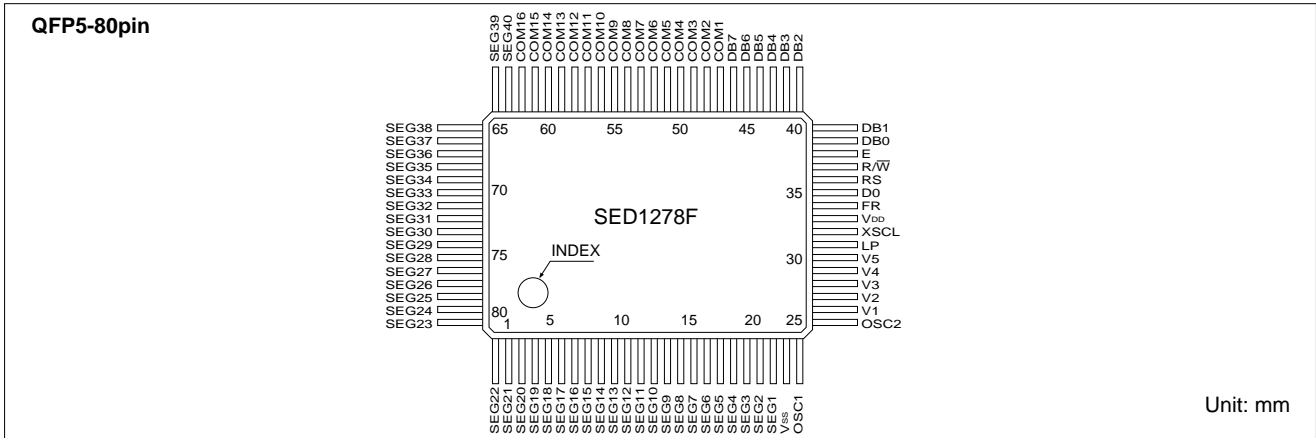




# SED1278F/D

## PIN CONFIGURATION



## PIN DESCRIPTION

Symbol	No. of signals	Function
RS	1	Register select signal
R/W	1	Read/write select signal
E	1	Read/write execute signal
DB0 to DB7	8	Data bus
LP	1	Data latching pulse
XSCL	1	Data transfer clock
FR	1	LCD AC driving signal
DO	1	Serial data
COM 1 to COM16	16	Common outputs COM9 to COM16: non-select for 1/8 duty COM12 to COM16: non-select for 1/11 duty
SEG1 to SEG40	40	Segment outputs
V1 to V5	5	LCD driving power ( $V_5 \cong V_{SS}$ )
V <sub>DD</sub>	1	+5V
V <sub>SS</sub>	1	0V (GND)
OSC1		Used to connect resistor (typ. 91K-ohms) for oscillation;
OSC2	2	OSC1 is for external clock input.

*1	RS	R/W	E	Operation
	0	0		Instruction write cycle
	0	1	1	Busy flag read cycle Address counter read cycle
	1	0		DD RAM or CG RAM data write cycle
	1	1	1	DD RAM or CG RAM data read cycle

## ABSOLUTE MAXIMUM RATINGS

(V<sub>SS</sub>=0V, Ta=25°C)

Rating	Symbol	Value	Unit
Supply voltage (1)	V <sub>DD</sub>	-0.3 to 7.0	V
Supply voltage (2)	V <sub>1</sub> to V <sub>5</sub>	-0.3 to V <sub>DD</sub> +0.3	V
Input voltage	V <sub>I</sub>	-0.3 to V <sub>DD</sub> +0.3	V
Output voltage	V <sub>O</sub>	-0.3 to V <sub>DD</sub> +0.3	V
Power dissipation	P <sub>D</sub>	300	mW
Operating temperature	T <sub>opr</sub>	-20 to 75	°C
Storage temperature	T <sub>stg</sub>	-65 to 150	°C
Soldering temperature and time	T <sub>sol</sub>	260°C · 10s (at lead)	—

Note: The following condition must always hold true: V<sub>DD</sub> ≧ V<sub>1</sub> ≧ V<sub>2</sub> ≧ V<sub>3</sub> ≧ V<sub>4</sub> ≧ V<sub>5</sub>

## ELECTRICAL CHARACTERISTICS

### DC Characteristics

( $V_{DD}=5.0V\pm 10\%$ ,  $V_{SS}=0V$ ,  $T_a=-20$  to  $75^\circ C$ )

Characteristic	Symbol	Condition	Applicable Pin	Min.	Typ.	Max.	Unit
"H" level input voltage (1)	$V_{IH1}$		DB0~DB7	2.0	—	$V_{DD}$	V
"L" level input voltage (1)	$V_{IL1}$		RS, R/W, E	$V_{SS}$	—	0.8	V
"H" level input voltage (2)	$V_{IH2}$		OSC1	$V_{DD}-1.0$	—	$V_{DD}$	V
"L" level input voltage (2)	$V_{IL2}$			$V_{SS}$	—	1.0	V
"H" level output voltage (1)	$V_{OH1}$	$I_{OH}=-0.205mA$	DB0~DB7	2.4	—	—	V
"L" level output voltage (1)	$V_{OL1}$	$I_{OL}=1.6mA$		—	—	0.4	V
"H" level output voltage (2)	$V_{OH2}$	$I_{OH}=-0.04mA$	XSCL LP DO	$0.9V_{DD}$	—	—	V
"L" level output voltage (2)	$V_{OL2}$	$I_{OL}=0.04mA$		—	—	$0.1V_{DD}$	V
Driver-on resistor (COM)	$R_{COM}$	$ V_{COM}-V_n =0.5V$	COM1~16	—	2	10	$k\Omega$
Driver-on resistor (SEG)	$R_{SEG}$	$ V_{SEG}-V_n =0.5V$	SEG1~40	—	2.5	10	$k\Omega$
I/O leakage current	$I_{IL}$	$V_I=0$ to $V_{DD}$		—	—	1	$\mu A$
Pull-up MOS current	$-I_P$	$V_{DD}=5V$		50	125	250	$\mu A$
Supply current	$I_{OP}$	Rf oscillation, from external clock $V_{DD}=5V$ , $f_{osc}=f_{CP}=270kHz$	$V_{DD}$	—	0.5	0.8	mA
External clock operation							
External clock operating frequency	$f_{EXTCL}$			125	250	350	kHz
External clock duty	Duty			45	50	55	%
External clock rise time	$t_{rEXTCL}$			-	—	0.2	$\mu S$
External clock fall time	$t_{fEXTCL}$			-	—	0.2	$\mu S$
Internal clock operation (Rf oscillation)							
Oscillation frequency	$f_{OSC}$	$R_f=91k\Omega \pm 2\%$		190	270	350	kHz
Internal clock operation (Ceramic filter oscillation)							
Oscillation frequency	$f_{OSC}$	Ceramic filter		245	250	255	kHz
LCD driving voltage	$V_{LCD}$	$V_{DD}-V_5$		3.0	—	$V_{DD}$	V

### AC Characteristics

#### Read Cycle

( $V_{DD}=5.0V\pm 10\%$ ,  $V_{SS}=0V$ ,  $T_a=-20$  to  $75^\circ C$ )

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Enable cycle time	$t_{cycE}$		500	—	—	ns
Enable "H" level pulse width	$t_{WEH}$		220	—	—	ns
Enable rise/fall time	$t_{rE}$ , $t_{fE}$		—	—	25	ns
RS, R/W setup time	$t_{AS}$		40	—	—	ns
RS, R/W address hold time	$t_{AH}$		10	—	—	ns
Read data output delay	$t_{RD}$	$C_L=100pF$	—	—	120	ns
Read data hold time	$t_{DHR}$		20	—	—	ns

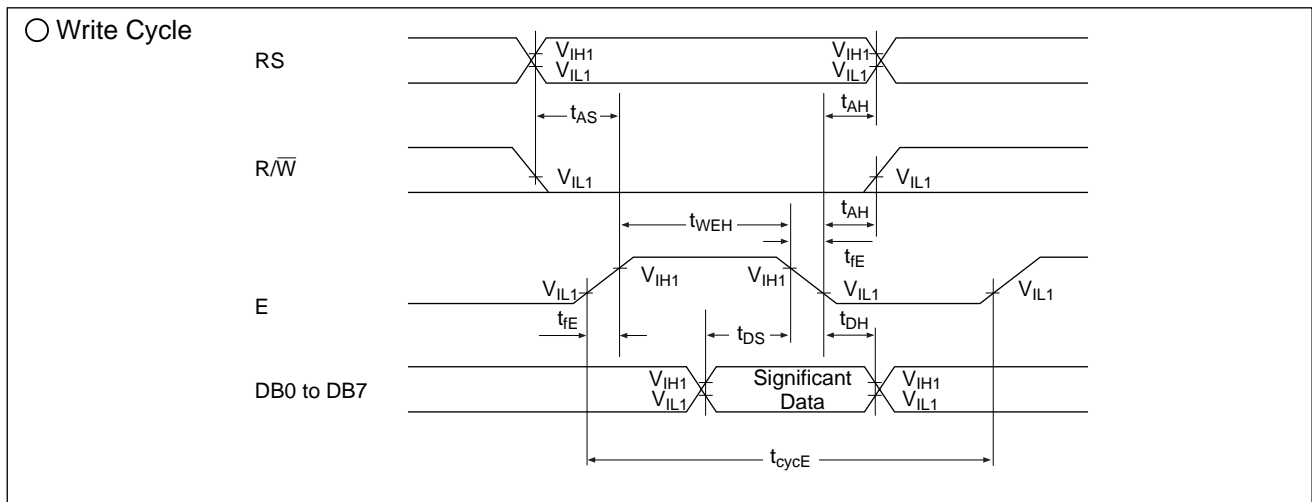
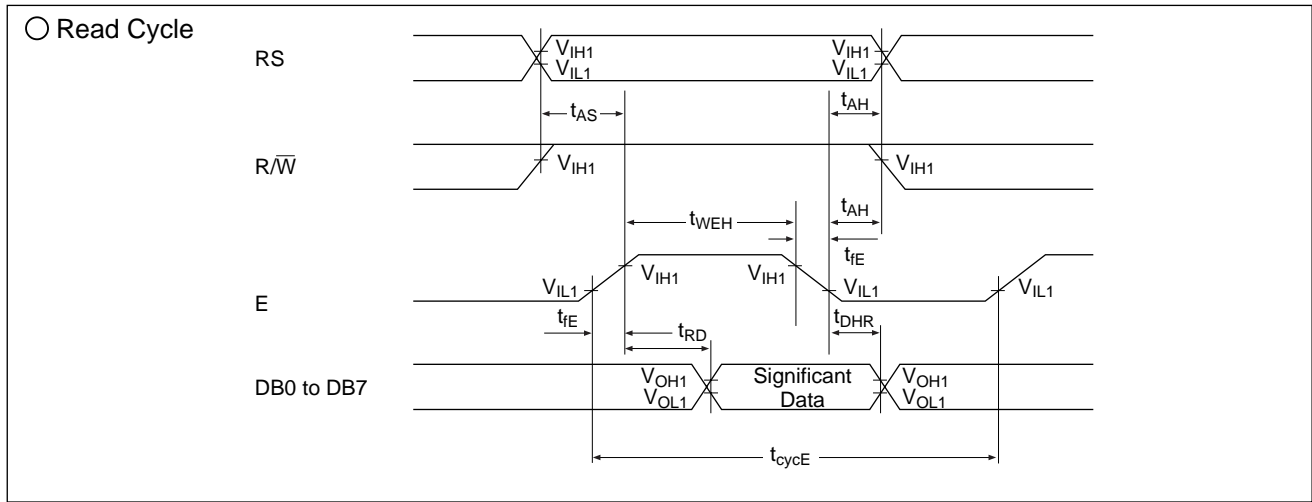
#### Write Cycle

( $V_{DD}=5.0V\pm 10\%$ ,  $V_{SS}=0V$ ,  $T_a=-20$  to  $75^\circ C$ )

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Enable cycle time	$t_{cycE}$		500	—	—	ns
Enable "H" level pulse width	$t_{WEH}$		220	—	—	ns
Enable rise/fall time	$t_{rE}$ , $t_{fE}$		—	—	25	ns
RS, R/W setup time	$t_{AS}$		40	—	—	ns
RS, R/W address hold time	$t_{AH}$		10	—	—	ns
Data setup time	$t_{DS}$		60	—	—	ns
Write data hold time	$t_{DH}$		10	—	—	ns

# SED1278F/D

## ● Timing Chart

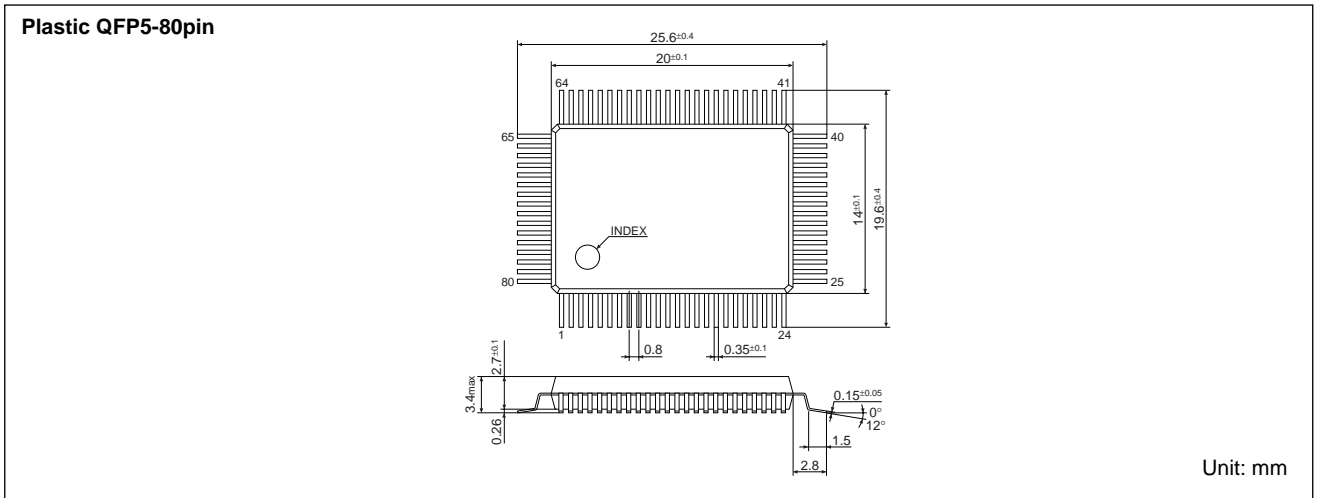


## ■ DISPLAY COMMAND

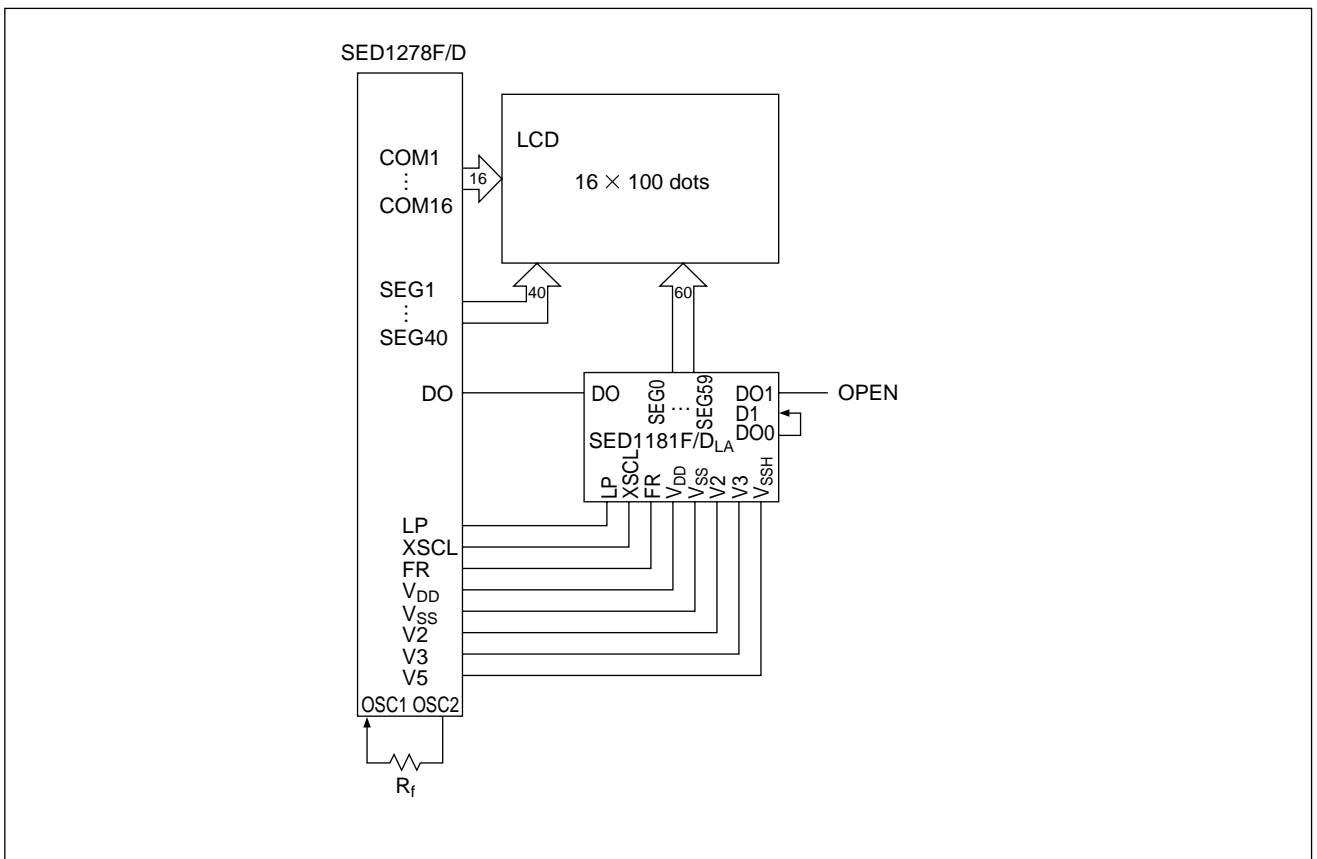
Parameter	RS	R/ $\bar{W}$	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Note
CLEAR DISPLAY	0	0	0	0	0	0	0	0	0	1	
CURSOR HOME	0	0	0	0	0	0	0	0	1	1	
ENTRY MODE SET	0	0	0	0	0	0	0	1	I/D	I/D	DB1=1: Increment, DB1=0: Decrement DB0=1: The display is shifted. DB0=0: The display is not shifted.
DISPLAY ON/OFF	0	0	0	0	0	0	1	D	C	C	DB2=1: Display on DB2=0: Display off DB1=1: Cursor on DB1=0: Cursor off DB0=1: Brinking on DB0=0: Brinking off
CURSOR/DISPLAY SHIFT	0	0	0	0	0	1	S/C	R/L	*	*	DB3=1: Shifts display one character DB2=1: Right shift, DB2=0: Left shift
SYSTEM SET	0	0	0	0	1	DL	N	F	*	*	DB4=1: 8 bits, DB4=0: 4 bits DB3=1: 2 lines display (1/16 duty), DB3=0: 1 line display ( DB2=1: 5×10 dots, 1/11 duty DB2=0: 5×7 dots, 1/8 duty )
SET CGRAM ADDRESS	0	0	0	1	$A_{CG}$					The address length that can be set is 64 addresses.	
SET DDRAM ADDRESS	0	0	1	$A_{DD}$					The address length that can be set is 80 addresses.		
READ BUSY FLUG/ ADDRESS COUNTER	0	1	BF	AC					DB7=1: Busy (instruction not accepted) DB7=0: Ready (instruction accepted)		
WRITE DATA	1	0	Write Data								
READ DATA	1	1	Read Data								

\* Don't care

## PACKAGE DIMENSIONS



## LCD PANEL INTERFACE EXAMPLE (2 lines × 20 characters)



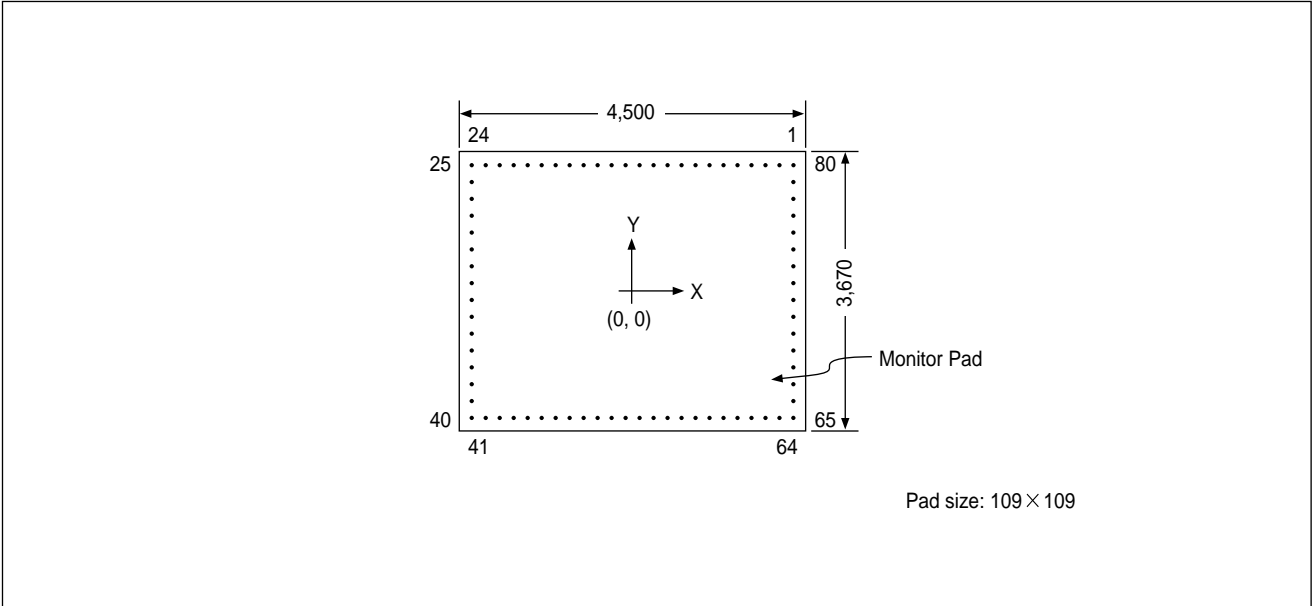
SED1278F/D is usually connected to 8-bit MPU via I/O ports.

# SED1278F/D

## SED1278D

### ● PAD LAYOUT

Unit:  $\mu\text{m}$



### ● PAD COORDINATION

Unit:  $\mu\text{m}$

Pad No.	Pad Name	X	Y	Pad No.	Pad Name	X	Y	Pad No.	Pad Name	X	Y
1	SEG22	2,087	1,671	28	V <sub>3</sub>	-2,087	819	55	COM9	452	-1,671
2	SEG21	1,905	↓	29	V <sub>4</sub>	↓	637	56	COM10	633	↓
3	SEG20	1,723	↓	30	V <sub>5</sub>	↓	455	57	COM11	814	↓
4	SEG19	1,541	↓	31	LP	↓	273	58	COM12	995	↓
5	SEG18	1,359	↓	32	XSCL	↓	91	59	COM13	1,177	↓
6	SEG17	1,177	↓	33	V <sub>CC</sub>	↓	-91	60	COM14	1,359	↓
7	SEG16	995	↓	34	FR	↓	-273	61	COM15	1,541	↓
8	SEG15	814	↓	35	DO	↓	-455	62	COM16	1,723	↓
9	SEG14	633	↓	36	RS	↓	-637	63	SEG40	1,905	↓
10	SEG13	452	↓	37	R/W	↓	-819	64	SEG39	2,087	↓
11	SEG12	272	↓	38	E	↓	-1,001	65	SEG38	↓	-1,365
12	SEG11	91	↓	39	DB0	↓	-1,183	66	SEG37	↓	-1,183
13	SEG10	-91	↓	40	DB1	↓	-1,365	67	SEG36	↓	-1,001
14	SEG9	-272	↓	41	DB2	↓	-1,671	68	SEG35	↓	-819
15	SEG8	-452	↓	42	DB3	↓	-1,905	69	SEG34	↓	-637
16	SEG7	-633	↓	43	DB4	↓	-1,723	70	SEG33	↓	-455
17	SEG6	-814	↓	44	DB5	↓	-1,541	71	SEG32	↓	-273
18	SEG5	-995	↓	45	DB6	↓	-1,359	72	SEG31	↓	-91
19	SEG4	-1,177	↓	46	DB7	↓	-1,177	73	SEG30	↓	91
20	SEG3	-1,359	↓	47	COM1	↓	-995	74	SEG29	↓	273
21	SEG2	-1,541	↓	48	COM2	↓	-814	75	SEG28	↓	455
22	SEG1	-1,723	↓	49	COM3	↓	-633	76	SEG27	↓	637
23	GND	-1,905	↓	50	COM4	↓	-452	77	SEG26	↓	819
24	OSC1	-2,087	↓	51	COM5	↓	-272	78	SEG25	↓	1,001
25	OSC2	↓	1,365	52	COM6	↓	-91	79	SEG24	↓	1,183
26	V <sub>1</sub>	↓	1,183	53	COM7	↓	91	80	SEG23	↓	1,365
27	V <sub>2</sub>	↓	1,001	54	COM8	↓	272				

■ SED1278D<sub>0A</sub> CHARACTER FONT

		Higher 4-bit (D4 to D7) of Character Code (Hexadecimal)																
		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
Lower 4-bit (D0 to D3) of Character Code (Hexadecimal)	0	CG RAM (1)			0	a	P	`	P					-	9	E	o	p
	1	CG RAM (2)	!	1	A	a	a	a					•	7	†	4	a	q
	2	CG RAM (3)	"	2	B	R	b	r					ˆ	4	u	x	p	o
	3	CG RAM (4)	#	3	C	S	c	s					ˆ	9	T	E	s	•
	4	CG RAM (5)	\$	4	D	T	d	t					ˆ	1	k	p	o	
	5	CG RAM (6)	%	5	E	U	e	u					•	*	*	o	o	
	6	CG RAM (7)	&	6	F	V	f	v					ˆ	9	c	a	p	z
	7	CG RAM (8)	'	7	G	W	g	w					ˆ	†	†	ˆ	g	g
	8	CG RAM (1)	(	8	H	X	h	x					ˆ	o	*	ˆ	ˆ	x
	9	CG RAM (2)	)	9	I	Y	i	y					ˆ	ˆ	ˆ	ˆ	ˆ	y
	A	CG RAM (3)	*	A	J	Z	j	z					ˆ	o	ˆ	ˆ	ˆ	z
	B	CG RAM (4)	+	B	K	0	k	(					ˆ	ˆ	ˆ	ˆ	ˆ	z
	C	CG RAM (5)	,	C	L	1	l	!					ˆ	ˆ	ˆ	ˆ	ˆ	z
	D	CG RAM (6)	-	D	M	2	m	)					ˆ	ˆ	ˆ	ˆ	ˆ	z
	E	CG RAM (7)	•	E	N	3	n	+					ˆ	ˆ	ˆ	ˆ	ˆ	z
	F	CG RAM (8)	/	F	O	4	o	+					ˆ	ˆ	ˆ	ˆ	ˆ	z

# SED1278F/D

## ■ SED1278F<sub>OB/DOB</sub> CHARACTER FONT

		Higher 4-bit (D4 to D7) of Character Code (Hexadecimal)																		
		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F			
Lower 4-bit (D0 to D3) of Character Code (Hexadecimal)	0	CG RAM (1)	±		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
	1	CG RAM (2)	≡	!	1	A	0	a	9	0	a	e	i	''	l	t	y	u		
	2	CG RAM (3)	7	"	2	B	R	b	r	e	b	e	6	°	o	8	8	x		
	3	CG RAM (4)	∟	#	3	C	S	c	s	8	8	0	'	7	9	e	v			
	4	CG RAM (5)	∟	\$	4	D	T	d	t	8	a	e	t	'	4	n	z	o		
	5	CG RAM (6)	∟	%	5	E	U	e	u	8	a	b	e	b	t	a	n	7		
	6	CG RAM (7)	∟	&	6	F	V	f	v	8	0	*	w	∟	0	0	∟			
	7	CG RAM (8)	∟	'	7	G	W	w	s	0	R	X	∟	∟	∟	∟	∟			
	8	CG RAM (1)	∟	(	8	H	X	h	x	8	0	∟	∟	∟	∟	∟	∟			
	9	CG RAM (2)	∟	)	9	I	Y	i	y	8	0	∟	∟	∟	∟	∟	∟			
	A	CG RAM (3)	∟	*		J	Z	j	z	8	0	∟	∟	∟	∟	∟	∟			
	B	CG RAM (4)	∟	+		K	C	k	c	∟	∟	∟	∟	∟	∟	∟	∟			
	C	CG RAM (5)	∟	,		L	∟	∟	∟	∟	∟	∟	∟	∟	∟	∟	∟			
	D	CG RAM (6)	∟	-		M	∟	∟	∟	∟	∟	∟	∟	∟	∟	∟	∟			
	E	CG RAM (7)	∟	.		N	∟	∟	∟	∟	∟	∟	∟	∟	∟	∟	∟			
	F	CG RAM (8)	∟	/		0	∟	∟	∟	∟	∟	∟	∟	∟	∟	∟	∟			



■ SED1278Foc/Doc CHARACTER FONT

		Higher 4-bit (D4 to D7) of Character Code (Hexadecimal)																
		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
Lower 4-bit (D0 to D3) of Character Code (Hexadecimal)	0	CG RAM (1)			0	0	P	'	P					e	e	e	l	l
	1	CG RAM (2)	!	!	A	A	a	a					o	o	i	i	e	e
	2	CG RAM (3)	"	"	Z	Z	R	R					e	e	o	o	i	i
	3	CG RAM (4)	#	#	C	C	S	S					a	a	o	o	i	i
	4	CG RAM (5)	\$	\$	D	D	T	T					a	a	o	o	i	i
	5	CG RAM (6)	%	%	E	E	U	U					a	a	o	o	i	i
	6	CG RAM (7)	&	&	F	F	V	V					'	o	a	"	o	a
	7	CG RAM (8)	'	'	G	G	W	W					N	o	o	o	e	e
	8	CG RAM (1)	(	(	H	H	X	X					e	e	o	o	w	o
	9	CG RAM (2)	)	)	I	I	Y	Y					e	e	o	o	y	o
	A	CG RAM (3)	*	*	J	J	Z	Z					e	o	o	a	o	e
	B	CG RAM (4)	+	+	K	K	!	!					i	o	o	i	o	o
	C	CG RAM (5)	,	,	L	L	!'	!'					i	o	o	a	o	e
	D	CG RAM (6)	-	-	M	M	!n	!n					i	a	i	o	e	+
	E	CG RAM (7)	.	.	N	N	!n	!n					a	e	o	e	e	e
	F	CG RAM (8)	/	/	O	O	!o	!o					e	e	o	o	e	o

# SED1278F/D

## ■ SED1278F<sub>0D</sub>/D<sub>0E</sub> CHARACTER FONT

		Higher 4-bit (D4 to D7) of Character Code (Hexadecimal)															
		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Lower 4-bit (D0 to D3) of Character Code (Hexadecimal)	0	CG RAM (1)			0	0	P	'	F								
	1	CG RAM (2)	!	1	A	Q	a	a									
	2	CG RAM (3)	"	2	B	R	b	r									
	3	CG RAM (4)	#	3	C	S	c	s									
	4	CG RAM (5)	\$	4	D	T	d	t									
	5	CG RAM (6)	%	5	E	U	e	u									
	6	CG RAM (7)	&	6	F	V	f	v									
	7	CG RAM (8)	'	7	G	W	g	w									
	8	CG RAM (1)	(	8	H	X	h	x									
	9	CG RAM (2)	)	9	I	Y	i	y									
	A	CG RAM (3)	*	*	J	Z	j	z									
	B	CG RAM (4)	+	+	K	[	k	[									
	C	CG RAM (5)	,	<	L	\	l	\									
	D	CG RAM (6)	-	=	M	]	m	]									
	E	CG RAM (7)	.	>	N	^	n	^									
	F	CG RAM (8)	/	?	O	_	o	_									

■ SED1278F<sub>OG</sub>/D<sub>OG</sub> CHARACTER FONT

		Higher 4-bit (D4 to D7) of Character Code (Hexadecimal)															
		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Lower 4-bit (D0 to D3) of Character Code (Hexadecimal)	0	CG RAM (1)			0	a	P	'	P			ÿ	É	À	À	Ç	Ï
	1	CG RAM (2)	!	1	A	a	a	a			0	a	1	À	Ç	!	!
	2	CG RAM (3)	"	2	B	R	b	r			é	É	ò	×	é	é	É
	3	CG RAM (4)	#	3	O	S	c	s			À	ò	ó	ó	ó	ó	ó
	4	CG RAM (5)	\$	4	O	T	d	t			À	ò	À	ó	ó	ó	ó
	5	CG RAM (6)	%	5	E	U	e	u			À	ò	N	'	ò	ó	ó
	6	CG RAM (7)	&	6	F	V	f	v			'	ò	a	'	ó	ó	ó
	7	CG RAM (8)	'	7	G	W	g	w			N	ò	ò	N	ó	ó	ó
	8	CG RAM (1)	(	8	H	X	h	x			é	é	ç	ç	é	é	é
	9	CG RAM (2)	)	9	I	Y	i	y			é	é	ó	ó	é	é	é
	A	CG RAM (3)	*	*	J	Z	j	z			é	ò	À	L	.	.	é
	B	CG RAM (4)	+	+	K	l	k	l			i	ò	ó	ó	ó	ó	ó
	C	CG RAM (5)	,	,	L	l	l	l			i	ò	ó	ó	ó	ó	ó
	D	CG RAM (6)	-	-	M	n	m	n			i	ò	ó	ó	ó	ó	ó
	E	CG RAM (7)	.	.	N	ñ	n	ñ			À	é	ó	ó	é	é	é
	F	CG RAM (8)	/	/	O	o	o	o			À	ó	ó	ó	ó	ó	ó

# SED1278F/D

## ■ SED1278F<sub>OH</sub>/D<sub>OH</sub> CHARACTER FONT

		Higher 4-bit (D4 to D7) of Character Code (Hexadecimal)															
		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Lower 4-bit (D0 to D3) of Character Code (Hexadecimal)	0	CG RAM (1)			0	0	P	'	P			E	0	4	.	2	4
	1	CG RAM (2)		!	1	A	0	a	a			r	9	w	.	w	4
	2	CG RAM (3)		"	2	B	R	b	r			E	6	v	.	w	4
	3	CG RAM (4)		#	3	C	S	c	s			#	5	v	.	a	4
	4	CG RAM (5)		\$	4	D	T	d	t			3	r	v	.	o	4
	5	CG RAM (6)		%	5	E	U	e	u			#	6	x	.	u	'
	6	CG RAM (7)		&	6	F	V	f	v			#	7	v	.	w	4
	7	CG RAM (8)		'	7	G	W	g	w			#	8	v	.	'	'
	8	CG RAM (1)		(	8	H	X	h	x			#	9	v	.	'	'
	9	CG RAM (2)		)	9	I	Y	i	y			#	0	v	.	'	'
	A	CG RAM (3)		*	:	J	Z	j	z			#	1	v	.	'	'
	B	CG RAM (4)		+	:	K	[	k	[			#	2	v	.	'	'
	C	CG RAM (5)		,	<	L	]	l	]			#	3	v	.	'	'
	D	CG RAM (6)		-	=	M	^	m	^			#	4	v	.	'	'
	E	CG RAM (7)		.	>	N	_	n	_			#	5	v	.	'	'
	F	CG RAM (8)		/	?	O	_	o	_			#	6	v	.	'	'

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