

LCD Controller Manual

MMS3224K Version 1.05

3 48-6

110002

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1. MMS3224K ,

2. MMS3224K Connector

- 2-1 LCD Module Interface Connector
- 2-2 LCD Module Interface Connector
- 2-3 Parallel Connector
- 2-4 Backlight Power Connector
- 2-5 RS-232C Connector
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3.

3-1.

4. MMS3224K Image Overwrite

[1.] MMS3224K

Special Font

1. MMS3224K

◆ MMS3224K

- LCD Resolution : Mono STN 320*240 dots
- : , KS5601
- LCD Bias Voltage 가
- LCD Back Light : Inverter _On/Off 가
- Font : , 16*16 dots
, 8*16 dots
16*16
- Touch Panel Interface
- Image File Memory : 320*240 BMP 53 [Page] 가
(Serial overwrite program)

◆ MMS3224K

- CPU : ARM7TDMI 32bit Processor
- Display Type : Mono STN 320*240 dots
- : +5[VDC]
- : 700[mA]
- LCD Backlight Inverter
- : RS-232C => 9600, 19200, 57600, 115200 [bps]
(Default 57600[bps])
- 8 Bit Parallel
- Reset
- Busy

◆ MMS3224K

- : 가 2 , 2 , 가 2
- Graphic : , Line, Rectangle, ,
- LCD Bias Voltage
- / Font
- 320*240 Mono BMP Image display 가 (53 [Page])
- Image display (Text)
-
- Cursor
- Clear : Block Clear , Clear
-
- Rectangle

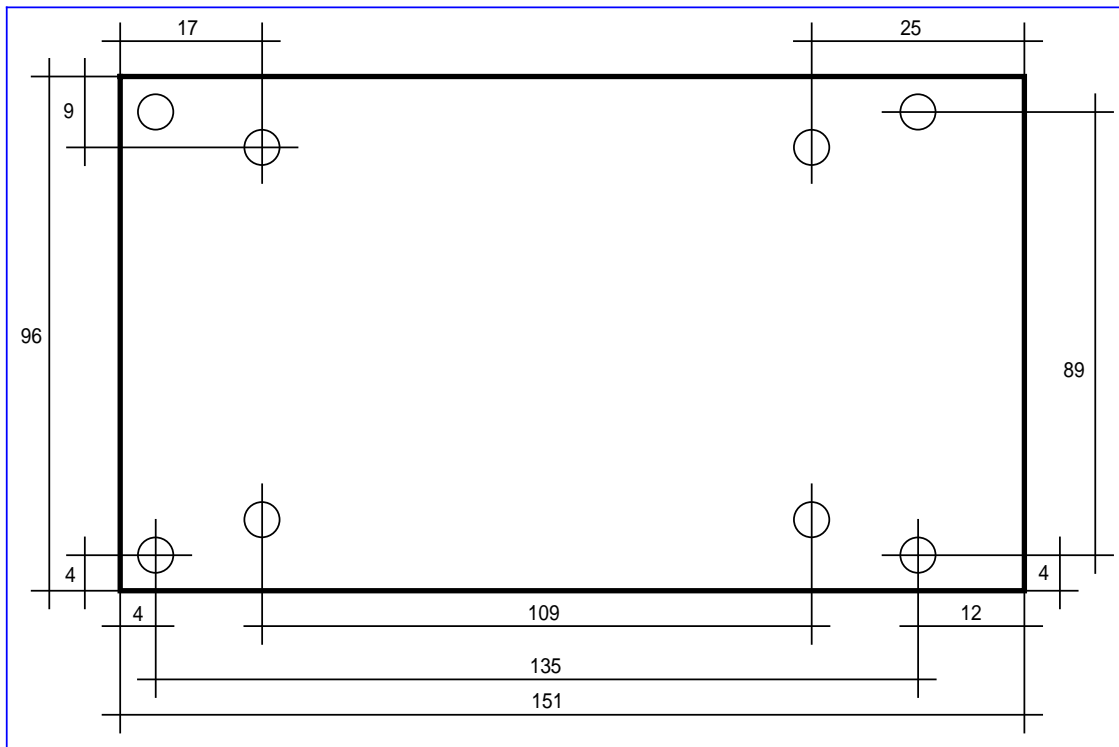
2. MMS3224K Connector

2 MMS3224K Dimensions Connector

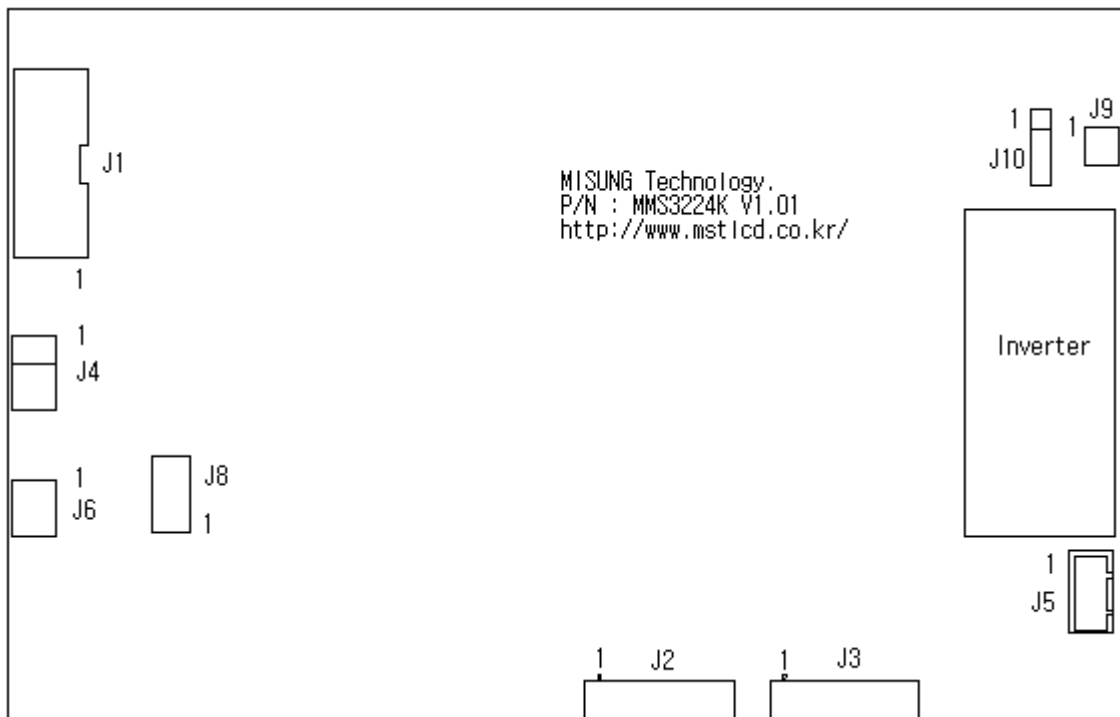
MMS3224K



MMS3224K Dimensions



LCD Controller Connector



2-1. LCD Module Interface Connector : J2

Pin Number	Symbol	Description
1	FLM	Display cycle clock
2	M	Frame modulation signal
3	CL1	Data latch signal
4	CL2	Data shift signal
5	DISP	Display Enable/Disable
6	D0	Display data line
7	D1	Display data line
8	D2	Display data line
9	D3	Display data line
10	VDD	Power supply (+5V)
11	VSS	GND
12	VEE	Power supply for LCD
13	VO	Power supply for LCD
14	FG	Open

**** J2 connector 가 LCD Module List

SAMSUNG UG32F03-BCW

EDTC EW50397BCW

2-2. LCD Module Interface Connector : J3

Pin Number	Symbol	Description
1	D0	Display data line
2	D1	Display data line
3	D2	Display data line
4	D3	Display data line
5	DISP	Display off control signal
6	FLM	Display cycle clock
7	M	Frame modulation signal
8	CL1	Data latch signal
9	CL2	Data shift signal
10	VDD	Power supply (+5V)
11	VSS	Ground
12	VEE	Power supply for LCD
13	VO	Power supply for LCD
14	FG	Open

**** J3 Connector 가 LCD Module List

EDTC : EW32F10BCW

: EW32F10NCW

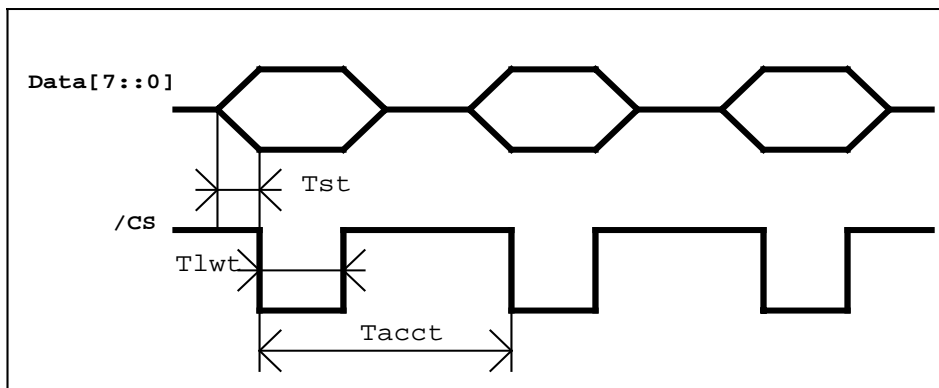
: EW32F10FCW

PalmTech : PMG3224A2

2-3. Parallel Connector: J1

Pin Number	Symbol	Description
1	BUSY	Busy Output
2	RESERVED	Reserved
3	RST	Reset (High Active)
4	RESERVED	Reserved
5	GND	Ground
6	/CS	Chip Select(Falling Edge Active)
7	D7	Data 7
8	D6	Data 6
9	D5	Data 5
10	D4	Data 4
11	D3	Data 3
12	D2	Data 2
13	D1	Data 1
14	D0	Data 0

Parallel Timing



Tst : Setup Time [Min,]

Tlwt : Low Width Time [Min,]

Tacct : Access Time [Min,]

2-4. Backlight Power Connector : J5

Pin Number	Symbol	Description
1	OUT	CCFL OUT
2	OPEN	OPEN
3	OPEN	OPEN
4	OUT_COM	CCFL_COM OUT

2-5. RS-232C Connector : J4

Pin Number	Symbol	Description
1	RXD	Receive Data : LCD Controller
2	TXD	Transmit Data : LCD Controller
3	GND	Ground

2-6. Power Connector : J6

Pin Number	Symbol	Description
1	VCC	+5[VDC]/700 [mA]
2	GND	Ground

2-7. Touch Connector : J9

Pin Number	Symbol	Description
1	X+	
2	Y-	
3	X-	
4	Y+	

2-8. Touch Connector : J10

Pin Number	Symbol	Description
1	X+	
2	Y-	
3	X-	
4	Y+	

***** J10 5.7" Touch Panel Touch Panel**

2-9. Serial Baud Rate : J8

Pin Number	Symbol	Description
1	-	Parallel Enable/Disable
2	-	4,7" or 5.7" Select
3	-	BaudRate Select
4	-	BaudRate Select

**** Parallel Input : J8 1 ON**

: J8 1 OFF

**** 4,7" LCD Touch Panel : J8 2 OFF**

**** 5,7" LCD Touch Panel : J8 2 ON**

**** BaudRate J8 Head pin .**

Pin NO.	J8 3	J8 4	BaudRate [bps]
	ON	ON	9,600
	ON	OFF	19,200
	OFF	ON	57,600
	OFF	OFF	115,200

3.

'Esc' = 0x1b [hex]

			Parameter	
'Esc'	'K'	'0x01'		
		'0x02'		KS5601
		'0x03'		(default)
		'0x04'		
'Esc'	'E'	'0x01'		
		'0x02'		
		'0x03'		(default)
		'0x04'		
'Esc'	'P'	'0x01'		Text
		'0x02'		Text
		'0x03'		Reserved
		'0x04'		Reserved
		'0x05'		Text ON
		'0x06'		Text OFF
		'0x07'		Text Font ON
		'0x08'		Text Font 가 ON
		'0x09'		Text Font ON
		'0x0a'		Text Font OFF
		'0x0b'		Reserved
		'0x0c'		Reserved
		'0x0d'		Reserved
		'0x0e'		Reserved
		'0x0f'		Text ON
		'0x10'		Text OFF
'0x11'		Reserved		
'0x12'		Reserved		
'Esc'	'D'	'0x01'		Text clear
		'0x02'	(X1,Y1,X2,Y2)	Text clear (X1,Y1,X2,Y2 hex 가 :0x00 ~ 0x27 :0x00 ~ 0x0e)
		'0x03'		Reserved
		'0x04'	(X1,Y1,X2,Y2)	Reserved
'Esc'	'C'	'0x01'	(X,Y)	Text X,Y cursor Text Display (X,Y hex 가 :0x00 ~ 0x27 :0x00 ~ 0x0e)
		'0x02'		Reserved

			Parameter	
		'0x03'		Cursor - Line
		'0x04'		Cursor - Box
		'0x05'		Cursor - Off
		'0x06'	(X,Y)	(X, Y) X:0x0000 ~ 0x013f Y:0x00 ~ 0xEf
'Esc'	'L'	'0x01'		CCFL Power ON
		'0x02'		CCFL Power OFF
'Esc'	'V'	'0x01'		LCD Bias Voltage UP
		'0x02'		LCD Bias Voltage DOWN
'Esc'	'G'	'0x01'	(X,Y)	Graphic _____ X:0x0000 ~ 0x013f Y:0x00 ~ 0xEf
		'0x02'	(X,Y)	Graphic _____ X:0x0000 ~ 0x013f Y:0x00 ~ 0xEf
		'0x03'	(X1,Y1,X2,Y2)	Graphic <u>Line</u> X1,X2:0x0000 ~ 0x013f Y1,Y2:0x00 ~ 0xEf
		'0x04'	(X1,Y1,X2,Y2)	Graphic <u>Line</u> X1,X2:0x0000 ~ 0x013f Y1,Y2:0x00 ~ 0xEf
		'0x05'	(X1,Y1,X2,Y2)	Graphic <u>Rectangle</u> X1,X2:0x0000 ~ 0x013f Y1,Y2:0x00 ~ 0xEf
		'0x06'	(X1,Y1,X2,Y2)	Graphic <u>Rectangle</u> X1,X2:0x0000 ~ 0x013f Y1,Y2:0x00 ~ 0xEf
		'0x07'	(X1,Y1,X2,Y2)	Graphic <u>Rectangle</u> X1,X2:0x0000 ~ 0x013f Y1,Y2:0x00 ~ 0xEf
		'0x08'	(X1,Y1,X2,Y2)	Graphic <u>Rectangle</u> X1,X2:0x0000 ~ 0x013f Y1,Y2:0x00 ~ 0xEf
		'0x09'	(X,Y,radius)	Graphic _____ X Y X:0x0000 ~ 0x013f Y:0x00 ~ 0xEf Radius :0x00 ~ 0x78
		'0x0a'	(X,Y,radius)	Graphic _____ X Y X:0x0000 ~ 0x013f Y:0x00 ~ 0xEf Radius :0x00 ~ 0x78
		'0x0b'	(X,Y,radius)	Graphic _____ X Y X:0x0000 ~ 0x013f Y:0x00 ~ 0xEf Radius :0x00 ~ 0x78
		'0x0c'	(X,Y,radius)	Graphic _____ X Y X:0x0000 ~ 0x013f Y:0x00 ~ 0xEf Radius :0x00 ~ 0x78
		'0x0d'	(X,Y,a,b)	Graphic _____ X Y X:0x0000 ~ 0x013f Y:0x00 ~ 0xEf a :320/2 b :240/2
		'0x0e'	(X,Y,a,b)	Graphic _____ X Y X:0x0000 ~ 0x013f Y:0x00 ~ 0xEf a :320/2 b :240/2

			Parameter	
		'0x0f'	(X,Y,a,b)	Graphic _____ X Y _____ X:0x0000 ~ 0x013f Y:0x00 ~ 0xEf a :320/2 b :240/2
		'0x10'	(X,Y,a,b)	Graphic _____ X Y _____ X:0x0000 ~ 0x013f Y:0x00 ~ 0xEf a :320/2 b :240/2
'Esc'	'A'	'0x01'		Reset (MMS3224K Rebooting)
		'0x02'		LCD Bias Voltage
		'0x03'		Echo '0x06' Send
		0x04		User font display 16Byte Send Image data가 16Byte dummy data 16Byte
'Esc'	'I'	'0x01'	(X)	Image One page draw (X 0x00~0x34)
		'0x02'		Select Text (default)
		'0x03'		Reserved
		'0x04'	(X1,Y1)	Image X1:0x00 ~ 0x140, Y1:0x00 ~ 0xf0 Ex) 10, 10 ->0x00, 0x0a, 0x0a X1 Y1 -> "0x05" image draw
		'0x05'	(I, X1)	I : Image Page Number(1byte) X1: 0x04 X1, Y1 Image number (0x00, 0x00 -> 2byte)
		'0x06'	(I,X1,Y1,X2,Y2)	I: Page Number, X1,Y1(start point), X2,Y2(end point) 2byte
		'0x07'	(I,X1,Y1,X2,Y2)	I: Page Number, 1byte X1,Y1 - image start point X2,Y2 - image size
'Esc'	'T'	'0x01'		Reserved
		'0x02'		Reserved
		'0x03'		Touch start -> Touch input -> Send to serial X,Y value coordinate -> #UP#
		'0x04'		Touch off
		'0x0a'		Touch calibration Data #OK# data가
'Esc'	'S'	'0x01'	(I)	I->1byte(0~9) SDRM Page number display data SDRAM 1page #OK# data가
		'0x02'	(I)	I->1byte(0~9) SDRM Page number SDRAM 1page display.
		'0x03'	(I)	I->1byte(0~9) SDRM Page number SDRAM 1page delete.

			Parameter			
		'0x04'		SDRAM page l->1byte(0~9) SDRM Page number x1,x2,y1->start sx1,sx2,sy2-> d1, d2, dy2->SDRAM	size point	
		'0x05'		cursor l display l->1byte(0~9) SDRM Page number x1,x2,y1->start sx1,sx2,y1->Imgag size	size	
		'0x06'		SDRAM flash l1->SDRAM page number l2->Flash memory page number #OK# data	data(1page)	

3-1.

Parameter '+'
 'Esc' = 0x1b

Graphic X MMS3224K byte
 X 가 1 byte byte
 . (byte Graphic X(X1 X2)
 .)

Text	Clear
	'ESC'+ 'D'
	'0x01' or '0x02'
Parameter	'X1'+ 'Y1'+ 'X2'+ 'Y2'
	'ESC'+ 'D'+ '0x01' => Text Clear) Text (5, 0, 20, 11) Clear => 'ESC'+ 'D'+ '0x02'+ '0x05'+ '0x00'+ '0x14'+ '0x0b' , Text X1 X2 0x00 ~ 0x27 Text Y1 Y2 0x00 ~ 0x0e , Text 8*16 dots Text X 320/8 0x00 ~ 0x27 . Y 240/16 0x00 ~ 0x0e가

Text	Cursor
	'ESC'+ 'C'
	'0x01' or '0x02' or '0x03 or '0x04' or '0x05' or '0x06'
Parameter	'X'+ 'Y' or 'None'
	'ESC'+ 'C'+ '0x01'+ 'X'+ 'Y' => Text (X, Y) Cursor (Graphic Cursor .) (Text) : X 0x00 ~ 0x27, Y 0x00 ~ 0x0e 'ESC'+ 'C'+ '0x06'+ 'X'+ 'Y' => Text (X, Y) Display (X, Y) (0~319, 0~239) , Text Dot Display가 X 0x0000 ~ 0x013f, Y 0x00 ~ 0xef X MMS3224K byte

Graphic /

	'ESC'+ 'G'
	'0x01' or '0x02'
Parameter	'X'+ 'Y'
	<p>'ESC'+ 'G'+ '0x01'+ 'X'+ 'Y' => (X, Y) .</p> <p>) Graphic (50, 80)</p> <p>=> 'ESC'+ 'G'+ '0x01'+ <u>'0x00'+ '0x32'</u>+ '0x50'</p> <p>'ESC'+ 'G'+ '0x02'+ 'X'+ 'Y' => (X, Y) .</p> <p>) Graphic (310, 80)</p> <p>=> 'ESC'+ 'G'+ '0x02'+ <u>'0x01'+ '0x36'</u>+ '0x50'</p> <p style="text-align: center;">X</p> <hr/> <p>(Graphic) : X 0x0000~0x013f, Y 0x00~0xef</p> <hr/> <p>Graphic X MMS3224K byte</p> <hr/> <p>(50, 80) X 가 1 byte</p> <hr/> <p>byte</p>

Graphic Line /

	'ESC'+ 'G'
	'0x03' or '0x04'
Parameter	'X1'+ 'Y1'+ 'X2'+ 'Y2'
	<p>'ESC'+ 'G'+ '0x03'+ 'X1'+ 'Y1'+ 'X2'+ 'Y2'</p> <p>=> (X1,Y1,X2,Y2) Line .</p> <p>) Graphic (0, 10, 319, 229) Line</p> <p>=> 'ESC'+ 'G'+ '0x03'+ <u>'0x00'+ '0x00'</u>+ '0x0a'+ <u>'0x01'+ '0x3f'</u>+ '0xe5'</p> <p>'ESC'+ 'G'+ '0x04'+ 'X1'+ 'Y1'+ 'X2'+ 'Y2'</p> <p>=> (X1,Y1,X2,Y2) Line .</p> <p>) Graphic (0, 10, 319, 229) Line</p> <p>=> 'ESC'+ 'G'+ '0x04'+ <u>'0x00'+ '0x00'</u>+ '0x0a'+ <u>'0x01'+ '0x3f'</u>+ '0xe5'</p> <p style="text-align: center;">X1, X2</p> <hr/> <p>(Graphic) : X 0x0000~0x013f, Y 0x00~0xef</p>

Graphic	/	Rectangle	/
	'ESC'+ 'G'		
	'0x05' or '0x06' or '0x07' or '0x08'		
Parameter	'X1'+ 'Y1'+ 'X2'+ 'Y2'		
	<pre>'ESC'+ 'G'+ '0x05'+ 'X1'+ 'Y1'+ 'X2'+ 'Y2' => (X1,Y1,X2,Y2) Rectangle .) Graphic (10, 10, 100, 100) Rectangle => 'ESC'+ 'G'+ '0x05'+ '0x00'+ '0x0a'+ '0x0a'+ '0x00'+ '0x64'+ '0x64' 'ESC'+ 'G'+ '0x06'+ 'X1'+ 'Y1'+ 'X2'+ 'Y2' => (X1,Y1,X2,Y2) Rectangle .) Graphic (10, 10, 100, 100) Rectangle => 'ESC'+ 'G'+ '0x06'+ '0x00'+ '0x0a'+ '0x0a'+ '0x00'+ '0x64'+ '0x64' 'ESC'+ 'G'+ '0x07'+ 'X1'+ 'Y1'+ 'X2'+ 'Y2' => (X1,Y1,X2,Y2) Rectangle .) Graphic (10, 10, 100, 100) Rectangle => 'ESC'+ 'G'+ '0x07'+ '0x00'+ '0x0a'+ '0x0a'+ '0x00'+ '0x64'+ '0x64' 'ESC'+ 'G'+ '0x08'+ 'X1'+ 'Y1'+ 'X2'+ 'Y2' => (X1,Y1,X2,Y2) Rectangle .) Graphic (10, 10, 100, 100) Rectangle => 'ESC'+ 'G'+ '0x08'+ '0x00'+ '0x0a'+ '0x0a'+ '0x00'+ '0x64'+ '0x64'</pre> <p style="text-align: center;">X1, X2</p> <hr/> <p style="text-align: center;">(Graphic) : X 0x0000~0x013f, Y 0x00~0xef</p>		

Graphic	/		/
	'ESC'+ 'G'		
	'0x09' or '0x0a' or '0x0b' or '0x0c'		
Parameter	'X'+ 'Y'+ radius		
	<pre>'ESC'+ 'G'+ '0x09'+ 'X'+ 'Y'+ 'radius' => (X,Y) 'radius' .) Graphic (100, 100) radius=50 => 'ESC'+ 'G'+ '0x09'+ '0x00'+ '0x64'+ '0x64'+ '0x32' 'ESC'+ 'G'+ '0x0a'+ 'X'+ 'Y'+ 'radius' => (X,Y) 'radius' .) Graphic (100, 100) radius=50 => 'ESC'+ 'G'+ '0x0a'+ '0x00'+ '0x64'+ '0x64'+ '0x32' 'ESC'+ 'G'+ '0x0b'+ 'X'+ 'Y'+ 'radius' => (X,Y) 'radius' .) Graphic (100, 100) radius = 50 => 'ESC'+ 'G'+ '0x0b'+ '0x00'+ '0x64'+ '0x64'+ '0x32' 'ESC'+ 'G'+ '0x0c'+ 'X'+ 'Y'+ 'radius' => (X,Y) 'radius' .) Graphic (100, 100) radius = 50 => 'ESC'+ 'G'+ '0x0c'+ '0x00'+ '0x64'+ '0x64'+ '0x32'</pre> <p style="text-align: center;">X</p> <hr/> <p style="text-align: center;">(Graphic) : X 0x0000~0x013f, Y 0x00~0xef radius '0x01' ~ '0x78'</p>		

Image display

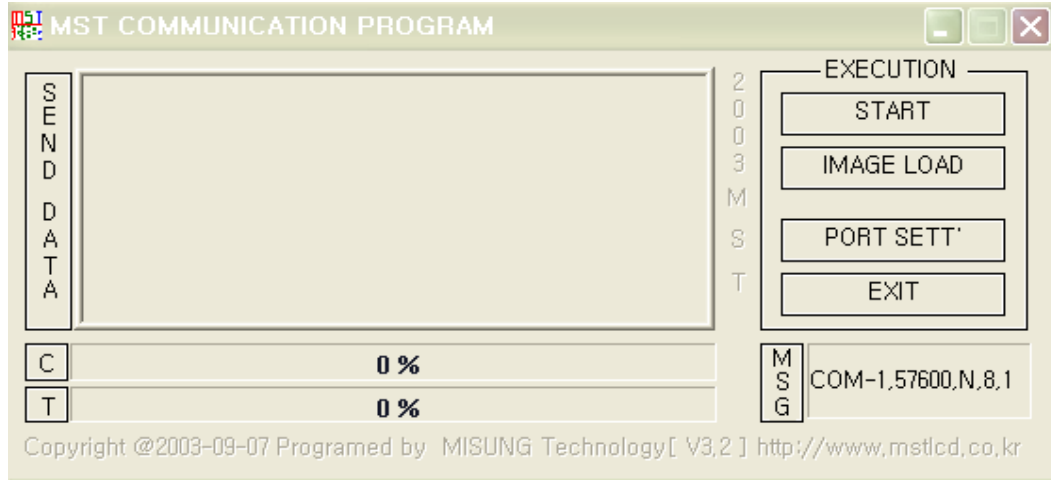
	'ESC'+'I'
	'0x01' or '0x02'
Parameter	'X'
	<p>'ESC'+'I'+ '0x01'+ 'X' => Image display x (page number) Memory Image display . 'X' [0x00 ~ 0x34] Display default가 Text Graphic 가 .) Image Text Display - 'ESC'+'I'+ '0x01'+ '0x02' => 320*240 Text . 'ESC'+'I'+ '0x02' => Image display at Text(default) 'ESC'+'I'+ '0x03' => Image display at Graphic</p>

Touch

	'ESC'+'T'
	'0x03' or '0x04' or '0x0a'
Parameter	
	<p>'ESC'+'T'+ '0x03' => Touch Panel X,Y ASCII format (xxx,yyy) Touch .(Touch event) ** (10, 200) 0x30 0x31 0x30 0x2C 0x32 0x30 0x30 [Hex Format]</p>

4. MMS3224K Image Overwrite

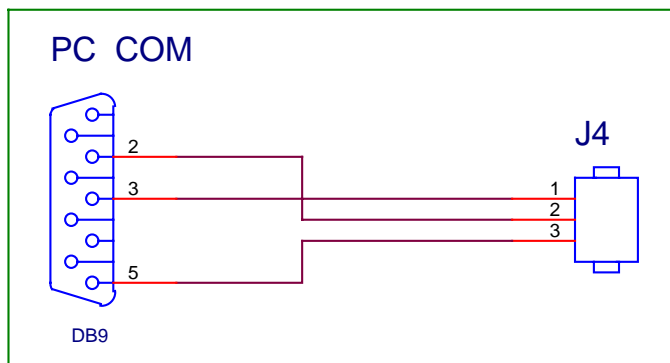
Image Overwrite Application Program



Overwrite Application Program

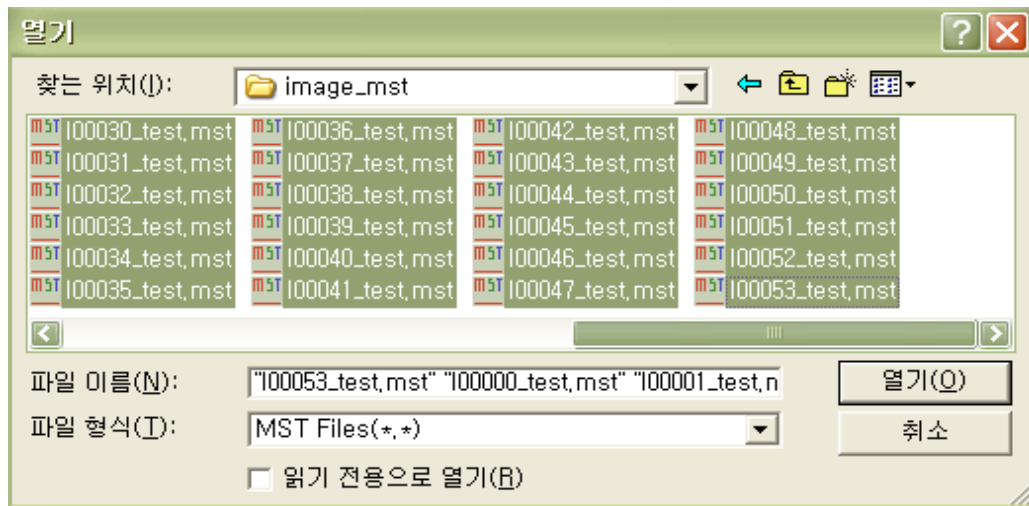
MMS3224K Image display
Image page Overwrite

, MMS3224K PC Serial Cable

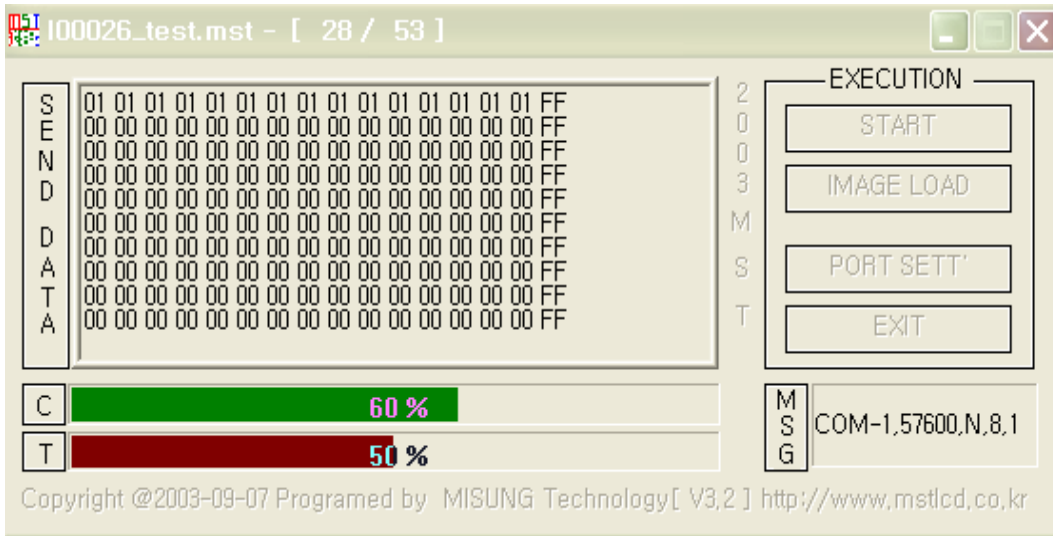


'IMAGE LOAD'

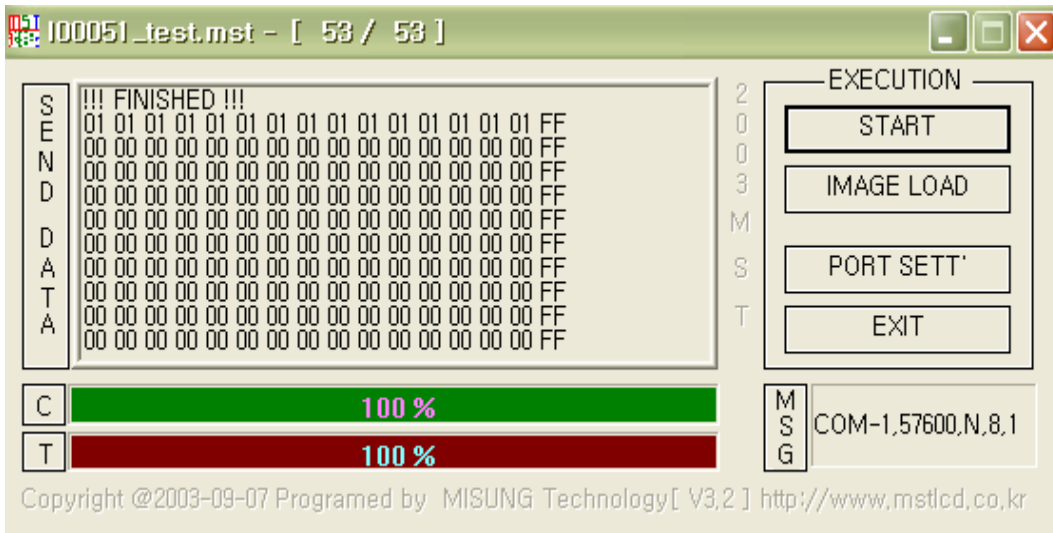
image



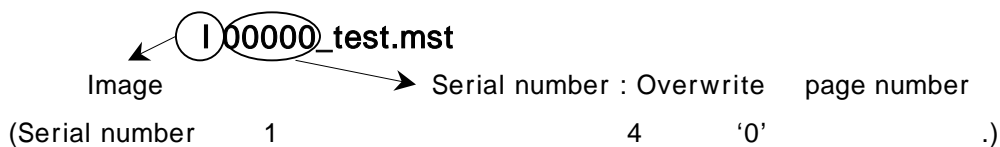
, 'START' MMS3224K Overwrite



Bar Bar Download
 , Bar
 Bar 가 '100%' Image Overwrite



'IMAGE LOAD' Image



Ex) 1 page Overwrite file I00001_test.mst

[1.] MMS3224K

Special Font

< 1- 1 > MMS3224K

(Special Font)

Special

< 1- 1 >

	0x00	0x01	0x02	0x03	0x04	0x05	0x06	0x07	0x08	0x09	0x0A	0x0B	0x0C	0x0D	0x0E	0x0F
0x00		☎	☎	☎	☎	☎	☎	☎		No.	Co.	TM.	am.		FM.	Tel.
0x10	I	II	III	IV	V	VI	VII	VIII	IX	X	ℓℓ	mℓ	dℓ	ℓ	kℓ	cc
0x20	mm ³	cm ³	m ³	km ³	fm	nm	μm	mm	cm	km	mm ²	cm ²	m ²	km ²	ha	ℓg
0x30	m _g	k _g	kt	cal	kcal	dB	m _s	m _s ²	ps	ns	μs	ms	pV	nV	μV	mV
0x40	kV	MV	PA	nA	μA	mA	KA	FW	nW	μW	mW	kW	MW	Hz	kHz	MHz
0x50	GHz	THz	Ω	kΩ	MΩ	PF	nF	μF	mol	cd	rad	rad _s	rad _s ²	sr	Pa	kPa
0x60	MPa	GPa	Wb	Im	lx	Bq	Gy	Sv	°/kg	㉿	㊀	㊁	㊂	㊃	㊄	㊅
0x70	㊆	㊇	㊈	㊉	㊊	㊋	㊌	㊍	㊎	㊏	㊑	㊒	㊓	㊔	㊕	㊖
0x80	㊗	㊘	㊙	㊚	㊛	㊜	㊝	㊞	㊟	㊠	㊡	㊢	㊣	㊤	㊥	㊦
0x90	㊧	㊨	㊩	㊪	㊫	㊬	㊭	㊮	㊯	㊰	㊱	㊲	㊳	㊴	㊵	㊶
0xA0	㊷	㊸	㊹	㊺	㊻	㊼	㊽	㊾	㊿	①	②	③	④	⑤	⑥	⑦
0xB0	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	⑲	⑳	㉑	㉒	㉓
0xC0	㉔	㉕	㉖	㉗	㉘	㉙	㉚	㉛	㉜	㉝	㉞	㉟	㊀	㊁	㊂	㊃
0xD0	㊄	㊅	㊆	㊇	㊈	㊉	㊊	㊋	㊌	㊍	㊎	㊏	㊑	㊒	㊓	㊔
0xE0	㊕	㊖	㊗	㊘	㊙	㊚	㊛	㊜	㊝	㊞	㊟	㊠	㊡	㊢	㊣	㊤
0xF0	㊥	㊦	㊧	㊨	㊩	㊪	㊫	㊬	㊭	㊮	㊯	㊰	㊱	㊲	㊳	㊴

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