

512 Kbit (64K x8) UV EPROM and OTP EPROM

Features

- 5V ± 10% supply voltage in read operation
- Access time: 45 ns
- Low power “CMOS” consumption:
 - Active current 30 mA
 - Standby current 100 µA
- Programming voltage: 12.75 V ± 0.25 V
- Programming time around 6 s.
- Electronic Signature
 - Manufacturer code: 20h
 - Device code: 3Dh
- Packages
 - ECOPACK® versions

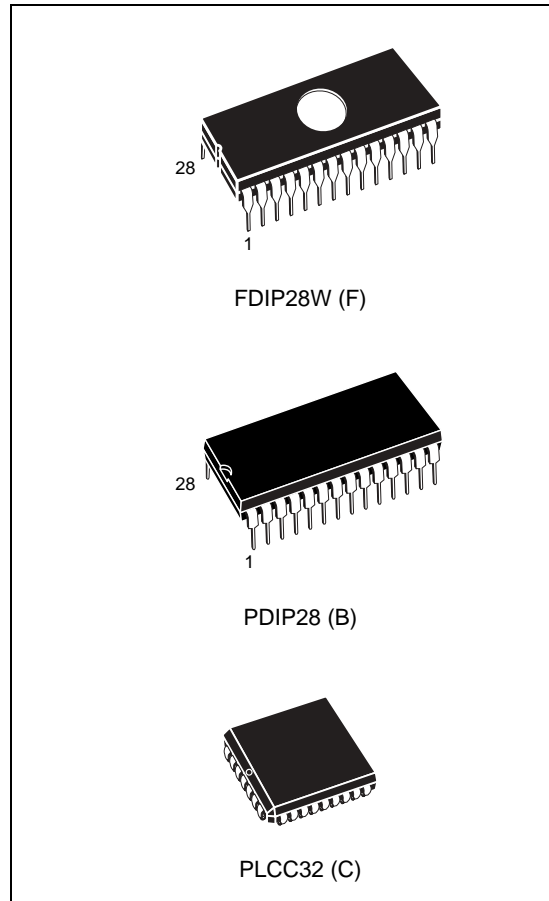


Table 1. Device summary

Package	45 ns	70 ns	90 ns	100 ns	120 ns	150 ns
PDIP28			M27C512-90B6			
PLCC32		M27C512-70C6	M27C512-90C1	M27C512-10C6	M27C512-12C3	
FDIP28W	M27C512-45XF1	M27C512-70XF1	M27C512-90F1 M27C512-90F6	M27C512-10F1	M27C512-12F1 M27C512-12F3	M27C512-15F1 M27C512-15F6

1 Description

The M27C512 is a 512 Kbit EPROM offered in the two ranges UV (ultra violet erase) and OTP (one time programmable). It is ideally suited for applications where fast turn-around and pattern experimentation are important requirements and is organized as 65536 by 8 bits.

The FDIP28W (window ceramic frit-seal package) has transparent lid which allows the user to expose the chip to ultraviolet light to erase the bit pattern. A new pattern can then be written to the device by following the programming procedure.

For applications where the content is programmed only one time and erasure is not required, the M27C512 is offered in FDIP28W, PDIP28, and PLCC32 packages. In order to meet environmental requirements, ST offers the M27C512 in ECOPACK® packages. ECOPACK packages are Lead-free. The category of second Level Interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com.

Figure 1. Logic diagram

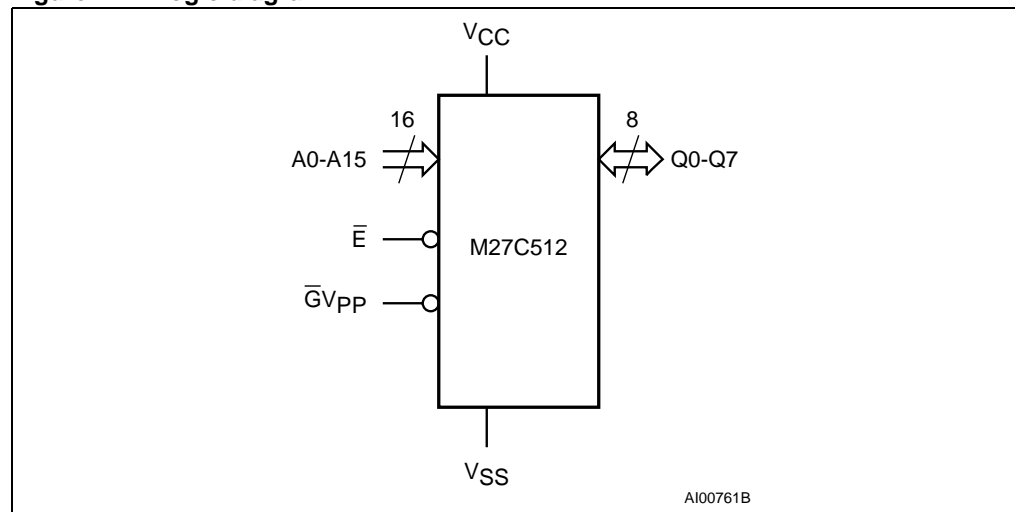


Table 2. Signal names

Name	Description	Direction
A0-A15	Address Inputs	Inputs
Q0-Q7	Data outputs	Outputs
\bar{E}	Chip Enable	Input
$\bar{G}V_{PP}$	Output Enable / Program Supply	Input
V_{CC}	Supply Voltage	Supply
V_{SS}	Ground	Supply
NC	Not Connected Internally	-
DU	Don't Use	-

4 Maximum rating

Stressing the device outside the ratings listed in <Blue>Table 5. may cause permanent damage to the device. These are stress ratings only, and operation of the device at these, or any other conditions outside those indicated in the Operating sections of this specification, is not implied. Exposure to Absolute Maximum Rating conditions for extended periods may affect device reliability. Refer also to the STMicroelectronics SURE Program and other relevant quality documents.

Table 5. Absolute maximum ratings

Symbol	Parameter	Value	Unit
T_A	Ambient Operating Temperature ⁽¹⁾	-40 to 125	°C
T_{BIAS}	Temperature Under Bias	-50 to 125	°C
T_{STG}	Storage Temperature	-65 to 150	°C
T_{LEAD}	Lead Temperature during Soldering	(note 1)	°C
$V_{IO}^{(2)}$	Input or Output Voltage (except A9)	-2 to 7	V
V_{CC}	Supply Voltage	-2 to 7	V
$V_{A9}^{(2)}$	A9 Voltage	-2 to 13.5	V
V_{PP}	Program Supply Voltage	-2 to 14	V

1. Depends on range.
2. Minimum DC voltage on Input or Output is -0.5V with possible undershoot to -2.0V for a period less than 20ns. Maximum DC voltage on Output is $V_{CC} + 0.5V$ with possible overshoot to $V_{CC} + 2V$ for a period less than 20ns.

5 DC and AC parameters

This section summarizes the operating and measurement conditions, and the DC and AC characteristics of the device. The parameters in the DC and AC Characteristic tables that follow are derived from tests performed under the Measurement Conditions summarized in the relevant tables. Designers should check that the operating conditions in their circuit match the measurement conditions when relying on the quoted parameters.

Table 6. AC measurement conditions

	High Speed	Standard
Input Rise and Fall Times	$\leq 10\text{ns}$	$\leq 20\text{ns}$
Input Pulse Voltages	0 to 3V	0.4V to 2.4V
Input and Output Timing Ref. Voltages	1.5V	0.8V and 2V

Figure 5. Testing input/output waveform

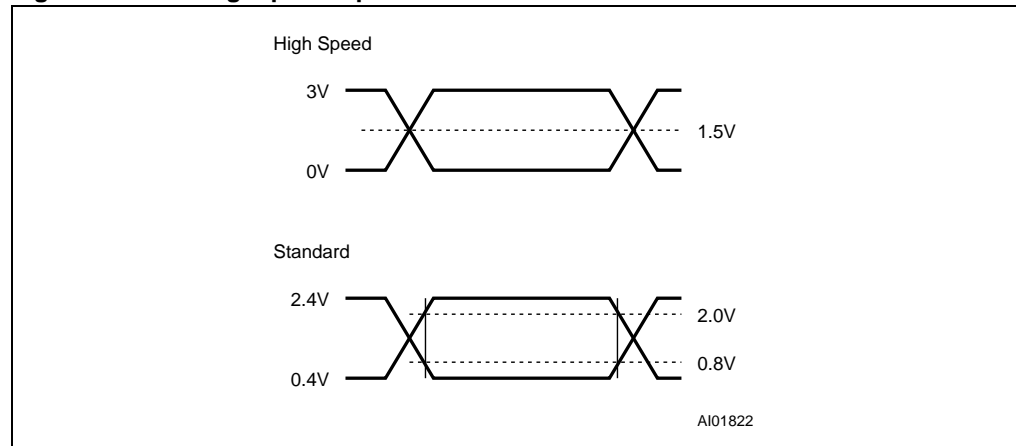


Figure 6. AC Testing Load Circuit

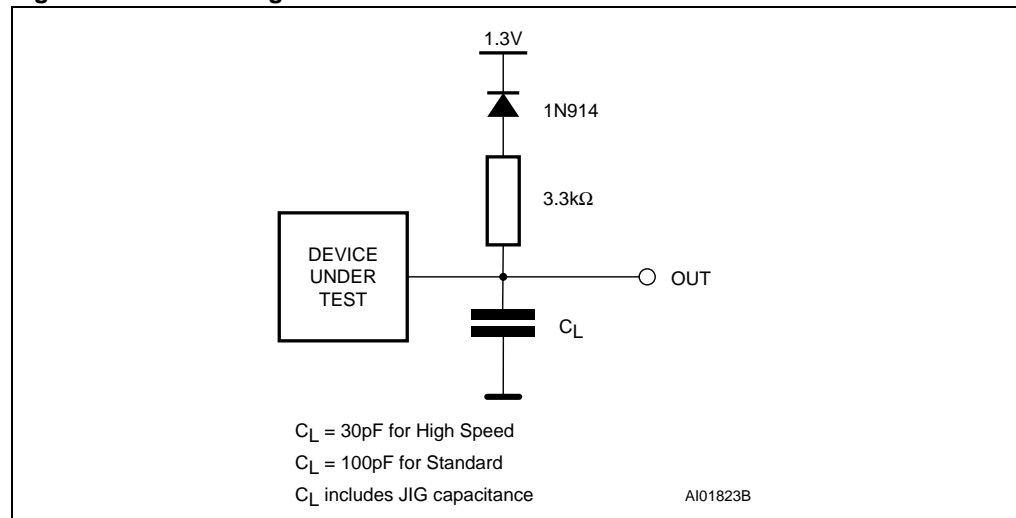


Table 7. Capacitance

Symbol	Parameter	Test Condition ⁽¹⁾⁽²⁾	Min	Max	Unit
C _{IN}	Input Capacitance	V _{IN} = 0V		6	pF
C _{OUT}	Output Capacitance	V _{OUT} = 0V		12	pF

1. T_A = 25°C, f = 1MHz

2. Sampled only, not 100% tested.

Table 8. Read mode DC characteristics

Symbol	Parameter	Test Condition ⁽¹⁾	Min	Max	Unit
I _{LI}	Input Leakage Current	0V ≤ V _{IN} ≤ V _{CC}		±10	μA
I _{LO}	Output Leakage Current	0V ≤ V _{OUT} ≤ V _{CC}		±10	μA
I _{CC}	Supply Current	$\bar{E} = V_{IL}, \bar{G} = V_{IL},$ I _{OUT} = 0mA, f = 5MHz		30	mA
I _{CC1}	Supply Current (Standby) TTL	$\bar{E} = V_{IH}$		1	mA
I _{CC2}	Supply Current (Standby) CMOS	$\bar{E} > V_{CC} - 0.2V$		100	μA
I _{PP}	Program Current	V _{PP} = V _{CC}		10	μA
V _{IL}	Input Low Voltage		-0.3	0.8	V
V _{IH} ⁽²⁾	Input High Voltage		2	V _{CC} + 1	V
V _{OL}	Output Low Voltage	I _{OL} = 2.1mA		0.4	V
V _{OH}	Output High Voltage TTL	I _{OH} = -1mA	3.6		V
	Output High Voltage CMOS	I _{OH} = -100μA	V _{CC} - 0.7V		V

1. V_{CC} must be applied simultaneously with or before V_{PP} and removed simultaneously or after V_{PP}.

2. Maximum DC voltage on Output is V_{CC} + 0.5V.

Table 9. Read mode AC characteristics

Symbol	Alt	Parameter	Test Condition ⁽¹⁾	M27C512				Unit
				-45 ⁽²⁾		-70		
				Min	Max	Min	Max	
t _{AVQV}	t _{ACC}	Address Valid to Output Valid	$\bar{E} = V_{IL}, \bar{G} = V_{IL}$		45		70	ns
t _{ELQV}	t _{CE}	Chip Enable Low to Output Valid	$\bar{G} = V_{IL}$		45		70	ns
t _{GLQV}	t _{OE}	Output Enable Low to Output Valid	$\bar{E} = V_{IL}$		25		35	ns
t _{EHQZ} ⁽³⁾	t _{DF}	Chip Enable High to Output Hi-Z	$\bar{G} = V_{IL}$	0	25	0	30	ns
t _{GHQZ} ⁽³⁾	t _{DF}	Output Enable High to Output Hi-Z	$\bar{E} = V_{IL}$	0	25	0	30	ns
t _{AXQX}	t _{OH}	Address Transition to Output Transition	$\bar{E} = V_{IL}, \bar{G} = V_{IL}$	0		0		ns

1. V_{CC} must be applied simultaneously with or before V_{PP} and removed simultaneously or after V_{PP}.
2. Speed obtained with High Speed AC measurement conditions.
3. Sampled only, not 100% tested.

Table 10. Read mode AC characteristics

Symbol	Alt	Parameter	Test Condition ⁽¹⁾	M27C512								Unit
				-90		-10		-12		-15		
				Min	Max	Min	Max	Min	Max	Min	Max	
t _{AVQV}	t _{ACC}	Address Valid to Output Valid	$\bar{E} = V_{IL}, \bar{G} = V_{IL}$		90		100		120		150	ns
t _{ELQV}	t _{CE}	Chip Enable Low to Output Valid	$\bar{G} = V_{IL}$		90		100		120		150	ns
t _{GLQV}	t _{OE}	Output Enable Low to Output Valid	$\bar{E} = V_{IL}$		40		40		50		60	ns
t _{EHQZ} ⁽²⁾	t _{DF}	Chip Enable High to Output Hi-Z	$\bar{G} = V_{IL}$	0	30	0	30	0	40	0	50	ns
t _{GHQZ} ⁽²⁾	t _{DF}	Output Enable High to Output Hi-Z	$\bar{E} = V_{IL}$	0	30	0	30	0	40	0	50	ns
t _{AXQX}	t _{OH}	Address Transition to Output Transition	$\bar{E} = V_{IL}, \bar{G} = V_{IL}$	0		0		0		0		ns

1. V_{CC} must be applied simultaneously with or before V_{PP} and removed simultaneously or after V_{PP}.
2. Sampled only, not 100% tested.

Figure 7. Read mode AC waveforms

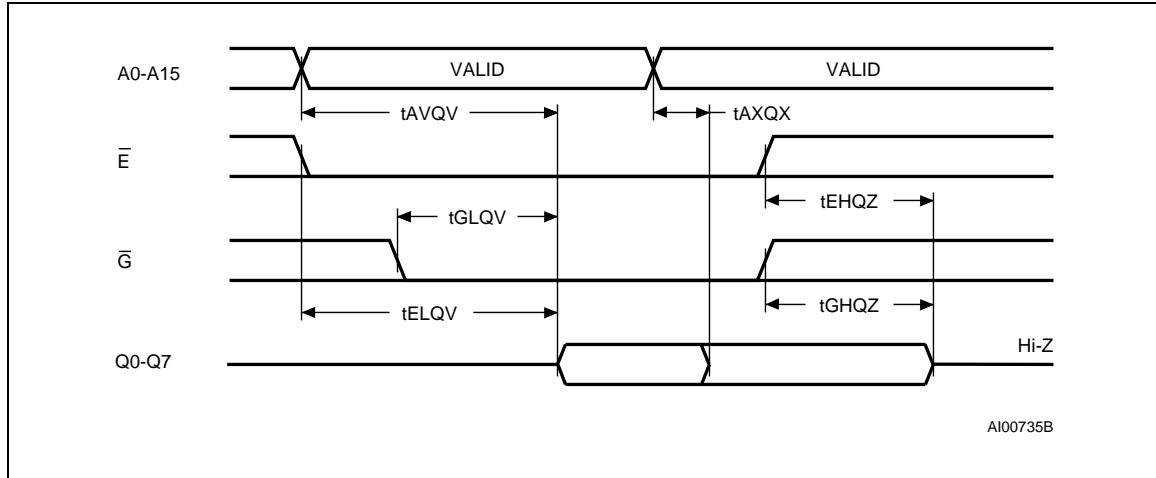


Table 11. Programming mode DC characteristics

Symbol	Parameter	Test Condition ⁽¹⁾⁽²⁾	Min	Max	Unit
I_{LI}	Input Leakage Current	$V_{IL} \leq V_{IN} \leq V_{IH}$		± 10	μA
I_{CC}	Supply Current			50	mA
I_{PP}	Program Current	$\bar{E} = V_{IL}$		50	mA
V_{IL}	Input Low Voltage		-0.3	0.8	V
V_{IH}	Input High Voltage		2	$V_{CC} + 0.5$	V
V_{OL}	Output Low Voltage	$I_{OL} = 2.1 mA$		0.4	V
V_{OH}	Output High Voltage TTL	$I_{OH} = -1 mA$	3.6		V
V_{ID}	A9 Voltage		11.5	12.5	V

1. $T_A = 25^\circ C$; $V_{CC} = 6.25V \pm 0.25V$; $V_{PP} = 12.75V \pm 0.25V$

2. V_{CC} must be applied simultaneously with or before V_{PP} and removed simultaneously or after V_{PP} .

Table 12. Margin Mode AC Characteristics

Symbol	Alt	Parameter	Test Condition ⁽¹⁾⁽²⁾	Min	Max	Unit
t_{A9HVPH}	t_{AS9}	V_{A9} High to V_{PP} High		2		μs
t_{VPHEL}	t_{VPS}	V_{PP} High to Chip Enable Low		2		μs
t_{A10HEH}	t_{AS10}	V_{A10} High to Chip Enable High (Set)		1		μs
t_{A10LEH}	t_{AS10}	V_{A10} Low to Chip Enable High (Reset)		1		μs
t_{EXA10X}	t_{AH10}	Chip Enable Transition to V_{A10} Transition		1		μs
t_{EXVPX}	t_{VPH}	Chip Enable Transition to V_{PP} Transition		2		μs
t_{VPXA9X}	t_{AH9}	V_{PP} Transition to V_{A9} Transition		2		μs

1. $T_A = 25^\circ C$; $V_{CC} = 6.25V \pm 0.25V$; $V_{PP} = 12.75V \pm 0.25V$

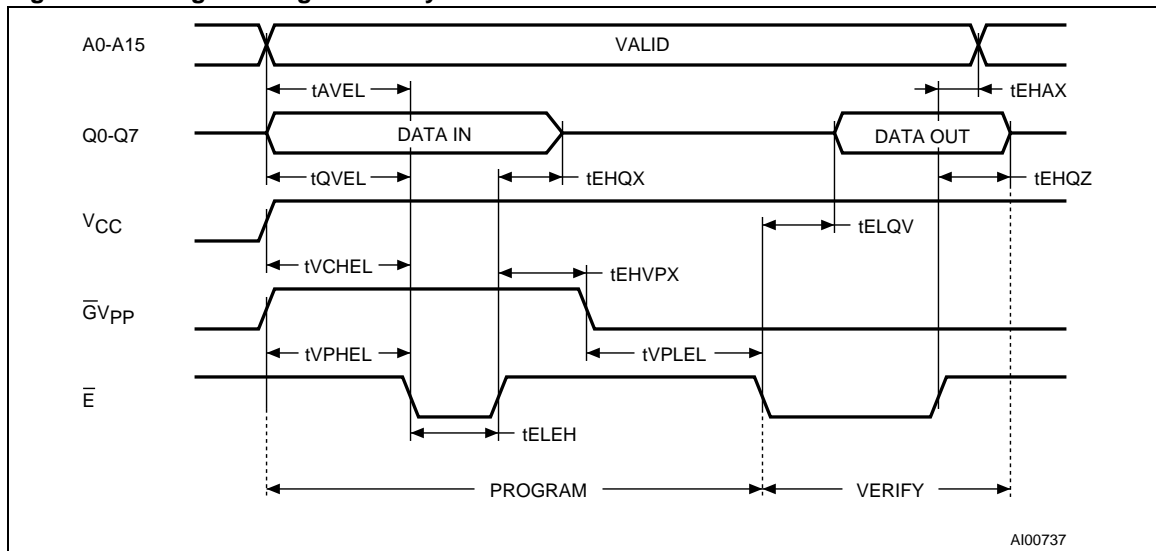
2. V_{CC} must be applied simultaneously with or before V_{PP} and removed simultaneously or after V_{PP} .

Table 13. Programming mode AC characteristics

Symbol	Alt	Parameter	Test Condition ⁽¹⁾⁽²⁾	Min	Max	Unit
t_{AVEL}	t_{AS}	Address Valid to Chip Enable Low		2		μs
t_{QVEL}	t_{DS}	Input Valid to Chip Enable Low		2		μs
t_{VCHEL}	t_{VCS}	V_{CC} High to Chip Enable Low		2		μs
t_{VPHEL}	t_{OES}	V_{PP} High to Chip Enable Low		2		μs
t_{VPLVPH}	t_{PRT}	V_{PP} Rise Time		50		ns
t_{ELEH}	t_{PW}	Chip Enable Program Pulse Width (Initial)		95	105	μs
t_{EHQX}	t_{DH}	Chip Enable High to Input Transition		2		μs
t_{EHVPX}	t_{OEH}	Chip Enable High to V_{PP} Transition		2		μs
t_{VPLEL}	t_{VR}	V_{PP} Low to Chip Enable Low		2		μs
t_{ELQV}	t_{DV}	Chip Enable Low to Output Valid			1	μs
$t_{EHQZ}^{(3)}$	t_{DFP}	Chip Enable High to Output Hi-Z		0	130	ns
t_{EHAX}	t_{AH}	Chip Enable High to Address Transition		0		ns

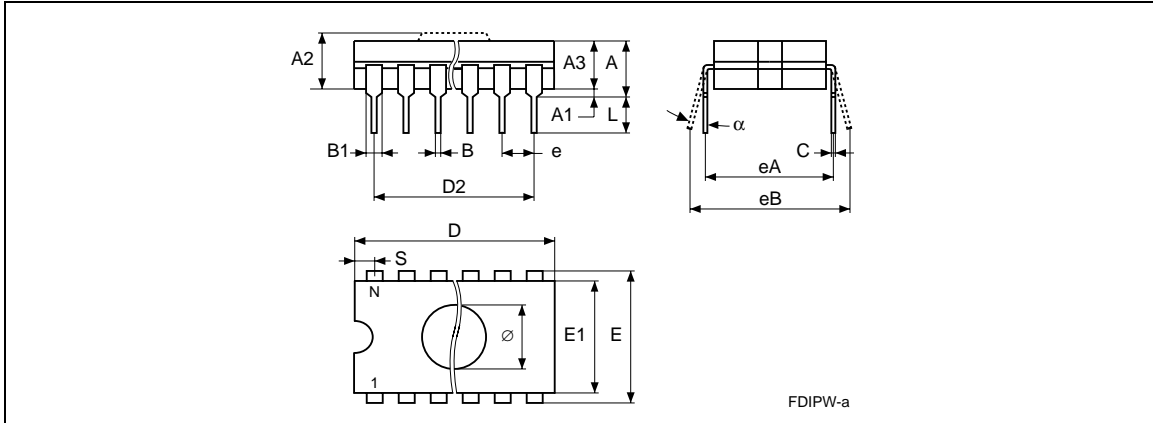
- $T_A = 25\text{ }^\circ\text{C}$; $V_{CC} = 6.25\text{V} \pm 0.25\text{V}$; $V_{PP} = 12.75\text{V} \pm 0.25\text{V}$
- V_{CC} must be applied simultaneously with or before V_{PP} and removed simultaneously or after V_{PP} .
- Sampled only, not 100% tested.

Figure 9. Programming and Verify modes AC waveforms



6 Package mechanical

Figure 10. FDIP28W - 28 pin Ceramic Frit-seal DIP, with window, Package Outline



1. Drawing is not to scale.

Table 14. FDIP28W - 28 pin Ceramic Frit-seal DIP, with window, Package Mechanical Data

Symbol	millimeters			inches		
	Typ	Min	Max	Typ	Min	Max
A			5.72			0.225
A1		0.51	1.40		0.020	0.055
A2		3.91	4.57		0.154	0.180
A3		3.89	4.50		0.153	0.177
B		0.41	0.56		0.016	0.022
B1	1.45	–	–	0.057	–	–
C		0.23	0.30		0.009	0.012
D		36.50	37.34		1.437	1.470
D2	33.02	–	–	1.300	–	–
E	15.24	–	–	0.600	–	–
E1		13.06	13.36		0.514	0.526
e	2.54	–	–	0.100	–	–
eA	14.99	–	–	0.590	–	–
eB		16.18	18.03		0.637	0.710
L		3.18	4.10		0.125	0.161
S		1.52	2.49		0.060	0.098
∅	7.11	–	–	0.280	–	–
α		4°	11°		4°	11°
N		28			28	

7 Part numbering

Table 17. Ordering Information Scheme

Example:	M27C512	-70	X	C	1
Device Type	M27				
Supply Voltage	C = 5V				
Device Function	512 = 512 Kbit (64Kb x8)				
Speed	-45 = 45 ns ⁽¹⁾ -70 = 70 ns -90 = 90 ns -10 = 100 ns -12 = 120 ns -15 = 150 ns				
V_{CC} Tolerance	blank = ± 10% X = ± 5%				
Package	F = FDIP28W B = PDIP28 C = PLCC32				
Temperature Range	1 = 0 to 70 °C 3 = -40 to 125 °C 6 = -40 to 85 °C				

1. High Speed, see AC Characteristics section for further information.

For a list of available options (speed, package, etc.) or for further information on any aspect of this device, please contact your nearest ST Sales Office.