
MR27V401E

524,288-Word × 8-Bit One Time PROM

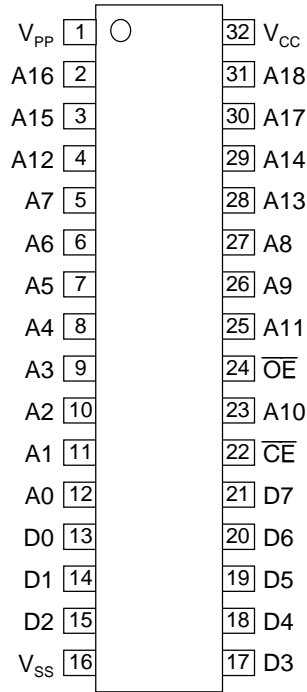
GENERAL DESCRIPTION

The MR27V401E is a 4 Mbit electrically One Time Programmable Read-Only Memory organized as 524,288-word × 8-bit. The MR27V401E supports high speed asynchronous read operation using a single 3.3V power supply.

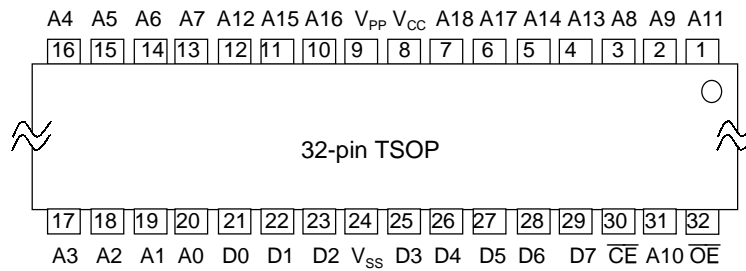
FEATURES

- 524,288-word × 8-bit
- +3.3 V power supply
- Access time 70 nS MAX
- Operating current 25 mA MAX
- Standby current 50 μA MAX
- Input/Output TTL compatible
- Three-state output
- Packages:
 - 32-pin plastic SOP (SOP32-P-525-1.27-K) (Product Name : MR27V401EMA)
 - 32-pin plastic TSOP (TSOP(1)32-P-0814-0.50-K) (Product Name : MR27V401ETA)

PIN CONFIGURATION (TOP VIEW)



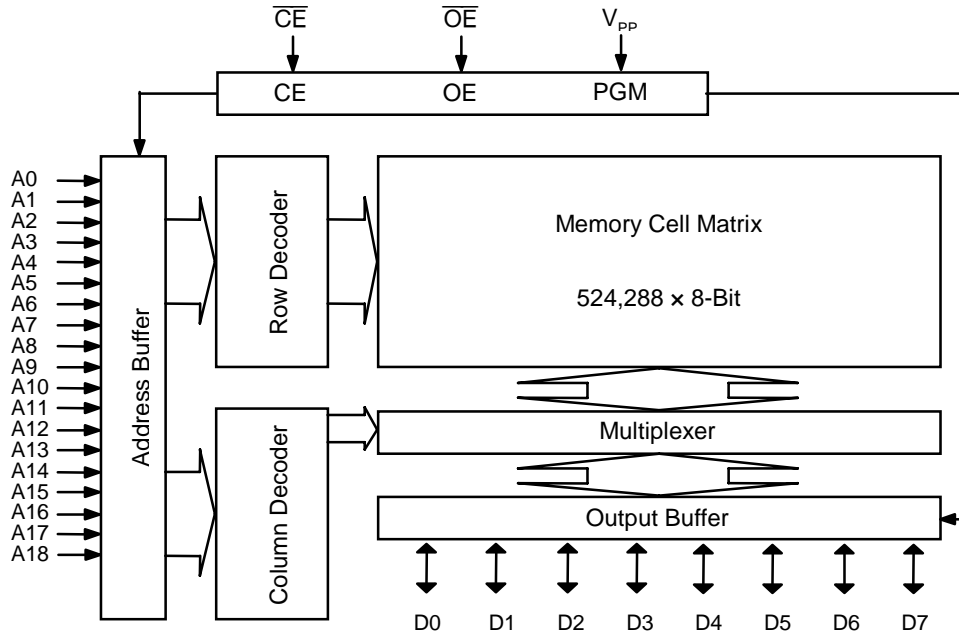
32-pin SOP



32-pin TSOP

Pin name	Functions
A0 to A18	Address input
D0 to D7	Data output
\overline{CE}	Chip enable
\overline{OE}	Output enable
V_{CC}	Power supply voltage
V_{SS}	GND
V_{PP}	Program power supply voltage

BLOCK DIAGRAM



FUNCTION TABLE

Mode	\overline{CE}	\overline{OE}	DC	V_{CC}	D0 to D7
Read	L	L	**	3.3 V	D_{OUT}
Output disable	L	H			Hi-Z
Standby	H	*			Hi-Z
Program	L	H	9.75V	4.0V	D_{IN}
Program Inhibit	H	H			Hi-Z
Program verify	H	L			D_{OUT}

*: Don't Care (H or L)

** : Don't Care (H or L or OPEN)

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Condition	Value	Unit
Operating temperature under bias	Ta	—	0 to 70	°C
Storage temperature	Tstg		-55 to 125	°C
Input voltage	V _I	relative to V _{SS}	-0.5 to V _{CC} +0.5	V
Output voltage	V _O		-0.5 to V _{CC} +0.5	V
Power supply voltage	V _{CC}		-0.5 to 5	V
Program power supply voltage	V _{PP}		-0.5 to 11.5	V
Power dissipation per package	P _D	—	1.0	W

RECOMMENDED OPERATING CONDITIONS

(Ta = 0 to 70°C)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
V _{CC} power supply voltage	V _{CC}	V _{CC} = 3.0 to 3.6 V	3.0	—	3.6	V
V _{PP} power supply voltage	V _{PP}		-0.5	—	V _{CC} +0.5*	V
Input "H" level	V _{IH}		2.2	—	V _{CC} +0.5*	V
Input "L" level	V _{IL}		-0.5**	—	0.6	V

Voltage is relative to V_{SS}.* : V_{CC}+1.5V(Max.) when pulse width of overshoot is less than 10ns.

** : -1.5V(Min.) when pulse width of undershoot is less than 10ns.

ELECTRICAL CHARACTERISTICS

DC Characteristics

($V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$, $T_a = 0\text{ to }70^\circ\text{C}$)

parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input leakage current	I_{LI}	$V_I = 0\text{ to }V_{CC}$	—	—	10	μA
Output leakage current	I_{LO}	$V_O = 0\text{ to }V_{CC}$	—	—	10	μA
V_{CC} power supply current (Standby)	I_{CCSC}	$\overline{CE} = V_{CC}$	—	—	50	μA
	I_{CCST}	$\overline{CE} = V_{IH}$	—	—	1	mA
V_{CC} power supply current (Read)	I_{CCA}	$\overline{CE} = V_{IL}$, $\overline{OE} = V_{IH}$ $t_c = 70\text{ ns}$	—	—	25	mA
V_{PP} power supply current	I_{PP}	$V_{PP} = V_{CC}$	—	—	10	μA
Input "H" level	V_{IH}	—	2.2	—	$V_{CC} + 0.5^*$	V
Input "L" level	V_{IL}	—	-0.5**	—	0.6	V
Output "H" level	V_{OH}	$I_{OH} = -400\ \mu\text{A}$	2.4	—	—	V
Output "L" level	V_{OL}	$I_{OL} = 2.1\ \text{mA}$	—	—	0.4	V

Voltage is relative to V_{SS} .

* : $V_{CC} + 1.5\text{V}$ (Max.) when pulse width of overshoot is less than 10ns.

** : -1.5V (Min.) when pulse width of undershoot is less than 10ns.

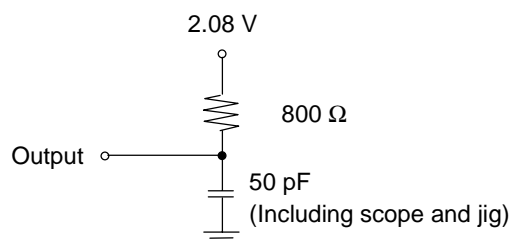
AC Characteristics

($V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$, $T_a = 0\text{ to }70^\circ\text{C}$)

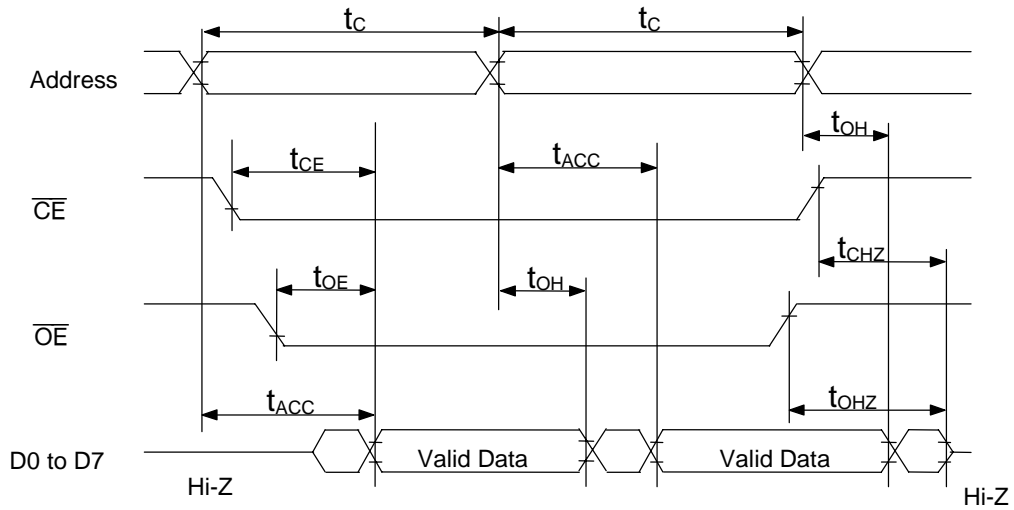
Parameter	Symbol	Condition	Min.	Max.	Unit
Address cycle time	t_C	—	70	—	ns
Address access time	t_{ACC}	$\overline{CE} = \overline{OE} = V_{IL}$	—	70	ns
\overline{CE} access time	t_{CE}	$\overline{OE} = V_{IL}$	—	70	ns
30	t_{OE}	$\overline{CE} = V_{IL}$	—	35	ns
Output disable time	t_{CHZ}	$\overline{OE} = V_{IL}$	0	30	ns
	t_{OHZ}	$\overline{CE} = V_{IL}$	0	25	ns
Output hold time	t_{OH}	$\overline{CE} = \overline{OE} = V_{IL}$	0	—	ns

Measurement conditions

- Input signal level----- 0 V/3 V
- Input timing reference level ----- 0.8 V/2.0 V
- Output load ----- 50 pF
- Output timing reference level----- 0.8 V/2.0 V



TIMING CHART (READ CYCLE)



ELECTRICAL CHARACTERISTICS (PROGRAMMING OPERATION)**DC Characteristics**

(Ta = 25°C ± 5°C)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input leakage current	I _{LI}	V _I = V _{CC} +0.5 V	—	—	10	μA
V _{PP} power supply current (Program)	I _{PP2}	$\overline{CE} = V_{IL}$	—	—	50	mA
V _{CC} power supply current	I _{CC}	—	—	—	80	mA
Input "H" level	V _{IH}	—	3.0	—	V _{CC} +0.5	V
Input "L" level	V _{IL}	—	-0.5	—	0.8	V
Output "H" level	V _{OH}	I _{OH} = -400 μA	2.4	—	—	V
Output "L" level	V _{OL}	I _{OL} = 2.1 mA	—	—	0.45	V
Program voltage	V _{PP}	—	9.5	9.75	10.0	V
V _{CC} power supply voltage	V _{CC}	—	3.9	4.0	4.1	V

Voltage is relative to V_{SS}.**AC Characteristics**(V_{CC} = 4.0 V ± 0.1 V, V_{PP} = 9.75 V ± 0.25 V, Ta = 25°C ± 5°C)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Address set-up time	t _{AS}	—	100	—	—	ns
\overline{OE} set-up time	t _{OES}	—	2	—	—	μs
Data set-up time	t _{DS}	—	100	—	—	ns
Address hold time	t _{AH}	—	2	—	—	μs
Data hold time	t _{DH}	—	100	—	—	ns
Output float delay time from \overline{OE}	t _{OHZ}	—	0	—	100	ns
V _{PP} voltage set-up time	t _{VS}	—	2	—	—	μs
Program pulse width	t _{PW}	—	9	10	11	μs
Data valid from \overline{OE}	t _{OE}	—	—	—	100	ns
Address hold from \overline{OE} high	t _{AOH}	—	0	—	—	ns

Pin Check Function

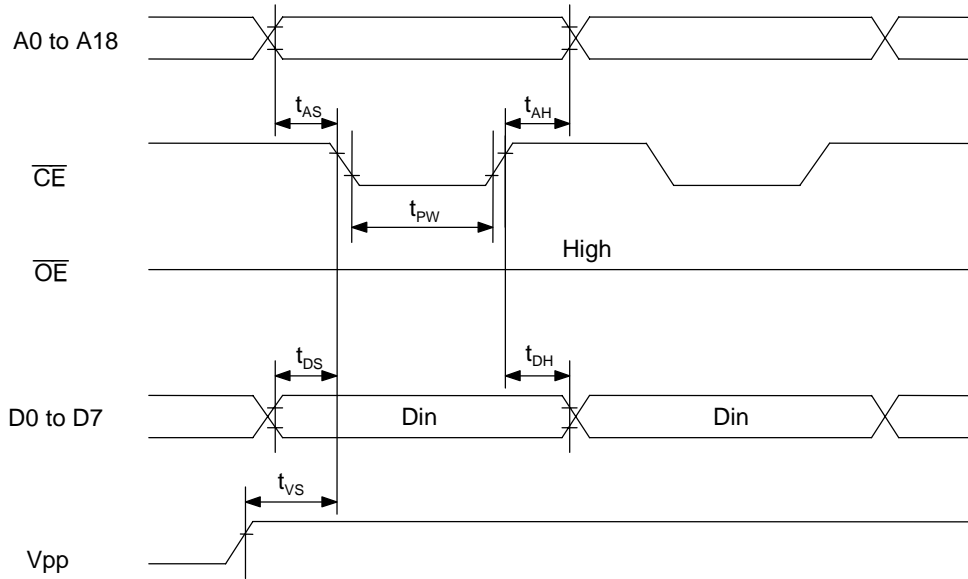
Pin Check Function is to check contact between each device-pin and each socket-lead with EPROM programmer. Setting up address as following condition call the preprogrammed codes on device outputs.

(V_{CC} = 3.3 V ± 0.3 V, $\overline{CE} = V_{IL}$, $\overline{OE} = V_{IL}$, Ta = 25°C ± 5°C)

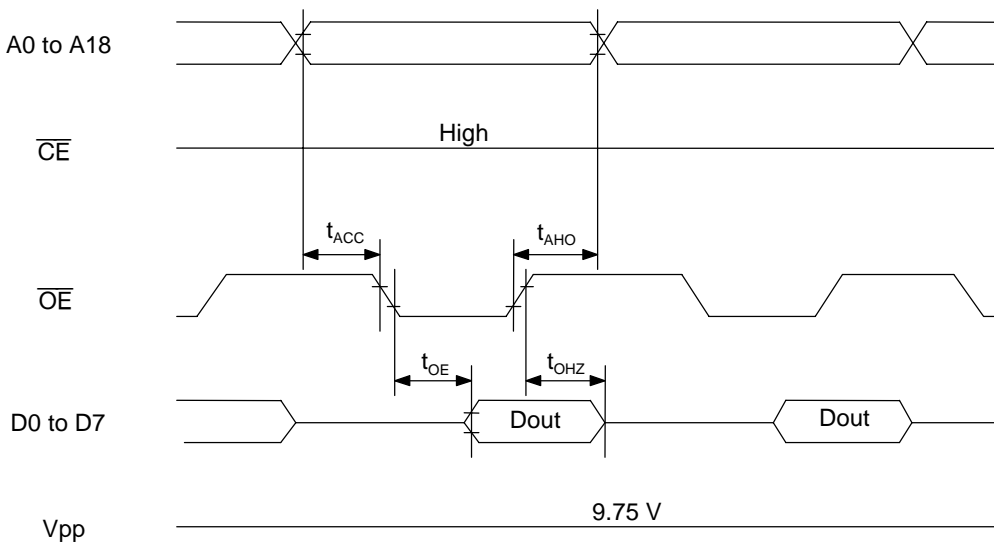
A0	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	DATA
0	1	0	1	0	1	0	1	0	VH	1	1	0	1	0	1	0	1	0	AA
1	0	1	0	1	0	1	0	1	VH	0	0	1	0	1	0	1	0	1	55
Other conditions																			FF

*: VH = 8 V ± 0.25 V

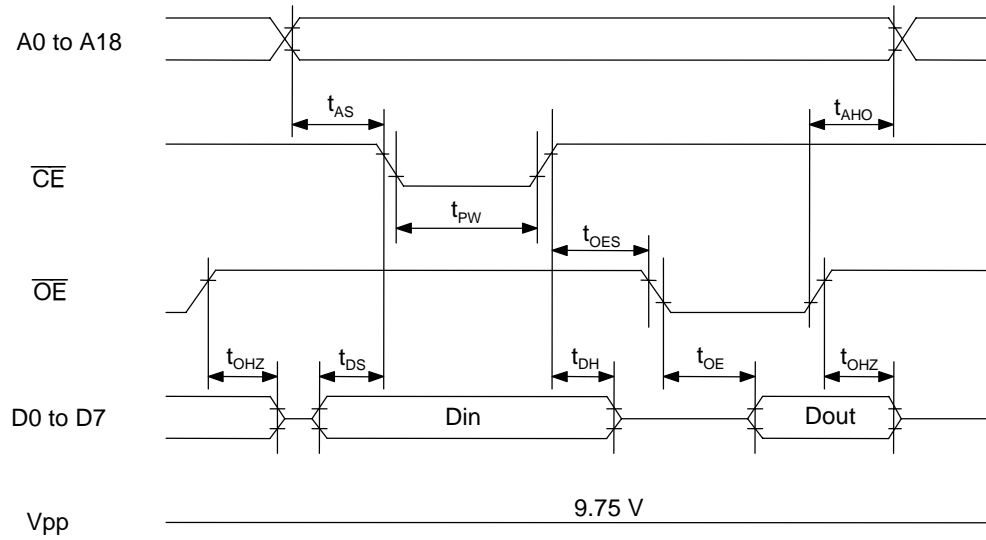
Consecutive Programming Waveforms



Consecutive Program Verify Waveforms



Program and Program Verify Cycle Waveforms

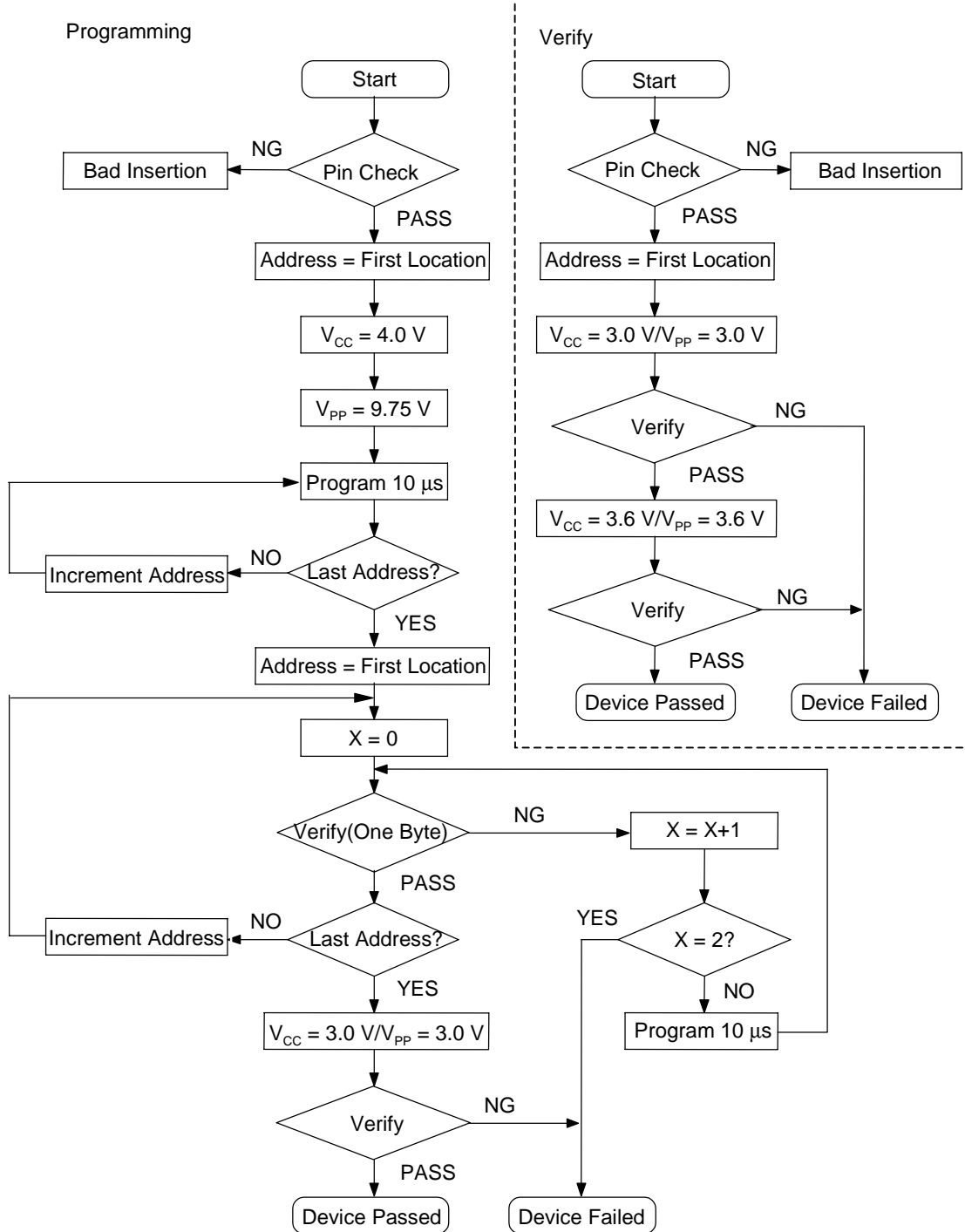


Pin Capacitance

($V_{CC} = 3.3\text{ V}$, $T_a = 25^\circ\text{C}$, $f = 1\text{ MHz}$)

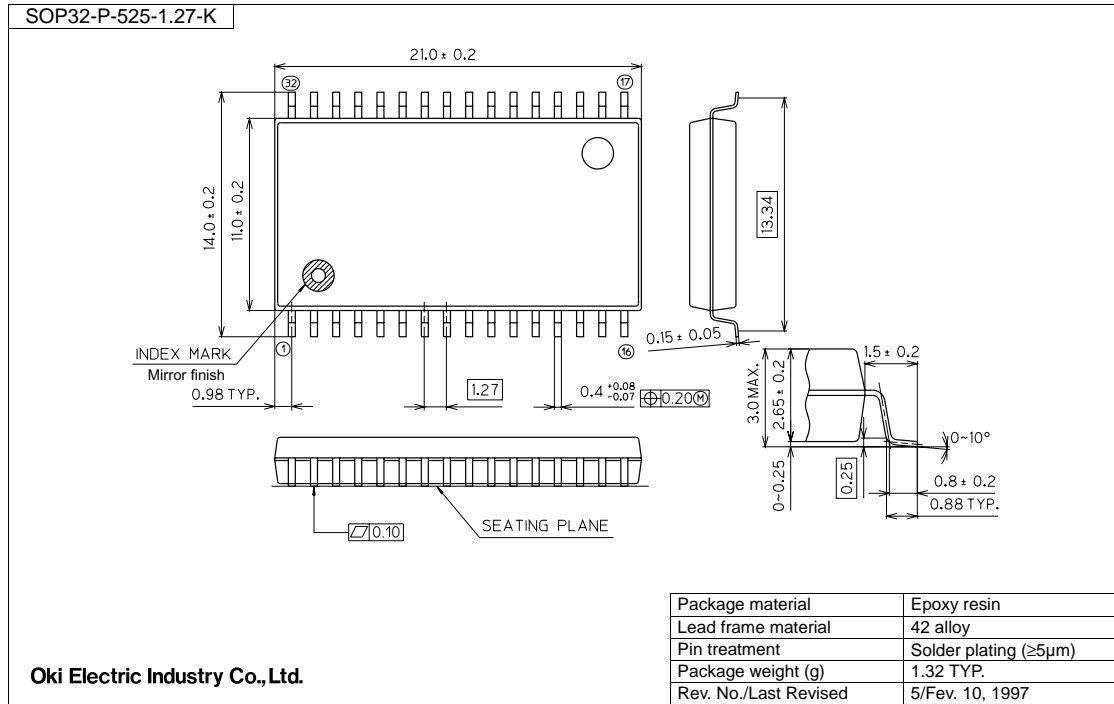
Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input	C_{IN1}	$V_I = 0\text{ V}$	—	—	8	pF
Output	C_{OUT}	$V_O = 0\text{ V}$	—	—	10	

Programming/Verify Flow Chart



PACKAGE DIMENSIONS

(Unit: mm)

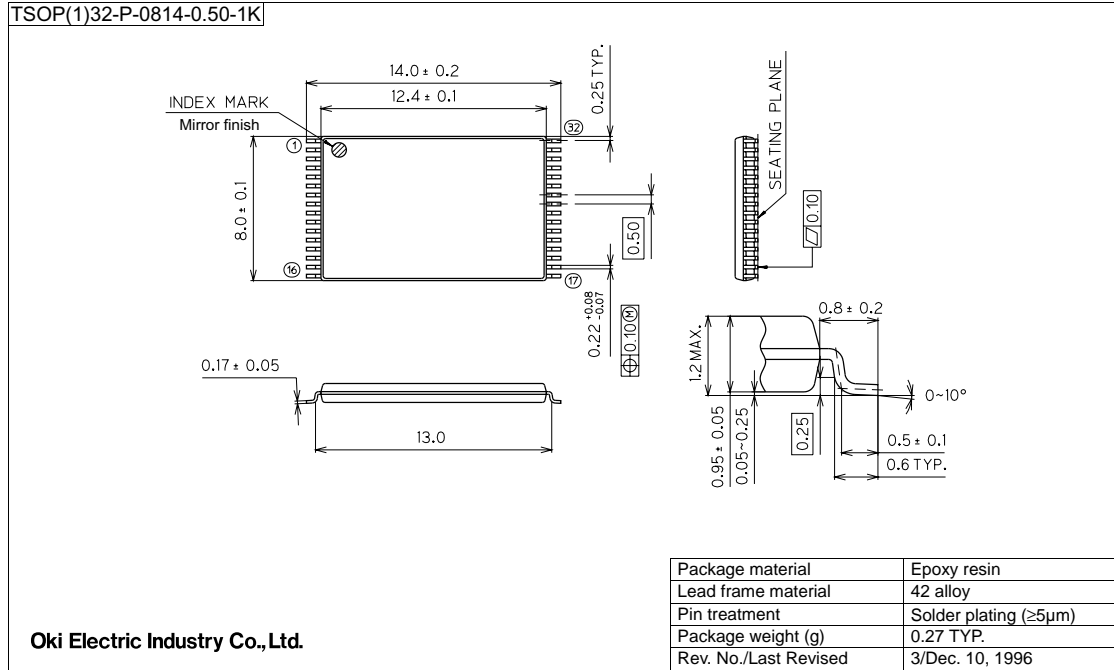


Notes for Mounting the Surface Mount Type Package

The surface mount type packages are very susceptible to heat in reflow mounting and humidity absorbed in storage.

Therefore, before you perform reflow mounting, contact Oki's responsible sales person for the product name, package name, pin number, package code and desired mounting conditions (reflow method, temperature and times).

(Unit: mm)



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