High Accuracy, Full Protection & Diagnostics, Constant-Current RGB LED Driver with Sleep-Mode

1. FEATURES

- 33 Constant-Current-Sink Output Channels
  - 30-mA Maximum Output Current
  - 5-V Maximum Output Voltage
  - 3 Output Groups: OUTRn, OUTGn, OUTBn
- Output Current Adjustment
  - 7-Bit Dot Correction for Each Channel
  - 8-Bit Intensity Control for Each Group
- Integrated PWM Grayscale Generator
  - PWM Dimming for Each Individual Channel
  - Adjustable Global Grayscale Mode: 12-Bit, 10-Bit, 8-Bit
- Protection and Diagnostics
  - LED-Open Detection, LED-Short Detection, Output Short-to-GND Detection
  - Adjacent-Pin Short Detection
  - Pre-Thermal Warning, Thermal Shutdown
  - IREF Resistor Open- and Short-Detection and -Protection
  - Negate Bit Toggle for GCLK Error Detect and LOD_LSD Register Error Check
  - LOS_LSF Circuit Self-Test
- Programmable Output Slew Rate
- Output Channel Group Delay
- Support Serial Data Interface Communication from Simple 8-bit MCU
- Support Sleep Mode with supply current below 100uA
- High Accuracy: Typical +/-7% per channel

2. APPLICATIONS

- Automotive Interior & RGB Ambient Lighting
- Automotive Center Stack Display
- Automotive Shift-by-Wire and Gear Shifter
- Automotive Faceplate
- Automotive Local Dimming Display

3. GENERAL DESCRIPTION

The HT1388 is designed for driving 33-channel LEDs Driver. It can supply a maximum 30mA constant output current set by an external resistor. The device has a 7-bit dot correction for each output. The device also has an 8-bit intensity control for the outputs of each color group.

A 12-, 10-, or 8-bit grayscale control adjusts the intensity of each output. The device has circuits that sense faults in the system, including LED faults, adjacent-pin short faults, reference-resistor faults, and etc. Two slew rate control can be programmed for adjustment to get the largest decrease in system noise. There is an interval between the changes of output level from on LED group to a different one. This interval helps to decrease the starting electrical current. The SDI and SDO pins let more than one device be connected in series for control through one serial interface.
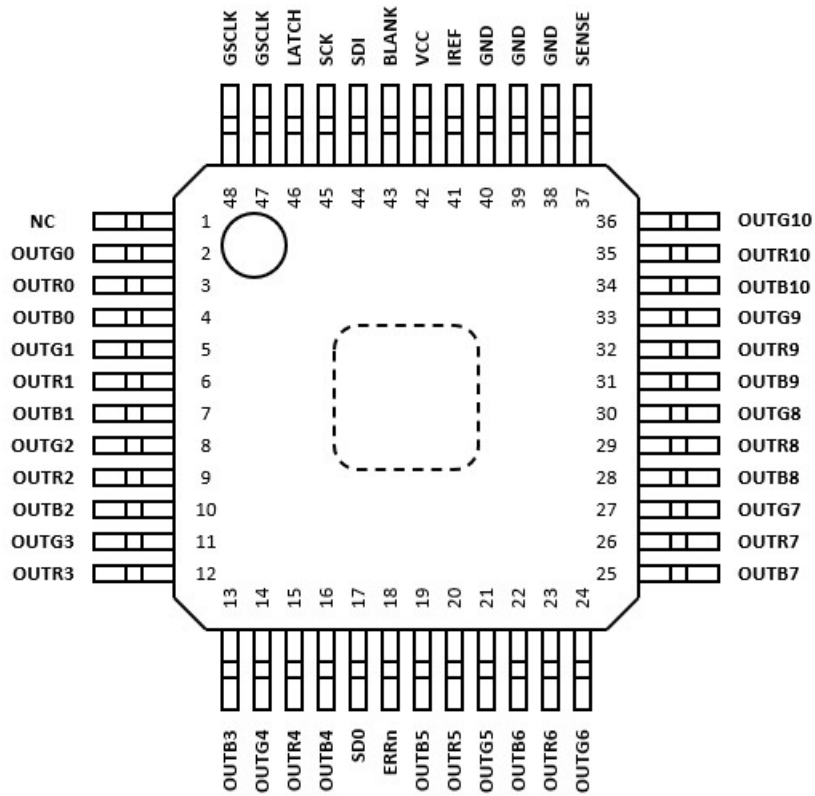
4. PART NUMBER INFORMATION

PART NO.	PACKAGE
HT1388FP	eQFP48
HT1388FN	QFN48

5. TYPICAL APPLICATION
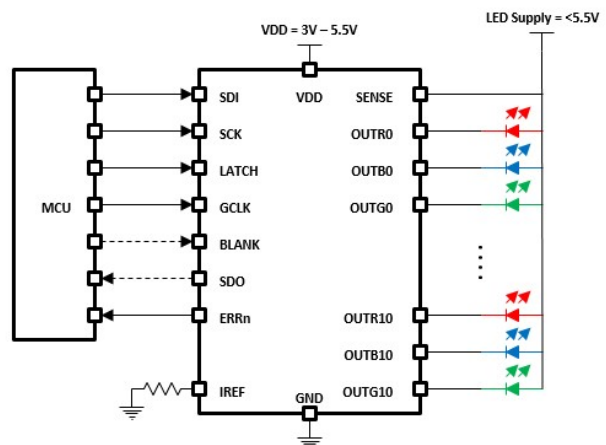
6. PIN CONFIGURATION AND DESCRIPTIONS

Pin assignment of HT1388FP

Pin Descriptions

Pin No.	Pin Name	I/O	Description
44	SDI	I	Serial data-in pin
45	SCK	I	Data-shift clock-input pin
46	LATCH	I	Latch-enable input pin
47,48	GCLK	I	Clock input for grayscale PWM counter. These two pins are connected together internally.
2,5,8,11,14,21,24,27,30,33,36	OUTG0-10	O	Constant-current outputs for color Green
3,6,9,12,15,20,23,26,29,32,35,	OUTR0-10	O	Constant-current outputs for color Red
4,7,10,13,16,19,22,25,28,31,34	OUTB0-10	O	Constant-current outputs for color Blue

Pin Descriptions (continued)

Pin No.	Pin Name	I/O	Description
38,39,40	GND	-	Power ground
37	SENSE	I	Connect to LED supply for LED diagnostics
41	IREF	I	Reference-current pin for setting the full-scale output current
42	VCC	-	Power supply pin
43	BLANK	I	Blank all outputs. BLANK low for
18	ERRn	O	Open-drain error feedback
17	SDO	O	Serial data-out pin
1	NC	-	Not connected
-	Thermal pad	-	Connect to ground to improve thermal performance

7. SPECIFICATIONS

7.1. Absolute Maximum Ratings

	PIN Name	Symbol	Value	Unit
Input Voltage	V_{CC}		-0.3 to 6	V
	SENSE		-0.3 to 6	V
	BLANK, GCLK, LATCH, SCK, SDI		-0.3 to V_{CC} + 0.3	V
Output Voltage	ERRn, IREF, SDO		-0.3 to V_{CC} + 0.3	V
	OUTR0-10, OUTG0-10, OUTB0-10		-0.3 to 6	V
Output Current	OUTR0-10, OUTG0-10, OUTB0-10		0 to 30	mA
Junction temperature range		T_J	-40 to +140	℃
Maximum soldering temperature (at leads, 10sec)		T_{LEAD}	+300	℃
Storage temperature range		T_S	-55 to +150	℃
Junction to case(bottom) thermal resistance		θ_{JC}	30	℃ /W

Remarks: 1) All voltages are with respect to GND unless otherwise noted.

7.2. ESD Ratings

		VALUE	Unit
HT1388FN (QFN48 package)			
Electrostatic Discharge	Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001	±2000	V