LCM SPECIFICATIONS

(using)

LCM MODE: GRAPHIC

PRODUCTION CODE: LCM12864Q

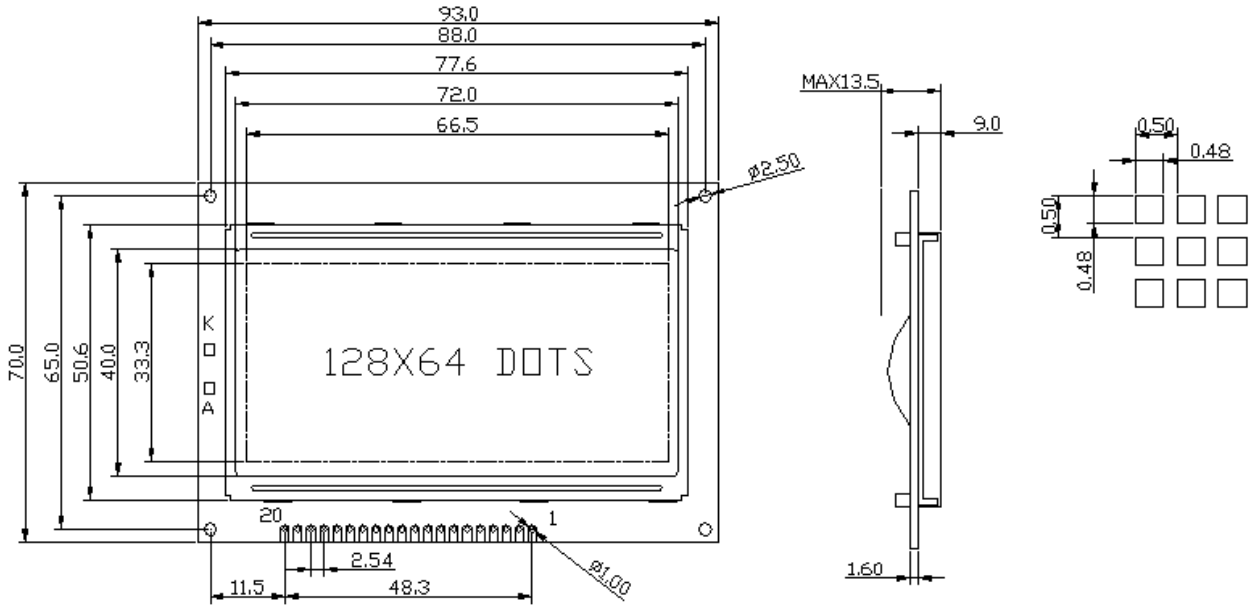
REVISION: ver1.0

DATE: 2008.6.27

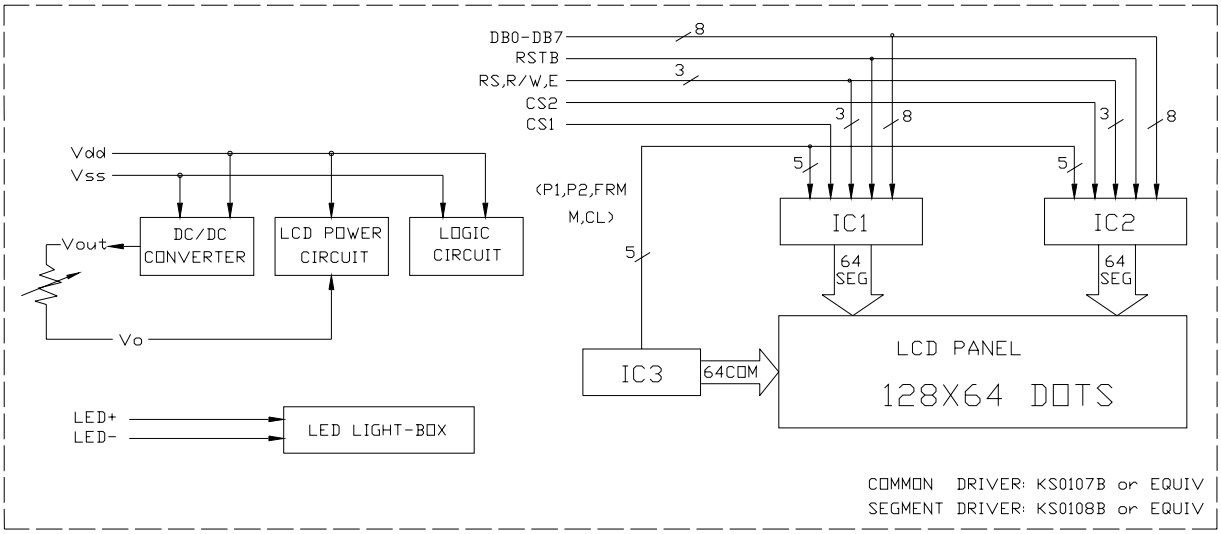
■ PHYSICAL DATA

Item	Contents	Unit
LCD type	STN	---
LCD duty	1/64	---
LCD bias	1/8	---
Viewing direction	6	---
Module size (W×H×T)	93.0 × 70.0 × 13.5 MAX	mm
Viewing area (W×H)	72.0 × 40.0	mm
Number of Dots	128 x 64	dots
Dot size (W×H)	0.48 × 0.48	mm
Dot pitch (W×H)	0.5 × 0.5	mm

■ EXTERNAL DIMENSIONS



■ BLOCK DIAGRAM



■ INTERFACE PIN CONNECTIONS

PIN	SYMBOL	SIGNAL DESCRIPTION
1	VSS	Ground(0V)
2	VDD	Logic voltage supply (+5.0V)
3	V0	LCD driver voltage input
4	RS	Data/Instruction register select
5	R/W	Read/Write select
6	E	Enable signal
7~14	DB0~DB7	Data bus line
15	CS1	Chip select1
16	CS2	Chip select 2
17	/RST	Reset signal
18	VEE	Negative voltage output
19	A	LED backlight anode
20	K	LED backlight cathode

■ ELECTRICAL CHARACTERISTICS (VDD = +5V±10% , VSS = 0V, Ta = 25° C)

1.Electro-Optic Characteristics(module unit):

ITEM	SYMBOL	MIN	TYP	MAX	Unit	CONDITION
Input high voltage	V_{IH}	0.7VDD	-	VDD	V	
Input low voltage	V_{IL}	0	-	0.3VDD	V	
Output high voltage	V_{OH}	2.4	-	-	V	
Output low voltage	V_{OL}	-	-	0.4	V	
Frame frequency	F_f	-	70	-	H_Z	F_{OSC}=430 KH_Z
Oscillation frequency	F_{OSC}	315	430	585	KH_Z	VDD=5V Rf=47kΩ ±2%

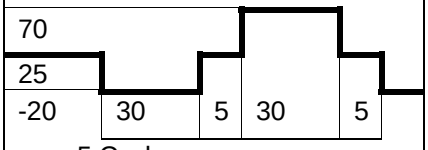
Condition:TEMP=(23±3)℃

No.	ITEM		SYMBOL	MIN	TYP	MAX	Unit	CONDITION
1	Supply voltage(Logic)		VDD-VSS	4.5	5.0	5.5	V	
2	Supply current (Logic)		IDD		8.75		mA	VDD=5V
3	LCD operating voltage		VDD-V0		13.5		V	0℃
				12.0	11.8	12.5	V	25℃
					11.0		V	50℃
4	Response time		Ton		176		ms	
			Toff		77		ms	
5	Contrast		CR	3				
6	Viewing angel	12H	θ1		54		Deg.	(CR≥3.0)
		6H	θ2		43			
		3H	θ3		60			
		9H	θ4		60			

2.Electrical-optical Characteristics(LED unit):

ITEM	SYMBOL	MIN	TYP	MAX	Unit	CONDITION
Forward Voltage	VF		5.0		V	IF=330mA
Forward Current	IF		330		mA	
Reverse Voltage	VR		10		V	
Reverse Current	IR		0.2		mA	
Power Dissipation	PD		0.67		W	IF=160 mA
Luminous Intensity	LV		210		cd/m²	IF=160 mA
Emission Wavelength	ΛP		568		nm	IF=10 mA Ta=25℃
Spectral Range	Δ Λ		35		nm	

■ RELIABILITY TEST

No.	ITEM	TEST CONDITION	EQUIPMENT	TEST RESULT
1	High Temp Storage	Temp:70±2℃ Time:96h Restore:24h	Tenny	Passed
2	Low Temp Storage	Temp:-20±3℃ Time:96h Restore:24h	Tenny	Passed
3	High Temp Static drive	Temp:50±2℃ Vop:5V Time:24h Restore:24h	Tenny	Passed
4	Low Temp Static drive	Temp:0±3℃ Vop:5V Time:24h Restore:24h	Tenny	Passed
5	High Temp High Hum Storage	Temp:40±2℃ Hum:95%Rh Time:96h Restore:24h	Tenny	Passed
6	Thermal Shock	Temp:(℃)  5 Cycles Restore:24h	Tenny	Passed

■ ABSOLUTE MAXIMUM RATINGS (Ta = 25° C)

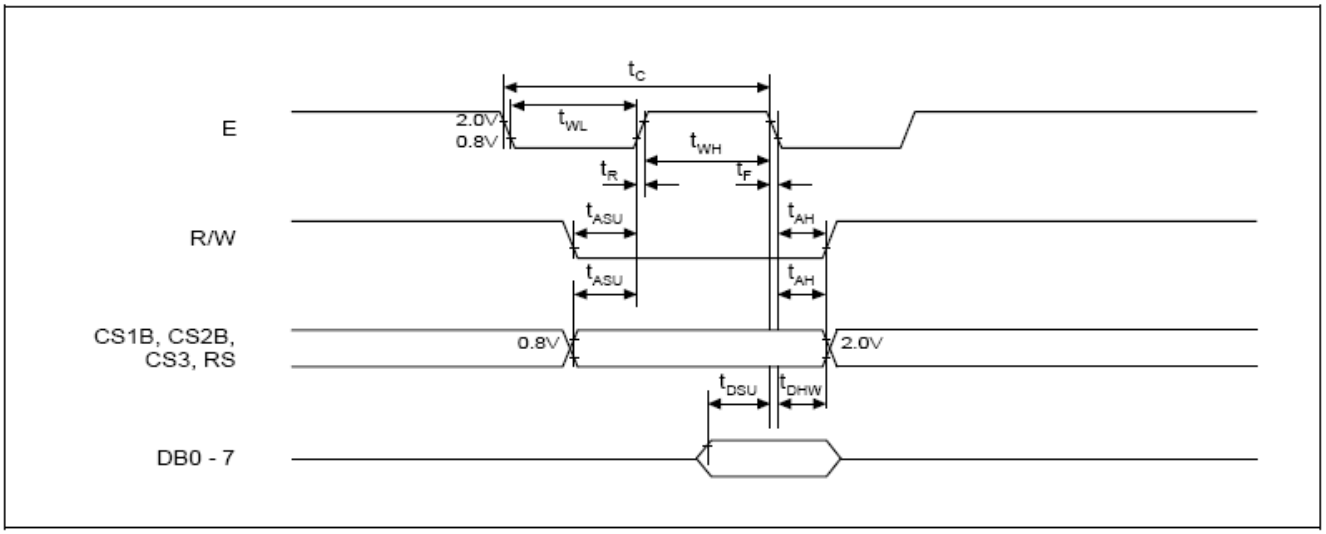
PARAMETER	SYMBOL	MIN	MAX	Unit
Supply voltage for logic	VDD	-0.3	7.0	V
Supply voltage for LCD	VDD - VO	-0.3	17.0	V
Input voltage	VI	-0.3	VDD+0.3	V
Operating temperature	TOP	-10	60	° C
Storage temperature	TST	-10	60	° C

■TIMING CHARACTERISTICS(VDD=4.5 to 5.5V)

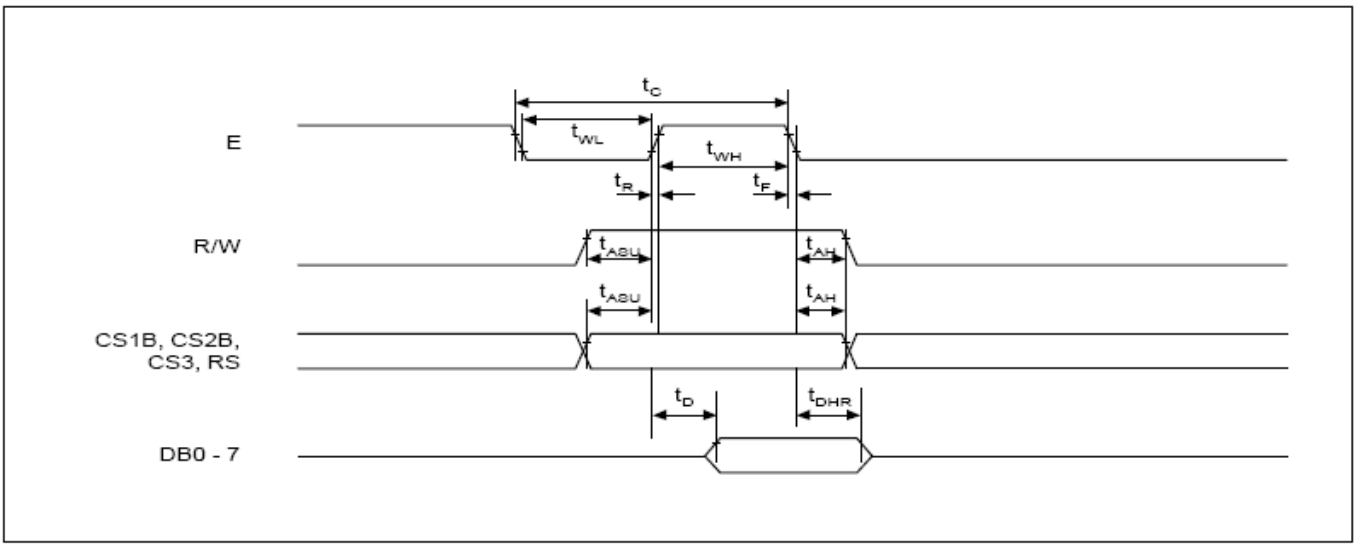
Write operation and Read operation

Characteristic	Symbol	Min	Typ	Max	Unit
E cycle	t_C	1000	-	-	ns
E high level width	t_{WH}	450	-	-	ns
E low level width	t_{WL}	450	-	-	ns
E rise time	t_R	-	-	25	ns
E fall time	t_F	-	-	25	ns
Address set-up time	t_{ASU}	140	-	-	ns
Address hold time	t_{AH}	10	-	-	ns
Data set-up time	t_{DSU}	200	-	-	ns
Data delay time	t_D	-	-	320	ns
Data hold time (write)	t_{DHW}	10	-	-	ns
Data hold time (read)	t_{DHR}	20	-	-	ns

Write Operation:



Read Operation



■ INSTRUCTION SETS

1.Instruction Table

Instruction	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Function
Display on/off	L	L	L	L	H	H	H	H	H	L/H	Controls the display on or off. Internal status and display RAM data is not affected. L: OFF, H: ON
Set address (Y address)	L	L	L	H	Y address (0 - 63)						Sets the Y address in the Y address counter.
Set page (X address)	L	L	H	L	H	H	H	Page (0 - 7)			Sets the X address at the X address register.
Display start line (Z address)	L	L	H	H	Display start line (0 - 63)						Indicates the display data RAM displayed at the top of the screen.
Status read	L	H	Busy	L	On / Off	Reset	L	L	L	L	Read status. BUSY L: Ready H: In operation ON/OFF L: Display ON H: Display OFF RESET L: Normal H: Reset
Write display data	H	L	Write data								Writes data (DB0:7) into display data RAM. After writing instruction, Y address is increased by 1 automatically.
Read display data	H	H	Read data								Reads data (DB0: 7) from display data RAM to the data bus.

EXAMPLE OF PROGRAME：

```
;
; This source file is for 128*64 dots liquid crystal graphic module drived
; by SAMSUNG's KS0107 & KS0108.
;
;     DATA1   EQU  30H
      DATA2   EQU  31H
      X       EQU  32H
      Y       EQU  33H
      TER0    EQU  34H
      TER1    EQU  35H
      COUNTER EQU  36H
      ADDRH   EQU  37H
      CTRL    EQU  38H
      CTWL    EQU  39H
      DARL    EQU  3AH
      DAWL    EQU  3BH
      ROW     EQU  3EH
      COLUMN  EQU  3FH
      N       EQU  40H
;
       RS   bit   p2.0
       RW   bit   p2.1
       E    bit   p2.2
       CSA  bit   p2.3
       CSB  bit   p2.4
;
      ORG   0000H
      AJMP  CBEGIN
;
      ORG   0040H
CBEGIN:   NOP
      NOP
      MOV   SP,#50H
      SETB  EA;     open interrupter
      SETB  EX1;    open ZD1
      CLR   IT1;    active low level
      NOP
CINITIAL: NOP
      MOV   A,#0C0H; set display start line 0
      LCALL CWRCTRL
      NOP
      MOV   A,#0B8H; set page address 0
      LCALL CWRCTRL
      NOP
      MOV   A,#40H;  set column address 0
      LCALL CWRCTRL
      NOP
      MOV   A,#3FH;  set display ON
      LCALL CWRCTRL
      NOP
      LCALL CCLRRAM
CDISALL:  MOV   DATA1,#0FFH
      MOV   DATA2,#0FFH
      MOV   TER1,#03H
      LCALL CWRITE;  display full screen
```

```
    LCALL DELAY1S
    LCALL CCLRRAM
    NOP

CDISROW:  MOV   DATA1,#55H
    MOV   DATA2,#55H
    MOV   TER1,#01H
    LCALL CWRITE;    one row on, one row off
    LCALL DELAY1S
    NOP
    MOV   DATA1,#0AAH
    MOV   DATA2,#0AAH
    MOV   TER1,#01H
    LCALL CWRITE;    one row on, one row off
    LCALL DELAY1S
    NOP
CDISCOL:  MOV   DATA1,#0FFH
    MOV   DATA2,#00H
    MOV   TER1,#01H
    LCALL CWRITE;  one column on, one column off
    LCALL DELAY1S
    NOP
    MOV   DATA1,#00H
    MOV   DATA2,#0FFH
    MOV   TER1,#01H
    LCALL CWRITE; one column on, one column off
    LCALL DELAY1S
    NOP
CDISDOT:  NOP
    MOV   DATA1,#0AAH
    MOV   DATA2,#55H
    MOV   TER1,#01H
    LCALL CWRITE;    one dot on, one dot off
    LCALL DELAY1S
    NOP
    MOV   DATA1,#55H
    MOV   DATA2,#0AAH
    MOV   TER1,#01H
    LCALL CWRITE;    one dot on, one dot off
    LCALL DELAY1S
      LCALL DELAY1S
       LCALL DELAY1S
    NOP
    LCALL CCLRRAM
       MOV DPTR, #WXZ1
     MOV R6,DPH
     MOV R7,DPL
     LCALL WXZ
      LCALL DELAY1S
       LCALL DELAY1S
        LCALL DELAY1S
     MOV DPTR,#WXZ2
     MOV R6,DPH
     MOV R7,DPL
     LCALL WXZ
      LCALL DELAY1S
       LCALL DELAY1S
        LCALL DELAY1S
       LCALL CCLRRAM
```

```
      LJMP  CINITIAL
      NOP
      NOP;------------------
;
;
CCLRRAM:  MOV   DATA1,#00H
      MOV   DATA2,#00H
      MOV   TER1,#01H
      LCALL CWRITE;   clear disram
      RET
      NOP;--------------------


CWRCTRL:   PUSH  DPH        ;WRITE  MIDDLE
      PUSH  DPL
      CLR   CSA
        CLR   CSB
        CLR   RS
        SETB  RW
        PUSH  ACC
 WCL:    MOV   P0,#0FFH
        SETB  E
        MOV   A, P0
        CLR   E
        JB    ACC.7,WCL
        CLR   RW
        POP   ACC
        MOV   P0,A
        SETB   E
        CLR    E


      POP   DPL
      POP   DPH
      RET
      NOP;---------------------
CWRDATA:  PUSH  DPH
      PUSH  DPL


      CLR   CSA
        SETB  CSB
        CLR   RS
        SETB  RW
        PUSH  ACC
 WDM:    MOV   P0,#0FFH
        SETB  E
        MOV   A, P0
        CLR   E
        JB    ACC.7,WDM
        SETB  RS
        CLR   RW
        POP   ACC
        MOV   P0,A
        SETB   E
        CLR    E
      POP   DPL
      POP   DPH
```

```
      PUSH  DPH          ;WRITE  RIGHT
     PUSH  DPL
     SETB  CSA
      CLR   CSB
      CLR   RS
      SETB  RW
      PUSH  ACC
WDR:    MOV   P0,#0FFH
      SETB  E
      MOV   A, P0
      CLR   E
      JB    ACC.7,WDR
      SETB  RS
      CLR   RW
      POP   ACC
      MOV   P0,A
      SETB   E
      CLR    E
     POP   DPL
     POP   DPH
     RET
     NOP;----------------------

CWRITE:   MOV   X,#00H;  start page address 0
CWRITE1:  MOV   A,X
     ORL   A,#0B8H; set page address
     LCALL CWRCTRL
     NOP
     MOV   A,#40H;  set column address 0
     LCALL CWRCTRL
     NOP
     MOV   Y,#32;   set column counter
CWRITE2:  MOV   A,DATA1
     LCALL CWRDATA
     MOV   A,DATA2
     LCALL CWRDATA
     LCALL DELAY
     DJNZ  Y,CWRITE2
     INC   X
     MOV   A,X
     CJNE  A,#08H,CWRITE1
     RET
     NOP;-----------------------


WXZ:
      MOV R4,#00H
      MOV R0,#00H
      MOV DPH,R6
      MOV DPL,R7

 WLOOP:  MOV A,R4
      ORL A,#0B8H
      LCALL  CWRCTRL
      MOV A,#40H
      LCALL  CWRCTRL
      NOP
WRPAGE1:
      LCALL WRPAGE
      INC R4
```

```
      CJNE R4,#8,WLOOP
       RET


WRPAGE:
      MOV R3,#64
WLOOP2:  LCALL WRMIDDLE
      NOP
      NOP
      INC  DPTR
      DJNZ R3,WLOOP2
      MOV R3,#64
WLOOP3:  LCALL WRRIGHT
      NOP
      NOP
      INC  DPTR
      DJNZ R3,WLOOP3
      RET

WRMIDDLE: PUSH ACC
       MOV A,#0
       MOVC A,@A+DPTR

        PUSH  DPH        ;WRITE  MIDDLE
     PUSH  DPL
     CLR   CSA
       SETB  CSB
       CLR   RS
       SETB  RW
       PUSH  ACC
 WDM1:    MOV   P0,#0FFH
       SETB  E
       MOV   A, P0
       CLR   E
       JB    ACC.7,WDM1
       SETB  RS
       CLR   RW
       POP   ACC
       MOV   P0,A
       SETB   E
       CLR    E
     POP   DPL
     POP   DPH
       POP ACC
       RET
WRRIGHT:  PUSH ACC
       MOV A,#00H
       MOVC A, @A+DPTR
       PUSH  DPH          ;WRITE  RIGHT
     PUSH  DPL
     SETB  CSA
       CLR   CSB
       CLR   RS
       SETB  RW
       PUSH  ACC
 WDR1:    MOV   P0,#0FFH
       SETB  E
       MOV   A, P0
       CLR   E
       JB    ACC.7,WDR1
```

```
        SETB  RS
        CLR   RW
        POP   ACC
        MOV   P0,A
        SETB   E
        CLR    E
       POP   DPL
       POP   DPH
        POP ACC
        RET


DELAY:    PUSH  TER1
      PUSH  TER0
DELAY1:   MOV   TER0,#250;    delay TER1 ms
DELAY2:   DJNZ  TER0,DELAY2
      DJNZ  TER1,DELAY1
      NOP
      POP   TER0
      POP   TER1
      RET
      NOP;----------------------
DELAY500: NOP;                delay 500 sec
      PUSH  TER1
      MOV   TER1,#250
      LCALL DELAY
      LCALL DELAY
      POP   TER1
      RET
      NOP;----------------------
DELAY1S:  NOP;                delay 1 sec
      PUSH  TER1
      MOV   TER1,#250
      LCALL DELAY
      LCALL DELAY
      LCALL DELAY
      LCALL DELAY
      POP   TER1
      RET
      NOP;----------------------
 wxz1: DB  000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,080H,080H,080H,0F0H
DB  000H,000H,0F0H,080H,080H,040H,000H,000H,000H,020H,020H,0A0H,0A0H,0A8H,0B0H,0A0H
DB  0A0H,0A0H,020H,020H,000H,000H,000H,010H,050H,050H,050H,0F8H,050H,050H,050H,050H
DB  000H,000H,000H,000H,010H,010H,010H,010H,010H,010H,010H,010H,000H,000H,000H,000H
DB  080H,040H,030H,020H,040H,0C0H,080H,0E0H,000H,000H,0F8H,000H,000H,020H,060H,0A8H
DB  030H,0A0H,060H,000H,0F0H,010H,010H,010H,000H,000H,000H,000H,0C0H,030H,000H,000H
DB  000H,030H,040H,080H,000H,000H,000H,050H,050H,050H,050H,050H,050H,050H,050H,010H
DB  0F0H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB  000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,010H,010H,008H,07FH
DB  000H,000H,03FH,020H,020H,020H,030H,000H,000H,020H,010H,00BH,042H,042H,07EH,002H
DB  002H,00BH,010H,020H,000H,000H,001H,001H,07FH,02BH,02BH,02BH,02BH,06BH,07FH,001H
DB  001H,000H,000H,001H,061H,051H,04DH,023H,021H,021H,029H,031H,061H,001H,000H,001H
DB  001H,07FH,041H,041H,051H,07FH,000H,00FH,000H,040H,07FH,000H,000H,035H,02DH,045H
DB  07FH,00DH,055H,035H,01FH,001H,07FH,001H,001H,000H,002H,021H,070H,028H,026H,021H
DB  020H,028H,030H,061H,003H,000H,000H,000H,01FH,009H,009H,009H,009H,01FH,000H,040H
DB  07FH,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB  000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,0C0H,040H,040H
DB  07CH,050H,050H,050H,0D0H,010H,000H,000H,000H,000H,0F8H,0C8H,038H,090H,070H,01CH
DB  0D0H,010H,010H,010H,000H,000H,000H,0F8H,088H,048H,0B8H,028H,0A8H,068H,008H,0F8H
DB  000H,000H,000H,080H,088H,0F8H,088H,0F8H,088H,080H,020H,010H,088H,040H,000H,000H
```

```
DB  020H,048H,010H,010H,0D0H,030H,094H,0F8H,050H,050H,0D0H,000H,000H,000H,000H,0F8H
DB  0A8H,0A8H,0A8H,0A8H,0A8H,0F8H,000H,000H,000H,000H,020H,020H,0FCH,0A0H,030H,0D0H
DB  07CH,050H,07CH,050H,0D0H,000H,040H,040H,0F8H,040H,040H,020H,020H,0FCH,020H,020H
DB  0E0H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB  000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,020H,01FH,002H,01AH
DB  022H,002H,01AH,002H,007H,008H,030H,000H,000H,000H,03FH,008H,007H,005H,005H,005H
DB  03FH,005H,005H,005H,000H,000H,000H,03FH,012H,012H,016H,01BH,01BH,012H,012H,03FH
DB  000H,000H,000H,000H,030H,00FH,000H,03FH,020H,020H,011H,011H,008H,006H,000H,000H
DB  030H,00EH,000H,001H,03FH,011H,011H,00EH,00DH,00BH,010H,000H,000H,000H,03EH,016H
DB  016H,03EH,000H,03EH,016H,016H,016H,03EH,000H,000H,006H,001H,03FH,030H,031H,037H
DB  035H,01DH,035H,035H,037H,010H,010H,008H,00FH,028H,025H,011H,00DH,003H,003H,00DH
DB  011H,031H,001H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB  000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB  000H,000H,000H,000H,000H,000H,010H,0F0H,000H,000H,000H,000H,020H,018H,008H,008H
DB  018H,0F0H,000H,070H,088H,088H,088H,070H,000H,000H,010H,060H,080H,0C0H,060H,010H
DB  000H,000H,000H,000H,0C0H,020H,010H,000H,000H,000H,000H,080H,060H,0F0H,000H,000H
DB  000H,000H,000H,000H,000H,000H,0F0H,010H,010H,010H,010H,030H,060H,0C0H,000H,000H
DB  0C0H,030H,010H,008H,008H,008H,008H,010H,030H,0C0H,010H,010H,0F0H,010H,010H,000H
DB  000H,070H,0C8H,088H,018H,010H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB  000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB  000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB  000H,000H,000H,000H,000H,000H,000H,01FH,000H,000H,000H,000H,010H,018H,014H,012H
DB  011H,010H,00EH,019H,010H,010H,010H,019H,00EH,000H,018H,004H,003H,003H,00CH,018H
DB  000H,000H,00EH,01BH,011H,011H,011H,00EH,000H,004H,007H,004H,004H,01FH,004H,000H
DB  000H,000H,000H,000H,000H,000H,01FH,010H,010H,010H,010H,018H,00CH,007H,000H,000H
DB  003H,00CH,008H,010H,010H,010H,010H,008H,00CH,003H,000H,000H,01FH,000H,000H,000H
DB  000H,008H,010H,010H,011H,00EH,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB  000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB  000H,000H,000H,000H,000H,000H,000H,0A0H,040H,0F0H,040H,0A0H,000H,000H,000H,000H
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