

# TLC6C5748-Q1 16-Bit Data Format Example



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Display and LED Drivers

The TLC6C5748-Q1 device is an automotive local dimming LED driver that supports 48-channel direct drive. The TLC6C5748-Q1 has one common shift register and three data latches: the grayscale (GS) data latch, the control data latch, and the dot correction (DC) data latch. The common shift register is 769 bits long, the GS data latch is 768 bits long, the control data latch is 371 bits long, and the DC data latch is 336 bits long. If the common shift register MSB is 0, the least significant 768 bits from the common shift register are latched into the GS data latch. If the MSB is '1', and bits 767 to 760 are 96h (10010110b), the data are latched into the control data latch.

TLC6C5748-Q1 protocol is similar to Serial Peripheral Interface (SPI), but not the same. An SPI port can support the data format. The following content demonstrates the standard data format for 16-bit SPI command.

First, after issuing the latch signal, the controller needs to issue 769 bits into TLC6C5748-Q1 including 9-bit identified data, 389-bit '0' data, 5-bit FC, 21-bit BC, 9-bit MC and 336-bit DC data to set the initial TLC6C5748-Q1 setting. To achieve 16-bit SPI data format, extend '1' data on MSB to a multiple of 16. For example, if the system use one TLC6C5748-Q1, the system needs to issue the 15-bit '1' data, 9-bit '110010110b', 389-bit '0' data, 5-bit FC setting, 21-bit BC, 9-bit MC and 336-bit DC data. Total data bit count is 784 bits. For N count TLC6C5748-Q1 devices, issue 2 × N times for the initial setting is recommended.

For issuing the grayscale data, use the same method, such as extending '1' data on MSB to a multiple of 16 as done with the initial control data setting. For N count TLC6C5748-Q1, the device needs to issue N times for all TLC6C5748-Q1 settings. For example, if the system uses one TLC6C5748-Q1 device, the system needs to issue the 15-bit '1' data, 1-bit '0' data for identification, and 768-bit data for 48 channel gray scale data. For N count TLC6C5748-Q1 devices, issue N times for the grayscale data is recommended.

The Microsoft® Excel® file in the [TLC6C5748-Q1](#) folder demonstrates the 16-bit example SPI command for TLC6C5748-Q1 and the Excel file provides a simple method to calculate MC and DC for the desired channel current by setting BC as 7Fh, see [Figure 1](#).

Desired Isink	10	mA	user input
IOLCMax(mA)	19.1	mA	user input-select a value > desired Isink
BC	7F	h	result
MC	4	h	
DC	2D	h	

Real IOUtn            9.9987748 mA

**Figure 1. MC, BC, DC Calculation Example**

BINARY																					
dummy bits		9bit				389bit		371bit													
Ignore (To fulfill 16bit SPI)		Identification for control data (DC/MC/BC/FC)				To fulfill 769bit		FC setting		BC(21bit), below data repeat 3 times											
LAT	1.....1b	1	1	0	0	1	0	1	1	0	0b*389	0	1	0	0	1	1111111	MC(9bit), below data repeat 3 times	004	DC(336bit), below data repeat 48 times	0101101
769bit*N																					
dummy bits		9bit				389bit		371bit													
Ignore (To fulfill 16bit SPI)		Identification for control data (DC/MC/BC/FC)				To fulfill 769bit		FC setting		BC(21bit), below data repeat 3 times											
LAT	1.....1b	1	1	0	0	1	0	1	1	0	0b*389	0	1	0	0	1	1111111	MC(9bit), below data repeat 3 times	004	DC(336bit), below data repeat 48 times	0101101
769bit*N																					
dummy bits		769bit*N																			
Ignore (To fulfill 16bit SPI)		identi	100% duty as example																		
LAT	1.....1b	0	FFFFh*48																		

N = Driver amounts

Two cascaded TLC6C5748-Q1 (TLC6C5748-Q1 use shift register.)

14bit		769bit		769bit	
Ignore (To fulfill 16bit SPI)		identi	100% duty as example	iden	100% duty as example
LAT	111111111111b	0	FFFFh*48	0	FFFFh*48
		This is for 2nd LED driver.		This is for 1st LED driver.	

**Figure 2. TLC6C5748-Q1 16-Bit SPI Command Example**

**BINARY**

LAT	dummy bits Ignore (To fulfill 16bit SPI) 1.....1b	9bit Identification for control data (DC/MC/BC/FC) 1 1 0 0 1 0 1 1 0	389bit To fulfill 769bit 0b*389	FC setting 0 1 0 0 1	BC (21bit), below data repeat 3 times 1111111	MC (9bit), below data repeat 3 times 004	DC (336bit), below data repeat 48 times 0101101
LAT	dummy bits Ignore (To fulfill 16bit SPI) 1.....1b	9bit Identification for control data (DC/MC/BC/FC) 1 1 0 0 1 0 1 1 0	389bit To fulfill 769bit 0b*389	FC setting 0 1 0 0 1	BC (21bit), below data repeat 3 times 1111111	MC (9bit), below data repeat 3 times 004	DC (336bit), below data repeat 48 times 0101101
LAT	dummy bits Ignore (To fulfill 16bit SPI) 1.....1b	769bit*N 100% duty as example FFFFH*48					

**N = Driver amounts**

Two cascaded TLC6C5748-Q1 (TLC6C5748-Q1 use shift register.)

LAT	14bit Ignore (To fulfill 16bit SPI) 111111111111b	769bit 100% duty as example FFFFH*48	Identif 0	769bit 100% duty as example FFFFH*48	Identif 0	LAT
						This is for 1st LED driver.
						This is for 2nd LED driver.

**Figure 3. (Portrait) TLC6C5748-Q1 16-Bit SPI Command Example**

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