Plasma Panel Display Modules

128 x 64 Graphics Display with ASCII Input Controller, DC/DC Converter and Drive Circuitry

The APD-128G064E is a dot matrix graphic display with an array of 128 x 64 pixels available. The module is composed of a highly reliable DC plasma display, ASCII input graphics controller, DC converter and drive circuitry which are assembled to form a rugged, slim profile display sub-system. Interface to the APD-128G064E is through a parallel or serial interface. The interface allows for efficient handshaking and flow of bi-directional data. Vishay Dale's patented open construction display technology assures a stable, flicker free screen.

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature: 0 °C to + 70 °C
Storage Temperature: - 20 °C to + 85 °C
Operating Humidity: 90 % RH non-condensing
Mechanical Shock: 30 G
Vibration: 0.018" [0.457] displacement amplitude from 10 to 50 Hz, 2 G acceleration from 50 to 2000 Hz logarithmic sweep rate.
Mean Time Between Failure: 60 000 h

OPTICAL SPECIFICATIONS

Pixel Size: 0.015" [0.381]
Pixel Array: 128 x 64
Pixel Pitch: 0.025" [0.635]
Luminance: 50 foot lamberts typical
Color: Neon orange
Refresh Cycle: 70 Hz
Viewing Angle: 150° cone
Contrast Ratio: 30:1

ELECTROSTATIC CAUTION

Vishay Dale display panels use electrostatic sensitive components. These assemblies should be unpacked and handled in an ESD controlled area only. When shipping use packing materials designed for protection of electrostatic sensitive components.
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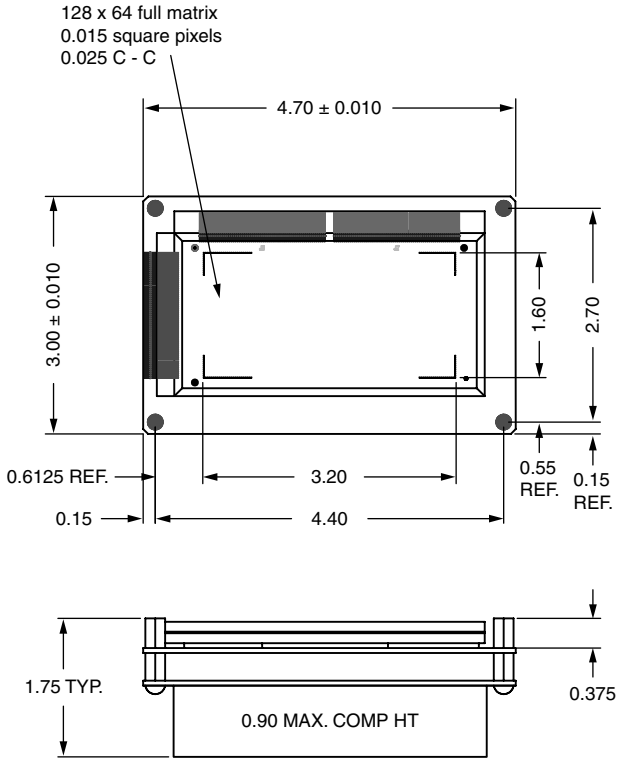
FEATURES

- 128 x 64 pixel array for bright and vivid graphics
- Parallel interface or RS-232 serial interface
- Powerful software commands make display integration simple and efficient
- + 5 V_{DC} logic voltage and + 5 to + 28 V_{DC} display voltage

STANDARD ELECTRICAL SPECIFICATIONS

DESCRIPTION	SYMBOL	MIN.	TYP.	MAX.	UNITS
Logic supply voltage	V_{CC}	4.5	5.0	5.5	V
Logic supply current	I_{CC}	-	0.1	-	A
Panel supply voltage	V_{DC}	5.0	12.0	28.0	V
Panel supply current	I_{DC} (at 12 V_{DC})	-	0.4	1.0	A

DIMENSIONS in inches [millimeters]



POWER UP CONDITION

The screen will have a message printed as follows:

DSP-xxx (date)

This message indicates the firmware revision and release date.

Note

- DC/DC converter start-up currents can exceed 3 x of maximum I_{DC} current specified.

Power up RESET cycle on display module takes approximately 1 s to complete. It is suggested the user wait for that time period to elapse before entering data.

POWER SUPPLY CONNECTION

CONNECTOR	PIN	SIGNAL
J1	1	+ 12 V_{DC}
	2	GROUND
	3	GROUND
	4	+ 5 V_{DC}

Mates to Tyco AMP 1 - 480424 - 0 housing (1 required)
350689 - 1 socket pins (4 required)

PARALLEL INTERFACE

J2, PARALLEL DATA CONNECTOR.
Mates with Tyco 746285-6, 26 pin, I_{DC} connector.

Note

- PARAL should be jumper selected on jumper block W1 for proper parallel interface operation.

SYSTEM BLOCK DIAGRAM

PIN	FUNCTION	DESCRIPTION
1, 3, 5, 7, 9, 11, 13, 15	D0 to D7 (data bus) (input/output)	Data written to and read from the display unit through an 8 bit bi-directional data bus.
17	WRITE (WR) (input)	Write data on low to high transmit.
21	READ (RD) (input)	Read data while low.
4, 6, 8, 12, 14, 16, 18, 20, 22	N/C	Not connected.
23	RESET (input)	Reset display to power-up condition when low, operate while high.
19	US (unit select) (input)	Read and Write commands only influence display while US is low.
25	BLANK (BL) (input)	Blank display while BL is low but maintain cursor and data.
24	BUSY (BU) (output)	When BUSY is high, no further data or commands should be given.
2, 26	GROUND	Common to both power supply input and host data interface.
10	DATA PRESENT (DP) (output)	Data is ready to be read when the DATA PRESENT signal is high.

INPUT/OUTPUT TIMING DIAGRAM, J2

BU	DP	WR	RD	US	FUNCTION
L	X	↑	H	L	Write character or control code
X	H	H	L	L	Read data from display while low
X	X	X	X	H	Input/output inhibited

Logic level: L = 0.0 V minimum to 0.8 V maximum
H = 2.2 V minimum to 5.0 V maximum
X = Do not care.

Note

- Input load is one 74 HCT type input with 4.7K to V_{CC}. Outputs are 74 HC type.

Once data write is complete, BUSY signal is output. BUSY signal = “1” during data disposition and while the communication buffer is full.

DATA WRITE: When WR changes from “0” to “1” while US = “0” and RD = “1”, data is latched.

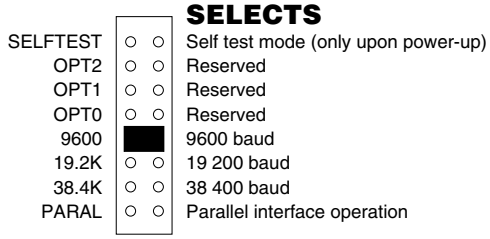
DATA READ: When RD = “0” while US = “0”. WR = “1”, and DP = “1”, data may be read by the host.

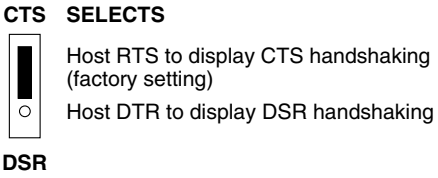
W1 JUMPER

Shunt 1 pair of pins only on jumper W1 to select serial interface baud rate, parallel interface operation, or self-test functions.

W2 JUMPER

The W2 jumper selects the serial handshake busy line from the host computer to the display for control of data flow from the display. On Jumper W2, select “CTS” for host RTS to display CTS handshaking, or “DSR” for host DTR to display DSR handshaking. Selection does not affect parallel interface operation.





SERIAL INTERFACE

J3, SERIAL INTERFACE CONNECTOR.

Serial interface, female DB-9 connector (10-pin connector optional)

The baud rate is jumper selected at jumper block W1 for 9600, 19.2K, or 38.4K baud.

SERIAL INTERFACE PIN CONNECTIONS

DISPLAY CONNECTOR J3			HOST CONNECTION		
10-PIN	DB-9	DESCRIPTION	DB-9	DB-25	DESCRIPTION
1	1	n/c (reserved)	-	-	-
2	6	n/c (reserved)	-	-	-
3	2	TxD (output)	2	3	RxD
4	7	CTS (input)	7	4	RTS
5	3	RxD (input)	3	2	TxD
6	8	RTS (output)	8	5	CTS
7	4	DSR (input)	4	20	DTR
8	9	n/c (reserved)	-	-	-
9	5	GND	5	7	GND
10	-	n/c (reserved)	-	-	-

COMMAND SET, TEXT MODE (SOFTWARE INSTRUCTIONS)

The ASCII control code characters from 00 h to 1 Fh are reserved by the controller for the command interpreter. A brief listing of the available commands and their description follows. Text mode operation is not true text mode, but rather simulated in graphics mode. Text and graphics may be mixed on the same screen.

HEX CODE	NUMBER OF BYTES	TEXT FUNCTIONS
00 to 06		NO FUNCTION
07	2	SET BRIGHTNESS. Sets brightness of display. Valid values are 0 to F. Default value is 8.
08	1	BACK SPACE CURSOR: Moves the cursor 1 column to the left in the current row. If the cursor is at the 1st column it will move to the end of the previous line.
09	1	HORIZONTAL TAB: Moves the cursor 1 column to the right. Will wrap around until the end of the screen. If mode is set to SCROLL then the screen will scroll up one line at the last character position of the last row, if not in SCROLL mode then the cursor will wrap to the HOME position.
0A	1	LINE FEED: Moves cursor down one row while remaining in same column position. If mode is set to SCROLL, when the cursor is at bottom row of screen, the screen will move (scroll) up 1 row and bottom row will be cleared (filled with spaces), when line feed is invoked. If not in SCROLL mode the cursor will wrap to the first row.
0B	1	VERTICAL TAB: Moves cursor up one row while remaining in the same column position. The cursor will wrap to the bottom row after the top row.
0C	1	CLEAR SCREEN: Fill the screen with blank characters, cursor moves to HOME position.
0D	1	CARRIAGE RETURN: Moves cursor to the first column of the present row.
0E	1	HOME CURSOR: Moves cursor to the 1st character position of the 1st row, the HOME position.
0F		NO OPERATION
10		NO OPERATION
11	3	POSITION CURSOR: Moves cursor to a specified column, row address depending upon next 2 bytes sent. The format is x, y, or col, row. The upper left corner is 0, 0.
12	2	SELECT CURSOR: Following byte selects cursor style: 01 = blinking underbar (1) 02 = non-blinking underbar 03 = blinking block 04 = non-display cursor
13		NO OPERATION
14	2	SELECT CHARACTER FONT: Following byte selects one of 4 character generator fonts: 01h = font 1: 4 x 5 character in 5 x 6 block 02h = font 2: 5 x 7 character in 6 x 8 block (1) 03h = font 3: 10 x 14 character in 12 x 16 block The cursor is moved to the home position when changing fonts.
15	1	Select reverse video overwrite mode (black on orange). Also see command (19h).
16		NO OPERATION
17		NO OPERATION
18		NO OPERATION
19	1	Select normal video overwrite mode (orange on black). Also see command (15h). (1)
1A		RESERVED, do not use
1B		See ESCAPE control codes
1C	1	SET TO SCROLL MODE: Sets the display mode so that whenever the cursor reaches the last position in the last column or a line feed occurs while cursor is on last row, the screen will scroll up one row. The top row of data will be lost and the bottom row of the display will be erased.
1D	1	SET TO AUTO WRAP MODE: In this mode, the cursor will automatically wrap around to the next row. When the last character position on the screen is reached, the cursor will return to HOME position. (1)
1E	1	BLANK DISPLAY: The display is blanked, but display memory is maintained and new data can be entered.
1F	1	UNBLANK DISPLAY: The display is restored/turned to active state. (1)

Note
(1) Indicates power up default

COMMAND SET, GRAPHIC MODE (SOFTWARE INSTRUCTIONS)

CURSOR LOCATION - All cursor locations are based upon Pixel location - NOT - character column and row locations. The upper left hand corner is 000,000 (X, Y) while the lower right hand corner is 127, 063 (X, Y). The cursor auto-increments based upon the character font size by the width of the font. The cursor is not visible in graphic logic.

WRITE LOGIC - Within most commands, the WRITE LOGIC byte must be included:

0 = SET PIXELS (turn-on foreground pixels)
1 = XOR PIXELS (invert foreground pixels)
2 = RESET PIXELS (turn-off foreground pixels)
3 = OVERWRITE (turn-on foreground and turn-off back ground pixels, image write and graphic text commands only)
4 = REVERSE VIDEO OVERWRITE (turn-off foreground and turn-on background pixels, image write and graphic text commands only)

FONT SIZE

The FONT SIZE must be written before text is written. There are three standard fonts included in the graphics mode:

1 = FONT 1, a 4 x 5 character in a 5 x 6 block
2 = FONT 2, a 5 x 7 character in a 6 x 8 block
3 = FONT 3, a 10 x 14 character in a 12 x 16 block

Refer to character set tables for supported characters and fonts.

Note

- The LOGIC byte and FONT byte are sent in ASCII format.

DATA FORMAT

All addresses must be sent in ASCII format. Column and row positions begin at the upper left hand corner at address 000, 000 (X, Y). A pixel address consists of a column address followed by row address. Addresses are sent to the panel as a three character ASCII sequence for column (x) followed by a three character ASCII sequence for row (y). An example is the upper left hand pixel is 000, 000 while the lower right hand corner is 127, 063.

Note

- Spaces are shown in the graphic sequences only for clarity and must not occur in the actual commands transmitted to the panel.

GRAPHIC COMMANDS

HEX CODE	GRAPHIC FUNCTIONS
1B, 41	FILL AREA: Logic byte, X1, Y1 (upper left corner), X2, Y2 (lower right corner) ESC A l xxx yyy xxx yyy
1B, 42	DRAW BOX: Logic byte, X1, Y1 (upper left hand corner), X2, Y2 (lower right hand corner) ESC B l xxx yyy xxx yyy
1B, 43	CLEAR SCREEN: This command will clear the current graphic screen (all pixels off). To clear all graphics pages, see the ESC G sequence. ESC C
1B, 44	SET PIXEL (DOT) COMMAND: Logic byte (l), x, y pixel address, end of data delimiter. ESC D l xxx yyy ESC \ (single pixel) ESC D l xxx yyy xxx yyy ..... ESC \ (continous)
1B, 45	DRAW ELLIPSE: Logic byte, major axis intercept offset, minor axis intercept offset (axis's intercept offset is measured in pixels from the center point), center point, from angle theta (t), in degrees, to phi (p). A complete rotation would be from 001 to 360. ESC E l mmm www xxx yyy ttt ppp
1B, 47	Clear all graphics pages: ESC G
1B, 49	WRITE GRAPHIC IMAGE: Logic byte, X1, Y1 (upper left hand corner), X2, Y2 (width and height), data. ESC I l xxx yyy xxx yyy ddd .... X1 start coordinate and X2 width must both be multiples of 8. The number of data bytes transmitted must be equal to (X2 width/8) x Y2 height. The first data byte transmitted will map into the 8 pixels on the top line in the upper left hand corner of the image with the least significant bit at the left and the most significant bit at the right. Successive bytes will write to the next byte to the right. When all bytes are written for this line, the next byte will map into the left most byte of the next line down. Graphical representation of each data byte: lsb x x x x x msb

GRAPHIC SOFTWARE COMMANDS (CONTINUED)

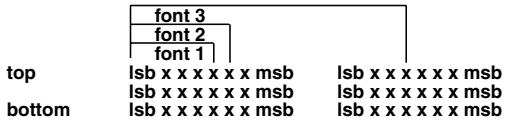
HEX CODE	GRAPHIC FUNCTIONS
1B, 49 (Continued)	LOAD GRAPHIC IMAGE: (Continued) GRAPHICAL REPRESENTATION OF DATA ARRAY: **data 0 data 1 ...** **data (width/8) data (width/8 + 1) ...** **data (2 x width/8) data (2 x width/8 + 1) ...** **data (n x width/8) data (n x width/8 + 1) ...** **data (height - 1) x (width/8) ... data (height) x (width/8) - 1** Contact factory for free image editor and monochrome bitmap conversion utilities.
1B, 4A	READ GRAPHIC IMAGE: X1, Y1 (upper left corner), X2, Y2 (lower right corner). ESC J xxx yyy xxx yyy Graphic image information is returned by the display after receipt of this command. X1 start coordinate and X2 width must both be multiples of 8. Refer to the WRITE GRAPHIC IMAGE command for the data format returned by the display.
1B, 4C	DRAW LINE(S): Logic byte, X1, Y1 (beginning of line), X2, Y2 (end of line), data delimiter (for single lines) ESC L l xxx yyy xxx yyy ESC \ (for continuous lines) ESC L l xxx yyy xxx yyy ..... xxx yyy ESC \
1B, 54	TEXT WRITE: Logic byte (l), font byte (f), x, y starting address, ASCII text, data delimiter. Wrap around will occur. ESC T l f xxx yyy aaaa ... aaaa ESC \
1B, 55	UPLOAD CUSTOM CHARACTER: Font, data ESC U f ddd... The custom character becomes ASCII value FFh and replaces any character which may be mapped at that location. One custom character is allowed for each font. To restore the original default character mapped at location FFh, upload a blank character where all data bytes are zero. To use multiple custom characters in a single font, upload new data as needed. Custom characters previously printed to the screen will not change when a new character is loaded. The number of data bytes is dependant on the font:

FONT	NUMBER OF DATA BYTES	WIDTH	HEIGHT	
1	6	5 bits	6 lines	(1 byte/line)
2	8	6 bits	8 lines	(1 byte/line)
3	32	12 bits	16 lines	(2 bytes/line)

For fonts 1 and 2, each byte represents a character line. The first byte is the top line of the character. Subsequent bytes map each line of the character. Typically, the right column and the bottom row of a character are blank for spaces between characters.

For font 3, two bytes (a word value) are required to represent each character line. The first byte represents the left part of the character, the second byte represents the right part of the character. The first word value is the top line of the character, subsequent words map each line of the character. Typically, the left and right columns and top and bottom rows of a character are blank for spaces between characters.

Graphical representation of character data:



Contact the factory for free support software to aid in generating character data.

FONT TABLES

FONT 1

Upper Nibble D7 to D4

Lower Nibble D3 to D0

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P										
1			!	1	A	Q										
2			"	2	B	R										
3			#	3	C	S										
4			$	4	D	T										
5			%	5	E	U										
6			&	6	F	V										
7			'	7	G	W										
8			(	8	H	X										
9			)	9	I	Y										
A			*	:	J	Z										
B			+	;	K	[										
C			,	<	L	\										
D			-	=	M	]										
E			.	>	N	^										
F			/	?	O	_										

FONT 2

Upper Nibble D7 to D4

Lower Nibble D3 to D0

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p	Ç	É		"	À	Đ	à	đ
1			!	1	A	Q	a	q	ü	æ	¡	±	Á	Ñ	á	ñ
2			"	2	B	R	b	r	é	Æ	¢	²	Â	Ò	â	ò
3			#	3	C	S	c	s	â	ô	£	³	Ã	Ó	ã	ó
4			$	4	D	T	d	t	ä	ö	¤	´	Ä	Ô	ä	ô
5			%	5	E	U	e	u	à	ò	¥	µ	Å	Õ	å	õ
6			&	6	F	V	f	v	å	û	¦	¶	Æ	Ö	æ	ö
7			'	7	G	W	g	w	ç	ù	§	·	Ç	×	ç	÷
8			(	8	H	X	h	x	ê	ÿ	¨	¸	È	Ø	è	ø
9			)	9	I	Y	i	y	ë	Ö	©	¹	É	Ù	é	ù
A			*	:	J	Z	j	z	è	Ü	ª	º	Ê	Ú	ê	ú
B			+	;	K	[	k	{	ï	ø	«	»	Ë	Û	ë	û
C			,	<	L	\	l	|	î	£	¬	¼	Ì	ì	ü
D			-	=	M	]	m	}	ì	Ø		½	Í	Ý	í	ý
E			.	>	N	^	n	~	Ä	×	®	¾	Î	Þ	î	þ
F			/	?	O	_	o	¤	Å	ƒ	¯	¿	Ï	ß	ï	ÿ

FONT 3

Upper Nibble D7 to D4

Lower Nibble D3 to D0

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

ORDERING INFORMATION

DESCRIPTION	PART NUMBER
Display Unit	APD-128G064E
J1, Power Connector Kit	280108-05
J2, Data Connector Kit (26 pin IDC)	280105-01

Standard warranty is 1 year parts and labor

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