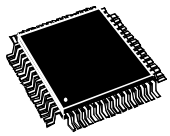
ST7SCR

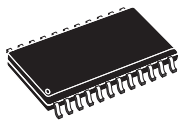
8-BIT LOW-POWER, FULL-SPEED USB MCU WITH 16K FLASH, 768 RAM, SMARTCARD I/F, TIMER

DATA BRIEFING

- **Memories**
  - Up to 16K of ROM or High Density Flash (HDFlash) program memory with read/write protection
  - HDFlash In-Circuit and In-Application Programming
  - Up to 768 bytes of RAM including up to 128 bytes stack and 256 bytes USB buffer
- **Clock, Reset and Supply Management**
  - Low Voltage Reset
  - 2 power saving modes: Halt and Wait modes
  - PLL for generating 48 MHz USB clock using a 4 MHz crystal
- **Interrupt Management**
  - Nested Interrupt Controller
- **USB (Universal Serial Bus) Interface**
  - 256-byte buffer for full speed bulk, control and interrupt transfer types compliant with USB specification (version 2.0)
  - On-Chip 3.3V USB voltage regulator and transceivers with software power-down
  - 7 USB Endpoints:
    One 8-byte Bidirectional Control Endpoint
    One 64-byte In Endpoint,
    One 64-byte Out Endpoint
    Four 8-byte In Endpoints
- **35 or 4 I/O ports**:
  - Up to 4 LED outputs with software programmable constant current (3 or 7 mA).
  - 2 General purpose I/Os programmable as interrupts
  - Up to 8 line inputs programmable as interrupts
  - Up to 20 Outputs
  - 1 line assigned by default as static input after reset



TQFP64 14x14



SO24

- **ISO7816-3 UART Interface:**
  - 4 Mhz Clock generation
  - Synchronous/Asynchronous protocols (T=0, T=1)
  - Automatic retry on parity error
  - Programmable Baud rate from 372 clock pulses up to 11.625 clock pulses (D=32/F=372)
  - Card Insertion/Removal Detection
- **Smartcard Power Supply:**
  - Selectable card V_{CC} 1.8V, 3V, and 5V
  - Internal Step-up converter for 5V supplied Smartcards (with a current of up to 55mA) using only two external components.
  - Programmable Smartcard Internal Voltage Regulator (1.8V to 3.0V) with current overload protection and 4 KV ESD protection (Human Body Model) for all Smartcard Interface I/Os
- **One 8-bit Timer**
  - Time Base Unit (TBU) for generating periodic interrupts.
- **Development Tools**
  - Full hardware/software development package

Table 1. Device Summary

Features	ST7FSCRDIE	ST7SCRDIE	ST7FSCR1R4	ST7SCR1R4	ST7FSCR1E4	ST7SCR1E4
Program memory	16K FLASH	16K ROM	16K FLASH	16K ROM	16K FLASH	16K ROM
User RAM (stack) - bytes	768 (256)					
Peripherals	USB Full-Speed (7 Ep), TBU, Watchdog timer, ISO7816-3 Interface					
Operating Supply	4.0 to 5.5V					
Package	DIE		TQFP64		SO24	
CPU Frequency	4 or 8 Mhz					
Operating temperature	0°C to +70°C					

1 INTRODUCTION

The ST7SCR and ST7FSCR devices are members of the ST7 microcontroller family designed for USB applications. All devices are based on a common industry-standard 8-bit core, featuring an enhanced instruction set.

The ST7SCR ROM devices are factory-programmed and are not reprogrammable.

The ST7FSCR versions feature dual-voltage Flash memory with Flash Programming capability.

They operate at a 4MHz external oscillator frequency.

Under software control, all devices can be placed in WAIT or HALT mode, reducing power consumption when the application is in idle or stand-by state.

The enhanced instruction set and addressing modes of the ST7 offer both power and flexibility to software developers, enabling the design of highly efficient and compact application code. In addition to standard 8-bit data management, all ST7 microcontrollers feature true bit manipulation, 8x8 unsigned multiplication and indirect addressing modes.

The devices include an ST7 Core, up to 16 Kbytes of program memory, up to 512 bytes of user RAM, up to 35 I/O lines and the following on-chip peripherals:

– USB full speed interface with 7 endpoints, programmable in/out configuration and embedded 3.3V voltage regulator and transceivers (no external components are needed).

– ISO7816-3 UART interface with Programmable Baud rate from 372 clock pulses up to 11.625 clock pulses

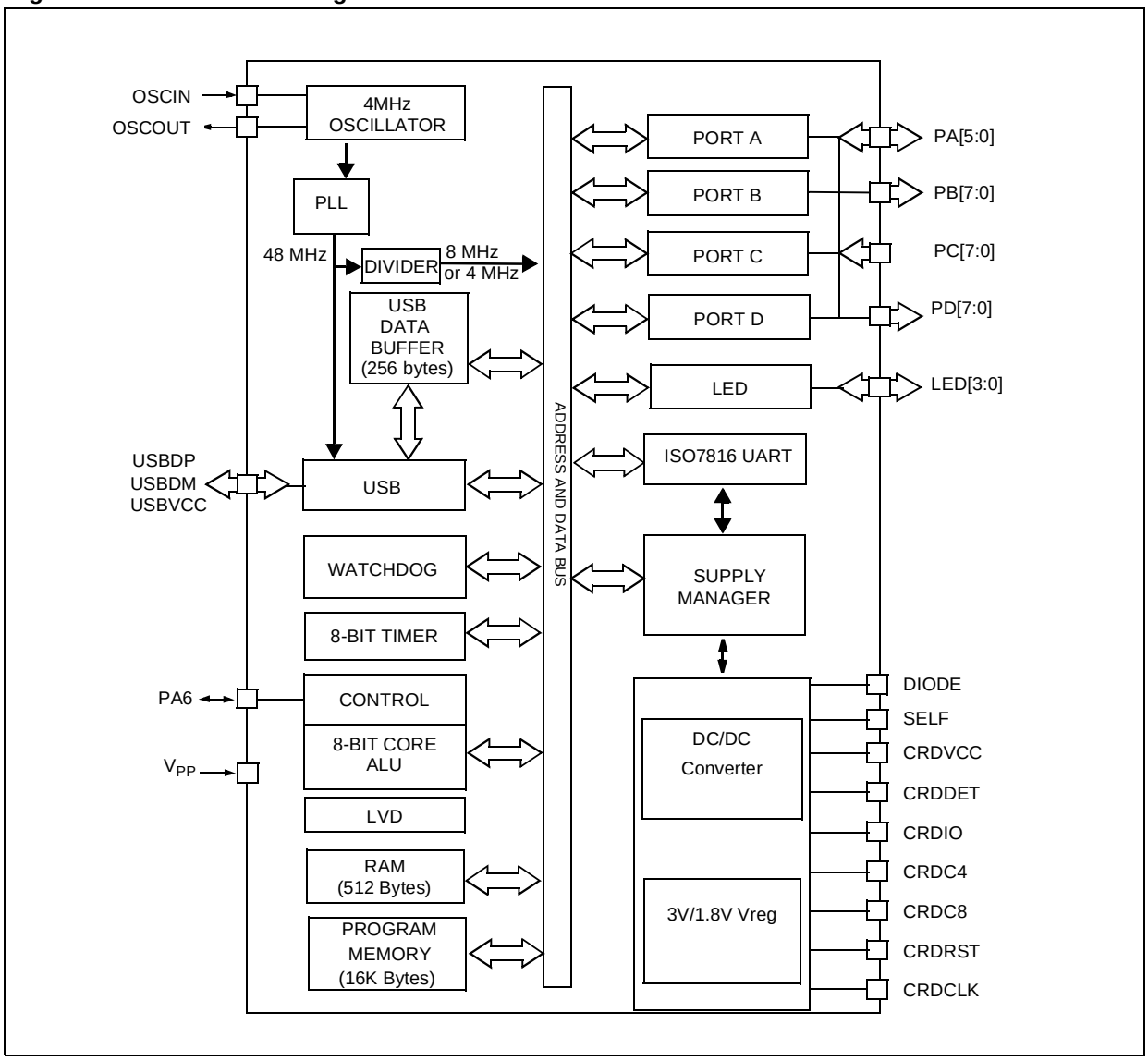
– Smartcard Supply Block able to provide programmable supply voltage and I/O voltage levels to the smartcards

– Low voltage reset ensuring proper power-on or power-off of the device (selectable by option)

– Watchdog Timer

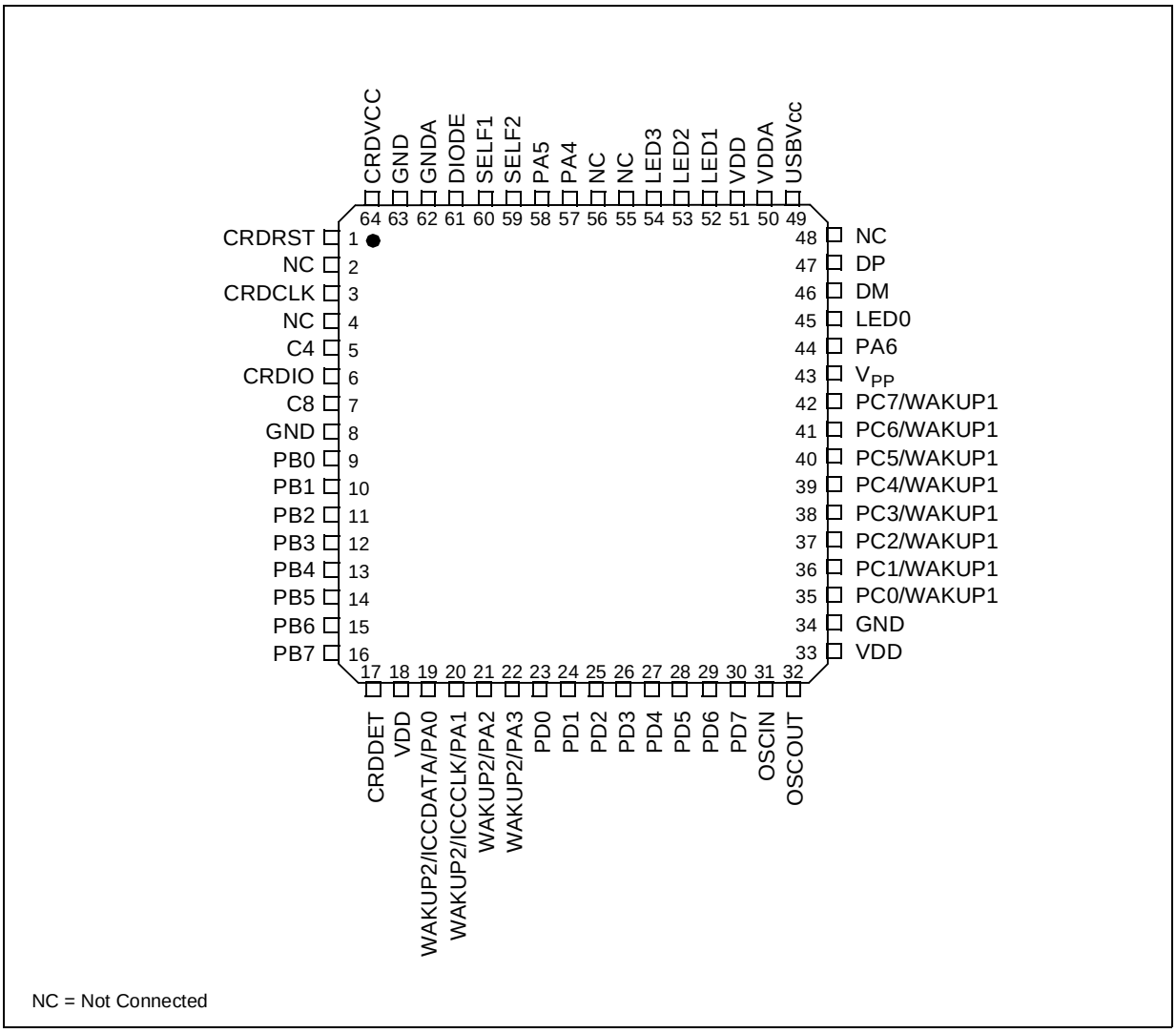
– 8-bit Timer (TBU)

Figure 1. ST7SCR Block Diagram



2 PIN DESCRIPTION

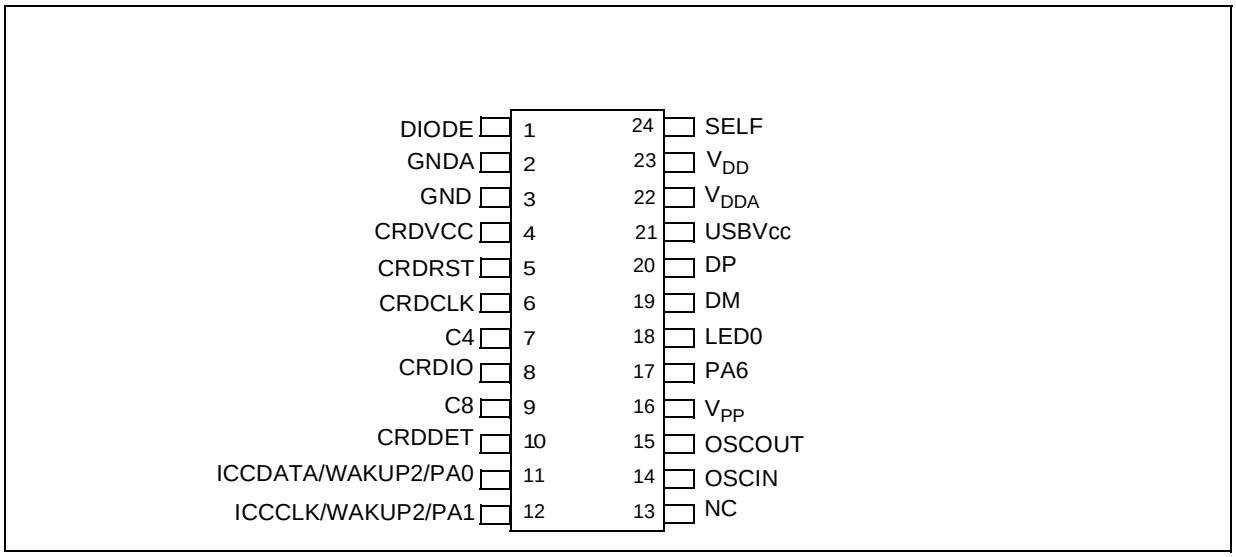
Figure 2. 64-Pin TQFP Package Pinout



NC = Not Connected

PIN DESCRIPTION (Cont'd)

Figure 3. 24-Pin SO Package Pinout



PIN DESCRIPTION (Cont'd)

Legend / Abbreviations:

Type: I = input, O = output, S = supply

In/Output level: C_T = CMOS $0.3V_{DD}/0.7V_{DD}$ with input trigger

Output level: HS = 10mA high sink (on N-buffer only)

Port and control configuration:

– Input:float = floating, wpu = weak pull-up, int = interrupt, ana = analog

– Output: OD = open drain, T = true open drain, PP = push-pull

Table 1. Pin Description

Pin n°		Pin Name	Type	Level		V_{CARD} supplied	Port / Control				Main Function (after reset)	Alternate Function
							Input		Output			
TQFP64	SO24			Input	Output		wpu	int	OD	PP		
1	5	CRDRST	O		C_T	X				X	Smartcard Reset	
2		NC									Not Connected	
3	6	CRDCLK	O		C_T	X				X	Smartcard Clock	
4		NC									Not Connected	
5	7	C4	O		C_T	X				X	Smartcard C4	
6	8	CRDIO	I/O	C_T		X	X		X		Smartcard I/O	
7	9	C8	O		C_T	X				X	Smartcard C8	
8	3	GND	S								Ground	
9		PB0	O		C_T				X	X	Port B0 [1]	
10		PB1	O		C_T				X	X	Port B1 [1]	
11		PB2	O		C_T				X	X	Port B2 [1]	
12		PB3	O		C_T				X	X	Port B3 [1]	
13		PB4	O		C_T				X	X	Port B4 [1]	
14		PB5	O		C_T				X	X	Port B5 [1]	
15		PB6	O		C_T				X	X	Port B6 [1]	
16		PB7	O		C_T				X	X	Port B7 [1]	
17	10	CRDDET	I	C_T			X				Smartcard Detection	
18		VDD	S								Power Supply voltage 4V-5.5V	
19	11	PA0/WAKUP2/ ICCDATA	I/O	C_T			X	X	X	X	Port A0	Interrupt, In-Circuit Communication Data Input
20	12	PA1/WAKUP2/ ICCCLK	I/O	C_T			X	X	X	X	Port A1	Interrupt, In-Circuit Communication Clock Input
21		PA2/WAKUP2	I/O	C_T			X	X	X	X	Port A2 [1]	Interrupt
22		PA3/WAKUP2	I/O	C_T			X	X	X	X	Port A3 [1]	Interrupt
23		PD0	O		C_T				X	X	Port D0 [1]	
24		PD1	O		C_T				X	X	Port D1 [1]	

Pin n°		Pin Name	Type	Level		V_{CARD} supplied	Port / Control				Main Function (after reset)	Alternate Function
							Input		Output			
TQFP64	SO24			Input	Output		wpu	int	OD	PP		
25		PD2	O		C_T				X	X	Port D2 [1]	
26		PD3	O		C_T				X	X	Port D3 [1]	
27		PD4	O		C_T				X	X	Port D4 [1]	
28		PD5	O		C_T				X	X	Port D5 [1]	
29		PD6	O		C_T				X	X	Port D6 [1]	
30		PD7	O		C_T				X	X	Port D7 [1]	
31	14	OSCIN		C_T							Input/Output Oscillator pins. These pins connect a 4MHz parallel-resonant crystal, or an external source to the on-chip oscillator.	
32	15	OSCOUT			C_T							
33		VDD	S								Power Supply voltage 4V-5.5V	
34		GND	S								Ground	
35		PC0/WAKUP1	I	C_T			X	X			PC0 [1]	External interrupt
36		PC1/WAKUP1	I	C_T			X	X			PC1 [1]	External interrupt
37		PC2/WAKUP1	I	C_T			X	X			PC2 [1]	External interrupt
38		PC3/WAKUP1	I	C_T			X	X			PC3 [1]	External interrupt
39		PC4/WAKUP1	I	C_T			X	X			PC4 [1]	External interrupt
40		PC5/WAKUP1	I	C_T			X	X			PC5 [1]	External interrupt
41		PC6/WAKUP1	I	C_T			X	X			PC6 [1]	External interrupt
42		PC7/WAKUP1	I	C_T			X	X			PC7 [1]	External interrupt
43	16	V_{PP}	S								Flash programming voltage. Must be held low in normal operating mode.	
44	17	PA6	I	C_T							PA6	
45	18	LED0	O		HS				X		Constant Current Output	
46	19	DM	I/O	C_T							USB Data Minus line	
47	20	DP	I/O	C_T							USB Data Plus line	
48		NC									Not Connected	
49	21	USBVCC	O		C_T						3.3 V Output for USB	
50	22	V_{DDA}	S								power Supply voltage 4V-5.5V	
51	23	V_{DD}	S								power Supply voltage 4V-5.5V	
52		LED1	O		HS				X		Constant Current Output	
53		LED2	O		HS				X		Constant Current Output	
54		LED3	O		HS				X		Constant Current Output	
55		NC									Not Connected	
56		NC									Not Connected	

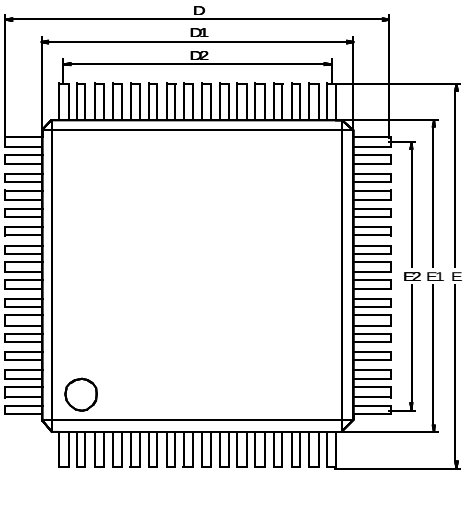
Pin n°		Pin Name	Type	Level		V_{CARD} supplied	Port / Control				Main Function (after reset)	Alternate Function
							Input		Output			
TQFP64	SO24			Input	Output		wpu	int	OD	PP		
57		PA4	I/O	C_T			X	X	X	X	Port A4	
58		PA5	I/O	C_T			X	X	X	X	Port A5	
59	24	SELF2	O		C_T						An External inductance must be connected to these pins for the step up converter	
60	24	SELF1	O		C_T							
61	1	DIODE	S		C_T						An External diode must be connected to this pin for the step up converter	
62	2	GNDA	S								Ground	
63	3	GND	S									
64	4	CDRVCC	O		C_T	X					Smartcard Supply pin	

Note 1: Keyboard interface

3 PACKAGE CHARACTERISTICS

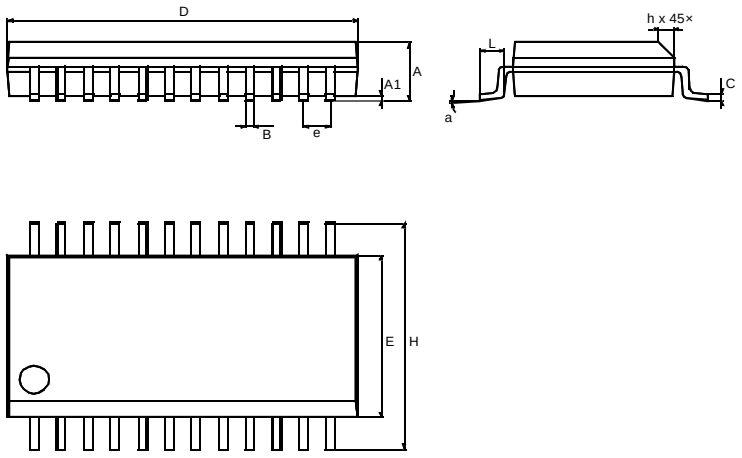
3.1 PACKAGE MECHANICAL DATA

Figure 4. 64-Pin Plastic Quad Flat Package



Dim.	mm			inches		
	Min	Typ	Max	Min	Typ	Max
A			3.40			0.134
A1	0.25		0.50	0.010		0.020
A2	2.50	2.70	2.90	0.098	0.106	0.114
b	0.29		0.45	0.011		0.018
c	0.11		0.23	0.004		0.009
D		17.20			0.677	
D1		14.00			0.551	
D2		12.00			0.472	
E		17.20			0.677	
E1		14.00			0.551	
E2		12.00			0.472	
e		0.80			0.031	
L	0.73	0.88	1.03	0.029	0.035	0.041
	Number of Pins					
N	64					

Figure 5. 24-Pin Plastic Small Outline Package, 300-mil Width



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Dim.	mm			inches		
	Min	Typ	Max	Min	Typ	Max
A	2.35		2.65	0.093		0.104
A1	0.10		0.30	0.004		0.012
B	0.33		0.51	0.013		0.020
C	0.23		0.32	0.009		0.013
D	15.20		15.60	0.599		0.614
E	7.40		7.60	0.291		0.299
e		1.27			0.050	
H	10.00		10.65	0.394		0.419
h	0.25		0.75	0.010		0.030
α	0°		8°	0°		8°
L	0.40		1.27	0.016		0.050
	Number of Pins					
N	24					

Dim.	mm			inches		
	Min	Typ	Max	Min	Typ	Max

Notes: