



## **Tentative Product Specification**

**Module name: C0280QGMA-T**

**Issue date: 2009/09/28**

**Version: 0.1**

<b>Customer</b>		
<b>Approved by Customer</b>		
<b>Approved by CMEL</b>		
<b>PD Division</b>	<b>ENG Division</b>	<b>QA Dept</b>

**Note:**

- The information contained may be changed without prior notice before approval. It is therefore advisable to contact Chi MEI EL Corp. before designing your product.



**Reversion History**

<b>Version</b>	<b>Date</b>	<b>Page</b>	<b>Description</b>
Ver.1.0	2009/09/28	All	Specification was first issued

## 1 Purpose:

This documentation defines general product specification for OLED module supplied by CMEL. The information described in this technical specification is tentative. Please Contact CMEL's representative while your product is modified.

## 2 General Description:

- Driving Mode: Active Matrix.
- Color Mode:
  - 12 bit/pixel: R(4), G(4), B(4)
  - 16 bit/pixel: R(5), G(6), B(5)
  - 18 bit/pixel: R(6), G(6), B(6)
  - 24 bit/pixel: R(8), G(8), B(8)
- Driver IC: HX8358, COG Assembly
- Interface:
  - MIPI-DBI 8-/9-/16-/18-/24-bit MPU parallel interface.
  - MIPI-DBI Serial data transfer interface.
  - MIPI-DPI 16-/18-/24- data lines parallel video (RGB) interface.
  - MIPI-DSI Lanes 1 or Lanes 2 mode interface
- Application: Cell phone etc..
- RoHS Compatible

## 3 Mechanical Data:

No.	Items	Specification	Unit
1	Diagonal Size	2.83"	Inch
2	Resolution	240 x RGB x 320	
3	Pixel Pitch	0.060 × 0.180	mm
4	Active Area	43.2 x 57.6	mm
5	Outline Area	49.1 x 67.3	mm
6	Thickness	1.75 (Typ.), 1.9 (Max)	mm
7	Weight	16	g

#### 4 Absolute Maximum ratings:

##### 4.1 Absolute ratings of environment :

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T <sub>ST</sub>	-40	+80	°C	(1)
Operating Ambient Temperature	T <sub>OP</sub>	-20	+60	°C	(2)

Note (1) The storage duration for both critical temperature (-40 & 80°C) meet reliability test criteria.

(2) The operating duration for both critical temperature (-20 & 60°C) meet reliability test criteria.

##### 4.2 Electrical absolute ratings :

Item	Symbol	Unit	Value
Power supply voltage 1	AR_Vdd	V	+5V +/- 0.03
Power supply voltage 2	AR_Vss	V	-4V +/- 0.1
Power supply voltage 3	VCI	V	+2.3 ~ +3.6
Power supply voltage 4	VDD3 (IOVcc)	V	+1.65 ~ +3.6

## 5 Electrical Characteristic:

### 5.1 DC Characteristic

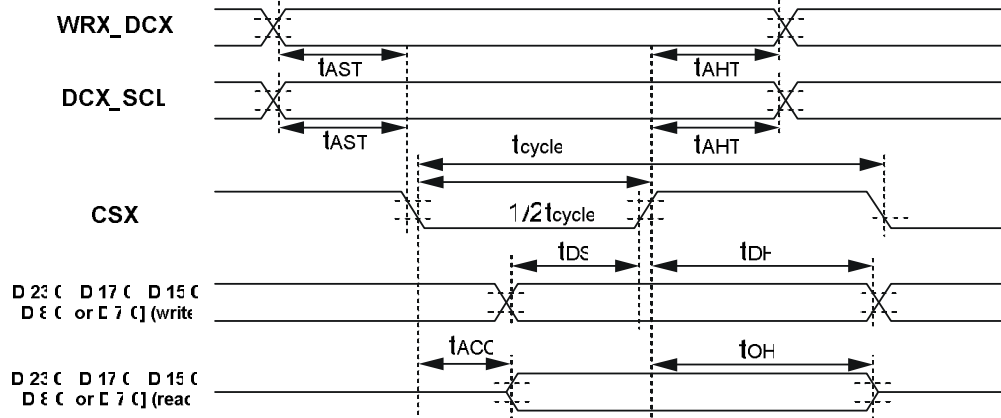
(Vcc = 2.3 ~ 3.3V, IOVcc = 1.65~3.3V, TA = -40 ~ 85 °C)

Item	Symbol	Test Condition	Min.	Typ.	Max.	Unit	Note
Input high voltage	V <sub>IH</sub>	IOVcc= 1.65 ~ 3.3V	0.7xIOVcc	-	IOVcc	V	-
Input low voltage	V <sub>IL</sub>	IOVcc= 1.65 ~ 3.3V	0.0	-	0.3xIOVcc	V	-
Output high voltage ( D23-0 Pins)	V <sub>OH</sub>	I <sub>OH</sub> = -1 mA	0.8xIOVcc	-	IOVcc	V	-
Output low voltage ( D23-0 Pins)	V <sub>OL</sub>	IOVcc= 1.65 ~ 2.4V I <sub>OL</sub> = +1mA	0.0	-	0.2xIOVcc	V	-
Logic High level input current	IIH	Except D[23:0], D[15:0], D[8:0] or D[7:0]			10	uA	
	IIHD	D[23:0], D[15:0], D[8:0]or D[7:0]			10	uA	
Logic Low level input current	IIL	Except D[23:0], D[15:0], D[8:0] or D[7:0]	-10			uA	
	IILD	D[23:0], D[15:0], D[8:0] or D[7:0]	-10			uA	
I/O leakage current	I <sub>Li</sub>	Vin = 0 ~ Vcc	-	5	-	μA	-
Current consumption during normal operation ( Vcc – VSSD )+ (IOVcc-VSSD)	I <sub>OP(Vcc)</sub>	Vci=IOVcc=Vcc=2.8V , Ta=25°C , GRAM data = 0000h, Frame rate = 70Hz, REV=0, SAP=100, AP=100, FS0=00, FS1=11, VC1=111  No panel load	-	1	-	μA	-
Current consumption during normal operation ( Vci – VSSD )	I <sub>OP(Vci)</sub>		-	5	-	mA	-
Current consumption during standby mode ( Vcc – VSSD ) + (IOVcc-VSSD)	I <sub>ST(VCC)</sub>	Vcc=2.8V , Ta=25°C	-	12	20	μA	-
Current consumption during standby mode ( Vci – VSSD )	I <sub>ST(VCi)</sub>		-	1	5-	μA	-
Output voltage deviation	-	-	-	80	-	mV	-
Dispersion of the Average Output Voltage	V	-	-	80	-	mV	-

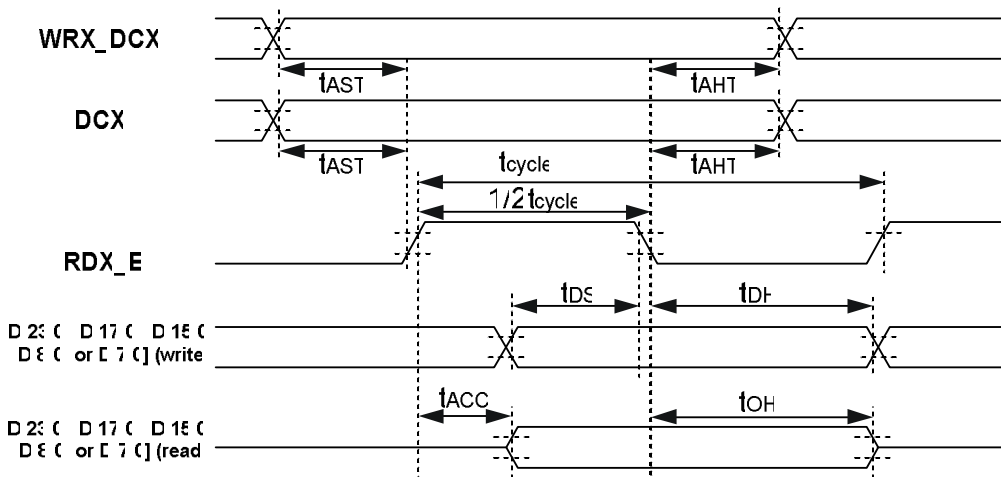


## 5.2 AC Characteristic

### 5.2.1 CPU Interface DBI TYPE-A (Fix-E & CLK-E mode)



DBI Type-A interface characteristics (Fix-E mode)



DBI Type-A interface characteristics (CLK-E mode)

(VSSA=0V, IOVCC=1.65V to 3.3V, VCC=2.3V TO 3.3V, VCI=2.3V to 3.3V, T<sub>A</sub> = -30 to 70°C)

Signal	Symbol	Parameter	MIN	MAX	Unit	Description
WRX_DCX or DCX_SCL	tAST	Address setup time	10	-	ns	-
	tAHT	Address hold time (Write/Read)	10	-	ns	-
CSX or RDX_E	tcycle	System clock cycle time	50	790	ns	-
D[23:0], D[17:0], D[15:0], D[8:0], or D[7:0]	tDS	Data setup time	15	-	ns	For maximum CL=30pF For minimum CL=8pF
	tDH	Data hold time	25	-	ns	
	tACC	Read access time	10	-	ns	
	tOH	Output disable time	10	-	ns	

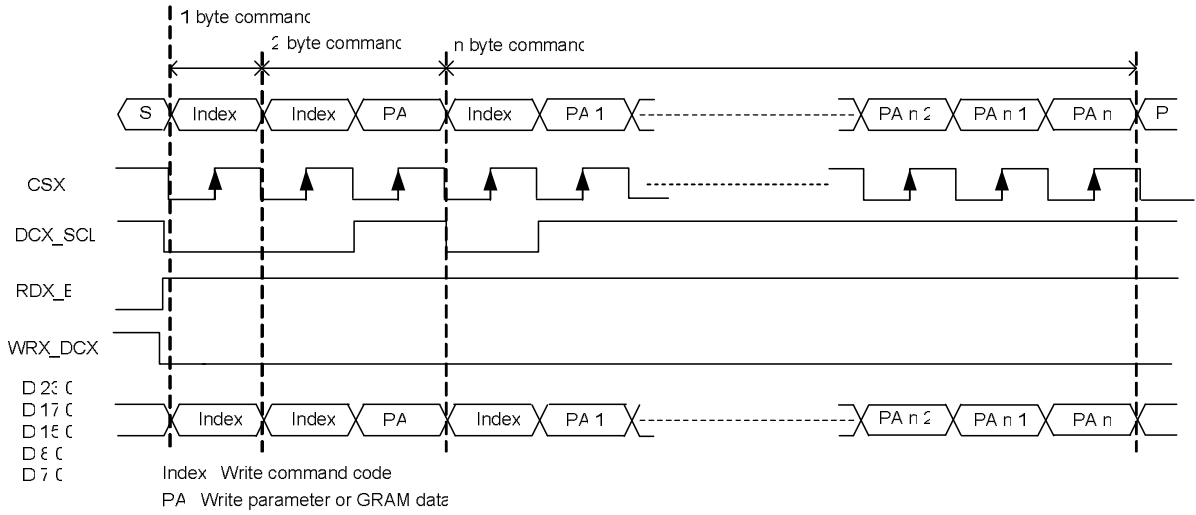
**Note:** The input signal rise time and fall time (tr, tf) is specified at 15 ns or less.

Logic high and low levels are specified as 30% and 70% of IOVCC for Input signals.

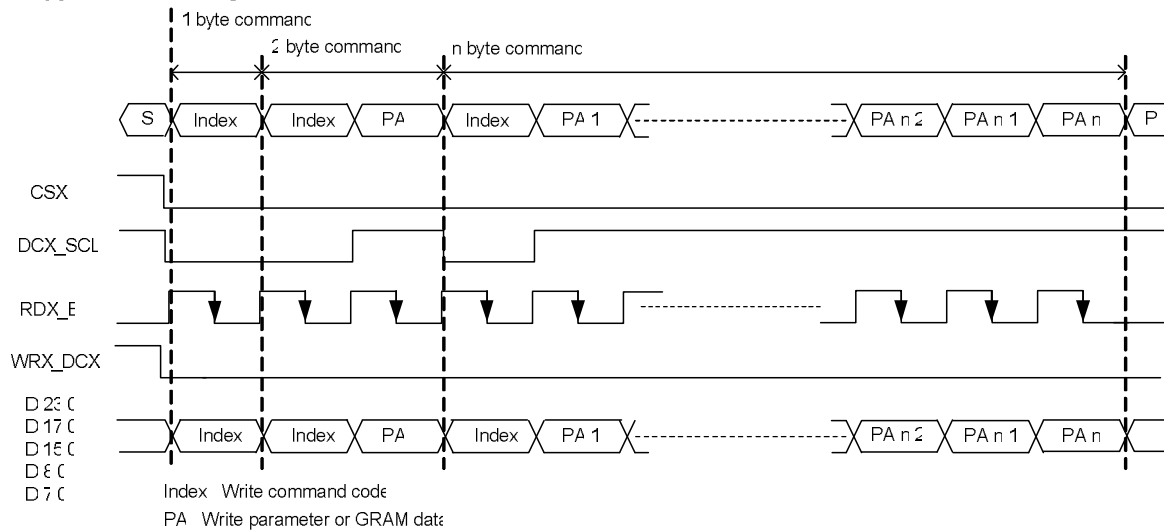


### DBI Type-A Write Control Timing:

#### DBI Type-A Write to register or GRAM - Fix-E mode



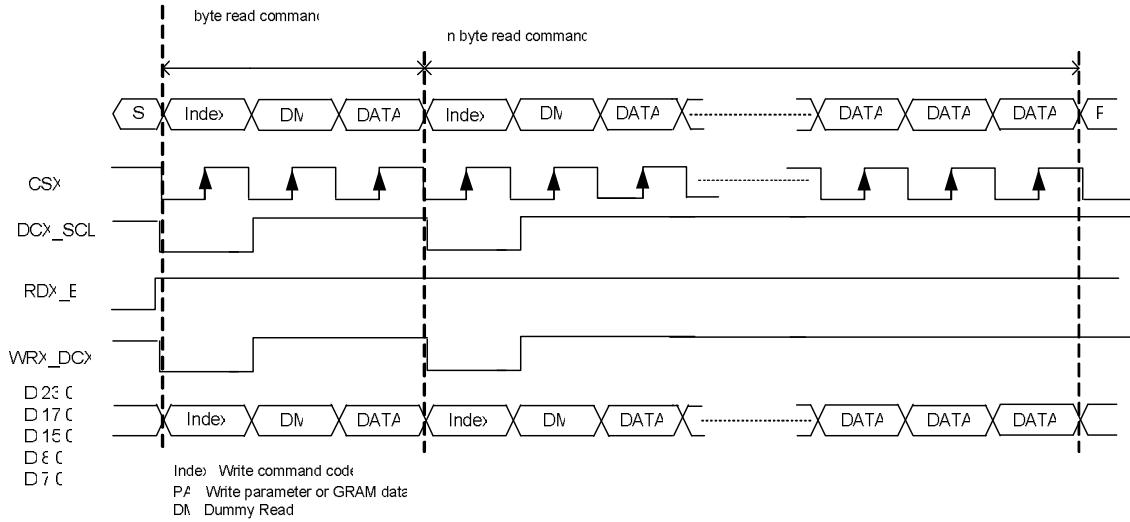
#### DBI Type-A Write to register or GRAM - CLK-E mode



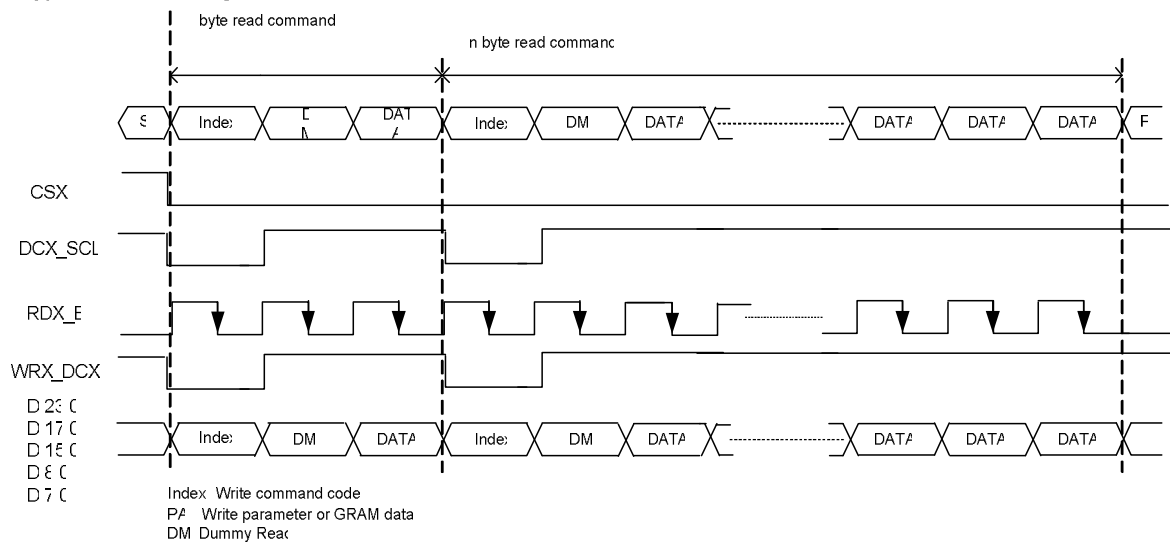
#### DBI-A System interface protocol, write to register or GRAM

DBI Type-A Read Control Timing:

DBI Type-A Read from register or GRAM - Fix-E mode



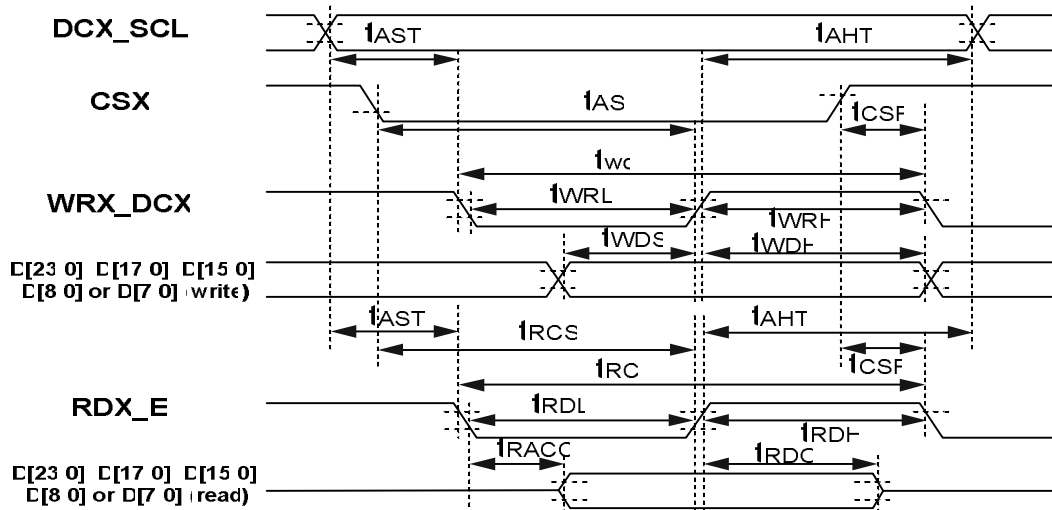
DBI Type-A Read from register or GRAM - CLK-E mode



DBI-A System interface protocol, read from register or GRAM



### 5.2.2 CPU interface DBI Type-B



DBI Type-B interface characteristic

(VSSA=0V, IOVCC=1.65V to 3.3V, VCC=2.3V TO 3.3V, VCI=2.3V to 3.3V, T<sub>A</sub> = -30 to 70°C)

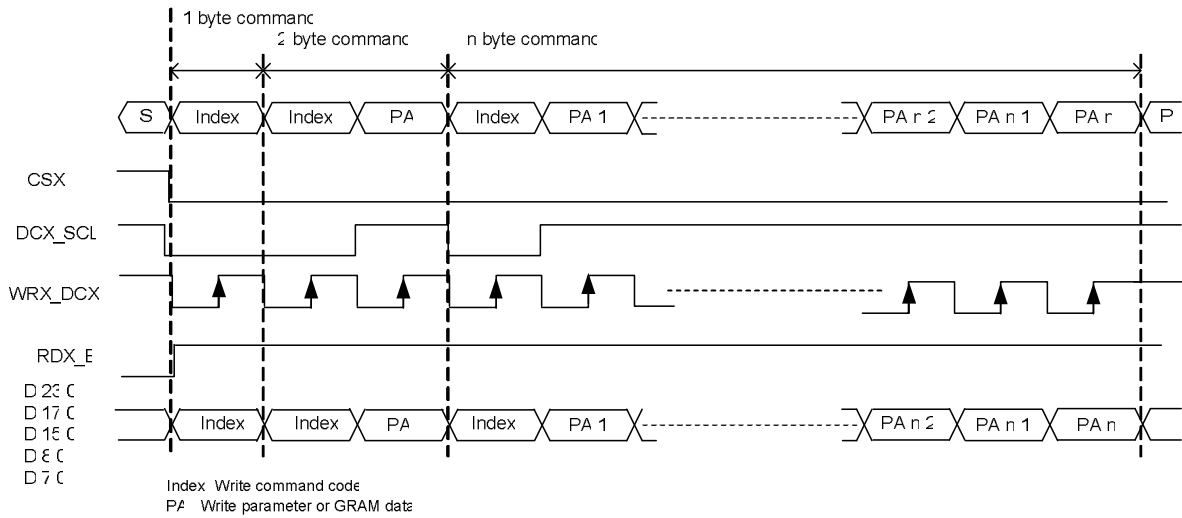
Signal	Symbol	Parameter	MIN	MAX	Unit	Description
DCX_SCL	tAST	Address setup time	10	-	ns	-
	tAHT	Address hold time (Write/Read)	10	-	ns	-
CSX	tCS	Chip select setup time (Write)	20	-	ns	-
	tRCS	Chip select setup time (Read)	20	-	ns	-
	tCSF	Chip select wait time (Write/Read)	20	-	ns	-
WRX_DCX	tWC	Write cycle	50	790	ns	-
	tWRH	Control pulse "H" duration	30	630	ns	-
	tWRL	Control pulse "L" duration	20	160	ns	-
RDX_E	tRC	Read cycle	50	790	ns	-
	tRDH	Control pulse "H" duration	30	630	ns	-
	tRDL	Control pulse "L" duration	20	160	ns	-
D[23:0], D[17:0], D[15:0], D[8:0], or D[7:0]	tWDT	Data setup time	15	-	ns	For maximum CL=30pF For minimum CL=8pF
	tWHT	Data hold time	25	-	ns	
	tRACC	Read access time	10	-	ns	
	tROH	Output disable time	10	-	ns	

**Note:** The input signal rise time and fall time (tr, tf) is specified at 15 ns or less.

Logic high and low levels are specified as 30% and 70% of IOVCC for Input signals.

### DBI Type-B Write Control Timing:

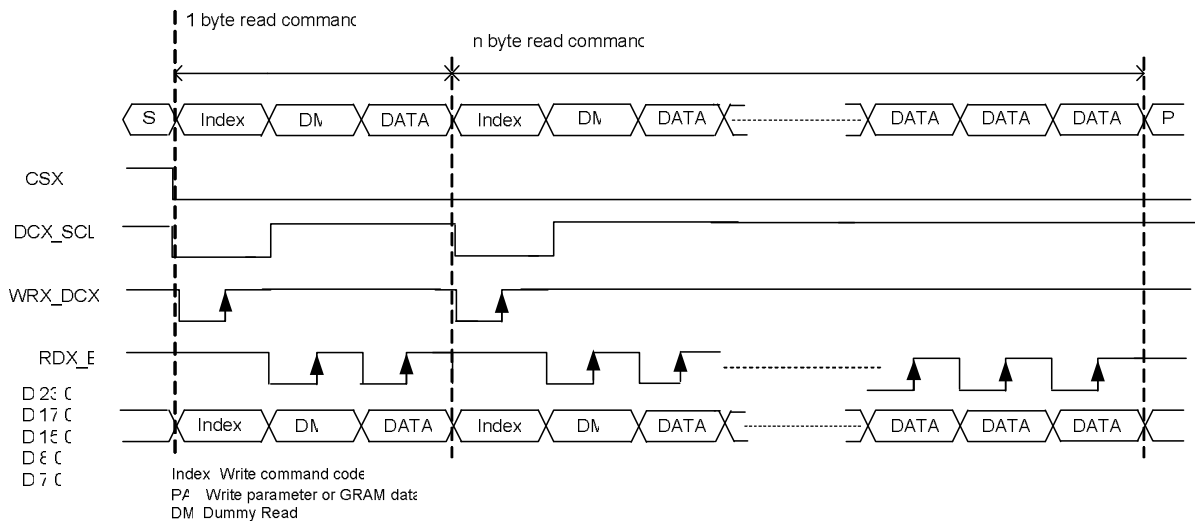
#### DBI Type-B Write to register or GRAM



#### DBI-B System interface protocol, write to register or GRAM

### DBI Type-B Read Control Timing:

#### DBI Type-B Read from register or GRAM



#### DBI-B System interface protocol, read from register or GRAM

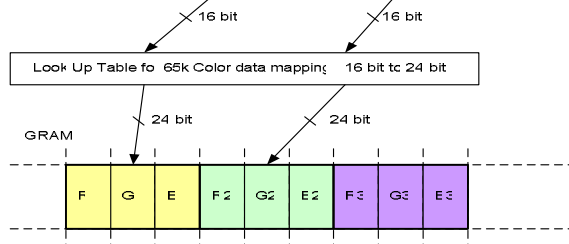
Image Data format for 24bit CPU interface (16.7M color)

1 <sup>st</sup> Iv Color Data	C0	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20	C21	C22	C23	C24	C25	C26	C27	C28	C29	C30	C31	C32	C33	C34	C35	C36	C37	C38	C39	C40	C41	C42	C43	C44	C45	C46	C47	C48	C49	C50	C51	C52	C53	C54	C55	C56	C57	C58	C59	C60	C61	C62	C63	C64	C65	C66	C67	C68	C69	C70	C71	C72	C73	C74	C75	C76	C77	C78	C79	C80	C81	C82	C83	C84	C85	C86	C87	C88	C89	C90	C91	C92	C93	C94	C95	C96	C97	C98	C99	C100	C101	C102	C103	C104	C105	C106	C107	C108	C109	C110	C111	C112	C113	C114	C115	C116	C117	C118	C119	C120	C121	C122	C123	C124	C125	C126	C127	C128	C129	C130	C131	C132	C133	C134	C135	C136	C137	C138	C139	C140	C141	C142	C143	C144	C145	C146	C147	C148	C149	C150	C151	C152	C153	C154	C155	C156	C157	C158	C159	C160	C161	C162	C163	C164	C165	C166	C167	C168	C169	C170	C171	C172	C173	C174	C175	C176	C177	C178	C179	C180	C181	C182	C183	C184	C185	C186	C187	C188	C189	C190	C191	C192	C193	C194	C195	C196	C197	C198	C199	C200	C201	C202	C203	C204	C205	C206	C207	C208	C209	C210	C211	C212	C213	C214	C215	C216	C217	C218	C219	C220	C221	C222	C223	C224	C225	C226	C227	C228	C229	C230	C231	C232	C233	C234	C235	C236	C237	C238	C239	C240	C241	C242	C243	C244	C245	C246	C247	C248	C249	C250	C251	C252	C253	C254	C255	C256	C257	C258	C259	C260	C261	C262	C263	C264	C265	C266	C267	C268	C269	C270	C271	C272	C273	C274	C275	C276	C277	C278	C279	C280	C281	C282	C283	C284	C285	C286	C287	C288	C289	C290	C291	C292	C293	C294	C295	C296	C297	C298	C299	C300	C301	C302	C303	C304	C305	C306	C307	C308	C309	C310	C311	C312	C313	C314	C315	C316	C317	C318	C319	C320	C321	C322	C323	C324	C325	C326	C327	C328	C329	C330	C331	C332	C333	C334	C335	C336	C337	C338	C339	C340	C341	C342	C343	C344	C345	C346	C347	C348	C349	C350	C351	C352	C353	C354	C355	C356	C357	C358	C359	C360	C361	C362	C363	C364	C365	C366	C367	C368	C369	C370	C371	C372	C373	C374	C375	C376	C377	C378	C379	C380	C381	C382	C383	C384	C385	C386	C387	C388	C389	C390	C391	C392	C393	C394	C395	C396	C397	C398	C399	C400	C401	C402	C403	C404	C405	C406	C407	C408	C409	C410	C411	C412	C413	C414	C415	C416	C417	C418	C419	C420	C421	C422	C423	C424	C425	C426	C427	C428	C429	C430	C431	C432	C433	C434	C435	C436	C437	C438	C439	C440	C441	C442	C443	C444	C445	C446	C447	C448	C449	C450	C451	C452	C453	C454	C455	C456	C457	C458	C459	C460	C461	C462	C463	C464	C465	C466	C467	C468	C469	C470	C471	C472	C473	C474	C475	C476	C477	C478	C479	C480	C481	C482	C483	C484	C485	C486	C487	C488	C489	C490	C491	C492	C493	C494	C495	C496	C497	C498	C499	C500	C501	C502	C503	C504	C505	C506	C507	C508	C509	C510	C511	C512	C513	C514	C515	C516	C517	C518	C519	C520	C521	C522	C523	C524	C525	C526	C527	C528	C529	C530	C531	C532	C533	C534	C535	C536	C537	C538	C539	C540	C541	C542	C543	C544	C545	C546	C547	C548	C549	C550	C551	C552	C553	C554	C555	C556	C557	C558	C559	C560	C561	C562	C563	C564	C565	C566	C567	C568	C569	C570	C571	C572	C573	C574	C575	C576	C577	C578	C579	C580	C581	C582	C583	C584	C585	C586	C587	C588	C589	C590	C591	C592	C593	C594	C595	C596	C597	C598	C599	C600	C601	C602	C603	C604	C605	C606	C607	C608	C609	C610	C611	C612	C613	C614	C615	C616	C617	C618	C619	C620	C621	C622	C623	C624	C625	C626	C627	C628	C629	C630	C631	C632	C633	C634	C635	C636	C637	C638	C639	C640	C641	C642	C643	C644	C645	C646	C647	C648	C649	C650	C651	C652	C653	C654	C655	C656	C657	C658	C659	C660	C661	C662	C663	C664	C665	C666	C667	C668	C669	C670	C671	C672	C673	C674	C675	C676	C677	C678	C679	C680	C681	C682	C683	C684	C685	C686	C687	C688	C689	C690	C691	C692	C693	C694	C695	C696	C697	C698	C699	C700	C701	C702	C703	C704	C705	C706	C707	C708	C709	C710	C711	C712	C713	C714	C715	C716	C717	C718	C719	C720	C721	C722	C723	C724	C725	C726	C727	C728	C729	C730	C731	C732	C733	C734	C735	C736	C737	C738	C739	C740	C741	C742	C743	C744	C745	C746	C747	C748	C749	C750	C751	C752	C753	C754	C755	C756	C757	C758	C759	C760	C761	C762	C763	C764	C765	C766	C767	C768	C769	C770	C771	C772	C773	C774	C775	C776	C777	C778	C779	C780	C781	C782	C783	C784	C785	C786	C787	C788	C789	C790	C791	C792	C793	C794	C795	C796	C797	C798	C799	C800	C801	C802	C803	C804	C805	C806	C807	C808	C809	C810	C811	C812	C813	C814	C815	C816	C817	C818	C819	C820	C821	C822	C823	C824	C825	C826	C827	C828	C829	C830	C831	C832	C833	C834	C835	C836	C837	C838	C839	C840	C841	C842	C843	C844	C845	C846	C847	C848	C849	C850	C851	C852	C853	C854	C855	C856	C857	C858	C859	C860	C861	C862	C863	C864	C865	C866	C867	C868	C869	C870	C871	C872	C873	C874	C875	C876	C877	C878	C879	C880	C881	C882	C883	C884	C885	C886	C887	C888	C889	C890	C891	C892	C893	C894	C895	C896	C897	C898	C899	C900	C901	C902	C903	C904	C905	C906	C907	C908	C909	C910	C911	C912	C913	C914	C915	C916	C917	C918	C919	C920	C921	C922	C923	C924	C925	C926	C927	C928	C929	C930	C931	C932	C933	C934	C935	C936	C937	C938	C939	C940	C941	C942	C943	C944	C945	C946	C947	C948	C949	C950	C951	C952	C953	C954	C955	C956	C957	C958	C959	C960	C961	C962	C963	C964	C965	C966	C967	C968	C969	C970	C971	C972	C973	C974	C975	C976	C977	C978	C979	C980	C981	C982	C983	C984	C985	C986	C987	C988	C989	C990	C991	C992	C993	C994	C995	C996	C997	C998	C999	C1000	C1001	C1002	C1003	C1004	C1005	C1006	C1007	C1008	C1009	C1010	C1011	C1012	C1013	C1014	C1015	C1016	C1017	C1018	C1019	C1020	C1021	C1022	C1023	C1024	C1025	C1026	C1027	C1028	C1029	C1030	C1031	C1032	C1033	C1034	C1035	C1036	C1037	C1038	C1039	C1040	C1041	C1042	C1043	C1044	C1045	C1046	C1047	C1048	C1049	C1050	C1051	C1052	C1053	C1054	C1055	C1056	C1057	C1058	C1059	C1060	C1061	C1062	C1063	C1064	C1065	C1066	C1067	C1068	C1069	C1070	C1071	C1072	C1073	C1074	C1075	C1076	C1077	C1078	C1079	C1080	C1081	C1082	C1083	C1084	C1085	C1086	C1087	C1088	C1089	C1090	C1091	C1092	C1093	C1094	C1095	C1096	C1097	C1098	C1099	C1100	C1101	C1102	C1103	C1104	C1105	C1106	C1107	C1108	C1109	C1110	C1111	C1112	C1113	C1114	C1115	C1116	C1117	C1118	C1119	C1120	C1121	C1122	C1123	C1124	C1125	C1126	C1127	C1128	C1129	C1130	C1131	C1132	C1133	C1134	C1135	C1136	C1137	C1138	C1139	C1140	C1141	C1142	C1143	C1144	C1145	C1146	C1147	C1148	C1149	C1150	C1151	C1152	C1153	C1154	C1155	C1156	C1157	C1158	C1159	C1160	C1161	C1162	C1163	C1164	C1165	C1166	C1167	C1168	C1169	C1170	C1171	C1172	C1173	C1174	C1175	C1176	C1177	C1178	C1179	C1180	C1181	C1182	C1183	C1184	C1185	C1186	C1187	C1188	C1189	C1190	C1191	C1192	C1193	C1194	C1195	C1196	C1197	C1198	C1199	C1200	C1201	C1202	C1203	C1204	C1205	C1206	C1207	C1208	C1209	C1210	C1211	C1212	C1213	C1214	C1215	C1216	C1217	C1218	C1219	C1220	C1221	C1222	C1223	C1224	C1225	C1226	C1227	C1228	C1229	C1230	C1231	C1232	C1233	C1234	C1235	C1236	C1237	C1238	C1239	C1240	C1241	C1242	C1243	C1244	C1245	C1246	C1247	C1248	C1249	C1250	C1251	C1252	C1253	C1254	C1255	C1256	C1257	C1258	C1259	C1260	C1261	C1262	C1263	C1264	C1265	C1266	C1267	C1268	C1269	C1270	C1271	C1272	C1273	C1274	C1275	C1276	C1277	C1278	C1279	C1280	C1281	C1282	C1283	C1284	C1285	C1286	C1287	C1288	C1289	C1290	C1291	C1292	C1293	C1294	C1295	C1296	C1297	C1298	C1299	C1300	C1301	C1302	C1303	C1304	C1305	C1306	C1307	C1308	C1309	C1310	C1311	C1312	C1313	C1314	C1315	C1316	C1317	C1318	C1319	C1320	C1321	C1322	C1323	C1324	C1325	C1326	C1327	C1328	C1329	C1330	C1331	C1332	C1333	C1334	C1335	C1336	C1337	C1338	C1339	C1340	C1341	C1342	C1343	C1344	C1345	C1346	C1347	C1348	C1349	C1350	C1351	C1352	C1353	C1354	C1355	C1356	C1357	C1358	C1359	C1360	C1361	C1362	C1363	C1364	C1365	C1366	C1367	C1368	C1369	C1370	C1371	C1372	C1373	C1374	C1375	C1376	C1377	C1378	C1379	C1380	C1381	C1382	C1383	C1384	C1385	C1386	C1387	C1388	C1389	C1390	C1391	C1392	C1393	C1394	C1395	C1396	C1397	C1398	C1399	C1400	C1401	C1402	C1403	C1404	C1405	C1406	C1407	C1408	C1409	C1410	C1411	C1412	C1413	C1414	C1415	C1416	C1417	C1418	C1419	C1420	C1421	C1422	C1423	C1424	C1425	C1426	C1427	C1428	C1429	C1430	C1431	C1432	C1433	C1434	C1435	C1436	C1437	C1438	C1439	C1440	C1441	C1442	C1443	C1444	C1445	C1446	C1447	C1448	C1449	C1450	C1451	C1452	C1453	C1454	C1455	C1456	C1457	C1458	C1459	C1460	C1461	C1462	C1463	C1464	C1465	C1466	C1467	C1468	C1469	C1470</
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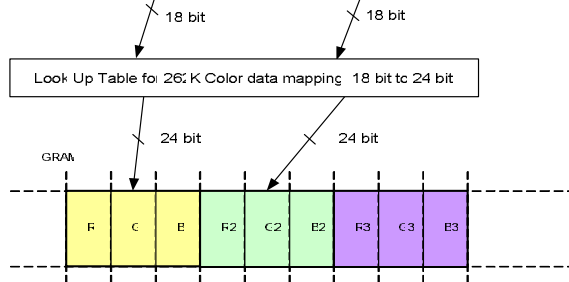
### Case 2: RGB Data 5-6-5 bits (65k color)

65k Color Data	C	CX	E23~E8	E7	E6	E5	E4	E3	E2	E1	E0	GRAM Write
MEMWF	C	X	GRAM Write command code									
1st write	X	X	F4	F3	F2	F1	F0	G5	G4	G3	X	
2nd write	X	X	G2	G1	G0	E4	E3	E2	E1	E0	X	st pixel F G E
3rd write	X	X	F22	F23	F22	F21	F20	G25	G24	G23	X	
4th write	X	X	G22	G21	G20	E24	E23	E22	E21	E20	X	2nd pixel F2 G2 E2



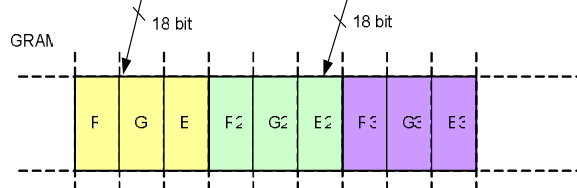
### Case 3: RGB Data 6-6-6 bits (262k color)

262K Color Data	C	CX	E23~E8	E7	E6	E5	E4	E3	E2	E1	E0	GRAM Write	
MEMWF	C	X	GRAM Write command code										
1st write	X	X	F6	F5	F4	F3	F2	F1	F0	X	X		
2nd write	X	X	G6	G5	G4	G3	G2	G1	G0	X	X		
3rd write	X	X	E6	E5	E4	E3	E2	E1	E0	X	X	st pixel F G E	
4th write	X	X	F26	F27	F26	F25	F24	F23	F22	F21	F20	X	
5th write	X	X	G26	G27	G26	G25	G24	G23	G22	G21	G20	X	
6th write	X	X	E26	E27	E26	E25	E24	E23	E22	E21	E20	X	2nd pixel F2 G2 E2

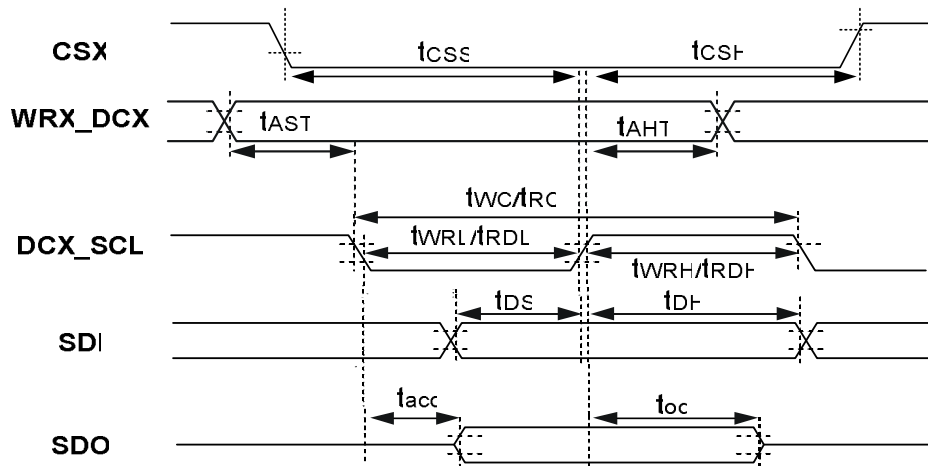


### Case 4: RGB Data 8-8-8 bits (16.7M color)

16.7M Color Data	C	CX	E23~E8	E7	E6	E5	E4	E3	E2	E1	E0	GRAM Write	
MEMWR	C	X	GRAM Write command code										
1st write	X	X	F7	F6	F5	F4	F3	F2	F1	F0	X		
2nd write	X	X	G7	G6	G5	G4	G3	G2	G1	G0	X		
3rd write	X	X	E7	E6	E5	E4	E3	E2	E1	E0	X	st pixel F G E	
4th write	X	X	F27	F28	F27	F26	F25	F24	F23	F22	F21	F20	
5th write	X	X	G27	G28	G27	G26	G25	G24	G23	G22	G21	G20	
6th write	X	X	E27	E28	E27	E26	E25	E24	E23	E22	E21	E20	2nd pixel F2 G2 E2



5.2.3 RGB interface DBI Type-C



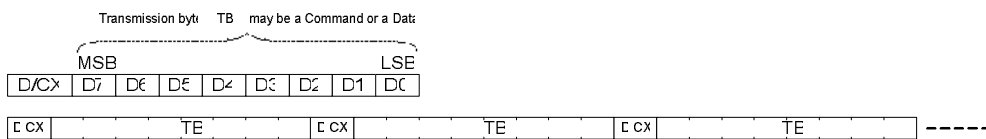
DBI Type-C interface characteristics

Signal	Symbol	Parameter	MIN	MAX	Unit	Description
CSX	tCSS	Chip select setup time (Write)	40	-	ns	-
	tCST	Chip select setup time (Read)	40	-	ns	
WRX_DCX	tAST	Address setup time	10	-	ns	-
	tAHT	Address hold time (Write/Read)	10	-	ns	
DCX_SCL (Write)	tWC	Write cycle	100	-	ns	-
	tWRH	Control pulse "H" duration	40	-	ns	
	tWRL	Control pulse "L" duration	40	-	ns	
DCX_SCL (Read)	tRC	Read cycle	150	-	ns	-
	tRDH	Control pulse "H" duration	60	-	ns	
	tRDL	Control pulse "L" duration	60	-	ns	
SDI	tDS	Data setup time	30	-	ns	For maximum CL=30pF For minimum CL=8pF
	tDT	Data hold time	30	-	ns	
SDO	tRACC	Read access time	10	-	ns	-
	tOD	Output disable time	10	50	ns	

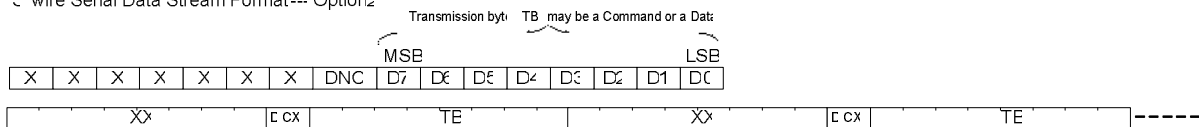
**Note:** The input signal rise time and fall time (tr, tf) is specified at 15 ns or less.  
 Logic high and low levels are specified as 30% and 70% of IOVCC for Input signals.

Image data transfer format

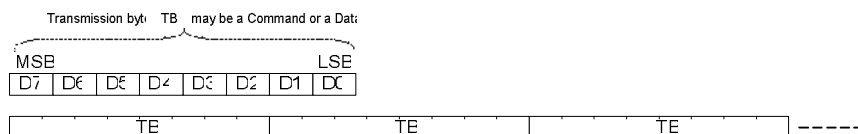
3 wire Serial Data Stream Format--- Option 1



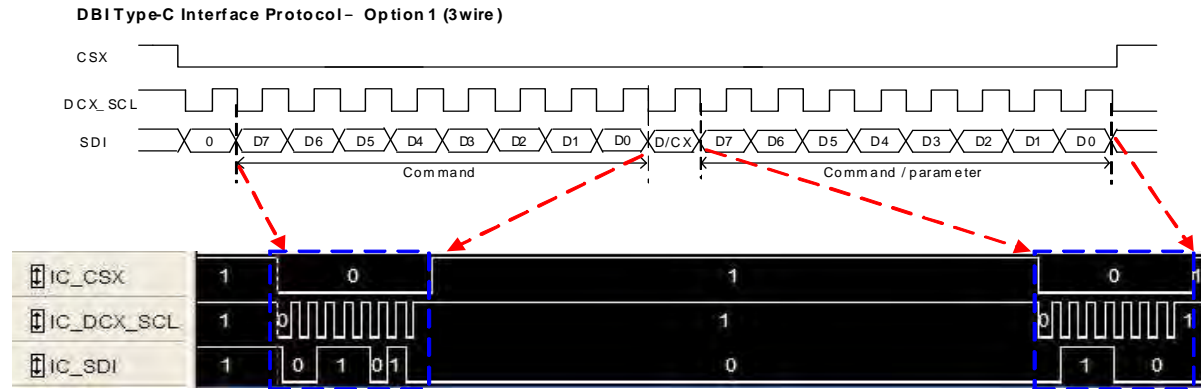
3 wire Serial Data Stream Format--- Option 2



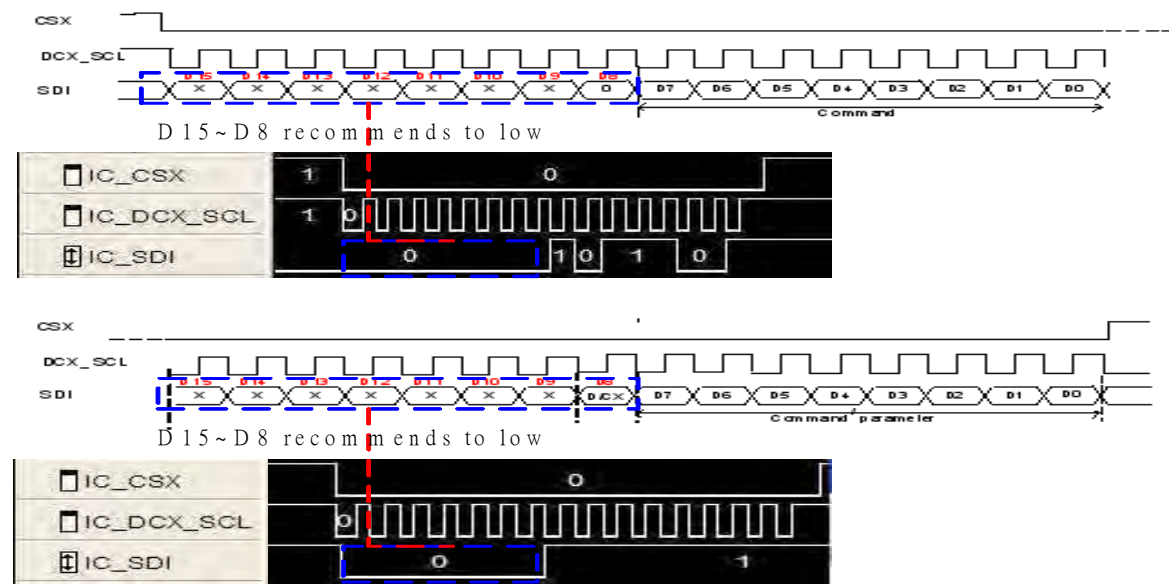
4 wire Serial Data Stream Format --- Option 3



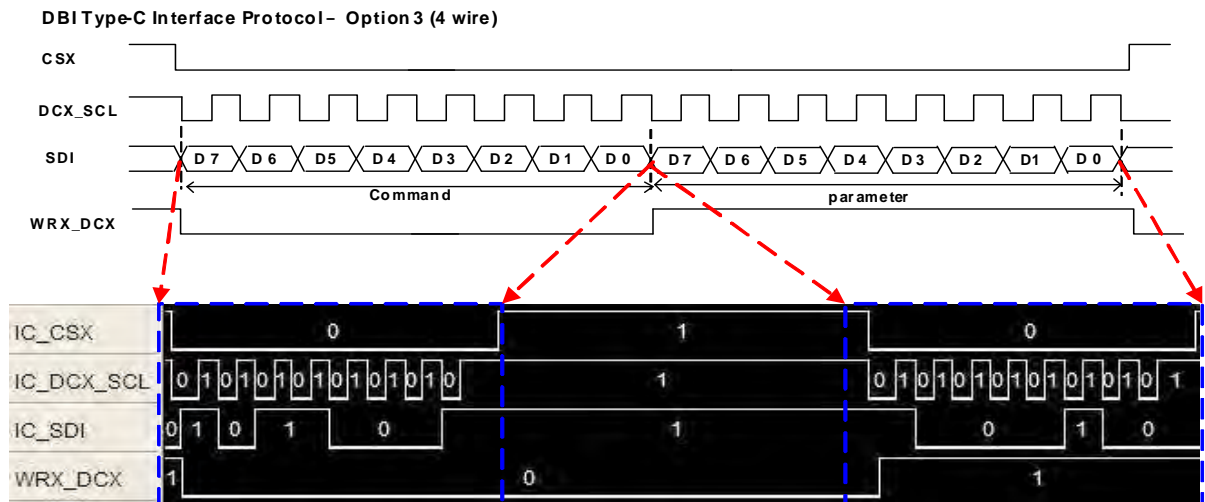
RGB Interface Option-1 (3 wire)



RGB Interface Option-2 (3 wire)

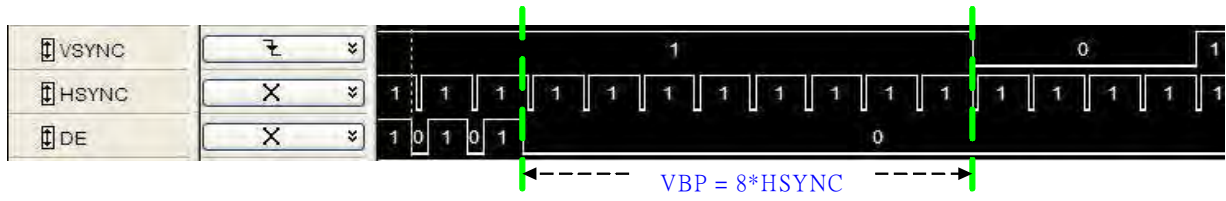


RGB Interface Option-3 (4 wire)

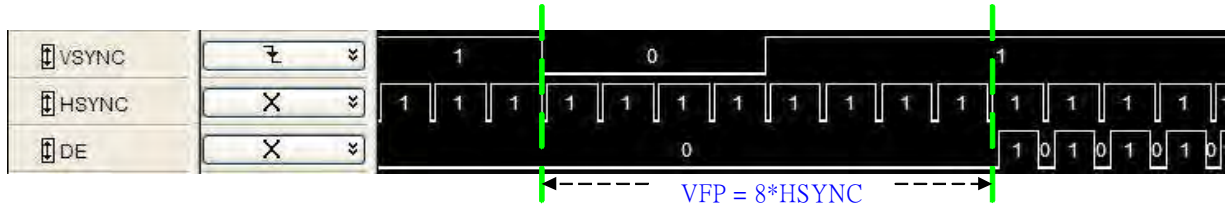


RGB Timing:

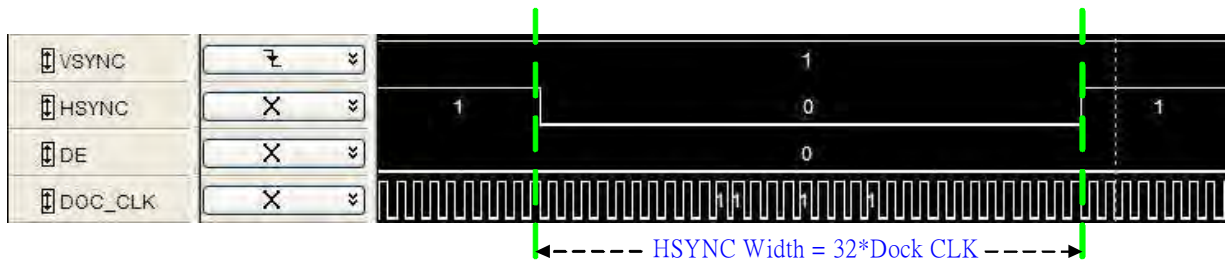
**V-back porch:**



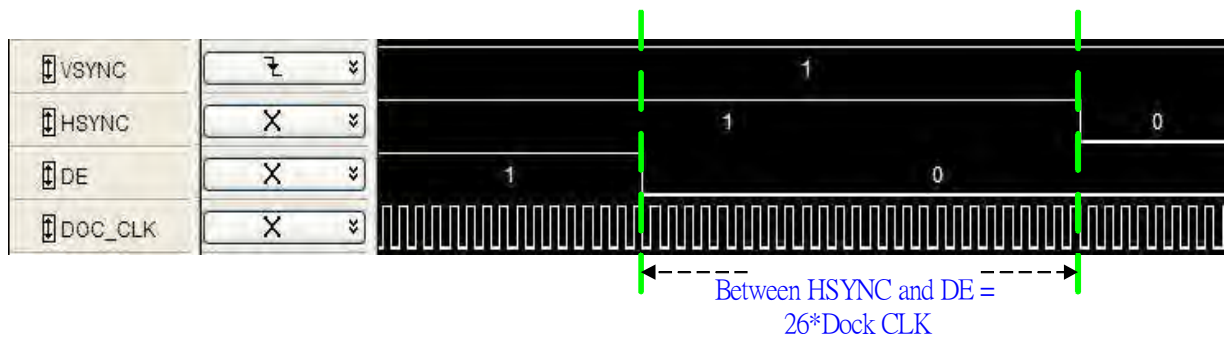
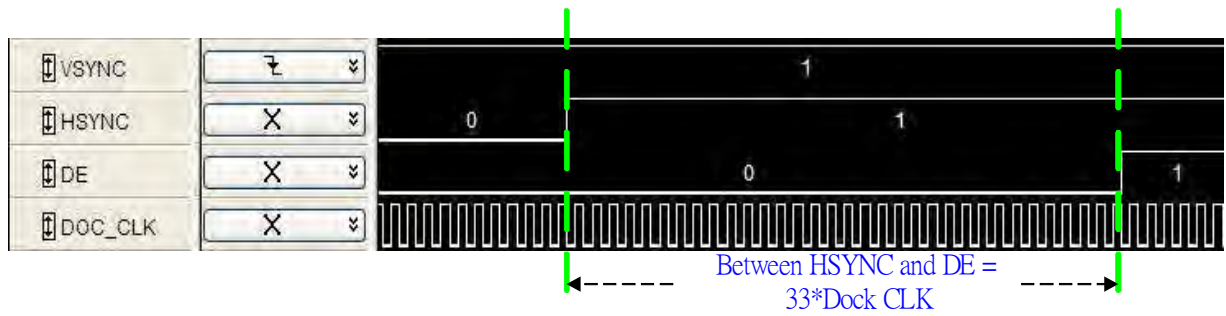
**V-front porch:**



**HSYNC-WIDTH:**

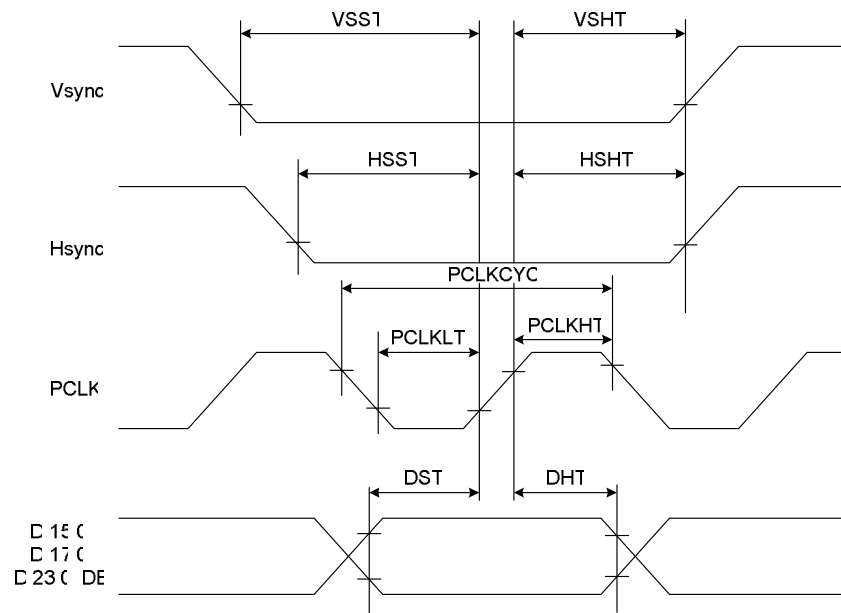


**The distance between HSYNC and DE:**





### 5.2.4 DPI interface

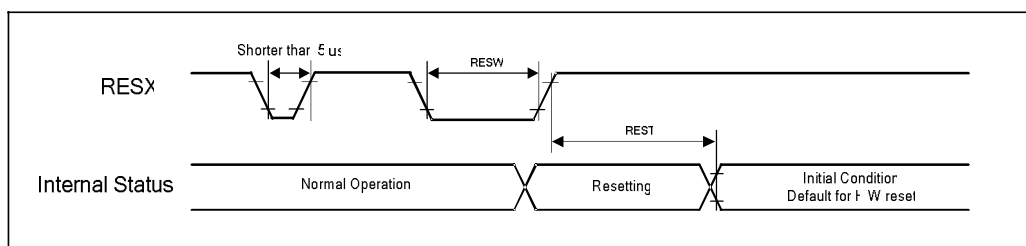


DPI Interface Characteristics

Parameter	Symbol	Condition	MIN	TYP	MAX	Unit
Vsync Setup Time	VSST	-	20	-	-	ns
Vsync Hold Time	VSHT	-	20	-	-	ns
Hsync Setup Time	HSS1	-	20	-	-	ns
Hsync Hold Time	HSHT	-	20	-	-	ns
Pixel Clock Duty Cycle	-	PCLKCYC	33	67	-	%
Pixel Clock Low Duration	PCLKLT		20	-	-	ns
Pixel Clock High Duration	PCLKHT		20	-	-	ns
Data Setup Time	DST	-	20	-	-	ns
Data Hold Time	DHT	-	20	-	-	ns

DPI Interface Characteristics(Default resolution is 240xRGBx230)

### 5.2.5 RESET TIMING



Reset Input Timing

Symbol	Parameter	Related Pins	MIN	TYP	MAX	Note	Unit
tRESW	*1) Reset low pulse width	RESX	10	-	-	-	μs
tREST	*2) Reset complete time	-	-	-	5	When reset applied during Sleep In mode	ms
		-	-	-	120	When reset applied during Sleep Out mode	ms

## 6 Electro-Optical Characteristic:

Items	Symbol	Min	Typ.	Max	Unit	Remark
Operating Luminance	L		200		Cd/m <sup>2</sup>	(1)(5)
Power Consumption	Pon	-	TBD	-	mW	30% pixels on (1)
Current	Icc	-		TBD-	mA	Full on (1)
Response Time	Tres	-	-	50	us	(2)
CIE <sub>x</sub> (White)	W <sub>x</sub>	-	0.31	-	-	(5)
CIE <sub>y</sub> (White)	W <sub>y</sub>	-	0.33	-	-	(5)
Color Saturation			70%			
Viewing Angle	VA	160	170	-	Degree	(3)
Contrast	CR	3000:1	10000:1	-		(4)
Operation Lifetime	LTop	TBD	-	-	Hrs	(1)(6)

Note:

Measuring surrounding: Dark room

Surrounding temperature: 25°C

IOVCC = 1.65V ~ 3.6V

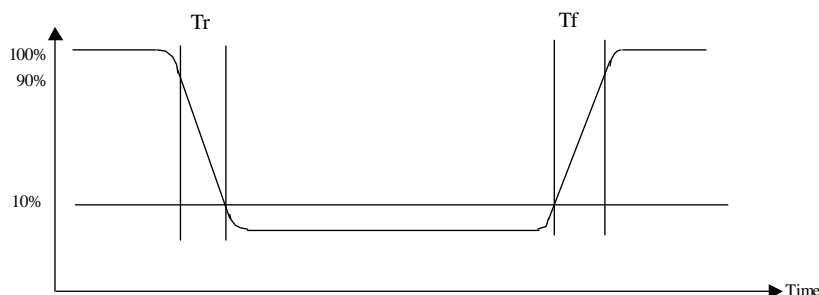
1. Test condition:

a. AR\_VDD= 5V+/- 0.03V, AR\_VSS= -4V+/- 0.1V

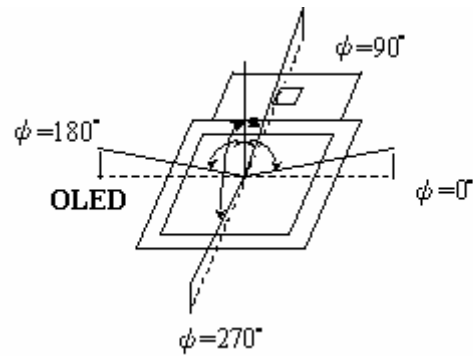
b. IC Initial Register Setting:

TBD

2. Response Time test condition



3. Viewing angle test condition:



Viewing Angle= CR>10

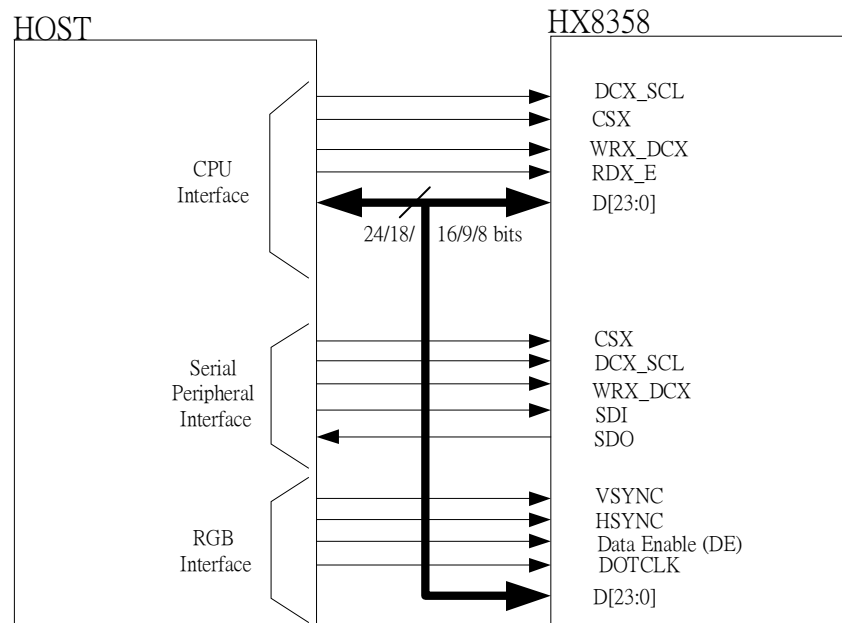
4. Contrast Ratio

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

5. Optical tester: CA210

6. Brightness of 30% power consumption. Operating Life Time is defined when the luminance has decayed to less than 50% of the initial measured luminance before life test.

**7 System Diagram:**





8 Pin Assignment:

PIN	Symbol	I/O	Description	Remarks	
1	TP1		Touch Panel		
2	TP2		Touch Panel		
3	TP3		Touch Panel		
4	TP4		Touch Panel		
5	VDDD	O	Output from internal logic voltage(1.5V)		
6	IOVCC	P	Digital IO Pad Power supply 1.65v ~ 3.6v		
7	RESX	I	Reset pin. Setting either pin low initializes the LSI. Must be reset after power is supplied. Must be connected to VSSD or IOVCC.		
8	BS0	I	BS0 BS1 BS2 BS3 Interface mode		
			0 0 0 0 DBI TYPE-A 8bit (Fix-E/ CLK-E)		
			0 0 0 1 DBI TYPE-A 9bit (Fix-E/ CLK-E)		
9	BS1	I	0 0 1 0 DBI TYPE-A 16bit (Fix-E/ CLK-E)		
			0 0 1 1 DBI TYPE-A 18bit (Fix-E/ CLK-E)		
			0 1 0 0 DBI TYPE-A 24bit (Fix-E/ CLK-E)		
10	BS2	I	0 1 0 1 DPI TYPE-C Option 1		
			0 1 1 0 DPI TYPE-C Option 2		
			0 1 1 1 DPI TYPE-C Option 3		
11	BS3	I	1 0 0 0 DBI TYPE-B 8bit		
			1 0 0 1 DBI TYPE-B 9bit		
			1 0 1 0 DBI TYPE-B 16bit		
12	VSYNC	I	1 1 1 1 DBI TYPE-B 18bit		
			1 1 0 0 DBI TYPE-B 24bit		
			1 1 0 1 DSI (Command mode)		
13	HSYNC	I	1 1 1 0 DSI (Video mode)		
			Pixel format (RGB 444/ RGB565/ RGB666 / RGB888) is selected by DCS command (0x3Ah)		
			Frame synchronizing signal for DPI I/F mode.		
14	PCLK	I	Pixel clock signal for DPI I/F mode		
15	DE	I	A data ENABLE signal for DPI I/F mode		
16	DB23	I/O	When Operates in MIPI DBI interface mode, it is used liked an 24-bit bi-directional data bus. 8-bit bus: use D7-D0 9-bit bus: use D8-D0 16-bit bus: use D15-D0 18-bit bus: use D17-D0 24-bit bus: use D23-D0 When Operation in MIPI DPI interface mode, it is an 24-bit bus RGB data bus. 16-bit bus: use D15-D0		
17	DB22	I/O			
18	DB21	I/O			
19	DB20	I/O			
20	DB19	I/O			
21	DB18	I/O			
22	DB17	I/O			
23	DB16	I/O			
24	DB15	I/O			
25	DB14	I/O			



26	DB13	I/O	18-bit bus: use D17-D0 24-bit bus: use D23-D0 If use MIPI interface, these pins are sub panel data bus (DBS23~DBS0). Let unused pins to the open.	
27	DB12	I/O		
28	DB11	I/O		
29	DB10	I/O		
30	DB9	I/O		
31	DB8	I/O		
32	DB7	I/O		
33	DB6	I/O		
34	DB5	I/O		
35	DB4	I/O		
36	DB3	I/O		
37	DB2	I/O		
38	DB1	I/O		
39	DB0	I/O		
40	SDO	O	Serial data output	
41	SDI	I	Serial data Input	
42	RDX_E	I	DBI Type-B: Serves as a read signal and read data at the low level. DBI Type-A: 0: Read/Write disable, 1: Read/Write enable. <b>If not use, let it open or connected to IOVCC. (weak pull high)</b>	
43	WRX_DCX	I	DBI Type-B: Serves as a write signal and write data at the low level. DBI Type-A: 0: Read/Write disable, 1: Read/Write enable. DBI Type-C Option 3: Data / Command Selection pin. <b>If not use, let it open or connected to IOVCC. (weak pull high)</b>	
44	CSX	I	Chip select signal. Low: chip can be accessed; High: chip cannot be accessed. <b>If not use, let it open or connected to IOVCC. (weak pull high)</b>	
45	DCX_SCL	I	Data / Command Selection pin in DBI Type-A and DBI Type-B When under DBI Type-C interface, it servers as SCL (Serial Clock) <b>If not use, let it open or connected to IOVCC. (weak pull high)</b>	
46	TE	O	Tearing effect output. If not used, please open this pin.	
47	PVDD	P	A voltage for the OTP programming. If not use, this pin must be open.	
48	CX11B	I/O	Connect to the step-up capacitors for step up circuit 1 operation. Leave this pin open if the internal step-up circuit is not used.	
49	CX11A	I/O		
50	DDVDH	P	Output from internal logic voltage (1.5V). Connect to a stabilizing capacitor	
51	C11B	I/O	Connect to the step-up capacitors according to the step-up factor. Leave this pin open if the internal step-up circuit is not used.	
52	C11A	I/O		
53	VREF	-	Reference voltage. Connect to a stabilizing capacitor	
54	VREG1	P	Internal generated stable power for source driver unit.	
55	C21B	I/O	Connect these pins to the capacitors for the step-up circuit 2. According to the step-up rate. When not using the step-up circuit2, disconnect them.	
56	C21A	I/O		



57	HVO	P	An output from the step-up circuit2.or 4 ~ 6 time the VCI level. The step-up rate is determined with BT3-0 bits. Connect to a stabilizing capacitor between VSSD and VGH. Place a schottkey barrier diode between VCI and VGH. Place a schottkey barrier diode (see “configuration of the power supply”).	
58	VGH	P	Internal generated stable power for AM-OLED VGH unit.	
59	ESD_VGH	P	Internal generated stable power for AM-OLED ESD_VGH unit.	
60	C22B	I/O	Connect these pins to the capacitors for the step-up circuit 2. According to the step-up rate. When not using the step-up circuit2, disconnect them.	
61	C22A	I/O		
62	C23B	I/O		
63	C23A	I/O		
64	LVO	P	An output from the step-up circuit2.or –3~ -5 time the VCI level. The step-up rate is determined with BT3-0 bits. Connect to a stabilizing capacitor between VSSD and VGL. Place a schottkey barrier diode between VSSD and VGL. Place a schottkey barrier diode (see “configuration of the power supply”).	
65	VGL	P	Internal generated stable power for AM-OLED VGL unit.	
66	ESD_VGL	P	Internal generated stable power for AM-OLED ESD_VGL unit.	
67	ARREF	P	Internal generated stable power for initial AM-OLED panel.	
68	VSSA, VSSD	P	Analog ground, Digital ground	
69	VCC, VCI	P	Digital power supply, 2.3V~3.3V, Analog power supply, 2.3V~3.3V	
70	AR_VSS	P	Positive voltage for OLED (+5V)	
71	AR_VDD	P	Negative voltage for OLED (-5V)	



**9 Reliability Test:**

**TBD**





## 10 Handling:

- 10.1 Do not scratch the surface of the polarizer film as it is easily damaged.
- 10.2 When cleaning the display surface, use soft cloth with solvent (as recommended below) and wipe lightly
  - Ethyl alcohol
  - Isopropyl alcohol
- 10.3 Do not wipe the display surface with dry or hard materials that damage the polarizer surface.
- 10.4 Since this OLED panel is made of glass, dropping the module or banging it against hard objects may cause cracks or fragmentation.
- 10.5 Do not disassemble the OLED module as it may cause permanent damage.
- 10.6 Hold OLED very carefully when placing OLED module into the system housing. Do not excessive stress or pressure to OLED module.

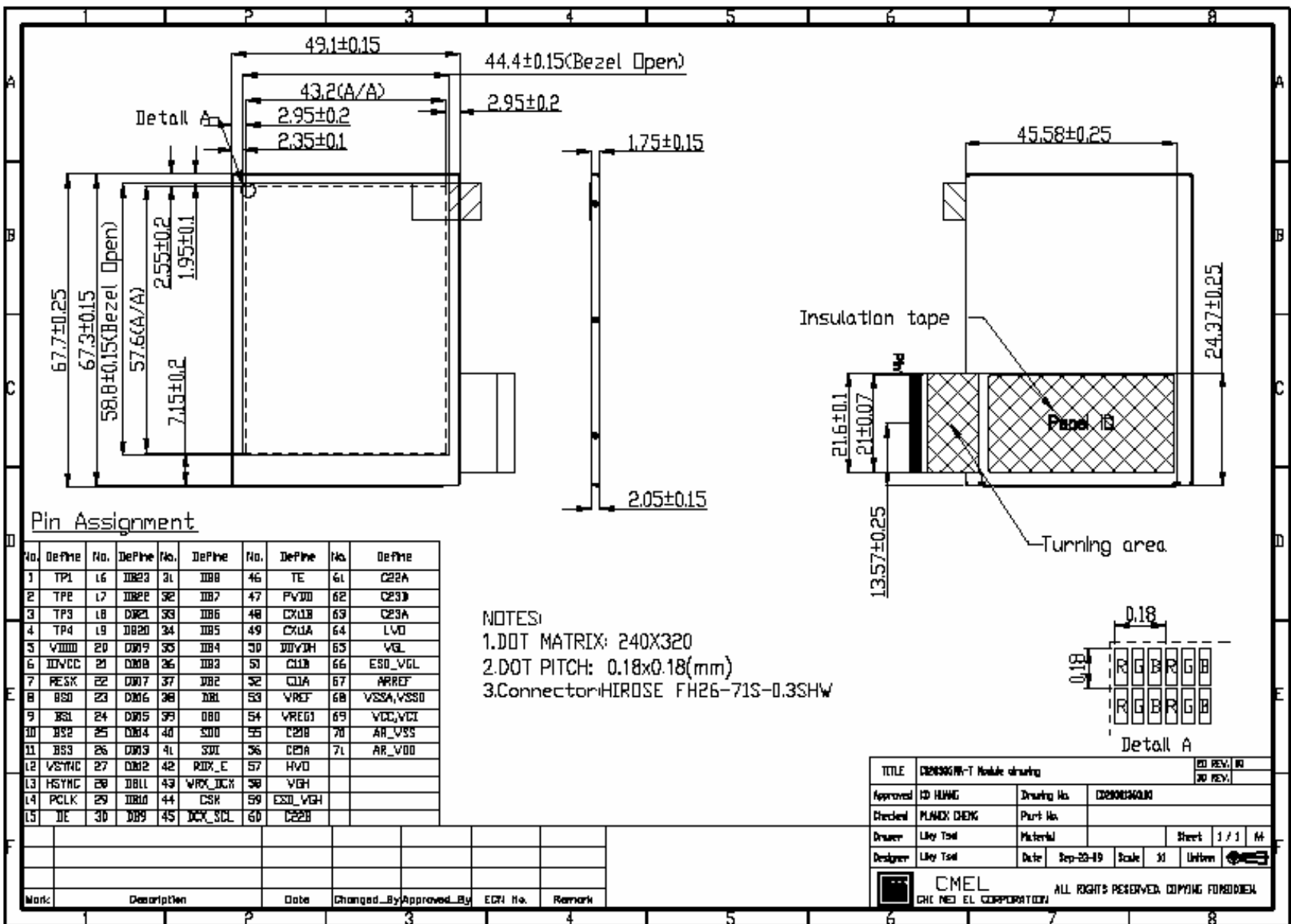
## 11 Storage

- 11.1 Storing in a polyethylene bag with the opening sealed.
- 11.2 Placing in a dark place where neither exposure to direct sunlight nor any fluorescent light is permitted and keep at room temperature & room humidity.
- 11.3 Storing with no contact with polarizer surface.

( It is recommended to store them in the inner container which we delivered. )



12 External Dimension:





13. Package:

