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What is "Embedded - Microcontrollers"?

"Embedded - Microcontrollers" refer to small, integrated circuits designed to perform specific tasks within larger systems. These microcontrollers are essentially compact computers on a single chip, containing a processor core, memory, and programmable input/output peripherals. They are called "embedded" because they are embedded within electronic devices to control various functions, rather than serving as standalone computers. Microcontrollers are crucial in modern electronics, providing the intelligence and control needed for a wide range of applications.

Applications of "Embedded - Microcontrollers"

Details	
Product Status	Obsolete
Core Processor	PIC
Core Size	8-Bit
Speed	20MHz
Connectivity	-
Peripherals	Brown-out Detect/Reset, LVD, POR, WDT
Number of I/O	11
Program Memory Size	3.5KB (2K x 14)
Program Memory Type	FLASH
EEPROM Size	-
RAM Size	128 x 8
Voltage - Supply (Vcc/Vdd)	2V ~ 3.6V
Data Converters	-
Oscillator Type	Internal
Operating Temperature	-40°C ~ 125°C (TA)
Mounting Type	Surface Mount
Package / Case	20-SOIC (0.295", 7.50mm Width)
Supplier Device Package	20-SOIC
Purchase URL	https://www.e-xfl.com/product-detail/microchip-technology/pic16f639-e-so

2.0 MEMORY ORGANIZATION

2.1 Program Memory Organization

[illegible]

2.2 Data Memory Organization

[illegible] 0 [illegible]

[illegible]	[illegible]	
0	0	[illegible]
0	1	[illegible]
1	0	[illegible]
1	1	[illegible]

FIGURE 2-1: PROGRAM MEMORY MAP AND STACK OF THE PIC12F635

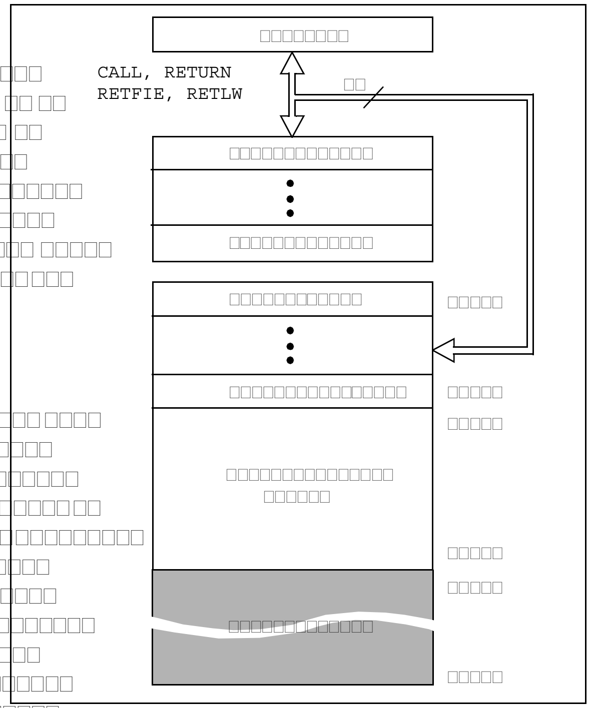


FIGURE 2-2: PROGRAM MEMORY MAP AND STACK OF THE PIC16F636/639

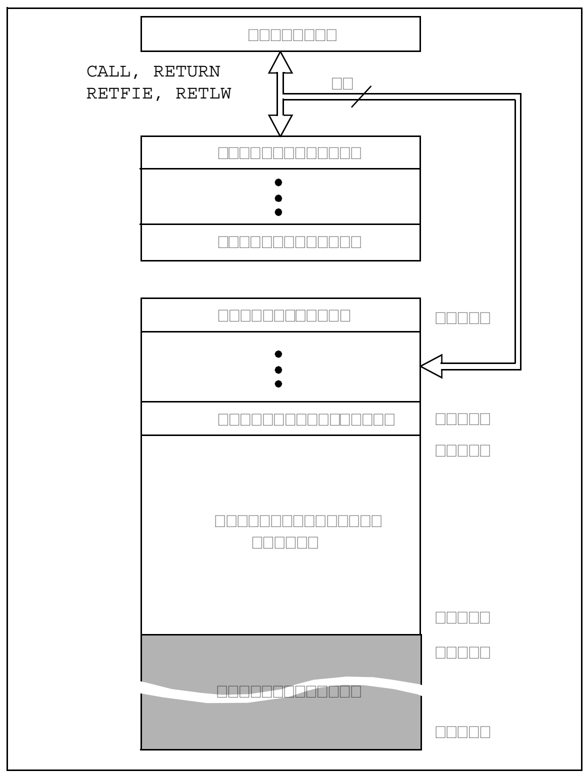


FIGURE 2-3: PIC12F635 SPECIAL FUNCTION REGISTERS

Note 1:

2:

TABLE 2-3: PIC16F636/639 SPECIAL FUNCTION REGISTERS SUMMARY BANK 0

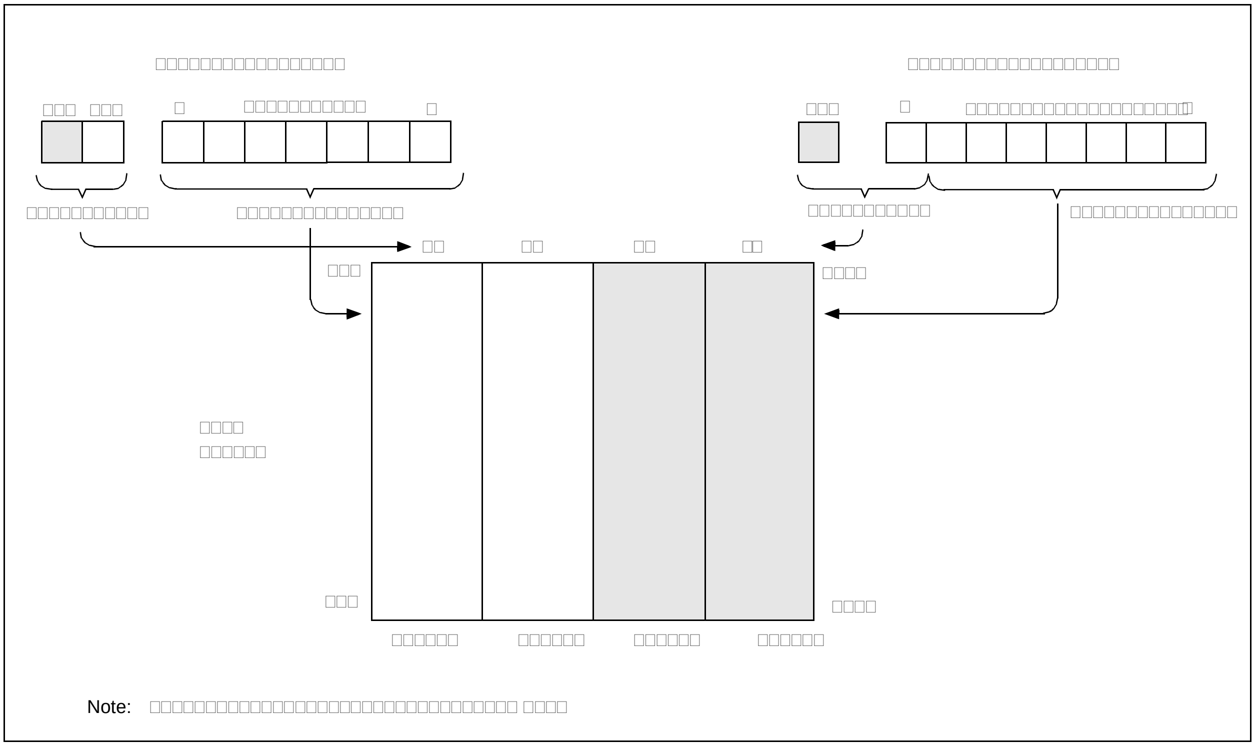
Addr	Name	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Value on POR/BOR/ WUR	Page
[illegible]											
[illegible]	[illegible]	[illegible]								xxxx xxxx	[illegible]
[illegible]	[illegible]	[illegible]								xxxx xxxx	[illegible]
[illegible]	[illegible]	[illegible]								0000 0000	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0001 1xxx	[illegible]
[illegible]	[illegible]	[illegible]								xxxx xxxx	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	--xx xx00	[illegible]
[illegible]	[illegible]	[illegible]								[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	--xx xx00	[illegible]
[illegible]	[illegible]	[illegible]								[illegible]	[illegible]
[illegible]	[illegible]	[illegible]								[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]					---0 0000	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] (2)	0000 000x	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0000 00-0	[illegible]
[illegible]	[illegible]	[illegible]								[illegible]	[illegible]
[illegible]	[illegible]	[illegible]								xxxx xxxx	[illegible]
[illegible]	[illegible]	[illegible]								xxxx xxxx	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0000 0000	[illegible]
[illegible]	[illegible]	[illegible]								[illegible]	[illegible]
[illegible]	[illegible]	[illegible]								[illegible]	[illegible]
[illegible]	[illegible]	[illegible]								[illegible]	[illegible]
[illegible]	[illegible]	[illegible]								[illegible]	[illegible]
[illegible]	[illegible]	[illegible]								[illegible]	[illegible]
[illegible]	[illegible]	[illegible]								[illegible]	[illegible]
[illegible]	[illegible]	[illegible]								[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	---0 1000	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0000 0000	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	---- --10	[illegible]
[illegible]	[illegible]	[illegible]								[illegible]	[illegible]
[illegible]	[illegible]	[illegible]								[illegible]	[illegible]
[illegible]	[illegible]	[illegible]								[illegible]	[illegible]
[illegible]	[illegible]	[illegible]								[illegible]	[illegible]
[illegible]	[illegible]	[illegible]								[illegible]	[illegible]

Legend: [illegible] 0 [illegible] u [illegible] x [illegible] q [illegible]

Note 1: [illegible]

2: [illegible]

FIGURE 2-6: DIRECT/INDIRECT ADDRESSING PIC12F635/PIC16F636/639



6.0 TIMER1 MODULE WITH GATE CONTROL

[illegible]

6.1 Timer1 Operation

[illegible]

6.2 Clock Source Selection

[illegible] 0 [illegible] 1 [illegible]

Clock Source	T1OSCEN	FOSC Mode	T1CS
[illegible]	x	xxx	x
[illegible]	x		1
[illegible]	1	[illegible]	

REGISTER 8-1: LVDCON: LOW-VOLT AGE DETECT CONTROL REGISTER

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible] (1)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]							[illegible]

Legend:

[illegible]

[illegible]	**Unimplemented:** [illegible] 0
[illegible]	**IRVST:** [illegible] (1) [illegible] 1 [illegible] 0 [illegible]
[illegible]	**LVDEN:** [illegible] 1 [illegible] 0 [illegible]
[illegible]	**Unimplemented:** [illegible] 0
[illegible]	**LVDL<2:0>:** [illegible] 111 [illegible] 110 [illegible] 101 [illegible] 100 [illegible] 011 [illegible] 010 [illegible] 001 [illegible] (2) 000 [illegible]

Note 1: [illegible]

2: [illegible]

TABLE 8-1: REGISTERS ASSOCIATED WITH PROGRAMMABLE LOW-VOLTAGE DETECT

Name	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Value on POR, BOR	Value on all other Resets
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0000 000x	0000 000x
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0000 -0-0	0000 -0-0
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0000 -0-0	0000 -0-0
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	--00 -100	--00 -100

Legend: x [illegible] - [illegible] 0 [illegible]

FIGURE 12-4: TIME-OUT SEQUENCE ON POWER-UP (DELAYED $\overline{MCLR}$)

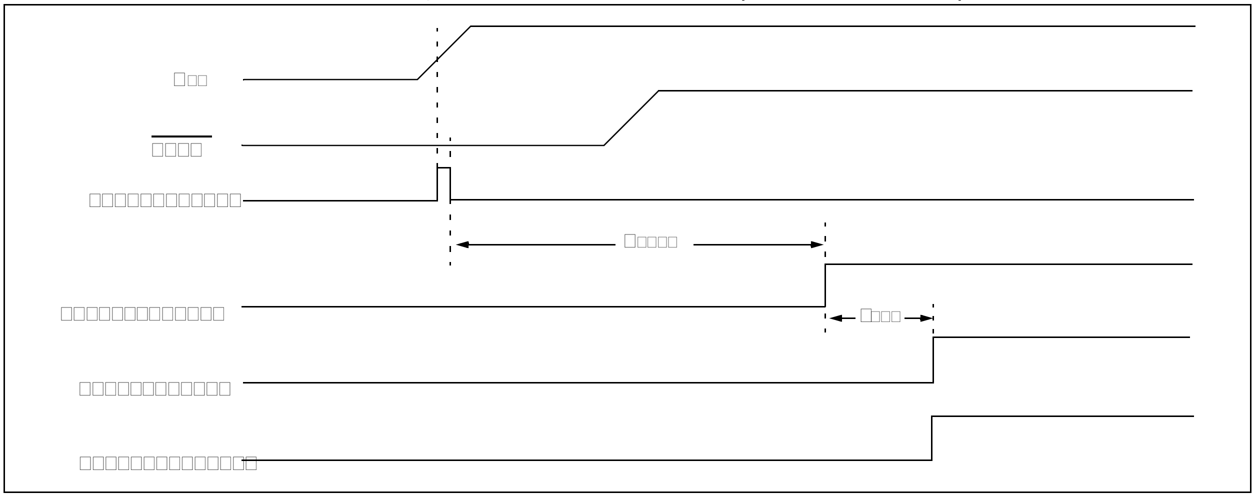


FIGURE 12-5: TIME-OUT SEQUENCE ON POWER-UP (DELAYED $\overline{MCLR}$)

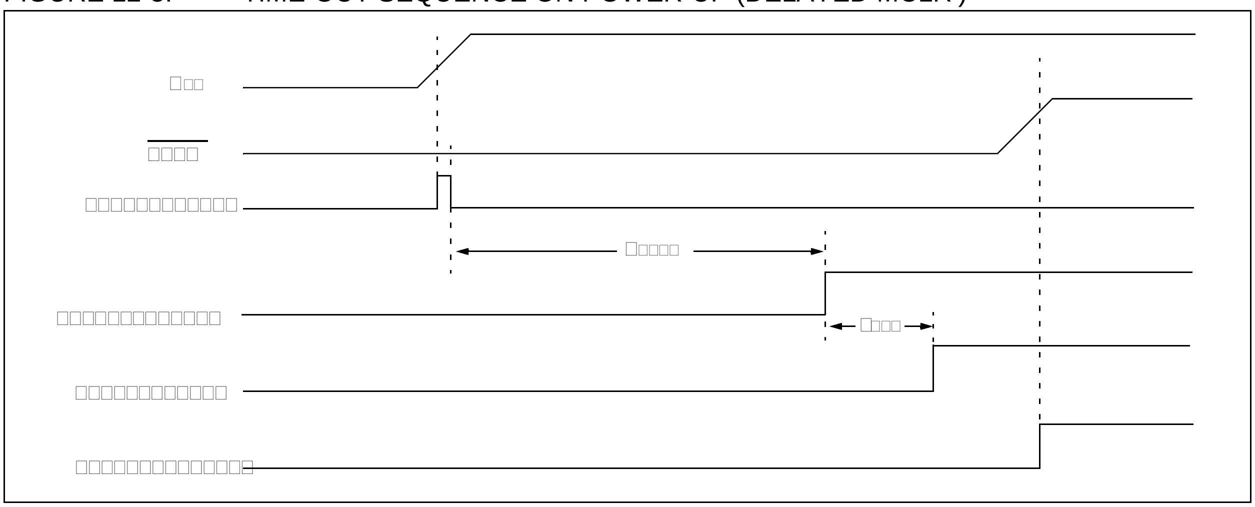


FIGURE 12-6: TIME-OUT SEQUENCE ON POWER-UP ($\overline{MCLR}$ WITH V_{DD})

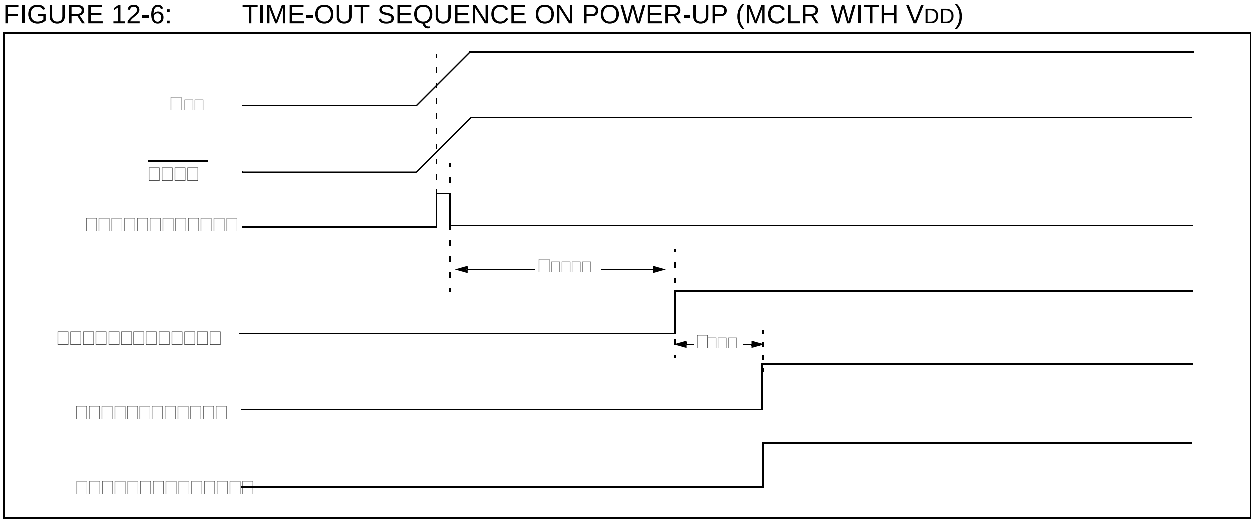


TABLE 12-4: INITIALIZATION CONDITION FOR REGISTERS

Register	Address	Power-on Reset Wake-up Reset	MCLR Reset WDT Reset Brown-out Reset (1) Wake-up Reset	Wake-up from Sleep through Interrupt Wake-up from Sleep through WDT Time-out
[illegible]	[illegible]	xxxx xxxx	uuuu uuuu	uuuu uuuu
[illegible]	[illegible]	xxxx xxxx	xxxx xxxx	uuuu uuuu
[illegible]	[illegible]	xxxx xxxx	uuuu uuuu	uuuu uuuu
[illegible]	[illegible]	0000 0000	0000 0000	[illegible](3)
[illegible]	[illegible]	0001 1xxx	000q quuu(4)	uuuq quuu(4)
[illegible]	[illegible]	xxxx xxxx	uuuu uuuu	uuuu uuuu
[illegible]	[illegible]	--xx xx00	--00 0000	--uu uu00
[illegible] (6)	[illegible]	--xx xx00	--00 0000	--uu uu00
[illegible]	[illegible]	---0 0000	---0 0000	---u uuuu
[illegible]	[illegible]	0000 000x	0000 000x	uuuu uuuu(2)
[illegible]	[illegible]	0000 00-0	0000 00-0	uuuu uu-u(2)
[illegible]	[illegible]	xxxx xxxx	uuuu uuuu	uuuu uuuu
[illegible]	[illegible]	xxxx xxxx	uuuu uuuu	uuuu uuuu
[illegible]	[illegible]	0000 0000	uuuu uuuu	-uuu uuuu
[illegible]	[illegible]	---0 1000	---0 1000	---u uuuu
[illegible]	[illegible]	0000 0000	0000 0000	uuuu uuuu
[illegible]	[illegible]	---- --10	---- --10	---- --uu
[illegible]	[illegible]	1111 1111	1111 1111	uuuu uuuu
[illegible]	[illegible]	--11 1111	--11 1111	--uu 1uuu
[illegible](6)	[illegible]	--11 1111	--11 1111	--uu 1uuu
[illegible]	[illegible]	0000 00-0	0000 00-0	uuuu uu-u
[illegible]	[illegible]	--01 q-qq	--0u u-uu(1,5)	--0u u-uu
[illegible]	[illegible]	-110 q000	-110 q000	-uuu uuuu
[illegible]	[illegible]	---0 0000	---u uuuu	---u uuuu
[illegible]	[illegible]	--11 -111	--11 -111	uuuu uuuu
[illegible]	[illegible]	--00 0000	--00 0000	--uu uuuu
[illegible]	[illegible]	--11 -111	--11 -111	uuuu uuuu
[illegible]	[illegible]	0-0- 0000	0-0- 0000	u-u- uuuu
[illegible]	[illegible]	0000 0000	0000 0000	uuuu uuuu
[illegible]	[illegible]	0000 0000	0000 0000	uuuu uuuu
[illegible]	[illegible]	---- x000	---- q000	---- uuuu
[illegible]	[illegible]	---- ----	---- ----	---- ----
[illegible]	[illegible]	xxxx xxxx	uuuu uuuu	uuuu uuuu
[illegible]	[illegible]	-000 ----	-000 ----	-uuu ----
[illegible]	[illegible]	--00 -000	--00 -000	--uu -uuu
[illegible]	[illegible]	00-- --00	00-- --00	uu-- --uu

Legend: u [illegible] x [illegible] - [illegible] 0 q [illegible]

Note 1: [illegible]

2: [illegible]

3: [illegible]

4: [illegible]

5: [illegible] 0 [illegible] u [illegible]

6: [illegible]

14.7 MPLAB ICE 2000 High-Performance In-Circuit Emulator

14.8 MPLAB REAL ICE In-Circuit Emulator System

14.9 MPLAB ICD 2 In-Circuit Debugger

14.10 MPLAB PM3 Device Programmer

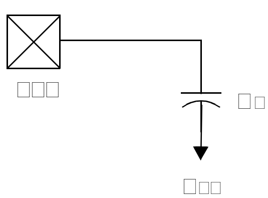
15.9 Timing Parameter Symbology

T	

pp	

S	

FIGURE 15-4: LOAD CONDITIONS



Legend:

FIGURE 15-9: TIMER0 AND TIMER1 EXTERNAL CLOCK TIMINGS

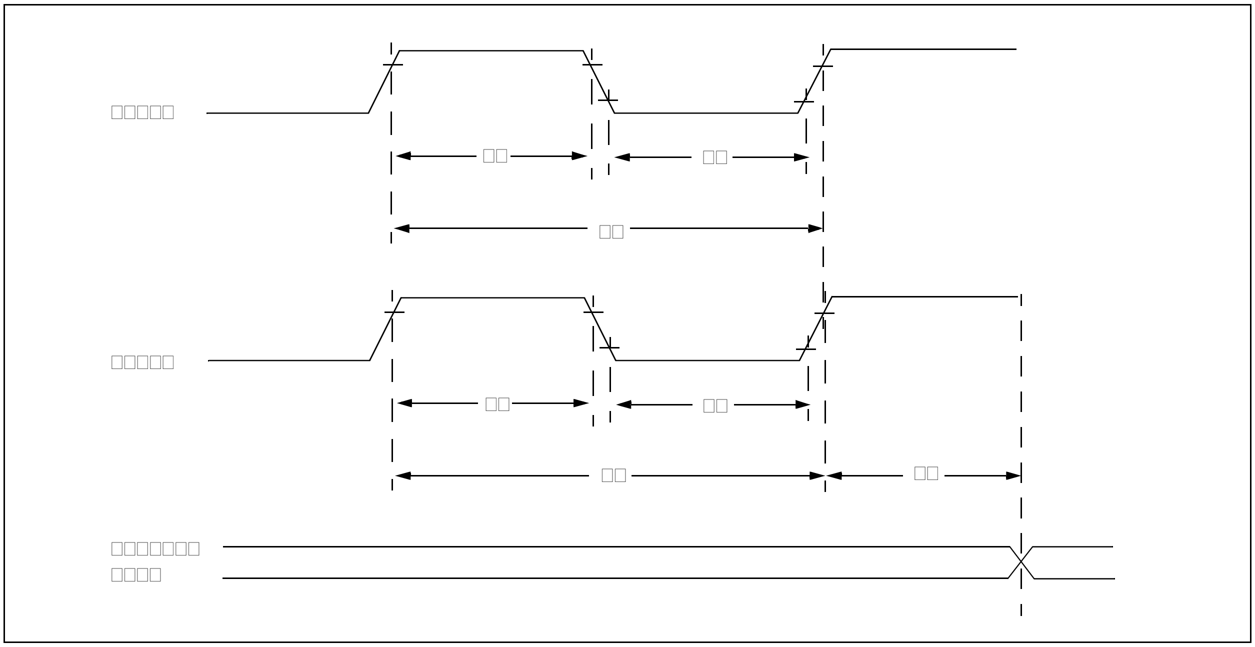


TABLE 15-5: TIMER0 AND TIMER1 EXTERNAL CLOCK REQUIREMENTS

Standard Operating Conditions (unless otherwise stated)
[illegible]

Param No.	Sym	Characteristic		Min	Typ†	Max	Units	Conditions
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

[illegible]

TABLE 15-6: COMPARATOR SPECIFICATIONS

Standard Operating Conditions (unless otherwise stated)
[illegible]

Param No.	Sym	Characteristics		Min	Typ†	Max	Units	Comments
[illegible]	[illegible]	[illegible]			—[illegible]	—[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	(NOTE 1)
			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	µ[illegible]	

[illegible]

[illegible]

Note 1: [illegible]

TABLE 15-7: COMPARATOR VOLTAGE REFERENCE (CV_{REF}) SPECIFICATIONS

Standard Operating Conditions (unless otherwise stated)
[illegible]

Param No.	Sym	Characteristics	Min	Typ†	Max	Units	Comments
[illegible]	[illegible]	[illegible](2)	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible]1[illegible] [illegible]0[illegible]
[illegible]	[illegible]	[illegible]	[illegible] [illegible]	[illegible] [illegible]	—[illegible] — [illegible]	[illegible] [illegible]	[illegible]1[illegible] [illegible]0[illegible]
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible](1)	[illegible]	[illegible]	[illegible]	µ[illegible]	

[illegible]

[illegible]

Note 1: [illegible] 1 [illegible] 0000 [illegible] 1111 [illegible]

2: [illegible] Section 7.11 “Comparator Voltage Reference” [illegible]

TABLE 15-8: PIC12F635/PIC16F636 PLVD CHARACTERISTICS:

DC CHARACTERISTICS			Standard Operating Conditions (unless otherwise stated) [illegible]				
Sym.	Characteristic		Min	Typ†	Max	Units	Conditions
[illegible]	[illegible]	[illegible]001	[illegible]	[illegible]	[illegible]	[illegible]	
		[illegible]010	[illegible]	[illegible]	[illegible]	[illegible]	
		[illegible]011	[illegible]	[illegible]	[illegible]	[illegible]	
		[illegible]100	[illegible]	[illegible]	[illegible]	[illegible]	
		[illegible]101	[illegible]	[illegible]	[illegible]	[illegible]	
		[illegible]110	[illegible]	[illegible]	[illegible]	[illegible]	
		[illegible]111	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]		[illegible]	[illegible] [illegible]	[illegible]	µ[illegible]	[illegible] [illegible]

[illegible]

[illegible]°[illegible]

TABLE 15-9: PIC16F639 PLVD CHARACTERISTICS :

DC CHARACTERISTICS			Standard Operating Conditions (unless otherwise stated) [illegible]				
Sym.	Characteristic		Min	Typ†	Max	Units	Conditions
[illegible]	[illegible]	[illegible] 001	[illegible]	[illegible]	[illegible]	[illegible]	
		[illegible] 010	[illegible]	[illegible]	[illegible]	[illegible]	
		[illegible] 011	[illegible]	[illegible]	[illegible]	[illegible]	
		[illegible] 100	[illegible]	[illegible]	[illegible]	[illegible]	
		[illegible] 101	[illegible]	[illegible]	[illegible]	[illegible]	
		[illegible] 110	[illegible]	[illegible]	[illegible]	[illegible]	
		[illegible] 111	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	µ[illegible]	[illegible]

[illegible]

[illegible] °[illegible]

15.11 AC Characteristics: Analog Front-End for PIC16F639 (Industrial)

AC CHARACTERISTICS			Standard Operating Conditions (unless otherwise stated) [illegible]				
Param No.	Sym.	Characteristic	Min	Typ†	Max	Units	Conditions
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] 0 [illegible] 00 [illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] μ[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] 0000 [illegible] 1111 [illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] 000000 [illegible] 111111 [illegible] 000000 [illegible] 111111 [illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] 000000 [illegible] 111111 [illegible] 000000 [illegible] 111111 [illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] 000000 [illegible] 111111 [illegible] 000000 [illegible] 111111 [illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	* [illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	μ[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	μ[illegible]	[illegible]

* [illegible]
[illegible]
Note 1: [illegible] TOEH [illegible]
2: [illegible] TOEL [illegible]

FIGURE 16-4: MAXIMUM I_{DD} vs. F_{OSC} OVER V_{DD} (HS MODE)

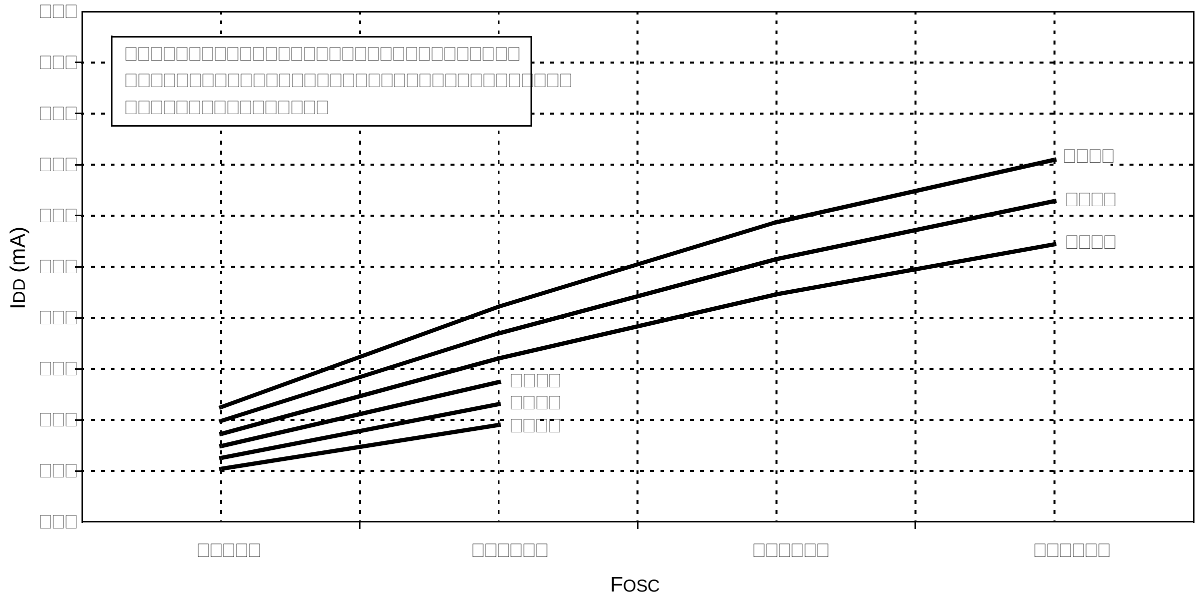


FIGURE 16-5: TYPICAL I_{DD} vs. V_{DD} OVER F_{OSC} (XT MODE)

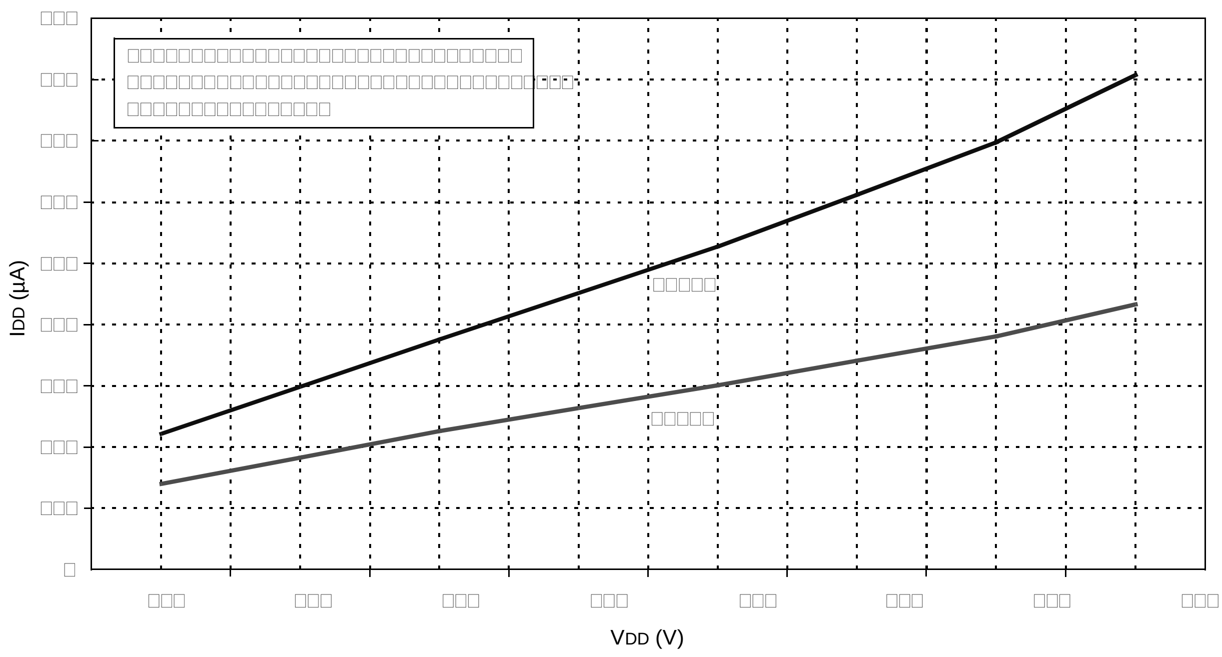


FIGURE 16-12: MAXIMUM I_{DD} vs. F_{OSC} OVER V_{DD} (HFINTOSC MODE)

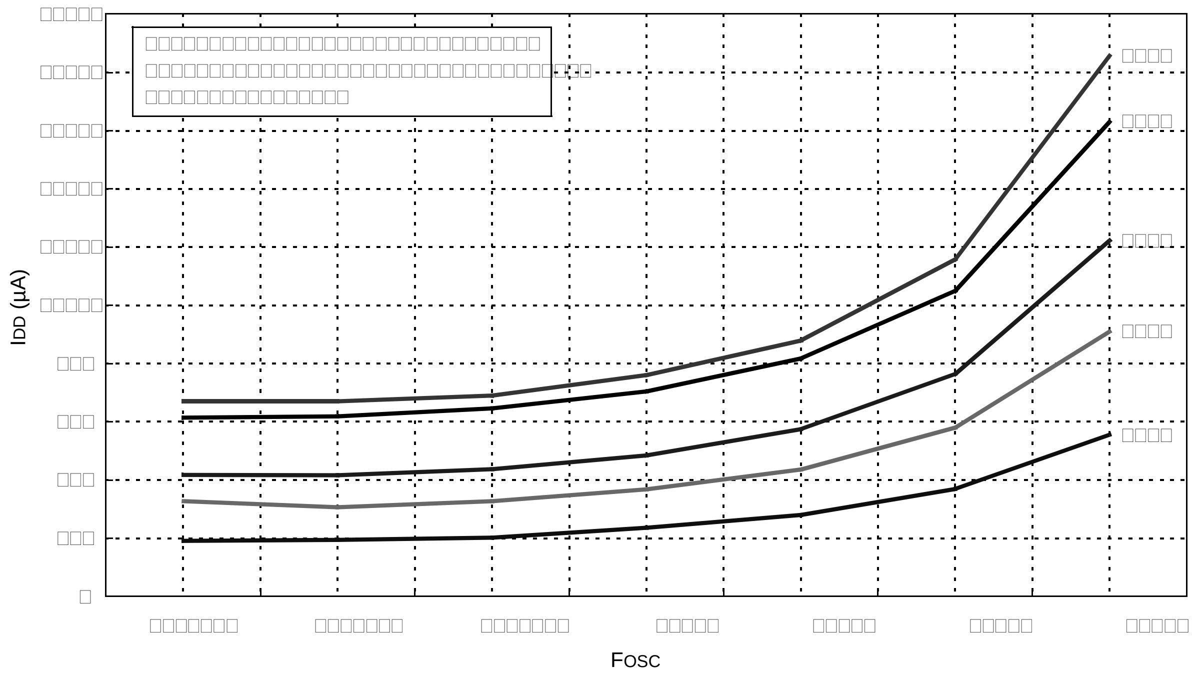


FIGURE 16-13: TYPICAL I_{PD} vs. V_{DD} (SLEEP MODE, ALL PERIPHERALS DISABLED)

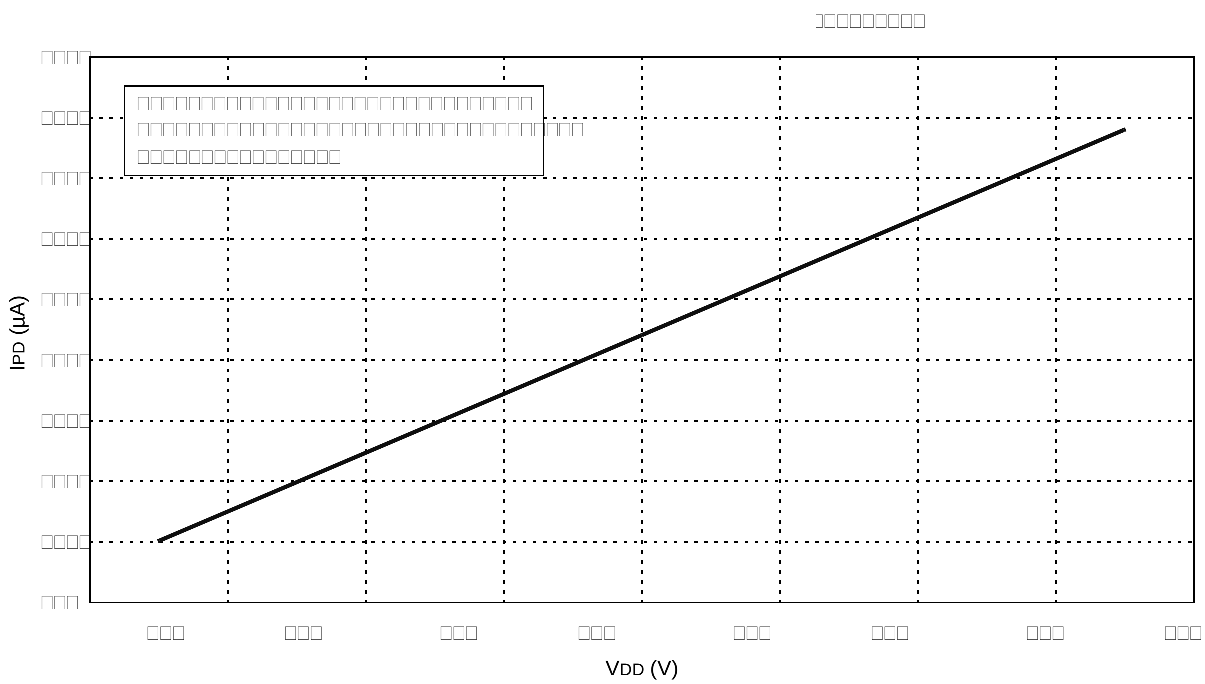


FIGURE 16-18: MAXIMUM WDT I_{PD} vs. V_{DD} OVER TEMPERATURE

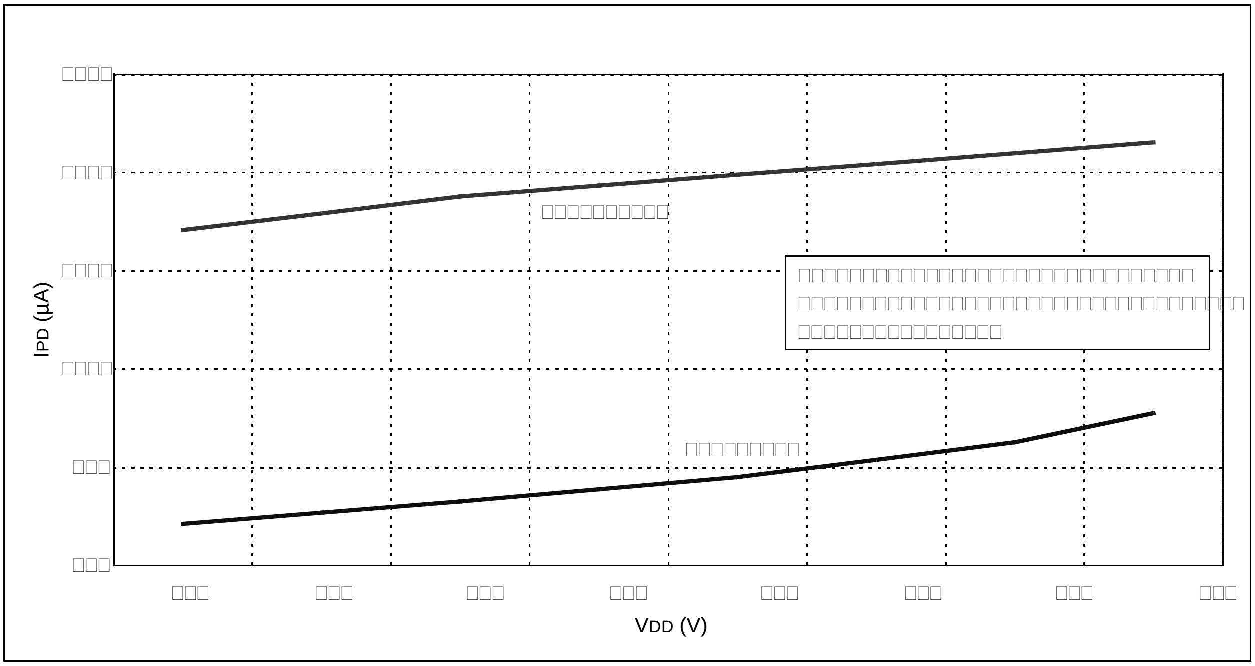
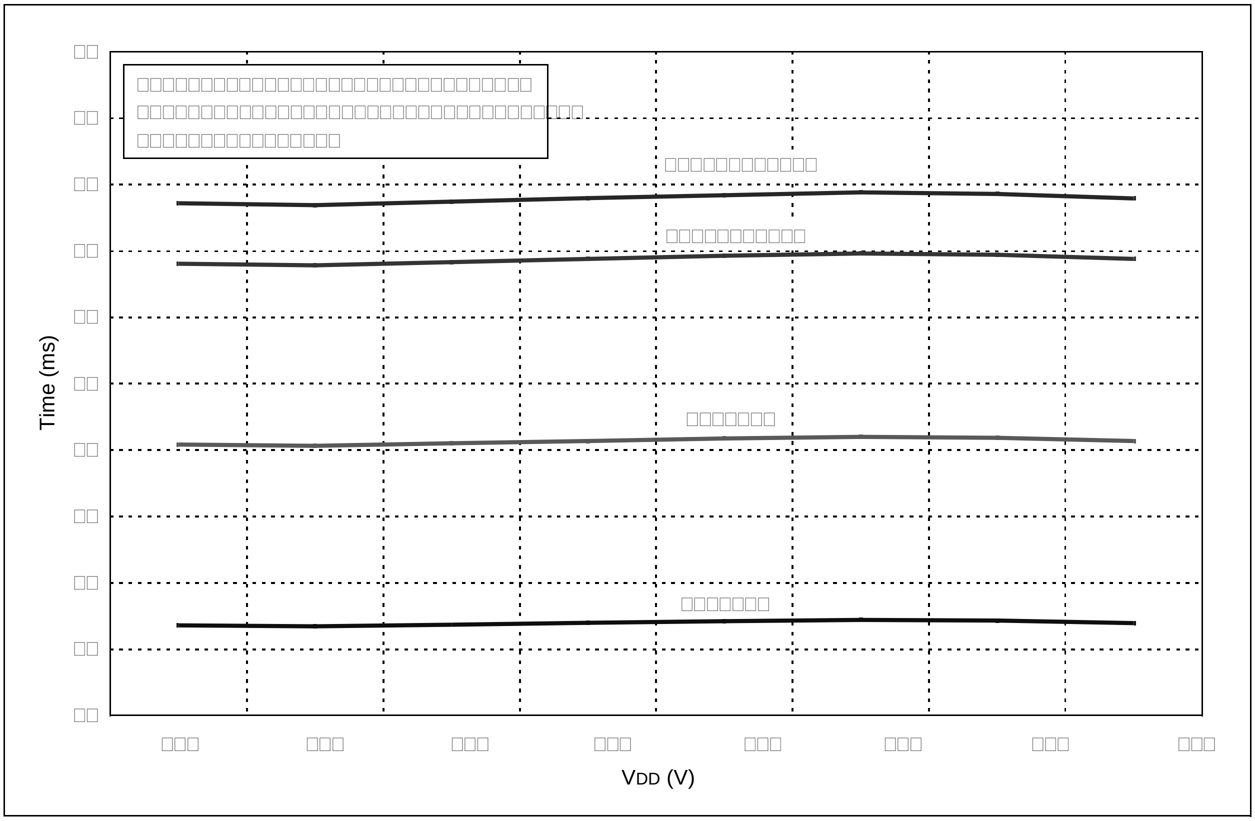
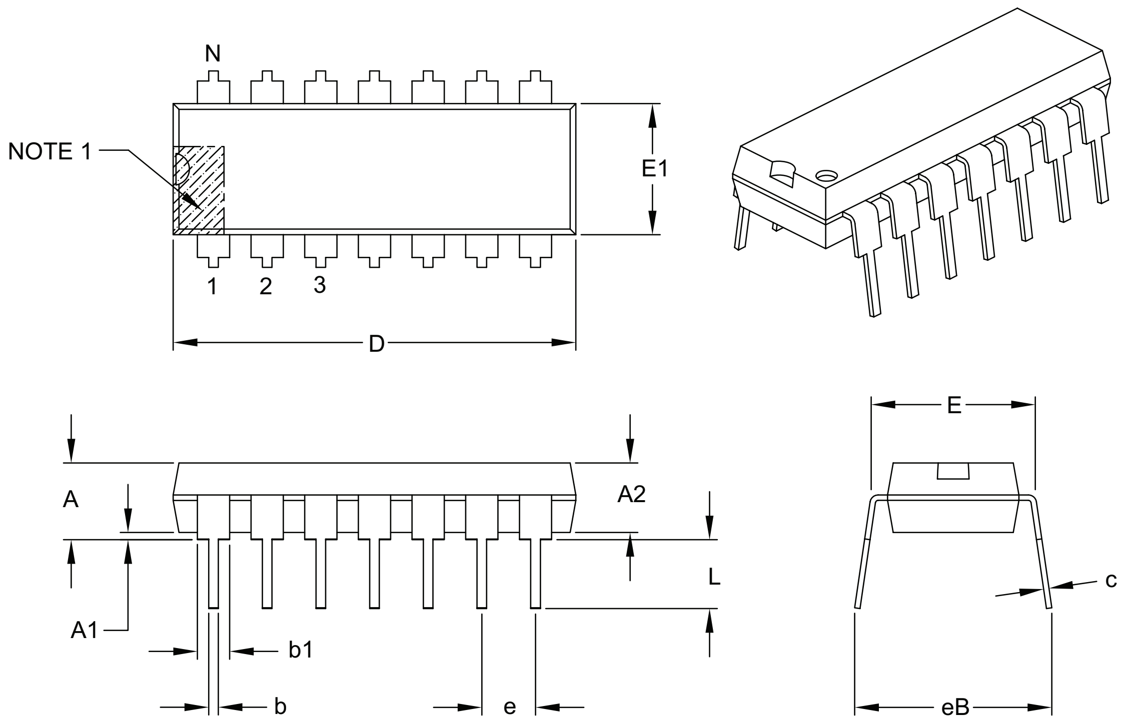


FIGURE 16-19: WDT PERIOD vs. V_{DD} OVER TEMPERATURE



14-Lead Plastic Dual In-Line (P or PD) – 300 mil Body [PDIP]

Note: [illegible]



[illegible]		[illegible]		
[illegible]		[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Notes:

[illegible]

NOTES:

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