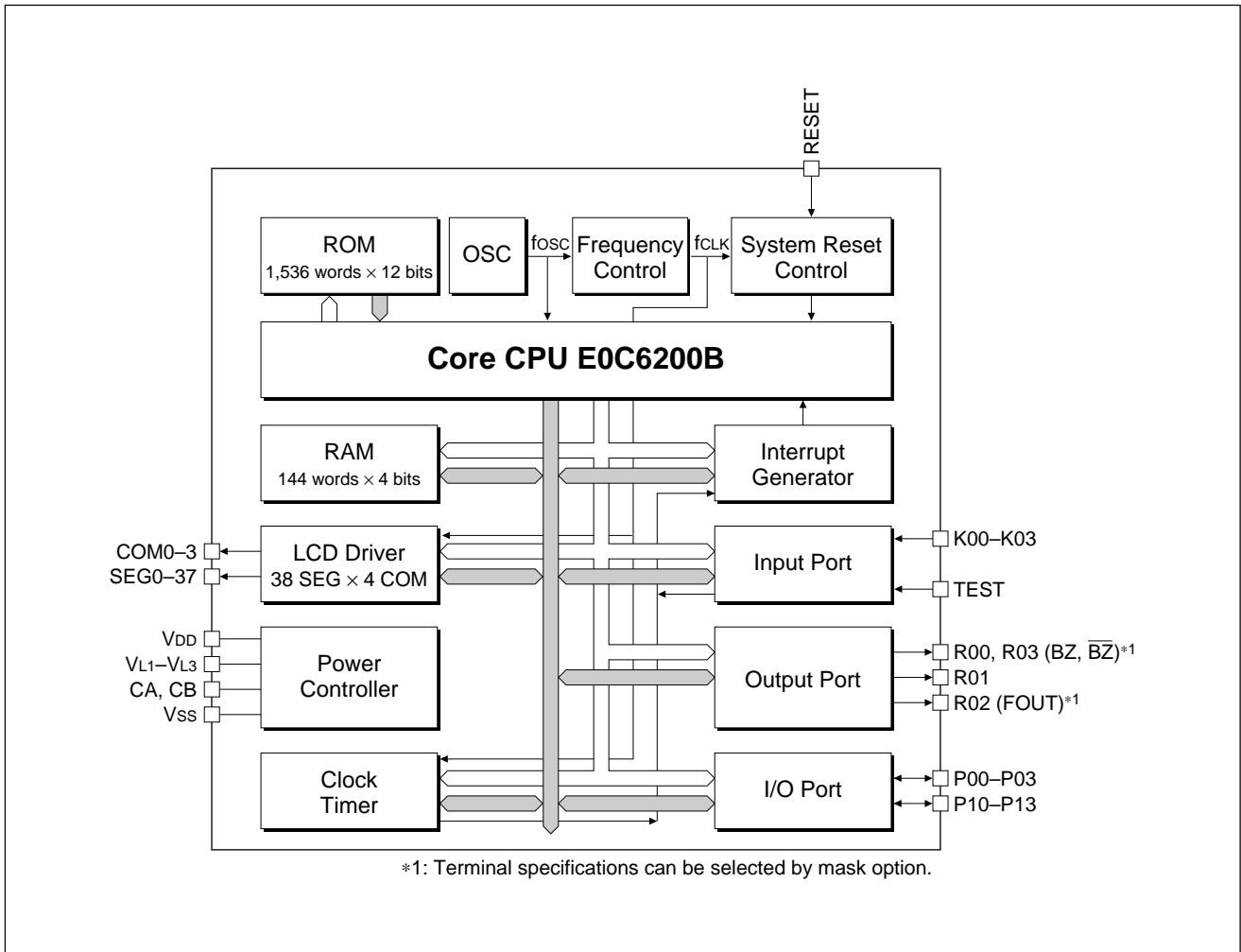


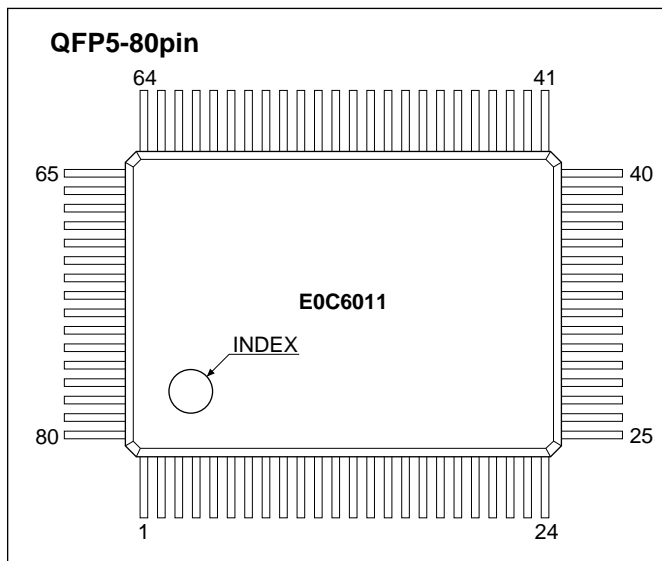


# E0C6011

## ■ BLOCK DIAGRAM

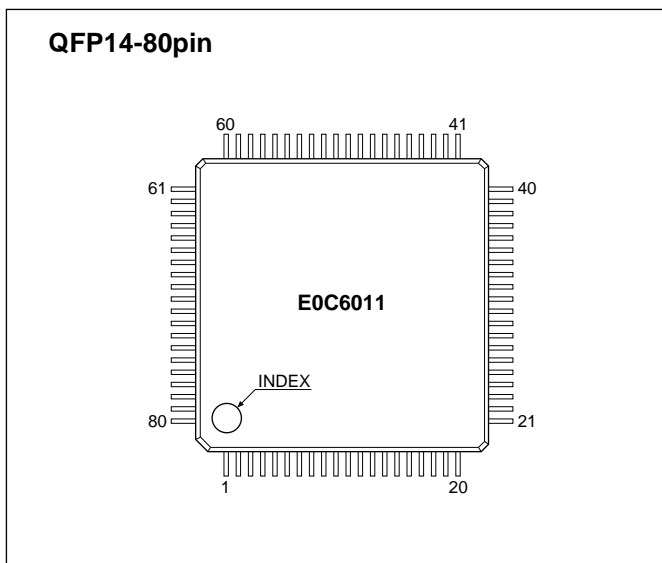


## ■ PIN CONFIGURATION



No.	Pin name	No.	Pin name	No.	Pin name	No.	Pin name
1	SEG35	21	R03	41	N.C.	61	N.C.
2	N.C.	22	N.C.	42	N.C.	62	N.C.
3	N.C.	23	N.C.	43	SEG1	63	N.C.
4	SEG36	24	N.C.	44	SEG2	64	SEG19
5	SEG37	25	Vss	45	SEG3	65	TEST
6	K03	26	RESET	46	SEG4	66	SEG20
7	K02	27	N.C.	47	SEG5	67	SEG21
8	K01	28	N.C.	48	SEG6	68	SEG22
9	K00	29	N.C.	49	SEG7	69	SEG23
10	P13	30	VDD	50	SEG8	70	SEG24
11	P12	31	VL3	51	SEG9	71	SEG25
12	P11	32	VL2	52	SEG10	72	SEG26
13	P10	33	VL1	53	SEG11	73	SEG27
14	P03	34	CB	54	SEG12	74	SEG28
15	P02	35	CA	55	SEG13	75	SEG29
16	P01	36	COM3	56	SEG14	76	SEG30
17	P00	37	COM2	57	SEG15	77	SEG31
18	R02	38	COM1	58	SEG16	78	SEG32
19	R01	39	COM0	59	SEG17	79	SEG33
20	R00	40	SEG0	60	SEG18	80	SEG34

N.C. = No Connection



No.	Pin name	No.	Pin name	No.	Pin name	No.	Pin name
1	N.C.	21	SEG36	41	N.C.	61	N.C.
2	N.C.	22	N.C.	42	N.C.	62	SEG1
3	SEG19	23	N.C.	43	Vss	63	SEG2
4	TEST	24	SEG37	44	RESET	64	SEG3
5	SEG20	25	K03	45	N.C.	65	SEG4
6	SEG21	26	K02	46	OSC2	66	SEG5
7	SEG22	27	K01	47	OSC1	67	SEG6
8	SEG23	28	K00	48	VDD	68	SEG7
9	SEG24	29	P13	49	VL3	69	SEG8
10	SEG25	30	P12	50	VL2	70	SEG9
11	SEG26	31	P11	51	VL1	71	SEG10
12	SEG27	32	P10	52	CB	72	SEG11
13	SEG28	33	P03	53	CA	73	SEG12
14	SEG29	34	P02	54	COM3	74	SEG13
15	SEG30	35	P01	55	COM2	75	SEG14
16	SEG31	36	P00	56	COM1	76	SEG15
17	SEG32	37	R02	57	COM0	77	SEG16
18	SEG33	38	R01	58	SEG0	78	SEG17
19	SEG34	39	R00	59	N.C.	79	SEG18
20	SEG35	40	R03	60	N.C.	80	N.C.

N.C. = No Connection

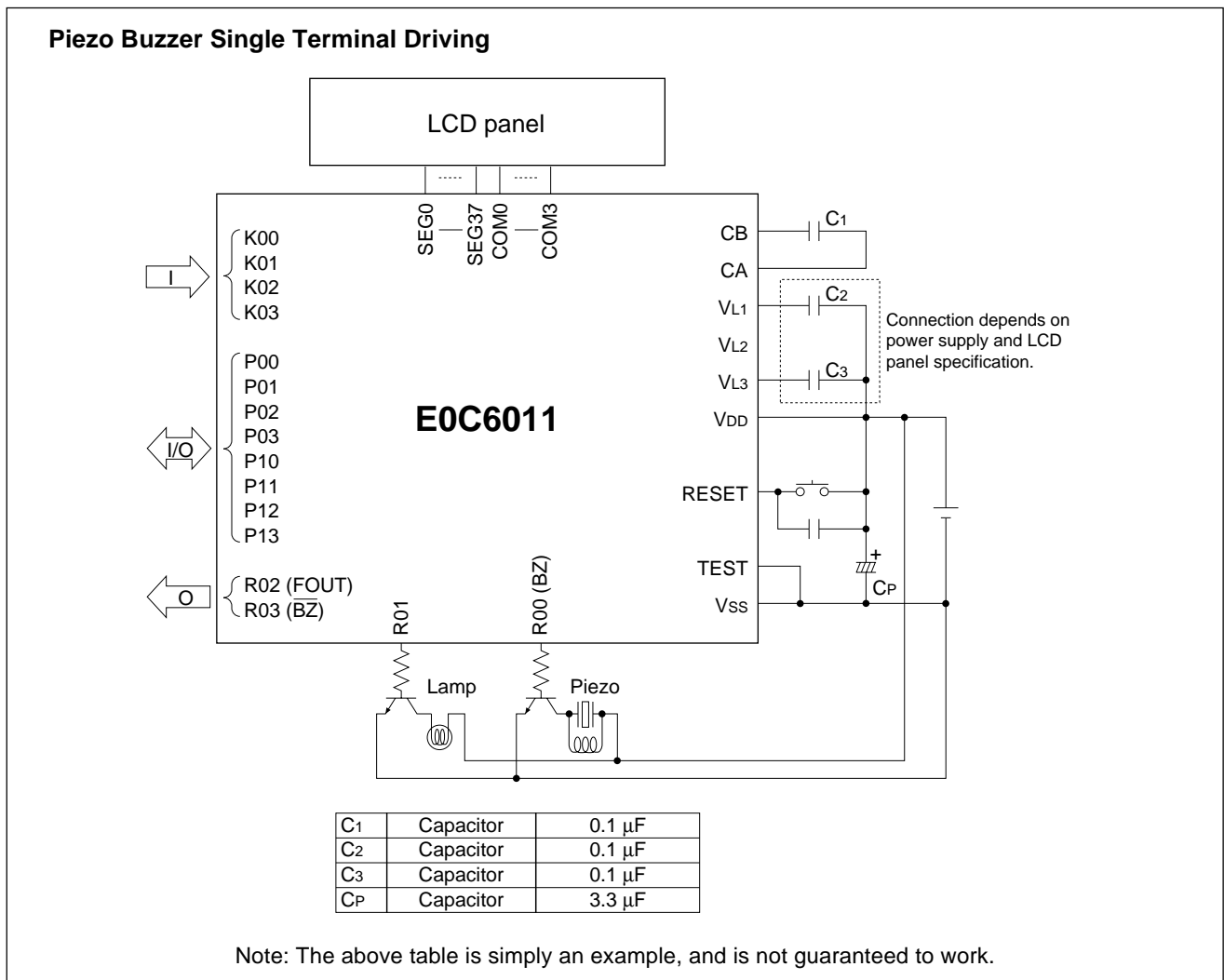
## ■ PIN DESCRIPTION

Pin name	Pin No.		I/O	Function
	QFP14	QFP5		
VDD	48	30	(I)	Power supply terminal (+)
Vss	43	25	(I)	Power supply terminal (-)
VL1-3	51-49	33-31	-	Power source for LCD
CA, CB	53, 52	35, 34	-	Booster capacitor connecting terminal
K00-03	28-25	9-6	I	Input port terminal
P00-03	36-33	17-14	I/O	I/O port terminal
P10-13	32-29	13-10	I/O	I/O port terminal
R00	39	20	O	Output port terminal (BZ output is selectable *)
R03	40	21	O	Output port terminal (BZ output is selectable *)
R01	38	19	O	Output port terminal
R02	37	18	O	Output port terminal (FOUT output is selectable *)
SEG0-37	58, 62-79, 3-21, 24	40, 43-60, 64, 66-80, 1, 4, 5	O	LCD segment output (DC output is selectable *)
COM0-3	57-54	39-36	O	LCD common output terminal (1/4, 1/3 or 1/2 duty are selectable *)
RESET	44	26	I	Initial reset input terminal
TEST	4	65	I	Test input terminal

\* Can be selected by mask option

# E0C6011

## ■ BASIC EXTERNAL CONNECTION DIAGRAM



## ■ ELECTRICAL CHARACTERISTICS

### ● Absolute Maximum Ratings

(V<sub>DD</sub>=0V)

Rating	Symbol	Value	Unit
Supply voltage	V <sub>SS</sub>	-5.0 to 0.5	V
Input voltage (1)	V <sub>I</sub>	V <sub>SS</sub> - 0.3 to 0.5	V
Input voltage (2)	V <sub>Iosc</sub>	V <sub>SS</sub> - 0.3 to 0.5	V
Operating temperature	T <sub>opr</sub>	-20 to 70	°C
Storage temperature	T <sub>stg</sub>	-65 to 150	°C
Soldering temperature / time	T <sub>sol</sub>	260°C, 10sec (lead section)	-

### ● Recommended Operating Conditions

(T<sub>a</sub>=-20 to 70°C)

Condition	Symbol	Remark	Min.	Typ.	Max.	Unit
Supply voltage	V <sub>SS</sub>	V <sub>DD</sub> =0V	-1.8	-1.5	-1.2	V
Oscillation frequency	f <sub>osc</sub>	CR oscillation		65		kHz
		CR oscillation		130		kHz
		CR oscillation		195		kHz
		CR oscillation		260		kHz
Booster capacitor	C1		0.1		$\mu$ F	

## ● DC Characteristics

(Unless otherwise specified:  $V_{DD}=0V$ ,  $V_{SS}=-1.5V$ ,  $f_{CLK}=65kHz$ ,  $T_a=25^\circ C$ ,  $V_{L1}-V_{L3}$  are internal voltage,  $C_1-C_3=0.1\mu F$ )

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
High level input voltage (1)	$V_{IH1}$	K00-03, P00-03, P10-13	$0.2 \cdot V_{SS}$		0	V
High level input voltage (2)	$V_{IH2}$	RESET, TEST	$0.1 \cdot V_{SS}$		0	V
Low level input voltage (1)	$V_{IL1}$	K00-03, P00-03, P10-13	$V_{SS}$		$0.8 \cdot V_{SS}$	V
Low level input voltage (2)	$V_{IL2}$	RESET, TEST	$V_{SS}$		$0.9 \cdot V_{SS}$	V
High level input current (1)	$I_{IH1}$	$V_{IH1}=0V$ , No pull-down K00-03, P00-03, P10-13	0		0.5	$\mu A$
High level input current (2)	$I_{IH2}$	$V_{IH2}=0V$ , Pull-down K00-03	5		20	$\mu A$
High level input current (3)	$I_{IH3}$	$V_{IH3}=0V$ , Pull-down P00-03, P10-13 RESET, TEST	25		100	$\mu A$
Low level input current	$I_{IL}$	$V_{IL}=V_{SS}$ K00-03, P00-03, P10-13 RESET, TEST	-0.5		0	$\mu A$
High level output current (1)	$I_{OH1}$	$V_{OH1}=0.1 \cdot V_{SS}$ R00, R03			-300	$\mu A$
High level output current (2)	$I_{OH2}$	$V_{OH2}=0.1 \cdot V_{SS}$ R01, R02, P00-03, P10-13			-150	$\mu A$
Low level output current (1)	$I_{OL1}$	$V_{OL1}=0.9 \cdot V_{SS}$ R00, R03	1400			$\mu A$
Low level output current (2)	$I_{OL2}$	$V_{OL2}=0.9 \cdot V_{SS}$ R01, R02, P00-03, P10-13	700			$\mu A$
Common output current	$I_{OH3}$	$V_{OH3}=-0.05V$ COM0-3			-3	$\mu A$
	$I_{OL3}$	$V_{OL3}=V_{L3}+0.05V$	3			$\mu A$
Segment output current (during LCD output)	$I_{OH4}$	$V_{OH4}=-0.05V$ SEG0-37			-3	$\mu A$
	$I_{OL4}$	$V_{OL4}=V_{L3}+0.05V$	3			$\mu A$
Segment output current (during DC output)	$I_{OH5}$	$V_{OH5}=0.1 \cdot V_{SS}$ SEG0-37			-100	$\mu A$
	$I_{OL5}$	$V_{OL5}=0.9 \cdot V_{SS}$	100			$\mu A$

## ● Analog Circuit Characteristics and Current Consumption

### LCD Drive Voltage

#### ● 4.5 V LCD panel, 1/4, 1/3, 1/2 duty, 1/3 bias ( $V_{L2}$ is shorted to $V_{SS}$ inside the IC)

(Unless otherwise specified:  $V_{DD}=0V$ ,  $V_{SS}=-1.5V$ ,  $f_{CLK}=65kHz$ ,  $T_a=25^\circ C$ ,  $V_{L1}-V_{L3}$  are internal voltage,  $C_1-C_3=0.1\mu F$ , Internal CR oscillation circuit)

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
LCD drive voltage	$V_{L1}$	Connect 1 M $\Omega$ load resistor between $V_{DD}$ and $V_{L1}$ (without panel load)		$V_{SS}$		V
	$V_{L2}$	Connect 1 M $\Omega$ load resistor between $V_{DD}$ and $V_{L2}$ (without panel load)	$2 \cdot V_{L1}$ - 0.1		$2 \cdot V_{L1}$ $\times 0.9$	V
	$V_{L3}$	Connect 1 M $\Omega$ load resistor between $V_{DD}$ and $V_{L3}$ (without panel load)	$3 \cdot V_{L1}$ - 0.1		$3 \cdot V_{L1}$ $\times 0.9$	V

#### ● 3 V LCD panel, 1/4, 1/3, 1/2 duty, 1/2 bias ( $V_{L3}$ is shorted to $V_{SS}$ inside the IC and $V_{L1}$ is shorted to $V_{L2}$ outside the IC)

(Unless otherwise specified:  $V_{DD}=0V$ ,  $V_{SS}=-1.5V$ ,  $f_{CLK}=65kHz$ ,  $T_a=25^\circ C$ ,  $V_{L1}-V_{L3}$  are internal voltage,  $C_1-C_3=0.1\mu F$ , Internal CR oscillation circuit)

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
LCD drive voltage	$V_{L1}$	Connect 1 M $\Omega$ load resistor between $V_{DD}$ and $V_{L1}$ (without panel load)		$V_{SS}$		V
	$V_{L2}$	Connect 1 M $\Omega$ load resistor between $V_{DD}$ and $V_{L2}$ (without panel load)		$V_{SS}$		V
	$V_{L3}$	Connect 1 M $\Omega$ load resistor between $V_{DD}$ and $V_{L3}$ (without panel load)	$2 \cdot V_{L1}$ - 0.1		$2 \cdot V_{L1}$ $\times 0.9$	V

### Current Consumption

(Unless otherwise specified:  $V_{DD}=0V$ ,  $V_{SS}=-1.5V$ ,  $T_a=25^\circ C$ ,  $V_{L1}-V_{L3}$  are internal voltage,  $C_1-C_3=0.1\mu F$ ,  $R_{CR}$  is internal resistor,  $f_{CLK}=65kHz$ )

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Current consumption ( $f_{osc}=65kHz$ )	$I_{OP1}$	During HALT		4	6	$\mu A$
		During execution	Without panel load	8	11	$\mu A$
Current consumption ( $f_{osc}=130kHz$ )	$I_{OP2}$	During HALT		8	11	$\mu A$
		During execution	Without panel load	15	21	$\mu A$
Current consumption ( $f_{osc}=195kHz$ )	$I_{OP3}$	During HALT		11	15	$\mu A$
		During execution	Without panel load	20	26	$\mu A$
Current consumption ( $f_{osc}=260kHz$ )	$I_{OP4}$	During HALT		14	19	$\mu A$
		During execution	Without panel load	26	34	$\mu A$
Current consumption	$I_{OP5}$	During SLEEP			0.3	$\mu A$

# E0C6011

## ● Oscillation Characteristics

Oscillation characteristics will vary according to different conditions (elements used, board pattern). Use the following characteristics as reference values.

(Unless otherwise specified:  $V_{DD}=0V$ ,  $V_{SS}=-1.5V$ ,  $T_a=25^{\circ}C$ )

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Oscillation frequency dispersion	fosc1	$V_{SS}=-1.5V$	42.3	65	87.8	kHz
Oscillation start time	tsta	$V_{SS}=-1.5V$			3	mS
Frequency v.s. voltage deviation	df1/dv	$V_{SS}=-1.2$ to $-1.8V$	-30		30	%
Frequency v.s. temperature deviation	df1/dta	$V_{SS}=-1.5V$ , $T_a=-25$ to $75^{\circ}C$	-15		15	%

(Unless otherwise specified:  $V_{DD}=0V$ ,  $V_{SS}=-1.5V$ ,  $T_a=25^{\circ}C$ )

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Oscillation frequency dispersion	fosc2	$V_{SS}=-1.5V$	84.5	130	175.5	kHz
Oscillation start time	tsta	$V_{SS}=-1.5V$			3	mS
Frequency v.s. voltage deviation	df2/dv	$V_{SS}=-1.2$ to $-1.8V$	-30		30	%
Frequency v.s. temperature deviation	df2/dta	$V_{SS}=-1.5V$ , $T_a=-25$ to $75^{\circ}C$	-15		15	%

(Unless otherwise specified:  $V_{DD}=0V$ ,  $V_{SS}=-1.5V$ ,  $T_a=25^{\circ}C$ )

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Oscillation frequency dispersion	fosc3	$V_{SS}=-1.5V$	136.5	195	253.5	kHz
Oscillation start time	tsta	$V_{SS}=-1.5V$			3	mS
Frequency v.s. voltage deviation	df3/dv	$V_{SS}=-1.2$ to $-1.8V$	-30		30	%
Frequency v.s. temperature deviation	df3/dta	$V_{SS}=-1.5V$ , $T_a=-25$ to $75^{\circ}C$	-15		15	%

(Unless otherwise specified:  $V_{DD}=0V$ ,  $V_{SS}=-1.5V$ ,  $T_a=25^{\circ}C$ )

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Oscillation frequency dispersion	fosc4	$V_{SS}=-1.5V$	182	260	338	kHz
Oscillation start time	tsta	$V_{SS}=-1.5V$			3	mS
Frequency v.s. voltage deviation	df4/dv	$V_{SS}=-1.2$ to $-1.8V$	-30		30	%
Frequency v.s. temperature deviation	df4/dta	$V_{SS}=-1.5V$ , $T_a=-25$ to $75^{\circ}C$	-15		15	%

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