

***ME* DISPLAYS**

SPECIFICATIONS

FOR

LCD MODULE

OPTO-0288CG

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• **FEATURES**

Number of Characters	16 Characters x 2 Lines
Display Font	5 x 7 dots
Built-in Controller	None
Input Data	4 Bits or 8 Bits Interface
Operating Voltage	3.0 V
Duty Cycle	1/16 Duty, 1/4 Bias
Standard Features	STN, Gray, Reflective, 6 O'Clock
Others	RoHS Compliant

• **MECHANICAL PARAMETER**

Module Size	47.0W x 18.5H x 5.2 mm
Viewing Area Size	43.0W x 12.0H mm

• **ABSOLUTE MAXIMUM**

Item	Symbol	Min.	Max	Unit
Power Supply for Logic	V_{DD}	-0.3	+7.0	V
Power Supply for LCD Drive	V_{LCD}	$V_{DD}-11.5$	$V_{DD}+0.3$	V
Input Voltage	V_i	-0.3	$V_{DD}+0.3$	V
Operating Temperature	T_a	-20	+70	C
Storage Temperature	T_{stg}	-30	+80	C

• **DC CHARACTERISTICS** ($V_{DD}=3.0V \pm 10\%$, $T_a=25C$, $V_{SS}=0V$)

Item	Symbol	Condition	Min	Typ	Max	U
Operating Voltage	V_{DD}	--	2.7	3.0	3.3	V
LCD Voltage	V_{LCD}	$V_{DD}-V_o$	--	3.8	--	V
Operating Current	I_{DD}	$V_{DD}=3.0V$ $F_{OSC}=270$ KHz	--	0.9 5	1.25	mA
Input "High" Voltage (1) (Except OSC1)	V_{IH1}	--	1.9	--	V_{DD}	V
Input "Low" Voltage(1) (Except OSC1)	V_{IL1}	--	-0.3	--	0.4	V
Input "High" Voltage (2) (Except OSC1)	V_{IH2}	--	$0.7 V_{DD}$	--	V_{DD}	V
Input "Low" Voltage(2) (Except OSC1)	V_{IL2}	--	--	--	$0.2 V_{DD}$	V
Output "High" Voltage(1) (D0-D7)	V_{OH1}	$I_{OH}=0.1mA$	2.0	--	--	V
Output "Low" Voltage(1) (D0-D7)	V_{OL}	$I_{OH}=0.1mA$	--	--	0.4	V

- PIN ASSIGNMENT**

No.	Symbol	Level	Function
1	V _{SS}	0V	Power Supply Ground
2	V _{DD}	3V	Power Supply Voltage
3	V _O	--	Power Supply for LCD
4	RS	H/L	Register Select H: Data register L: Instruction register
5	R/W	H/L	H: Read L: Write
6	E	H, H/L	Start enable signal to read or write the data
7	BD0	H/L	Data bus used in 8 bit transfer
8	DB1	H/L	Data bus used in 8 bit transfer
9	DB2	H/L	Data bus used in 8 bit transfer
10	DB3	H/L	Data bus used in 8 bit transfer
11	DB4	H/L	Data bus for both 4 and 8 bit transfer
12	DB5	H/L	Data bus for both 4 and 8 bit transfer
13	DB6	H/L	Data bus for both 4 and 8 bit transfer
14	DB7	H/L	Data bus for both 4 and 8 bit transfer

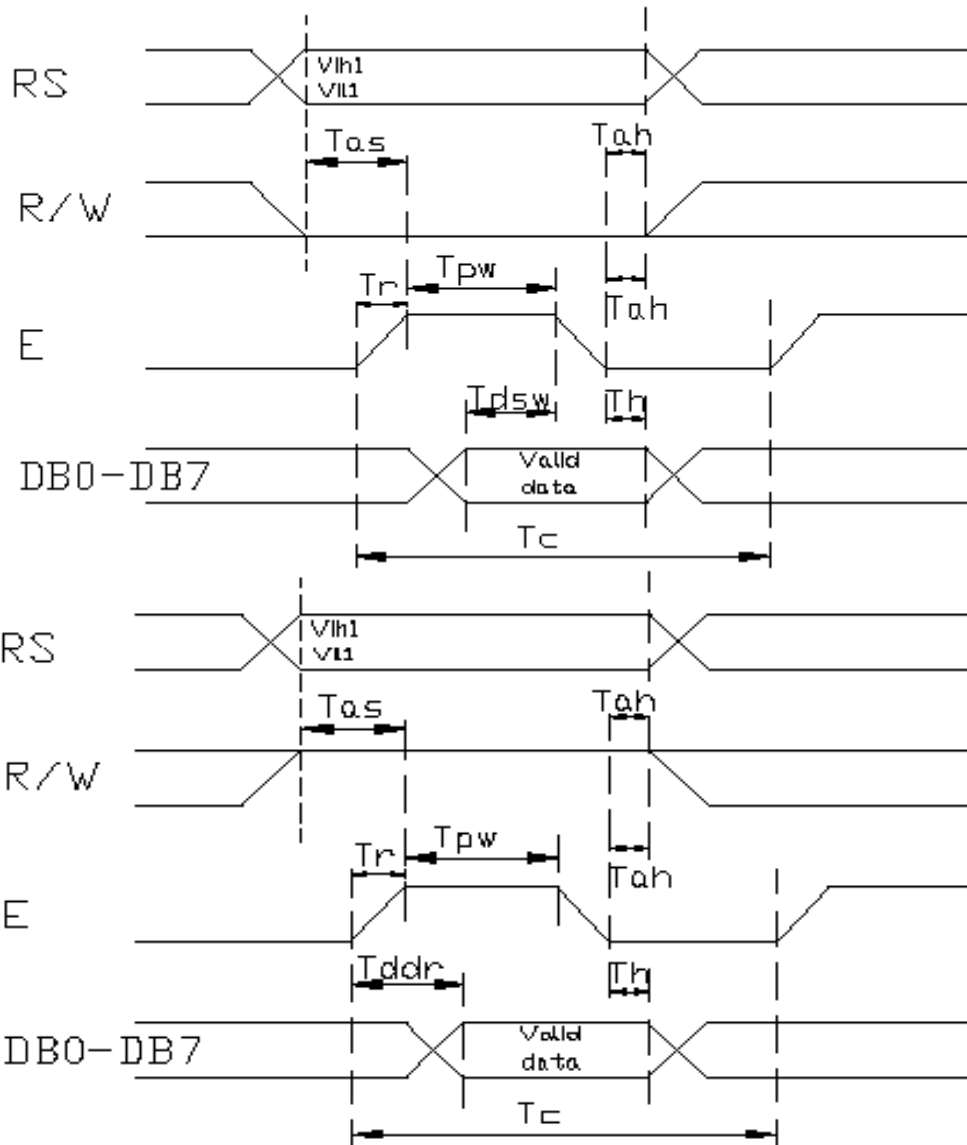
- TIMING CHARACTERISTICS** (V_{dd}=3.0V±10%, V_{ss}=0V, T_a=25)
(Write mode)

Characteristic	Symbol	Min.	Typ.	Max.	Unit
E Cycle Time	T _c	1400	--	--	ns
E Rise/Fall Time	T _r , T _f	--	--	25	ns
E Pulse Width (High, Low)	T _{ow}	400	--	--	ns
R/W and RS Set-up Time	T _{as}	60	--	--	ns
R/W and RS Hold Time	T _{ah}	20	--	--	ns
Data Set-up Time	T _{dsw}	140	--	--	ns
Data Hold Time	T _h	10	--	--	ns

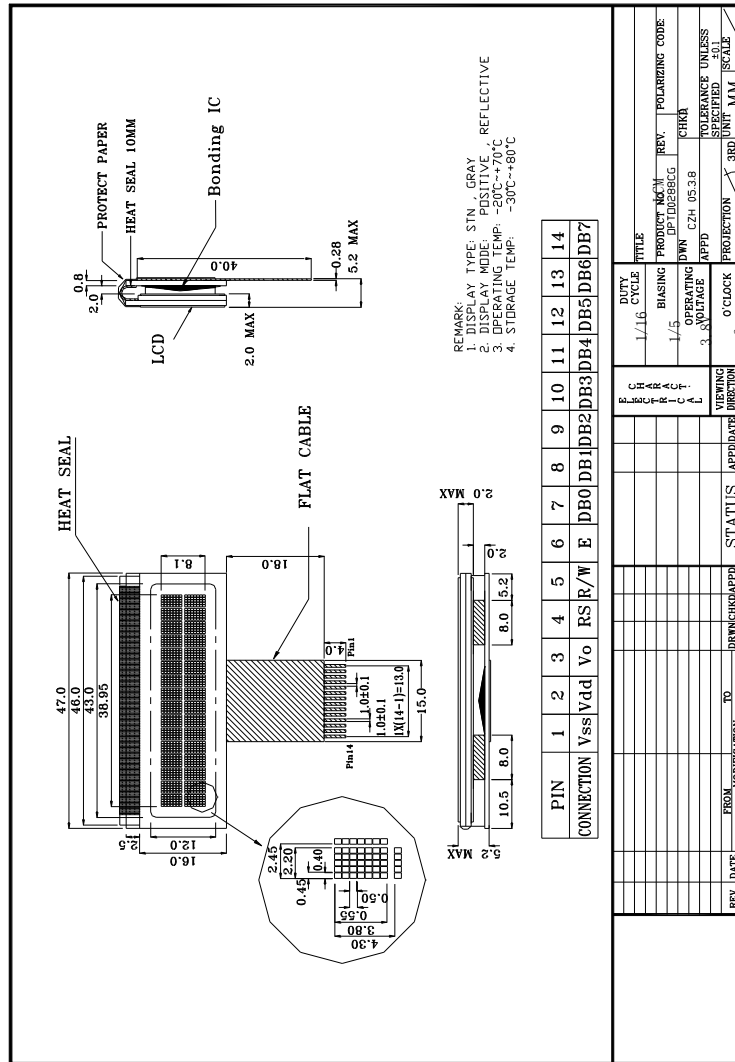
(Read mode)

Characteristic	Symbol	Min.	Typ.	Max.	Unit
E Cycle Time	T _c	1400	--	--	ns
E Rise/Fall Time	T _r , T _f	--	--	25	ns
E Pulse Width (High, Low)	T _{pw}	400	--	--	ns
R/W and RS Set-up Time	T _{as}	60	--	--	ns
R/W and RS Hold Time	T _{ah}	20	--	--	ns
Data Set-up Time	T _{ddr}	--	--	360	ns
Data Hold Time	T _h	5	--	--	ns

TIMING DIAGRAMS



• DIAGRAM OPTO-0288CG



• **CONTROL AND DISPLAY COMMANDS**

Command	RS	R/W	DB 7	DB 6	DB5	DB4	DB3	DB2	DB1	DB0	Remark
Display Clear	L	L	L	L	L	L	L	L	L	H	Write "20H" to DDRAM.and set DDRAM address to "00H" from AC.
Return Home	L	L	L	L	L	L	L	L	H	X	Cursor move to first digit
Entry Mode Set	L	L	L	L	L	L	L	H	I/D	SH	I/D: Set cursor move direction H-Increase L-Decrease SH: Specifies shift of display H-Display is shifted L-Display is not shifted
Display On/Off Control	L	L	L	L	L	L	H	D	C	B	D: Display (H-on, L-off) C: Cursor (H-on, L-off) B: Blinking (H-on, L-off)
Shift	L	L	L	L	L	H	S/C	R/L	X	X	SC:(H-Display shift-Cursor move) R/L:(H-Right shift-Left shift)
Set Function	L	L	L	L	H	DL	N	F	X	X	DL:(H-8 bits interface, L-4 bits interface) N:(H-2 line display, L-1 line display) F:(H-5 x 10 dots, L-5 x 7 dots)
Set CGRAM Address	L	L	L	H	CG RAM address (Corresponds to address)					CGRAM data is sent and received after this setting	
Set DDRAM Address	L	L	H	DD RAM address					DDRAM data is sent and received after this setting		
Read Busy Flag & Address	L	H	BF	Address Counter used for Both DD _ CGRAM address					BF:(H-Busy, L-Ready) --Reads BF indication Internal operating is being performed --Reads address counter contents		
Write Data to RAM	H	L	Write Data					Write data into DDRAM or CGRAM			
Read Data from RAM	H	H	Read Data					Read data from DDRAM or CGRAM			

"X": Don't Care