



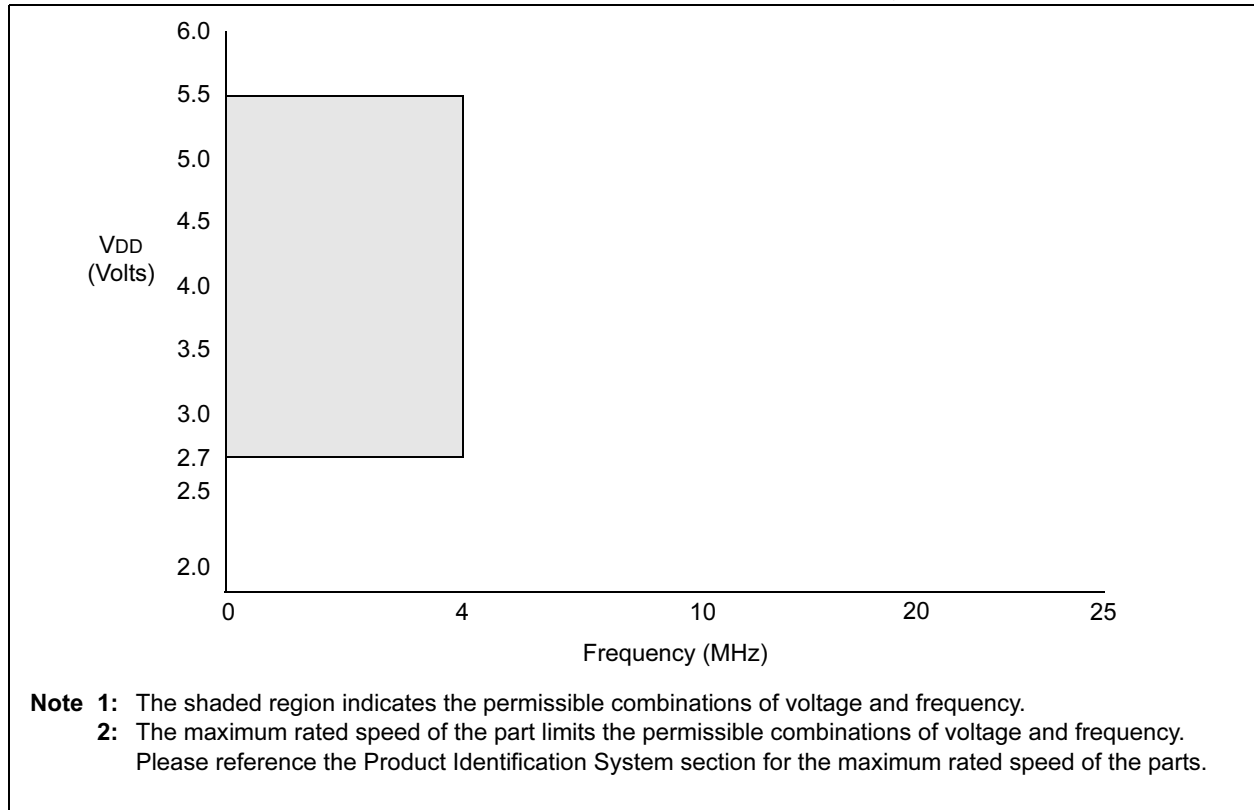
PIC12CE518/CE519

PIC12CE518/CE519 Rev. B Silicon/Data Sheet Errata

The PIC12CE518/CE519 (Rev. B) parts you have received conform functionally to the Device Data Sheet (**DS40172** and **DS40139E**), except for the anomalies described below.

1. Valid regions of operation:

FIGURE 1: PIC12LCE518/LCE519 VOLTAGE-FREQUENCY GRAPH, $-40^{\circ}\text{C} \leq T_A \leq 0^{\circ}\text{C}$



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FIGURE 2: PIC12LCE518/LCE519 VOLTAGE-FREQUENCY GRAPH, $0^{\circ}\text{C} \leq T_A \leq +70^{\circ}\text{C}$

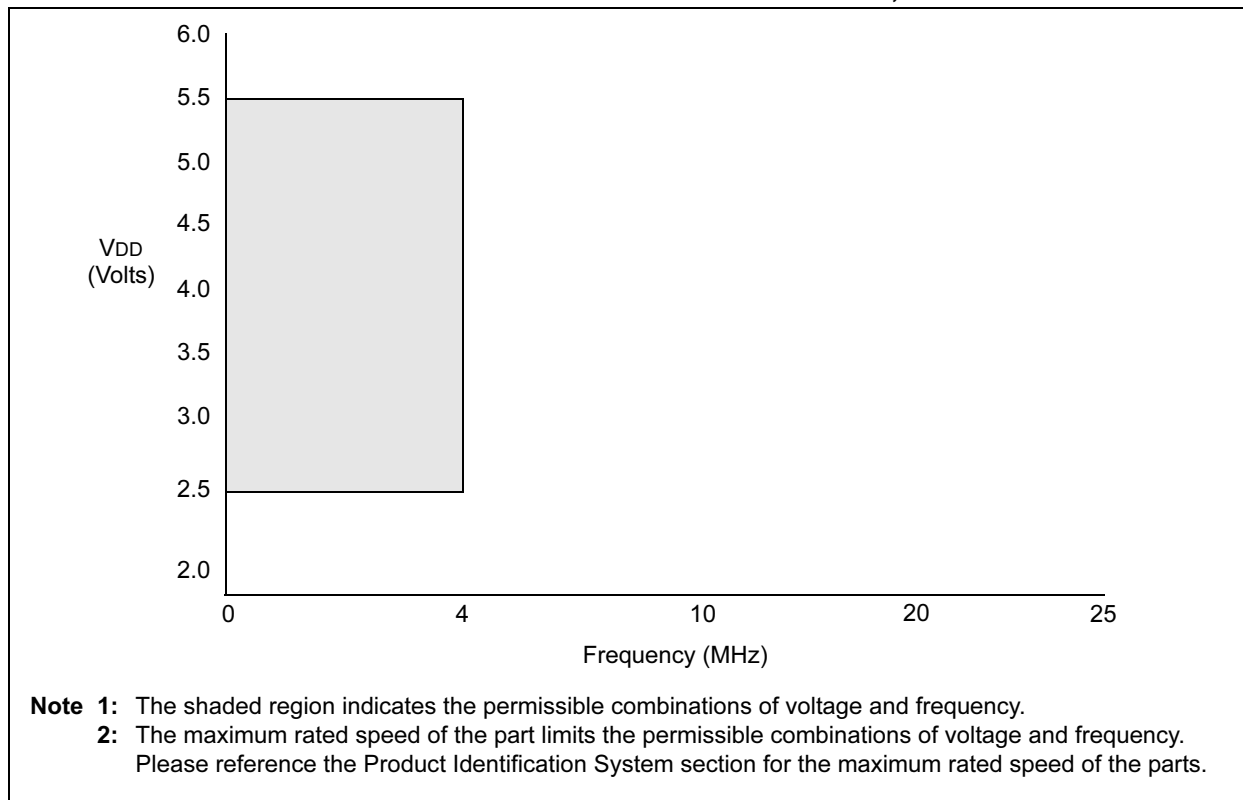
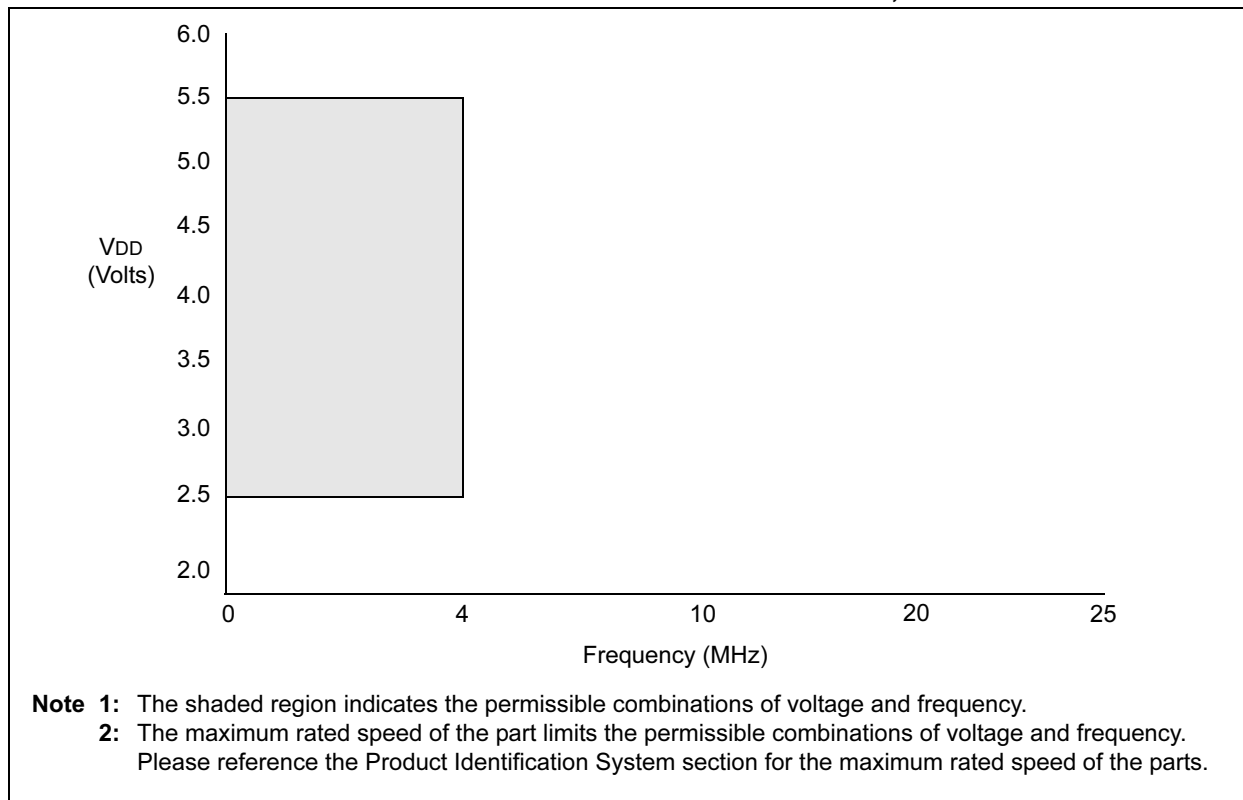


FIGURE 3: PIC12LCE518/LCE519 VOLTAGE-FREQUENCY GRAPH, $+70^{\circ}\text{C} \leq T_A \leq +125^{\circ}\text{C}$

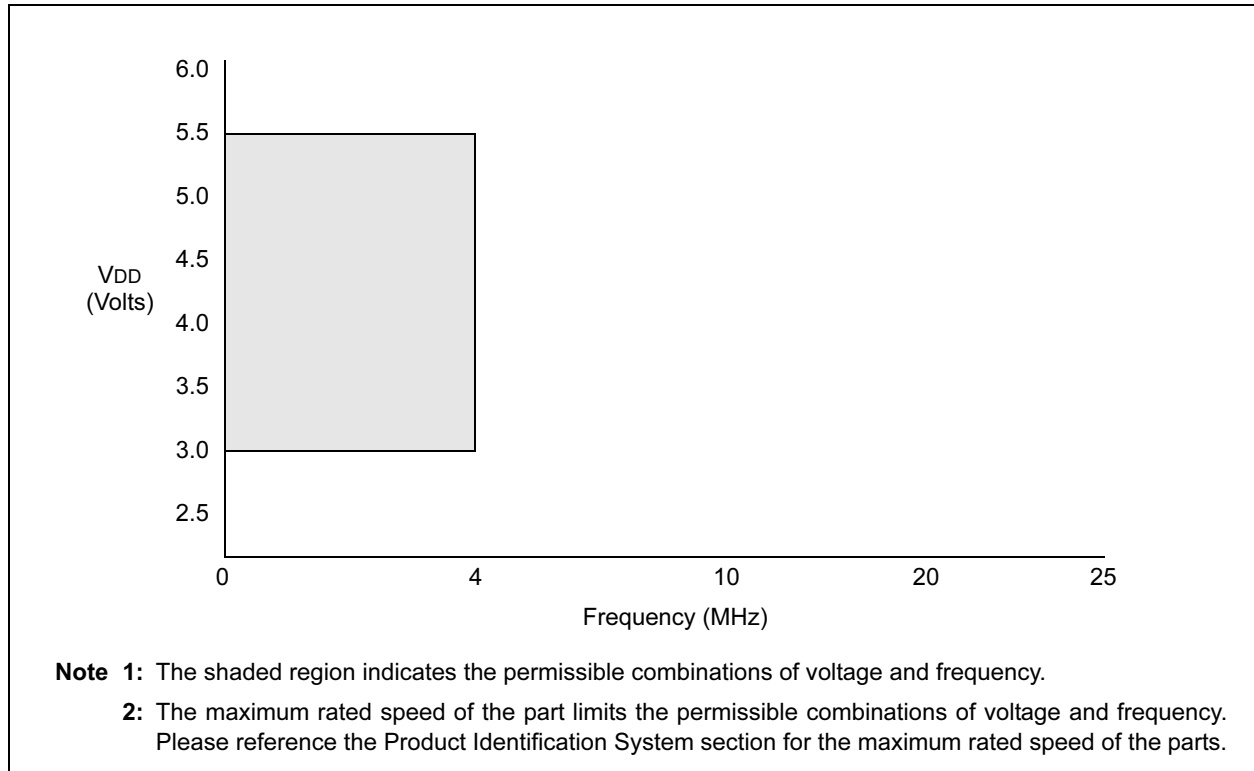


Clarifications/Corrections to the Data Sheet:

In the Device Data Sheet (**DS40139E**), the following clarifications and corrections should be noted.

1. Valid regions of operation:

FIGURE 4: PIC12CE518/CE519 VOLTAGE-FREQUENCY GRAPH, $-40^{\circ}\text{C} \leq T_A \leq +125^{\circ}\text{C}$



2. In Section 13: Corrections for the DC Characteristics, Sections 13.1, 13.2, 13.3, and 13.4 are shown. Corrections for the GPIO pull-up resistor ranges are shown in Table 13-1. For the section titled "RESET", additional information is provided on OSC1/CLKIN and OSC2/CLKOUT pin states during a MCLR.

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13.1 DC CHARACTERISTICS: PIC12C508A/509A (Commercial, Industrial, Extended) PIC12CE518/519 (Commercial, Industrial, Extended) PIC12CR509A (Commercial, Industrial, Extended)

DC Characteristics Power Supply Pins			Standard Operating Conditions (unless otherwise specified)				
			Operating Temperature 0°C ≤ TA ≤ +70°C (commercial) -40°C ≤ TA ≤ +85°C (industrial) -40°C ≤ TA ≤ +125°C (extended)				
Parm No.	Characteristic	Sym	Min	Typ ⁽¹⁾	Max	Units	Conditions
D001	Supply Voltage	VDD	3.0		5.5	V	See Figures 1-4.
D010	Supply Current ⁽³⁾	IDD	—	0.8	1.4	mA	XT and EXTRC options ⁽⁴⁾ FOSC = 4 MHz, VDD = 5.5V
D010C			—	0.8	1.4	mA	INTRC Option FOSC = 4 MHz, VDD = 5.5V
D010A			—	19	27	μA	Commercial Temperature, LP Option FOSC = 32 kHz, VDD = 3.0V, WDT disabled
			—	19	35	μA	Industrial Temperature, LP Option FOSC = 32 kHz, VDD = 3.0V, WDT disabled
			—	30	55	μA	Extended Temperature, LP Option FOSC = 32 kHz, VDD = 3.0V, WDT disabled
1A	LP Oscillator Operating Frequency	FOSC	0	—	200	kHz	All temperatures
	XT Oscillator Operating Frequency		0	—	4	MHz	All temperatures

* These parameters are characterized but not tested.

Note 1: Data in the Typical ("Typ") column is based on characterization results at 25°C. This data is for design guidance only and is not tested.

2: This is the limit to which VDD can be lowered in SLEEP mode without losing RAM data.

3: The supply current is mainly a function of the operating voltage and frequency. Other factors such as bus loading, oscillator type, bus rate, internal code execution pattern, and temperature also have an impact on the current consumption.

a) The test conditions for all IDD measurements in Active Operation mode are:

OSC1 = external square wave, from rail-to-rail; all I/O pins tristated, pulled to VSS,

T0CKI = VDD, MCLR = VDD; WDT enabled/disabled as specified.

b) For standby current measurements, the conditions are the same, except that the device is in SLEEP mode.

4: Does not include current through REXT. The current through the resistor can be estimated by the formula:

$I_R = V_{DD}/2R_{EXT}$ (mA) with REXT in kOhm.

5: The power-down current in SLEEP mode does not depend on the oscillator type. Power-down current is measured with the part in SLEEP mode, with all I/O pins in hi-impedance state and tied to VDD or VSS.

13.2 DC CHARACTERISTICS: PIC12LC508A/509A (Commercial, Industrial) PIC12LCE518/519 (Commercial, Industrial) PIC12LCR509A (Commercial, Industrial)

DC Characteristics Power Supply Pins			Standard Operating Conditions (unless otherwise specified)				
			Operating Temperature $0^{\circ}\text{C} \leq T_A \leq +70^{\circ}\text{C}$ (commercial) $-40^{\circ}\text{C} \leq T_A \leq +85^{\circ}\text{C}$ (industrial)				
Parm No.	Characteristic	Sym	Min	Typ ⁽¹⁾	Max	Units	Conditions
D001	Supply Voltage	VDD	2.5		5.5	V	See Figures 1-4
1A	LP Oscillator Operating Frequency	FOSC	0	—	200	kHz	All temperatures
	XT Oscillator Operating Frequency		0	—	4	MHz	All temperatures
		ΔI_{WDT}	—	2.0	4	μA	VDD = 2.5V, Commercial
				2.0	5	μA	VDD = 2.5V, Industrial

* These parameters are characterized but not tested.

Note 1: Data in the Typical ("Typ") column is based on characterization results at 25°C. This data is for design guidance only and is not tested.

2: This is the limit to which VDD can be lowered in SLEEP mode without losing RAM data.

3: The supply current is mainly a function of the operating voltage and frequency. Other factors such as bus loading, oscillator type, bus rate, internal code execution pattern, and temperature also have an impact on the current consumption.

a) The test conditions for all IDD measurements in Active Operation mode are:

OSC1 = external square wave, from rail-to-rail; all I/O pins tristated, pulled to Vss,
T0CKI = VDD, MCLR = VDD; WDT enabled/disabled as specified.

b) For standby current measurements, the conditions are the same, except that the device is in SLEEP mode.

4: Does not include current through REXT. The current through the resistor can be estimated by the formula:
 $I_R = V_{DD}/2R_{EXT}$ (mA) with REXT in kOhm.

5: The power-down current in SLEEP mode does not depend on the oscillator type. Power-down current is measured with the part in SLEEP mode, with all I/O pins in hi-impedance state and tied to VDD or Vss.

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13.3 DC CHARACTERISTICS: PIC12C508A/509A (Commercial, Industrial, Extended) PIC12CE518/519 (Commercial, Industrial, Extended) PIC12CR509A (Commercial, Industrial, Extended)

DC CHARACTERISTICS Standard Operating Conditions (unless otherwise specified) Operating temperature $0^{\circ}\text{C} \leq T_A \leq +70^{\circ}\text{C}$ (commercial) $-40^{\circ}\text{C} \leq T_A \leq +85^{\circ}\text{C}$ (industrial) $-40^{\circ}\text{C} \leq T_A \leq +125^{\circ}\text{C}$ (extended) Operating voltage V_{DD} range as described in DC spec Section 13.1 and Section 13.2.							
Param No.	Characteristic	Sym	Min	Typ†	Max	Units	Conditions
Input High Voltage							
D040 D040A	I/O ports with TTL buffer	V_{IH}	2.0V $0.25V_{DD} + 0.8V$	— —	V_{DD} V_{DD}	V V	$4.5V \leq V_{DD} \leq 5.5V$ otherwise
D070	GPIO weak pull-up current ⁽⁴⁾	I_{PUR}	30	250	400	μA	$V_{DD} = 5V, V_{PIN} = V_{SS}$
Input Leakage Current^{(2), (3)}							
D061	$\overline{\text{GP3/MCLR}}^{(5)}$	I_{IL}	8	130	250	μA	$V_{SS} \leq V_{PIN} \leq V_{DD}$
D061A	$\overline{\text{GP3/MCLR}}^{(6)}$		—	—	± 5	μA	$V_{SS} \leq V_{PIN} \leq V_{DD}$

† Data in "Typ" column is at 5V, 25°C unless otherwise stated. These parameters are for design guidance only and are not tested.

- Note 1:** In EXTRC oscillator configuration, the OSC1/CLKIN pin is a Schmitt Trigger input. It is not recommended that the PIC12C5XX be driven with external clock in RC mode.
- 2:** The leakage current on the $\overline{\text{MCLR}}$ pin is strongly dependent on the applied voltage level. The specified levels represent normal operating conditions. Higher leakage current may be measured at different input voltages.
- 3:** Negative current is defined as coming out of the pin.
- 4:** Does not include GP3. For GP3 see parameters D0061 and D0061A.
- 5:** This specification applies to $\overline{\text{GP3/MCLR}}$ configured as external $\overline{\text{MCLR}}$ and $\overline{\text{GP3/MCLR}}$ configured as input with internal pull-up enabled.
- 6:** This specification applies when $\overline{\text{GP3/MCLR}}$ is configured as an input with pull-up disabled. The leakage current of the $\overline{\text{MCLR}}$ circuit is higher than the standard I/O logic.

13.4 DC CHARACTERISTICS: PIC12LC508A/509A (Commercial, Industrial) PIC12LCE518/519 (Commercial, Industrial) PIC12LCR509A (Commercial, Industrial)

DC CHARACTERISTICS		Standard Operating Conditions (unless otherwise specified) Operating temperature $0^{\circ}\text{C} \leq T_A \leq +70^{\circ}\text{C}$ (commercial) $-40^{\circ}\text{C} \leq T_A \leq +85^{\circ}\text{C}$ (industrial) Operating voltage V_{DD} range as described in DC spec Section 13.1 and Section 13.2.					
Param No.	Characteristic	Sym	Min	Typ†	Max	Units	Conditions
D040 D040A	Input High Voltage						
	I/O ports with TTL buffer	V_{IH}	2.0V $0.25V_{DD}$ + 0.8V	— — —	V_{DD} V_{DD}	V V	$4.5\text{V} \leq V_{DD} \leq 5.5\text{V}$ otherwise
D070	GPIO weak pull-up current ⁽⁴⁾	I_{PUR}	30	250	400	mA	$V_{DD} = 5\text{V}$, $V_{PIN} = V_{SS}$
D061 D061A	Input Leakage Current^{(2), (3)}						
	GP3/ $\overline{\text{MCLR}}$ ⁽⁵⁾	I_{IL}	8	130	250	mA	$V_{SS} \leq V_{PIN} \leq V_{DD}$
	GP3/ $\overline{\text{MCLR}}$ ⁽⁶⁾	I_{IL}	—	—	± 5	mA	$V_{SS} \leq V_{PIN} \leq V_{DD}$

† Data in "Typ" column is at 5V, 25°C unless otherwise stated. These parameters are for design guidance only and are not tested.

- Note 1:** In EXTRC oscillator configuration, the OSC1/CLKIN pin is a Schmitt Trigger input. It is not recommended that the PIC12C5XX be driven with external clock in RC mode.
- 2:** The leakage current on the $\overline{\text{MCLR}}$ pin is strongly dependent on the applied voltage level. The specified levels represent normal operating conditions. Higher leakage current may be measured at different input voltages.
- 3:** Negative current is defined as coming out of the pin.
- 4:** Does not include GP3. For GP3 see parameters D0061 and D0061A.
- 5:** This specification applies to GP3/ $\overline{\text{MCLR}}$ configured as external $\overline{\text{MCLR}}$ and GP3/ $\overline{\text{MCLR}}$ configured as input with internal pull-up enabled.
- 6:** This specification applies when GP3/ $\overline{\text{MCLR}}$ is configured as an input with pull-up disabled. The leakage current of the $\overline{\text{MCLR}}$ circuit is higher than the standard I/O logic.

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TABLE 1: PULL-UP RESISTOR RANGES* - PIC12C508A, PIC12C509A, PIC12CR509A, PIC12CE518, PIC12CE519, PIC12LC508A, PIC12LC509A, PIC12LCR509A, PIC12LCE518 and PIC12LCE519

VDD (Volts)	Temperature (°C)	Min	Typ	Max	Units
GP0/GP1					
2.5	-40	38K	42K	63K	Ω
	25	42K	48K	63K	Ω
	85	42K	49K	63K	Ω
	125	50K	55K	63K	Ω
5.5	-40	15K	17K	20K	Ω
	25	18K	20K	23K	Ω
	85	19K	22K	25K	Ω
	125	22K	24K	28K	Ω
GP3 ⁽¹⁾					
2.5	-40	65K	80K	850K	Ω
	25	80K	100K	1150K	Ω
	85	85K	110K	1300K	Ω
	125	100K	120K	1500K	Ω
5.5	-40	50K	60K	600K	Ω
	25	60K	65K	750K	Ω
	85	65K	80K	900K	Ω
	125	75K	90K	990K	Ω

* These parameters are characterized but not tested.

Note 1: The weak pull-up resistor and associated current for the GP3/MCLR pin is non-linear when the respective pin voltage is less than VDD - 1.0V. See parameter D061 for GP3/MCLR pin current specifications.

1. Module: RESET

When MCLR is asserted, the state of the OSC1/CLKIN and CLKOUT/OSC2 pins are as follows:

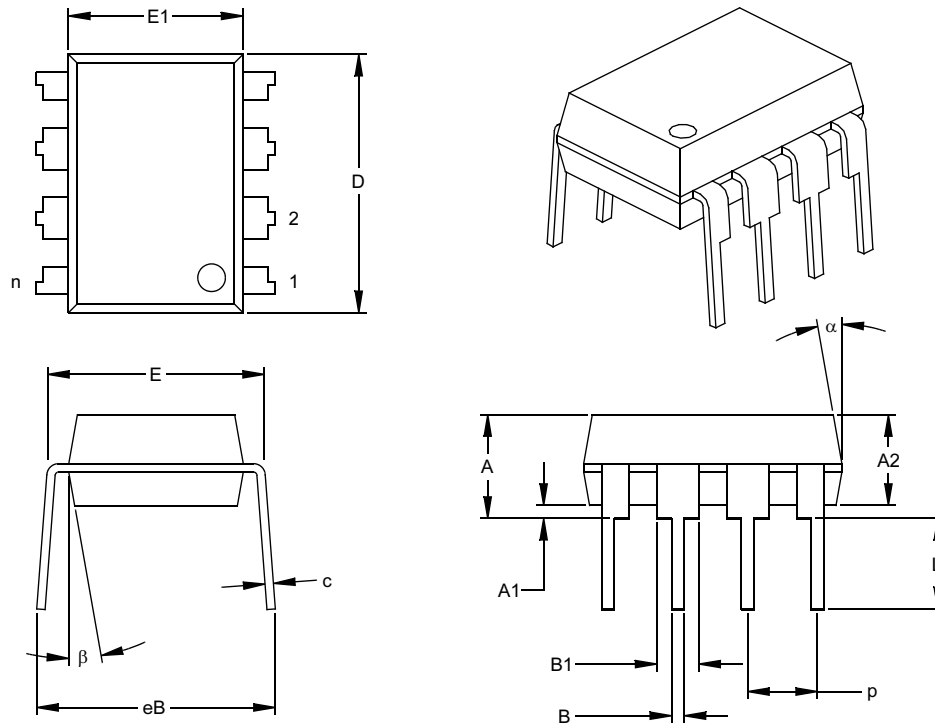
CLKIN/CLKOUT PIN STATES WHEN MCLR ASSERTED

Oscillator Mode	OSC1/CLKIN Pin	OSC2/CLKOUT Pin
EXTRC, CLKOUT on OSC2	OSC1 pin is tristated and driven by external circuit	OSC2 pin is driven low
EXTRC, OSC2 is I/O	OSC1 pin is tristated and driven by external circuit	OSC2 pin is tristate input
INTRC, CLKOUT on OSC2	OSC1 pin is tristate input	OSC2 pin is driven low
INTRC, OSC2 is I/O	OSC1 pin is tristate input	OSC2 pin is tristate input

2. Module: Packaging

The package information contained in the data sheet is incorrect. Please refer to the following tables for correct package date.

8-Lead Plastic Dual In-line (P) – 300 mil (PDIP)



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		8			8	
Pitch	p		.100			2.54	
Top to Seating Plane	A	.140	.155	.170	3.56	3.94	4.32
Molded Package Thickness	A2	.115	.130	.145	2.92	3.30	3.68
Base to Seating Plane	A1	.015			0.38		
Shoulder to Shoulder Width	E	.300	.313	.325	7.62	7.94	8.26
Molded Package Width	E1	.240	.250	.260	6.10	6.35	6.60
Overall Length	D	.360	.373	.385	9.14	9.46	9.78
Tip to Seating Plane	L	.125	.130	.135	3.18	3.30	3.43
Lead Thickness	c	.008	.012	.015	0.20	0.29	0.38
Upper Lead Width	B1	.045	.058	.070	1.14	1.46	1.78
Lower Lead Width	B	.014	.018	.022	0.36	0.46	0.56
Overall Row Spacing	§ eB	.310	.370	.430	7.87	9.40	10.92
Mold Draft Angle Top	α	5	10	15	5	10	15
Mold Draft Angle Bottom	β	5	10	15	5	10	15

* Controlling Parameter

§ Significant Characteristic

Notes:

Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed

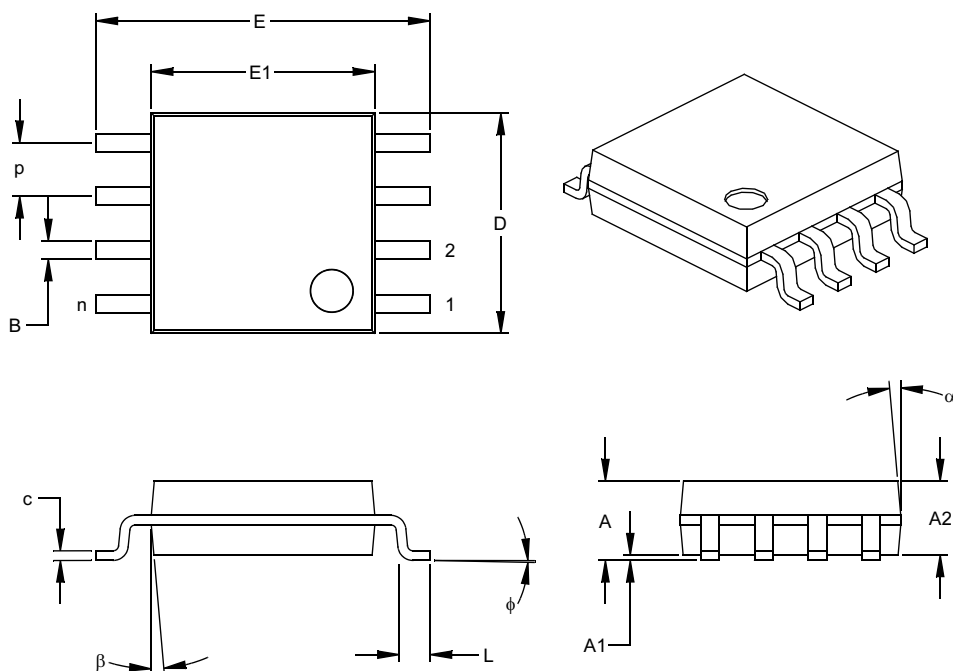
.010" (0.254mm) per side.

JEDEC Equivalent: MS-001

Drawing No. C04-018

PIC12CE518/CE519

8-Lead Plastic Small Outline (SM) – Medium, 208 mil (SOIC)



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		8			8	
Pitch	p		.050			1.27	
Overall Height	A	.070	.075	.080	1.78	1.97	2.03
Molded Package Thickness	A2	.069	.074	.078	1.75	1.88	1.98
Standoff §	A1	.002	.005	.010	0.05	0.13	0.25
Overall Width	E	.300	.313	.325	7.62	7.95	8.26
Molded Package Width	E1	.201	.208	.212	5.11	5.28	5.38
Overall Length	D	.202	.205	.210	5.13	5.21	5.33
Foot Length	L	.020	.025	.030	0.51	0.64	0.76
Foot Angle	φ	0	4	8	0	4	8
Lead Thickness	c	.008	.009	.010	0.20	0.23	0.25
Lead Width	B	.014	.017	.020	0.36	0.43	0.51
Mold Draft Angle Top	α	0	12	15	0	12	15
Mold Draft Angle Bottom	β	0	12	15	0	12	15

* Controlling Parameter

§ Significant Characteristic

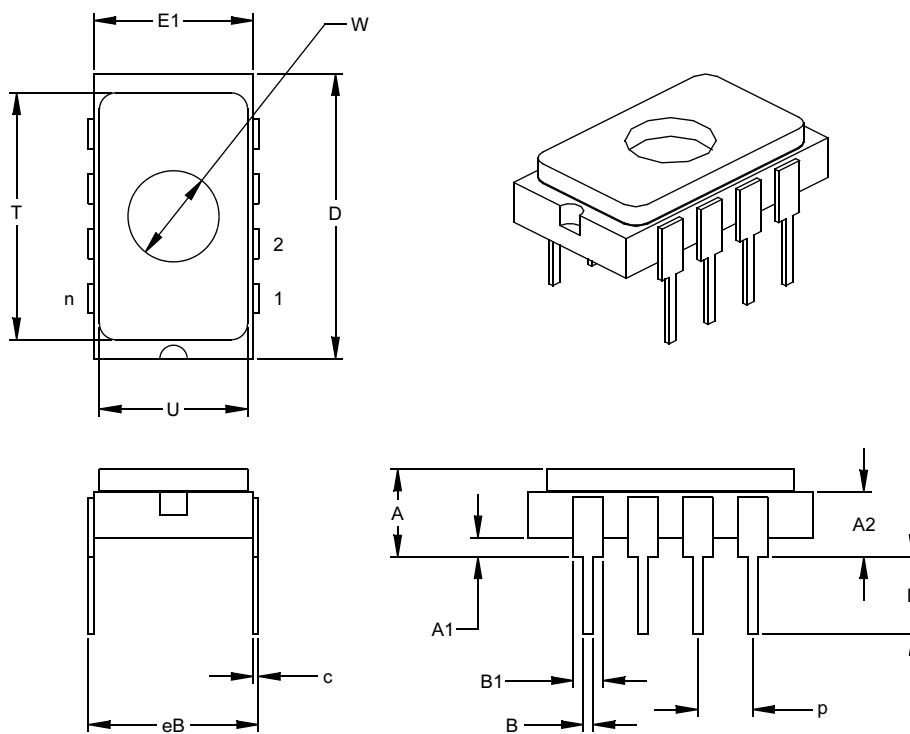
Notes:

Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

Drawing No. C04-056

PIC12CE518/CE519

8-Lead Ceramic Side Brazed Dual In-line with Window (JW) – 300 mil

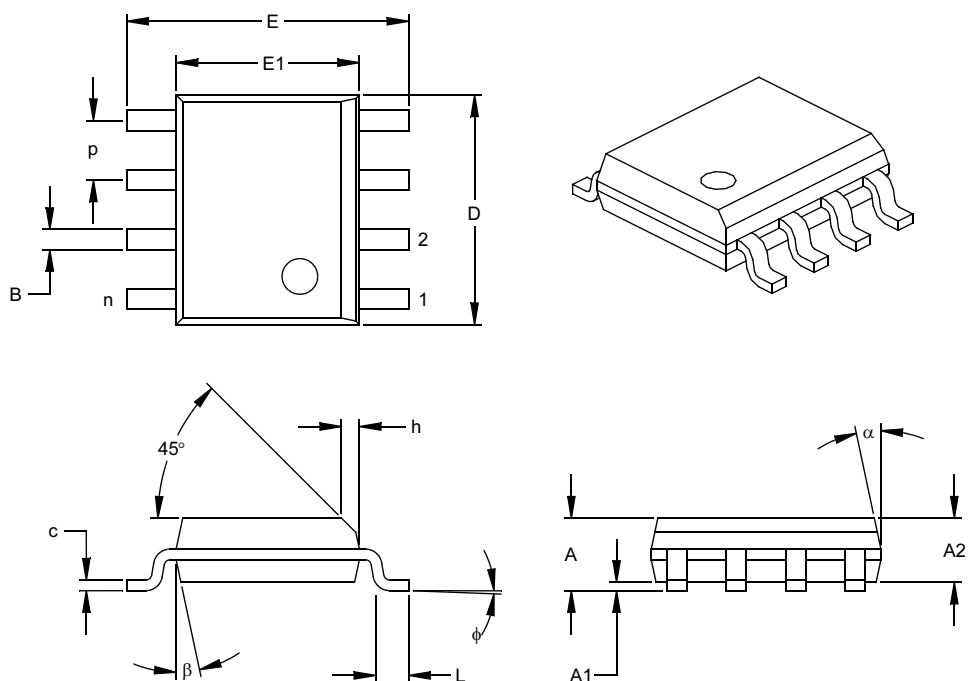


Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		8			8	
Pitch	p		.100			2.54	
Top to Seating Plane	A	.145	.165	.185	3.68	4.19	4.70
Top of Body to Seating Plane	A2	.103	.123	.143	2.62	3.12	3.63
Standoff	A1	.025	.035	.045	0.64	0.89	1.14
Package Width	E1	.280	.290	.300	7.11	7.37	7.62
Overall Length	D	.510	.520	.530	12.95	13.21	13.46
Tip to Seating Plane	L	.130	.140	.150	3.30	3.56	3.81
Lead Thickness	c	.008	.010	.012	0.20	0.25	0.30
Upper Lead Width	B1	.050	.055	.060	1.27	1.40	1.52
Lower Lead Width	B	.016	.018	.020	0.41	0.46	0.51
Overall Row Spacing §	eB	.296	.310	.324	7.52	7.87	8.23
Window Diameter	W	.161	.166	.171	4.09	4.22	4.34
Lid Length	T	.440	.450	.460	11.18	11.43	11.68
Lid Width	U	.260	.270	.280	6.60	6.86	7.11

* Controlling Parameter
 § Significant Characteristic
 JEDEC Equivalent: MS-015
 Drawing No. C04-083

PIC12CE518/CE519

8-Lead Plastic Small Outline (SN) – Narrow, 150 mil (SOIC)



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		8			8	
Pitch	p		.050			1.27	
Overall Height	A	.053	.061	.069	1.35	1.55	1.75
Molded Package Thickness	A2	.052	.056	.061	1.32	1.42	1.55
Standoff §	A1	.004	.007	.010	0.10	0.18	0.25
Overall Width	E	.228	.237	.244	5.79	6.02	6.20
Molded Package Width	E1	.146	.154	.157	3.71	3.91	3.99
Overall Length	D	.189	.193	.197	4.80	4.90	5.00
Chamfer Distance	h	.010	.015	.020	0.25	0.38	0.51
Foot Length	L	.019	.025	.030	0.48	0.62	0.76
Foot Angle	φ	0	4	8	0	4	8
Lead Thickness	c	.008	.009	.010	0.20	0.23	0.25
Lead Width	B	.013	.017	.020	0.33	0.42	0.51
Mold Draft Angle Top	α	0	12	15	0	12	15
Mold Draft Angle Bottom	β	0	12	15	0	12	15

* Controlling Parameter

§ Significant Characteristic

Notes:

Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

JEDEC Equivalent: MS-012

Drawing No. C04-057

APPENDIX A: REVISION HISTORY

Rev. D Document (3/2003)

Under Clarifications/Corrections to the Data Sheet,
Item 2, Packaging: correct package data was added.
Added Appendix A: Revision History.

PIC12CE518/CE519

NOTES:

Note the following details of the code protection feature on Microchip devices:

- Microchip products meet the specification contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is one of the most secure families of its kind on the market today, when used in the intended manner and under normal conditions.
- There are dishonest and possibly illegal methods used to breach the code protection feature. All of these methods, to our knowledge, require using the Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Most likely, the person doing so is engaged in theft of intellectual property.
- Microchip is willing to work with the customer who is concerned about the integrity of their code.
- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of their code. Code protection does not mean that we are guaranteeing the product as "unbreakable."

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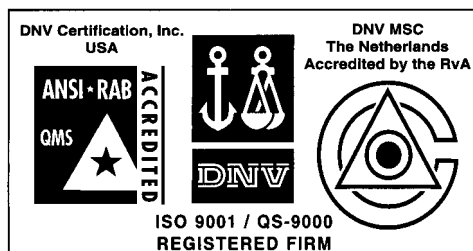
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