

Features

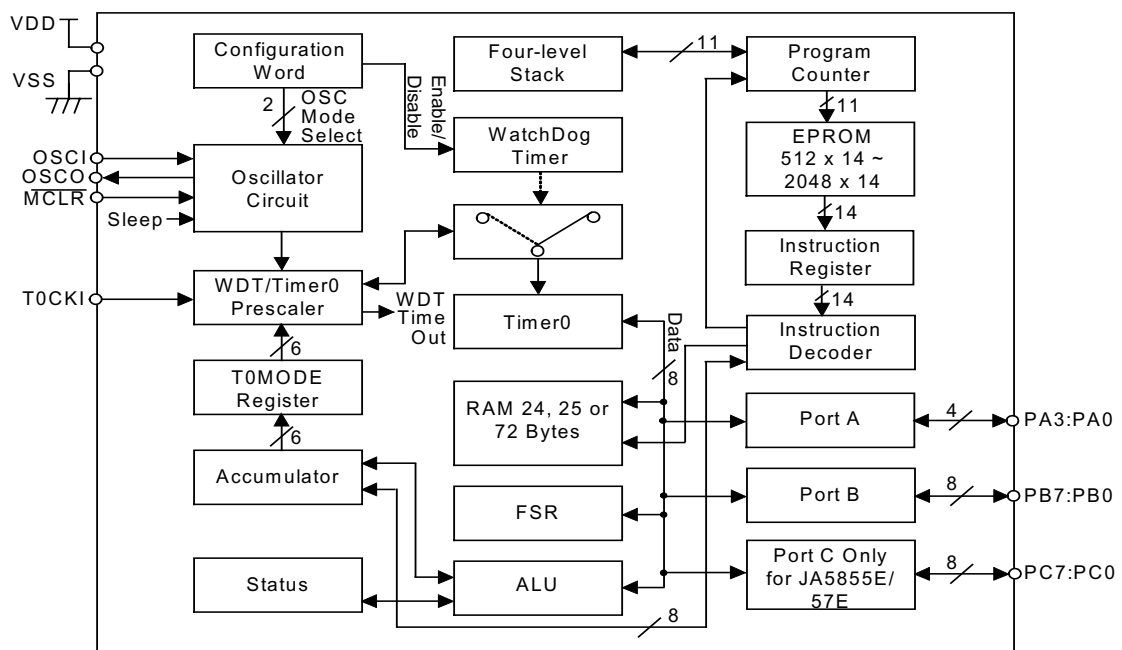
- Total of 33 single word instructions
- The fast execution time may be 200ns for all single cycle instructions under 20MHz operation
- Operating voltage range: 2.4V ~ 5.5V
- 8-bit data bus
- 14-bit instruction word
- Four-level stacks
- On chip EPROM size:
 - 512x14 bits for JA5854E/55E
 - 1Kx14 bits for JA5856E
 - 2Kx14 bits for JA5857E
- Internal RAM size:
 - 25 bytes for JA5854E/56E
 - 24 bytes for JA5855E
 - 72 bytes for JA5857E
- Direct and indirect addressing modes for data accessing
- 8-bit real time clock/counter with 8-bit programmable prescalers
- Internal power-on Reset
- Device Reset Timer
- Code protection
- Sleep mode for power saving
- On chip Watchdog Timer (WDT) based on internal RC oscillator
- Two I/O ports PA, PB with independent direction control for JA5854E/56E.
- Three I/O ports PA, PB and PC with independent direction control for JA5855E/57E
- 4 types of oscillators can be selected by code options:
 - RC : Low-cost RC oscillator
 - XTAL : Standard crystal oscillator
 - HFXTAL : High frequency crystal oscillator
 - LFXTAL : Low frequency crystal oscillator

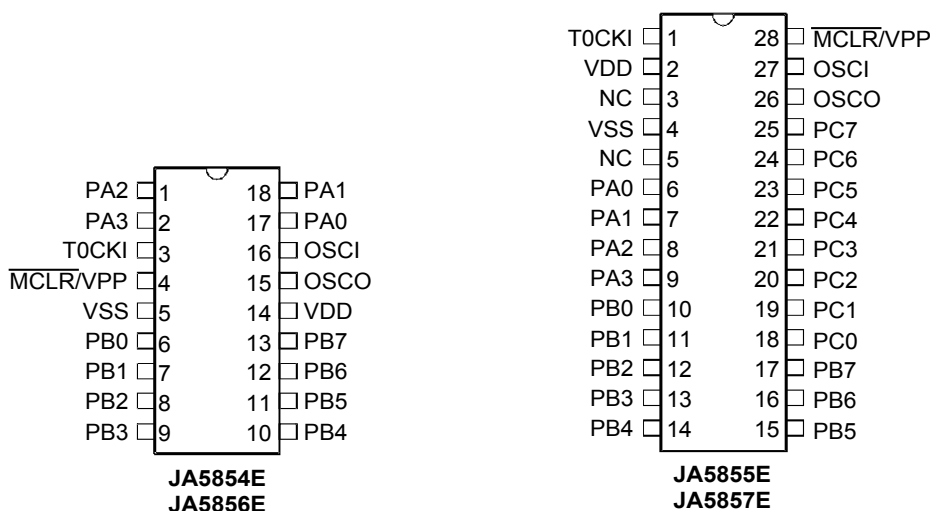
General Description

JA585XE series is an EPROM based 8-bit microcontroller that employs a full CMOS technology enhanced with lowcost, high speed and high noise immunity. Watchdog Timer, RAM, EPROM, tri-state I/O port, power down mode, and real time programmable clock/counter are integrated into this chip. JA585XE

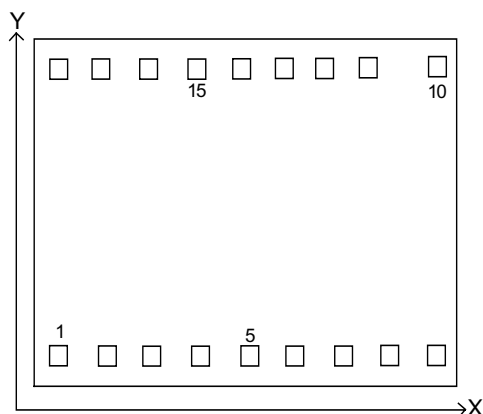
contains 33 instructions, all are single cycle except for program branches which take two cycles. On chip memory is available with 512x14 bits of EPROM for JA5854E/55E, 1Kx14 bits of EPROM for JA5856E, 2Kx14 bits of EPROM for JA5857E and 24 to 72 bytes of static RAM.

Block Diagram



Pin Assignment

Pad Assignment and Coordinates
JA5854E/JA5856E

Chip size : 1710 x 1760 μm
 Pad size : 110 x 110 μm

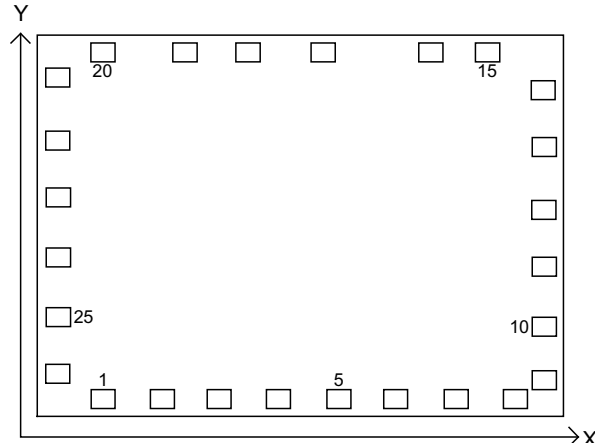

JA5854E/JA5856E

Pad No.	Pad Name	X	Y	Pad No.	Pad Name	X	Y
1	PB0	145.45	153.05	10	OSCO	1598.95	1606.95
2	PB1	320.95	153.05	11	OSCI	1264.95	1606.95
3	PB2	496.45	153.05	12	PA0	1098.45	1606.95
4	PB3	671.95	153.05	13	PA1	922.95	1606.95
5	PB4	847.45	153.05	14	PA2	747.45	1606.95
6	PB5	1022.95	153.05	15	PA3/SDA	571.95	1606.95
7	PB6	1198.45	153.05	16	TOCKI/SCL	424.90	1606.95
8	PB7	1373.95	153.05	17	MCLR/VPP	249.20	1606.95
9	VDD	1557.45	153.05	18	VSS	124.20	1606.95

Chip size : 1710 x 1760 μm

JA5855E/JA5857E

 Chip size : 2201 x 1822 μm

 Pad size : 110 x 110 μm

JA5855E/JA5857E

Pad No.	Pad Name	X	Y	Pad No.	Pad Name	X	Y
1	PB1	217.01	93.20	14	PC6	2117.01	1627.80
2	PB2	476.09	93.20	15	PC7	1830.89	1738.75
3	PB3	720.67	93.20	16	OSCO	1595.29	1733.20
4	PB4	979.75	93.20	17	OSCI	1210.68	1733.20
5	PB5	1224.33	93.20	18	MCLR/VPP	863.95	1738.79
6	PB6	1483.41	93.20	19	TOCKI/SCL	603.04	1738.75
7	PB7	1727.99	93.20	20	VDD	344.41	1738.75
8	PC0	2117.01	93.20	21	VSS	101.98	1644.97
9	PC1	2117.01	361.40	22	PA0	93.21	1372.18
10	PC2	2117.01	620.48	23	PA1	93.21	1127.60
11	PC3	2117.01	865.06	24	PA2	93.21	868.52
12	PC4	2117.01	1124.14	25	PA3/SDA	93.21	623.94
13	PC5	2117.01	1386.72	26	PB0	93.21	364.86

Chip size : 2201 x 1822 μm

Pin Descriptions

Pad Name	I/O	Description
OSCI	I	RC type: Input pin of RC oscillator XTAL type: Input terminal of crystal oscillator
OSCO	O	RC type: OSCO outputs with 1/4 frequency of OSCI to denote the cycle rate for instruction. XTAL type: Output terminal of crystal oscillator
T0CKI/SCL	I	Input pin of real time counter/clock. Must be tied to Vss or Vdd when unused.
$\overline{\text{MCLR}}/\text{VPP}$	I	Input pin for device reset or high voltage programming input for EPROM. If this pin is low, the device is reset. In programming mode, this pin is connected to 12V. In normal operating mode, this pin must not exceed VDD to avoid entering unintended programming mode.
PA0~PA3	I/O	PA0~PA3 as bi-directional I/O port
PB0~PB7	I/O	PB0~PB7 as bi-directional I/O port
PC0~PC7	I/O	PC0~PC7 as bi-directional I/O port(only for JA5855E/57E)
VDD	-	Power supply
VSS	-	Ground

Absolute Maximum Rating

Ta = 0 to 70°C GND=0V

Ambient Operating Temperature	0°C to +70°C
Store Temperature	-65°C to +150°C
DC Supply Voltage (V _{DD})	0V to +6V
Voltage with respect to Ground (V _{SS}).....	0.6V to (V _{DD} +0.6V)
Voltage on $\overline{\text{MCLR}}(\text{V}_{\text{PP}})$ with respect to Ground (V _{SS})	0V to +12V

Operating Conditions

Ta = 0 to 70°C GND=0V

DC Supply Voltage.....	+2.3V to +6.0v
Operating Temperature.....	0°C to 70°C

Electrical Characteristics (Under Operating Conditions)
Electrical characteristics of JA5854E/56E

Parameter	Symbol	Condition	Typical	Unit.		
Operating Current	HFXTAL : 20MHz , WDT disable					
	I _{DD}	V _{DD} =5.0V	4.70	mA		
		V _{DD} =4.0V	3.31	mA		
		V _{DD} =3.0V	1.87	mA		
	HFXTAL : 12MHz , WDT disable					
	I _{DD}	V _{DD} =5.0V	3.96	mA		
		V _{DD} =4.0V	2.54	mA		
		V _{DD} =3.0V	1.42	mA		
		V _{DD} =2.4V	786	μA		
	XTAL : 12MHz , WDT disable					
	I _{DD}	V _{DD} =5.0V	3.87	mA		
		V _{DD} =4.0V	2.74	mA		
		V _{DD} =3.0V	1.54	mA		
		V _{DD} =2.4V	881	μA		
	XTAL : 4MHz , WDT disable					
	I _{DD}	V _{DD} =5.0V	2.73	mA		
		V _{DD} =4.0V	1.95	mA		
		V _{DD} =3.0V	1.01	mA		
		V _{DD} =2.4V	510	μA		
	LFX TAL : 32KHz , WDT disable					
	I _{DD}	V _{DD} =5.0V	1.63	mA		
		V _{DD} =4.0V	1.24	mA		
		V _{DD} =3.0V	621	μA		
		V _{DD} =2.4V	264	μA		
	V _{DD} =5V , RC mode , WDT disable , These values include current through Rext					
	I _{DD}	C=3P	R=1k Ohm	F=9.639MHz	5.962	mA
			R=3.3k Ohm	F=8.206MHz	3.859	mA
			R=4.7k Ohm	F=7.375MHz	3.479	mA
R=5.1k Ohm			F=7.157MHz	3.398	mA	
R=10k Ohm			F=5.236MHz	2.828	mA	
R=47k Ohm			F=1.766MHz	2.076	mA	
R=100k Ohm			F=931kHz	1.811	mA	
R=300k Ohm			F=336.8kHz	1.715	mA	

Parameter	Symbol	Condition		Typical	Unit.	
Operating Current	I _{DD}	C=20P	R=1k Ohm	F=8.004MHz	5.789	mA
			R=3.3k Ohm	F=5.296MHz	3.459	mA
			R=4.7k Ohm	F=4.334MHz	3.04	mA
			R=5.1k Ohm	F=4.122MHz	2.955	mA
			R=10k Ohm	F=2.569MHz	2.425	mA
			R=47k Ohm	F=690.6kHz	1.918	mA
			R=100k Ohm	F=347.76kHz	1.734	mA
			R=300k Ohm	F=120.52kHz	1.686	mA
		C=100P	R=1k Ohm	F=4.602MHz	5.342	mA
			R=3.3k Ohm	F=2.105MHz	2.966	mA
			R=4.7k Ohm	F=1.587MHz	2.599	mA
			R=5.1k Ohm	F=1.484MHz	2.55	mA
			R=10k Ohm	F=823.4kHz	2.165	mA
			R=47k Ohm	F=192.8kHz	1.852	mA
			R=100k Ohm	F=94.44kHz	1.702	mA
			R=300k Ohm	F=31.932kHz	1.685	mA
		C=300P	R=1k Ohm	F=2.301MHz	4.948	mA
			R=3.3k Ohm	F=899.6kHz	2.766	mA
			R=4.7k Ohm	F=656kHz	2.469	mA
			R=5.1k Ohm	F=609.8kHz	2.411	mA
			R=10k Ohm	F=324.8kHz	2.091	mA
			R=47k Ohm	F=72.84kHz	1.839	mA
			R=100k Ohm	F=35.312kHz	1.699	mA
			R=300k Ohm	F=11.832kHz	1.689	mA

Electrical characteristics of JA5855E/57E

Parameter	Symbol	Condition		Typical	Unit.	
Operating Current	HFXTAL : 20MHz , WDT disable					
	I _{DD}	V _{DD} =5.0V		4.62	mA	
		V _{DD} =4.0V		3.25	mA	
		V _{DD} =3.0V		1.87	mA	
	HFXTAL : 12MHz , WDT disable					
	I _{DD}	V _{DD} =5.0V		3.53	mA	
		V _{DD} =4.0V		2.49	mA	
		V _{DD} =3.0V		1.42	mA	
		V _{DD} =2.4V		798	μA	
	XTAL : 12MHz , WDT disable					
	I _{DD}	V _{DD} =5.0V		3.68	mA	
		V _{DD} =4.0V		2.60	mA	
		V _{DD} =3.0V		1.41	mA	
		V _{DD} =2.4V		810	μA	
	XTAL : 4MHz , WDT disable					
	I _{DD}	V _{DD} =5.0V		2.56	mA	
		V _{DD} =4.0V		1.80	mA	
		V _{DD} =3.0V		968	μA	
		V _{DD} =2.4V		492	μA	
	LFXTAL : 32KHz , WDT disable					
	I _{DD}	V _{DD} =5.0V		1.50	mA	
		V _{DD} =4.0V		1.09	mA	
		V _{DD} =3.0V		557	μA	
		V _{DD} =2.4V		236	μA	
	V _{DD} =5V , RC mode , WDT disable , These values include current through Rext					
	I _{DD}	C=3P	R=1k Ohm	F=11.87MHz	6.061	mA
			R=3.3k Ohm	F=9.508MHz	3.885	mA
			R=4.7k Ohm	F=8.250MHz	3.444	mA
R=5.1k Ohm			F=7.934MHz	3.348	mA	
R=10k Ohm			F=5.390MHz	2.679	mA	
R=47k Ohm			F=1.621MHz	1.896	mA	
R=100k Ohm			F=828.6kHz	1.678	mA	
R=300k Ohm			F=830.6kHz	1.664	mA	
C=20P		R=1k Ohm	F=9.680MHz	5.827	mA	
		R=3.3k Ohm	F=5.786MHz	3.350	mA	

Parameter	Symbol	Condition		Typical	Unit.	
Operating Current	I _{DD}	C=20P	R=4.7k Ohm	F=4.606MHz	2.910	mA
			R=5.1k Ohm	F=4.351MHz	2.821	mA
			R=10k Ohm	F=2.607MHz	2.269	mA
			R=47k Ohm	F=662.0kHz	1.761	mA
			R=100k Ohm	F=328.2kHz	1.615	mA
			R=300k Ohm	F=328.7kHz	1.600	mA
		C=100P	R=1k Ohm	F=5.090MHz	5.187	mA
			R=3.3k Ohm	F=2.175MHz	2.805	mA
			R=4.7k Ohm	F=1.616MHz	2.469	mA
			R=5.1k Ohm	F=1.506MHz	2.402	mA
			R=10k Ohm	F=820.2kHz	2.018	mA
			R=47k Ohm	F=188.0kHz	1.701	mA
			R=100k Ohm	F=91.38kHz	1.588	mA
			R=300k Ohm	F=91.48kHz	1.573	mA
		C=300P	R=1k Ohm	F=2.430MHz	4.762	mA
			R=3.3k Ohm	F=932.2kHz	2.600	mA
			R=4.7k Ohm	F=677.6kHz	2.311	mA
			R=5.1k Ohm	F=628.8kHz	2.257	mA
			R=10k Ohm	F=338.5kHz	1.941	mA
			R=47k Ohm	F=73.60kHz	1.689	mA
			R=100k Ohm	F=35.56kHz	1.580	mA
			R=300k Ohm	F=35.64kHz	1.566	mA

Functional Description

Register Map

The register of JA5854E/56E is depicted as below:

The register map of JA5854E/56E	
Address	Description
00H	Indirect addressing register
01H	Timer0
02H	PC
03H	Status
04H	FSR
05H	Port A
06H	Port B
07H~1FH	General purpose register

The register of JA5855E is depicted as below:

The register map of JA5855E	
Address	Description
00H	Indirect addressing register
01H	Timer0
02H	PC
03H	Status
04H	FSR
05H	Port A
06H	Port B
07H	Port C
08H~1FH	General purpose register

The register map of JA5857E is depicted as below:

The register map of JA5857E				
Address	Description			
	Bank 0	Bank 1	Bank 2	Bank 3
	FSR<6:5> : 00	FSR<6:5> : 01	FSR<6:5> : 10	FSR<6:5> : 11
00H	Indirect addressing register	Map back to address in Bank 0		
01H	Timer0			
02H	PC			
03H	Status			
04H	FSR			
05H	Port A			
06H	Port B			
07H	Port C			
08H~0FH	General purpose register			
10H~1FH	General purpose register	30H~3FH General purpose register	50H~5FH General purpose register	70H~7FH General purpose register

- **INAR (Indirect Address Register) : 00h**

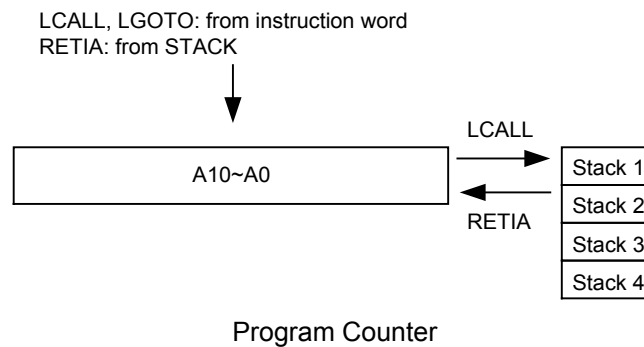
This Register is not a physically implemented register. It is used as an indirect addressing pointer. Any instruction accessing this register can access data pointed by FSR(04h).

- **Timer0 (8-bit real-time clock/timer) : 01h**

This register increases by an external signal edge applied to T0CKI pin, or by internal instruction cycle. It can be read or written as any other register.

- **PC (Program Counter) : 02h**

This register increases itself along with every instruction cycle, except the following condition specified as below:



- **Status (Status Register) : 03h**

The content of R3 is listed in Table.

Bit	Symbol	Description
0	C	Carry/borrow bit ADDAR = 1, a carry occurred = 0, a carry did not occur SUBAR = 1, a borrow did not occur = 0, a borrow occurred
1	DC	Half carry/half borrow bit ADDAR = 1, a carry from the 4th low order bit of the result occurred = 0, a carry from the 4th low order bit of the result did not occur SUBAR = 1, a borrow from the 4th low order bit of the result did not occur = 0, a borrow from the 4th low order bit of the result occurred
2	Z	Zero bit: = 1, the result of a logic operation is zero = 0, the result of a logic operation is not zero
3	PD	Power down flag bit: = 1, after power-up or by the CLRWDT instruction = 0, by the SLEEP instruction
4	TO	Time overflow flag bit: = 1, after power-up or by the CLRWDT or SLEEP instruction = 0, a WDT time-overflow occurred
5~7	-	Reserved

- **FSR (File select register pointer): 04h**

In JA5854E/56E, Bit 5~7 were fixed 1. Bit 0~4 are used to select up to 32 registers (address: 00h~1Fh). The indirect addressing mode shows as below:

B7	B6	B5	B4	B3	B2	B1	B0
1	1	1	Indirect Address mode location select				

(FSR Content)		Real Address
1110 0000	INAR	00
1110 0001	TIMER0	01
1110 0010	PC	02
1110 0011	STATUS	03
1110 0100	FSR	04
1110 0101	PORT A	05
1110 0110	PORT B	06
1110 0111	General Purpose Register	07
1111 1111		1F

Data Memory Configuration for JA5854E/56E

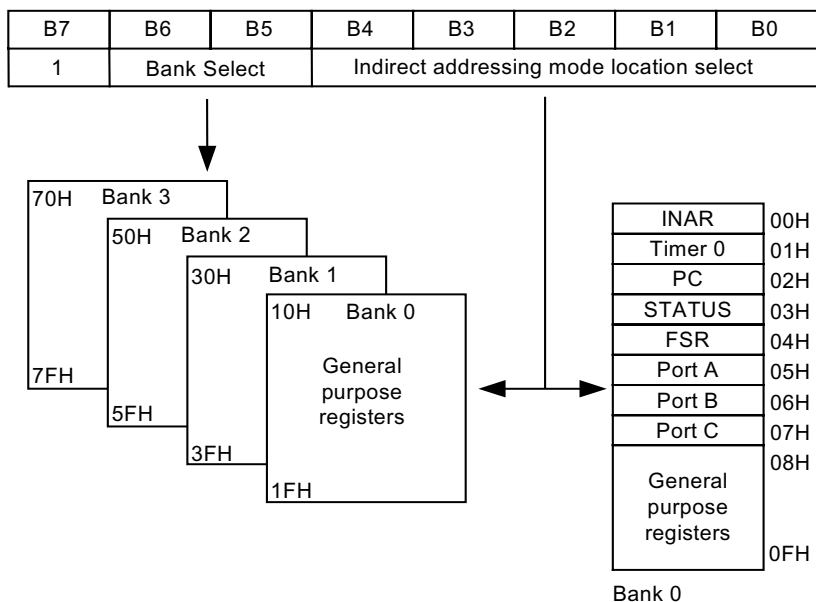
In JA5855E, Bit 5~7 were fixed 1. Bit 0~4 are used to select up to 32 registers (address: 00h~1Fh). The indirect addressing mode shows as below:

B7	B6	B5	B4	B3	B2	B1	B0
1	1	1	Indirect Address mode location select				

(FSR Content)		Real Address
1110 0000	INAR	00
1110 0001	TIMER0	01
1110 0010	PC	02
1110 0011	STATUS	03
1110 0100	FSR	04
1110 0101	PORT A	05
1110 0110	PORT B	06
1110 0111	PORT C	07
1110 1000	General Purpose Register	08
1111 1111		1F

Data Memory Configuration for JA5855E

In JA5857E, Bit 0~4 are used to select up to 32 registers (address: 00h~1Fh) and Bit 5~6 are Bank Select (Bank0~3) in the indirect addressing mode shown in follow.



Data Memory Configuration for JA5857E

- **PORT A: 05h**
PA3:PA0, bi-directional I/O Register
- **PORT B: 06h**
PB7:PB0, bi-directional I/O Register
- **PORT C: 07h**
PC7:PC0, bi-directional I/O Register, and for JA5855E/57E only

• **T0MODE REGISTER:**

T0MODE is a write-only register and the content is listed in Table.

Bit	Symbol	Description		
		Bit Value	Timer Rate	WDT Ratev
2~0	PS0:PS0	0 0 0	1:2	1:1
		0 0 1	1:4	1:2
		0 1 0	1:8	1:4
		0 1 1	1:16	1:8
		1 0 0	1:32	1:16
		1 0 1	1:64	1:32
		1 1 0	1:128	1:64
		1 1 1	1:256	1:128
3	PSC	Prescaler assign bit: = 0, Timer0 = 1, WDT		
4	TE	Timer0 source signal edge select bit: = 0, increment when low-to-high transition on T0CKI pin = 1, increment when high-to-low transition on T0CKI pin		

Bit	Symbol	Description
5	TS	Timer0 source signal select bit: = 0, internal instruction clock cycle = 1, transition on T0CKI pin
6~7	-	Reserved

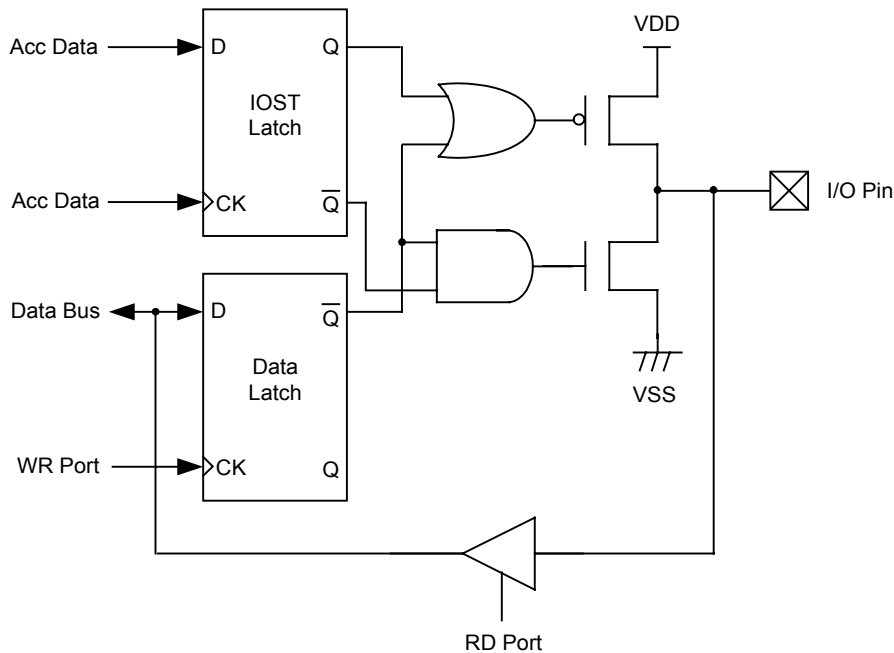
- **IOST (Control Port I/O Mode Register)**

The IOST register is "write-only"

= 0, I/O pin in output mode;

= 1, I/O pin in input mode.

I/O Ports Equivalent Circuit



Note:

1. The IOST registers are "write-only" and set upon RESET.
2. If the IOST latch is "0", the corresponding I/O pin is in output mode;
if the IOST latch is "1", the corresponding I/O pin is in input mode.

RESET

This device may be reset by one of the following ways:

- (1) Power-on Reset : At power-up, this device is kept in a RESET condition for a period of 18ms after the voltage on MCLR/V_{PP} pin has reached a logic high level.
- (2) MCLR reset (normal operation).
- (3) WDT reset (normal operation).
- (4) MCLR wake-up (from sleep mode).
- (5) WDT wake-up (from sleep mode): Executing the SLEEP instruction can force this device to enter sleep mode (power saving mode). While in sleep mode, the WDT is cleared but keeps running. This device can be awakened by WDT time-out or reset input on MCLR pin.

The contents of registers after reset are listed as below:

Address	Register	Power-On Reset	MCLR or WDT Reset
00h	INAR	xxxx xxxx	uuuu uuuu
01h	Timer0	xxxx xxxx	uuuu uuuu
02h	PC	1111 1111	1111 1111
03h	STATUS	0001 1xxx	000# #uuu
04h	FSR	1##x xxxx(For JA5854E/56E) 1xxx xxxx(For JA5855E/57E)	1##u uuuu(For JA5854E/56E) 1uuu uuuu(For JA5855E/57E)
05h	PORTA	---- xxxx	---- uuuu
06h	PORTB	xxxx xxxx	uuuu uuuu
07h	General Purpose Register (for JA5854E/56E) or PORTC (for JA5855E/57E)	xxxx xxxx	uuuu uuuu
08h-1Fh	General Purpose Register	xxxx xxxx	uuuu uuuu
30h-3Fh	General Purpose Register (for JA5857E only)	xxxx xxxx	uuuu uuuu
50h-5Fh	General Purpose Register (for JA5857E only)	xxxx xxxx	uuuu uuuu
70h-7Fh	General Purpose Register (for JA5857E only)	xxxx xxxx	uuuu uuuu
N/A	Acc	xxxx xxxx	uuuu uuuu
N/A	IOST	1111 1111	1111 1111
N/A	T0MODE	--11 1111	--11 1111

Note:

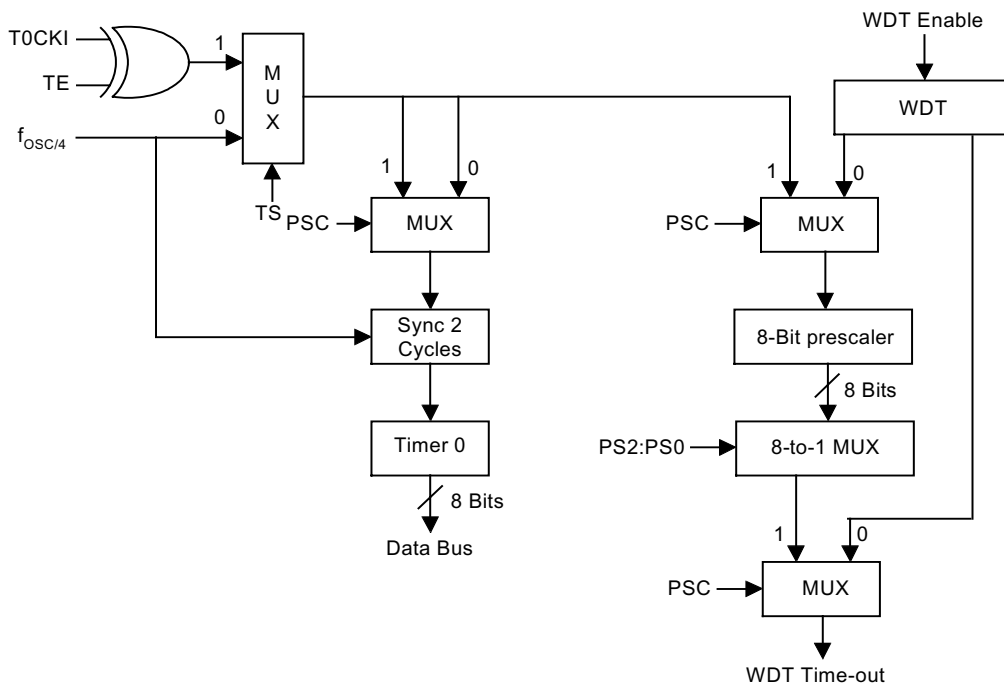
- "x" = unknown,
- "u" = unchanged,
- "-" = unimplemented, read as "0",
- "#" = refer to the following tables

The STATUS (03H) Register situation for different conditions:

Condition	Status: bit 4	Status: bit 3
MCLR Reset (not during SLEEP)	u	u
MCLR Reset during SLEEP	1	0
WDT Reset (not during SLEEP)	0	1
WDT Reset during SLEEP	0	0

The FSR (04H) Register has some different part for JA5854E/56E and shown as below:

Address	Register	Power-On Reset	MCLR or WDT Reset
04h	FSR	1xxx xxxx(For Version AH)	1uuu uuuu(For Version AH)
		111x xxxx(For Version AI)	111u uuuu(For Version AI)

Real Time Clock (Timer0) and Watchdog Timer


- **Timer0**

Timer0 is an 8-bit timer/counter. The clock source of Timer0 could be come from the internal clock or by an external clock source presented by the T0CKI pin.

To select the internal clock source, bit 5 of the T0MODE register should be clear. In this mode, Timer0 increases by 1 in every instruction cycle (without prescaler).

To select the external clock source, bit 5 of the T0MODE register should be set. In this mode, Timer0 increases by 1 on every falling or rising edge of T0CKI pin which is be controlled by bit 4 of T0MODE register.

- **Watchdog Timer (WDT)**

The Watchdog Timer is a free running on-chip RC oscillator. This RC oscillator is separated from the RC oscillator of the OSCI pin. That means the WDT keeps running even when the oscillator driver is turned off, such as in sleep mode. During normal operation or in sleep mode, a WDT time-out causes the device reset and the \overline{TO} bit (bit 4 of STATUS register) was cleared.

Without prescaler, the WDT time-out period is 18ms. This period can increase by using the prescaler. The division ratio of prescaler is up to 1:128. Thus, the longest time-out period is approximately 2.3s.

- **Prescaler**

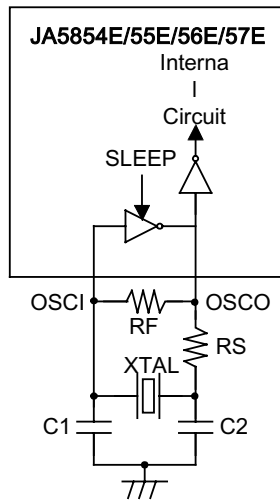
The 8-bit prescaler may be assigned to either the Timer0 or the WDT through the PSC bit (bit 3 of the T0MODE register). Setting this bit is assign the prescaler to the WDT. Resetting this bit is assign the prescaler to the Timer0. The PS2:PS0 bits determine the prescale ratio. The prescaler can't be assigned to both the Timer0 and WDT simultaneously.

Oscillator Configuration

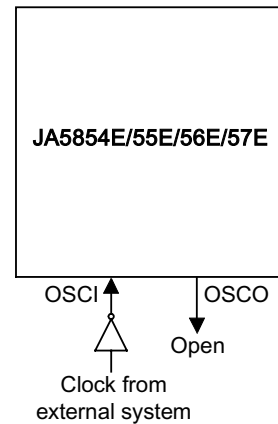
This device supports four oscillator modes. Users can select the appropriate mode by compile tool. These oscillator modes offered as:

- RC: Low-cost oscillator
- XTAL: Standard crystal oscillator
- HFXTAL: High frequency crystal oscillator

- LFXTAL: Low frequency crystal oscillator
- XTAL, HFXTAL or LFXTAL modes

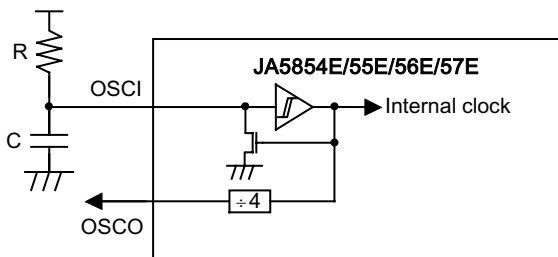


(a) Crystal operation (or ceramic resonator)



(b) External clock input operation

- RC Oscillator Mode



Instruction Table

Mnemonic Operands	Description	Cycles	Instruction Code	Status Affected
BCR R, bit	Clear bit in R	1	11 11bb brrr rrrr	None
BSR R, bit	Set bit in R	1	11 10bb brrr rrrr	None
BTRSC R, bit	Test bit in R and skip if clear	1 or 2(skip)	11 01bb brrr rrrr	None
BTRSS R, bit	Test bit in R and skip if set	1 or 2(skip)	11 00bb brrr rrrr	None
CLRWDT	Clear Watchdog Timer	1	01 0000 0000 0001	\overline{TO} , \overline{PD}
T0MODE	Load T0MODE Register	1	01 0000 0000 0010	None
SLEEP	Go into standby mode	1	01 0000 0000 0011	\overline{TO} , \overline{PD}
IOST R	Load IOST Register	1	01 0000 0000 0rrr	None
ANDIA I	AND immediate with Acc	1	00 1001 iiiii iiiii	Z
XORIA I	Exclusive OR immediate with Acc	1	00 1000 iiiii iiiii	Z
MOVIA I	Move immediate to Acc	1	00 0001 iiiii iiiii	None
IORIA I	Inclusive OR immediate with Acc	1	00 0011 iiiii iiiii	Z
RETIA I	Return, place immediate in A	2	00 1100 iiiii iiiii	None
LCALL I	Call subroutine	2	10 0iii iiiii iiiii	None

Mnemonic Operands	Description	Cycles	Instruction Code	Status Affected
LGOTO I	Unconditional branch	2	10 1iii iiiiii	None
NOP	No operation	1	01 0000 0000 0000	None
MOVAR R	Move Acc to R	1	01 0000 1rrr rrrr	None
COMR R, d	Complement R	1	01 0010 drrr rrrr	Z
MOVR R, d	Move R	1	01 0011 drrr rrrr	Z
RRR R, d	Rotate right R	1	01 1110 drrr rrrr	C
RLR R, d	Rotate left R	1	01 1100 drrr rrrr	C
SWAPR R, d	Swap halves R	1	01 1101 drrr rrrr	None
CLRA	Clear Acc	1	01 0001 0000 0000	Z
CLRR R	Clear R	1	01 0001 1rrr rrrr	Z
INCR R, d	Increment R	1	01 1000 drrr rrrr	Z
INCRSZ R, d	Increment R, Skip if 0	1 or 2(skip)	01 100 1 drrr rrrr	None
DECR R, d	Decrement R	1	01 0110 drrr rrrr	Z
DECRSZ R, d	Decrement R, Skip if 0	1 or 2(skip)	01 0111 drrr rrrr	None
SUBAR R, d	Subtract Acc from R	1	01 1010 drrr rrrr	C, DC, Z
XORAR R, d	Exclusive OR Acc with R	1	01 1011 drrr rrrr	Z
ANDAR R, d	AND Acc with R	1	01 0100 drrr rrrr	Z
ADDAR R, d	Add Acc and R	1	01 0101 drrr rrrr	C, DC, Z
IORAR R, d	Inclusive OR Acc with R	1	01 1111 drrr rrrr	Z

Note:

b : Bit position WDT : Watchdog Timer R : Register address
 i : Immediate data Acc : Accumulator TOMODE : TOMODE register
 PD : Power down flag TO : Time overflow bit IOST : I/O port status register
 Z : Zero flag C : Carry flag DC : Digital carry flag
 I : ($i_7 i_6 i_5 i_4 i_3 i_2 i_1 i_0$) R : ($r_6 r_5 r_4 r_3 r_2 r_1 r_0$)

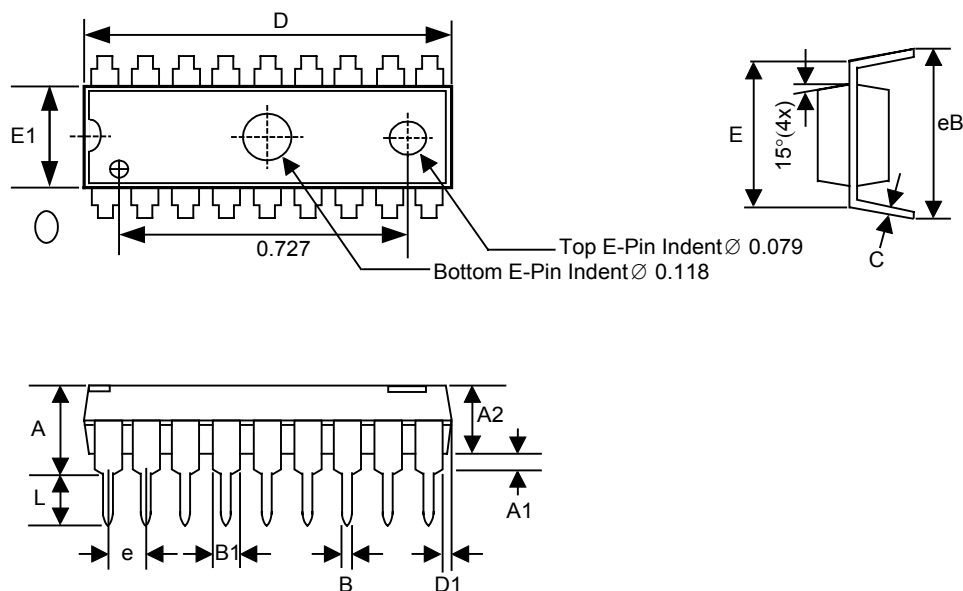
D ∈ [0,1] Destination:

If d is "0", the result is stored in the Acc register.

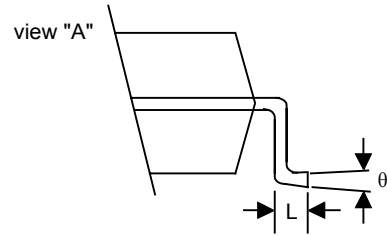
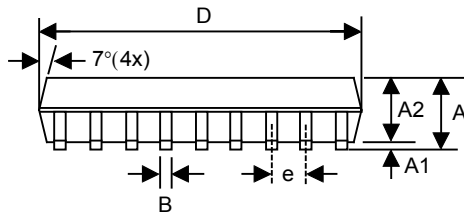
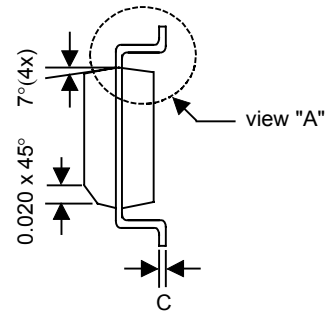
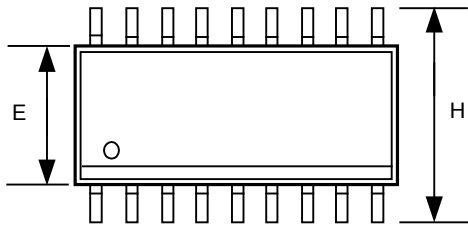
If d is "1", the result is stored back in register R.

Order Information

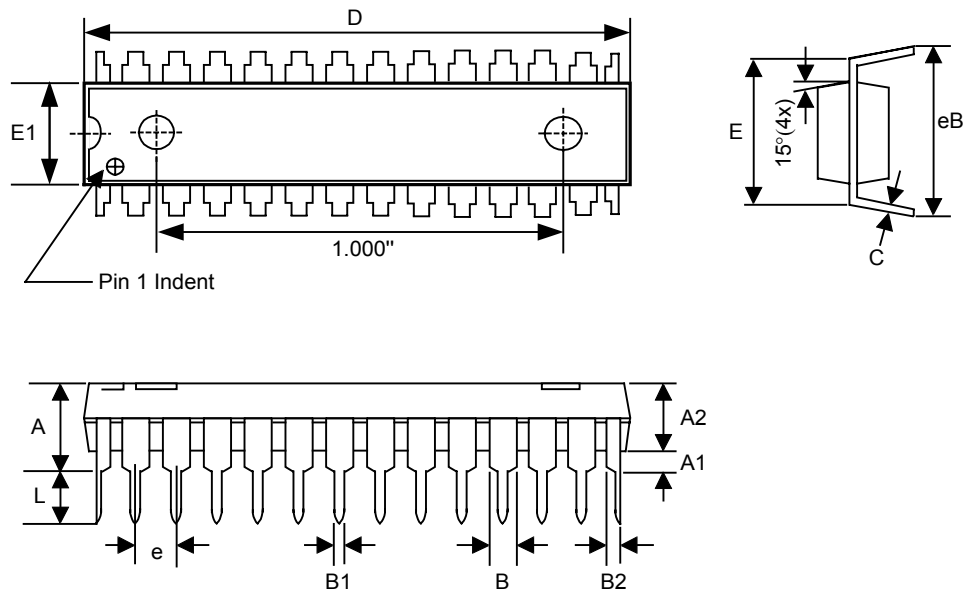
Type	300mil PDIP	600mil PDIP	300mil SOP	Die Form
18pins	JA5854EN	—	JA5854EP	JA5854E
28pins	JA5855EM	JA5855EN	JA5855EP	JA5855E
18pins	JA5856EN	—	JA5856EP	JA5856E
28pins	JA5857EM	JA5857EN	JA5857EP	JA5857E

Package Dimension
18 Pin PDIP 300mil for JA5854EN and JA5856EN


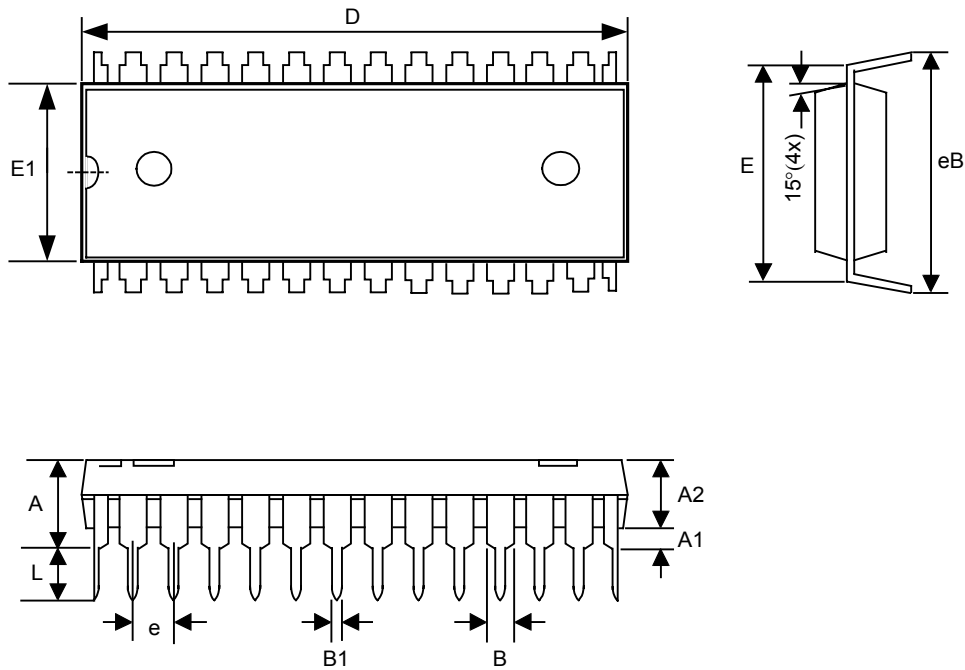
Symbol	Dimension in Millimeters			Dimension in Millimeters		
	Min	Nom	Max	Min	Nom	Max
A	—	—	4.57	—	—	0.180
A1	0.13	—	—	0.005	—	—
A2	—	0.30	3.56	—	—	0.140
B	0.36	0.46	0.56	0.014	—	0.022
B1	1.27	1.52	1.78	0.050	—	0.070
C	0.20	0.25	0.33	0.008	—	0.013
D	22.71	22.96	23.11	0.894	—	0.910
D1	0.43	0.56	0.69	0.017	—	0.027
e	7.62	—	8.26	0.300	—	0.325
E1	6.40	6.50	6.65	0.252	—	0.262
E	—	2.54	—	—	—	—
L	3.18	—	—	0.125	—	—
eB	8.38	—	9.65	0.330	—	0.380

18 Pin SOP for JA5854EP and JA5856EP


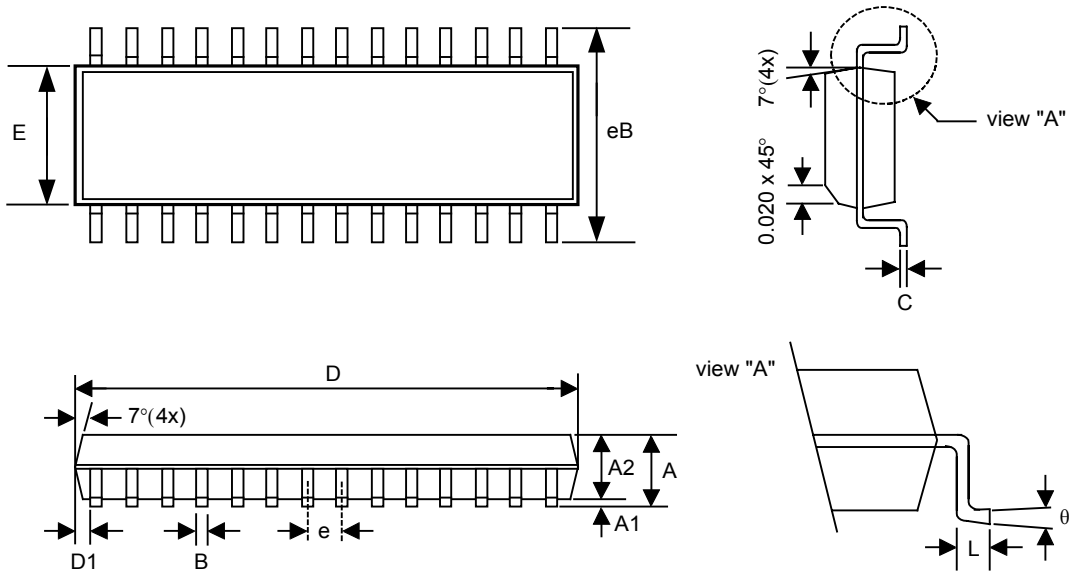
Symbol	Dimension in Millimeters			Dimension in Millimeters		
	Min	Nom	Max	Min	Nom	Max
A	2.36	2.49	2.64	0.093	0.098	0.104
A1	0.10	—	0.30	0.04	—	0.012
A2	—	2.31	—	—	0.091	—
B	0.33	0.41	0.51	0.013	0.016	0.020
C	0.18	0.23	0.28	0.007	0.009	0.011
D	11.35	—	11.76	0.447	—	0.463
E	7.39	7.49	7.59	0.291	0.295	0.299
e	—	1.27	—	—	0.050	—
H	10.01	10.31	10.64	0.394	0.406	0.419
L	0.38	0.81	1.27	0.015	0.032	0.050
θ	0°	—	8°	0°	—	8°

28 Pin PDIP 300mil for JA5855EN and JA5857EM


Symbol	Dimension in Millimeters			Dimension in Millimeters		
	Min	Nom	Max	Min	Nom	Max
A	—	—	4.57	—	—	0.180
A1	0.38	—	—	0.015	—	—
A2	—	3.30	3.56	—	0.130	0.140
B	1.02	—	1.65	0.004	—	0.065
B1	0.41	—	0.58	0.016	—	0.023
C	0.71	—	1.12	0.028	—	0.044
D	0.20	0.25	0.33	0.008	0.010	0.013
D1	35.13	35.18	35.43	1.383	1.385	1.395
e	7.87	8.31	8.38	0.310	0.327	0.330
E1	7.26	7.32	7.52	0.284	0.288	0.296
E	—	2.54	—	—	0.100	—
L	3.18	—	—	0.125	—	—
eB	8.64	—	9.65	0.340	—	0.380

28 Pin PDIP 600mil for JA5855EN and JA5857EN


Symbol	Dimension in Millimeters			Dimension in Millimeters		
	Min	Nom	Max	Min	Nom	Max
A	—	—	5059	—	—	0.220
A1	0.38	—	—	0.015	—	—
A2	3.81	3.94	4.06	0.150	0.155	0.160
B	—	1.52	—	—	0.06	—
B1	—	0.46	—	—	0.018	—
D	36.96	37.08	37.34	1.455	1.460	1.470
E	—	15.24	—	—	0.600	—
E1	13.72	13.84	13.97	0.540	0.545	0.550
e	—	2.54	—	—	0.100	—
L	3.18	—	—	0.125	—	—
eB	16.00	16.51	17.02	0.630	0.650	0.670

28 Pin SOP for JA5855EP and JA5857EP


Symbol	Dimension in Millimeters			Dimension in Millimeters		
	Min	Nom	Max	Min	Nom	Max
A	—	2.488	2.743	—	0.098	0.108
A1	0.152	—	—	0.006	—	—
A2	2.210	2.336	2.464	0.087	0.091	0.097
B	0.305	0.406	0.508	0.012	0.016	0.020
C	0.204	0.254	0.304	0.008	0.010	0.012
D	17.78	17.91	18.42	0.700	0.705	0.725
E	3.366	7.493	7.62	0.290	0.295	0.300
e	1.219	1.270	1.321	0.048	0.050	0.052
eB	10.26	10.42	10.57	0.404	0.410	0.416
L	0.635	—	—	0.025	—	—
θ	0°	4°	8°	0°	4°	8°
D1	0.356	0.508	—	0.014	0.020	—