

SED1335F

Graphic LCD Controller



- For Medium-scale LCD
- Wide Operating Voltage 2.7 to 5.0V
- On Chip Character Generator ROM

DESCRIPTION

The SED1335F is a graphics and character display controller for use with medium scale dot matrix LCDs. The SED1335F generates all the signals required by the display memory and LCD drivers, and incorporates a character generator ROM, so that flexible, low power, display systems can be designed with a minimum number of external components.

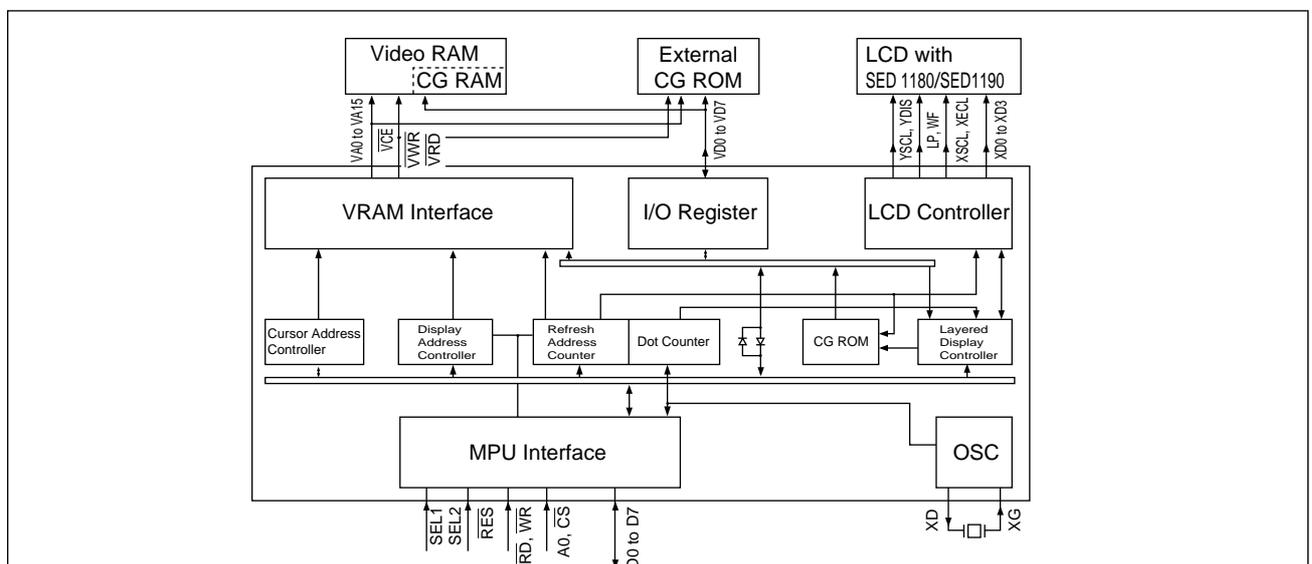
The SED1335F's high speed MPU interface can be configured for both 6800 family and 8080 family processors, and the rich command set allows the user to create a layered display of characters and graphics, scroll the display, and assign display attributes to selected areas of the screen with a minimum of MPU intervention. The controller also functions as a pipeline buffer between the MPU and display memory so that low cost, medium speed SRAM can be used.

The SED1335F character generator system supports user defined characters, which can be used alone, or in conjunction with the on board character set.

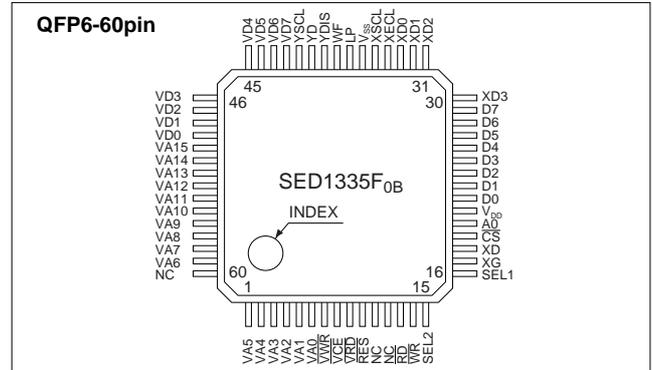
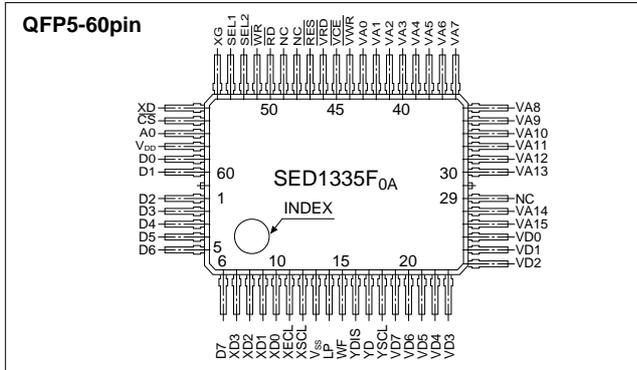
FEATURES

- 6800 and 8080 family compatibility, 2-pin programmable
- Software compatible with SED1330 and SED1336
- Programmable cursor movement
- Flexible scrolling
 -Scrolling in both horizontal and vertical directions
 -Scrolling of selected areas of the display
- Multimode display
 -Up to 2 layers of mixed character and graphics
 -Up to 3 layers of graphics
- Selectable display synthesis
 -Display attributes (reverse video, flashing, etc.) for selected areas of the display
 -Simple animation
- Supports 64K bytes of memory
 -4K bytes of user definable characters
 -60K bytes of display memory
- 160 JIS 5x7 pixel characters internal
- Supports external character ROM or RAM
 -8x8 or 8x16 pixel characters
 -Allows mixing of ROM RAM character sets
- Variable LCD duty cycle, from 1/2 to 1/256
- Low power CMOS fabrication
 -5mA (typical)
 -0.05μA (typical), standby
- Supply voltage 2.7 to 5.5V
- Package .. SED1335FOA: QFP5-60pin (plastic)
SED1335FOB: QFP6-60pin (plastic)

BLOCK DIAGRAM



■ PIN CONFIGURATION



■ PIN DESCRIPTION

Pin Name	Pin No.		I/O	Function	Pin Name	Pin No.		I/O	Function
	SED1335F _{0A}	SED1335F _{0B}				SED1335F _{0A}	SED1335F _{0B}		
XG	54	17	I	Oscillator terminal	VWR	44	7	O	VRAM write signal
XD	55	18	O	Oscillator terminal	VRD	46	9	O	VRAM read signal
V _{DD}	58	21	+5V	Power supply	VCE	45	8	O	VRAM chip enable
V _{SS}	13	36	GND(0V)	Power supply	XD3 to XD0	7 to 10	30 to 33	O	Dot data output bus to X driver
SEL1, 2	53•52	16•15	I	MPU interface format selection	XSCL	12	35	O	Dot data shift clock for X driver
D0 to D7	59 to 60 1 to 6	22 to 29	I/O	Data bus	XECL	11	34	O	Chip enable shift clock for X driver
A0	57	20	I	Data type selection	LP	14	37	O	Dot data latch pulse
RD	50	13	I	80 series Read strobe signal 68 series "E" clock	WF	15	38	O	Frame signal
WR	51	14	I	80 series Write strobe signal 68 series R/W signal	YSCL	18	41	O	Scan data shift clock for Y driver
CS	56	19	I	Chip select	YD	17	40	O	Scan data output
RES	47	10	I	Reset	YDIS	16	39	O	Power down signal when display OFF
VA15 to VA0	27•28 30 to 43	1 to 6 50 to 59	O	VRAM address bus	NC : Non Connection				
VD7 to VD0	19 to 26	42 to 49	I/O	VRAM data bus					

■ ABSOLUTE MAXIMUM RATINGS

(V_{SS} = 0V)

Rating	Symbol	Value	Unit
Supply voltage	V _{DD}	-0.3 to 7.0	V
Input voltage	V _{IN}	-0.3 to V _{DD} +0.3	V
Power dissipation	P _D	300	mW
Operating temperature	T _{opr}	-20 to 75	°C
Storage temperature	T _{stg}	-60 to 150	°C
Soldering temperature and time	T _{sol}	260°C, 10s (at lead)	—

■ ELECTRICAL CHARACTERISTICS

● DC Electrical Characteristics (1)

(V_{SS} = 0V, V_{DD} = 4.5 to 5.5V, Ta = -20 to 75°C)

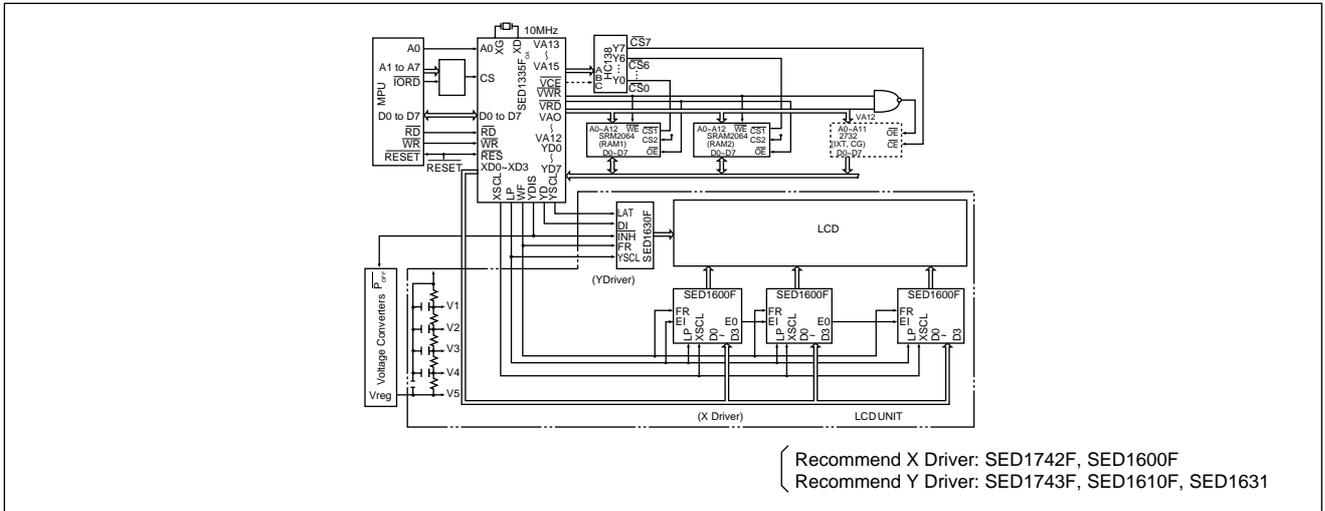
Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit	Pin	
Operating voltage	V _{DD}		4.5	—	5.5	V	V _{DD}	
Register data retention voltage	V _{OH}		2.0	—	6.0	V		
TTL	High level input voltage	V _{IHT}	0.5×V _{DD}	—	V _{DD}	V	D0 to D7, A0, \overline{CS} , \overline{RD} , \overline{WR} , VD0 to VD7, VA0 to VA15, \overline{VCE} VRD, \overline{VWR}	
	Low level input voltage	V _{ILT}	V _{SS}	—	0.2×V _{DD}	V		
	High level output voltage	V _{OHT}	I _{OH} = -5.0mA	2.4	—	—		V
	Low level output voltage	V _{OHT}	I _{OL} = 5.0mA	—	—	V _{SS} +0.4		V
CMOS	High level input voltage	V _{IHC}	0.8×V _{DD}	—	V _{DD}	V	SEL1, SEL2, YD, XD0 to XD3, XSCL, YDIS, LP, WF, CL0, XECL, YSCL	
	Low level input voltage	V _{ILC}	V _{SS}	—	0.2×V _{DD}	V		
	High level output voltage	V _{OHC}	I _{OH} = -2.0mA	V _{DD} -0.4	—	—		V
	Low level output voltage	V _{OLC}	I _{OL} = 2.0mA	—	—	V _{SS} +0.4		V
MUTUAL	Positive trigger threshold voltage	V _{T+}	0.5V _{DD}	0.7V _{DD}	0.8V _{DD}	V	\overline{RES}	
	Negative trigger threshold voltage	V _{T-}	0.2V _{DD}	0.3V _{DD}	0.5V _{DD}	V		
Input leakage current	I _{LI}	V _{IN} = V _{DD} /V _{SS}	—	0.05	2.0	μA		
Output leakage current	I _{LO}		—	0.10	5.0	μA		
Average operating current	I _{opr}	f _{OSC} = 10MHz, No-load 256×200dot	—	11	15	mA	V _{DD}	
Standby current	I _Q	Sleep X _G , \overline{CS} , \overline{RD} = V _{DD}	—	0.05	20	μA	V _{DD}	
Oscillation frequency	f _{OSC}	AT X'tal	1.0	—	10.0	MHz	XG, XD	
External clock frequency	f _{CL}	Duty 47.5%	1.0	—	10.0	MHz		
Feed back resistance	R _f		0.5	1.0	3.0	MΩ		

● DC Electrical Characteristics (2)

(V_{SS} = 0V, V_{DD} = 4.5 to 5.5V, Ta = -20 to 75°C)

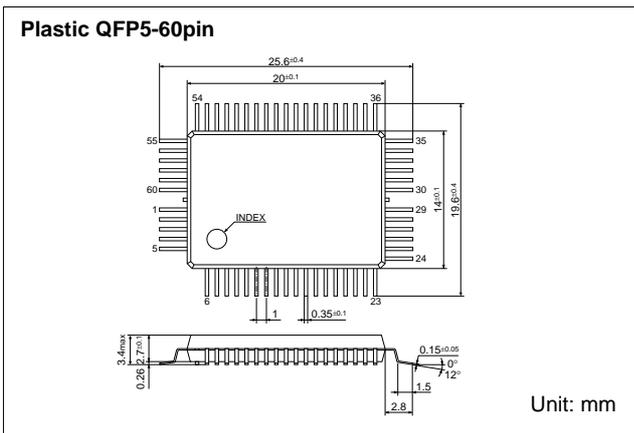
Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit	Pin	
Operating voltage	V _{DD}		2.7	3.5	4.5	V	V _{DD}	
Register data retention voltage	V _{OH}		2.0	—	6.0	V		
TTL	High level input voltage	V _{IHT}	0.8×V _{DD}	—	V _{DD}	V	D0 to D7 A0, \overline{CS} , \overline{RD} , \overline{WR} VD0 to VD7 VA0 to VA15, \overline{VCE} , VRD, \overline{VWR}	
	Low level input voltage	V _{ILT}	V _{SS}	—	0.2×V _{DD}	V		
	High level output voltage	V _{OHT}	I _{OH} = -3.0mA	V _{DD} -0.4	—	—		V
	Low level output voltage	V _{OHT}	I _{OL} = 3.0mA	—	—	V _{SS} +0.4		V
CMOS	High level input voltage	V _{IHC}	0.8×V _{DD}	—	V _{DD}	V	SEL1, SEL2, YD XD0 to XD3, XSCL, YDIS LP, WF, CL0, XECL, YSCL	
	Low level input voltage	V _{ILC}	V _{SS}	—	0.2×V _{DD}	V		
	High level output voltage	V _{OHC}	I _{OH} = -1.0mA	V _{DD} -0.4	—	—		V
	Low level output voltage	V _{OLC}	I _{OL} = 1.0mA	—	—	V _{SS} +0.4		V
MUTUAL	Positive trigger threshold voltage	V _{T+}	0.5V _{DD}	0.7V _{DD}	0.8V _{DD}	V	\overline{RES}	
	Negative trigger threshold voltage	V _{T-}	0.2V _{DD}	0.3V _{DD}	0.5V _{DD}	V		
Input leakage current	I _{LI}	V _{IN} = V _{DD} /V _{SS}	—	0.05	2.0	μA		
Output leakage current	I _{LO}		—	0.10	5.0	μA		
Average operating current	I _{opr}	f _{OSC} = 6.1MHz, No-load 256×200dot	—	3.5 V _{DD} = 3.5V	7.0	mA	V _{DD}	
Standby current	I _Q	Sleep X _G , \overline{CS} , \overline{RD} = V _{DD}	—	0.05	20	μA	V _{DD}	
Oscillation frequency	f _{OSC}	AT X'tal	1.0	—	8.0	MHz	XG, XD	
External clock frequency	f _{CL}	Duty 47.5%	1.0	—	8.0	MHz		
Feed back resistance	R _f		0.7	1.0	4.0	MΩ		

■ MPU AND LCD PANEL CONNECTION EXAMPLE

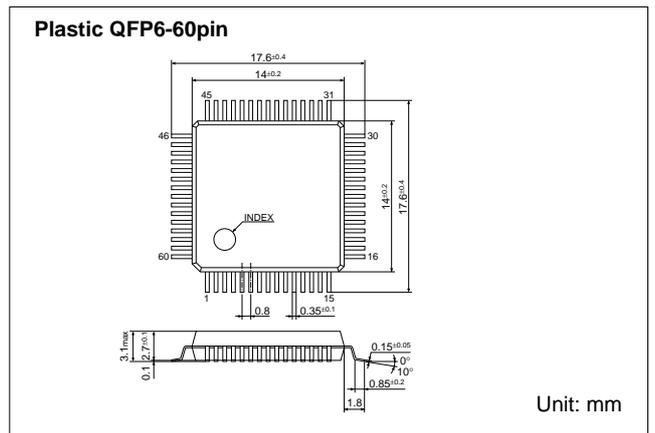


■ PACKAGE DIMENSIONS

● SED1335FOA



● SED1335FOB



■ CHARACTER CODE TABLE (BUILT-IN CHARACTER GENERATOR)

		Lower 4bit (D0 to D3) of Character Code (Hexadecimal)															
		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Upper 4bit (D4 to D7) of Character Code (Hexadecimal)	2																
	3	0	1	2	3	4	5	6	7	8	9	:	<	=	>	?	
	4	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	
	5	P	Q	R	S	T	U	V	W	X	Y	Z	[]			
	6	'	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
	7	P	q	r	s	t	u	v	w	x	y	z	{	}			
	A	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	
	B	'	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
	C	0	1	2	3	4	5	6	7	8	9	:	<	=	>	?	
	D	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	
	1																

Note : means all dots of 6x8 matrix are on.

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