

LCD Controller Manual

MMS3224K-WT Version 1.04

3 48-6

110002

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[1.] MMS3224K-WT Special Font

1. MMS3224K - WT

◆ MMS3224K - WT

- 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 - WT

- 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

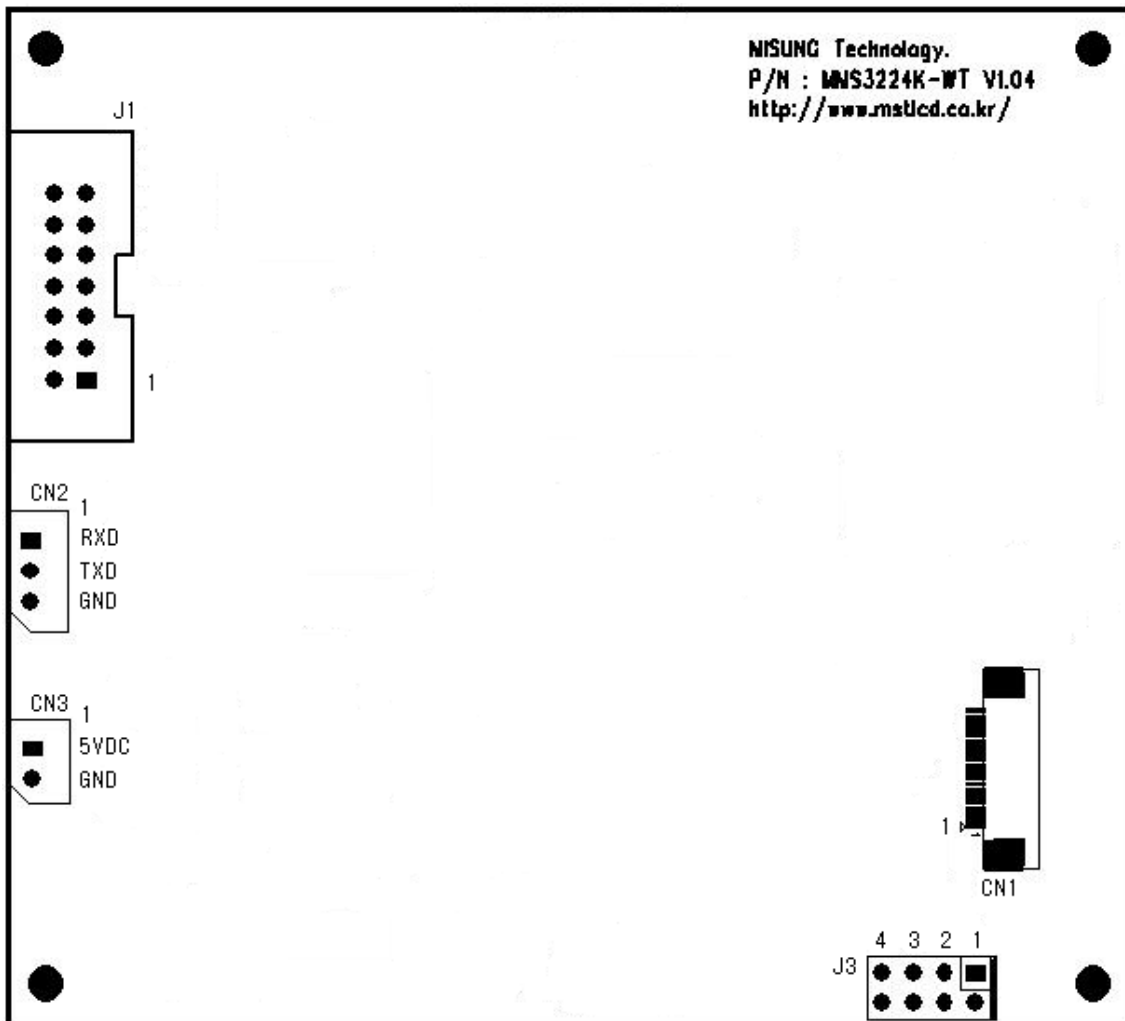
◆ MMS3224K - WT

- : 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-WT Connector

2 MMS3224K-WT Dimensions Connector

MMS3224K-WT Connector



2-1. LCD Module Interface Connector : CN1

Pin Number	Symbol	Description
1	VDD	Power
2	FG	Frame Ground
3	VLCD	Power
4	FLM	Frame modulation signal
5	DISP	Display Enable/Disable
6	M	AC Signal
7	CL1	Data latch signal
8	CL2	Data shift signal
9	VSS	GND
10	D0	Display data line
11	D1	Display data line
12	D2	Display data line
13	D3	Display data line
14	VSS	GND
15	A(+)	Power LED (+)
16	K(-)	Power LED (-)
17	NC	No Connection
18	NC	No Connection
19	NC	No Connection
20	NC	No Connection

2-2. Parallel Connector: J1

Pin Number	Symbol	Description
1	BUSY	Busy Output
2	GND	GND
3	RST	Reset (High Active)
4	+5[VDC]	Power +5[VDC]
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

2-3. RS-232C Connector : CN2

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

2-4. Power Connector : CN3

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

2-5. Serial Baud Rate : J3

Pin Number	Symbol	Description
1	-	Parallel Enable/Disable
2	-	Reserved
3	-	BaudRate Select
4	-	BaudRate Select

**** Parallel Input : J3 1 ON**

: J3 1 OFF

**** BaudRate J3 Head pin .**

Pin NO.	J3 3	J3 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'			3-1-1
		'0x02'		KS5601	
		'0x03'		(default)	
		'0x04'			
'Esc'	'E'	'0x01'			3-1-2
		'0x02'			
		'0x03'		(default)	
		'0x04'			
'Esc'	'P'	'0x01'		Text	3-1-3
		'0x02'		Text	
		'0x03'		Reserved	3-1-4
		'0x04'		Reserved	
		'0x05'		Text ON	3-1-5
		'0x06'		Text OFF	
		'0x07'		Text Font ON	3-1-6
		'0x08'		Text Font 가 ON	
		'0x09'		Text Font ON	
		'0x0a'		Text Font OFF	
		'0x0b'		Reserved	3-1-7
		'0x0c'		Reserved	
		'0x0d'		Reserved	
		'0x0e'		Reserved	
		'0x0f'		Text ON	3-1-8
		'0x10'		Text OFF	
'0x11'		Reserved			
'0x12'		Reserved			
'Esc'	'D'	'0x01'		Text clear	3-1-9
		'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)	3-1-10
		'0x02'		Reserved	

			Parameter		
		'0x03'		Reserved	
		'0x04'		Reserved	
		'0x05'		Reserved	
		'0x06'	(X,Y)	(X, Y) X:0x0000 ~ 0x013f Y:0x00 ~ 0xEf	
'Esc'	'L'	'0x01'		CCFL Power ON	3-1-11
		'0x02'		CCFL Power OFF	
'Esc'	'V'	'0x01'		LCD Bias Voltage UP	3-1-12
		'0x02'		LCD Bias Voltage DOWN	
'Esc'	'G'	'0x01'	(X,Y)	Graphic _____ X:0x0000 ~ 0x013f Y:0x00 ~ 0xEf	3-1-13
		'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	3-1-14
		'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	3-1-15
		'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	3-1-16
		'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	3-1-17
		'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-WT Rebooting)	3-1-18
		'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)	3-1-19
		'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	3-1-20
		'0x02'		Reserved	
		'0x03'		Touch start -> Touch input -> Send to serial X,Y value coordinate ->Touch end	
'Esc'	'Z'	'0x01'		Viewport	3-1-21
		'0x02'		Viewport	

3-1.

Parameter '+'
 'Esc' = 0x1b

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

3-1-1.

	'ESC'+ 'K'
	'0x01' or '0x02' or '0x03' or '0x04'
Parameter	
	'ESC'+ 'K'+ '0x01' => 'ESC'+ 'K'+ '0x02' => KS5601 'ESC'+ 'K'+ '0x03' => (default) 'ESC'+ 'K'+ '0x04' =>

3-1-2.

	'ESC'+ 'E'
	'0x01' or '0x02' or '0x03' or '0x04'
Parameter	
	'ESC'+ 'E'+ '0x01' => ASCII 256 'ESC'+ 'E'+ '0x02' => 'ESC'+ 'E'+ '0x03' => (default) 'ESC'+ 'E'+ '0x04' =>

3-1-3. Text

	'ESC'+ 'P'
	'0x01' or '0x02'
Parameter	
	'ESC'+ 'P'+ '0x01' => Text 'ESC'+ 'P'+ '0x02' => Text

3-1-4. Reserved

3-1-5. Text ON/OFF

	'ESC'+ 'P'
	'0x05' or '0x06'
Parameter	
	'ESC'+ 'P'+ '0x05' => Text ON 'ESC'+ 'P'+ '0x06' => Text OFF

3-1-6. Text

	'ESC'+ 'P'
	'0x07' or '0x08' or '0x09' or '0x0a'
Parameter	
	'ESC'+ 'P'+ '0x07' => Text Font 8*16 dots => 16*32 dots , 16*16 dots => 32*32 dots 'ESC'+ 'P'+ '0x08' => Text Font 가 8*16 dots => 16*16 dots , 16*16 dots => 32*16 dots 'ESC'+ 'P'+ '0x09' => Text Font 8*16 dots => 8*32 dots , 16*16 dots => 16*32 dots 'ESC'+ 'P'+ '0x0a' => Text Font OFF

3-1-7. Reserved

3-1-8. Text ON/OFF

	'ESC'+ 'P'
	'0x0f' or '0x10'
Parameter	
	'ESC'+ 'P'+ '0x0f' => Text ON 'ESC'+ 'P'+ '0x10' => Text OFF

3-1-9. 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 .

3-1-10. Text Cursor

	'ESC'+ 'C'
	'0x01' 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-WT byte .

3-1-11. CCFL Power ON/OFF

	'ESC'+ 'L'
	'0x01' or '0x02'
Parameter	
	'ESC'+ 'L'+ '0x01' => CCFL Power ON 'ESC'+ 'L'+ '0x02' => CCFL Power OFF

3-1-12. LCD Bias Voltage UP/DOWN

	'ESC'+ 'V'
	'0x01' or '0x02'
Parameter	
	'ESC'+ 'V'+ '0x01' => LCD Bias Voltage UP 'ESC'+ 'V'+ '0x02' => LCD Bias Voltage DOWN

3-1-13. Graphic /

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

3-1-14. Graphic Line /

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

3-1-15. 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' X1, X2 (Graphic) : X 0x0000~0x013f, Y 0x00~0xef</pre>

3-1-16. 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' X (Graphic) : X 0x0000~0x013f, Y 0x00~0xef radius '0x01' ~ '0x78'</pre>

3-1-19. 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>

3-1-20. Touch

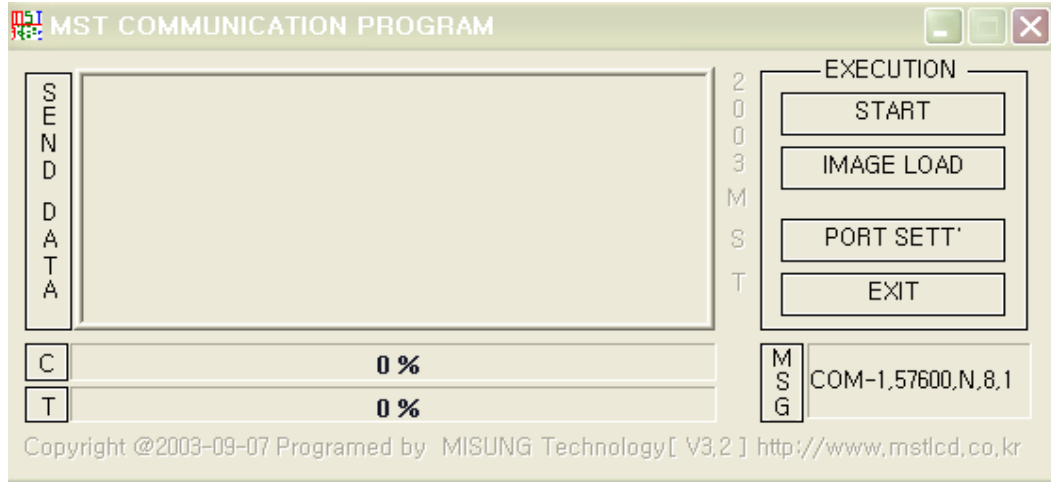
	'ESC'+ 'T'
	'0x03'
Parameter	
	<p>'ESC'+ 'T'+ '0x03' => Touch Panel X,Y ASCII format (xxx,yyy) Touch .(Touch event) ** (10, 200) 0x30 0x31 0x30 0x2C 0x32 0x30 0x30 [Hex Format]</p>

3-1-21. Viewport

	'ESC'+ 'Z'
	'0x01' or '0x02'
Parameter	
	<p>'ESC'+ 'Z'+ '0x01' => Viewport 'ESC'+ 'Z'+ '0x02' => Viewport</p>

4. MMS3224K-WT Image Overwrite

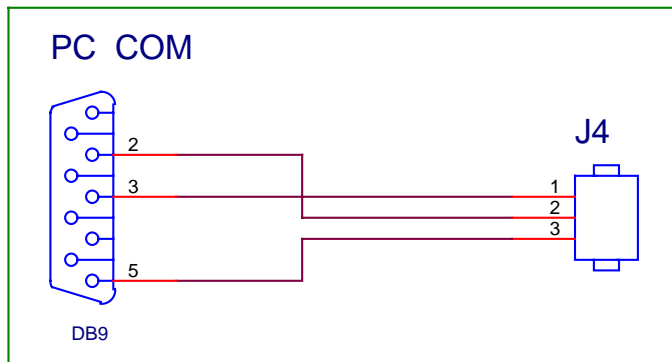
Image Overwrite Application Program



Overwrite Application Program

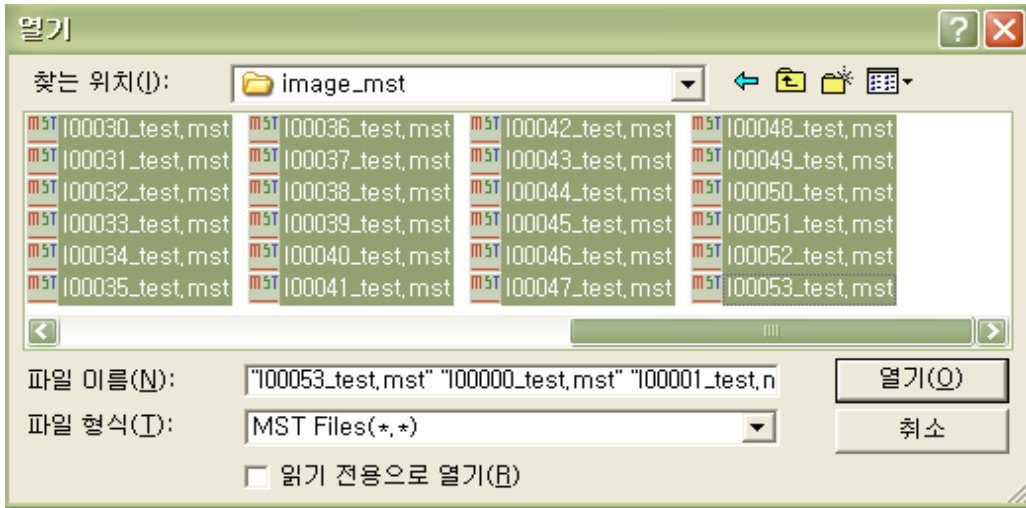
MMS3224K-WT Image display
Image page Overwrite

, MMS3224K-WT PC Serial Cable

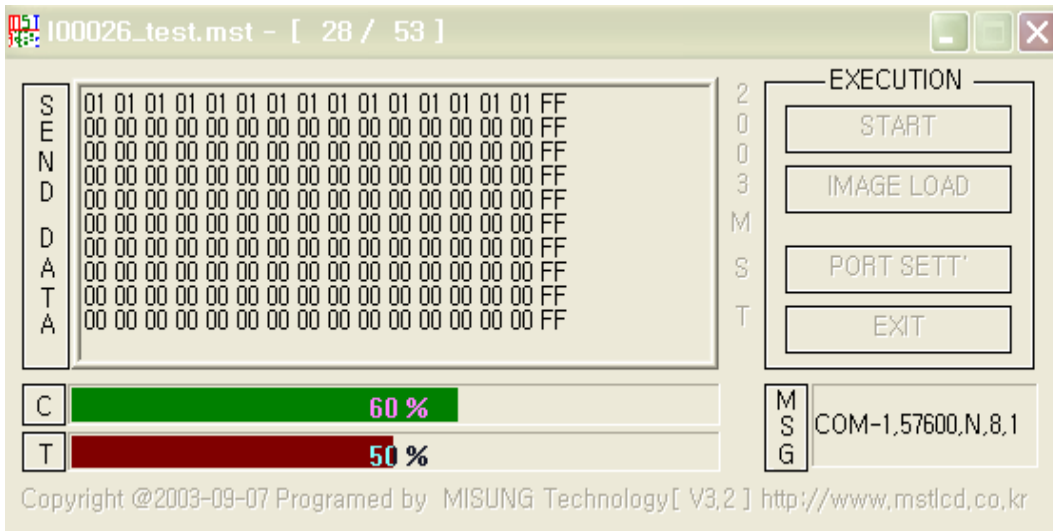


'IMAGE LOAD'

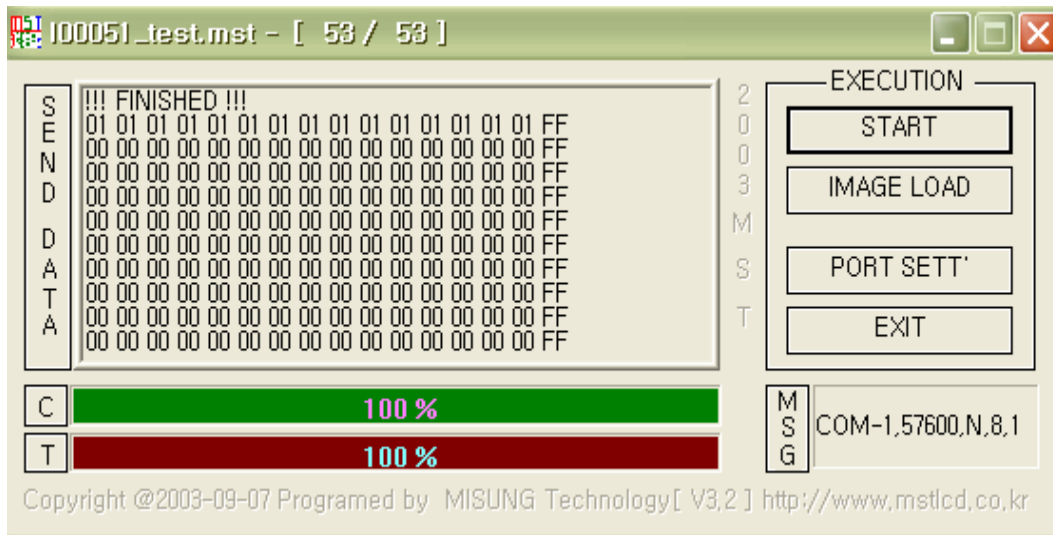
image



, 'START' MMS3224K-WT Overwrite

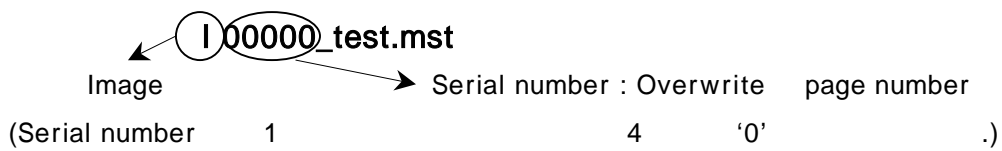


Bar Bar Download
 , Bar
 Bar 가 '100%' Image Overwrite



'IMAGE LOAD'

Image



Ex) 1 page Overwrite file I00001_test.mst

[1.] MMS3224K-WT

Special Font

< 1- 1 > MMS3224K-WT (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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