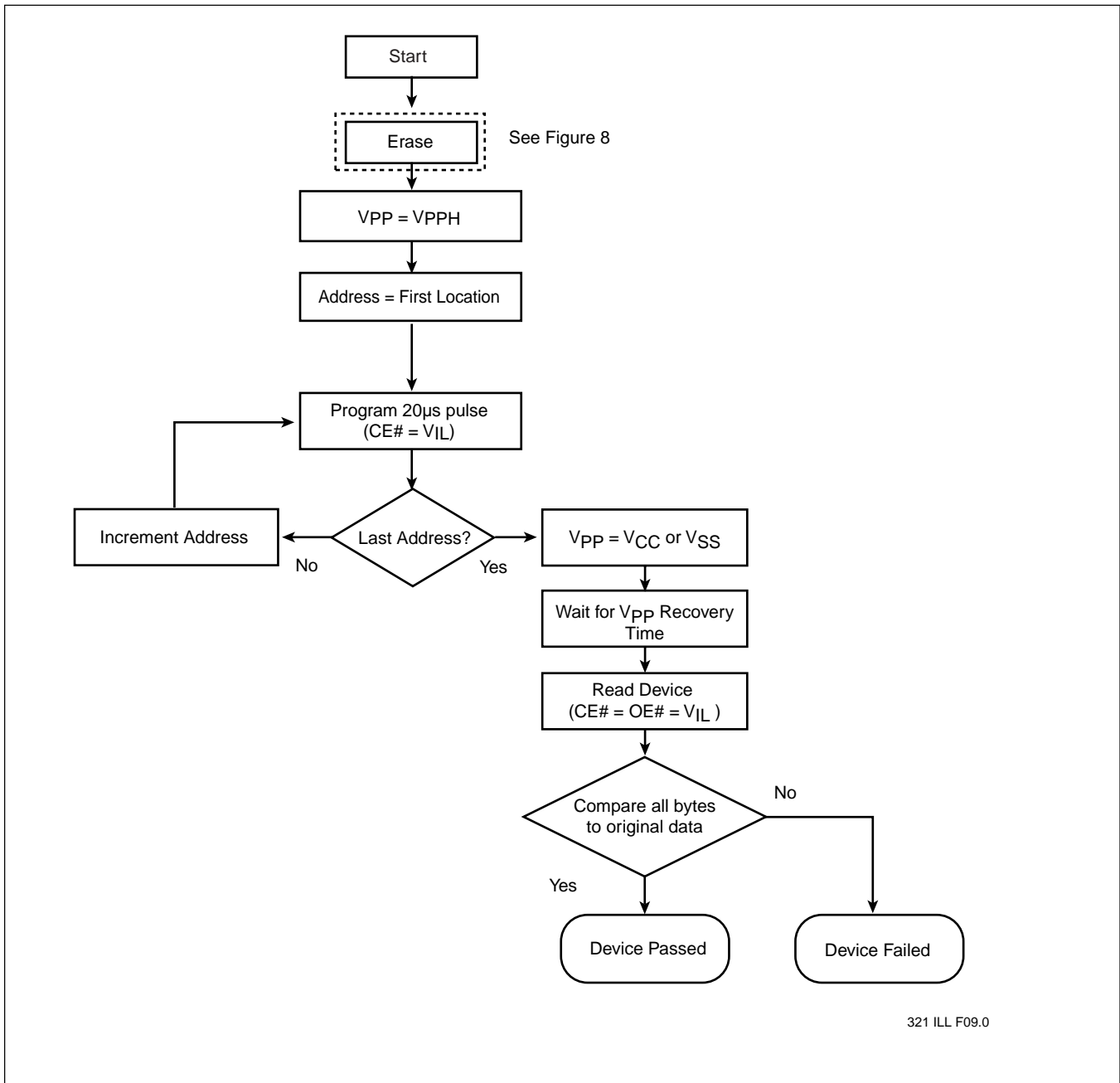
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FIGURE 8: ERASE ALGORITHM



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FIGURE 9: PROGRAMMING ALGORITHM



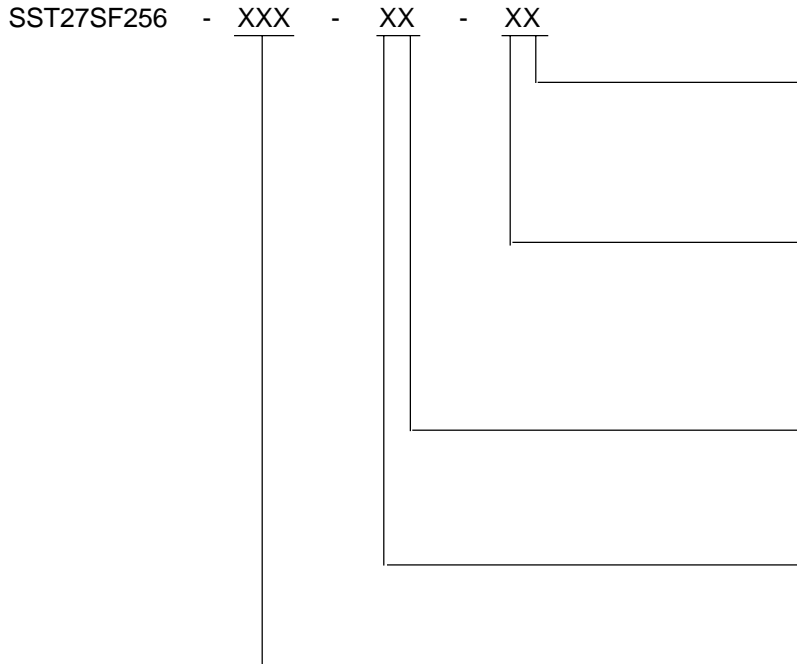
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PRODUCT ORDERING INFORMATION

Device Speed Suffix1 Suffix2



Package Modifier

- G = 28 leads
- H = 32 leads
- Numeric = Die modifier

Package Type

- P = PDIP
- N = PLCC
- W = TSOP (die up) (8mm x 14mm)
- U = Unencapsulated die

Operating Temperature

- C = Commercial = 0° to 70°C
- I = Industrial = -40° to 85°C

Minimum Endurance

- 3 = 1000 cycles

Read Access Speed

- 70 = 70 ns, 90 = 90 ns

Valid combinations

SST27SF256- 70-3C-WH	SST27SF256- 70-3C-NH	SST27SF256- 70-3C-PG
SST27SF256- 90-3C-WH	SST27SF256- 90-3C-NH	SST27SF256- 90-3C-PG
SST27SF256- 70-3I-WH	SST27SF256- 70-3I-NH	
SST27SF256- 90-3I-WH	SST27SF256- 90-3I-NH	SST27SF256- 90-3C-U1

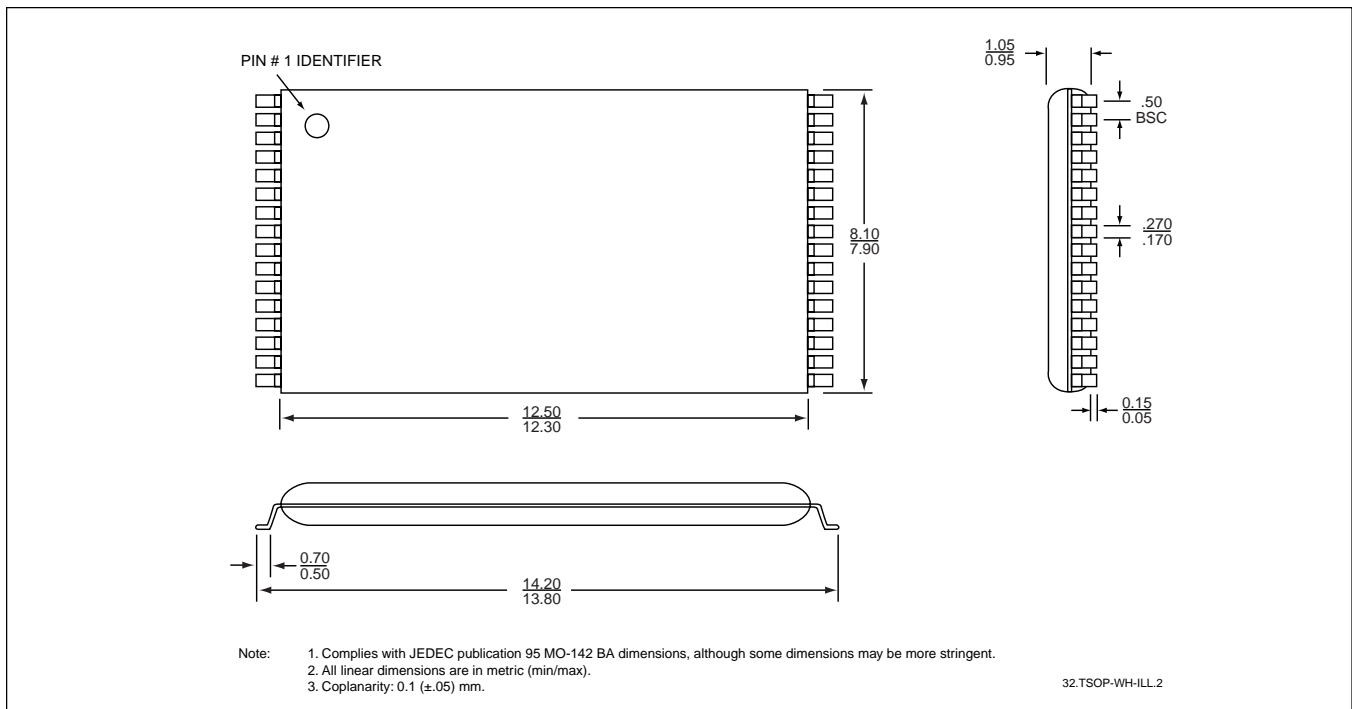
Example: Valid combinations are those products in mass production or will be in mass production. Consult your SST sales representative to confirm availability of valid combinations and to determine availability of new combinations.



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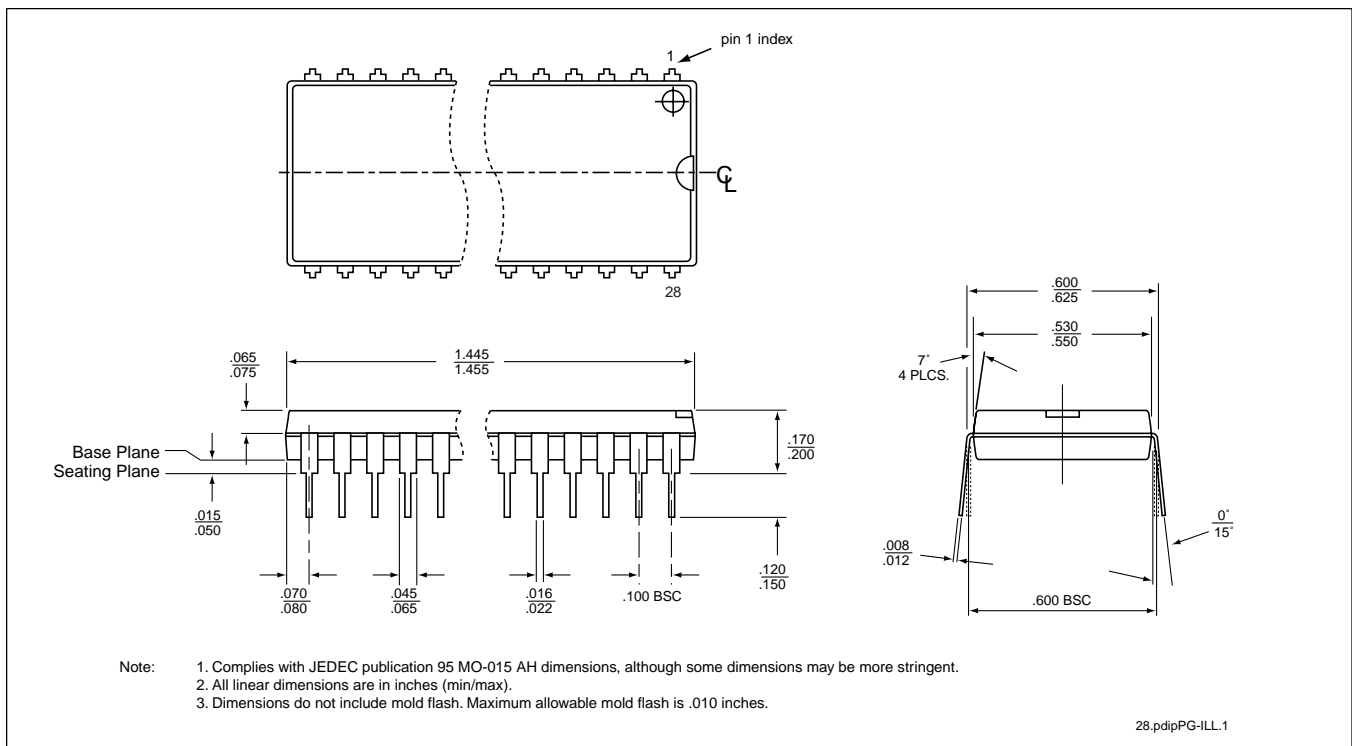
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PACKAGING DIAGRAMS



32-LEAD THIN SMALL OUTLINE PACKAGE (TSOP)

SST PACKAGE CODE: WH



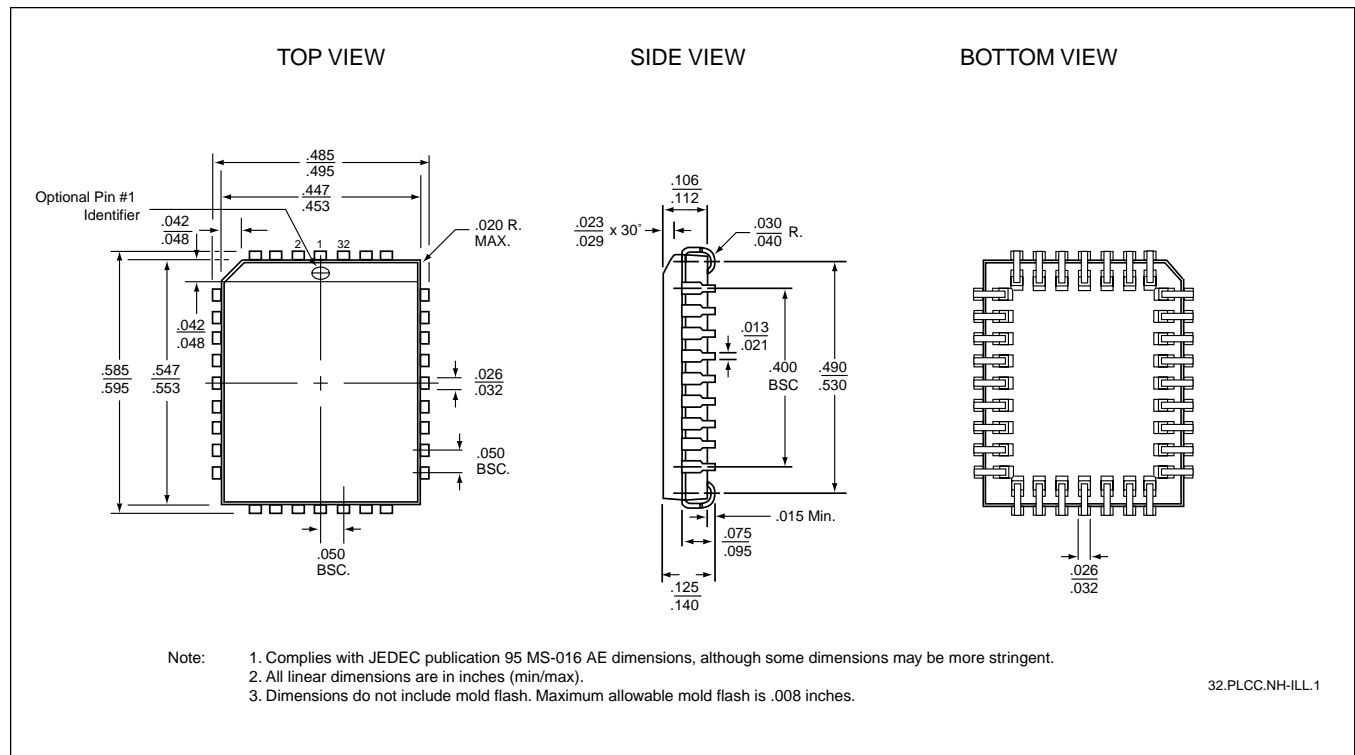
28-LEAD PLASTIC DUAL-IN-LINE PACKAGE (PDIP)

SST PACKAGE CODE: PG



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32-LEAD PLASTIC LEAD CHIP CARRIER (PLCC) SST PACKAGE CODE: NH



SALES OFFICES

SST Area Offices

Customer Service	(408) 523-7754
Northwest USA, Rocky Mtns. & West Canada	(408) 523-7661
Central & Southwest USA	(727) 771-8819
East USA & East Canada	(978) 356-3845
North America - Distribution	(941) 505-8893
Asia Pacific	(408) 523-7762
East Asia	(81) 45-471-1851
Europe	(44) 1932-230555

North American Sales Representatives

Alabama M-Squared, Inc. - Huntsville	(205) 830-0498
Arizona QuadRep, Inc.	(602) 839-2102
California	
Costar - Northern	(408) 946-9339
Falcon Sales & Technology - San Marcos	(760) 591-0504
Westar Rep Company, Inc. - Calabasas	(818) 880-0594
Westar Rep Company, Inc. - Irvine	(949) 453-7900
Colorado Lange Sales, Inc.	(303) 795-3600
Florida	
M-Squared, Inc. - Clearwater	(727) 669-2408
M-Squared, Inc. - Coral Springs	(954) 753-5314
M-Squared, Inc. - Longwood	(407) 682-6662
Georgia M-Squared, Inc. - Atlanta	(770) 447-6124
Illinois	
Oasis Sales Corporation - Northern	(847) 640-1850
Rush & West Associates - Southern	(314) 965-3322
Indiana Applied Data Management	(317) 257-8949
Iowa Rush & West Associates	(319) 398-9679
Kansas Rush & West Associates	(913) 764-2700
Maryland Nexus Technology Sales	(301) 663-4159
Massachusetts A/D Sales	(978) 851-5400
Michigan Applied Data Management	(734) 741-9292
Minnesota Cahill, Schmitz & Cahill	(612) 699-0200
Missouri Rush & West Associates	(314) 965-3322
North Carolina	
M-Squared, Inc. - Charlotte	(704) 522-1150
M-Squared, Inc. - Raleigh	(919) 848-4300
New Jersey Nexus Technology Sales	(201) 947-0151
New Mexico QuadRep, Inc.	(505) 332-2417
New York	
Nexus Technology Sales	(516) 843-0100
Reagan/Compar - Endwell	(607) 754-2171
Reagan/Compar - E. Rochester	(716) 218-4370
Ohio	
Applied Data Management - Cincinnati	(513) 579-8108
Applied Data Management - Cleveland	(440) 946-6812
Oregon Thorson Pacific, Inc.	(503) 293-9001
Pennsylvania Nexus Technology Sales	(215) 675-9600
Texas	
Technical Marketing, Inc. - Carrollton	(972) 387-3601
Technical Marketing, Inc. - Houston	(713) 783-4497
Technical Marketing, Inc. - Austin	(512) 343-6976
Utah Lange Sales, Inc.	(801) 487-0843
Washington Thorson Pacific, Inc.	(425) 603-9393
Wisconsin Oasis Sales Corporation	(414) 782-6660
Canada	
Electronics Sales Professionals - Ottawa	(613) 828-6881
Electronics Sales Professionals - Toronto	(905) 856-8448
Electronics Sales Professionals - Montreal	(514) 388-6596
Thorson Pacific, Inc. - B.C.	(604) 294-3999

International Sales Representatives & Distributors

Australia ACD	(61) 3-762 7644
Belgium Memec Benelux	(32) 1540-0080
China/Hong Kong	
Actron Technology Co., Ltd. (HQ) Hong Kong	(852) 2727-3978
Actron Technology Co., Ltd. - Shanghai	(86) 21-6482-8021
Actron Technology Co., Ltd. - Shenzhen	(86) 755-376-2763
Actron Technology Co., Ltd. - Chengdu	(86) 28-553-2896
Actron Technology Co., Ltd. - Beijing	(86) 10-6261-0042
Actron Technology Co., Ltd. - Wuhan	(86) 27-8788-7226
Actron Technology Co., Ltd. - Xian	(86) 29-831-4585
MetaTech Limited (HQ) - Hong Kong	(852) 2421-2379
MetaTech Limited - Beijing	(86) 10-6858-2188
MetaTech Limited - Shanghai	(86) 21-6485-7530
MetaTech Limited - Chengdu	(86) 28-5577-415
MetaTech Limited - Fuzhou	(86) 591-378-1033
MetaTech Limited - Shenzhen	(86) 755-321-9726
Serial System Ltd. - Hong Kong	(852) 2950-0820
Serial System Ltd. - Chengdu	(86) 28-524-0208
Serial System Ltd. - Shanghai	(86) 21-6473-2080
Serial System Ltd. - Shenzhen	(86) 755-212-9076
France	
A2M - Bron	(33) 4 72 37 0414
A2M - Sevres	(33) 1 46 23 7900
Germany	
Endrich Bauelemente	
Vertriebs GMBH - Bramstedt	(49) 4192-897910
Endrich Bauelemente	
Vertriebs GMBH - Nagold	(49) 7452-60070
India	
Team Technology - Bangalore	(91) 80-526-1102
Team Technology - Hyderabad	(91) 40-231130
Team Technology - New Delhi	(91) 11-220-5624
Ireland Curragh Technology	(353) 61 316116
Israel Spectec Electronics	(972) 3-6498404
Italy Carlo Gavazzi Cefra SpA	(39) 2-424-1471
Japan	
Asahi Electronics Co., Ltd. - Tokyo	(81) 3-3350-5418
Asahi Electronics Co., Ltd. - Kitakyushu	(81) 93-511-6471
Microtek, Inc. - Osaka	(81) 6-6263-5080
Microtek, Inc. - Tokyo	(81) 3-5300-5515
Ryoden Trading Co., Ltd. - Osaka	(81) 6-6399-3443
Ryoden Trading Co., Ltd. - Tokyo	(81) 3-5396-6218
Silicon Technology Co., Ltd.	(81) 3-3795-6461
Korea Bigshine Korea Co., Ltd.	(82) 2-832-8881
Malaysia	
MetaTech (M) SDN BHD	(60) 4-658-4276
Serial System SDN BHD	(60) 4-657-0204
Serial System - Kuala Lumpur	(60) 3-737-1243
Netherlands Memec Benelux	(31) 40-265-9399
Singapore	
MetaTech (S) Pte Ltd.	(65) 748-4844
Serial System Ltd. (HQ)	(65) 280-0200
South Africa KH Distributors	(27) 11 845-5011
Spain Tekelec Espana S.A.	(34) 91 371-7768
Switzerland Leading Technologies	(41) 27-721-7440/43
Taiwan, R.O.C.	
GCH-Sun Systems Co., Ltd. (GSS)	(886) 2-2555-0880
PCT Limited	(886) 2-2698-0098
Tonsam Corporation	(886) 2-2651-0011
United Kingdom Ambar Components, Ltd.	(44) 1296-397396

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