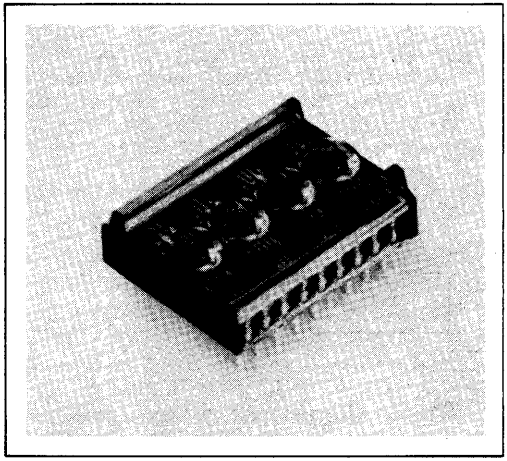
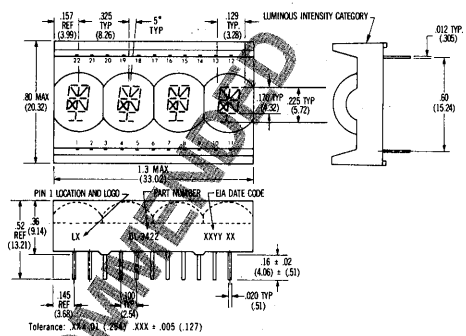
SIEMENS

DL-3422

.170"/.100" (Nom.) UPPER AND LOWER CASE 4-DIGIT 22-SEGMENT ALPHANUMERIC Intelligent Display® WITH MEMORY/DECODER/DRIVER



Package Dimensions in Inches (mm)



FEATURES

- 170 Mil/100 Mil (Nom.) Upper & Lower Case Letters
- Wide Viewing Angle ± 40°
- Close Vertical Row Spacing, .800 Inches
- Rugged Solid Plastic Encapsulated Package
- Fast Access Time, 500 nSEC
- Full Size Display for Stationary Equipment
- Built-in Memory
- Built-in Character Generator
- Built-in Multiplex and LED Drive Circuitry
- Direct Access to Each Digit Independently & Asynchronously
- TTL Compatible, 5 Volt Power
- Independent Cursor Function
- 22 Segment for 96 Character ASCII Format Upper & Lower Case Letters
- Memory Clear Function
- Display Blank Function

DESCRIPTION

The DL 3422 is a four digit display module having 22 segments and a built-in CMOS integrated circuit.

The integrated circuit contains memory, ASCII ROM decoder, multiplexing circuitry, and drivers. Data entry is asynchronous and can be random. A display system can be built using any number of DL 3422's since each digit of any DL 3422 can be addressed independently and will continue to display the character last stored until replaced by another.

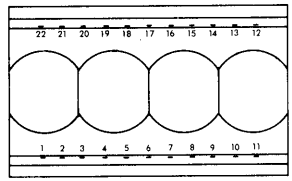
System interconnection is very straightforward. The least significant two address bits (A_0, A_1) are normally connected to the like named inputs of all DL 3422's in the system. With two chip enables (CE1, and $\overline{CE2}$) four DL 3422's (16 characters) can easily be interconnected without a decoder.

Alternatively, one-of-n decoder IC's can be used to extend the address for large displays.

Data lines are connected to all DL 3422's directly and in parallel, as is the write line ($\overline{WR}$). The display will then behave as a write-only memory.

The cursor function causes all segments of a digit position to illuminate. The cursor is *not* a character, however, and upon removal the previously displayed character will reappear.

Important: Refer to Appnote 18, "Using and Handling Intelligent Displays". Since this is a CMOS device, normal precautions should be taken to avoid static damage.



Pin	Function	Pin	Function
1	CE1 Chip Enable	12	Gnd
2	N/C	13	N/C
3	$\overline{CE2}$ Chip Enable	14	$\overline{BL}$ Blanking
4	N/C	15	N/C
5	$\overline{CLR}$ Clear	16	D0 Data Input
6	VCC	17	D1 Data Input
7	A0 Digit Select	18	D2 Data Input
8	A1 Digit Select	19	D3 Data Input
9	$\overline{WR}$ Write	20	D4 Data Input
10	$\overline{CU}$ Cursor Select	21	D5 Data Input
11	CUE Cursor Enable	22	D6 Data Input

OPTO-ELECTRONIC CHARACTERISTICS @ 25°C

MAXIMUM RATINGS

Voltage, any pin respect to GND . . -.5 to 6.0 VDC
Operating Temperature . . . . . -20° to +65°C
Storage Temperature . . . . . -20° to +70°C
Relative Humidity
(non condensing) @ 65°C 85%

OPTICAL CHARACTERISTICS

Luminous Intensity 8 Segments @ 5 V . . 0.5mcd
Off Axis Viewing Angle (Note 1) . . . . . ±50°
Digit Size . . . . . 160 mils
Spectral Peak Wavelength . . . . . 660 nm

DC CHARACTERISTICS

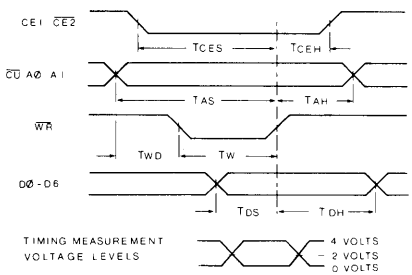
Parameter	-20°C Typ	+25°C[4]	+65°C Typ	Conditions
I_{CC} 4 digits on (10 seg/digit)	135 mA	125 mA max[1]	100 mA	V_{CC} = 5.0 V
I_{CC} 4 digits or Cursor[2]	160 mA	140 mA max[1]	120 mA	V_{CC} = 5.0 V
I_{CC} Blank		3.7 mA max		V_{IN} = 0 V_{CC} = 5.0 V $\overline{WR}$ = 5.0 V
I_{IL}	200 μA	160 μA max	100 μA	V_{IN} = .8 V V_{CC} = 5.0 V
V_{IL}		.8 V max		V_{CC} = 4.5 V
V_{IH}[3]		2.7 V min		V_{CC} = 4.5 V
		3.3 V min		V_{CC} = 5.5 V

1. Measured at 5 sec.
2. 60 sec max duration.
3. $V_{CC} \geq V_{IH} \geq 0.6\ V_{CC}$.
4. V_{CC} = +5.0 VDC ±10%

AC CHARACTERISTICS
Timing Parameter @ 4.5 V (nanoseconds)

	-20°C Typ	+25°C Min	+65°C Typ
T_{AS}	300	450	600
T_{WD}	50	150	175
T_W	250	300	425
T_{DS}	150	250	350
T_{DH}	50	50	100
T_{AH}	50	50	100
T_{CEH}	50	50	100
T_{CES}	300	450	600
T_{CLR}		15 milliseconds	

TIMING CHARACTERISTICS
Write Cycle Waveforms



Note 1: "Off Axis Viewing Angle" is here defined as: "the minimum angle in any direction from the normal to the display surface at which any part of the segment in the display is not visible".

Note 2: This display contains a CMOS integrated circuit. Normal CMOS handling precautions should be taken to avoid damage due to high static voltages or electric fields.

Note 3: Unused inputs must be tied to an appropriate logic voltage level (either V+ or V–).

Note 4: **Warning** — Do not use solvents containing alcohol.

LOADING DATA

Setting the chip enables (CE1, $\overline{CE2}$) to their true state will enable data loading. The desired data code (D0-D6) and digit address (A_0, A_1) should be held stable during the write cycle for storing new data.

Data entry may be asynchronous and random. (Digit 0 is defined as right hand digit with $A_1 = A_0 = 0$.)

Clearing of the entire internal four-digit memory can be accomplished by holding the clear ($\overline{CLR}$) low for one complete display multiplex cycle, 15 mS minimum. Clear ($\overline{CLR}$) is inactive during $\overline{BL}$.

LOADING CURSOR

Setting the chip enables (CE1, $\overline{CE2}$) and cursor select ($\overline{CU}$) to their true state will enable cursor loading. A write ($\overline{WR}$) pulse will now store or remove a cursor into the digit location addressed by A_0, A_1; as defined in data entry. A cursor will be stored if DO = 1; and will be removed if DO = 0. Cursor will not be cleared by the $\overline{CLR}$ signal.

For those users not requiring the cursor, the cursor enable signal (CUE) may be tied low to disable display of the cursor function. A flashing cursor can be realized by simply pulsing CUE. If cursor has been loaded to any or all positions in the display, then CUE will control whether the cursor(s) or the characters appear. CUE does not affect the contents of cursor memory.

DISPLAY BLANKING

Blanking the display may be accomplished by loading a blank or space into each digit of the display or by using the ($\overline{BL}$) display blank input.

Setting the ($\overline{BL}$) input low does not affect the contents of either data or cursor memory. A flashing display can be realized by pulsing ($\overline{BL}$).

TYPICAL LOADING DATA STATE TABLE

$\overline{BL}$	CE1	$\overline{CE2}$	CUE	$\overline{CU}$	$\overline{WR}$	$\overline{CLR}$	A1	A0	D6	D5	D4	D3	D2	D1	D0	DIGIT 3	2	1	0
H	X	X	L	X	H	H	PREVIOUSLY LOADED DISPLAY									G	R	E	Y
H	L	X	L	X	X	H	X	X	X	X	X	X	X	X	X	G	R	E	Y
H	X	X	L	X	X	H	X	X	X	X	X	X	X	X	X	G	R	E	Y
H	X	H	L	X	X	H	X	X	X	X	X	X	X	X	X	G	R	E	Y
H	X	X	L	X	X	H	X	X	X	X	X	X	X	X	X	G	R	E	Y
H	X	X	L	X	H	H	X	X	X	X	X	X	X	X	X	G	R	E	Y
H	H	L	L	H	L	H	L	L	H	L	L	L	H	L	H	G	R	E	E
H	H	L	L	H	L	H	L	H	H	L	H	L	H	L	H	G	R	U	E
H	H	L	L	H	L	H	H	L	H	L	L	H	H	L	L	G	L	U	E
H	H	L	L	H	L	H	H	H	H	L	L	L	L	H	L	B	L	U	E
O	X	X	X	X	H	H	BLANK DISPLAY												
H	H	L	L	H	L	H	H	H	H	L	L	L	H	H	H	G	L	U	E
H	X	X	L	X	X	L	CLEARS CHARACTER DISPLAY												
H	H	L	L	H	L	H	X	X	SEE CHARACTER CODE							SEE CHARACTER SET			

X = DON'T CARE

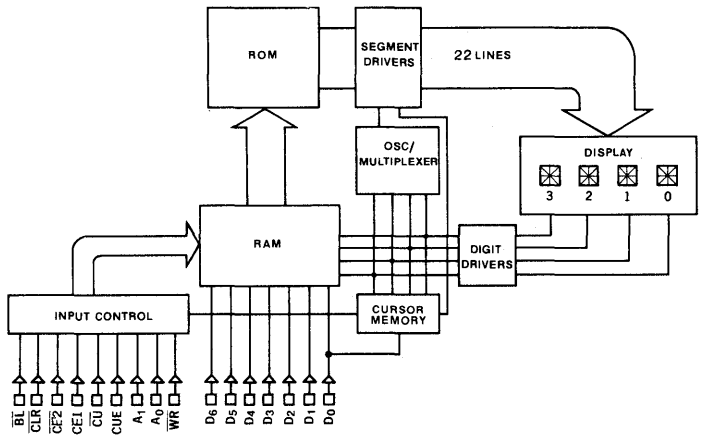
LOADING CURSOR STATE TABLE

$\overline{BL}$	CE1	$\overline{CE2}$	CUE	$\overline{CU}$	$\overline{WR}$	$\overline{CLR}$	A1	A0	D6	D5	D4	D3	D2	D1	D0	DIGIT 3	2	1	0
H	X	X	L	X	H	H	PREVIOUSLY LOADED DISPLAY									B	E	A	R
H	X	X	H	X	H	H	DISPLAY PREVIOUSLY STORED CURSORS									B	E	A	R
H	H	L	H	L	L	H	L	L	X	X	X	X	X	X	H	B	E	A	⊠
H	H	L	H	L	L	H	L	H	X	X	X	X	X	X	H	B	E	⊠	⊠
H	H	L	H	L	L	H	H	L	X	X	X	X	X	X	H	B	⊠	⊠	⊠
H	H	L	H	L	L	H	H	H	X	X	X	X	X	X	H	⊠	⊠	⊠	⊠
H	H	L	H	L	L	H	H	L	X	X	X	X	X	X	L	⊠	E	⊠	⊠
H	X	X	L	X	H	H	DISABLE CURSOR DISPLAY									B	E	A	R
H	H	L	L	L	L	H	H	H	X	X	X	X	X	X	L	B	E	A	R
H	X	X	H	X	H	H	DISPLAY STORED CURSORS									B	E	⊠	⊠

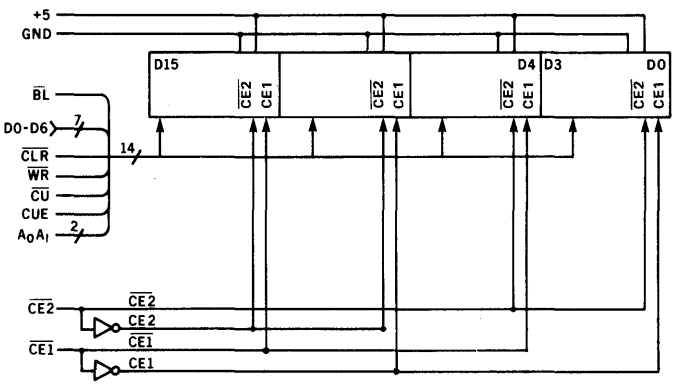
X = DON'T CARE

CHARACTER SET

				D0	L	H	L	H	L	H	L	H	L	H	L	H	L	H	L	H
				D1	L	L	H	H	L	L	H	H	L	L	H	H	L	L	H	H
				D2	L	L	L	L	H	H	H	H	L	L	L	L	H	H	H	H
				D3	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H
D6	D5	D4	HEX		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
L	H	L	2			!	"	#	$	%	&	'	(	)	*	+	,	-	.	/
L	H	H	3		0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
H	L	L	4	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	
H	L	H	5	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_	
H	H	L	6	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	
H	H	H	7	p	q	r	s	t	u	v	w	x	y	z	{	|	}	~		



Internal Block Diagram



Typical Schematic for 16 Digit System