FEDR27V401E-01-03
Issue Date: Jan. 15, 2004

OKI Semiconductor

MR27V401E

524,288-Word × 8-Bit One Time PROM

GENERAL DESCRIPTION

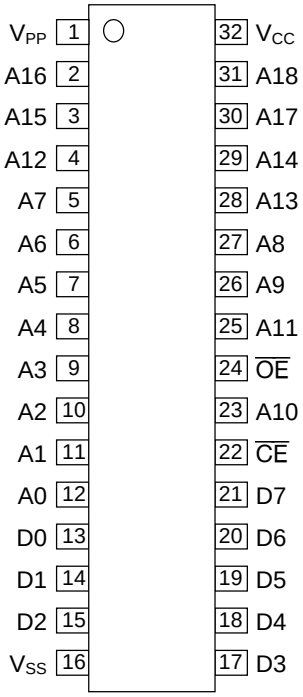
The MR27V401E is a 4 Mbit electrically One Time Programmable Read-Only Memory organized as 524,288-word × 8-bit. The MR27V401E supports high speed asynchronous read operation using a single 3.3V power supply.

FEATURES

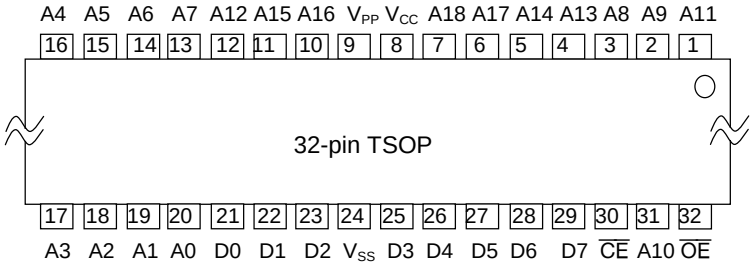
· 524,288-word × 8-bit
· +3.3 V power supply
· Access time 70 nS MAX
· Operating current 25 mA MAX
· Standby current 50 µA MAX
· Input/Output TTL compatible
· Three-state output
· Packages:

32-pin plastic SOP	(SOP32-P-525-1.27-K)	(MR27V401EMA)
32-pin plastic TSOP	(TSOP(1)32-P-0814-0.50-1K)	(MR27V401ETA)
32-pin plastic DIP	(DIP32-P-600-2.54)	(MR27V401ERA)

PIN CONFIGURATION (TOP VIEW)

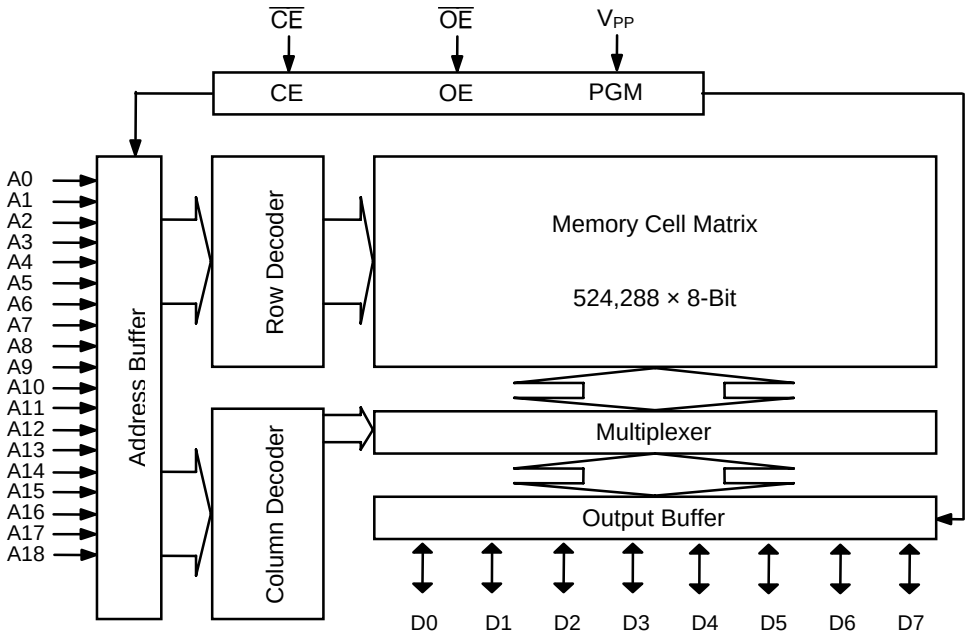


32-pin SOP/DIP



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}.

* : Vcc+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 V ± 0.3 V, Ta = 0 to 70°C)

parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input leakage current	I_{LI}	V_I = 0 to V_{CC}	—	—	10	μA
Output leakage current	I_{LO}	V_O = 0 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} tc = 70 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 μA	2.4	—	—	V
Output "L" level	V_{OL}	I_{OL} = 2.1 mA	—	—	0.4	V

Voltage is relative to V_{SS}.

* : Vcc+1.5V(Max.) when pulse width of overshoot is less than 10ns.

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

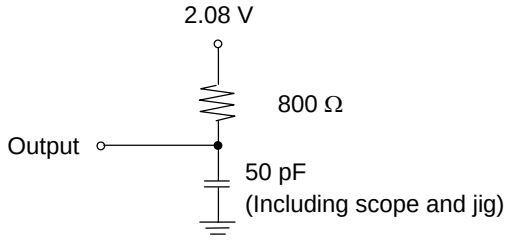
AC Characteristics

(V_{CC} = 3.3 V ± 0.3 V, Ta = 0 to 70°C)

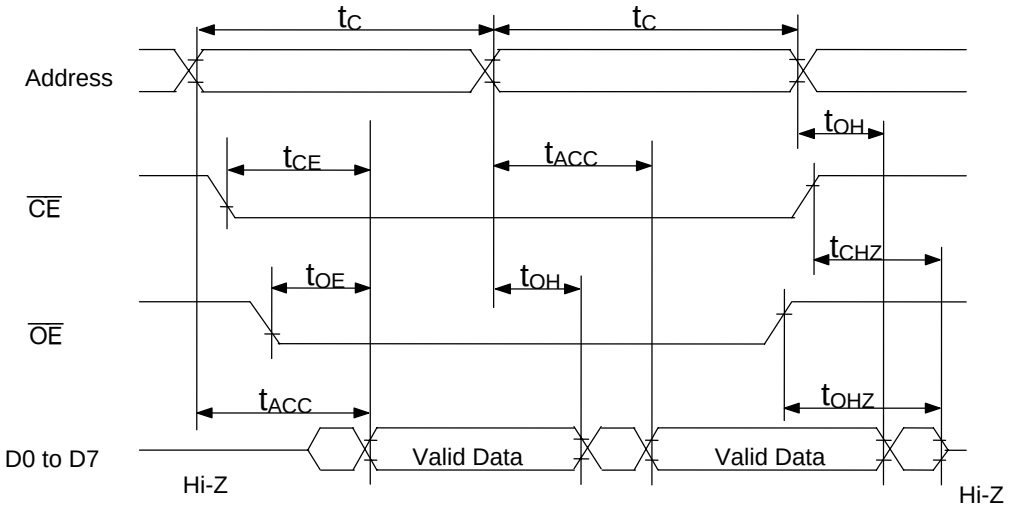
Parameter	Symbol	Condition	Min.	Max.	Unit
Address cycle time	t_C	—	70	—	ns
Address access time	t_{ACC}	$\overline{CE}$ = $\overline{OE}$ = V_{IL}	—	70	ns
$\overline{CE}$ access time	t_{CE}	$\overline{OE}$ = V_{IL}	—	70	ns
30	t_{OE}	$\overline{CE}$ = V_{IL}	—	35	ns
Output disable time	t_{CHZ}	$\overline{OE}$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

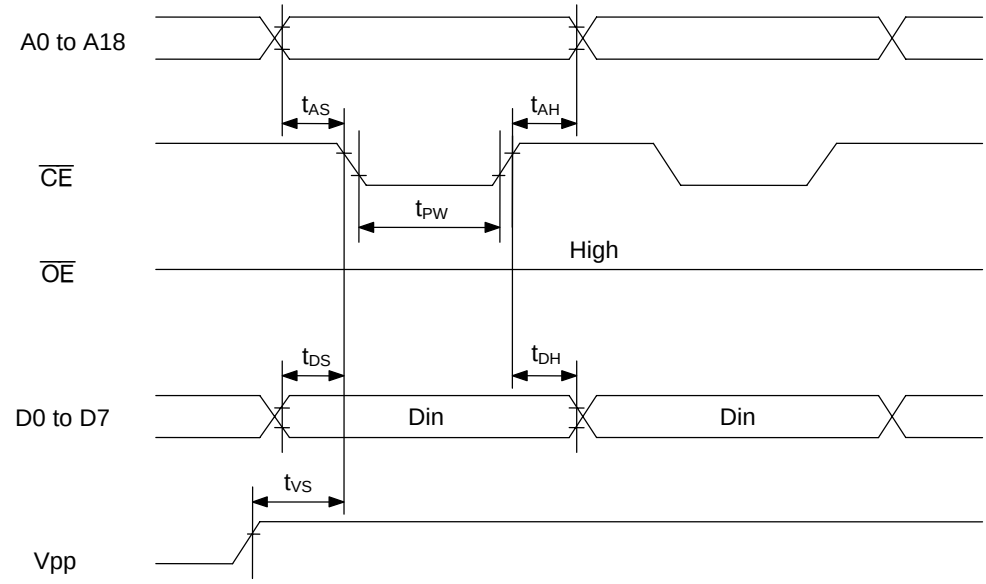
Pin Check Function is to check contact between each device-pin and each socket-lead with EPROM programmer. Setting up address as following condition call the preprogrammed codes on device outputs.

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

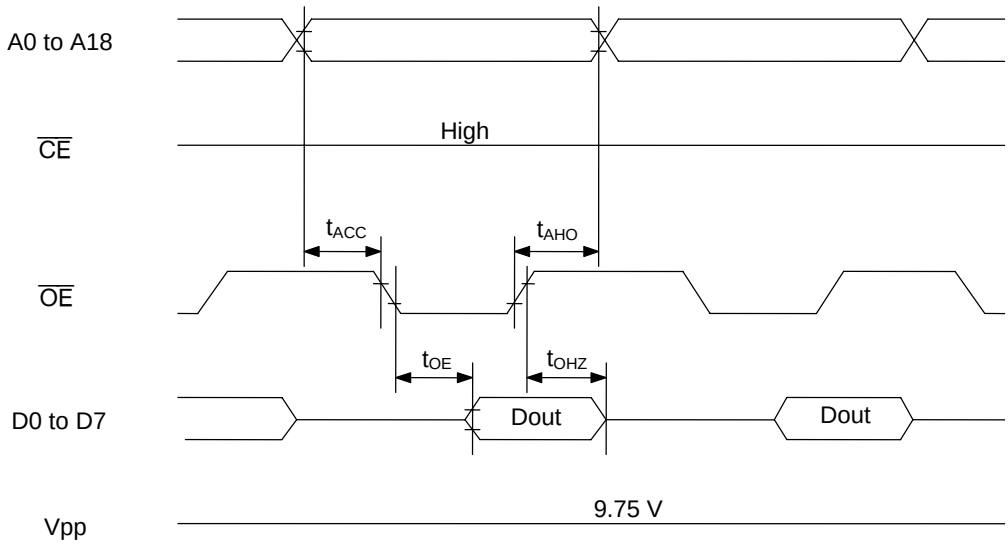
A0	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	DATA
0	1	0	1	0	1	0	1	0	VH*	1	1	0	1	0	1	0	1	0	AA
1	0	1	0	1	0	1	0	1	VH*	0	0	1	0	1	0	1	0	1	55
Other conditions																			FF

*: VH = 8 V ± 0.25 V

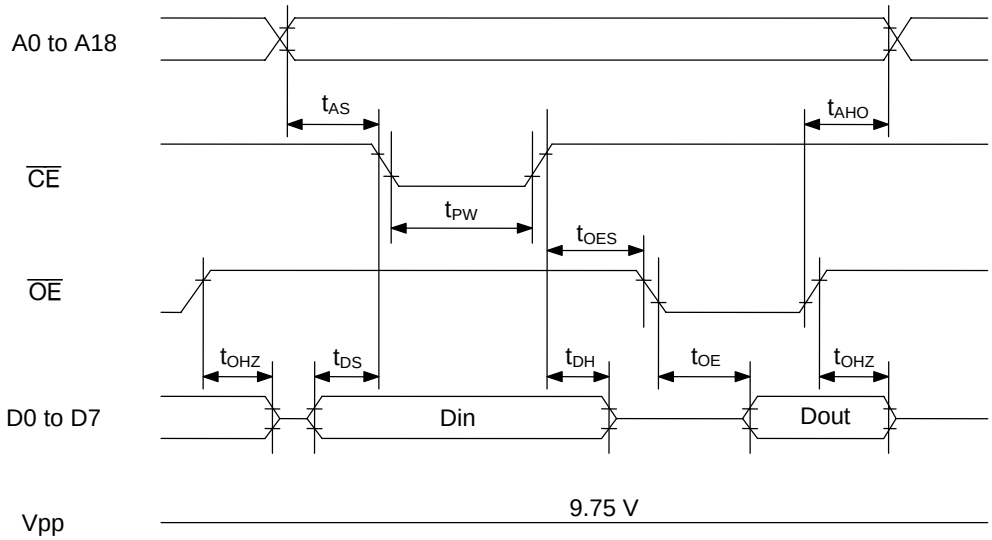
Consecutive Programming Waveforms



Consecutive Program Verify Waveforms



Program and Program Verify Cycle Waveforms

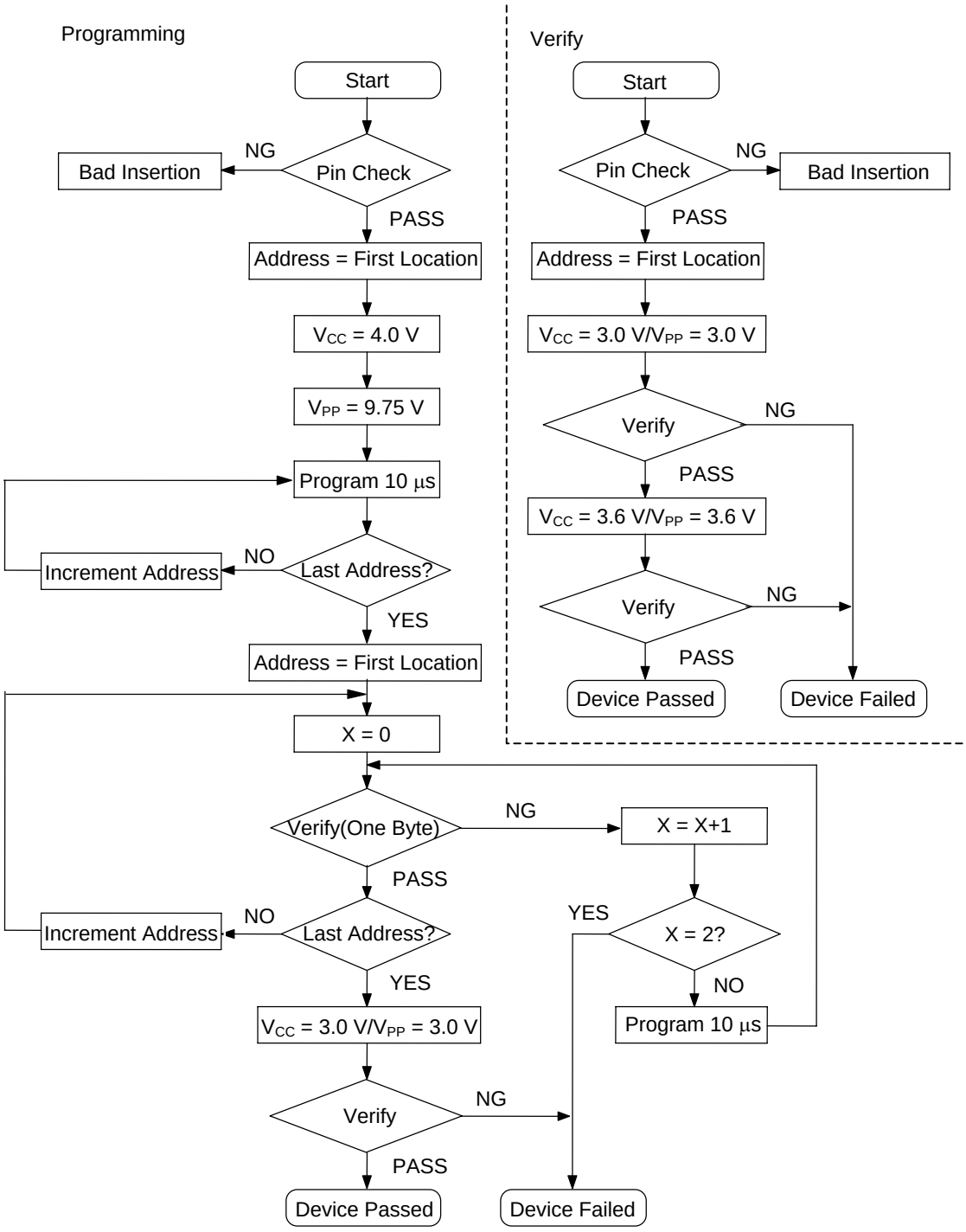


Pin Capacitance

(V_{CC} = 3.3 V, Ta = 25°C, f = 1 MHz)

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

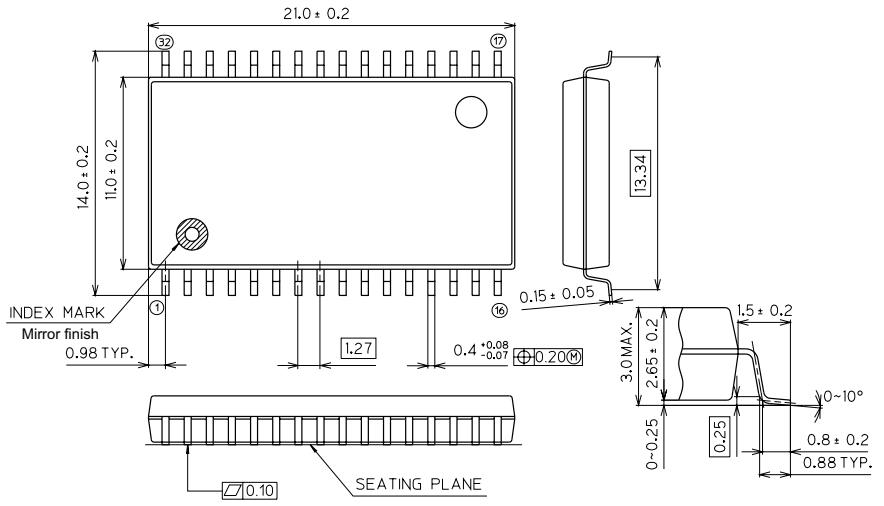
Programming/Verify Flow Chart



PACKAGE DIMENSIONS

(Unit: mm)

SOP32-P-525-1.27-K



Package material	Epoxy resin
Lead frame material	42 alloy
Pin treatment	Solder plating (≥5µm)
Package weight (g)	1.32 TYP.
Rev. No./Last Revised	5/Fev. 10, 1997

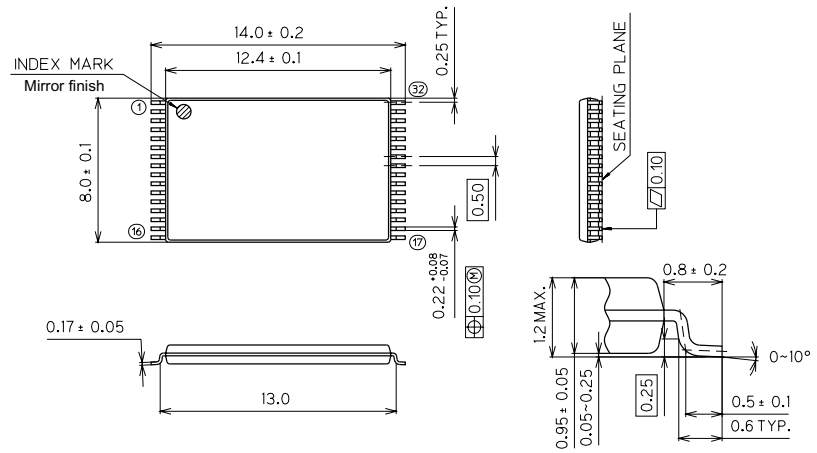
Oki Electric Industry Co., Ltd.

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)

TSOP(1)32-P-0814-0.50-1K



Package material	Epoxy resin
Lead frame material	42 alloy
Pin treatment	Solder plating (≥5µm)
Package weight (g)	0.27 TYP.
Rev. No./Last Revised	3/Dec. 10, 1996

Oki Electric Industry Co., Ltd.

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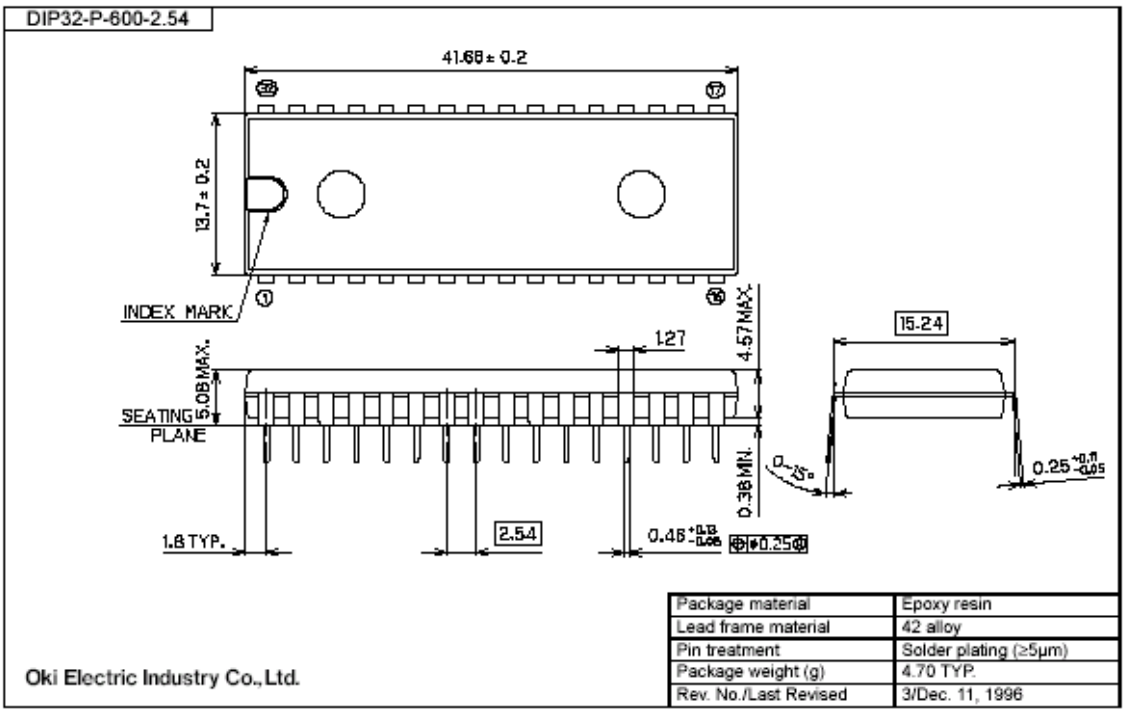
(Unit: mm)



Package material	Epoxy resin
Lead frame material	42 alloy
Pin treatment	Solder plating (≥5μm)
Package weight (g)	4.70 TYP.
Rev. No./Last Revised	3/Dec. 11, 1996

REVISION HISTORY

Document No.	Date	Page		Description
		Previous Edition	Current Edition	
FEDR27V401E-01-02	Sep. 2001	–	–	Final edition 2
FEDR27V401E-01-03	Jan. 15, 2004	1, 2	1, 2, 13	Added 32DIP package.

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2. The outline of action and examples for application circuits described herein have been chosen as an explanation for the standard action and performance of the product. When planning to use the product, please ensure that the external conditions are reflected in the actual circuit, assembly, and program designs.

3. When designing your product, please use our product below the specified maximum ratings and within the specified operating ranges including, but not limited to, operating voltage, power dissipation, and operating temperature.

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