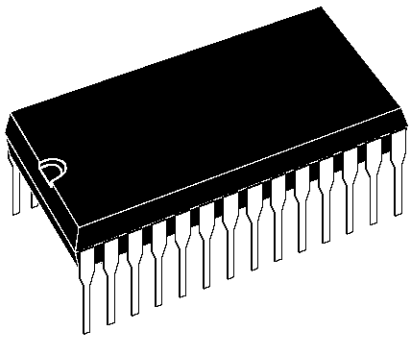
SGS-THOMSON MICROELECTRONICS

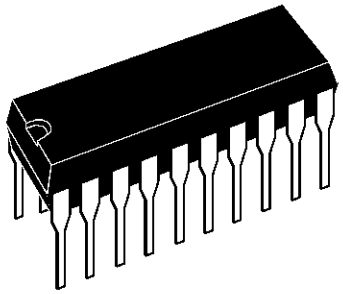
ST6260Bx3
ST6265Bx3

8-BIT HCMOS MCUs WITH A.D.C, EEPROM & AUTO-RELOAD TIMER WITH AUTOMOTIVE TEMPERATURE RANGE

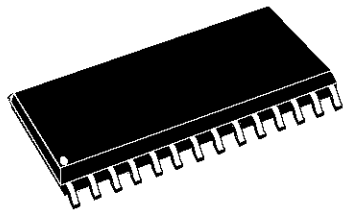
- 3.0 to 6.0V Supply Operating Range
- 4 MHz Maximum Clock Frequency
- -40 to +125°C Operating Temperature Range
- Run, Wait & Stop Modes
- 5 different interrupt vectors
- Look-up table capability in ROM
- User ROM: 3884 bytes
- Data ROM: User selectable size (in program ROM)
- Data RAM: 128 bytes
- EEPROM: 128 bytes
- PDIP20, PSO20 (ST6260B) packages
- PDIP28, PSO28 (ST6265B) packages
- 13/21 fully software programmable I/O as:
  - Input with pull-up resistor
  - Input without pull-up resistor
  - Input with interrupt generation
  - Open-drain or push-pull outputs
  - Analog Inputs
- 6/8 I/O lines can sink up to 15mA for direct LED or TRIAC driving
- 8 bit counter with a 7-bit programmable prescaler (TIMER 1)
- 8 bit Auto-reload Timer with 7-bit programmable prescaler (AR TIMER)
- Digital Watchdog
- 8 bit A/D Converter with up to 7 (ST6260B) and up to 13 (ST6265B) analog inputs
- 8 bit Synchronous Peripheral Interface (SPI)
- On-chip clock oscillator driven by Quartz Crystal, Ceramic resonator or RC network
- User configurable Power-on Reset
- One external not maskable interrupt
- 9 powerful addressing modes
- The development tool of the ST626xB microcontrollers consists of the ST626xB-EMU emulation and development system connected via a standard RS232 serial line to an MS-DOS Personal Computer



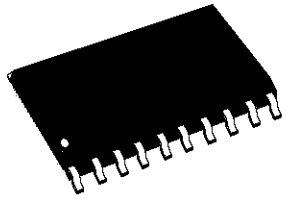
PDIP28



PDIP20



PSO28



PSO20

(Ordering Information at the end of the datasheet)

INTRODUCTION

ROM devices of the ST626XB family are available in extended Automotive temperature range -40°, 125° (Suffix 3). All the functionnalities remain the same as in Consumer (Suffix 1) and Industrial (Suffix 6) temperature ranges while electrical characteristics are redefined.

No OTP device are available for this range of temperature.

THE READER IS ASKED TO REFER TO THE DATASHEET OF ST6260B AND ST6265B FOR COMPLETE FUNCTIONNAL DESCRIPTION.

ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings

This product contains devices to protect the inputs against damage due to high static voltages, however it is advised to take normal precaution to avoid application of any voltage higher than maximum rated voltages.

For proper operation it is recommended that V_I and V_O must be higher than V_{SS} and smaller V_{DD}. Reliability is enhanced if unused inputs are connected to an appropriated logic voltage level (V_{DD} or V_{SS}).

Power Considerations. The average chip-junction temperature, Tj, in Celsius can be obtained from :

$Tj = T_A + PD \times RthJA$

Where : T_A = Ambient Temperature.

RthJA = Package thermal resistance (junction-to ambient).

PD = Pint + Pport.

Pint = $I_{DD} \times V_{DD}$ (chip internal power).

Pport = Port power dissipation (determinated by the user).

Symbol	Parameter	Value	Unit
V_{DD}	Supply Voltage	-0.3 to 7.0	V
V_I	Input Voltage	V_{SS} - 0.3 to V_{DD} + 0.3(1)	V
V_O	Output Voltage	V_{SS} - 0.3 to V_{DD} + 0.3(1)	V
I_O	Current Drain per Pin Excluding V_{DD}, V_{SS}	10	mA
I_{INJ+}	Pin Injection current (positive), All I/O, V_{DD} = 4.5V	+5	mA
I_{INJ-}	Pin Injection current (negative), All I/O, VDD = 4.5V	-5	mA
IV_{DD}	Total Current into V_{DD} (source)	50	mA
IV_{SS}	Total Current out of V_{SS} (sink)	50(2)	mA
Tj	Junction Temperature	150	°C
T_{STG}	Storage Temperature	-60 to 150	°C

Notes :

- Stresses above those listed as "absolute maximum ratings" may cause permanent damage to the device . This is a stress rating only and functional operation of the device at these conditions is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.
- (1) Within these limits, clamping diodes are guaranteed to be not conductive. Voltages outside these limits are authorised as long as injection current is kept within the specification.
- (2) The total current through ports A and B combined may not exceed 50 mA. The total current through port C may not exceed 50 mA. If the application is designed with care and observing the limits stated above, total current may reach 100 mA.

THERMAL CHARACTERISTIC

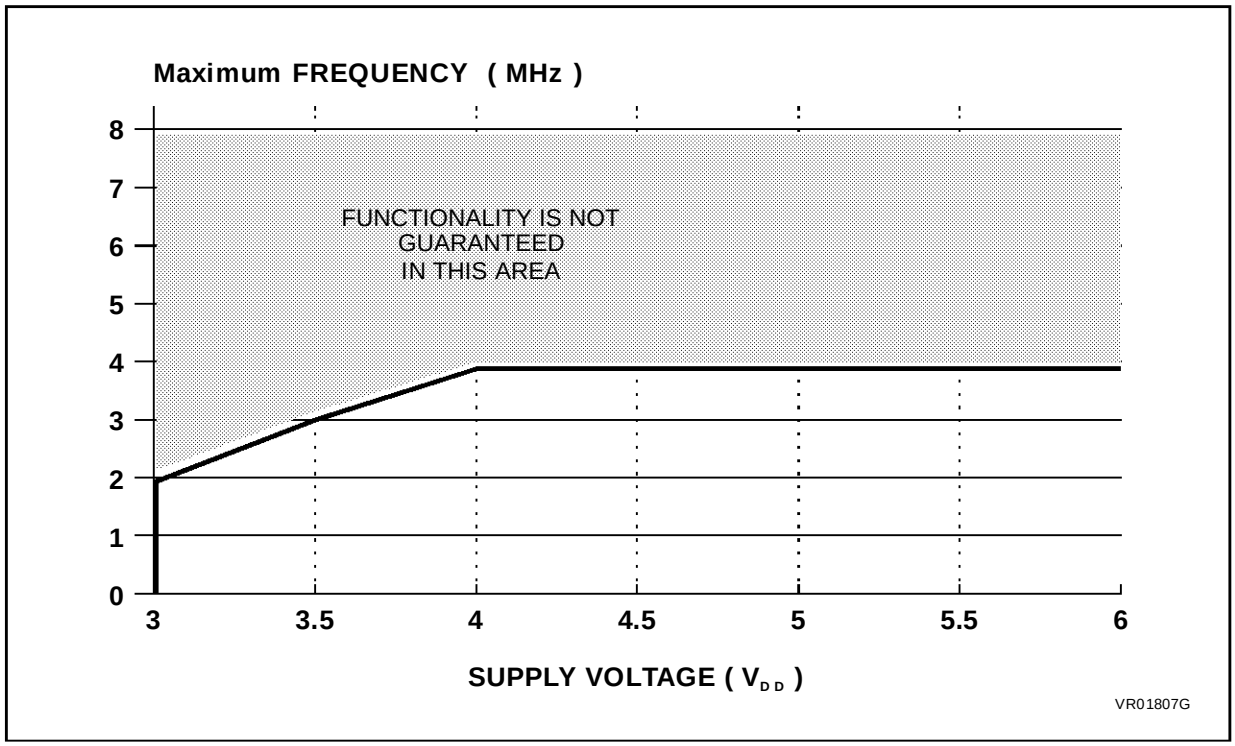
Symbol	Parameter	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
RthJA	Thermal Resistance	PDIP28			55	°C/W
		PDIP20			60	
		PSO28			75	
		PSO20			80	

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
T_A	Operating Temperature	3 Suffix Version	-40		125	°C
V_{DD}	Operating Supply Voltage	f_{OSC}= 2MHz f_{INT} = 2MHz	3.0		6.0	V
		f_{OSC} = 4MHz f_{INT} = 4MHz	4.0		6.0	V
f_{INT}	Internal Frequency (3)	V_{DD} = 3V V_{DD} = 4.5V	0 0		2.0 4.0	MHz MHz
I_{INJ+}	Pin Injection Current (positive) Digital Input (1) Analog Inputs(2)	V_{DD} = 4.5 to 5.5V			+5	mA
I_{INJ-}	Pin Injection Current (negative) Digital Input (1) Analog Inputs	V_{DD} = 4.5 to 5.5V			-5	mA

Notes :
1. A current of 5mA can be forced on each pin of the digital section without affecting the functional behaviour of the device. For a positive current injected into one pin, a part of this current (~ 10%) can be expected to flow from the neighbouring pins.
2. If a total current of +1 mA is flowing into the single analog channel or if the total current flowing into all the analog inputs is of 1mA, all the resulting conversions are shifted by +1 LSB. If a total positive current is flowing into the single analog channel or if the total current flowing into all the analog inputs is of 5mA, all the resulting conversions are shifted by +2 LSB.
3. An internal frequency above 1MHz is recommended for reliable A/D results.

Maximum Operating FREQUENCY (Fmax) Versus SUPPLY VOLTAGEV_{DD}



The shaded area is outside the ST6260B/65B operating range, device functionality is not guaranteed.
The striped area is guaranteed only with the LOW VOLTAGE option.

DC ELECTRICAL CHARACTERISTICS

(TA=-40 to +125°C unless otherwise specified)

Symbol	Parameter	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
V_{IL}	Input Low Level Voltage All inputs				V_{DD} x 0.3	V
V_{IH}	Input High Level Voltage All inputs		V_{DD} x 0.7			V
V_{Hys}	Hysteresis Voltage (4) All Inputs	V_{DD}=5V V_{DD}=3V	0.2 0.2			V
V_{OL}	Low Level Output Voltage Port A, C	V_{DD}=4.5V I_{OL} = +1.6mA V_{DD}=4.5V I_{OL} = +5.0mA V_{DD}=3.0V I_{OL} = +0.7mA			0.4 1.3 0.4	V
V_{OL}	Low Level Output Voltage Port B	V_{DD}=4.5V I_{OL} = +1.6mA V_{DD}=4.5V I_{OL}=+15.0mA V_{DD}=3.0V I_{OL} = +0.7mA			0.4 1.3 0.4	V
V_{OH}	High Level Output Voltage Port A, B, C	V_{DD}=4.5V I_{OL} = -1.6mA V_{DD}=4.5V I_{OL} = -5.0mA V_{DD}=3.0V I_{OL} = -0.7mA	4.1 3.5 2.6			V
I_{PU}	Input Pull-up Current Input Mode with Pull-up Port A, B, C, NMI	V_{IN} = V_{SS}, V_{DD}=2.5-6V			100	µA
I_{IL} I_{IH}	Input Leakage Current(1)	V_{IN} = V_{SS} V_{IN} = V_{DD}			1.0	µA
I_{DD}	Supply Current in RESET Mode	V_{RESET}=V_{SS} f_{OSC}=4MHz			3.5	mA
	Supply Current in RUN Mode (2)	V_{DD}=5.0V f_{INT}=4MHz V_{DD}=3.0V f_{INT}=4MHz			6.6 TBD	mA
	Supply Current in WAIT Mode (3)	V_{DD}=5.0V f_{INT}=4MHz V_{DD}=3.0V f_{INT}=4MHz			1.50 TBD	mA
	Standard STOP Mode Consumption Option(3)	I_{LOAD}=0mA V_{DD}=6.0V; 70°C V_{DD}=6.0V; 125°C			10 20	µA
	Low STOP Mode Consumption Option(3)	I_{LOAD}=0mA V_{DD}=3.0V; 70°C V_{DD}=3.0V; 125°C			2 4	µA

Notes :
1. Only when pull-ups are not inserted
2. All peripherals running
3. EEPROM and A/D Converter in Stand-by
4. Hysteresis voltage between switching levels

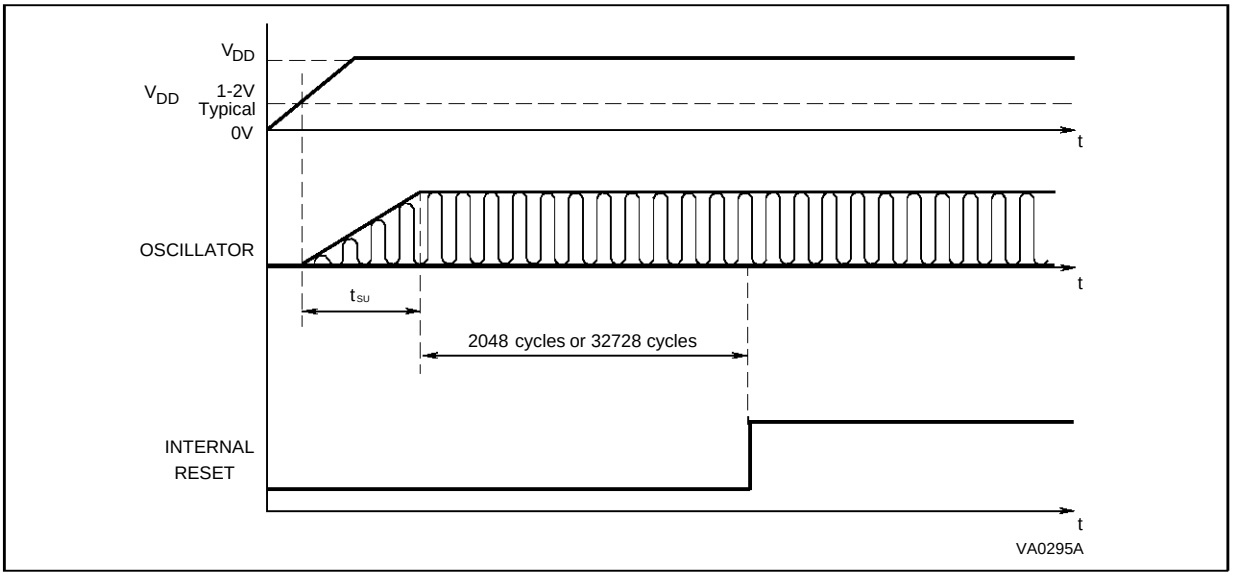
AC ELECTRICAL CHARACTERISTICS

(TA=-40 to +125°C unless otherwise specified)

Symbol	Parameter	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
f_{OSC}	Oscillator Frequency	V_{DD} = 3.0V V_{DD} = 4.5V			2 4	MHz
t_{SU}	Oscillator Start-up Time at Power On (2)	Ceramic Resonator C_{L1} = C_{L2} = 22pF		5	100	ms
t_{SUS}	Oscillator STOP mode Recovery Time (2)	4MHz Ceramic Resonator CL1=C_{L2}=22pF		0.2	100	
		4MHz Quartz CL1=C_{L2}=22pF		10	100	
t_{REC}	Supply Recovery Time (1)		100			
T_{WR}	Minimum Pulse Width (V_{DD} = 5V) RESET pin NMI pin		 100 100			ns
T_{WEE}	EEPROM Write Time	T_A = 25°C T_A = 85°C T_A = 125°C		5 10 20	10 20 30	ms
Endurance	EEPROM WRITE/ERASE Cycle	Q_A L_{OT} Acceptance	300,000			cycles
Retention	EEPROM Data Retention	T_A = 55°C	10			years
C_{IN}	Input Capacitance	All Inputs Pins			10	pF
C_{OUT}	Output Capacitance	All Outputs Pins			10	pF

Note:
1. Period for which V_{DD} has to be connected at 0V to allow internal Reset function at next power-up.
2. See Figure 59. This value is highly dependent on the Ceramic Resonator or Quartz Crystal used in the application.

Figure 1. Power On Reset



I/O PORT CHARACTERISTICS

(TA=-40 to +125°C unless otherwise specified)

Symbol	Parameter	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
V_{IL}	Input Low Level Voltage	I/O Pins			0.3x V_{DD}	V
V_{IH}	Input High Level Voltage	I/O Pins	0.7x V_{DD}			V
V_{OL}	Low Level Output Voltage	V_{DD}= 5.0V I_{OL}= 10µA , All I/O Pins I_{OL}= 3mA , Standard I/O I_{OL}= 7mA , Port B I_{OL}= 15mA , Port B			0.1 0.8 0.8 1.3	V
V_{OH}	High Level Output Voltage	I_{OH}= – 10µA I_{OH}= – 3mA, V_{DD}= 5.0V I_{OH}= – 1mA, V_{DD}= 3.0V	V_{DD}-0.1 3.5 2.0			V
I_{IL} I_{IH}	Input Leakage Current I/O Pins (pull-up resistor off)	Vin= V_{DD} or V_{SS} V_{DD}= 3.0V V_{DD}= 5.5V		0.1 0.1	1.0 1.0	µA
R_{PU}	Pull-up Resistor	Vin= 0V; All I/O Pins	50	100	200	KΩ

SPI CHARACTERISTICS

(TA=-40 to +125°C unless otherwise specified)

Symbol	Parameter	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
f_{CL}	Clock Frequency at SCK				500	kHz
t_{SV}	Data Set up time on Sin			TBD		
t_H	Data hold time on Sin			TBD		
t_{TS}	Delay Transmission started on Sin	4MHz	0	Note 1		µs

Note 1. Minimum time 0µs
Maximum time 1 instruction cycle

TIMER1 CHARACTERISTICS

(TA=-40 to +125°C unless otherwise specified)

Symbol	Parameter	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
t_{RES}	Resolution		$\frac{12}{f_{INT}}$			s
f_{IN}	Input Frequency on TIM1 Pin(1)				$\frac{f_{INT}}{8}$	MHz
t_W	Pulse Width at TIM1 Pin(1)	V_{DD} = 3.0V V_{DD} = 4.5V V_{DD} = 5.5V	1 250 250			µs ns ns

Note :
1. Not available for ST6260B

AR TIMER CHARACTERISTICS

(TA=-40 to +125°C unless otherwise specified)

Symbol	Parameter	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
t_{RES}	Resolution		$\frac{1}{f_{INT}}$			s
f_{ARin}	Input Frequency on ARTIMin pin	STOP Mode RUN and WAIT Modes			2 $\frac{f_{INT}}{8}$	MHz MHz
t_W	Pulse Width at ARTIMin Pin	V_{DD} = 3.0V V_{DD} = 4.5V V_{DD} = 5.5V	250 250 250			ns ns ns

A/D CONVERTER CHARACTERISTICS

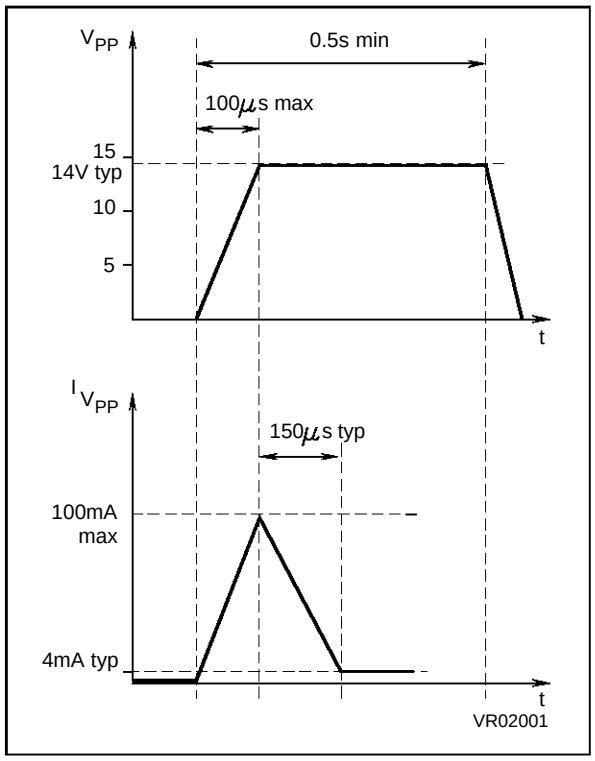
(TA=-40 to +125°C unless otherwise specified)

Symbol	Parameter	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
Res	Resolution			8		Bit
A_{TOT}	Total Accuracy (1) (2)	f_{OSC} > 1.2MHz			±2	LSB
		f_{OSC} > 32kHz	To be defined			
t_C	Conversion Time	fOSC = 4MHz		140		µs
V_{AN}	Conversion Range		V_{SS}		V_{DD}	V
ZIR	Zero Input Reading	Conversion result when $V_{IN} = V_{SS}$	00			Hex
FSR	Full Scale Reading	Conversion result when $V_{IN} = V_{DD}$			FF	Hex
AD_I	Analog Input Current During Conversion	V_{DD}= 4.5V			1.0	µA
AC_{IN}(3)	Analog Input Capacitance			2	5	pF
ASI	Analog Source Impedance	Analog Channel switched just before conversion start (4)			30	kΩ

Notes:
1. Noise at V_{DD}, V_{SS} <10mV
2. With oscillator frequencies less than 1MHz, the A/D Converter accuracy is decreased.
3. Excluding Pad Capacitance.
4. ASI can be increased as long as the load of the A/D Converter input capacitor is ensured before conversion start.

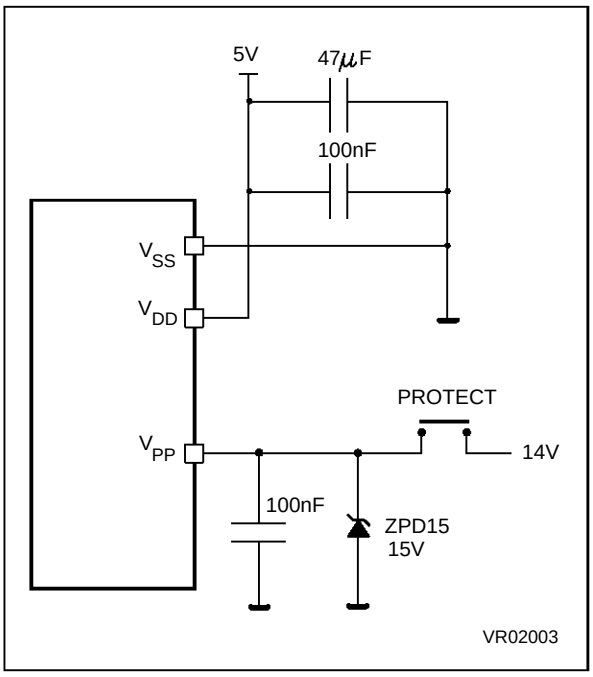
READ PROTECTION FUSE

If the ROM READOUT PROTECTION option is selected as enabled, the following waveform must be applied at the V_{PP} pin for the fuse to be blown:



The following circuit can be used for this purpose:

Figure 2. Example of READOUT PROTECTION Fuse programming circuit



Note: ZPD15 is used for overvoltage protection

ORDERING INFORMATION

The following chapter deals with the procedure for transfer customer codes to SGS-THOMSON.

Communication of the customer code. Customer code is made up of the ROM contents and the list of the selected mask options. The ROM contents are to be sent on one diskette with the hexadecimal file generated by the development tool. All unused bytes must be set to FFh.

The selected mask options are communicated to SGS-THOMSON using the correctly filled OPTION LIST appended.

Listing Generation & Verification. When SGS-THOMSON receives the diskette, a computer listing is generated from it. This listing refers exactly to the mask that will be used to produce the microcontroller. Then the listing is returned to the customer that must thoroughly check, complete, sign and return it to SGS-THOMSON. The signed listing constitutes a part of the contractual agreement for the creation of the customer mask.

SGS-THOMSON sales organization will provide detailed information on contractual points.

Table 1. ROM Memory Map

Device Address	Description
0000h-007Fh	Reserved (1)
0080h-0F9Fh	User ROM
0FA0h-0FEFh	Reserved (1)
0FF0h-0FF7h	Interrupt Vectors
0FF8h-0FFBh	Reserved (1)
0FFCh-0FFDh	NMI Interrupt Vector
0FFEh-0FFFh	Reset Vector

Notes :
1. Reserved Areas should be filled with FFh

ORDERING INFORMATION TABLE

Sales Type	ROM x8	I/O	Temperature Range	Package
ST6260BB3/XXX	4K Bytes	13	-40 to +125°C	PDIP20
ST6260BM3/XXX	4K Bytes	13	-40 to +125°C	PSO20
ST6265BB3/XXX	4K Bytes	21	-40 to +125°C	PDIP28
ST6265BM3/XXX	4K Bytes	21	-40 to +125°C	PSO28

Note: /XXX is a 2-3 alphanumeric character code added to the generic sales type on receipt of a ROM code and valid options.

ST6260B, ST6265B MICROCONTROLLER OPTION LIST

Customer . . . . . .
Address . . . . . .
. . . . . .
Contact . . . . . .
Phone No . . . . . .
Reference . . . . . .

SGS-THOMSON Microelectronics references

Device: [ ] ST6260B, [ ] ST6265B

Package: [ ] Dual in Line Plastic [ ] Small Outline Plastic

In this case, select conditioning

[ ] Standard (Stick) [ ] Tape & Reel

Temperature Range: [ ] 0°C to + 70°C [ ] – 40°C to + 85°C [ ] – 40°C to + 125°C

Special Marking: [ ] No
[ ] Yes "_ _ _ _ _ _ _ _ _ _"

Authorized characters are letters, digits, '.', '–', '/' and spaces only.
Maximum character count DIP20 - DIP28: 10
SO20 - SO28: 8.

Oscillator Source Selection : [ ] Crystal Quartz/Ceramic Resonnator
[ ] RC Network

Power on Reset Delay: [ ] 32768 cycles delay
[ ] 2048 cycles delay

Watchdog Selection: [ ] Software Activation (STOP mode available)
[ ] Hardware Activation (no STOP mode)

External STOP Mode Control: [ ] Enabled
[ ] Disabled

ROM Readout Protection: [ ] Disabled

For Enabled option, contact your local SGS-THOMSON office.

STOP Mode Consumption: [ ] Standard (10µA max)

For Low STOP Mode Consumption option contact your local SGS-THOMSON office.

Supply Operating Range: [ ] Standard Range: 3.0V to 6.0V

Notes . . . . . .
. . . . . .
Signature . . . . . .

Date . . . . . .

Notes: