EPD Driving Circuit

Rev. **01** (Dec 2020)

Preface

The document will introduce the driving reference circuit with full range of EPDs with iTC driver.

Please refer to another document or contact us for EPDs with eTC driver.

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龍亭新技股份有限公司　Pervasive Displays Inc. (PDI)　https://www.pervasivedisplays.com

4F, No. 28, Chuangye Rd., Tainan Science Park, Tainan City 74144, Taiwan (R.O.C.)

Tel: +886-6-279-5399

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Glossary of Acronyms

EPD	Electrophoretic Display (e-Paper Display)
EPD Panel	EPD
EPD Module	EPD with TCon board
MCU	Microcontroller Unit
FPC	Flexible Printed Circuit
FPL	Front Plane Laminate, E ink material film
SPI	Serial Peripheral Interface
COG	Chip on Glass, driver IC
PDI	Pervasive Displays Incorporated
PCBA	Printed Circuit Board Assembly

1. Application circuit block diagram
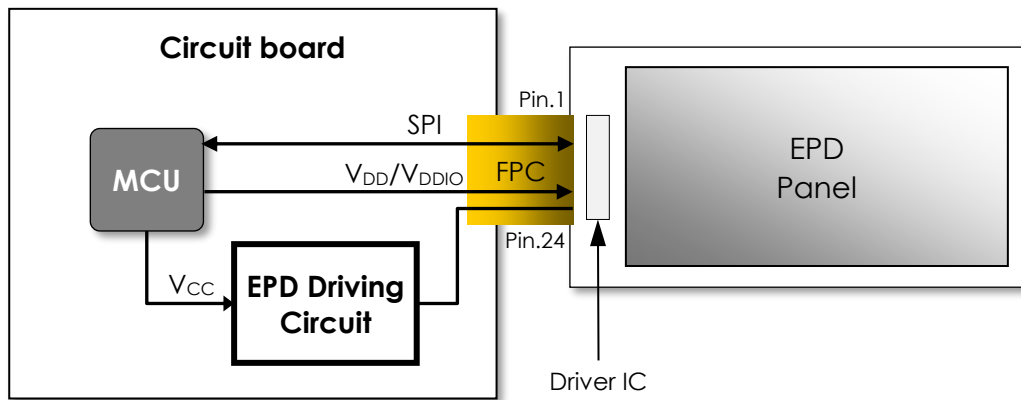
Please follow the EPD driving circuit below on your PCBA to work with our EPD panels for iTC drivers. All the components and circuits are necessary.

2. EPD driving circuit
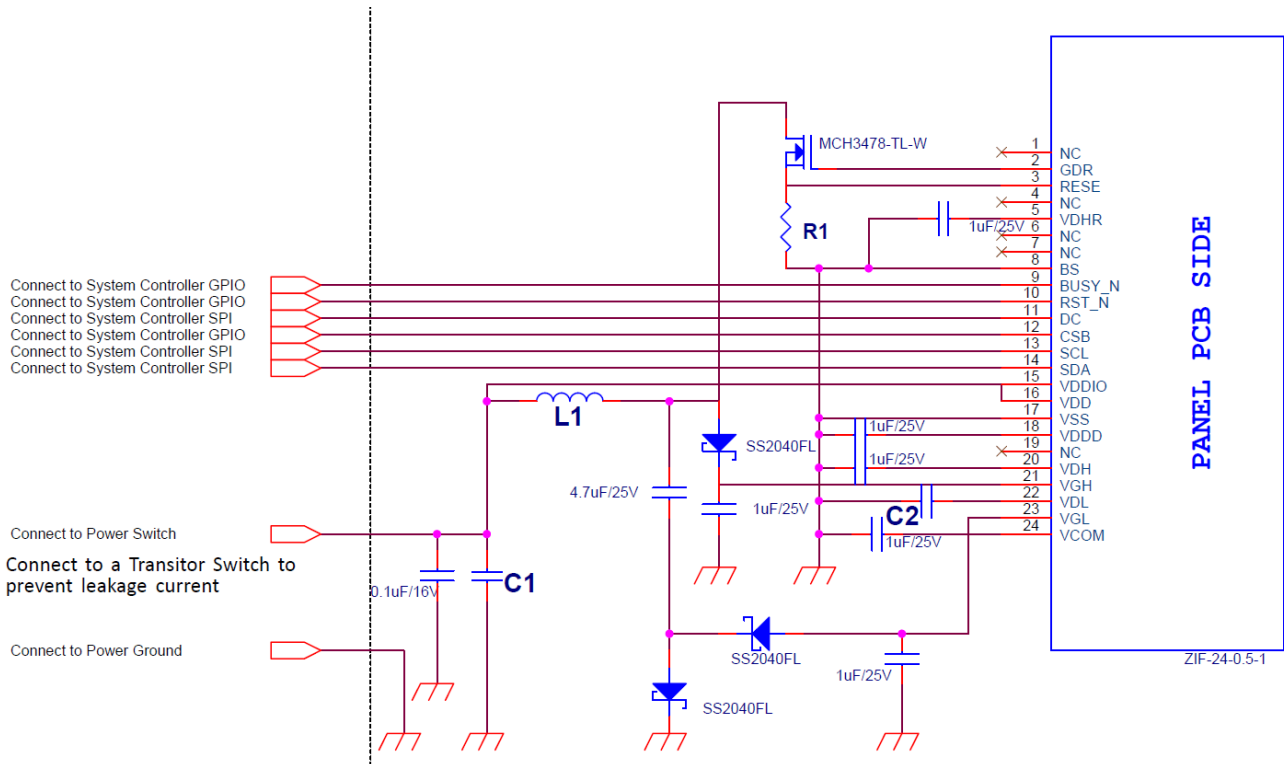
- **EPD group**

Group	EPD sizes
G1	1.54", 2.13", 2.66", 2.71", 2.87", 2.90"
G2	3.7", 4.2", 4.37"
G3	5.81", 7.4", 9.7", 12.2"

- **Specification of specific components**

Group	EPD group	Specification
L1	G1, G2	10μH (default)
	G3	47μH
R1	G1, G2	0.47ohm (default)
	G3	0R ohm/1%
C1	G1	1μF / 6.3V
	G2, G3	4.7μF / 6.3V (default)
C2	G1, G2	1μF / 25V (default)
	G3	0.47μF / 25V

Note: if your circuit will support to drive multiple sizes of EPD, please use the default specifications.

- **Other component specifications**

Type	Specification	Vendor
Inductor	10uH ATNR4010100MT ±20% 0.8A	ARLITECH
	47uH ETPRH3D16B-470M 0.3A	ARLITECH
Transistor (1)	Si1308EDL SOT-23 N-Channel	Vishay
	MCH3478 SOT-23 N-Channel 30V/2A	ON-Semi
	PJ2306 SOT-23 N-Channel 30V/3.2A	PANJIT
Diode (2)	SS2040FL SOD-123FL	PANJIT
Capacitors	25V 0603	

Note:

(1) Si1308EDL, MCH3478 or PJ2306 is a N-Channel Power MOSFET. The specification of selection criteria is R_{DS}<200m ohm (the lower the better), V_{DDS}=30V, V_{GS}<2.5V@I_d=0.5A or less.

(2) SS2040FL is a Schottky diode needs the V_F as lower as possible, e.g. 0.2 to 0.4V and the repetitive peak reverse voltage > 25V.

- **Driving circuit for 9.7" or 12.2" where has 2 FPCs**
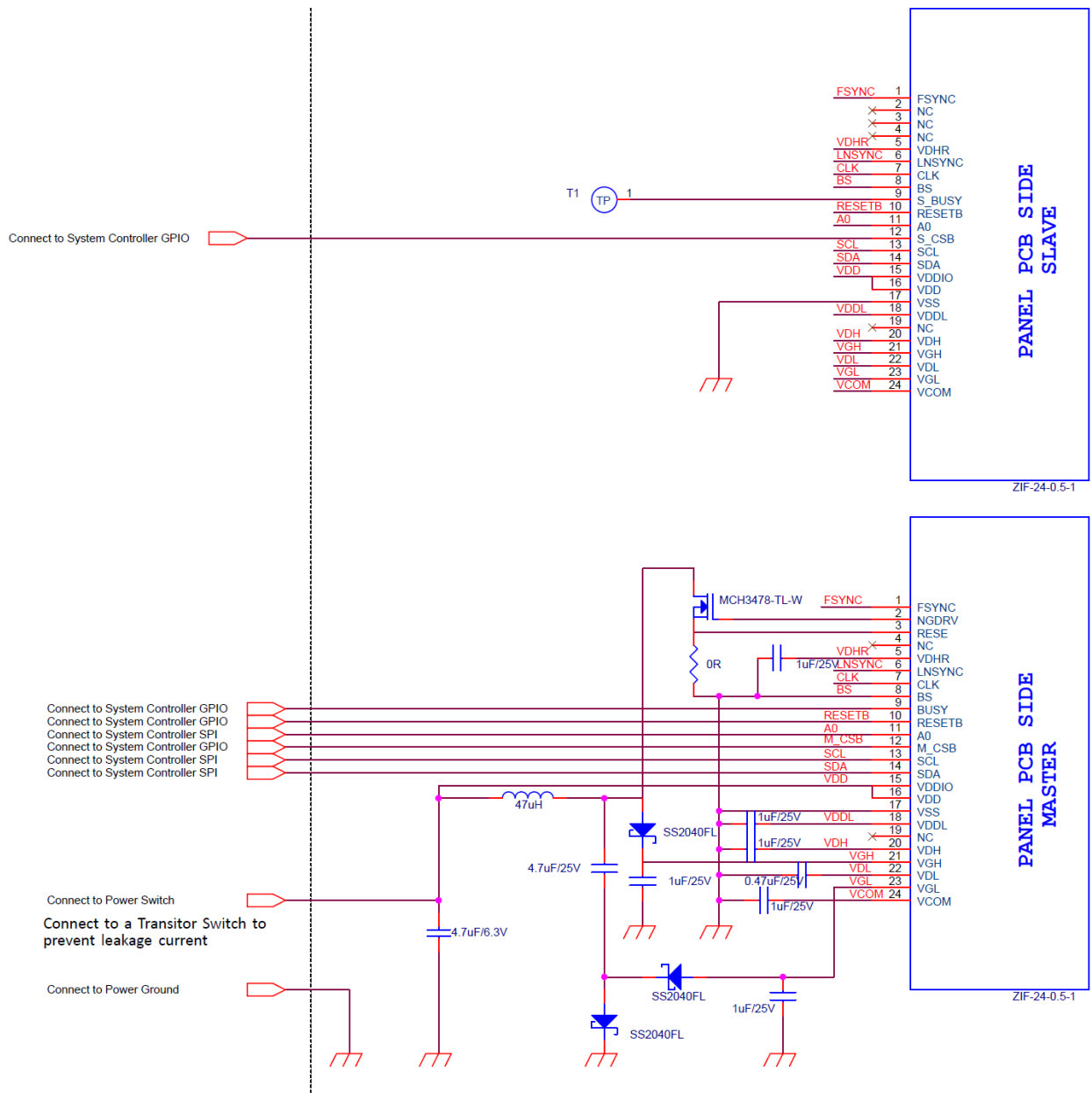
3. Terminal pin assignment

- **FPC specification**

Item	Pin numbers	Pitch	ZIF Connector
Golden finger	24	0.5 mm	HRS FH34SRJ 24S or STARCONN 6700S24

- **Pin assignment**

No.	Signal	Type	Connected to	Function
1	NC	-	-	Not connected
2	GDR	O	Power MOSFET driver control	This pin is the N-Channel MOSFET Gate Drive Control.
3	RESE	I	Booster control Input	This pin is the Current Sense Input for the Control Loop.
4	NC	-	-	Not connected
5	VDHR	C	Capacitor	This pin is the Positive Gate driving voltage and the Power Supply pin for VDHR. A stabilizing capacitor should be connected between VDHR and GND.
6	NC	-	-	Not connected
7	NC	-	-	Not connected
8	BS	I	VSS	This pin is for SPI type selection
9	BUSY_N	O	Device Busy Signal	This pin is Busy state output pin. When Busy is Low, the operation of the chip should not be interrupted, and command should not be sent.
10	RST_N	I	System Reset	This pin is reset signal input. Active Low.
11	DC	I	VDDIO or VSS	This pin is Data/Command control.
12	CSB	I	VDDIO or VSS	This pin is the chip select.
13	SCL	I	Data Bus	Serial communication clock input.
14	SDA	I	Data Bus	Serial communication data input/output.
15	VDDIO	P	Power Supply	Power for interface logic pins & I/O. It should be connected with VDDIO.
16	VDD	P	Power Supply	Power Supply for the chip.
17	VSS (GND)	P	Ground	Ground
18	VDDD	C	Capacitor	Internal regulator output A capacitor should be connected between VDDD and GND.

19	NC	-	-	Not connected
20	VDH	C	Capacitor	This pin is the Positive Source driving voltage. A stabilizing capacitor should be connected between VDH and GND.
21	VGH	C	Capacitor	This pin is the Positive Gate driving voltage. A stabilizing capacitor should be connected between VGH and GND.
22	VDL	C	Capacitor	This pin is the Negative Source driving voltage. A stabilizing capacitor should be connected between VDL and GND.
23	VGL	C	Capacitor	This pin is the Negative Gate driving voltage. A stabilizing capacitor should be connected between VGL and GND.
24	VCOM	C	Capacitor	This pin is the VCOM driving voltage A stabilizing capacitor should be connected between VCOM and GND.

Type: I=Input, O=Output, C=Capacitor, P=Power

- **Pin assignment for 9.7" or 12.2" where has 2 FPCs**
  - **Master FPC**

No.	Signal	Type	Connected to	Function
1	FSYNC	I/O	Slave FSYNC	Cascade line frame sync
2	NGDRV	O	Power MOSFET Driver control	This pin is the N-Channel MOSFET Gate Drive Control.
3	RESE	I	Booster Control Input	This pin is the Current Sense Input for the Control Loop.
4	INTERNAL_VPP	P	VPP PIN & Slave FPC	MTP power internal
5	NC	C	-	NC
6	LNSYNC	I/O	Slave LNSYNC	Cascade line sync
7	CLK	I/O	Slave CLK	Cascade clock
8	BS	I	VSS	This pin is for SPI type selection
9	M_BUSY	O	Device Busy Signal	This pin is Busy state output pin of the master chip. When Busy is Low, the operation of the chip should not be interrupted, and Command should not be sent.
10	RESETB	I	System Reset	This pin is reset signal input. Active Low.
11	A0	I	VDDIO or VSS	This pin is Data/Command control.
12	M_CSB	I	VDDIO or VSS	This pin is the Master chip select.
13	SCL	I	Data Bus	Serial communication clock input.
14	SDA	I	Data Bus	Serial communication data input/output.
15	VDDIO	P	Power Supply	Power for interface logic pins & I/O. It should

No.	Signal	Type	Connected to	Function
				be connected with VDDIO.
16	VDD	P	Power Supply	Power Supply for the chip.
17	VSS	P	Ground	Ground
18	VDDL	C	Capacitor	Internal regulator output A capacitor should be connected between VDDL and VSS.
19	NC	-	-	Not connected
20	VDH	C	Capacitor	This pin is the Positive Source driving voltage. A stabilizing capacitor should be connected between VDH and VSS.
21	VGH	C	Capacitor	This pin is the Positive Gate driving voltage. A stabilizing capacitor should be connected between VGH and VSS.
22	VDL	C	Capacitor	This pin is the Negative Source driving voltage. A stabilizing capacitor should be connected between VDL and VSS.
23	VGL	C	Capacitor	This pin is the Negative Gate driving voltage. A stabilizing capacitor should be connected between VGL and VSS.
24	VCOM	C	Capacitor	This pin is the VCOM driving voltage A stabilizing capacitor should be connected between VCOM and VSS.

o **Slave FPC**

No.	Signal	Type	Connected to	Function
1	FSYNC	I/O	Master FSYNC	Cascade line frame sync
2	NC	-	-	Not connected
3	NC	-	-	Not connected
4	NC	-	-	Not connected
5	NC	-	-	Not connected
6	LNSYNC	I/O	Master LNSYNC	Cascade line sync
7	CLK	I/O	Master CLK	Cascade clock
8	BS	I	VSS	This pin is for SPI type selection
9	S_BUSY	O	Device Busy Signal	This pin is Busy state output pin of the slave chip. When Busy is Low, the operation of the chip should not be interrupted, and Command should not be sent.
10	RESETB	I	System Reset	This pin is reset signal input. Active Low.
11	A0	I	VDDIO or VSS	This pin is Data/Command control.
12	S_CSB	I	VDDIO or VSS	This pin is the Slave chip select.

13	SCL	I	Data Bus	Serial communication clock input.
14	SDA	I	Data Bus	Serial communication data input/output.
15	VDDIO	P	Power Supply	Power for interface logic pins & I/O. It should be connected with VDDIO.
16	VDD	P	Power Supply	Power Supply for the chip.
17	VSS	P	Ground	Ground
18	VDDL	C	Capacitor	Internal regulator output A capacitor should be connected between VDDL and VSS.
19	NC	-	-	Not connected
20	VDH	C	Capacitor	This pin is the Positive Source driving voltage. A stabilizing capacitor should be connected between VDH and VSS.
21	VGH	C	Capacitor	This pin is the Positive Gate driving voltage A stabilizing capacitor should be connected between VGH and VSS.
22	VDL	C	Capacitor	This pin is the Negative Source driving voltage. A stabilizing capacitor should be connected between VDL and VSS.
23	VGL	C	Capacitor	This pin is the Negative Gate driving voltage. A stabilizing capacitor should be connected between VGL and VSS.
24	VCOM	C	Capacitor	This pin is the VCOM driving voltage A stabilizing capacitor should be connected between VCOM and VSS.

4. BOM

Item	Description	Vendor	Q'ty	Remark
1	CAP 1uF 25V 0603 Y5V		6 or 7	0603/1u/25V/Y
2	CAP 4.7uF 25V 0603 Y5V		1 or 2	0603/4.7u/25V/Y
3	CAP 100nF 25V 0603 Y5V		1	0603/100n/25V/Y
4	DIODE SS2040FL SOD-123FL	PANJIT	3	SS2040FL
5	CONN 24P 6702A24-000000-G2-R Pitch=0.5mm	STARCONN	1	6702A24-000000-G2-R
6	IND 10uH ATNR4010100MT +-20% 0.8A H=0.9mm	ARLITECH	0 or 1	ATNR40100100MT/10u
7	IND 47uH ATNR4047100MT +-20% 0.8A H=0.9mm	ARLITECH	0 or 1	ATNR40470100MT/47u
8	MOSFET MCH3478 SOT-23 N-Channel 30V/2A	ON Semi.	1	MCH3478
9	RES 0.47 ohm 0603 1% 1/10W		1	0603/0.47R/1%