

General Description

Using the IDT CMOS Oscillator technology, originally developed by Mobius Microsystems, the MM8202 replaces quartz crystal based resonators and oscillators with a monolithic CMOS IC at the thinnest possible form factors without the use of any mechanical frequency source or PLL. The product is specially designed to work with the next generation USB 2.0 High Speed, USB 2.0 Full/Low Speed and USB-IC (USB-InterChip) interface controller ICs, and high density SIM-, and smart-cards.

Ordering Information

8202 - 12 VP C NSG T
 1 2 3 4 5 6 7

- 1) IDT Base Part Number
- 2) FF: Factory Programmed Frequency in MHz
- 3) Supply Voltage Configuration
 - VP: 1.8V to 3.3V continuous operation
 - V: 3.3V only operation
 - T: 2.5V only operation
 - P: 1.8V only operation
- 4) Output Signal Type
 - C: CMOS Output
- 5) Package Options*
 - -D: Wafer form 200um thickness
 - -C: Wafer form 350um thickness
 - -E: Wafer form 750um thickness
 - NSG: 5x3.2, 4-Pin Package
 - NVG: 2.5x2.0, 4-Pin Package
 - M: SOIC, 8-Pin Package
- 6) Temperature Grade
 - “: 0 to 70°C Commercial Temperature Range i.e. default is blank
 - “R”: -20 to 85°C Restricted Industrial Temperature Range
- 7) Tape & Reel Option
 - “: Shipped in Tube i.e. default is blank
 - T: Shipped in Tape & Reel

This product is rated “Green”. Please contact factory for environmental compliancy information.

The Preliminary Information presented herein represents a product in pre-production. The noted characteristics are based on initial product characterization and/or qualification. Integrated Device Technology, Incorporated (IDT) reserves the right to change any circuitry or specifications without notice

Features

- All-CMOS Temperature Compensated Oscillator
- TimeStak™: Available in die form for the thinnest and smallest MCP options (-D package option)
- Ultra-low power operation (2mA typical at 1.8V supply)
- No quartz or PLL used: very low jitter performance leading to low link Bit Error Rates (BER)
- Excellent reliability: Shock and vibration resistant
- Many frequencies are supported
- Factory programmable from 6 to 133MHz

Pin Assignment

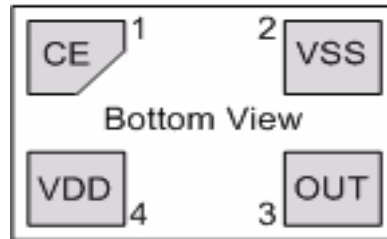
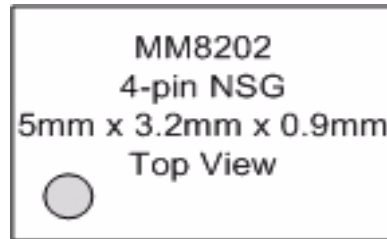


Table 1. Pin Descriptions

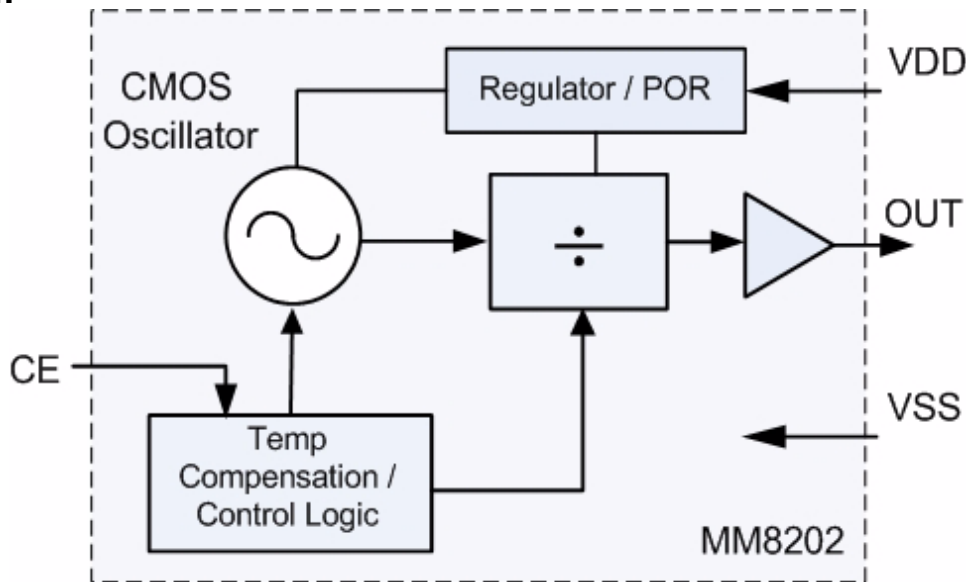
No	Name	Type	Description
1	CE	Input Pullup	Chip Enable. Internal Pullup. MM8202 is enabled when HIGH. When LOW, OUT has a weak pull-down to GND internally
2	VSS	Power	System Ground
3	OUT	Output	Frequency Output
4	VDD	Power	Power Supply. Use a 0.1µF decoupling capacitor between VDD and VSS

Table 2. Pin Descriptions

Below Pin Descriptions apply to SOIC-8 Package

No	Name	Type	Description
1	CE	Input Pullup	Chip Enable. Internal Pullup. MM8202 is enabled when HIGH. When LOW, OUT has a weak pull-down to GND internally
4	VSS	Power	System Ground
6	OUT	Output	Frequency Output
8	VDD	Power	Power Supply. Use a 0.1 μ F decoupling capacitor between VDD and VSS
2,3,5,7	NC		No Connect Pins. These pins may be left floating.

Block Diagram



Functional Description

MM8202 is a monolithic all-CMOS frequency source. The internal CMOS Oscillator generates the factory-programmed frequencies with high accuracy and excellent phase noise and jitter. The device is a silicon alternative to quartz based crystal resonators and oscillators. Various programming and configuration options are supported as given in the Part Ordering Information section above. The easy-to-use device offers programmable frequencies and various supply voltage configurations. Offered in common crystal oscillator pin-outs, the MM8202 allows the designer to disable the oscillator via the CE pin to enter a very low current, quiescent state. The CMOS oscillator features very fast start-up time to enable rapid wake-up from the quiescent state. All required circuit elements other than those that are noted in the Pin Descriptions Table (Table.1) above are internal to the device.

In addition to common package options in 5x3.2mm and 2.5x2.0mm dimensions, the MM8202 is offered in “wafer” form to be used in Chip-on-Board (CoB) and Multi-Chip-Package (MCP) configurations for space and cost-sensitive applications. IDT offers MM8202 in Known-Good-Die (KGD) format with all applicable test and manufacturing information to allow for rapid evaluation and use.

Absolute Maximum Ratings

NOTE: Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These ratings are stress specifications only. Functional operation of product at these conditions or any conditions beyond those listed in the *DC Characteristics* or *AC Characteristics* is not implied. Exposure to absolute maximum rating conditions for extended periods may affect product reliability.

Item	Rating
Supply Voltage, VDD	4.6V
Input, V _I (CE pin)	-0.5V to VDD + 0.5V
Output, V _O (OUT pin)	-0.5V to VDD + 0.5V
Storage Temperature	-65°C to 150°C

Electrical Characteristics⁵ [3.3V]

VDD=3.0V to 3.6V, T_A=0 to 70°C unless otherwise noted. Typical values are measured at VDD=3.3V, T_A=35°C

Parameter	Symbol	Conditions	Min	Typ	Max	Units
ElectroStaticDischarge	ESD	Human Body Model, tested per JESD D22-A114	4000			V
Supply Voltage	VDD	Normal Operation ³	3.0	3.3	3.6	V
Input LOW level	V _{IL}	CE pin	-0.3		VDD*0.3	V
Input HIGH level	V _{IH}	CE pin	VDD*0.7		VDD+0.3	V
Supply Current	IDD	Active supply current, VDD=3.3V, T=35°C, no output load		2.5	3.0	mA
Quiescent Current	IDDQ	CE=LOW, output disabled		0.2	1	μA
Output LOW level	V _{OL}	I _{OL} = -4mA			0.5	V
Output HIGH level	V _{OH}	I _{OH} = 4mA	VDD-0.5			V
Output Frequency	F _{OUT}	Factory Programmable.Contact IDT for frequencies not listed	6	12,24,25,50	133	MHz
Frequency Stability	F _{TOT}	Total Frequency Stability over temperature,supply variation,aging (1st year at 35°C),shock&vibration. " " device option, over 0-70°C range			±400	ppm
		Total Frequency Stability over temperature,supply variation,aging (1st year at 35°C),shock&vibration. "R" device option, over -20-85°C range			±400	ppm
Rise Time	RT	20% to 80% x VDD. Output load (C _L) =8pF, NSG-option			1.9	ns
Fall Time	FT	80% to 20% x VDD. Output load (C _L) =8pF, NSG-option			1.9	ns
Duty Cycle	DC	Clock output duty cycle. Measured under 80MHz, VDD/2, C _L =8pF	45		55	%
		Clock output duty cycle. Measured over 80MHz, VDD/2, C _L =8pF	40		60	%
Power-up time	t _{on}	Output valid time after VDD meets the specified range&CE transition	50	100	400	μs
Period Jitter	PJ _{RMS}	Total RMS Period Jitter (including random and deterministic) ^{1,2}		3.5		ps _{RMS}
Cycle-cycle Jitter	CJ	The absolute value of max change in the periods of any 2 adjacent cycles ^{1,2,4}			50	ps
Phase Noise	PN	1MHz offset from carrier ^{1,2}		-140	-135	dBc/Hz

Notes 1. Measured with a 50Ω to GND termination

2: Measured at 48MHz output frequency

3. The MM8202 will support continuous VDD operation from 1.62 to 3.6V. The device can be powered up with a supply voltage at any of the 3 main supply rails of 1.8V, 2.5V or 3.3V.

4. Measured over 1000 cycles per JEDEC standard 65

5. Electrical parameters are guaranteed by design and characterization over the specified ambient operating temperature range, which is established when the device is mounted in a test socket with maintained transverse airflow greater than 500lpm. The device will meet specifications after thermal equilibrium has been reached under these conditions.

Electrical Characteristics⁵ [2.5V]

VDD=2.25V to 2.75V, T_A=0 to 70°C unless otherwise noted. Typical values are measured at VDD=2.5V, T_A=35°C

Parameter	Symbol	Conditions	Min	Typ	Max	Units
ElectroStaticDischarge	ESD	Human Body Model, tested per JESD D22-A114	4000			V
Supply Voltage	VDD	Normal Operation ³	2.25	2.5	2.75	V
Input LOW level	V _{IL}	CE pin	-0.3		VDD*0.3	V
Input HIGH level	V _{IH}	CE pin	VDD*0.7		VDD+0.3	V
Supply Current	IDD	Active supply current, VDD=2.5V, T=35°C, no output load		2.25	2.75	mA
Quiescent Current	IDDQ	CE=LOW, output disabled		0.2	1	μA
Output LOW level	V _{OL}	I _{OL} = -3mA			0.4	V
Output HIGH level	V _{OH}	I _{OH} = 3mA	VDD-0.4			V
Output Frequency	F _{OUT}	Factory Programmable.Contact IDT for frequencies not listed	6	12,24,25,50	133	MHz
Frequency Stability	F _{TOT}	Total Frequency Stability over temperature,supply variation,aging (1st year at 35°C),shock&vibration. " " device option, over 0-70°C range			±400	ppm
		Total Frequency Stability over temperature,supply variation,aging (1st year at 35°C),shock&vibration. "R" device option, over -20-85°C range			±400	ppm
Rise Time	RT	20% to 80% x VDD. Output load (C _L) =7pF, NSG-option			2.3	ns
Fall Time	FT	80% to 20% x VDD. Output load (C _L) =7pF, NSG-option			2.3	ns
Duty Cycle	DC	Clock output duty cycle. Measured under 100MHz at VDD/2, C _L =7pF	45		55	%
		Clock output duty cycle. Measured over 100MHz at VDD/2, C _L =7pF	40		60	%
Power-up time	t _{on}	Output valid time after VDD meets the specified range&CE transition	50	100	400	μs
Period Jitter	PJ _{RMS}	Total RMS Period Jitter (including random and deterministic) ^{1,2}		3.5		ps _{RMS}
Cycle-cycle Jitter	CJ	The absolute value of max change in the periods of any 2 adjacent cycles ^{1,2,4}			50	ps
Phase Noise	PN	1MHz offset from carrier ^{1,2}		-140	-135	dBc/Hz

Notes 1. Measured with a 50Ω to GND termination

2: Measured at 48MHz output frequency

3. The MM8202 will support continuous VDD operation from 1.62 to 3.6V. The device can be powered up with a supply voltage at any of the 3 main supply rails of 1.8V, 2.5V or 3.3V.

4. Measured over 1000 cycles per JEDEC standard 65

5. Electrical parameters are guaranteed by design and characterization over the specified ambient operating temperature range, which is established when the device is mounted in a test socket with maintained transverse airflow greater than 500lfpm. The device will meet specifications after thermal equilibrium has been reached under these conditions.

Electrical Characteristics⁵ [1.8V]

VDD=1.62V to 1.98V, T_A=0 to 70°C unless otherwise noted. Typical values are measured at VDD=1.8V, T_A=35°C

Parameter	Symbol	Conditions	Min	Typ	Max	Units
ElectroStaticDischarge	ESD	Human Body Model, tested per JESD D22-A114	4000			V
Supply Voltage	VDD	Normal Operation ³	1.62	1.8	1.98	V
Input LOW level	V _{IL}	CE pin	-0.3		VDD*0.3	V
Input HIGH level	V _{IH}	CE pin	VDD*0.7		VDD+0.3	V
Supply Current	IDD	Active supply current, VDD=1.8V, T=35°C, no output load		2.0	2.5	mA
Quiescent Current	IDDQ	CE=LOW, output disabled		0.2	1	μA
Output LOW level	V _{OL}	I _{OL} = -1.8mA			0.3	V
Output HIGH level	V _{OH}	I _{OH} = 1.8mA	VDD-0.3			V
Output Frequency	F _{OUT}	Factory Programmable.Contact IDT for frequencies not listed	6	12,24,25,50	133	MHz
Frequency Stability	F _{TOT}	Total Frequency Stability over temperature,supply variation,aging (1st year at 35°C),shock&vibration. " " device option, over 0-70°C range			±400	ppm
		Total Frequency Stability over temperature,supply variation,aging (1st year at 35°C),shock&vibration. "R" device option, over -20-85°C range			±400	ppm
Rise Time	RT	20% to 80% x VDD. Output load (C _L) =4pF, NSG-option			2.75	ns
Fall Time	FT	80% to 20% x VDD. Output load (C _L) =4pF, NSG-option			2.75	ns
Duty Cycle	DC	Clock output duty cycle. Measured at VDD/2, C _L =4pF	45		55	%
Power-up time	t _{on}	Output valid time after VDD meets the specified range&CE transition	50	100	400	μs
Period Jitter	PJ _{RMS}	Total RMS Period Jitter (including random and deterministic) ^{1,2}		3.5		ps _{RMS}
Cycle-cycle Jitter	CJ	The absolute value of max change in the periods of any 2 adjacent cycles ^{1,2,4}			50	ps
Phase Noise	PN	1MHz offset from carrier ^{1,2}		-140	-135	dBc/Hz

Notes 1. Measured with a 50Ω to GND termination

2: Measured at 48MHz output frequency

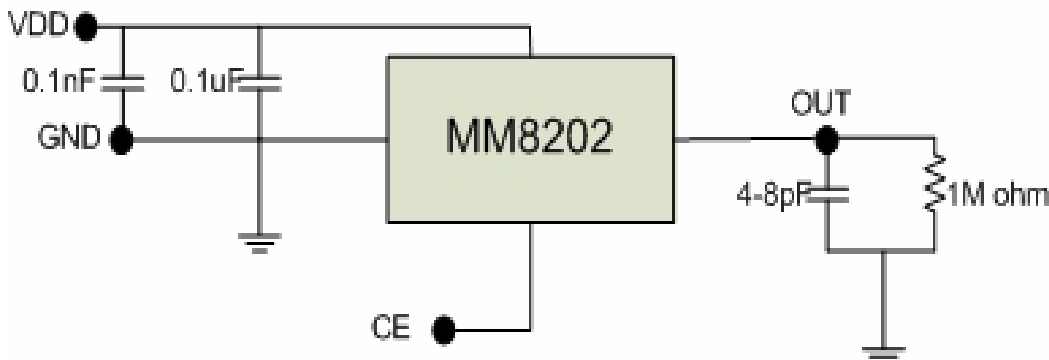
3. The MM8202 will support continuous VDD operation from 1.62 to 3.6V. The device can be powered up with a supply voltage at any of the 3 main supply rails of 1.8V, 2.5V or 3.3V.

4. Measured over 1000 cycles per JEDEC standard 65

5. Electrical parameters are guaranteed by design and characterization over the specified ambient operating temperature range, which is established when the device is mounted in a test socket with maintained transverse airflow greater than 500lfpm. The device will meet specifications after thermal equilibrium has been reached under these conditions.

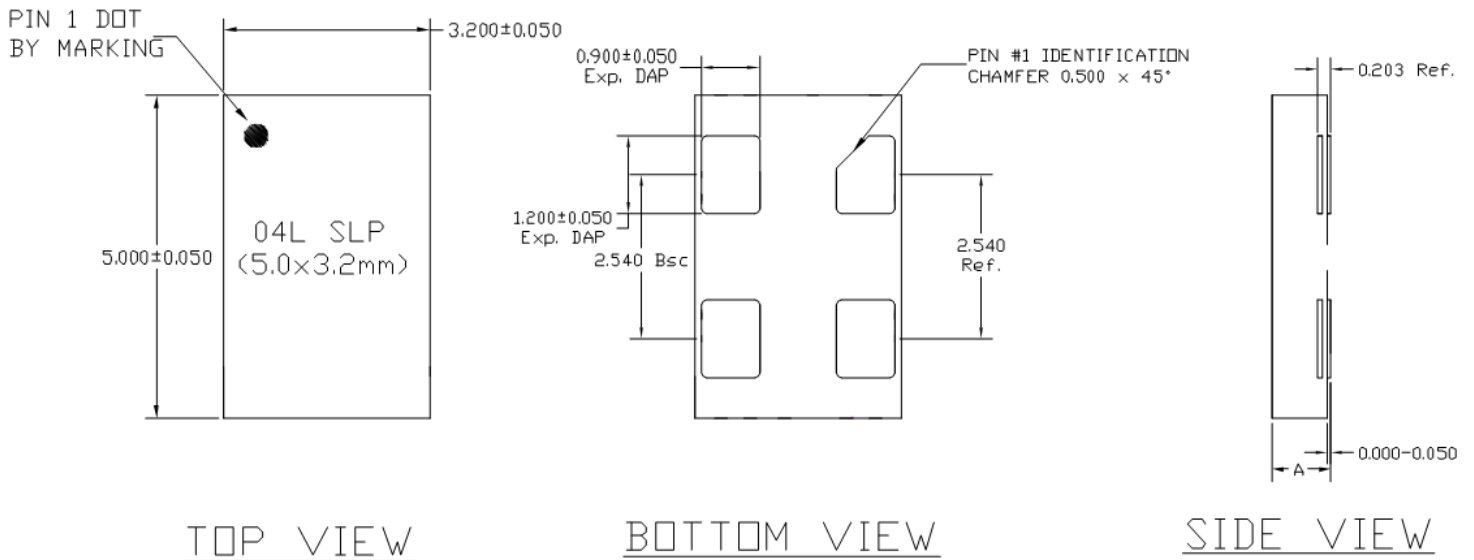
Application Diagram

Below is a representative application diagram to evaluate the MM8202. For 50Ω terminated measurements, a balun is necessary to provide proper impedance matching



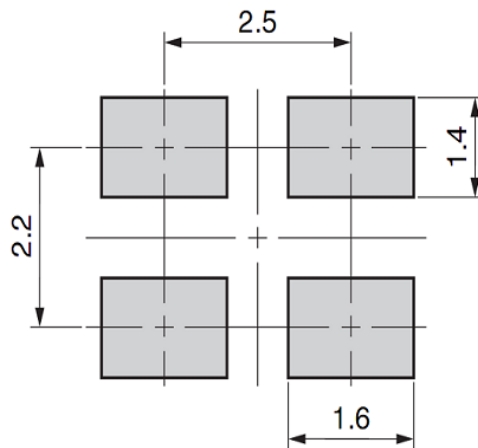
Package Outline and Package Dimensions

Package Outline for NSG -5.0x3.2x0.9mm, 4-pin package:



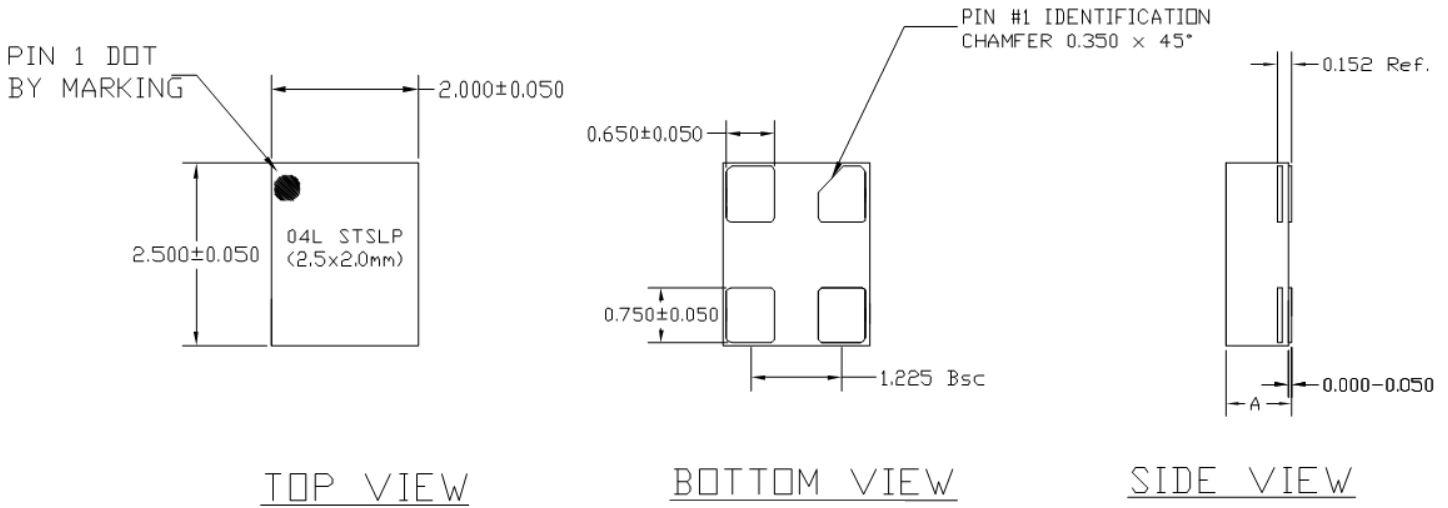
A	MAX.	SLP
	NOM.	0.900
	MIN.	0.850
		0.800

Below is the recommended PCB land pattern for the MM8202 NSG package:



Package Outline and Package Dimensions

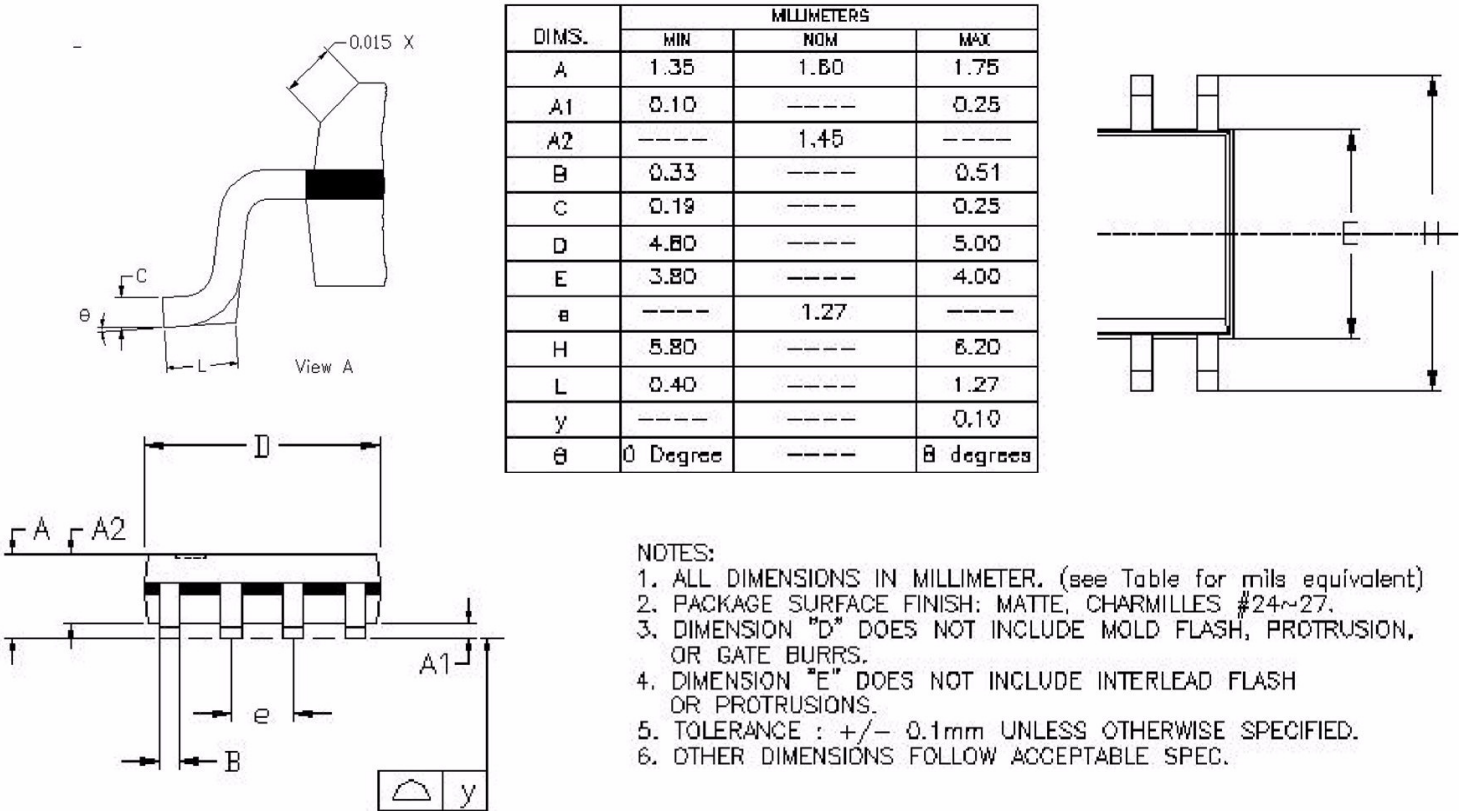
Package Outline for NVG -2.5x2.0x0.55mm, 4-pin package:



NOTE:

A	MAX.	0.600
	NOM.	0.550
	MIN.	0.500

Package Outline for SOIC, 8-pin package:



Die Information:

MM8202 is offered in “wafer” form (-E, -D and -C package options) to be used in Chip-on-Board (CoB) and Multi-Chip-Package (MCP) designs. Please contact your IDT sales representative to obtain further information.

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