



ON Semiconductor®

FCH041N65EF

N-Channel SuperFET® II FRFET® MOSFET

650 V, 76 A, 41 mΩ

Features

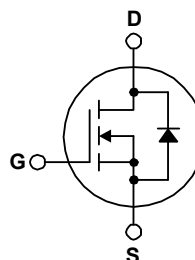
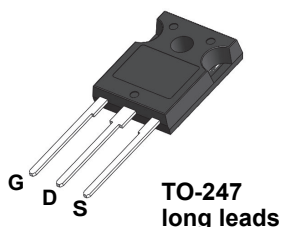
- 700 V @ $T_J = 150^\circ\text{C}$
- Typ. $R_{DS(on)} = 36\text{ m}\Omega$
- Ultra Low Gate Charge (Typ. $Q_g = 229\text{ nC}$)
- Low Effective Output Capacitance (Typ. $C_{oss(eff.)} = 631\text{ pF}$)
- 100% Avalanche Tested
- RoHS Compliant

Applications

- LCD / LED / PDP TV
- Telecom / Server Power Supplies
- Solar Inverter
- AC - DC Power Supply

Description

SuperFET® II MOSFET is ON Semiconductor's brand-new high voltage super-junction (SJ) MOSFET family that is utilizing charge balance technology for outstanding low on-resistance and lower gate charge performance. This technology is tailored to minimize conduction loss, provide superior switching performance, dv/dt rate and higher avalanche energy. Consequently, SuperFET II MOSFET is very suitable for the switching power applications such as PFC, server/telecom power, FPD TV power, ATX power and industrial power applications. SuperFET II FRFET® MOSFET's optimized body diode reverse recovery performance can remove additional component and improve system reliability.



Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	FCH041N65EF-F155	Unit
V_{DSS}	Drain to Source Voltage	650	V
V_{GSS}	Gate to Source Voltage	- DC	± 20
		- AC ($f > 1\text{ Hz}$)	± 30
I_D	Drain Current	- Continuous ($T_C = 25^\circ\text{C}$)	76
		- Continuous ($T_C = 100^\circ\text{C}$)	48.1
I_{DM}	Drain Current - Pulsed (Note 1)	228	A
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	2025	mJ
I_{AR}	Avalanche Current (Note 1)	15	A
E_{AR}	Repetitive Avalanche Energy (Note 1)	5.95	mJ
dv/dt	MOSFET dv/dt	100	V/ns
	Peak Diode Recovery dv/dt (Note 3)	50	
P_D	Power Dissipation	($T_C = 25^\circ\text{C}$)	595
		- Derate Above 25°C	4.76
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	$^\circ\text{C}$
T_L	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds	300	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	FCH041N65EF-F155	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.21	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	40	

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FCH041N65EF-F155	FCH041N65EF	TO-247 G03	Tube	N/A	N/A	30 units

Electrical Characteristics $T_C = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
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Off Characteristics

BV_{DSS}	Drain to Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 10\text{ mA}, T_J = 25^\circ\text{C}$	650	-	-	V
		$V_{GS} = 0\text{ V}, I_D = 10\text{ mA}, T_J = 150^\circ\text{C}$	700	-	-	
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 10\text{ mA}$, Referenced to 25°C	-	0.72	-	$V/^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 650\text{ V}, V_{GS} = 0\text{ V}$	-	-	10	μA
		$V_{DS} = 520\text{ V}, T_C = 125^\circ\text{C}$	-	145	-	
I_{GSS}	Gate to Body Leakage Current	$V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$	-	-	± 100	nA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 7.6\text{ mA}$	3	-	5	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{ V}, I_D = 38\text{ A}$	-	36	41	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS} = 20\text{ V}, I_D = 38\text{ A}$	-	71.7	-	S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 100\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	-	9446	12560	pF
C_{oss}	Output Capacitance		-	366	490	pF
C_{riss}	Reverse Transfer Capacitance		-	35	-	pF
C_{oss}	Output Capacitance	$V_{DS} = 380\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	-	197	-	pF
$C_{oss(eff.)}$	Effective Output Capacitance	$V_{DS} = 0\text{ V to } 400\text{ V}, V_{GS} = 0\text{ V}$	-	631	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{DS} = 380\text{ V}, I_D = 38\text{ A}, V_{GS} = 10\text{ V}$ (Note 4)	-	229	298	nC
Q_{gs}	Gate to Source Gate Charge		-	50	-	nC
Q_{gd}	Gate to Drain "Miller" Charge		-	90	-	nC
ESR	Equivalent Series Resistance	$f = 1\text{ MHz}$	-	0.6	-	Ω

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 380\text{ V}, I_D = 38\text{ A}, V_{GS} = 10\text{ V}, R_g = 4.7\ \Omega$ (Note 4)	-	55	120	ns
t_r	Turn-On Rise Time		-	65	140	ns
$t_{d(off)}$	Turn-Off Delay Time		-	175	360	ns
t_f	Turn-Off Fall Time		-	48	106	ns

Drain-Source Diode Characteristics

I_S	Maximum Continuous Drain to Source Diode Forward Current	-	-	76	A	
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current	-	-	228	A	
V_{SD}	Drain to Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_{SD} = 38\text{ A}$	-	-	1.2	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0\text{ V}, I_{SD} = 38\text{ A}, di_F/dt = 100\text{ A}/\mu\text{s}$	-	207	-	ns
Q_{rr}	Reverse Recovery Charge		-	1.5	-	μC

Notes:

1. Repetitive rating: pulse width limited by maximum junction temperature.
2. $I_{AS} = 15\text{ A}, R_G = 25\ \Omega$, starting $T_J = 25^\circ\text{C}$.
3. $I_{SD} \leq 38\text{ A}, di/dt \leq 200\text{ A}/\mu\text{s}, V_{DD} \leq 380\text{ V}$, starting $T_J = 25^\circ\text{C}$.
4. Essentially independent of operating temperature typical characteristics.

Typical Performance Characteristics

Figure 1. On-Region Characteristics

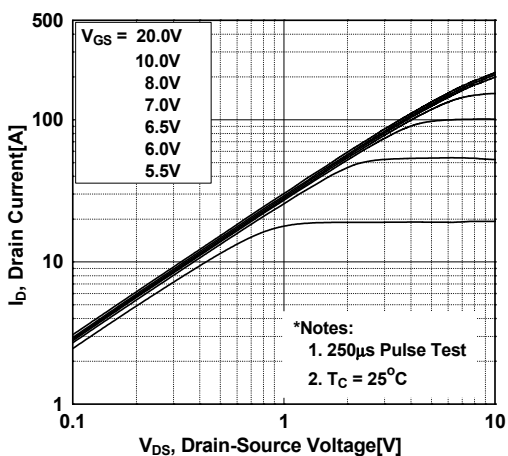


Figure 2. Transfer Characteristics

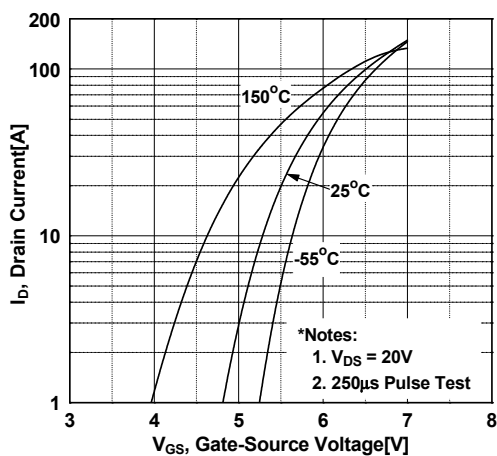


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

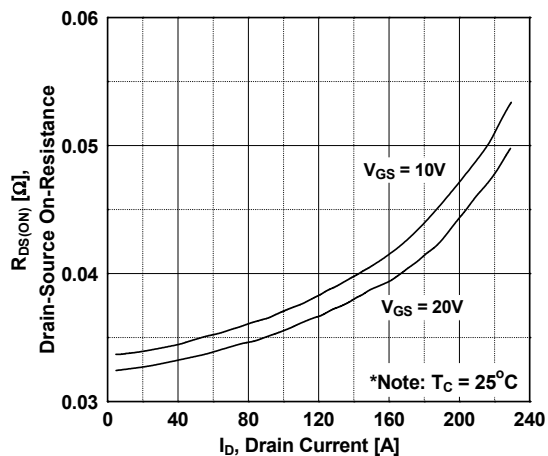


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

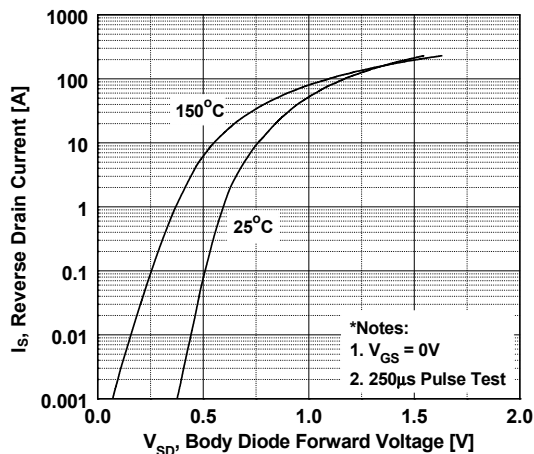


Figure 5. Capacitance Characteristics

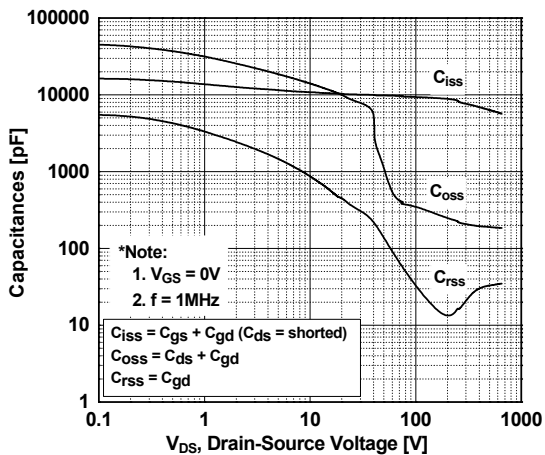
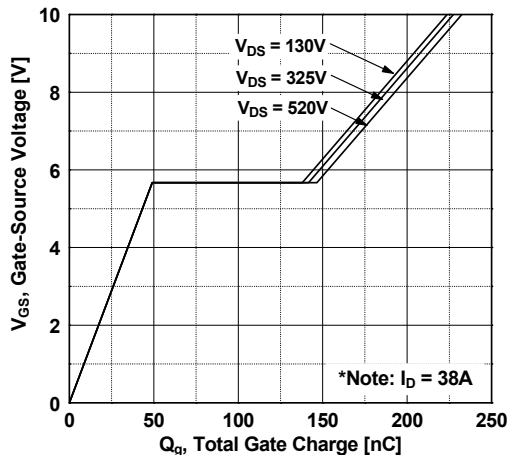


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

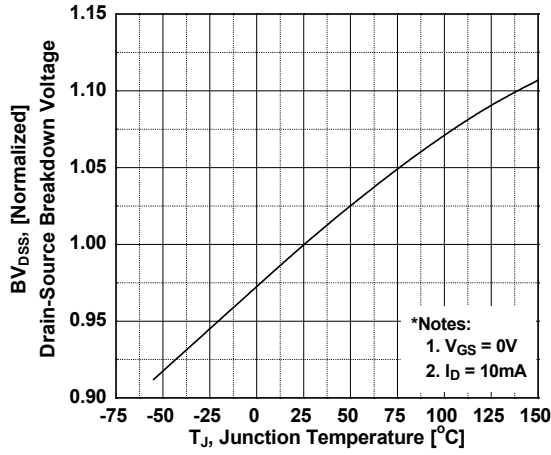


Figure 8. On-Resistance Variation vs. Temperature

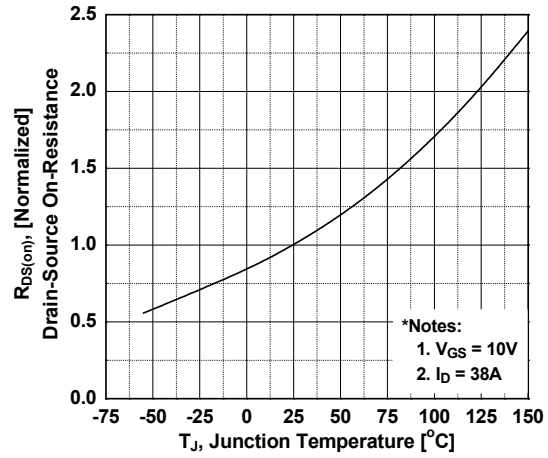


Figure 9. Maximum Safe Operating Area

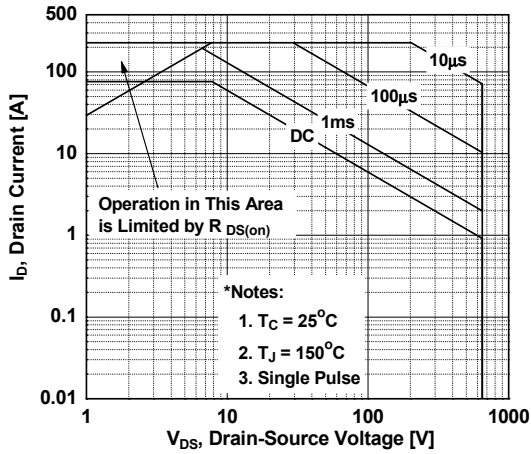


Figure 10. Maximum Drain Current vs. Case Temperature

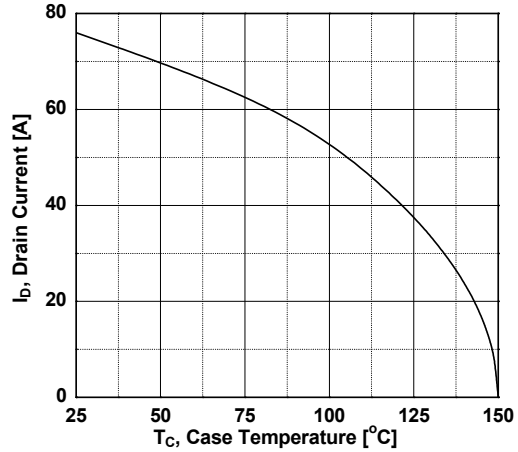
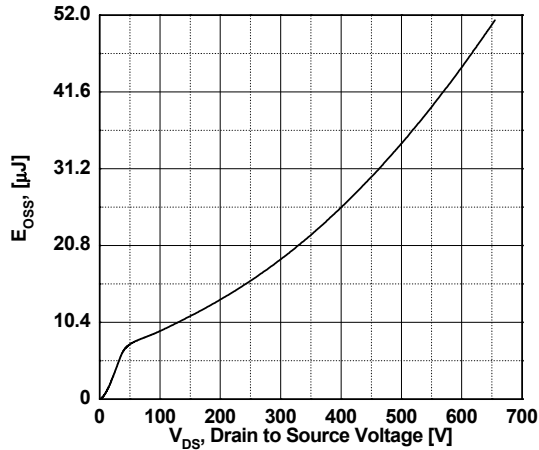
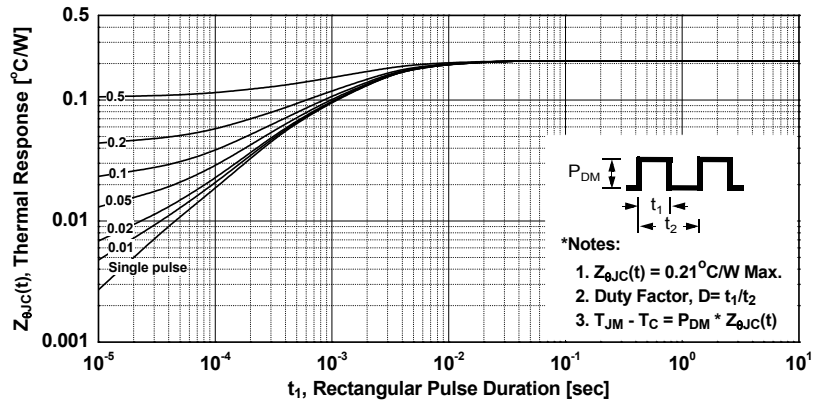


Figure 11. Eoss vs. Drain to Source Voltage



Typical Performance Characteristics (Continued)

Figure 12. Transient Thermal Response Curve



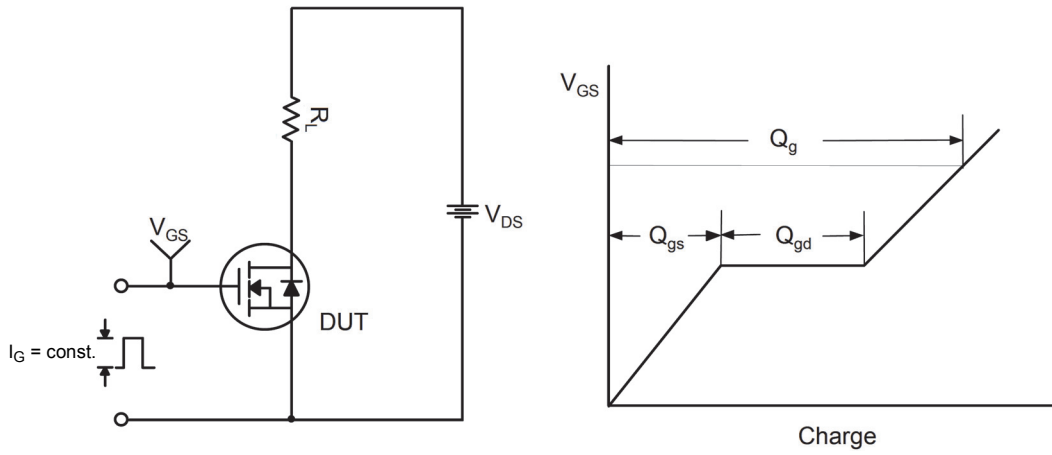


Figure 15. Gate Charge Test Circuit & Waveform

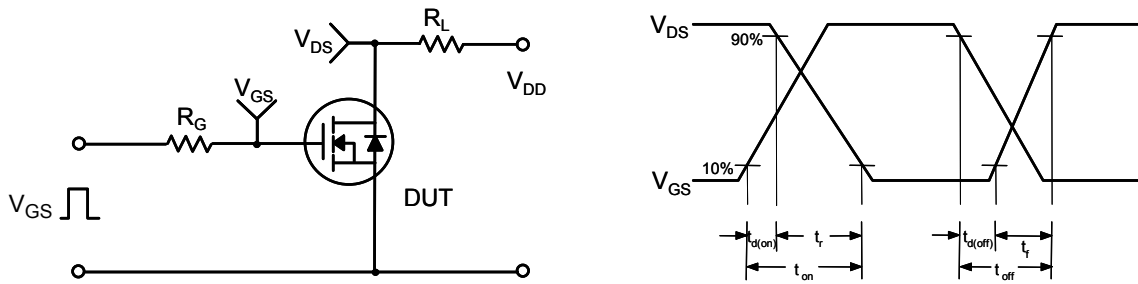


Figure 16. Resistive Switching Test Circuit & Waveforms

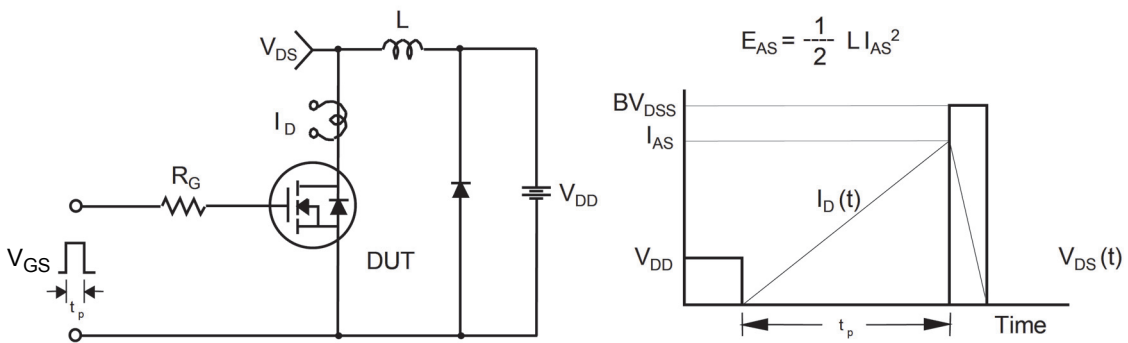


Figure 17. Unclamped Inductive Switching Test Circuit & Waveforms

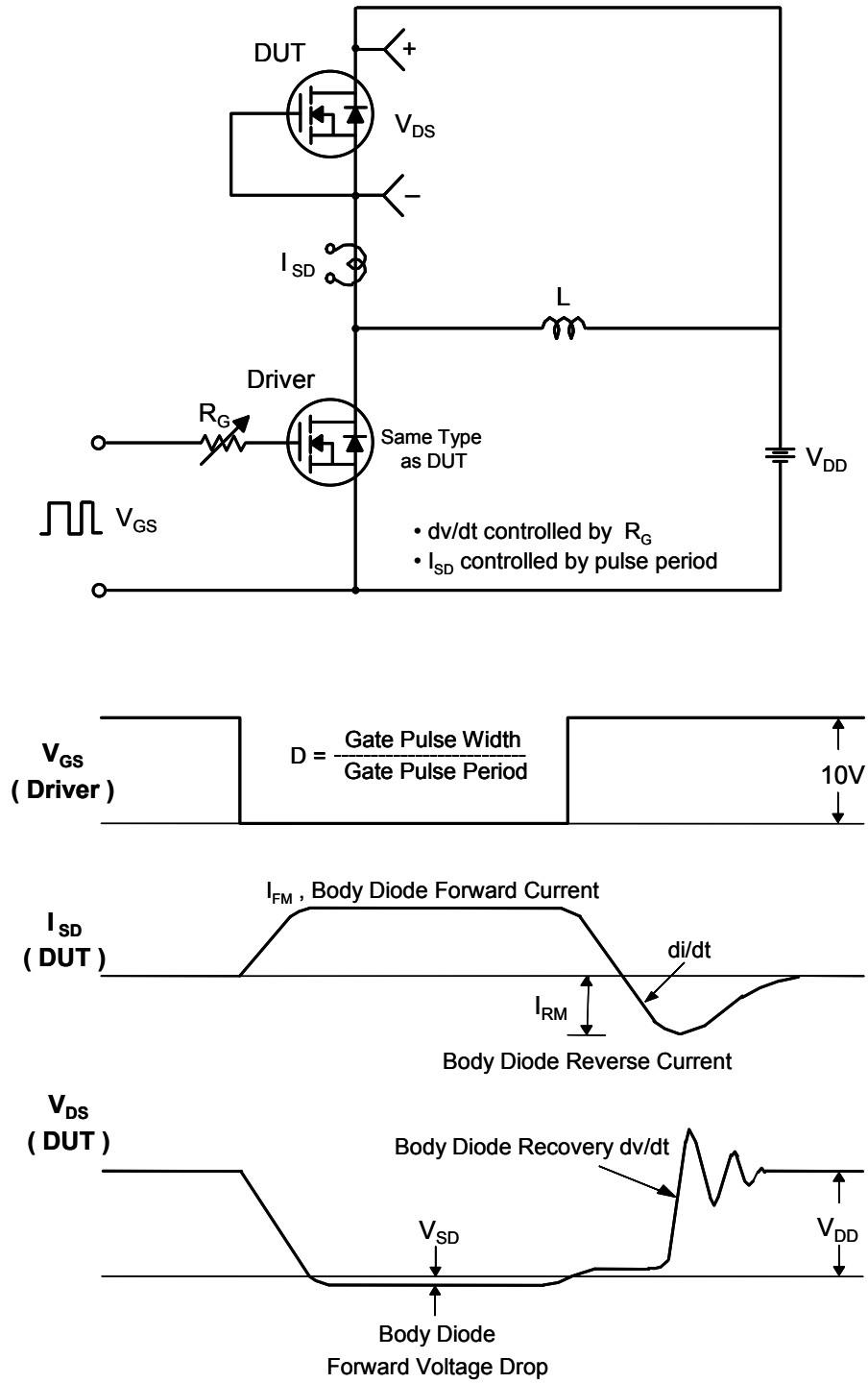


Figure 18. Peak Diode Recovery dv/dt Test Circuit & Waveforms

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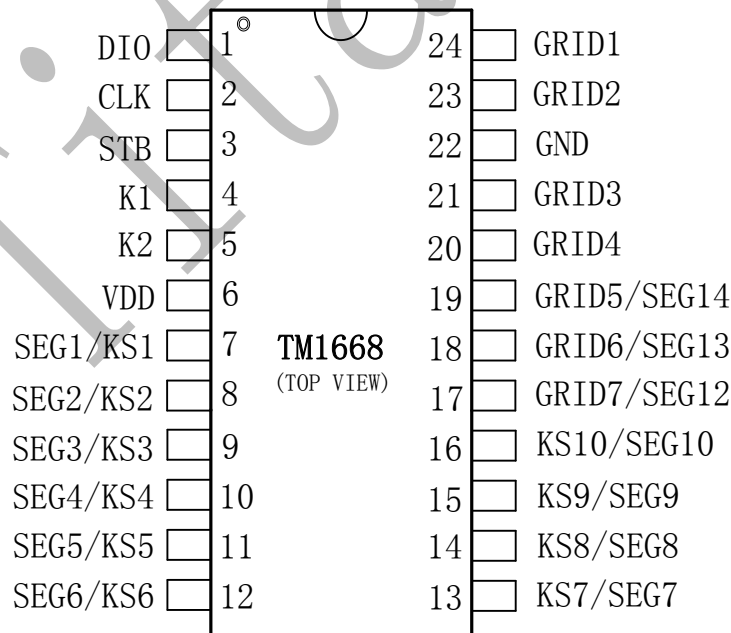
一、概述

TM1668是一种带键盘扫描接口的LED(发光二极管显示器)驱动控制专用IC, 内部集成有MCU 数字接口、数据锁存器、LED 驱动、键盘扫描等电路。本产品质量可靠、稳定性好、抗干扰能力强。主要适用于家电设备(智能热水器、微波炉、洗衣机、空调、电磁炉)、机顶盒、电子称、智能电表等数码管或LED显示设备。

二、特性说明

- 采用CMOS工艺
- 多种显示模式 (10 段×7 位 ~ 13段×4 位)
- 最大支持矩阵按键10×2
- 辉度调节电路 (8 级占空比可调)
- 串行接口 (CLK, STB, DIO)
- 振荡方式: 内置RC振荡
- 内置上电复位电路
- 内置数据锁存电路
- 内置针对LED反偏漏电导致暗亮问题优化电路
- 抗干扰能力强
- 封装形式: SOP24、SSOP24、SDIP24

三、管脚定义:



四、管脚功能定义：

符号	管脚名称	管脚号	说明
DIO	数据输出输入	1	在时钟上升沿输入串行数据, 从低位开始。在时钟下降沿输出串行数据, 从低位开始。输出时为N管开漏输出, 内置13.3K Ω 上拉电阻。
CLK	时钟输入	2	在上升沿读取串行数据, 下降沿输出数据。内置13.3K Ω 上拉电阻
STB	片选输入	3	在下降沿初始化串行接口, 随后等待接收指令。STB为低后的第一个字节作为指令, 当处理指令时, 当前其它处理被终止。当STB为高时, CLK 被忽略。内置13.3K Ω 上拉电阻
K1~K2	键扫信号输入	4~5	输入该脚的数据在显示周期结束后被锁存, 内置7.2K Ω 下拉电阻
SGE1/KS1~ SEG10/KS10	输出(段)	7~16	段输出(也用作键扫描输出), P管开漏输出, 内置4K Ω 下拉电阻
GRID1~GRID4	输出(位)	24~23 21~20	位输出, N管开漏输出, 内置2.7K Ω 上拉电阻
SEG12/DRID7 ~ SEG14/GRID5	输出(段/位)	19~17	段/位复用输出, 只能选段或位输出
VDD	逻辑电源	6	接电源正
GND	逻辑地	22	接系统地

五、指令说明:

指令用来设置显示模式和LED驱动器的状态。

在STB下降沿后由DIN输入的第一个字节作为指令。经过译码,取最高B7、B6两位比特位以区别不同的指令。

B7	B6	指令
0	0	显示模式命令设置
0	1	数据命令设置
1	0	显示控制命令设置
1	1	地址命令设置

如果在指令或数据传输时STB被置为高电平,串行通讯被初始化,并且正在传送的指令或数据无效(之前传送的指令或数据保持有效)。

(1) 显示模式命令设置:

该指令用来设置选择段和位的个数(4~7位,10~13段)。当该指令被执行时,显示被强制关闭。在显示模式不变时,显存内的数据不会被改变,显示控制命令控制显示开关。上电时,默认显示模式为7位10段。

MSB				LSB				显示模式
B7	B6	B5	B4	B3	B2	B1	B0	
0	0	无关项, 填 0				0	0	4位13段
0	0					0	1	5位12段
0	0					1	0	6位11段
0	0					1	1	7位10段

(2) 数据命令设置:

该指令用来设置数据写和读,B1和B0位不允许设置01或11。

MSB				LSB				功能	说明	
B7	B6	B5	B4	B3	B2	B1	B0			
0	1	无关项, 填 0					0	数据读写模式 设置	写数据到显示寄存器 读键扫数据	
0	1						1			0
0	1						0		地址增加模式 设置	自动地址增加 固定地址
0	1						1			
0	1						0		测试模式设置 (内部使用)	普通模式 测试模式
0	1						1			

(3) 显示控制命令设置:

该指令用来设置显示的开关以及显示亮度调节。共有8级辉度可供选择进行调节。

MSB				LSB				功能	说明
B7	B6	B5	B4	B3	B2	B1	B0		
1	0	无相关项, 填 0			0	0	0	消光数量设置	设置脉冲宽度为 1/16
1	0				0	0	1		设置脉冲宽度为 2/16
1	0				0	1	0		设置脉冲宽度为 4/16
1	0				0	1	1		设置脉冲宽度为 10/16
1	0				1	0	0		设置脉冲宽度为 11/16
1	0				1	0	1		设置脉冲宽度为 12/16
1	0				1	1	0		设置脉冲宽度为 13/16
1	0				1	1	1		设置脉冲宽度为 14/16
1	0			0				显示开关设置	显示关
1	0			1					显示开

(4) 地址命令设置:

该指令用来设置显示寄存器的地址。最多有效地址为14位 (C0H-CDH), 如果地址设为CEH或更高, 数据被忽略, 直到有效地址被设定。上电时, 地址默认设为C0H。

MSB				LSB				显示地址
B7	B6	B5	B4	B3	B2	B1	B0	
1	1	无相关项, 填 0		0	0	0	0	C0H
1	1			0	0	0	1	C1H
1	1			0	0	1	0	C2H
1	1			0	0	1	1	C3H
1	1			0	1	0	0	C4H
1	1			0	1	0	1	C5H
1	1			0	1	1	0	C6H
1	1			0	1	1	1	C7H
1	1			1	0	0	0	C8H
1	1			1	0	0	1	C9H
1	1			1	0	1	0	CAH
1	1			1	0	1	1	CBH
1	1			1	1	0	0	CCH
1	1			1	1	1	0	1

六、显示寄存器地址：

该寄存器存储通过串行接口接收从外部器件传送到TM1668的数据，最多有效地址从COH-CDH共14字节单元，分别与芯片SGE和GRID管脚对应，具体分配如图(2)：

写LED显示数据的时候,按照显示地址从低位到高位,数据字节从低位到高位操作。

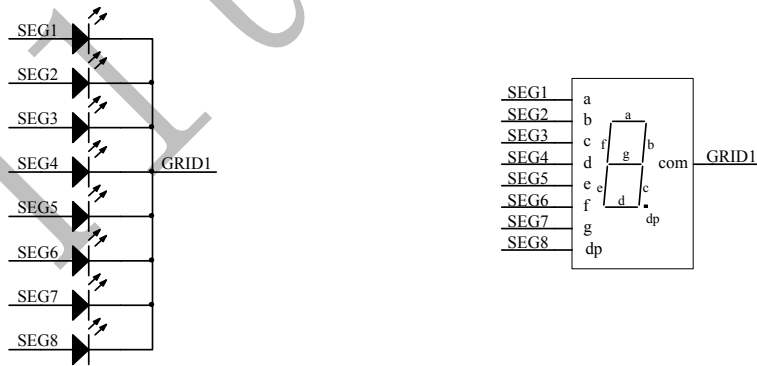
SEG1	SEG2	SEG3	SEG4	SEG5	SEG6	SEG7	SEG8	SEG9	SEG10	X	SEG12	SEG13	SEG14	X	X	
xxHL (低四位)				xxHU (高四位)				xxHL (低四位)				xxHU (高位)				
B0	B1	B2	B3	B4	B5	B6	B7	B0	B1	B2	B3	B4	B5	B6	B7	
COHL				COHU				C1HL				C1HU				GRID1
C2HL				C2HU				C3HL				C3HU				GRID2
C4HL				C4HU				C5HL				C5HU				GRID3
C6HL				C6HU				C7HL				C7HU				GRID4
C8HL				C8HU				C9HL				C9HU				GRID5
CAHL				CAHU				CBHL				CBHU				GRID6
CCHL				CCHU				CDHL				CDHU				GRID7

图(2)

▲注意：芯片显示寄存器在上电瞬间其内部保存的值可能是随机不确定的,此时客户直接发送开屏命令,将有可能出现显示乱码。所以我司建议客户对显示寄存器进行一次上电清零操作,即上电后向14位显存地址(COH-CDH)中全部写入数据0x00。

七、显示：

1、驱动共阴数码管：



图(7)

图7给出共阴极数码管的连接示意图,如果让该数码管显示“0”,只需要向00H (GRID1) 地址中从低位开始写入0x3F数据即可,此时00H 对应每一个SEG1-SEG8的数据如下表格。

SEG8	SEG7	SEG6	SEG5	SEG4	SEG3	SEG2	SEG1	
0	0	1	1	1	1	1	1	GRID1 (COH)
B7	B6	B5	B4	B3	B2	B1	B0	

2、驱动共阳极数码管：

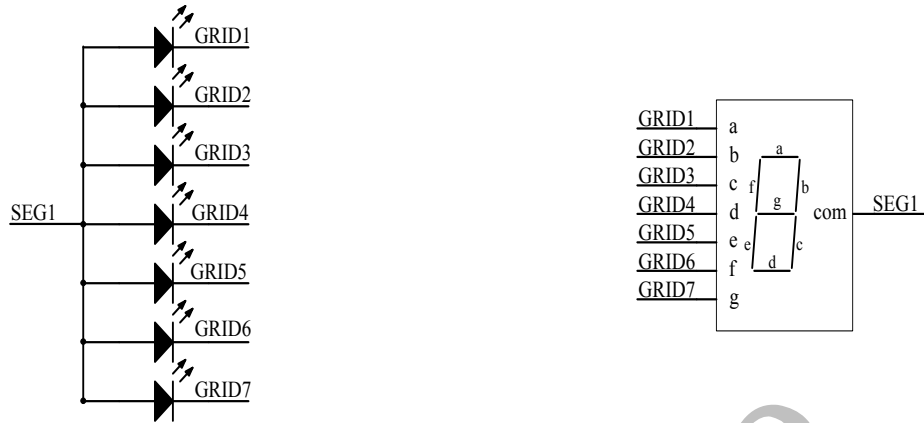


图 (8)

图8给出共阳极数码管的连接示意图, 如果让该数码管显示“0”, 要向地址单元C0H (GRID1)、C2H (GRID2)、C4H (GRID3)、C6H (GRID4)、C8H (GRID5)、CAH (GRID6) 里面分别写数据01H, 其余的地址CCH (GRID7) 单元全部写数据00H。每一个SEG1-SEG8对应的数据如下表格。

SEG8	SEG7	SEG6	SEG5	SEG4	SEG3	SEG2	SEG1	
0	0	0	0	0	0	0	1	GRID1 (C0H)
0	0	0	0	0	0	0	1	GRID2 (C2H)
0	0	0	0	0	0	0	1	GRID3 (C4H)
0	0	0	0	0	0	0	1	GRID4 (C6H)
0	0	0	0	0	0	0	1	GRID5 (C8H)
0	0	0	0	0	0	0	1	GRID6 (CAH)
0	0	0	0	0	0	0	0	GRID7 (CCH)
B7	B6	B5	B4	B3	B2	B1	B0	

▲注意：无论是驱动共阴极数码管还是驱动共阳极数码管, SEG引脚只能接LED的阳极, GRID只能接LED的阴极, 不可反接。

八、 键扫描和键扫数据寄存器：

该芯片最大支持的键扫矩阵为10×2bit, 如下所示：

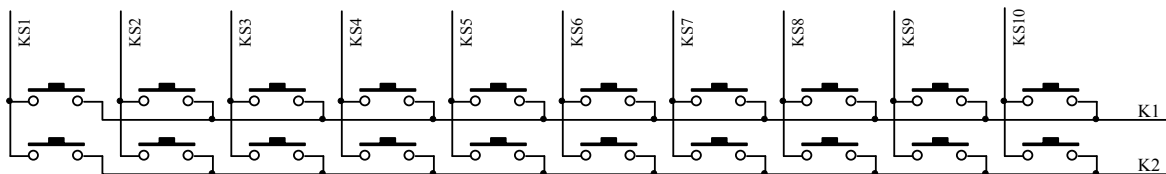


图 (3)

键扫数据储存地址如下所示, 先发读按键命令后, 开始读取5字节的按键数据BYTE1—BYTE5, 读数据从低位开始输出, 其中B7和B6位为无效位固定输出为0。芯片K和KS引脚对应的按键按下时, 相对应的字节内的BIT位为1。

B0	B1	B2	B3	B4	B5	B6	B7
K1	K2	X	K1	K2	X	X	X
KS1		KS2			0	0	BYTE1
KS3		KS4			0	0	BYTE2
KS5		KS6			0	0	BYTE3
KS7		KS8			0	0	BYTE4
KS9		KS10			0	0	BYTE5

图 (4)

▲注意：1、TM1668最多可以读5个字节，不允许多读。

2、读数据字节只能按顺序从BYTE1-BYTE5读取，不可跨字节读。例如：硬件上的K2与KS10对应按键按下时，此时想要读到此按键数据，必须需要读到第5个字节的第5BIT位，才可读出数据。

九、按键：

(1) **按键扫描：**键扫描由TM1668自动完成，不受用户控制，用户只需要按照时序读按键值。完成一次键扫需要2个显示周期，一个显示周期大概需要 $T=4ms$ ，在8ms内先后按下了2个不同的按键，2次读到的键值都是先按下的那个按键的键值。

7位10段模式下，IC在上电后芯片内部扫描SEG1/KS1-SEG10/KS10的波形如图 (10)：

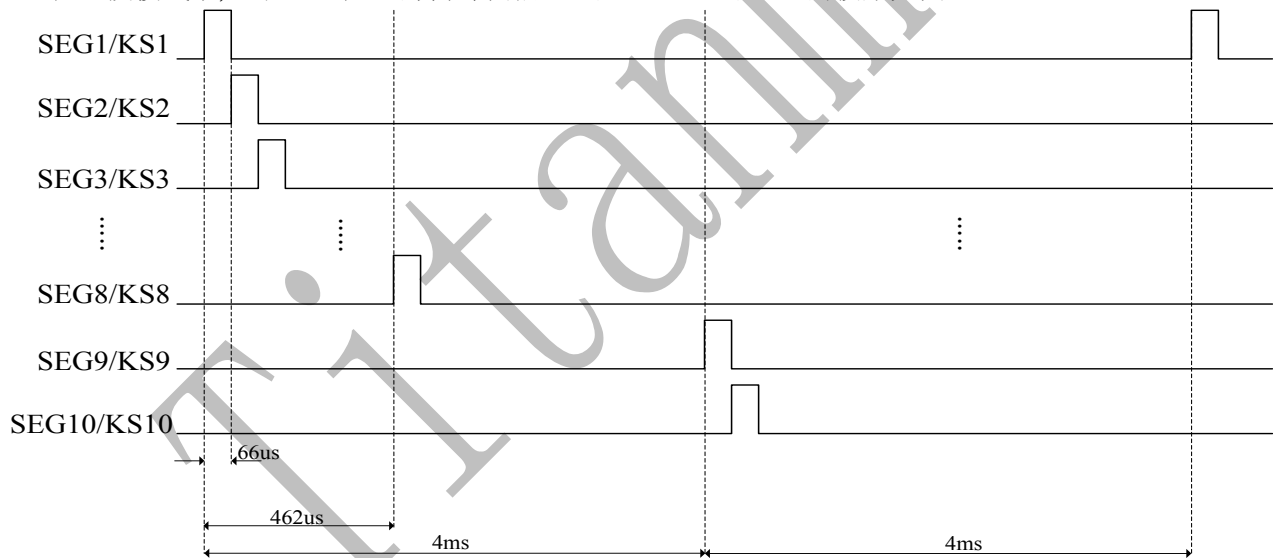
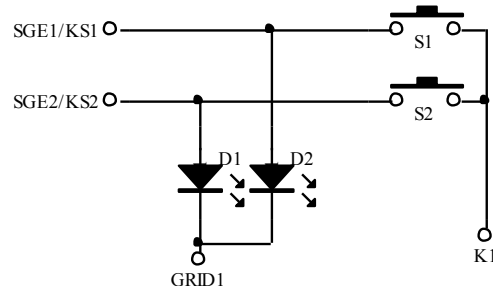


图 (10)

如图 (10) 可知，芯片内部按键扫描原理如下：芯片从SEG1/KS1开始逐渐扫描到SEG10/KS10结束，并且SEG1/KS1-SEG8/KS8在一个周期内完成，SEG9/KS9-SEG10/KS10在下一个周期内完成。在发送读按键指令时，如果SEG1/KS1-SEG10/KS10 端的按键扫描高电平通过按键引入K1/K2/K3引脚中，芯片内部会识别该高电平并且在读5个字节的按键数据时，相应的BIT位会被置高。

▲注意：显示周期和IC工作的振荡频率有关，振荡频率不完全一致，以上数据仅供参考，以实际测量为准。

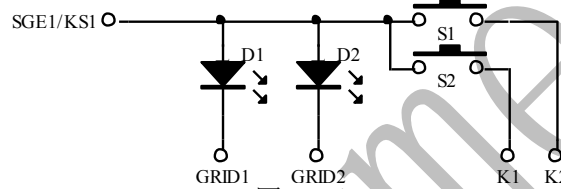
(2) **按键复用：** 复合按键的问题：SEG1/KS1-SEG10/KS10是显示和按键扫描复用的。以图（12）为例子，显示需要D1亮, D2灭, 需要让SEG1为“0”, SEG2为“1”状态, 如果S1, S2同时被按下, 相当于SEG1, SEG2被短路, 这时D1, D2都被点亮。



图（12）

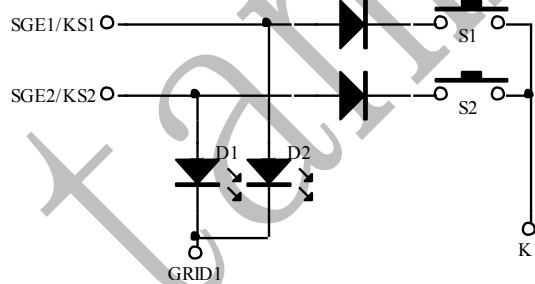
解决方案：

1、在硬件上, 可以将需要同时按下的键设置在不同的K线上面如图（13）所示,



图（13）

2、串联二极管如图（14）所示。



图（14）

▲**注意：** 建议使用同一个KS不同的K键作为复合按键。

十、串行数据传输格式：

读取和接收1个BIT都在时钟的上升沿操作。

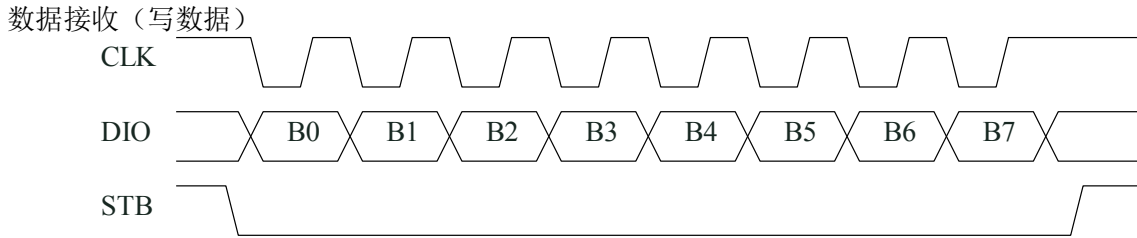


图 (5)

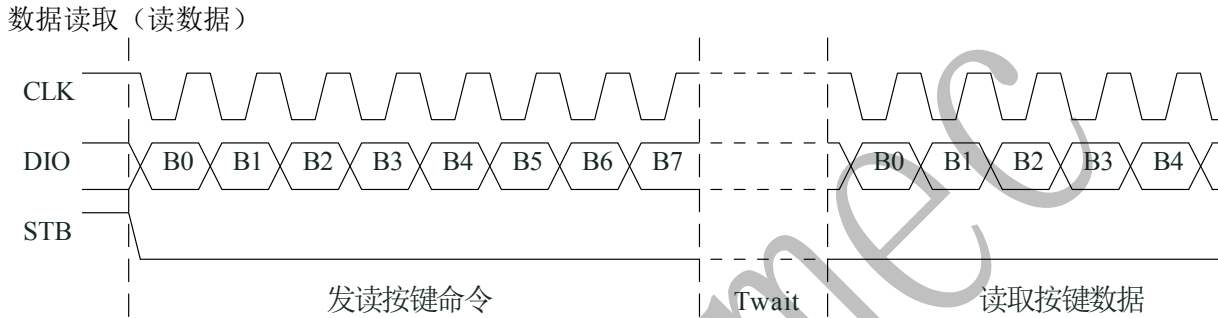


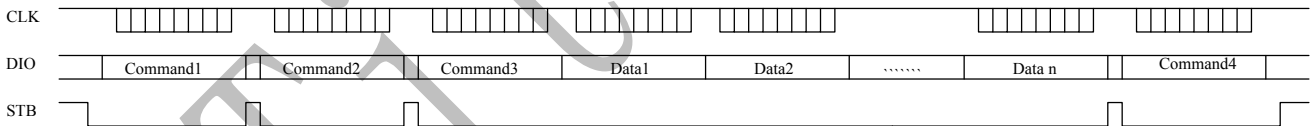
图 (6)

▲注意：1、读取数据时，从串行时钟CLK的第8个上升沿开始设置指令到CLK下降沿读数据之间需要一个等待时间Twait(最小2μ S)。具体参数见时序特性表。

十一、应用时串行数据的传输：

(1) 地址增加模式

使用地址自动加1模式，设置地址实际上是设置传送的数据流存放的起始地址。起始地址命令字发送完毕，“STB”不需要置高紧跟着传数据，最多14BYTE，数据传送完毕才将“STB”置高。



Command1：设置显示模式

Command2：设置数据命令

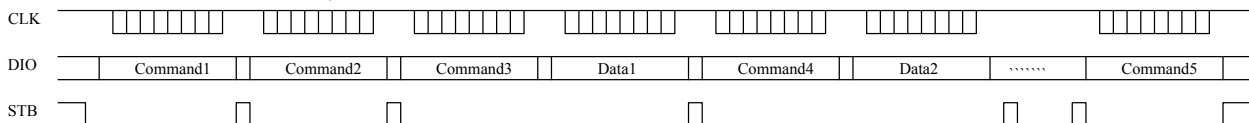
Command3：设置显示地址

Data1~ n：传输显示数据至Command3地址和后面的地址内（最多14bytes）

Command4：显示控制命令

(2) 固定地址模式

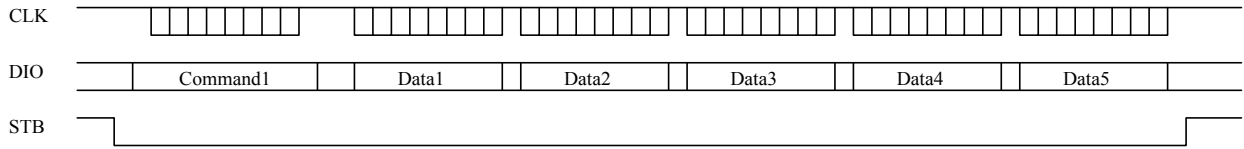
使用固定地址模式，设置地址其实际上是设置需要传送的1BYTE数据存放的地址。地址发送完毕，“STB”不需要置高，紧跟着传1BYTE数据，数据传送完毕才将“STB”置高。然后重新设置第2个数据需要存放的地址，最多14BYTE数据传送完毕，“STB”置高。



Command1：设置显示模式

Command2: 设置数据命令
 Command3: 设置显示地址1
 Data1: 传输显示数据1至Command3地址内
 Command4: 设置显示地址2
 Data2: 传输显示数据2至Command4地址内
 Command5: 显示控制命令

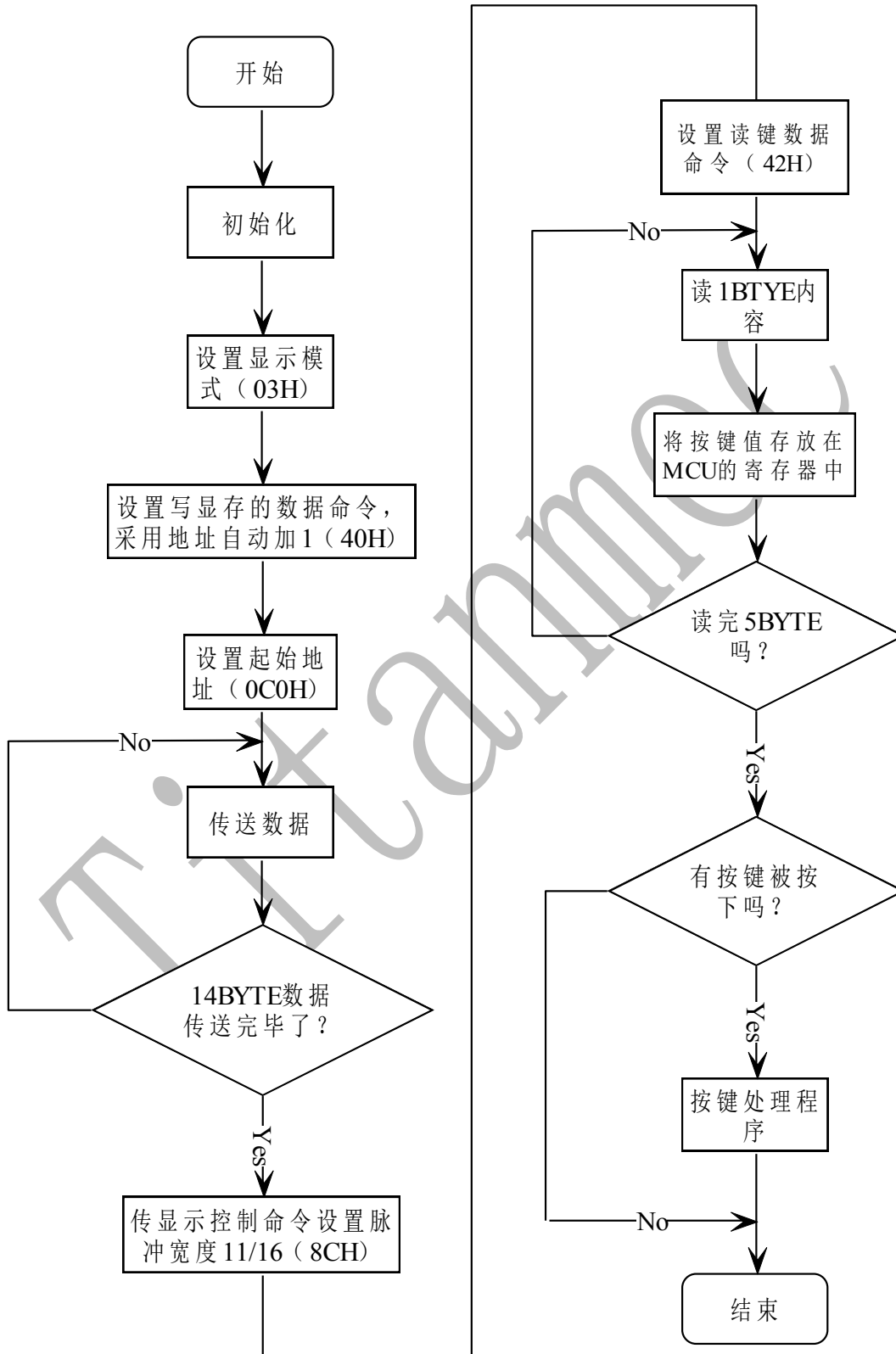
(3) 读按键时序



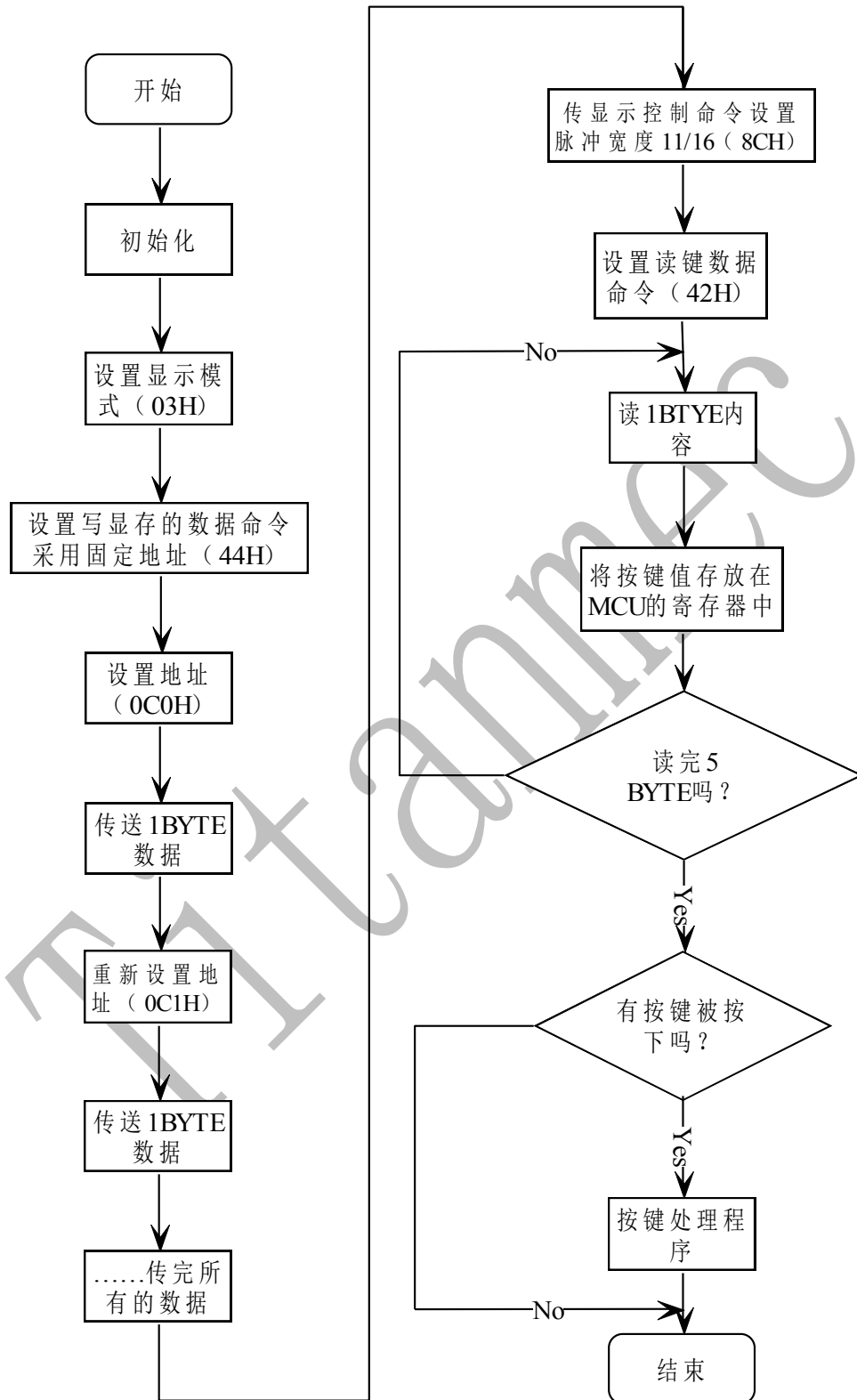
Command1: 设置读按键命令
 Data1~5: 读取按键数据

(4) 采用地址自动加一和固定地址方式的程序设计流程图:

采用自动地址加一的程序设计流程图:

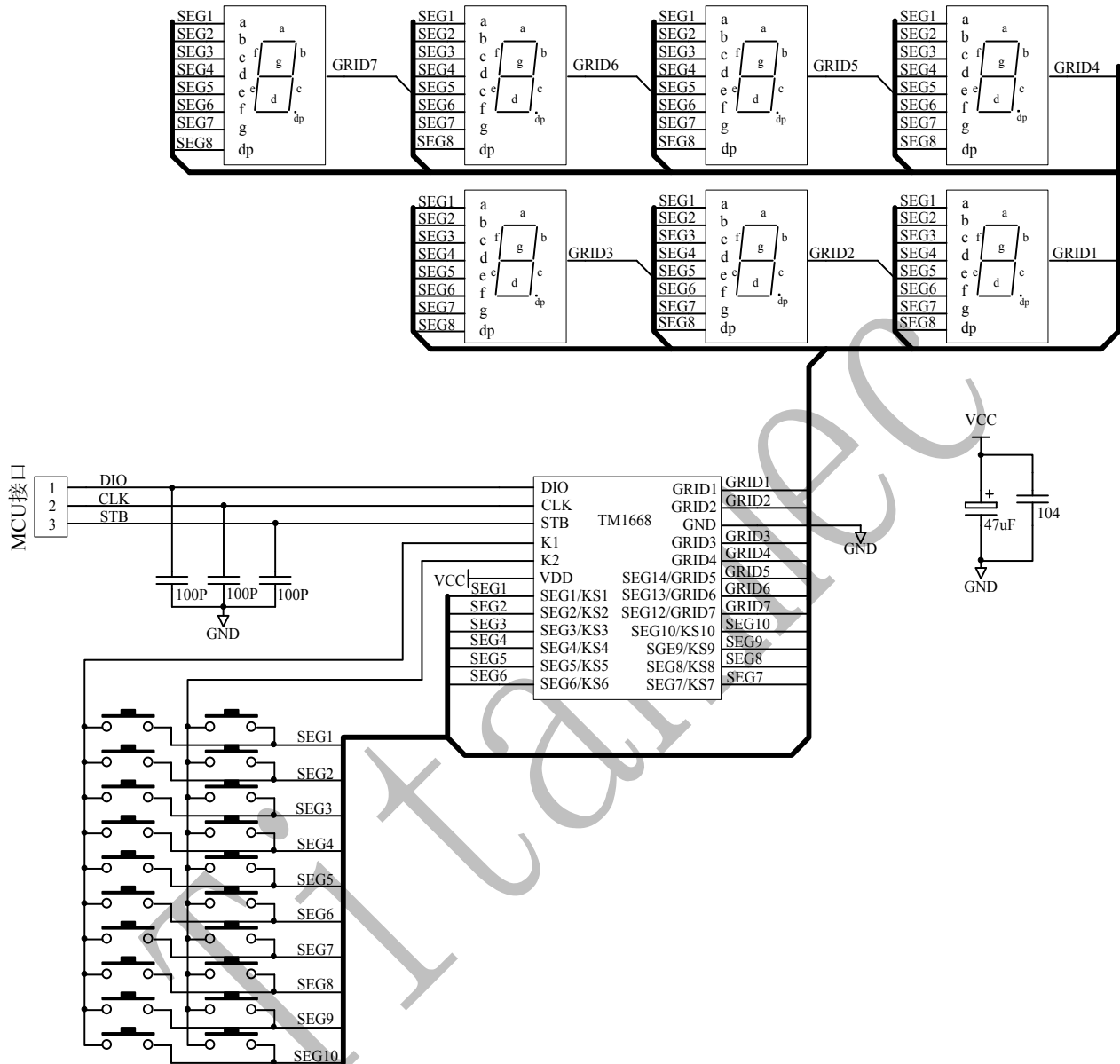


采用固定地址的程序设计流程图:



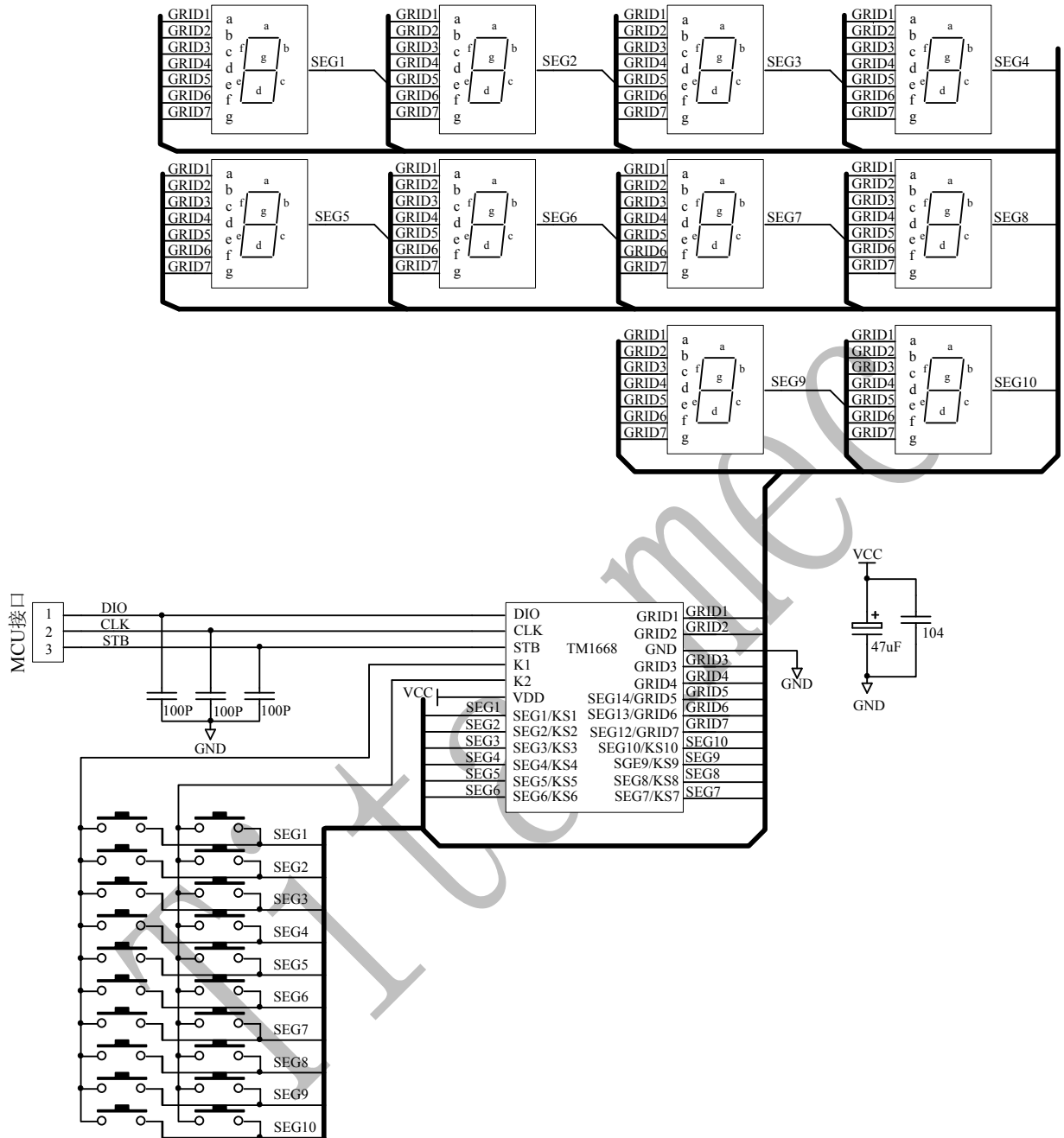
十二、应用电路：

TM1668驱动共阴数码屏硬件电路图（18）



图（18）

TM1668驱动共阳数码屏硬件电路图（19）



图（19）

- ▲注意：1、VDD、GND之间滤波电容在PCB板布线应尽量靠近TM1668芯片放置，加强滤波效果。
2、连接在DIO、CLK、STB通讯口上下拉三个100pF电容可以降低对通讯口的干扰。
3、因蓝光数码管的导通压降约为3V，因此TM1668供电应选用5V。

十三、 电气参数：
极限参数 (Ta = 25°C, Vss = 0V)

参数	符号	范围	单位
逻辑电源电压	VDD	-0.5 ~ +7.0	V
逻辑输入电压	VI1	-0.5 ~ VDD + 0.5	V
LED SEG 驱动输出电流	I01	-50	mA
LED GRID 驱动输出电流	I02	+200	mA
功率损耗	PD	400	mW
工作温度	Topt	-40 ~ +80	°C
储存温度	Tstg	-65 ~ +150	°C

正常工作范围 (Ta = -20 ~ +80°C, Vss = 0V)

参数	符号	最小	典型	最大	单位	测试条件
逻辑电源电压	VDD	3	5	6	V	-
高电平输入电压	V _{IH}	0.7 VDD	-	VDD	V	-
低电平输入电压	V _{IL}	0	-	0.3 VDD	V	-

电气特性 (Ta = -20 ~ +80°C, VDD = 5V, VSS = 0V)

参数	符号	最小	典型	最大	单位	测试条件
高电平输出电流	Ioh1	20	35	60	mA	SEG1~SEG10, Vo = VDD -3V
低电平输入电流	IOL	80	120	-	mA	GRID1~GRID7 Vo=0.3V
低电平输出电流	Idout	3	-	-	mA	Vo = 0.4V, Dout
高电平输出电流容 许量	Ito1sg	-	-	5	%	Vo = VDD - 3V, SEG1~SEG10
高电平输入电压	VIH	0.7 VDD	-	-	V	CLK, DIO, STB
低电平输入电压	VIL	-	-	0.3 VDD	V	CLK, DIO, STB

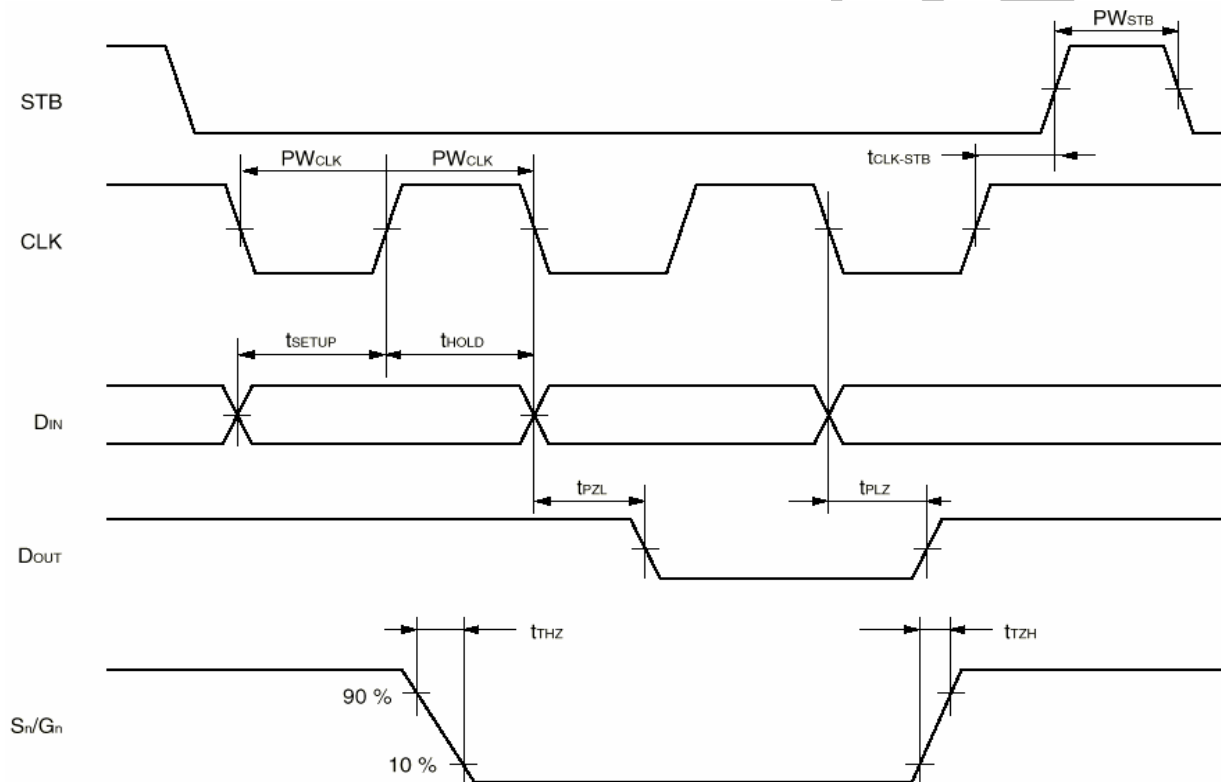
开关特性 (Ta = -20 ~ +80°C, VDD = 5V)

参数	符号	最小	典型	最大	单位	测试条件
传输延迟时间	tPLZ	-	-	300	ns	CLK → DOUT
	tPZL	-	-	100	ns	CL = 15pF, RL = 10K Ω
上升时间	tTZH 1	-	-	2	μs	SEG1~SEG10
	tTZH 2	-	-	0.5	μs	CL = 300p F GRID1~GRID4 SEG12/Grid7~ SEG14/Grid5
下降时间	tTHZ	-	-	1.5	μs	CL = 300pF, SEGn, GRIDn
最大输入时钟频 率	Fmax	-	-	1	MHz	占空比50%
输入电容	CI	-	-	15	pF	-

时序特性 (Ta = -20 ~ +80°C, VDD = 5V)

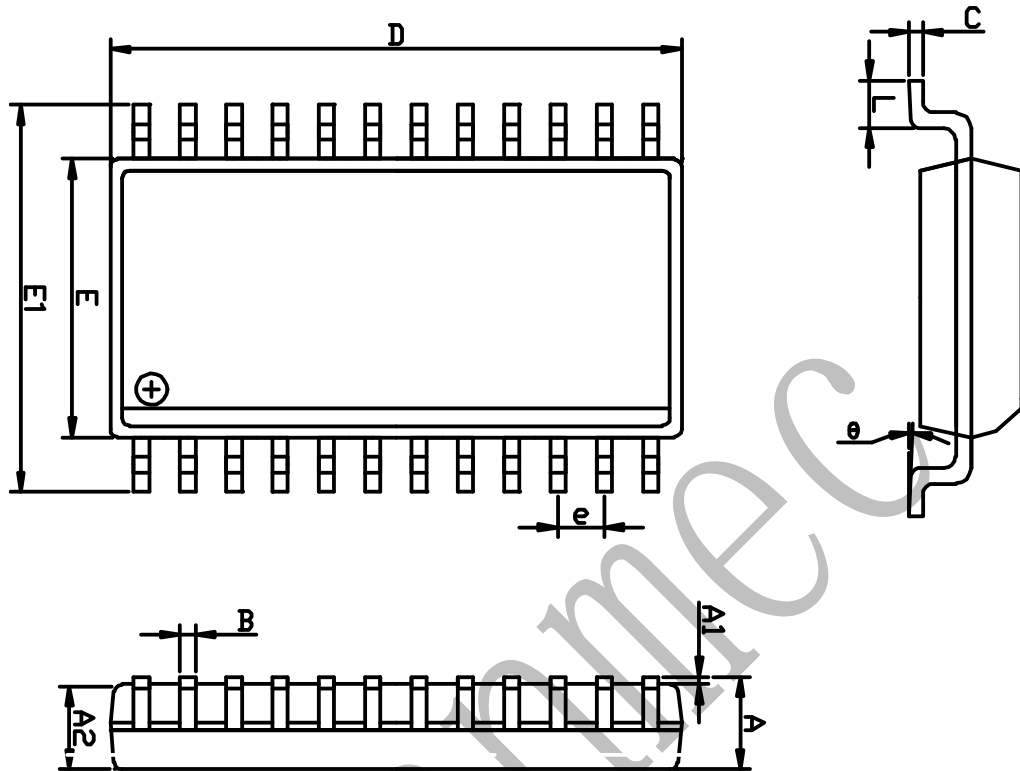
参数	符号	最小	典型	最大	单位	测试条件
时钟脉冲宽度	PW _{CLK}	500	-	-	ns	-
选通脉冲宽度	PW _{STB}	1	-	-	μs	-
数据建立时间	t _{SETUP}	100	-	-	ns	-
数据保持时间	t _{HOLD}	100	-	-	ns	-
CLK → STB 时间	t _{CLK-STB}	1	-	-	μs	CLK ↑ → STB ↑

时序波形图:



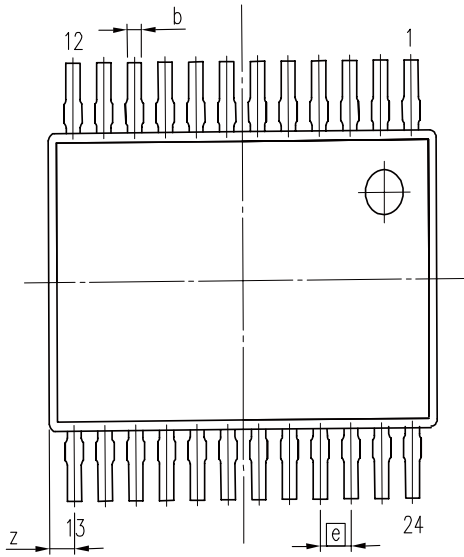
十四、IC 封装示意图:

SOP24

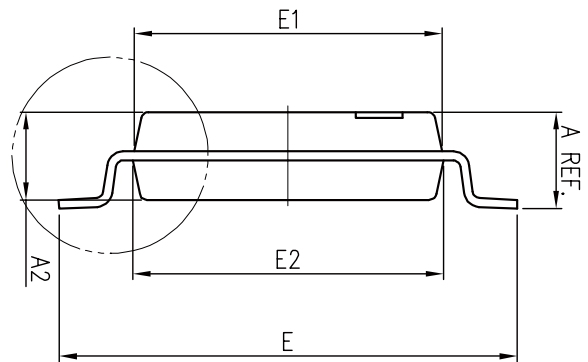
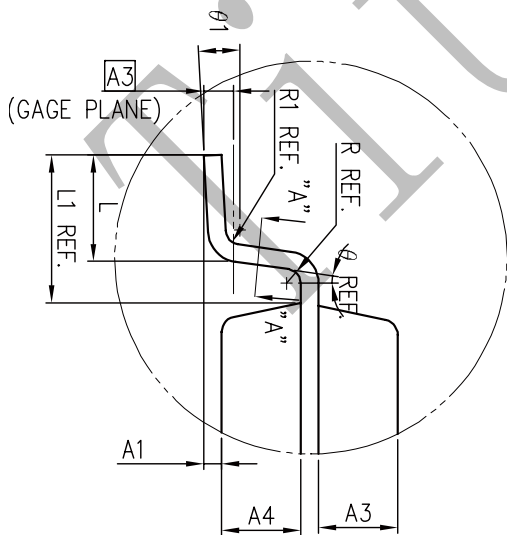
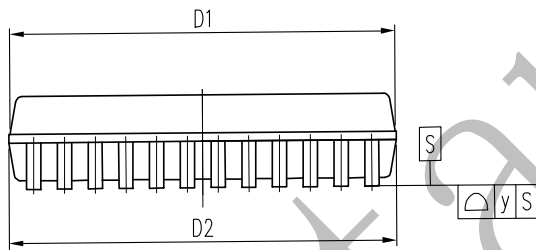


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	2.280	2.630	0.090	0.104
A1	0.100	0.300	0.004	0.012
A2	2.180	2.330	0.086	0.092
B	0.350	0.510	0.014	0.020
C	0.204	0.360	0.008	0.014
D	15.200	15.600	0.598	0.614
E	7.400	7.600	0.291	0.299
E1	10.000	10.650	0.394	0.419
e	1.270(TYP)		0.050(TYP)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

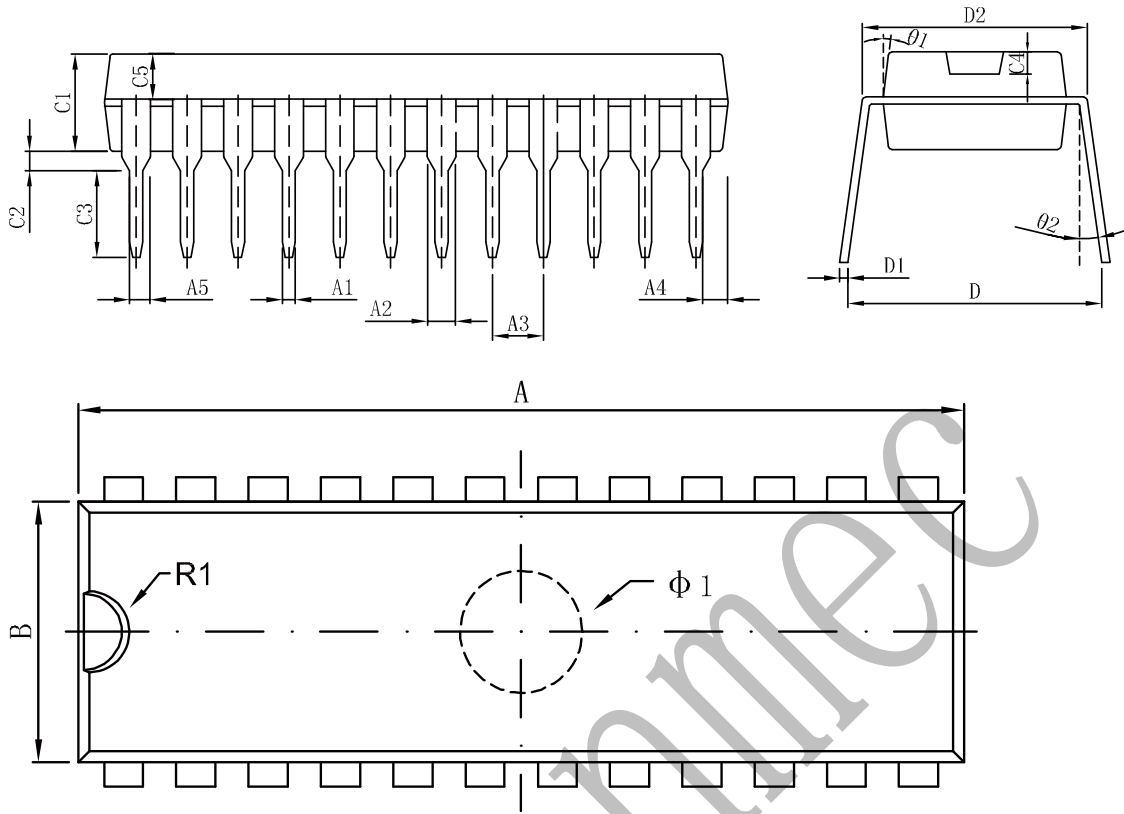
SSOP24



Symbol	Min/mm	Nom/mm	Max/mm
A	-----	1.650	-----
A1	0.050	0.150	0.250
A2	1.400	1.500	1.600
A3	-----	0.250	-----
b	0.270	0.320	0.370
b1	0.250	0.300	0.350
c	-----	0.152	-----
D1	8.050	8.150	8.250
D2	8.100	8.200	8.300
E	7.600	7.800	8.000
E1	5.150	5.250	5.350
E2	5.200	5.300	5.400
e	-----	0.650	-----
L	0.700	0.900	1.100
L1	-----	1.250	-----
R	-----	0.120	-----
R1	-----	0.200	-----
theta	0	-----	-----
theta1	0	-----	10°
y	-----	-----	0.1
Z	-----	0.525	-----



SDIP24



尺寸 标注	最小 (mm)	最大 (mm)	尺寸 标注	最小 (mm)	最大 (mm)
A	21.90	22.10	C4	0.8TYP	
A1	0.36	0.56	C5	1.63TYP	
A2	0.90	1.10	D	8.20	8.80
A3	1.778TYP		D1	0.20	0.35
A4	1.0TYP		D2	7.62	7.87
A5	0.73TYP		R1	1.0TYP	
B	6.30	6.50	$\Phi 1$		
C1	3.40	3.60	$\theta 1$	10° TYP	
C2	0.60		$\theta 2$	5° TYP	
C3	2.80	3.20			

All specs and applications shown above subject to change without prior notice.
(以上电路及规格仅供参考, 如本公司进行修正, 恕不另行通知。)