

OKI Semiconductor

FEDR27V402E-01-03

Issue Date: Jan. 15, 2004

MR27V402E

262,144-Word × 16-Bit or 524,288-Word × 8-Bit One Time PROM

GENERAL DESCRIPTION

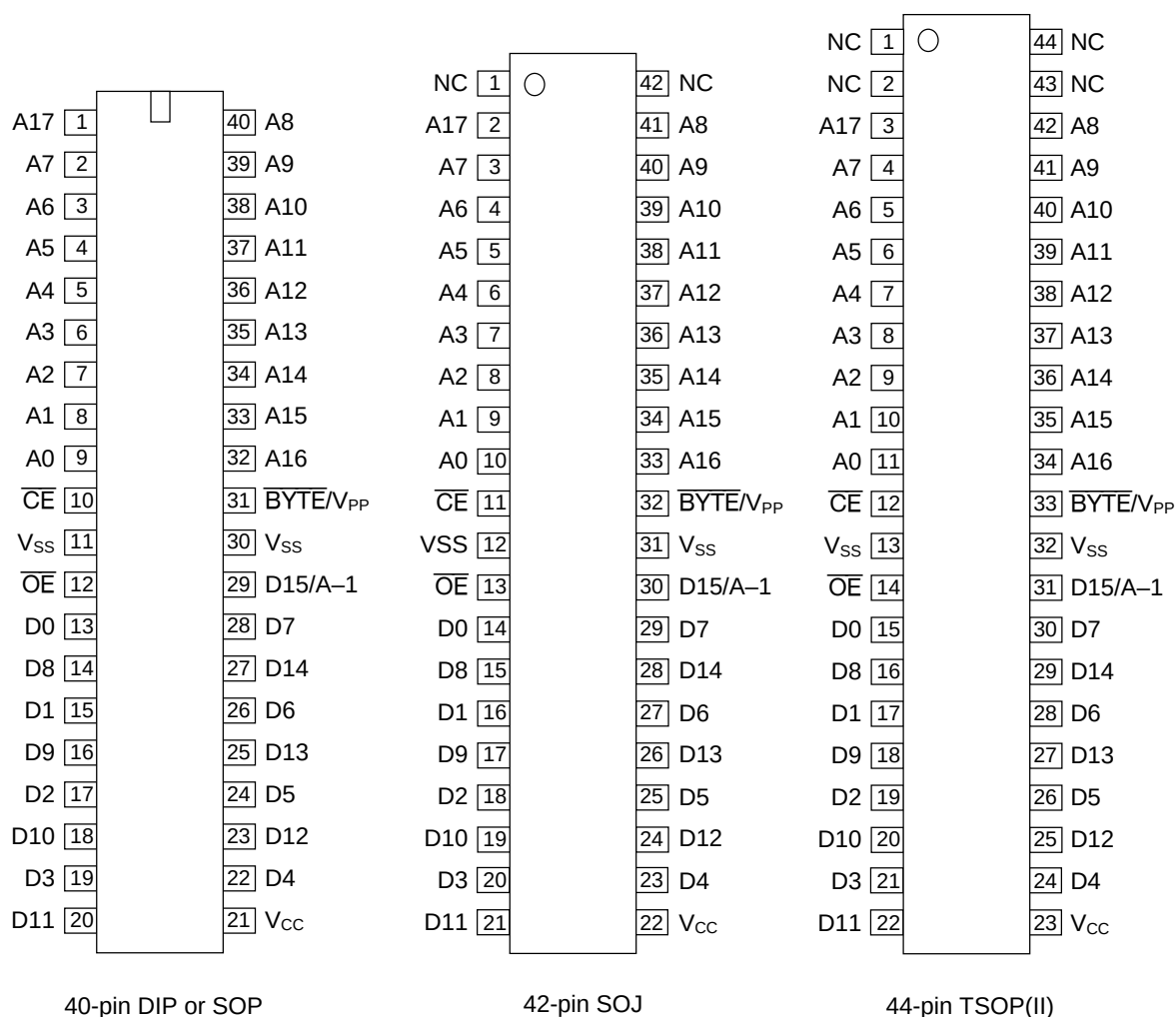
The MR27V402E is a 4 Mbit One Time Programmable Read-Only Memory that can be electrically switched between 262,144-word × 16-bit and 524,288-word × 8-bit by the state of the BYTE pin. The MR27V402E supports high speed asynchronous read operation using a single 3.3V power supply.

FEATURES

- 262,144-word × 16-bit/524,288-word × 8-bit electrically switchable configuration
- +3.3 V power supply
- Access time 80 nS MAX
- Operating current 30 mA MAX
- Standby current 50 µA MAX
- Input/Output TTL compatible
- Three-state output
- Packages:

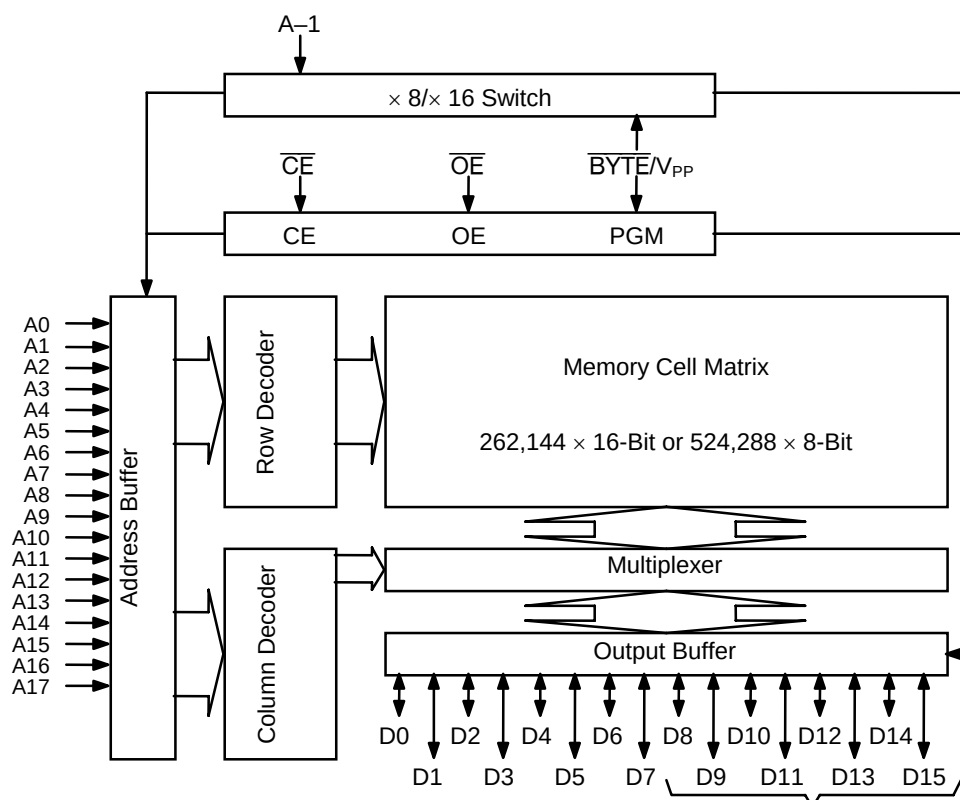
40-pin plastic DIP	(DIP40-P-600-2.54)	(MR27V402ERP)
40-pin plastic SOP	(SOP40-P-525-1.27-K)	(MR27V402EMP)
44-pin plastic TSOP	(TSOP(2)44-P-400-0.80-K)	(MR27V402ETP)
42-pin plastic SOJ	(SOJ42-P-400-1.27)	(MR27V402EJA)

PIN CONFIGURATION (TOP VIEW)



Pin name	Functions
D15/A-1	Data output / Address input
A0 to A17	Address input
D0 to D14	Data output
$\overline{CE}$	Chip enable
$\overline{OE}$	Output enable
BYTE/ V_{PP}	Mode switch / Program power supply voltage
V_{CC}	Power supply voltage
V_{SS}	GND
NC	Non connection

BLOCK DIAGRAM



In 8-bit output mode, these pins are placed in a high-Z state and pin D15 functions as the A-1 address pin.

FUNCTION TABLE

Mode	$\overline{\text{CE}}$	$\overline{\text{OE}}$	$\overline{\text{BYTE}}$	V_{CC}	D0 to D7	D8 to D14	D15/A–1
Read (16-Bit)	L	L	H	3.3 V	D _{OUT}		
Read (8-Bit)	L	L	L		D _{OUT}	Hi–Z	L/H
Output disable	L	H	H		Hi–Z		
			L				
Standby	H	*	H		Hi–Z		
			L				
Program	L	H	9.75 V	4.0 V	D _{IN}		
Program inhibit	H	H			Hi–Z		
Program verify	H	L			D _{OUT}		

*: Don't Care (H or L)

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

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

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 = 80 ns	—	—	30	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}.* : V_{CC}+1.5 V(Max.) when pulse width of overshoot is less than 10 ns.

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

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	—	80	—	ns
Address access time	t _{ACC}	$\overline{CE} = \overline{OE} = V_{IL}$	—	80	ns
$\overline{CE}$ access time	t _{CE}	$\overline{OE} = V_{IL}$	—	80	ns
$\overline{OE}$ access time	t _{OE}	$\overline{CE} = V_{IL}$	—	40	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

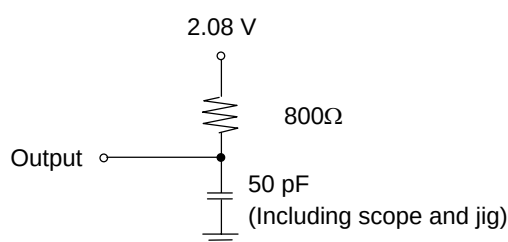
Measurement conditions

Input signal level----- 0 V/3 V

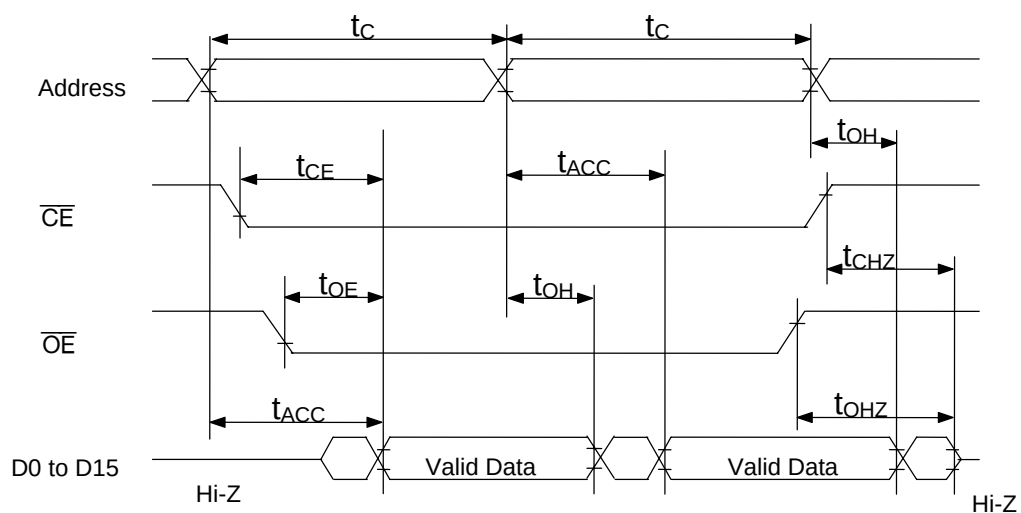
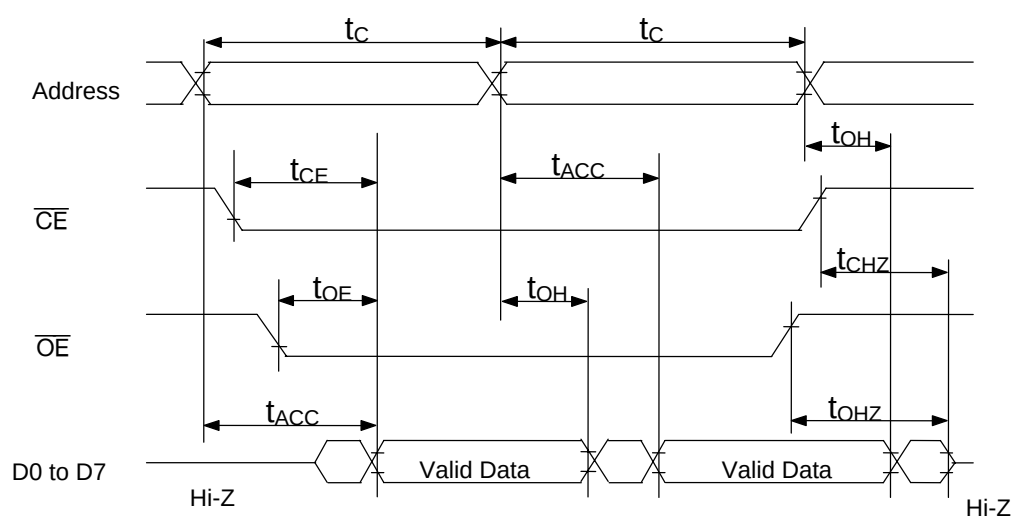
Input timing reference level----- 0.8 V/2.0 V

Output load ----- 50 pF

Output timing reference level----- 0.8 V/2.0 V



Timing Chart (Read Cycle)

16-Bit Read Mode ($\overline{\text{BYTE}} = V_{IH}$)8-Bit Read Mode ($\overline{\text{BYTE}} = V_{IL}$)

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}	$\overline{\text{CE}} = V_{\text{IL}}$	—	—	50	mA
V _{CC} power supply current	I _{CC}	—	—	—	50	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, $\overline{\text{BYTE}}/\text{V}_{\text{PP}} = 9.75 \text{ V} \pm 0.25 \text{ V}$, Ta = 25°C ±5°C)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Address set-up time	t _{AS}	—	100	—	—	ns
$\overline{\text{OE}}$ 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 $\overline{\text{OE}}$	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 $\overline{\text{OE}}$	t _{OE}	—	—	—	100	ns
Address hold from $\overline{\text{OE}}$ high	t _{AOH}	—	0	—	—	ns

Pin Check Function

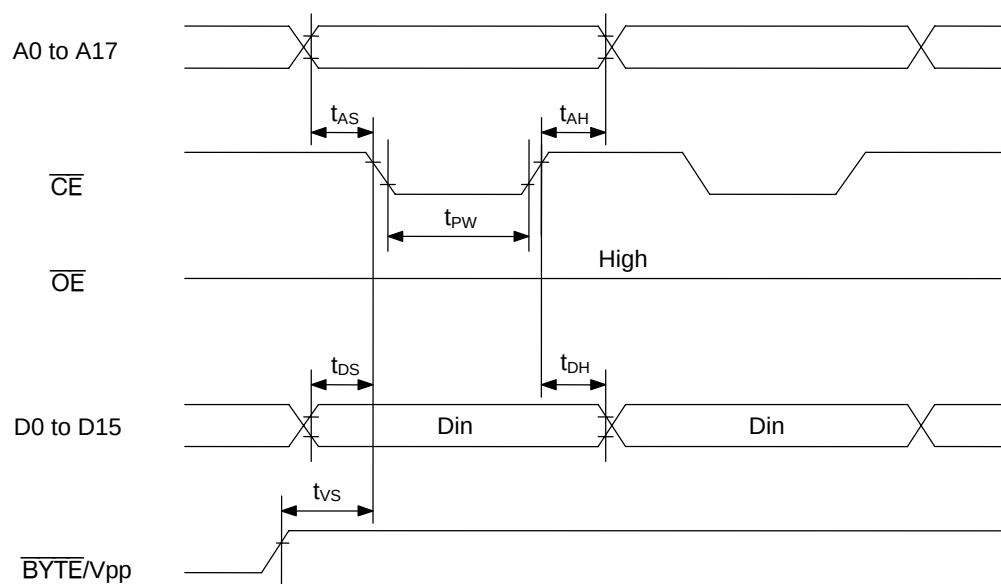
Pin Check Function is to check contact between each device-pin and each socket-lead with EPROM programmer. Setting up address as following condition call the preprogrammed codes on device outputs.

(V_{CC} = 3.3 V ±0.3 V, $\overline{\text{CE}} = V_{\text{IL}}$, $\overline{\text{OE}} = V_{\text{IL}}$, $\overline{\text{BYTE}}/\text{V}_{\text{PP}} = V_{\text{IH}}$, Ta = 25°C ±5°C)

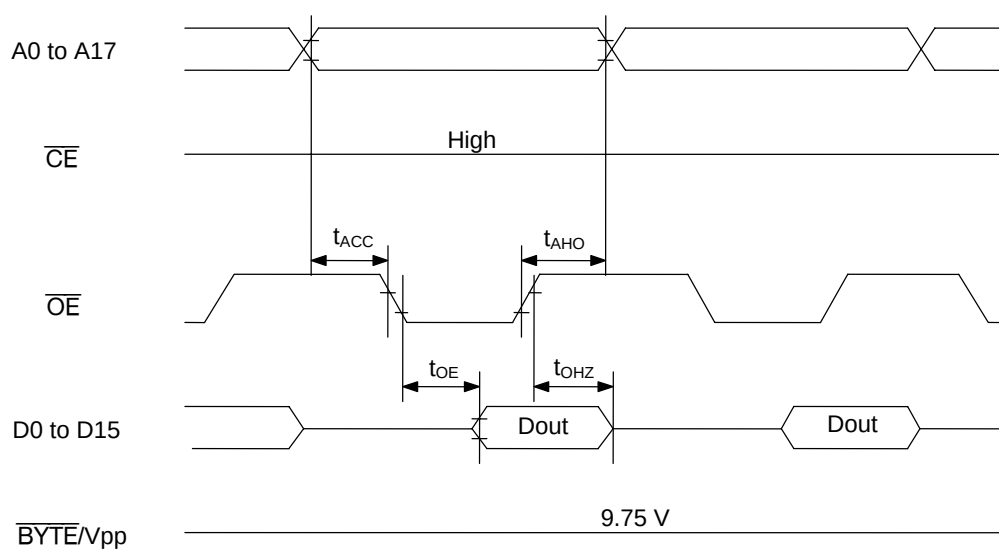
A0	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	DATA
0	1	0	1	0	1	0	1	0	VH*	0	1	0	1	0	1	0	0	FF00
1	0	1	0	1	0	1	0	1	VH*	1	0	1	0	1	0	1	1	00FF
Other conditions																		FFFF

*: VH = 8 V ±0.25 V

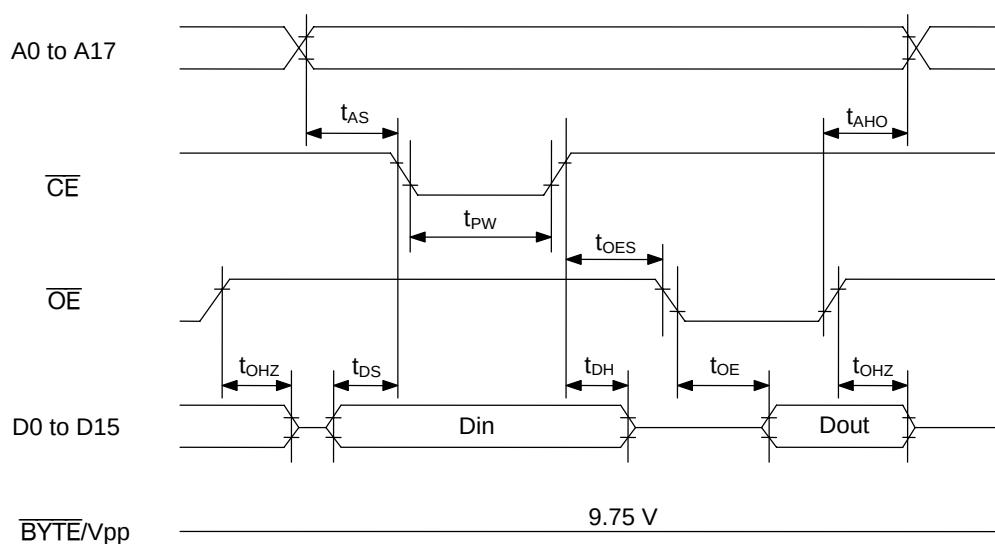
Consecutive Programming Waveforms



Consecutive Program Verify Waveforms



Program and Program Verify Cycle Waveforms



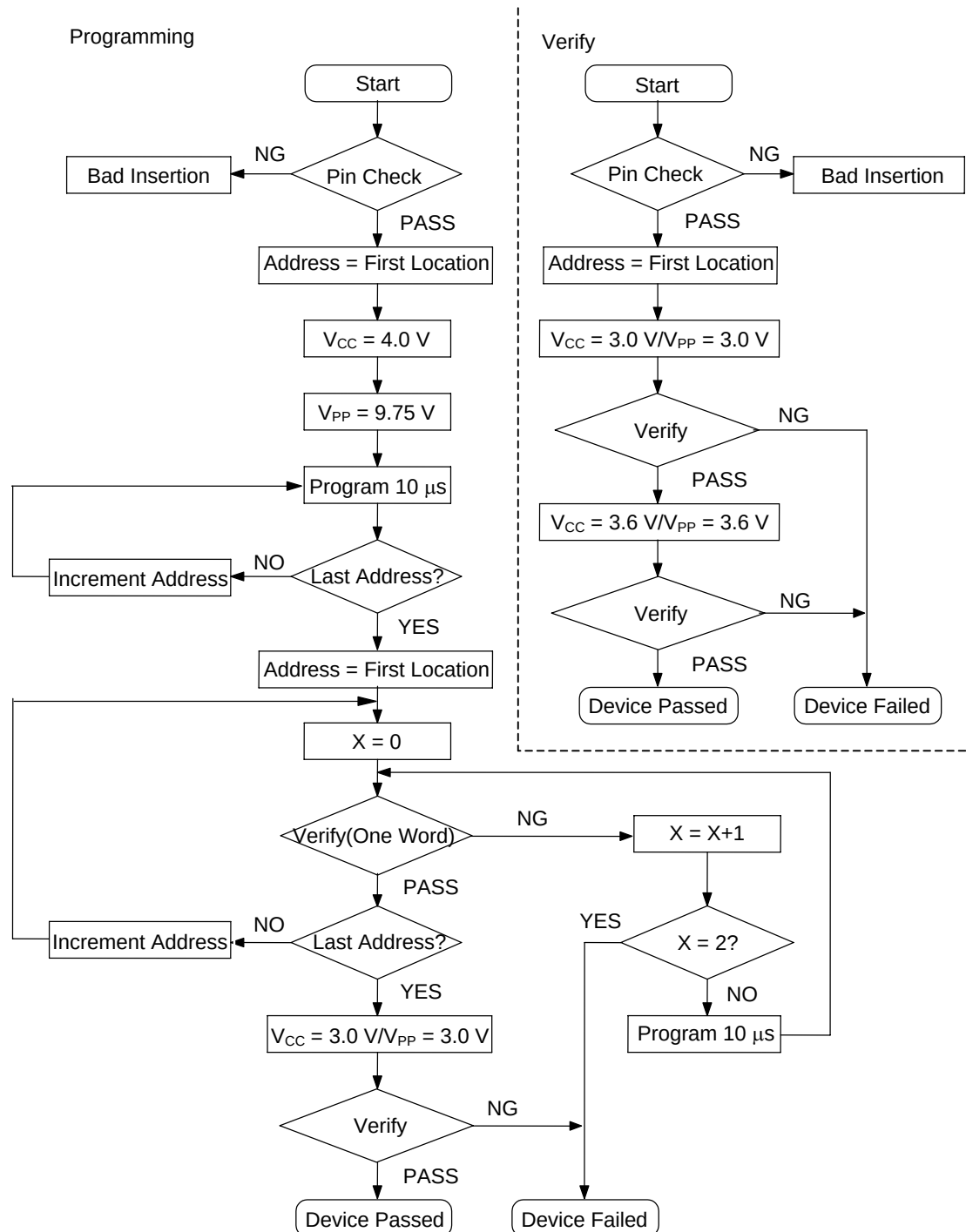
Pin Capacitance

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

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input	C_{IN1}	$V_I = 0 \text{ V}$	—	—	8 (10)	pF
$\overline{\text{BYTE}}/V_{PP}$	C_{IN2}		—	—	60	
Output	C_{OUT}	$V_O = 0 \text{ V}$	—	—	10 (12)	

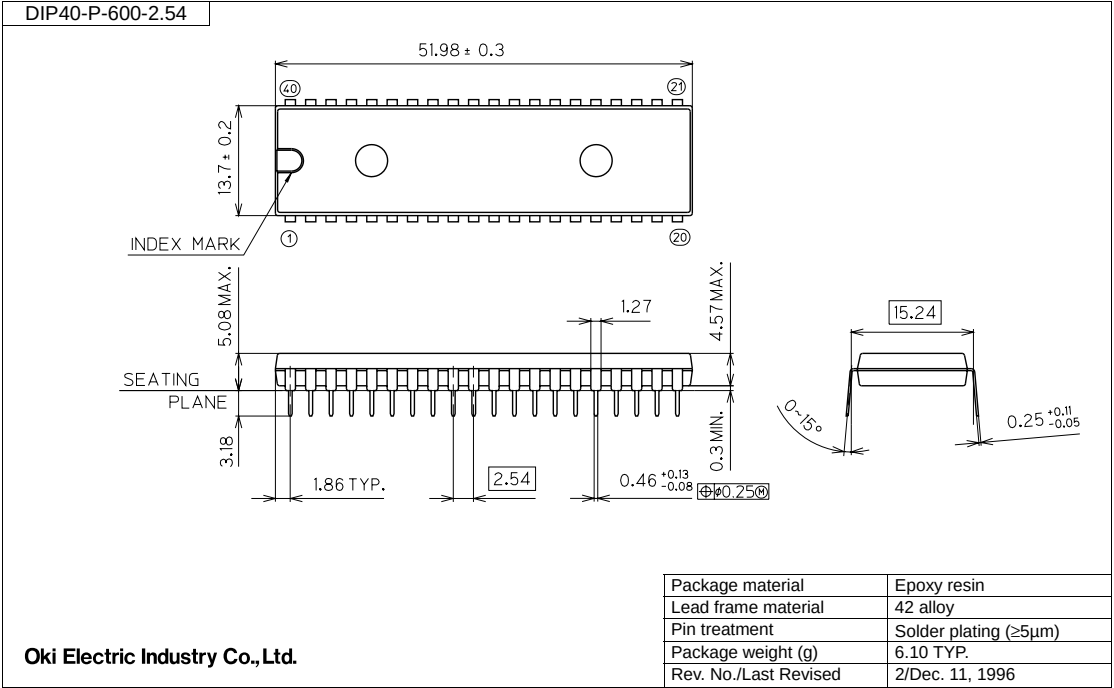
() : DIP only

Programming/Verify Flow Chart

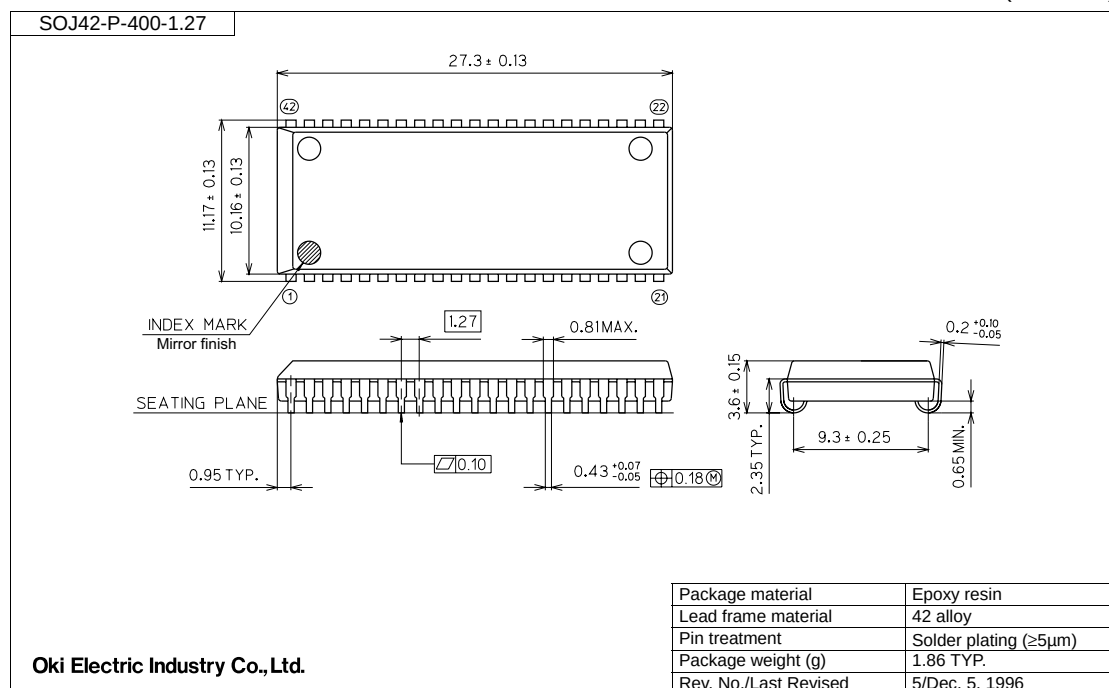


PACKAGE DIMENSIONS

(Unit: mm)



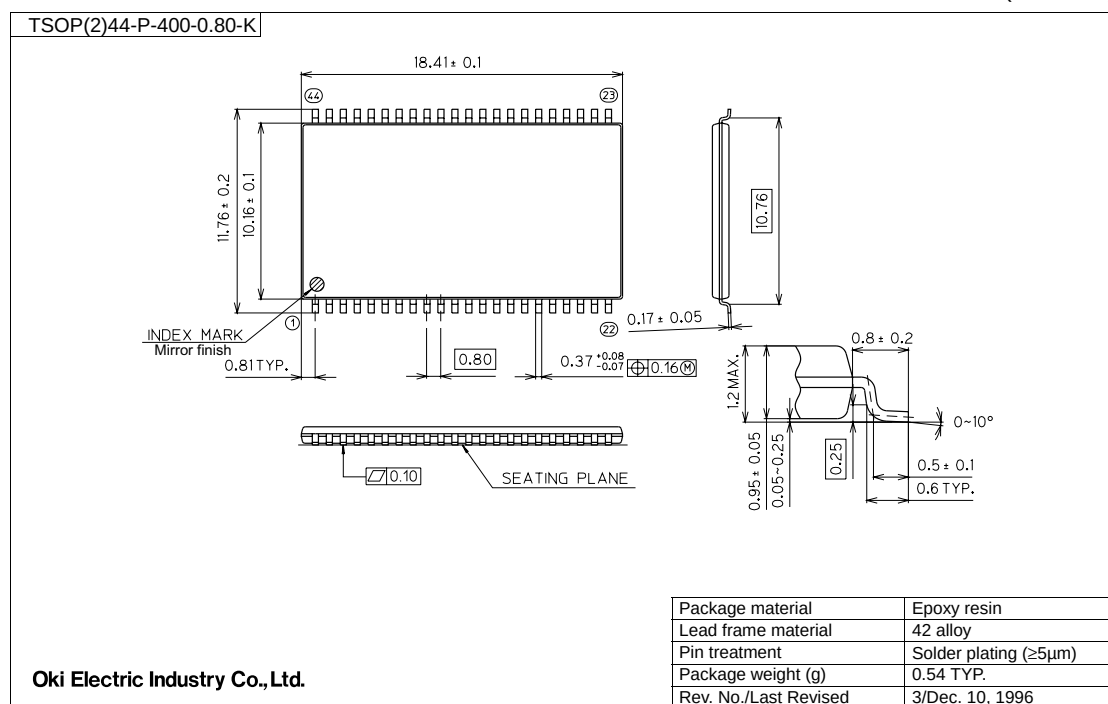
(Unit: mm)



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).

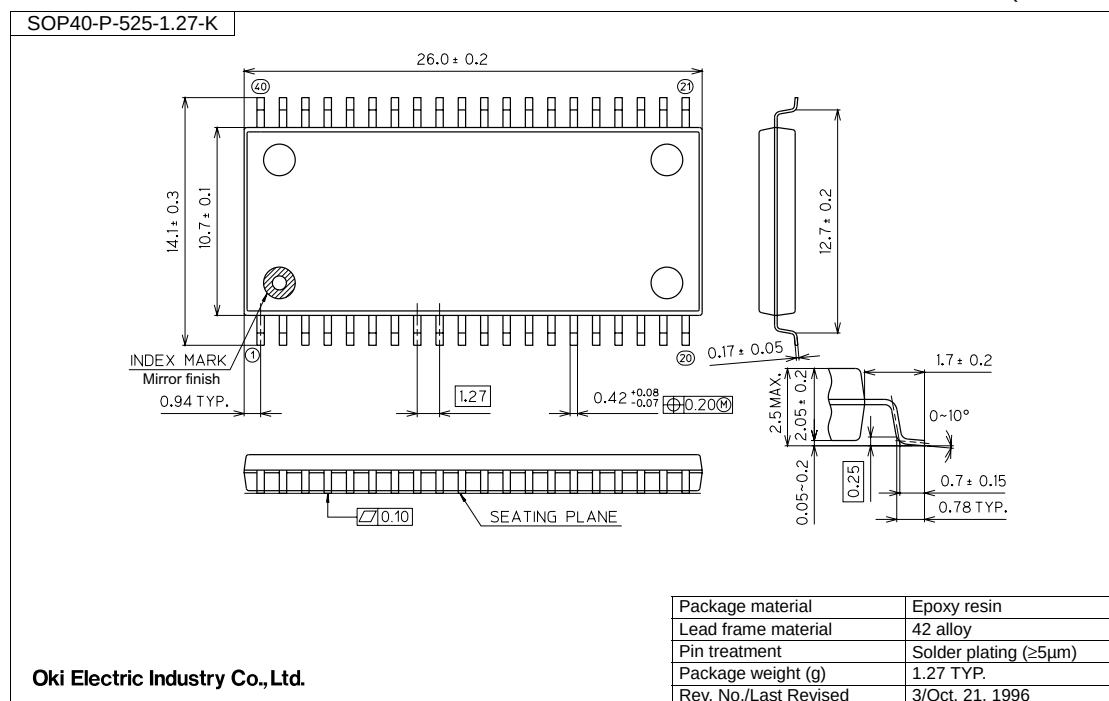
(Unit: mm)



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(Unit: mm)



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REVISION HISTORY

Document No.	Date	Page		Description
		Previous Edition	Current Edition	
FEDR27V402E-01-02	Sep. 2001	–	–	Final edition 2
FEDR27V402E-01-03	Jan. 15, 2004	1, 2	1, 2, 12	Added 42SOJ package.

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