FEDR27V402E-01-03
Issue Date: Jan. 15, 2004

OKI Semiconductor

MR27V402E

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

GENERAL DESCRIPTION

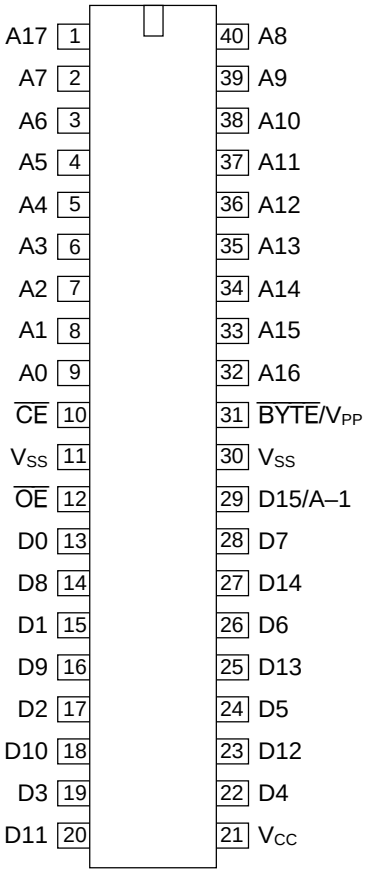
The MR27V402E is a 4 Mbit One Time Programmable Read-Only Memory that can be electrically switched between 262,144-word × 16-bit and 524,288-word × 8-bit by the state of the $\overline{\text{BYTE}}$ pin. The MR27V402E supports high speed asynchronous read operation using a single 3.3V power supply.

FEATURES

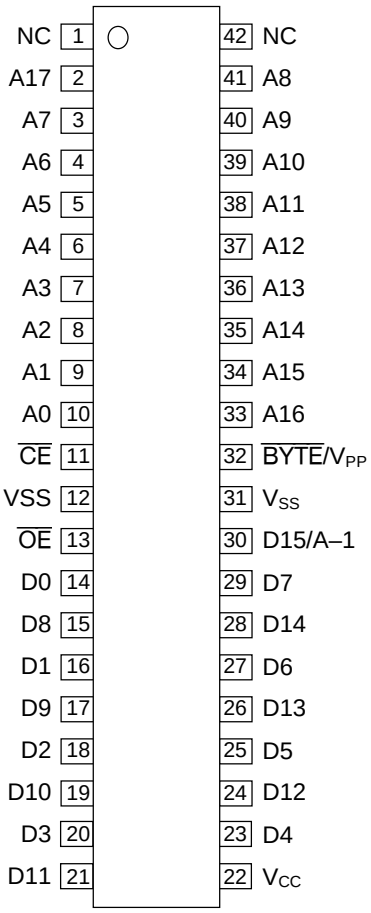
· 262,144-word × 16-bit/524,288-word × 8-bit electrically switchable configuration
· +3.3 V power supply
· Access time 80 nS MAX
· Operating current 30 mA MAX
· Standby current 50 µA MAX
· Input/Output TTL compatible
· Three-state output
· Packages:

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)

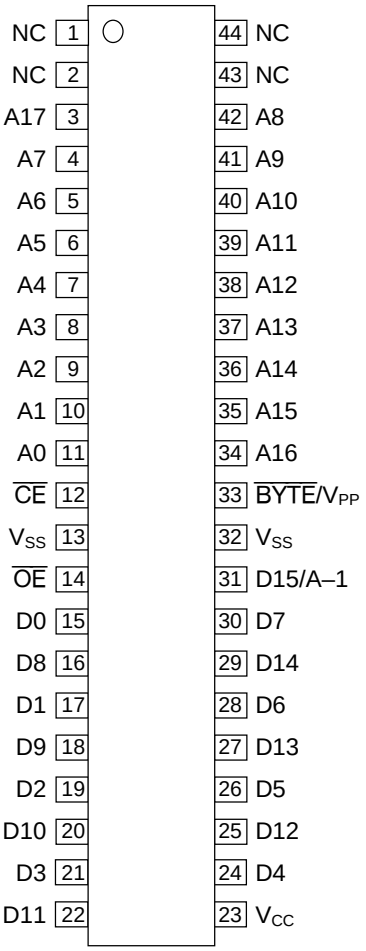
PIN CONFIGURATION (TOP VIEW)



40-pin DIP or SOP



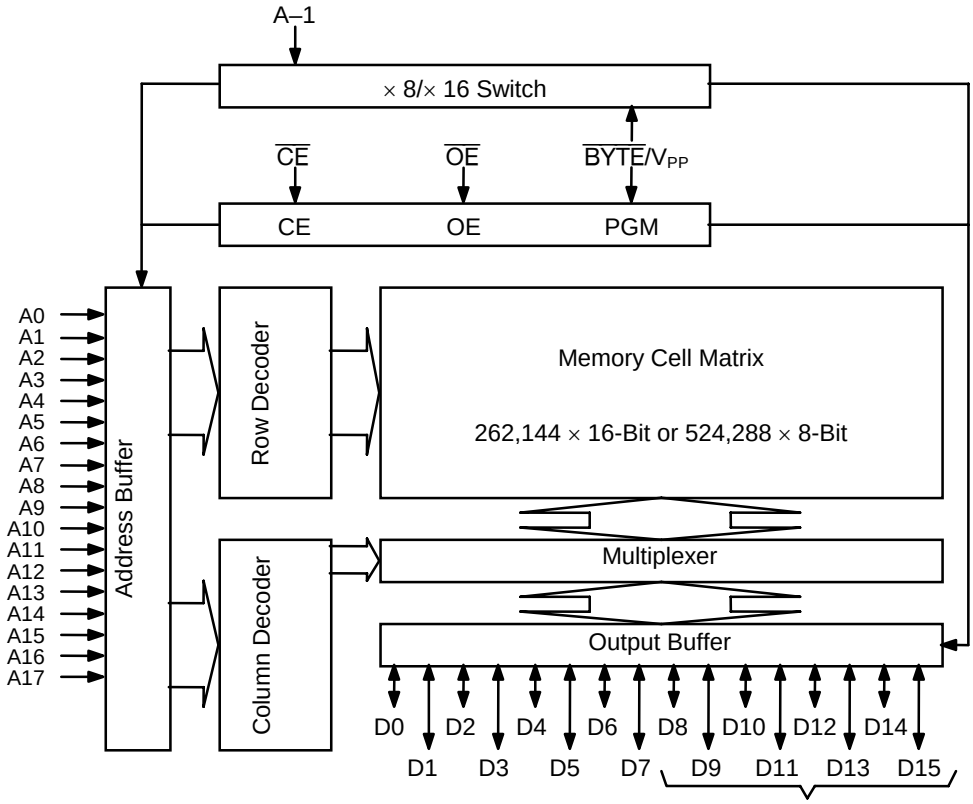
42-pin SOJ



44-pin TSOP(II)

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
$\overline{BYTE}/V_{PP}$	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	$\overline{CE}$	$\overline{OE}$	$\overline{BYTE}$	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}.

* : Vcc+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}.

* : Vcc+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.

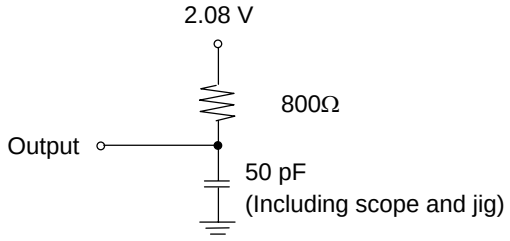
AC Characteristics

(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

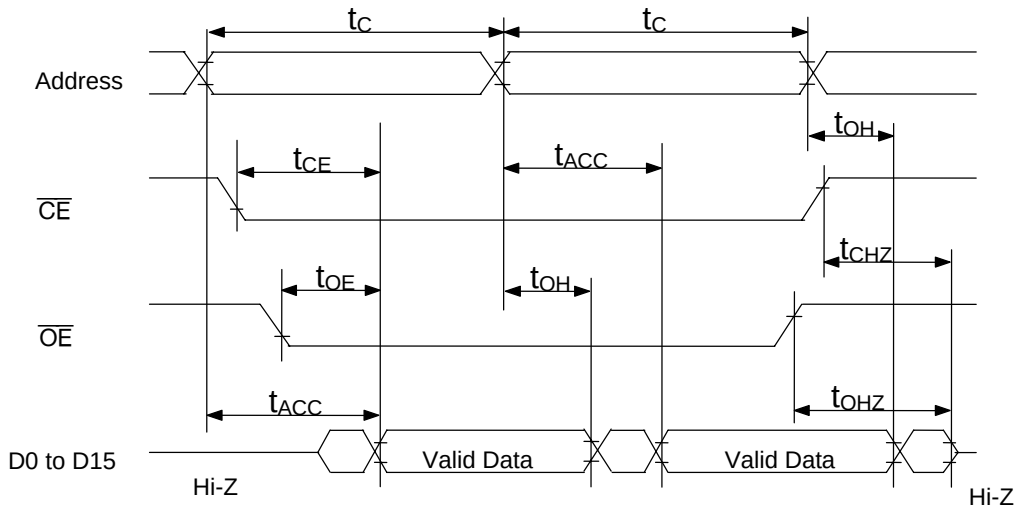
Measurement conditions

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

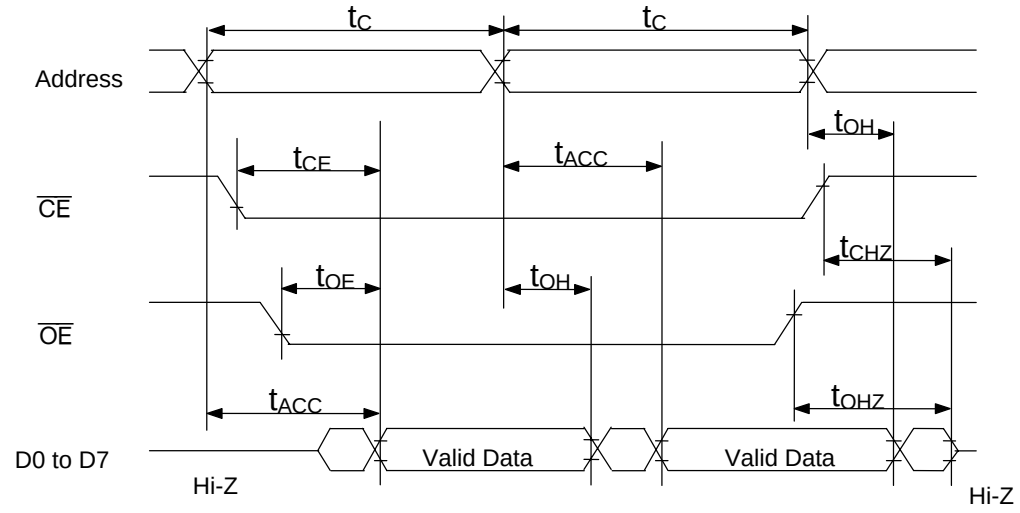


Timing Chart (Read Cycle)

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



8-Bit Read Mode ($\overline{BYTE}$ = 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}	$\overline{CE} = V_{IL}$	—	—	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, $\overline{BYTE}/V_{PP}$ = 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

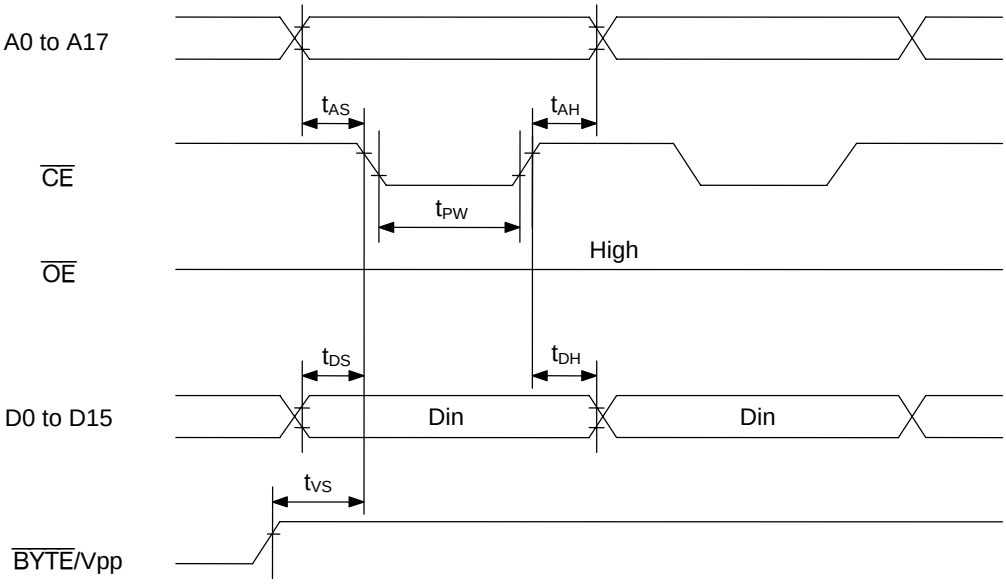
Pin Check Function is to check contact between each device-pin and each socket-lead with EPROM programmer. Setting up address as following condition call the preprogrammed codes on device outputs.

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

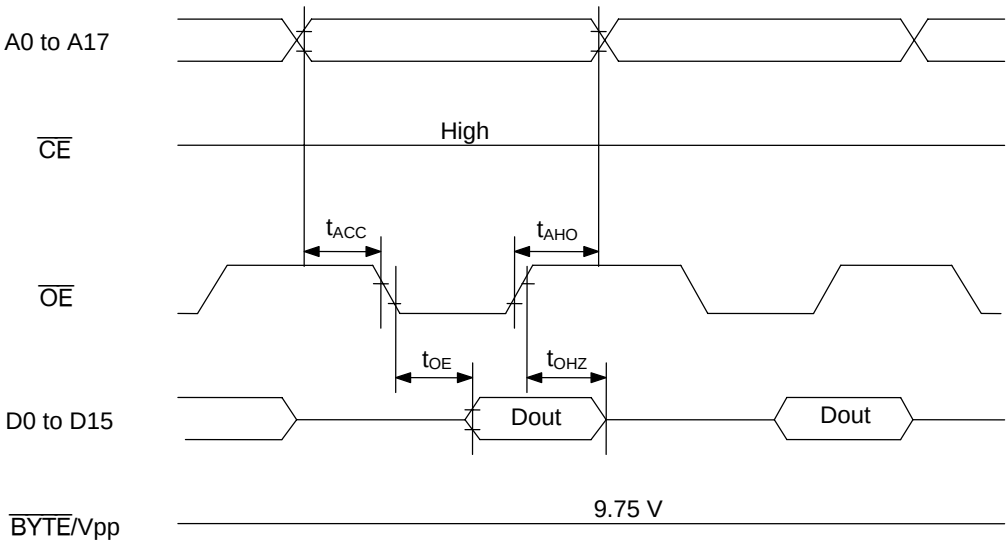
A0	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	DATA
0	1	0	1	0	1	0	1	0	VH*	0	1	0	1	0	1	0	0	FF00
1	0	1	0	1	0	1	0	1	VH*	1	0	1	0	1	0	1	1	00FF
Other conditions																		FFFF

*: VH = 8 V ±0.25 V

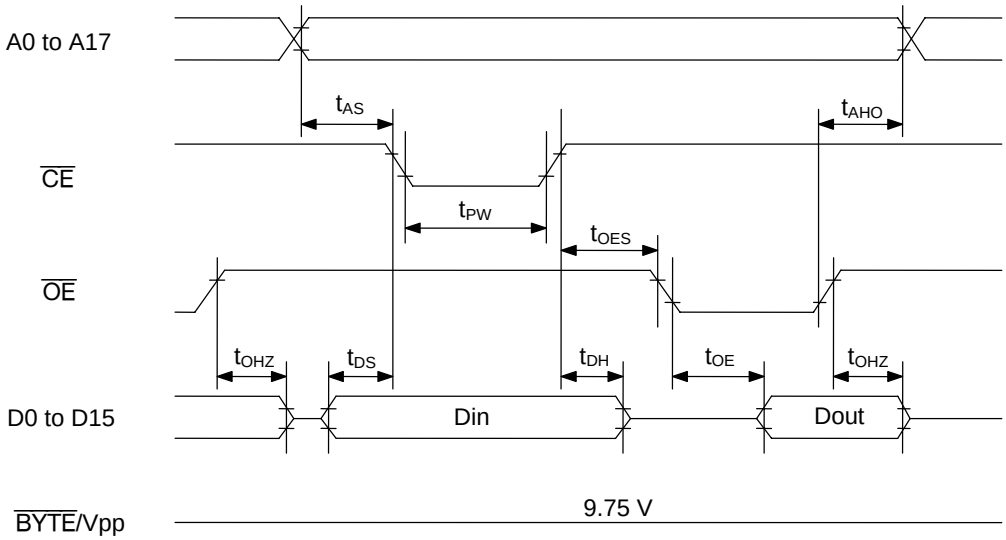
Consecutive Programming Waveforms



Consecutive Program Verify Waveforms



Program and Program Verify Cycle Waveforms



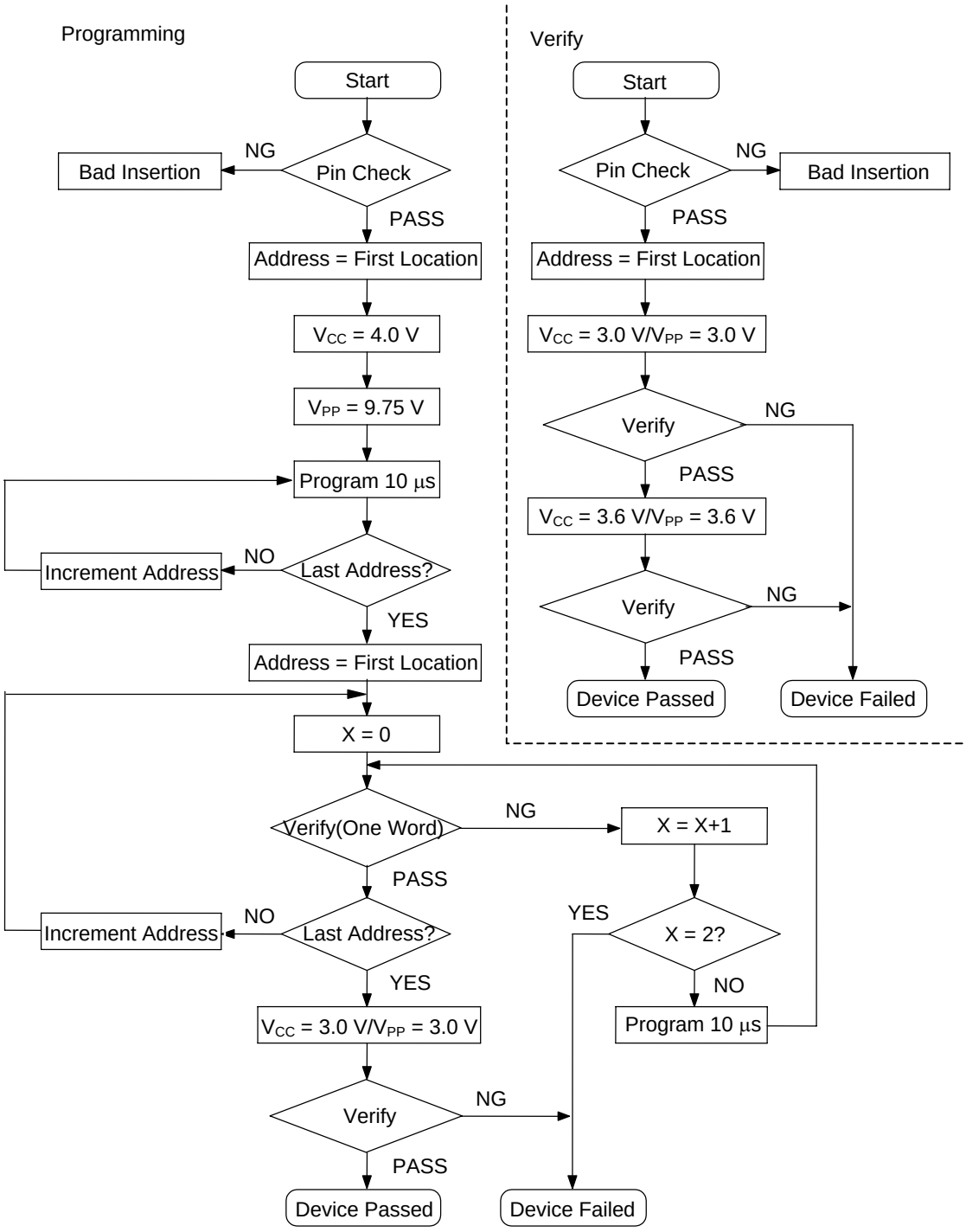
Pin Capacitance

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

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

( ) : DIP only

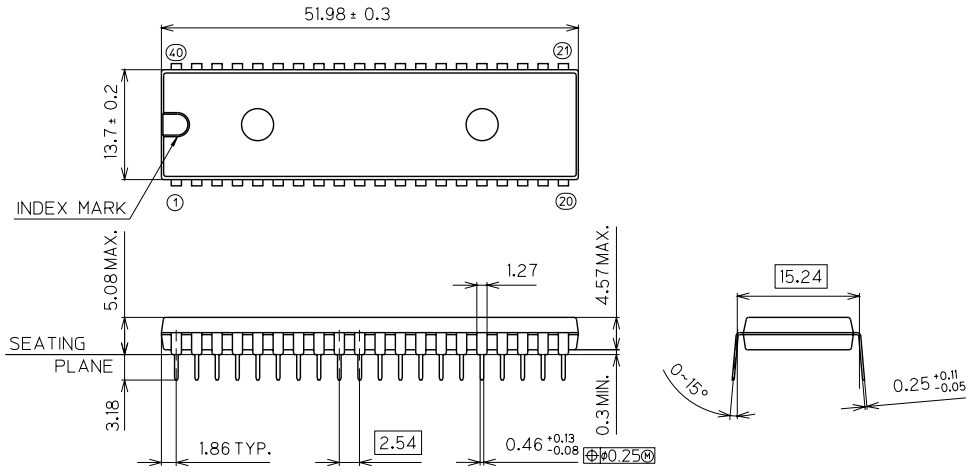
Programming/Verify Flow Chart



PACKAGE DIMENSIONS

(Unit: mm)

DIP40-P-600-2.54



Package material	Epoxy resin
Lead frame material	42 alloy
Pin treatment	Solder plating (≥5µm)
Package weight (g)	6.10 TYP.
Rev. No./Last Revised	2/Dec. 11, 1996

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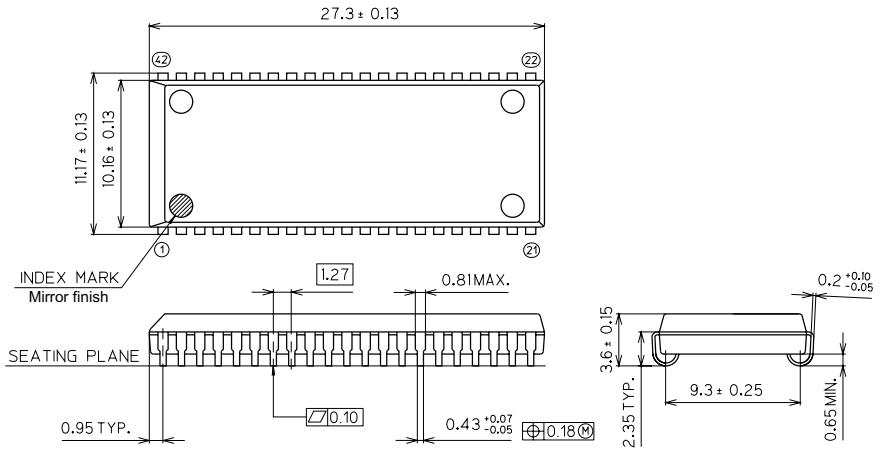
(Unit: mm)

SOJ42-P-400-1.27



Package material	Epoxy resin
Lead frame material	42 alloy
Pin treatment	Solder plating (≥5µm)
Package weight (g)	1.86 TYP.
Rev. No./Last Revised	5/Dec. 5, 1996

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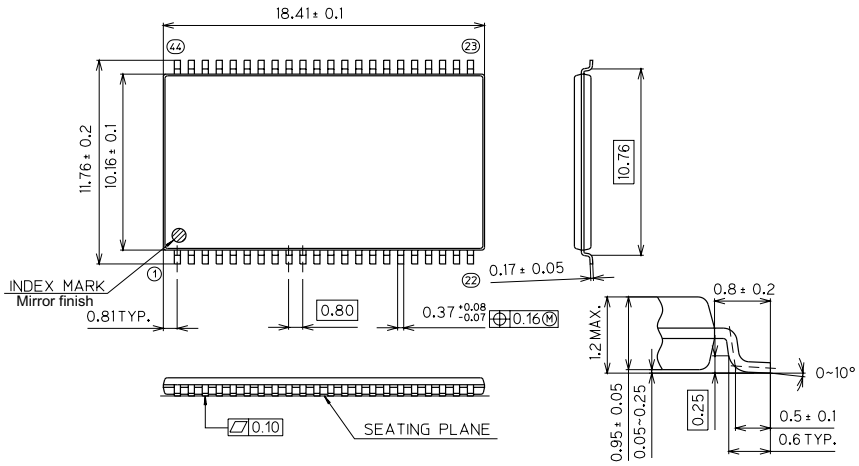
Notes for Mounting the Surface Mount Type Package

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(2)44-P-400-0.80-K



Package material	Epoxy resin
Lead frame material	42 alloy
Pin treatment	Solder plating (≥5µm)
Package weight (g)	0.54 TYP.
Rev. No./Last Revised	3/Dec. 10, 1996

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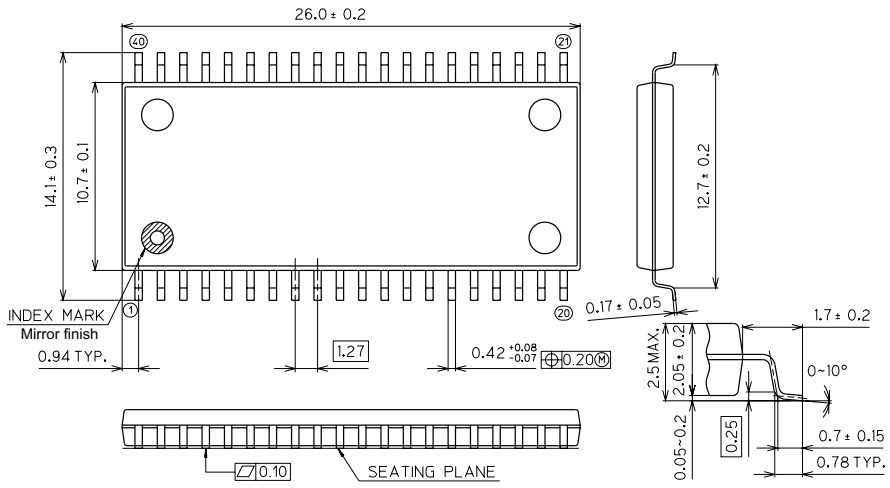
(Unit: mm)

SOP40-P-525-1.27-K



Package material	Epoxy resin
Lead frame material	42 alloy
Pin treatment	Solder plating (≥5µm)
Package weight (g)	1.27 TYP.
Rev. No./Last Revised	3/Oct. 21, 1996

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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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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.

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