共阴极16x9阵列LED 驱动器

Common Cathode 18x12 Matrix LED Driver

■ FEATURES

- Supply voltage range: 2.7V to 5.5V
- 16 current source (CS), 9 current switches (SW)
- External RISET to adjust global current, and internal global 64 DC current steps
- Individual 256 PWM control steps for dimming
- Integrated Reset and UVLO reset function
- Sleep mode to reduce current consumption
- Over-temperature protection and Thermal Foldback function
- 2-wire serial interface
- De-Ghost
- QFN5×5-32L package

- 输入电压范围：2.7V-5.5V
- 16路电流源(CS)，9路开关(SW)
- 外部R_{ISET}调整全局电流，及内部全局64个直流设置台阶
- 独立的256阶PWM调光
- 软件复位、欠压复位功能
- 内置睡眠模式，实现低功耗待机
- 过温保护功能、限温保护功能
- 2线串行接口，简单快速控制灯
- 消隐功能
- QFN5×5-32L

■ APPLICATIONS

- Home appliances
- IOT device
- Consumer electronics
- Key Boards and Mouse

- 家电
- IOT设备
- 个人消费电子
- 键鼠

■ DESCRIPTION

HTR6916 is a 16x9 Matrix LED driver programmed via 2-wire serial interface. Each LED can be programed individually with 8-bit PWM data (brightness dimming). There are also global current settings via external resistor R_{ISET}.

The HTR6916 operates from 2.7V to 5.5V and features a very low shutdown and operational current. HTR6916 is available in QFN5×5-32L package.

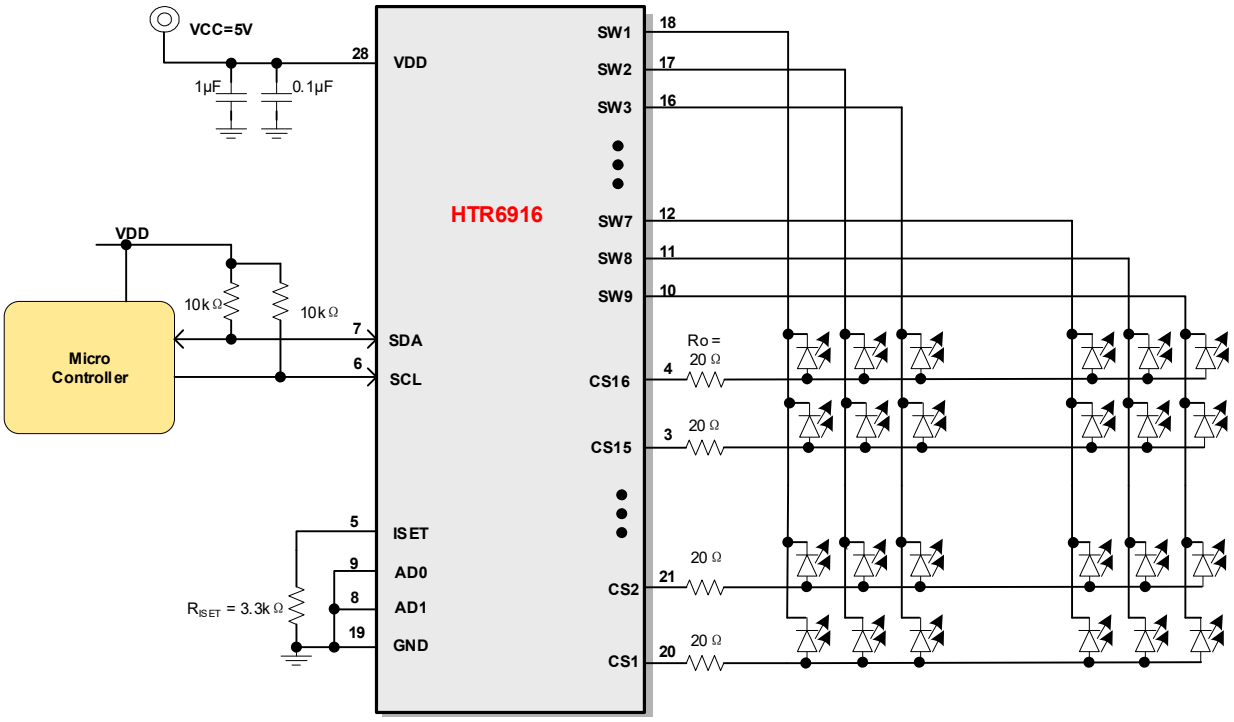
HTR6916是一款通过2线串行接口进行编程的支持16×9阵列的LED驱动芯片，每个LED都支持8位PWM数据进行独立调光。此外，可以通过ISET端的外部电阻设置全局电流。

HTR6916的工作电压在2.7V到5.5V之间，并且关断电流和工作电流都非常小。HTR6916支持QFN5×5-32L封装。

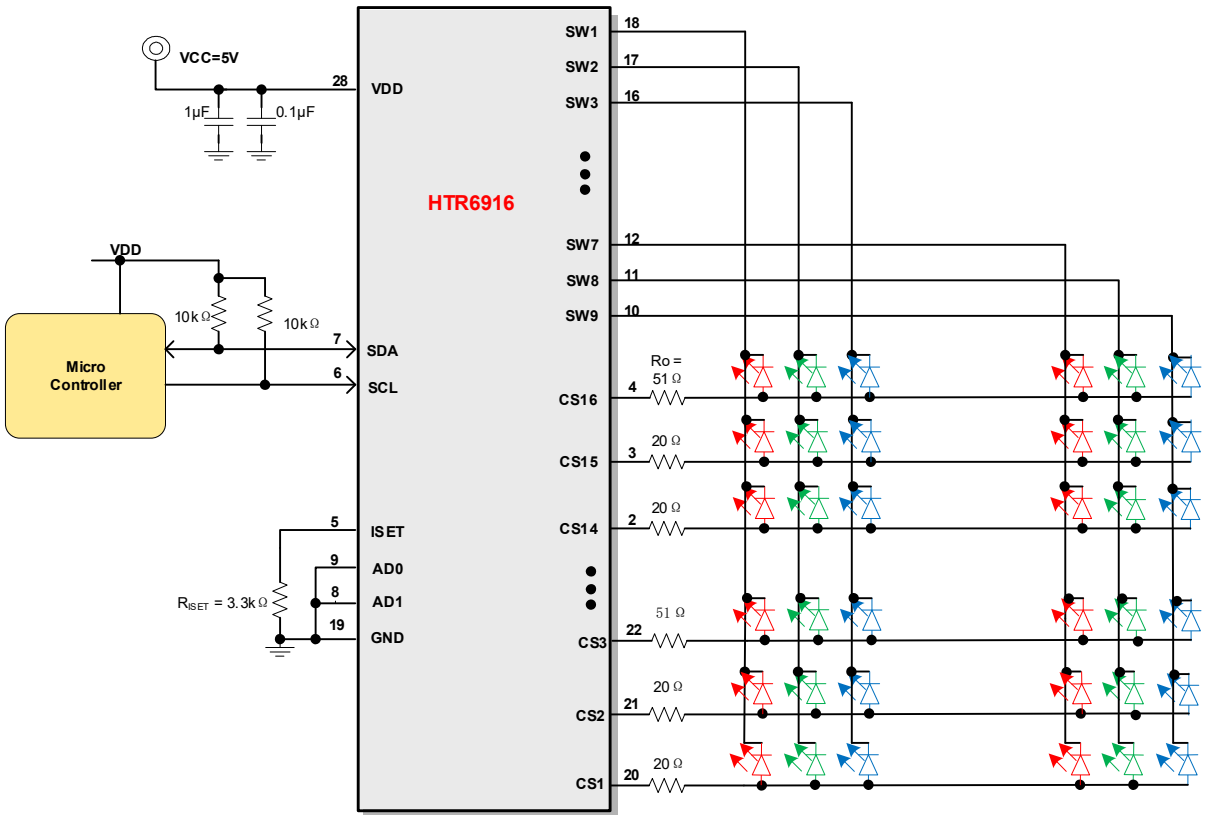
■ EXTENDED DEVICE INFORMATION

Part Number	Channel	Interface	Package
HTR6916SQER	16*9=144	pseudo-I2C	QFN5*5-32L
HTR6916SSQER	16*9=144	pseudo-SPI	QFN5*5-32L
HTR6916LSQER	16*9=144	pseudo-SPI	QFN4*4-32L
HTR6816SQER	16*8=128	pseudo-I2C	QFN4*4-28L
HTR6915SQER	15*9=135	pseudo-I2C	QFN4*4-28L
HTR6911SQER	11*9=99	pseudo-I2C	QFN4*4-24L
HTR6812SQER	12*8=96	pseudo-I2C	QFN4*4-24L
HTR6713SQER	13*7=91	pseudo-I2C	QFN4*4-24L

■ TYPICAL APPLICATION



HTR6916 Driving 16×9 LEDs

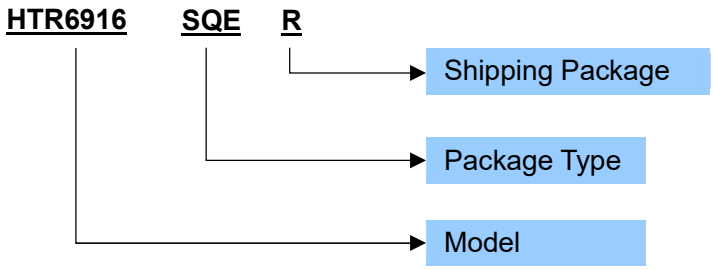


Driving 16×3 RGBs

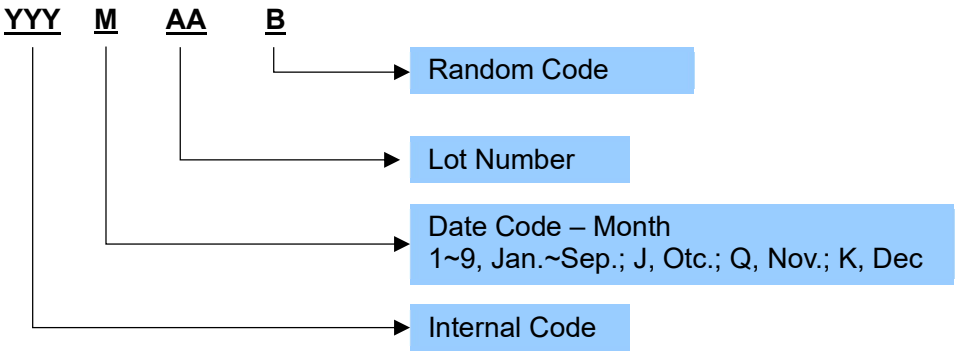
■ ORDERING INFORMATION

Part Number	Package Type	Package Abbr.	Eco Plan	MSL Level	Marking	Shipping Package / MOQ
HTR6916SQER	QFN5×5-32L (SQE)	SQE	RoHS	MSL3	HTR6916 YYYMAAB[1]	Tape and Reel (R) / 5000pcs

Part Number

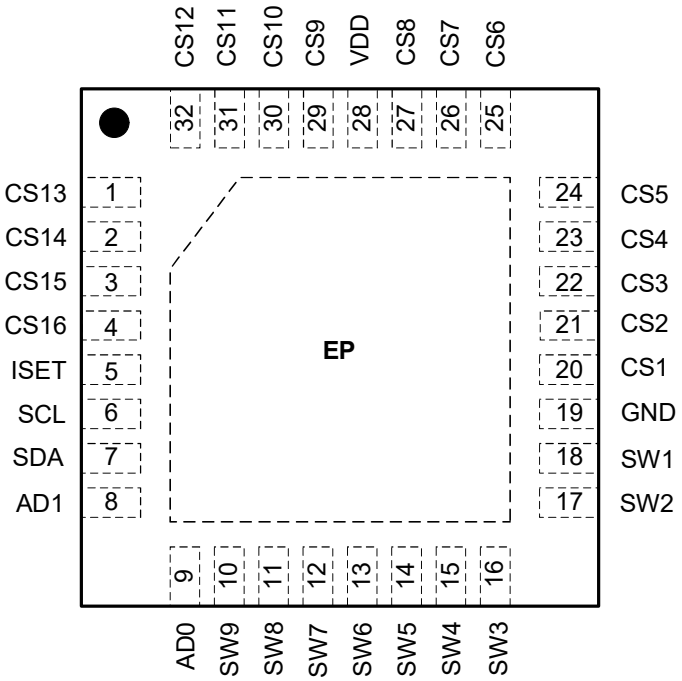


Production Tracking Code



[1] YYYMAAB is production tracking code

■ TERMINAL CONFIGURATION



HTR6916 Top View

■ TERMINAL FUNCTION

Terminal No.	Name	Description
20~27, 29~32, 1~4	CS1~CS16	Current source output.电流源输出
10~18	SW1~SW9	Switch power sink 开关电源
28	VDD	Power supply. 电源输入端
5	ISET	Current setting pin. 外部电流设置引脚
19	GND	Ground. 地
8,9	AD1, AD0	Device Address setting. 器件地址设置端
6	SCL	Serial clock. 串行通讯时钟端
7	SDA	Serial data. 串行通讯数据端
EP	NC	No connection, connect to GND for better thermal performance. 内部无连接，外部接地散热。

■ SPECIFICATIONS[1]

● Absolute Maximum Ratings [2]

PARAMETER	Symbol	MIN	TYP	MAX	UNIT
Power supply voltage for VDD	VDD	-0.3		6	V
Voltage at SCL, SDA, AD0, AD1, SWx, CSx	V_I	-0.3		VDD+0.3	V
Voltage at ISET	V_{ISET}	-0.3		2	V
Moisture Sensitivity Level (MSL)			MSL3		
Ambient Operating Temperature	T_A	-40		85	℃
Junction Temperature	T_J	-40		150	℃
Storage Temperature	T_{STG}	-65		150	℃
Package thermal resistance, junction to ambient (4 layer standard test PCB based on JEDEC standard)	θ_{JA}		30		°C/W
ESD (HBM)			±2		kV
ESD (CDM)			±1		kV

● Main Electrical Characteristics

Condition: T_A = 25°C, VDD = 5V, internal RISET, unless otherwise specified

PARAMETER	Symbol	CONDITION	MIN	TYP	MAX	UNIT
Power supply voltage for VCC and PVCC	VCC		2.7		5.5	V
Quiescent power supply current	I_{CC}	all LEDs off, SLEEP=0		2.4		mA
Shutdown current	I_{SD}	SLEEP=1		200		uA
constant current of CSX	I_{OUTCS}	Internal RISET, ISET="11111", VCS = 4V		30		mA
Maximum current of SWx	I_{OUTSW}			800		mA
Thermal shutdown	T_{SD}			165		℃
Thermal shutdown hysteresis	T_{SD_HYS}			25		℃

● Logic Electrical Characteristics (SDA, SCL, AD0, AD1)

PARAMETER	Symbol	CONDITION	MIN	TYP	MAX	UNIT
Logic "0" input voltage	V_{IL}	V_{CC}= 2.7V~5.5V	GND		1.5	V
Logic "1" input voltage	V_{IH}	V_{CC}= 2.7V~5.5V	3.0		VDD	V

● HTR6916 Serial Port

PARAMETER	Symbol	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
Serial-Clock frequency	f_{SCL}			400			1000	kHz
Bus free time between a STOP and a START condition	t_{BUF}	1.3			0.5			us
Hold time (repeated) START condition. After this period, the first clock pulse is generated.	$t_{h(STA)}$	0.6			0.26			us
Setup time for a repeated START condition	$t_{su(STA)}$	0.6			0.26			us
Setup Time for SCL to STOP condition	$t_{su(STO)}$	0.6			0.26			us
Data hold time	$t_{h(DAT)}$	0			0			us
Setup Time, SDA to SCL	$t_{su(DAT)}$	100			50			ns
Required Pulse Duration, SCL HIGH	t_{HIGH}	0.7			0.26			us
Required Pulse Duration, SCL LOW	t_{LOW}	1.3			0.5			us
Rise Time, SCL and SDA	T_r			300			120	ns
Fall Time, SCL and SDA	T_f			300			120	ns

[1] Depending on parts and PCB layout, characteristics may be changed.
[2] Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under recommended operating conditions is not implied. Exposure to absolute–maximum–rated conditions for extended periods may affect device reliability.

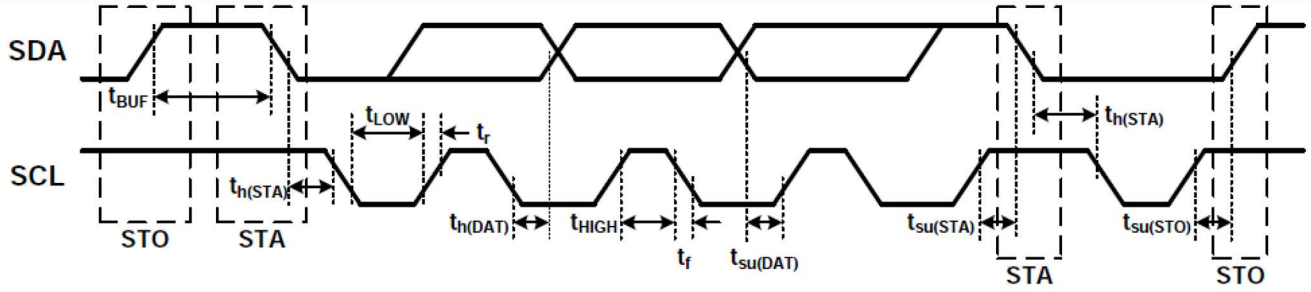


Figure 1 Timing

■ APPLICATION INFORMATION

1 Power On Timing and Reset

Once the device is powered on, the device is reset.

当芯片上电时，芯片复位。

Once the power supply VDD voltage drops below UVLO threshold (2.0V typ) and the bit UVLO of the command8 is set to “1, the device is reset.

当 VCC 降低到 UVLO 阈值(2V 典型值)且指令 8 中的 UVLO 设为“1”，芯片复位。

Once the bit reset (Command 8, HTR6916) is correctly written, the device is reset, all the registers and commands are reset to default value and all the CS terminals shut off.

当 HTR6916 的指令 8 的 bit reset 被成功写入，芯片复位。

芯片复位后：所有寄存器和指令回复到默认值，所有 CS 端口关闭，SW1 开启、其他 SW 关闭，串口通信复位， RAM 数据保持不变

Once the device reset, all registers and commands are reset to default value, all CS terminals shut off, SW1 on and other SWx shut off, serial interface reset, and RAM data keep the value.

Any serial communication can be done only 0.5ms after the software reset or power on reset.

软件复位或上电复位后，需经过 0.5ms，才能进行有效的串行通讯。

2 Operation Mode

2.1 Active Mode

Once SLEEP = “0” (in Command5), the device goes into active mode.

当 SLEEP = “0” （指令 5），芯片进入工作模式。

2.2 SLEEP Mode

Once SLEEP = “1” (in Command5), the device goes into sleep mode, where all necessary module is shutdown to save the power consumption. Before sleep mode enabled, make sure that all LED is switched off (command6). When UVLO is triggered, the device goes into sleep mode, and CS terminals will be shut off.

当指令 5 中的 SLEEP 设为“1”，芯片进入休眠模式，此时所有必要的模拟模块关断以节省功耗。在写入 sleep 使芯片休眠前，确保所有 LED 关闭（指令 6）。当 UVLO 启动，所有寄存器被复位为初始值，CS 端口关闭。

3 Under Voltage Lockout (UVLO)

Once the bit UVLO of the command8 is set to “1”, the device monitors the VDD voltage. Once the VDD voltage falls below UVLO threshold (2.0V typ.), the device will reset all the commands and registers, and CS terminals will be shut off. If the VDD voltage rises above the UVLO threshold, the device will enter into active mode again.

command8 中的 UVLO 设为“1”，芯片会监测 VDD 电压。一旦 VDD 电压低于 UVLO 阈值（2.0V 典型值），芯片复位所有指令，CS 端口关闭。如果 VDD 电压回升到 UVLO 阈值后，芯片重新进入工作模式。

4 Over Temperature Protection

Thermal Foldback

Once the iunction temperature of the device exceeds the value of 125℃ (Typ.), while the TFB of command4 is set to "0", I_{OUT} will be decreased 1/3 of the value (that is 2/3 of previous value).

Over Temperature Shutdown

Once the bit OTP of command4 is set to "0", the over temperature protection is enabled. Once the temperature exceeds 165°C (typ.), all CS terminals shut off.

When the temperature falls below 140°C (typ.), the device will enter into active mode again.

温度折返

当芯片结温超过 125℃，且指令 4 的 TFB 设为"0"，I_{OUT} 会减小 1/3（即为原来的 2/3)。

过温关断

如果 HTR6916 指令 4 的 OTP 设"0"，过温保护开启，芯片结温超过 165℃后，所有 CS 端口关断。

如果芯片结温降低到 OTP 阈值（140°C 典型值）后，芯片重新进入工作模式。

5 LED Display and Control

HTR6916 is able to drive up to 16x9=144 Matrix LEDs, shown as the following picture.

HTR6916 支持驱动最多 16x9=144 矩阵 LED，如下图。

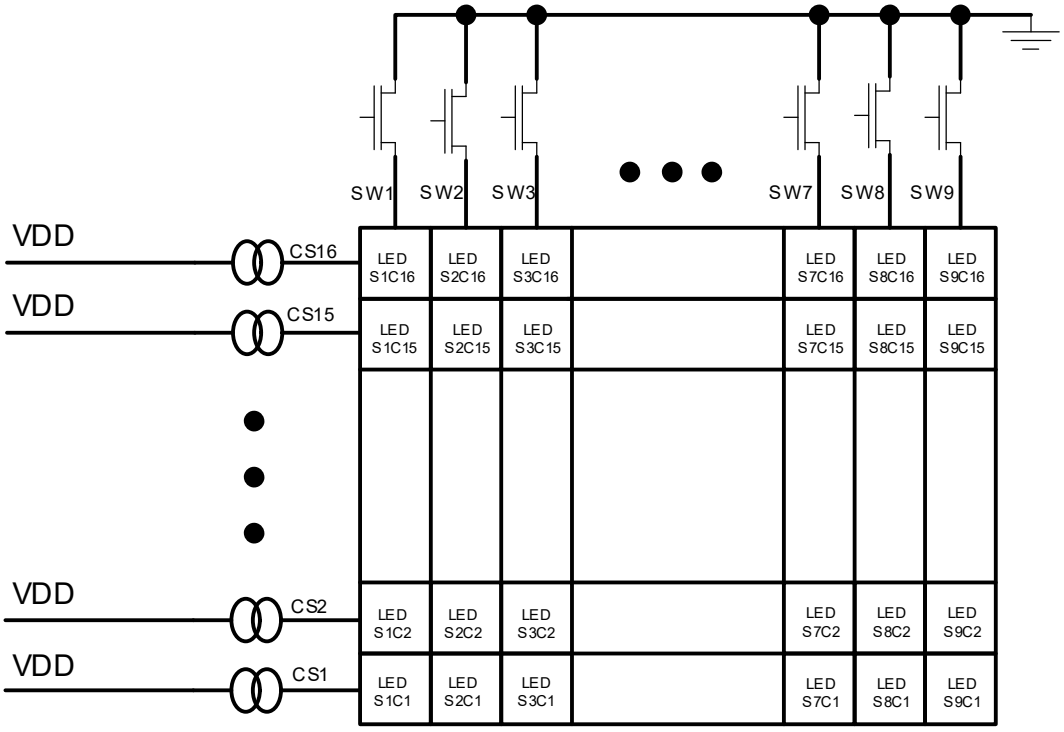


Figure 2 LED Display Map

Each LED is controlled by 3 parameters:

(1) Global current control, set by RISET (internal or external) and ISET.

(2) PWM control, set by RAM writing; it can be used for brightness dimming for each LED.

(3) Switch, global switch all LED on or off.

每个 LED 由 3 个参数控制：

（1） 全局电流控制，RISET (内置或外置) 和 ISET；

（2） PWM 控制，由写 RAM 来配置，其可用于每个 LED 的各自调光；

（3） Switch，全局控制 LED 开或关。

6 R_{ISET} and LED Current

For internal RISET mode, the maximum LED current IOUT = 0.175mA*(17+I[5:0]);

For external RISET mode, the resistor R_{ISET} determines the maximum LED current IOUT:

$$I_{OUT}(mA) = 1.12 \times \frac{17 + I[5:0]}{R_{ISET\ (kohm)}}$$

Do not set IOUT larger than 45mA.

内置 RISET 模式时，LED 最大电流 IOUT = 0.175mA*(17+I[5:0])；

外置 RISET 时，电阻 R_{ISET} 可以设置最大的 LED 电流：

$$I_{OUT}(mA) = 1.12 \times \frac{17 + I[5:0]}{R_{ISET\ (kohm)}}$$

IOUT 设置不要大于 45mA.

7 De-ghost Function

The “ghost” term is used to describe the behavior of an LED that should be OFF but instead glows dimly when another LED is turned ON. A ghosting effect typically can occur when multiplexing LEDs. In matrix architecture any parasitic capacitance found in the constant-current outputs or the PCB traces to the LEDs may provide sufficient current to dimly light an LED to create a ghosting effect.

To prevent this LED ghost effect, the HTR6916 has integrated de-ghost function.

“ghost” 这个词是用来描述某个 LED 灯处于 OFF 态，但在别的 LED 灯打开时，却有比较淡的发光。鬼影现象通常发生在 LED 多路复用的时候。在阵列结构中，任何在恒流输出端或者 PCB 到 LED 灯的寄生电容都可能提供足够的电流去点亮某个 LED 灯，从而导致鬼影现象。

为了防止这种鬼影，在 HTR6916 中，有 De-Ghost 功能。

8 Communication Operation for HTR6916

The HTR6916 uses a serial bus, which follow the I²C protocol, to control the chip’s functions with two wires: SCL and SDA. The HTR6916 supports 1MHz write and read operations.

The chip has a 7-bit slave device address (A7:A1), followed by the R/W bit, A0. The slave device addresses can be determined by AD0 and AD1, see as the following table.

HTR6916 使用两条沿用 I²C 通信协议的串行传输线 SDA 和 SCL 来控制芯片的工作方式。HTR6916 支持 1MHz 的读写操作。

HTR6916 使用 7 位的从器件地址（A7:A1），最后一位为读写位。器件地址由 AD1 和 AD1 决定，如下表。

Table1 Slave Device Address

A7:A3	A2:A1	A0 (wire/read)	AD1	AD0	Device Address [A7:A1]	Device Address [A7:A0], A0=0
01111	00	0/1	GND	GND	0x3C	0x78
	01		GND	VDD	0x3D	0x7A
	10		VDD	GND	0x3E	0x7C
	11		VDD	VDD	0x3F	0x7E

Table2 RAM Address (Start address and end address for write)

SW (Command2)	Effective SW Channels	RAM Address Range (ADS = 0) Start address ~ end address	RAM Address Range (ADS = 1) Start address ~ end address
0000	SW1	0x00~0x0F	ADs[7:0](Command10&11)~0x0F
0001	SW1~SW2	0x00~0x1F	ADs[7:0]~0x1F
0010	SW1~SW3	0x00~0x2F	ADs[7:0]~0x2F
0011	SW1~SW4	0x00~0x3F	ADs[7:0]~0x3F
0100	SW1~SW5	0x00~0x4F	ADs[7:0]~0x4F
0101	SW1~SW6	0x00~0x5F	ADs[7:0]~0x5F
0110	SW1~SW7	0x00~0x6F	ADs[7:0]~0x6F
0111	SW1~SW8	0x00~0x7F	ADs[7:0]~0x7F
1000~1111	SW1~SW9	0x00~0x8F	ADs[7:0]~0x8F

The SCL line is uni-directional. The SDA line is bi-directional (open-collector) with an internal pull-up resistor (typ. 10k). The maximum clock frequency is 1MHz. In this discussion, the master is the microcontroller and the slave is the HTR6916.

The SDA is latched in on the stable high level of the SCL. When there is no interface activity, the SDA line should be held high.

The “START” signal is generated by lowering the SDA signal while the SCL signal is high. The start signal will alert all devices attached to the serial interface bus to check the incoming address against their own chip address.

The 8-bit device address is sent next, most significant bit first. Each address bit must be stable while the SCL level is high.

After the last bit of the chip address is sent, the master checks for the HTR6916’s acknowledge. The master releases the SDA line high (through a pull-up resistor). Then the master sends an SCL pulse. If the HTR6916 has received the address correctly, then it holds the SDA line low during the SCL pulse. If the SDA line is not low, then the master should send a “STOP” signal (discussed later) and abort the transfer.

Following acknowledge of HTR6916, the 8-bit command byte is sent, most significant bit first. HTR6916 must generate another acknowledge indicating that the command byte has been received.

For command 10&11, then continuous RAM data is sent. Each data bit should be valid while the SCL level is stable high. After each byte of RAM data is sent, the HTR6916 must generate another acknowledge to indicate that the data was received. The continuous RAM data is written into RAM address from start address to end address one by one.

For other commands, after 8-bit command byte following ACK, Stop signal should be sent. If another command need to be write, “Start” another writing after “Stop”

The “STOP” signal ends the transfer. To signal “STOP”, the SDA signal goes high while the SCL signal is high.

SCL 为单向端口；SDA 为双向端口，开漏输出驱动，内置 10k 上拉电阻。最大时钟频率为 1MHz。在这种情况下，主控器件为单片机等控制器，从器件为 HTR6916。

在 SCL 为稳定的高电平时，SDA 为闭锁状态，并且在不使用的时候应保持高电平。

“开始”信号由 SCL 为高电平时将 SDA 拉低产生。“开始”信号会提醒所有的设备接收串行接口总线上即将到来的地址与自己的地址进行比较。

接着发送的是 8bit 器件地址，高位优先。在 SCL 为高电平的时候每个地址位必须保持稳定。

在最后一位传送出去后，主控器件应检测 HTR6916 的应答信号。主控器件通过上拉电阻释放 SDA 为高电平，然后使 SCL 发送一个脉冲。如果 HTR6916 正确的接收到 8 位数据，在 SCL 的脉冲期间它将使 SDA 拉低；如果 SDA 线不为低，则表示数据没有正确接收，主控器件应发送一个“停止”信号并且中断数据传递。

在 HTR6916 的应答信号发送之后，8bit 指令将被发送，高位优先。寄存器地址发出后，HTR6916 必须再产生一个应答位来表示指令已被正确接收。

对于指令 10&11，接下来传送的是连续的 RAM 数据。在 SCL 保持稳定的高电平时每位数据都是有效的。每个 8 位数据传送完后，HTR6916 同样需要产生一个应答位来表示数据的正确接收。连续的 RAM 数据，对应从 RAM 开始地址至 RAM 结束地址，逐一被写入。

对于其他指令，指令结束并传输 ACK 后，必须转入“结束”信号；若需写入其他指令，结束重新“开始”

传送结束后需要发送“停止”信号。结束信

号由 SCL 为高时将 SDA 拉高。

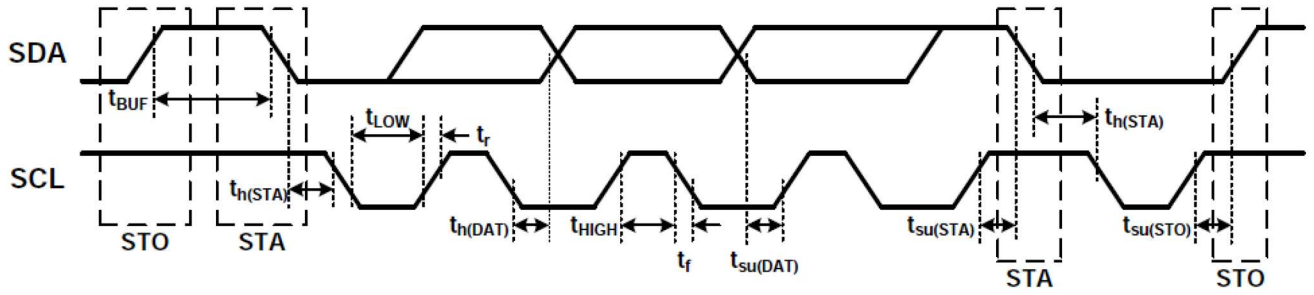


Figure 3 Serial Interface Timing

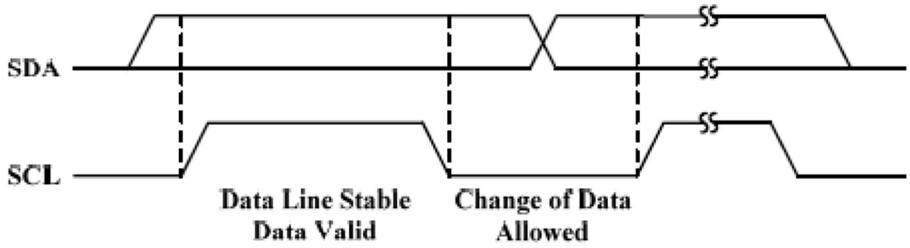


Figure 4 Bit Transfer

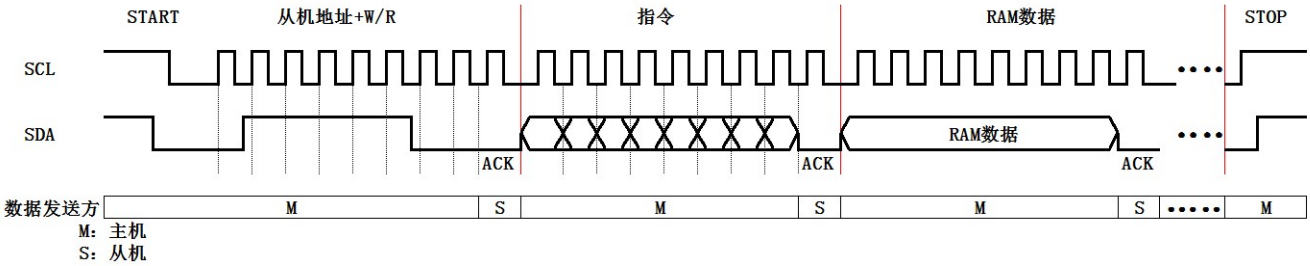


Figure 5 Typical RAM Writing

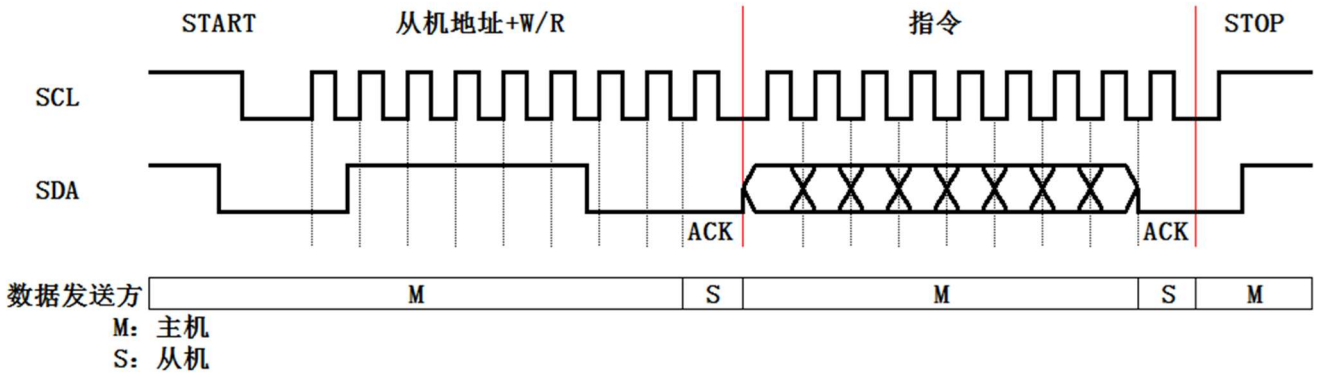


Figure 6 Typical Command Writing

9 Command Map and RAM Register Map for HTR6916

Table3 Command Map

Command 指令	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	Default Value
Command1 指令 1	0	0	ISET						0x00
2	0	1	0	0	SW				0x47
4	0	1	0	1	Td_SW		OTP	TFB	0x50
5	0	1	1	0	AIOUT	ADS	RISET	SLEEP	0x60
6	1	0	0	0	Freq		Switch	Ghost	0x80
8	1	0	0	1	0	0	Reset	UVLO	0x90
10	1	1	0	0	ADs[7:4] (Initial RAM address for Reading or Writing)				0xC0
11	1	1	1	0	RAM address ADs[3:0] (Initial RAM address for Reading or Writing)				0xE0

Command1

Bit	Label	Default	Description
D7:D6	Reserved	00	Reserved
D5:D0	I[5:0]	00000	For internal RISET mode, CS IOUT = 0.375mA*(17+I[5:0]) For external RISET mode, CS IOUT = 1.12*(17+I[5:0])/R_{ISET} (kohm) (Do not set larger than 45mA)

Command2

Bit	Label	Default	Description
D7:D4	Reserved	0100	Reserved
D3:D0	SW	0111	Effective SW channels: 0000: SW1 is active; 0001: SW1~SW2 are active; 0010: SW1~SW3 are active; … 0111: SW1~SW8 are active; 1000~1111: SW1~SW9 are active;

Command4

Bit	Label	Default	Description
D7:D4	Reserved	0101	Reserved
D3:D2	Td_SW	00	Set the dead time of SW: 00: 4T (4T is around 0.5us); 01: 8T; 10: 16T; 11: 24T
D1	OTP	0	0: Over temperature protection enabled: Once the junction temperature >165℃, CS off 1: Over temperature protection disabled
D0	TFB	0	0: Thermal foldback function enabled: Once the junction temperature >125℃, CS IOUT' = 2/3 IOUT 1: Thermal foldback function disabled

Command5

Bit	Label	Default	Description
D7:D4	Reserved	0110	Reserved
D3	AIOUT	0	0: CS IOUT<10mA 1: CS IOUT>10mA
D2	ADS	0	0: RAM address starts from 0x00 when reading or writing; 1: RAM address starts from RAM address [7:0] (Command 10 &11) when reading or writing
D1	RISET	0	0: internal RISET; 1: external RISET
D0	SLEEP	0	0: Normal work 1: sleep mode, where: SW: current SW maintain the status, other SWx shut off 当前 SW 保持输出，其他 SW 关闭 CS: switch off, hi-z Internal clock disabled ISET terminal switch into Hi-Z

Command6

Bit	Label	Default	Description
D7:D4	Reserved	1000	Reserved
D3:D2	Freq	00	Set SW scan frequency: 00: around 400Hz; 01: around 800Hz; 10: around 1600Hz; 11: around 3200Hz
D1	Switch	0	0: All LED switched off; 1: All LED switched on
D0	Ghost	0	0: De-Ghost function disabled; 1: De-ghost function enabled

Command8

Bit	Label	Default	Description
D7:D4	Reserved	1001	Reserved
D3:D2	Reserved	00	Reserved
D1	Reset	0	1: Write “1” to this bit will reset all the registers to their default value. RAM data is not changed. After writing, this bit resume “0”.
D0	UVLO	0	UVLO reset enable: 0: UVLO reset disabled 1: reset enabled, when VDD voltage is lower than 2V, the device will reset all the registers to their default value.

RAM Address and PWM Value

HTR6916 内置了 RAM 用于存储每个 LDE 的 PWM 调光数据。每个 RAM 地址的值对应一个 LED (SmCn，表示该 LED 灯接至 Sm 端和 Cn 端)的 PWM 调光，如下表：

HTR6916 integrates RAM to store PWM diming data for each LED. Each LED PWM diming is determined by the value of each RAM address as follows:

Table4 RAM Address and LED

RAM Address	LED	RAM Address	LED	RAM Address	LED	RAM Address	LED	RAM Address	LED
0x00	S1C1	0x10	S2C1	0x20	S3C1	0x30	S4C1	0x40	S5C1
0x01	S1C2	0x11	S2C2	0x21	S3C2	0x31	S4C2	0x41	S5C2
0x02	S1C3	0x12	S2C3	0x22	S3C3	0x32	S4C3	0x42	S5C3
0x03	S1C4	0x13	S2C4	0x23	S3C4	0x33	S4C4	0x43	S5C4
0x04	S1C5	0x14	S2C5	0x24	S3C5	0x34	S4C5	0x44	S5C5
0x05	S1C6	0x15	S2C6	0x25	S3C6	0x35	S4C6	0x45	S5C6
0x06	S1C7	0x16	S2C7	0x26	S3C7	0x36	S4C7	0x46	S5C7
0x07	S1C8	0x17	S2C8	0x27	S3C8	0x37	S4C8	0x47	S5C8
0x08	S1C9	0x18	S2C9	0x28	S3C9	0x38	S4C9	0x48	S5C9
0x09	S1C10	0x19	S2C10	0x29	S3C10	0x39	S4C10	0x49	S5C10
0x0A	S1C11	0x1A	S2C11	0x2A	S3C11	0x3A	S4C11	0x4A	S5C11
0x0B	S1C12	0x1B	S2C12	0x2B	S3C12	0x3B	S4C12	0x4B	S5C12
0x0C	S1C13	0x1C	S2C13	0x2C	S3C13	0x3C	S4C13	0x4C	S5C13
0x0D	S1C14	0x1D	S2C14	0x2D	S3C14	0x3D	S4C14	0x4D	S5C14
0x0E	S1C15	0x1E	S2C15	0x2E	S3C15	0x3E	S4C15	0x4E	S5C15
0x0F	S1C16	0x1F	S2C16	0x2F	S3C16	0x3F	S4C16	0x4F	S5C16

Table5 RAM Address and LED

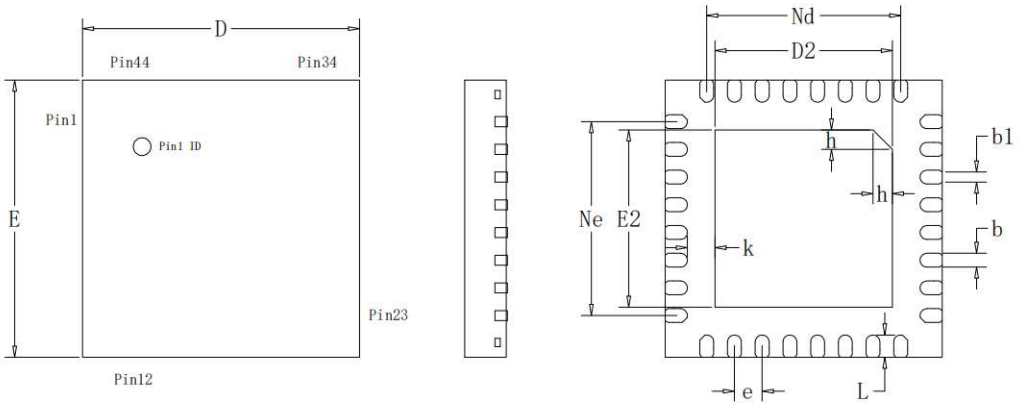
RAM Address	LED	RAM Address	LED	RAM Address	LED	RAM Address	LED
0x50	S6C1	0x60	S7C1	0x70	S8C1	0x80	S9C1
0x51	S6C2	0x61	S7C2	0x71	S8C2	0x81	S9C2
0x52	S6C3	0x62	S7C3	0x72	S8C3	0x82	S9C3
0x53	S6C4	0x63	S7C4	0x73	S8C4	0x83	S9C4
0x54	S6C5	0x64	S7C5	0x74	S8C5	0x84	S9C5
0x55	S6C6	0x65	S7C6	0x75	S8C6	0x85	S9C6
0x56	S6C7	0x66	S7C7	0x76	S8C7	0x86	S9C7
0x57	S6C8	0x67	S7C8	0x77	S8C8	0x87	S9C8
0x58	S6C9	0x68	S7C9	0x78	S8C9	0x88	S9C9
0x59	S6C10	0x69	S7C10	0x79	S8C10	0x89	S9C10
0x5A	S6C11	0x6A	S7C11	0x7A	S8C11	0x8A	S9C11
0x5B	S6C12	0x6B	S7C12	0x7B	S8C12	0x8B	S9C12
0x5C	S6C13	0x6C	S7C13	0x7C	S8C13	0x8C	S9C13
0x5D	S6C14	0x6D	S7C14	0x7D	S8C14	0x8D	S9C14
0x5E	S6C15	0x6E	S7C15	0x7E	S8C15	0x8E	S9C15
0x5F	S6C16	0x6F	S7C16	0x7F	S8C16	0x8F	S9C16

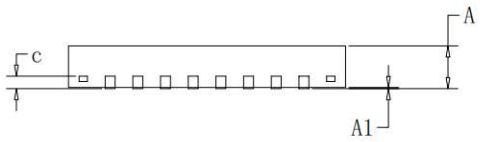
■ Revision History

Date	Version	Revision Content
2025-10-20	V0.1	Preliminary Version.
2025-12-2	V0.5	Delete HTR6916S.

■ PACKAGE OUTLINE

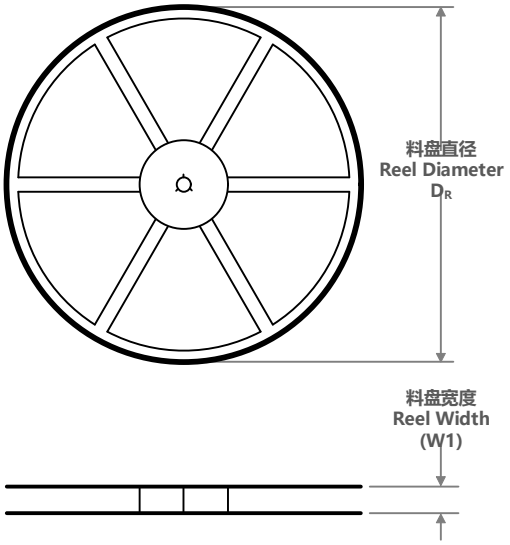
SQE (QFN5×5-32L)

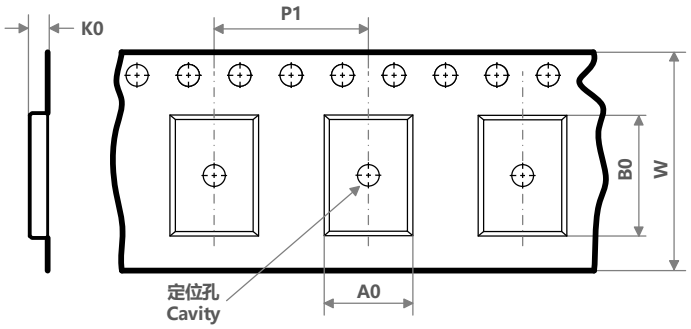




SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	--	0.02	0.05
b	0.20	0.25	0.30
b1	0.13	0.18	0.23
c	0.203 REF		
D	4.90	5.00	5.10
D2	3.10	3.20	3.30
Nd	3.50 BSC		
e	0.50 BSC		
E	4.90	5.00	5.10
E2	3.10	3.20	3.30
Ne	3.50 BSC		
h	0.30	0.35	0.40
k	0.45	0.50	0.55
L	0.35	0.40	0.45

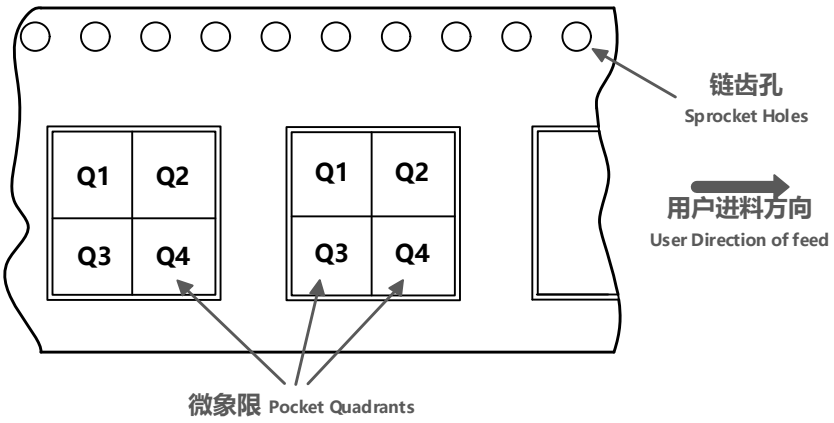
■ TAPE AND REEL INFORMATION





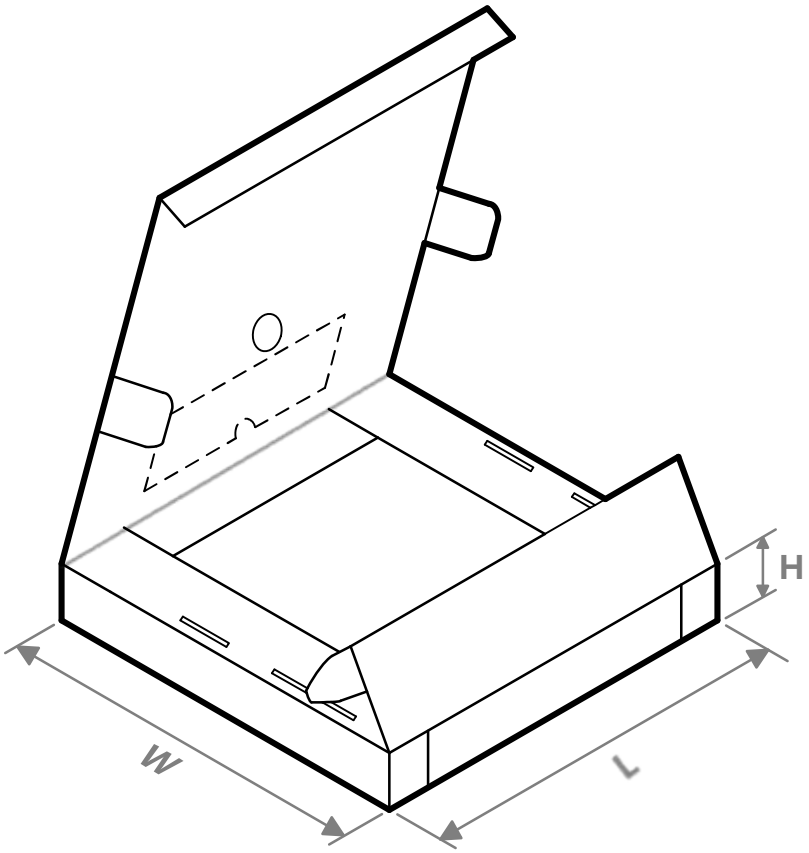
A0	Dimension designed to accommodate the component width; 料槽宽度
B0	Dimension designed to accommodate the component length; 料槽长度
K0	Dimension designed to accommodate the component thickness; 料槽厚度
W	Overall width of the carrier tape; 载带整体宽度
P1	Pitch between successive cavity centers; 相邻槽中心间距

编带 PIN1 方位象限分配
Quadrant Assignments for Pin1 Orientation in Tape



器件料号 Part No.	封装类型 Package Type	封装标识 Package Code	引脚数 Pins	SPQ	料盘直径 D_R(mm)	料盘宽度 W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 象限 Quadrant
HTR6916SQER	QFN5×5	SQE	32	5000	330	12	5.4	5.4	1.25	8	12	Q1

■ TAPE AND REEL BOX INFORMATION



器件料号 Part No.	封装类型 Package Type	封装标识 Package Code	引脚数 Pins	SPQ	长度 Length (mm)	宽度 Width (mm)	高度 Height (mm)
HTR6916SQER	QFN5×5	SQE	32	10000	360	345	65

IMPORTANT NOTICE
注意

Heroic Electronic Technology (Jiaxing) Co., Ltd (HT) reserves the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any products or services. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete.

禾润电子科技（嘉兴）股份有限公司（以下简称HT）保留对产品、服务、文档的任何修改、更正、提高、改善和其他改变，或停止提供任何产品和服务的权利。客户在下单和生产前应确保所得到的信息是最新、最完整的。

HT assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using HT components.

HT对相关应用的说明和协助以及客户产品的板级设计不承担任何责任。

HT products are not authorized for use in safety-critical applications (such as life support devices or systems) where a failure of the HT product would reasonably be expected to affect the safety or effectiveness of that devices or systems.

HT的产品并未授权用于诸如生命维持设备等安全性极高的应用中。

The information included herein is believed to be accurate and reliable. However, HT assumes no responsibility for its use; nor for any infringement of patents or other rights of third parties which may result from its use.

本文中的相关信息是精确和可靠的，但HT并不对其负责，也不对任何可能的专利和第三方权利的侵害负责。

Following are URLs and contacts where you can obtain information or supports on any HT products and application solutions:

下面是可以联系到我公司的相关链接和联系方式：

禾润电子科技（嘉兴）股份有限公司
Heroic Electronic Technology (Jiaxing) Co., Ltd.
地址: 浙江省嘉兴市南湖区亚太路906号科创CBD园区21号楼11层
Add: 11th floor, Building 21, No. 906, Yatai Road, Jiaxing, Zhejiang Province
Sales: 0573-82586608, sales@heroic.com.cn
Support: 0573-82586151, support@heroic.com.cn
Website: www.heroic.com.cn; wap.heroic.com.cn
Wechat MP: HEROIC_JX
请及时关注禾润官方微信公众号，随时获取最新产品信息和技术资料！