Inductorless, Four Channel Flash LED Driver

FEATURES

- Dual Independent 1.0A LED1/LED2 Current Source
  - Flash：3.91mA~1.0A，256 levels 3.91mA/level
  - Torch：1.46mA~375mA，256 levels 1.46mA/level
  - Flash Timeout：40ms~1.6s，16 levels
- Dual Independent 375 mA LED3/LED4 Current Sink
  - Flash：1.46mA~375mA，256 levels 1.46mA/level
  - Torch：1.46mA~375mA，256 levels 1.46mA/level
  - Flash Timeout：40ms~1.6s，16 levels
- Optimized Flash LED Current During Low Battery Conditions (IVFM)
- Hardware Strobe Enable (STROBE)
- 400kHz I^2C：AW36429（I^2C Address=0x63）
- 0.4mm Pitch，FCQFN-10L Package

APPLICATION

Smartphone Camera Flash

GENERAL DESCRIPTION

The AW36429 is a inductorless four channel flash LED driver that provides a high level of adjustability within a ultra-small solution size. The AW36429 includes two current sources and two current sinks which are controlled independently by I^2C-compatible interface. The AW36429 provides IVFM protection mode to prevent system reset or shutdown under low battery condition.

The AW36429 is controlled via an I^2C-compatible interface. The main features of the AW36429 include: flash / torch / IR current, flash timeout duration and IVFM. The AW36429 also provides hardware flash pin (STROBE) to control flash event.

The device operates over a –40°C to +85°C ambient temperature range.

The AW36429 is available in small 0.4mm pitch 1.6mm×1.2mm FCQFN-10L package.

TYPICAL APPLICATION CIRCUIT

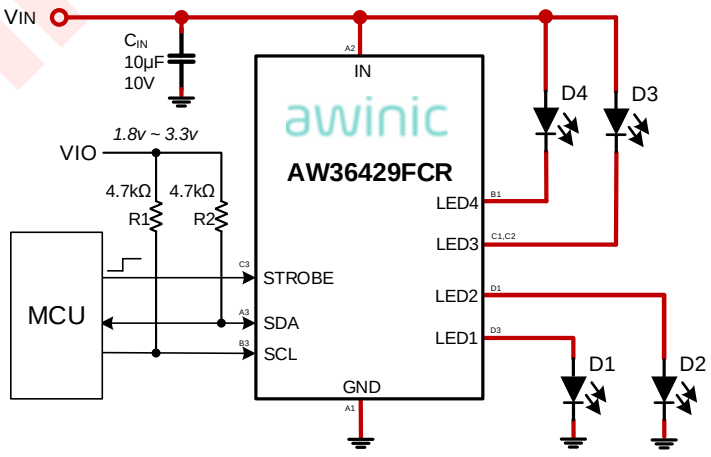
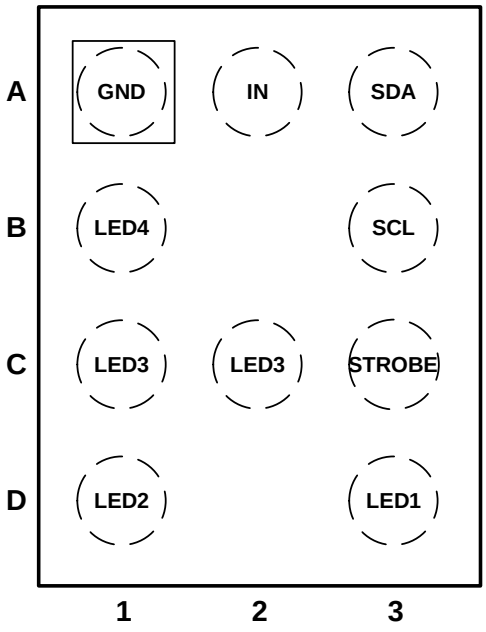


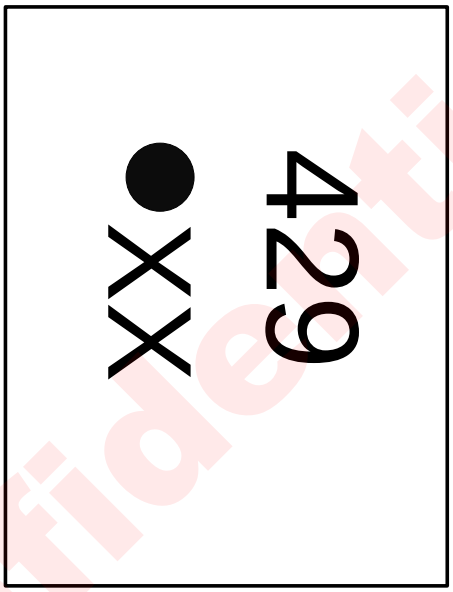
Fig 1 Typical Application Circuit of AW36429

PIN CONFIGURATION AND TOP MARK

AW36429FCR Pin Configuration (Top View)



AW36429FCR Top Mark (Top View)



429 – AW36429FCR
XX – Manufacture Tracking Code

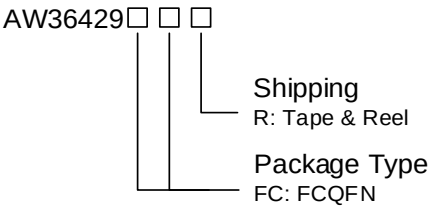
Fig 2 Pin Configuration and Top Mark

PIN DEFINITION

No.	NAME	TYPE	DESCRIPTION
A1	GND	Ground	Ground
A2	IN	Power	Input voltage connection. Connect IN to GND with a 10μF or larger ceramic capacitor.
A3	SDA	I/O	Serial data input/output of the I^2C interface.
B1	LED4	I/O	Low-side current sink output for flash LED4.
B3	SCL	I/O	Serial clock input of the I^2C interface.
C1,C2	LED3	Power	Low-side current sink output for flash LED3.
C3	STROBE	I/O	Active high hardware flash enable. Drive STROBE high to turn on Flash pulse. Internal pull down resistor of 300kΩ between STROBE and GND.
D1	LED2	Power	High-side current source output for flash LED2.
D3	LED1	Power	High-side current source output for flash LED1.

ORDERING INFORMATION

Part Number	Temperature	Package	Marking	Moisture Sensitivity Level	Environmental Information	Delivery Form
AW36429FCR	-40℃～85℃	FCQFN-10L	429	MSL1	ROHS+HF	3000 units/ Tape and Reel



AWINIC FLASH LED DRIVER SERIES

Product	Channels	Type	Description	Package
AW3644	2	Boost	High Efficiency, Dual Independent 1.5A Flash LED Driver	CSP-12
AW36414	2	Boost	High Efficiency, Dual Independent 1.5A Flash LED Driver	CSP-12
AW3643	2	Boost	High Efficiency, Dual 1.5A Flash LED Driver	CSP-12
AW36413	2	Boost	High Efficiency, Dual 1.5A Flash LED Driver	CSP-12
AW3648	1	Boost	High Efficiency, 1.5A Flash LED Driver	CSP-12
AW3641E	1	Charge Pump	Flash Current & Flash Timer Programmable 1A Flash LED Driver	DFN-10
AW3640	1	Current Sink	200mA 1-Wire Configurable Front Flash LED Driver	DFN-6
AW36402	1	Current Sink	200mA 1-wire Configurable Front Flash LED Driver	DFN-6
AW36404	1	Current Sink	400mA 1-wire Configurable Front Flash LED Driver	DFN-8
AW36406	1	Current Sink	600mA PWM Configurable Front Flash LED Driver	DFN-8

TYPICAL APPLICATION CIRCUITS

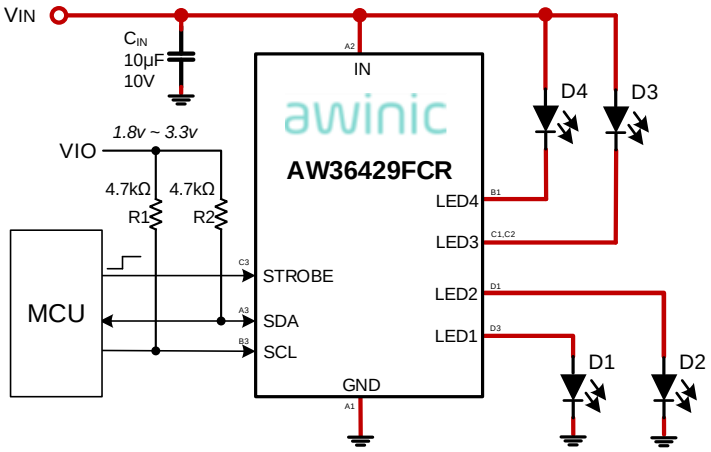


Fig 3 AW36429 Application Circuit

Notice for Typical Application Circuits:

1. Please place C_{IN} as close to the chip as possible.
2. For the sake of driving capability, the power lines, and the connection lines of LED should be short and wide as possible.

ABSOLUTE MAXIMUM RATINGS(NOTE1)

PARAMETERS		Range	Unit
IN, LED1, LED2, LED3, LED4		-0.3 to 6	V
SCL, SDA, STROBE		−0.3 to (V_{IN}+0.3)	V
Continuous power dissipation		Internally limited	
Max Junction Temperature T_{JMAX}		155	℃
Storage Temperature T_{STG}		-65 to 150	℃
Maximum lead temperature (soldering)		260	℃
Junction to Ambient Thermal Resistance θ_{JA}		92	℃/W
ESD, All Pins(NOTE2)	HBM	±2000	V
	MM	±200	V
	CDM	±2000	V
Latch-Up JESD78D		+IT：+350 -IT：-350	mA

RECOMMENDED OPERATING CONDITIONS

PARAMETERS	Range	Unit
V_{IN}	2.7 to 5.5	V
Junction temperature (T_J)	-40 to 125	℃
Ambient temperature (T_A)	-40 to 85	℃

NOTE1: *Conditions out of those ranges listed in "absolute maximum ratings" may cause permanent damages to the device. In spite of the limits above, functional operation conditions of the device should within the ranges listed in "recommended operating conditions". Exposure to absolute-maximum-rated conditions for prolonged periods may affect device reliability.*

NOTE2: *The human body model is a 100pF capacitor discharged through a 1.5kΩ resistor into each pin. Test method: MIL-STD-883J Method 3015.9*

ELECTRICAL CHARACTERISTICS

Typical limits tested at T_A=25℃. Minimum and maximum limits apply over the full operating ambient temperature range(-40℃≤T_A≤85℃). Unless otherwise specified, V_{IN}=3.8V.

Symbol	Description	Test Condition	Min	Typ	Max	Unit
Vin Supply						
V_{IN}	Input Operating Range		2.7		5.5	V
I_{SB}	Standby Supply Current	2.7V≤VIN≤5.5V, SCL=SDA=0V		1	2	μA
I_Q	Quiescent Supply Current			0.2	0.5	mA
UVLO	Under Voltage Lockout Threshold	Falling V_{IN}		2.5		V
		Rising V_{IN}		2.6		V
Current Source Specifications						
$I_{LED1/2}$	Current Source Accuracy	Flash Code=0xFF=1.0A	-10%	1	10%	A
		Torch Code=0x7F=187.5mA	-10%	187.5	10%	mA
$I_{LED3/4}$	Current Source Accuracy	Flash Code =0xFF=400mA	-10%	400	10%	mA
		Torch Code=0x7F=200mA	-10%	200	10%	mA
$V_{HR\_LED1/2}$	Headroom Voltage of LED1/2	Flash Code=0xFF=1.0A		200	300	mV
		Torch Code=0x7F=187.5mA		50	75	mV
$V_{HR\_LED3/4}$	Headroom Voltage of LED3/4	Flash Code =0xFF=375mA		180	270	mV
		Torch Code=0x7F=187.5mA		90	135	mV
T_{FLASH}	Flash Time-out Duration	Reg 0x0B, bits[3:0]=”1010”	-5%	600	5%	ms
V_{IVFM}	Input Voltage Flash Monitor Trip Threshold	Reg 0x02, bits[3:1]=”000”	-3%	2.9	3%	V
T_{SD}	Thermal Shutdown Threshold			155		℃
	Thermal Shutdown Hysteresis			20		
I^2C-Compatible Interface Specifications(SCL,SDA)						
V_{IL}	Input Logic Low		0		0.4	V
V_{IH}	Input Logic High		1.2		V_{IN}	V
V_{OL}	Output Logic Low	I_{LOAD}=3mA			0.4	V
STROBE Voltage Specifications						
V_{IL}	Input Logic Low		0		0.4	V
V_{IH}	Input Logic High		1.2		V_{IN}	V
R_{PD}	Internal Pull Down Resistors			300		kΩ

I²C INTERFACE TIMING

Symbol	Description		Min	Typ	Max	Units
F_{SCL}	Interface Clock Frequency				400	kHz
$T_{DEGLITCH}$	Deglitch Time	SCL		200		ns
		SDA		250		ns
$T_{HD:STA}$	(Repeat-Start) Start Condition Hold Time		0.6			μs
T_{LOW}	Low Level Width of SCL		1.3			μs
T_{HIGH}	High Level Width of SCL		0.6			μs
$T_{SU:STA}$	(Repeat-Start) Start Condition Setup Time		0.6			μs
$T_{HD:DAT}$	Data Hold Time		0			μs
$T_{SU:DAT}$	Data Setup Time		0.1			μs
T_R	Rising Time of SDA And SCL				0.3	μs
T_F	Falling Time of SDA And SCL				0.3	μs
$T_{SU:STO}$	Stop Condition Setup Time		0.6			μs
T_{BUF}	Time Between Start and Stop Condition		1.3			μs

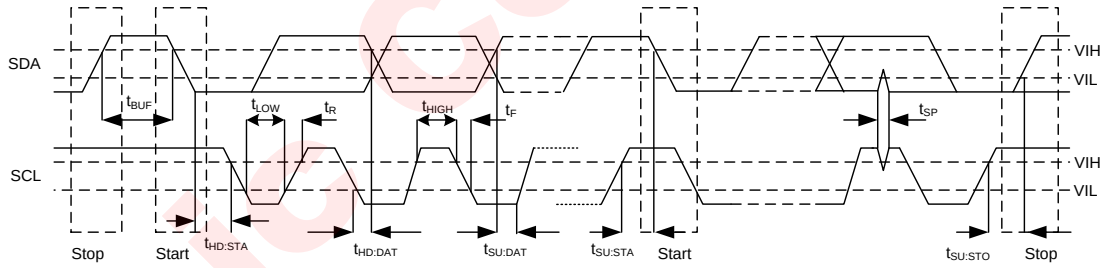


Fig 4 I²C INTERFACE TIMING

TYPICAL CHARACTERISTICS

Ta=25°C, V_{IN}=3.8V, VLED=2.9V @ 375mA, IVFM=Off, unless otherwise noted .

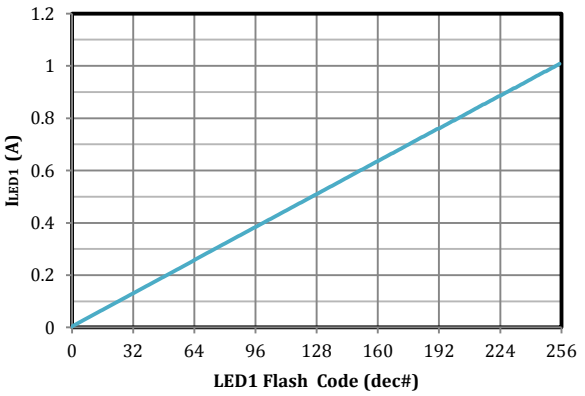


Fig5. LED1 Flash Current vs Brightness Code

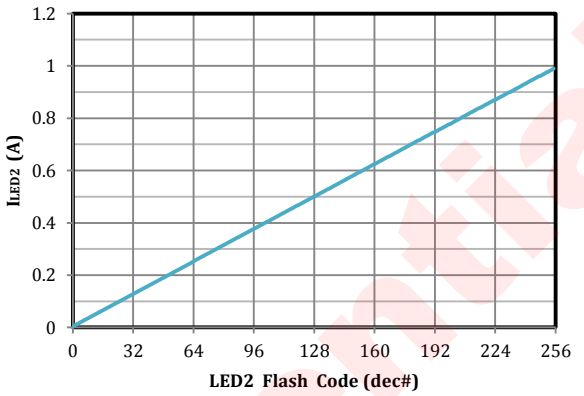


Fig6. LED2 Flash Current vs Brightness Code

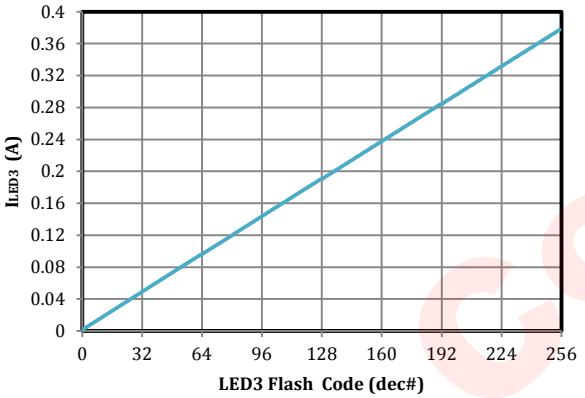


Fig7. LED3 Flash Current vs Brightness Code

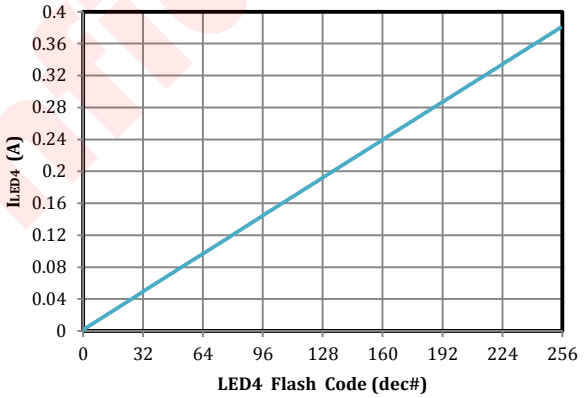


Fig8. LED4 Flash Current vs Brightness Code

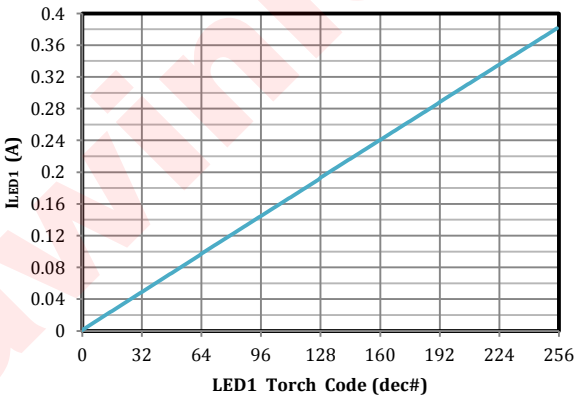


Fig9. LED1 Torch Current vs Brightness Code

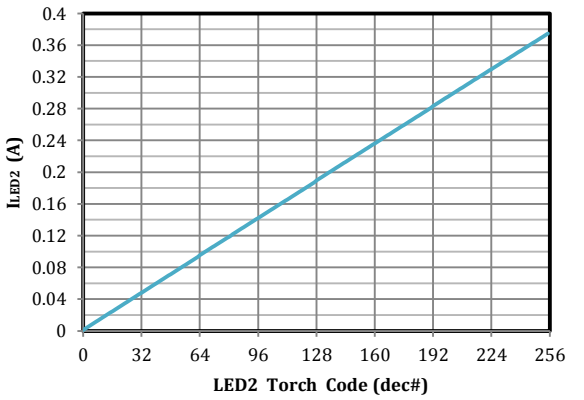


Fig10. LED2 Torch Current vs Brightness Code

Typical Characteristics (continued)

Ta=25°C, V_{IN}=3.8V, VLED=2.9V @ 375mA, IVFM=Off, unless otherwise noted .

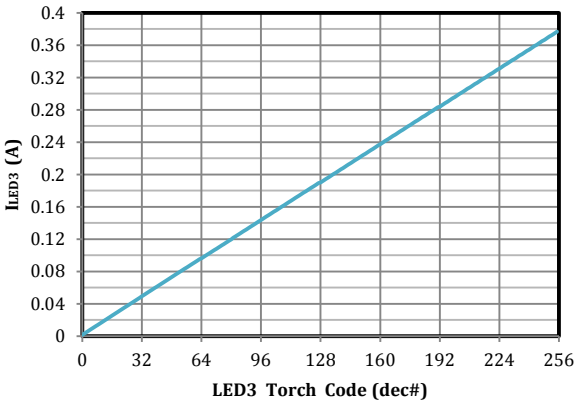


Fig11. LED3 Torch Current vs Brightness Code

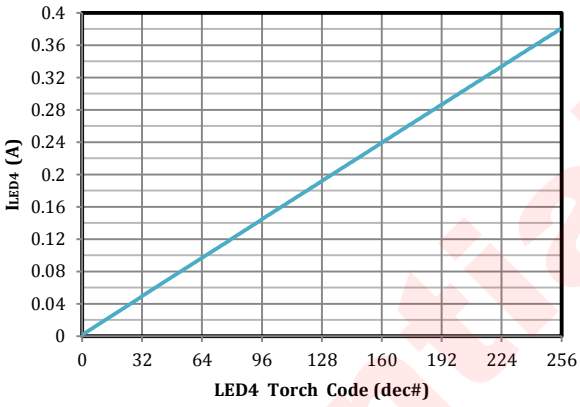


Fig12. LED4 Torch Current vs Brightness Code

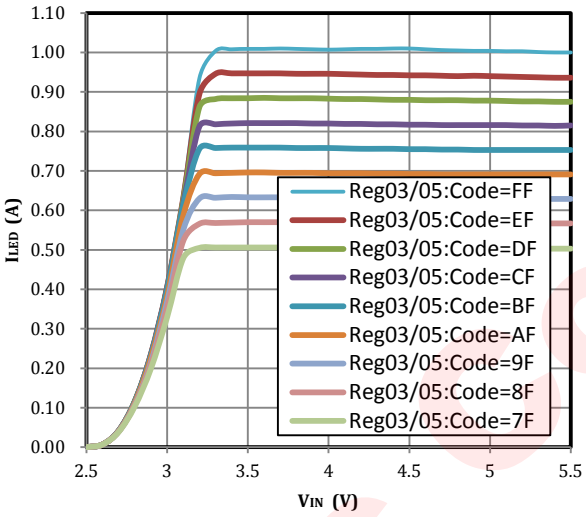


Fig13. LED1/2 Flash Current vs Input Voltage

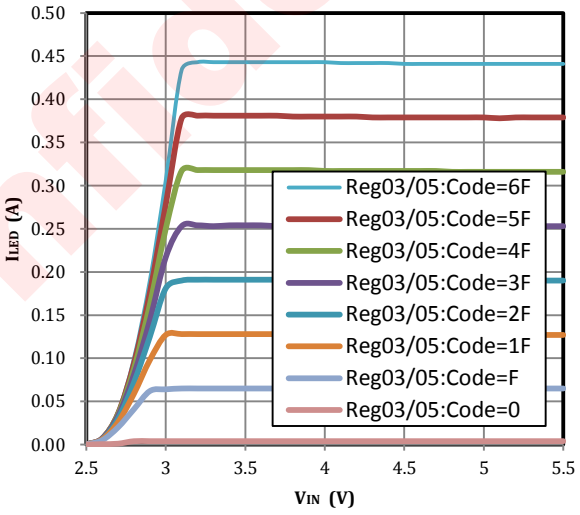


Fig14. LED1/2 Flash Current vs Input Voltage

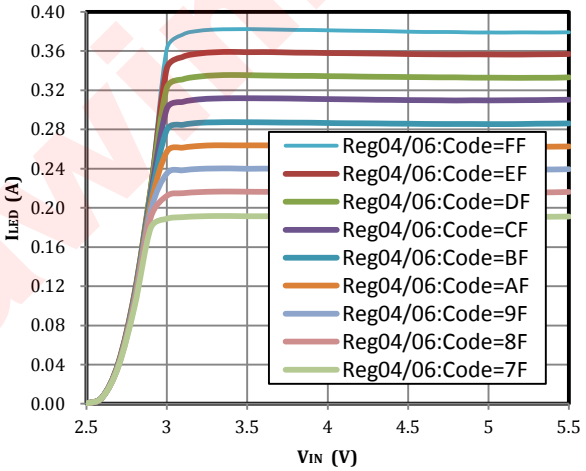


Fig15. LED1/2 Torch Current vs Input Voltage

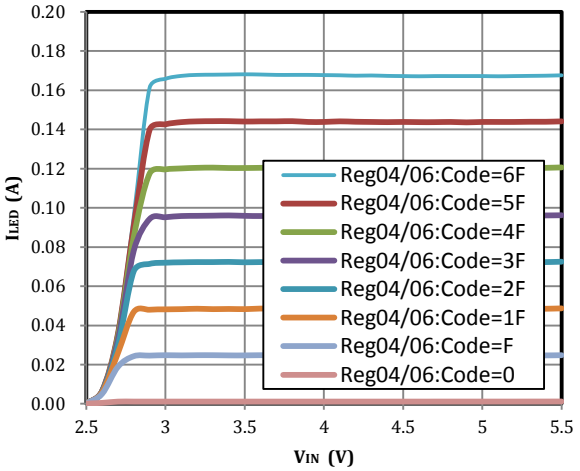


Fig16. LED1/2 Torch Current vs Input Voltage

Typical Characteristics (continued)

Ta=25°C, V_{IN}=3.8V, VLED=2.9V @ 375mA, IVFM=Off, unless otherwise noted .

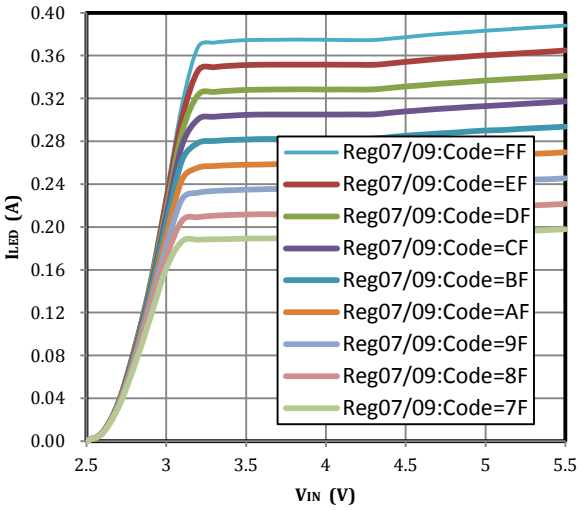


Fig17. LED3/4 Flash Current vs Input Voltage

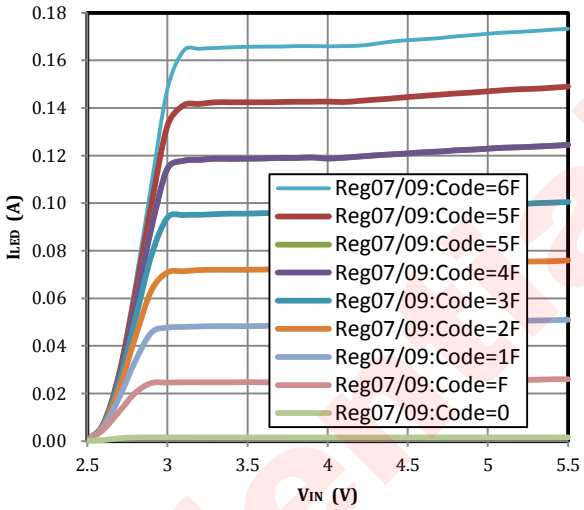


Fig18. LED3/4 Flash Current vs Input Voltage

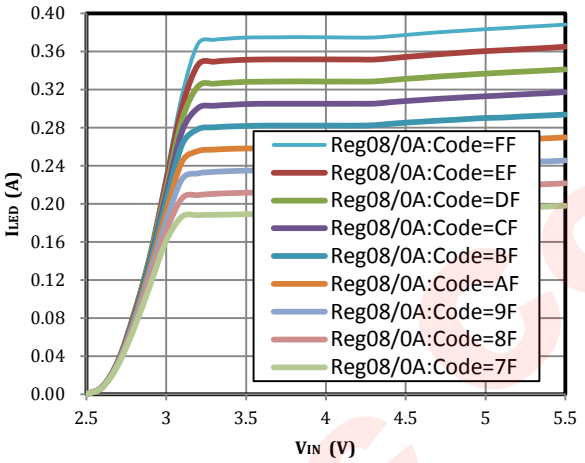


Fig19. LED3/4 Torch Current vs Input Voltage

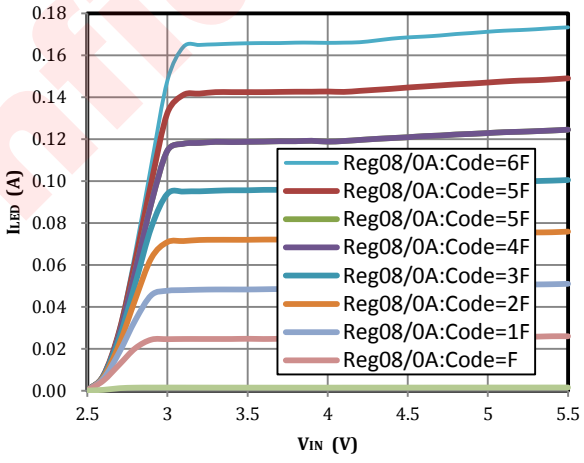


Fig20. LED3/4 Torch Current vs Input Voltage

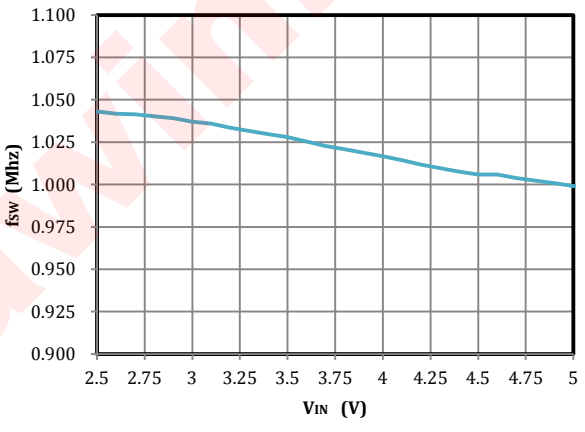


Fig 21. Oscillator Frequency vs Input Voltage

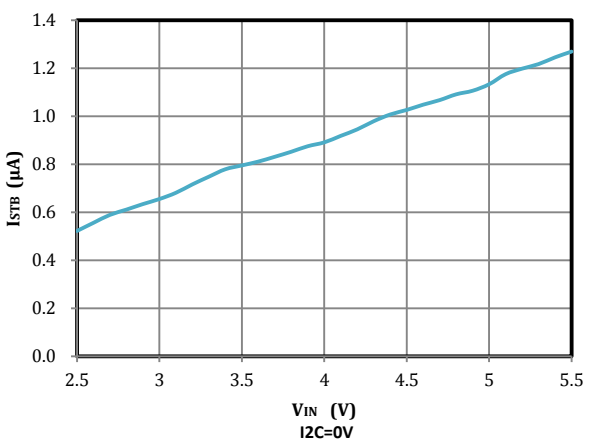


Fig 22. Standby Current vs Input Voltage

Typical Characteristics (continued)

Ta=25°C, V_{IN}=3.8V, VLED=2.9V @ 375mA, IVFM=Off, unless otherwise noted .

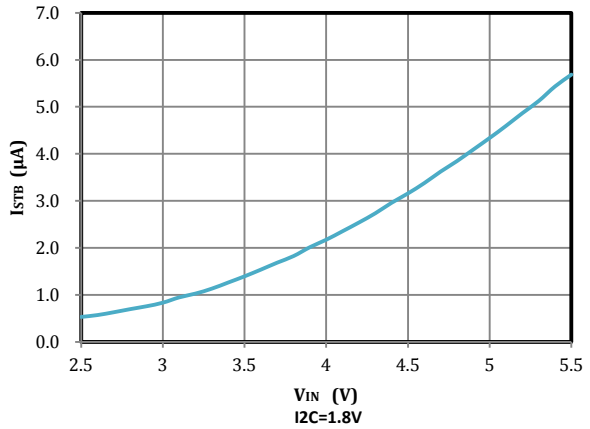


Fig 23. Standby Current vs Input Voltage

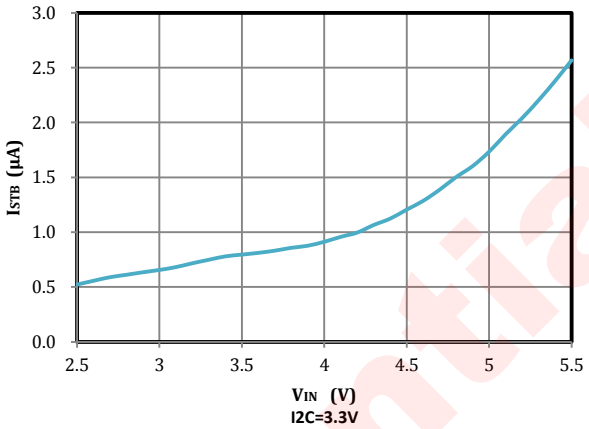
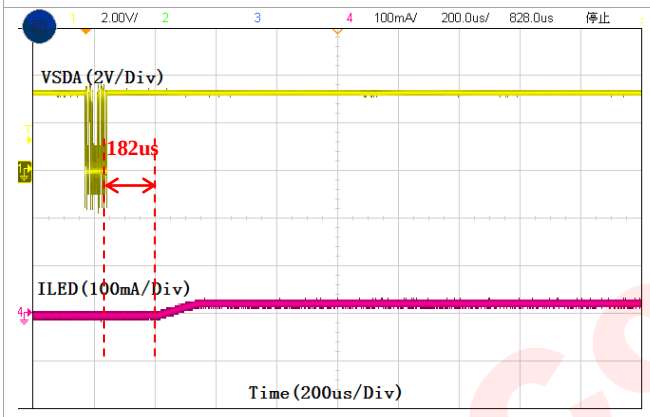
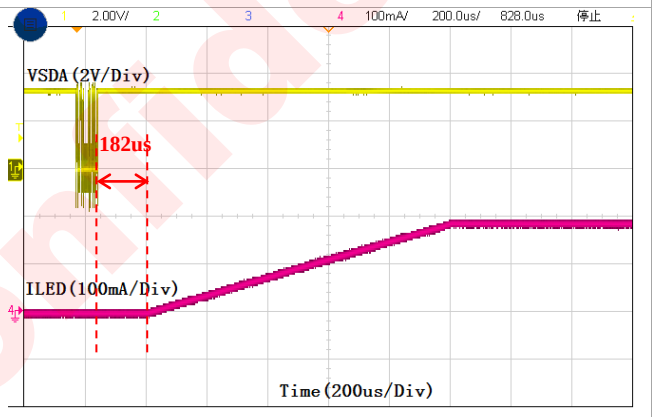


Fig 24. Standby Current vs Input Voltage



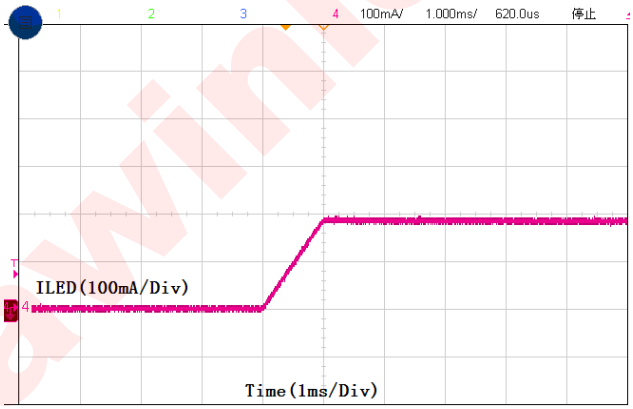
ILED=187.5mA, V_{IN}=3.5V, IVFM=3.6V

Fig 25. IVFM ON



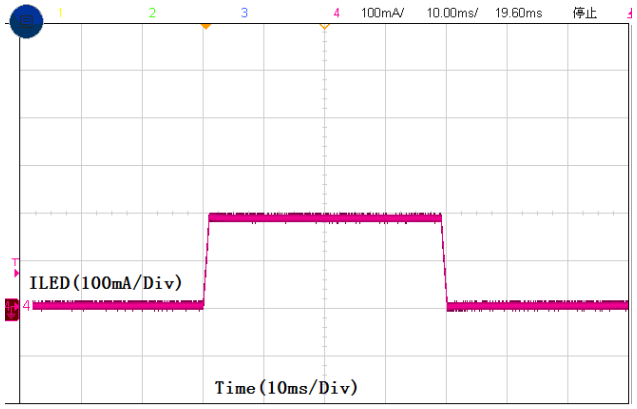
ILED=187.5mA, V_{IN}=3.5V, IVFM=3.6V

Fig 26. IVFM OFF



ILED=187.5mA

Fig 27. Flash Ramp up time

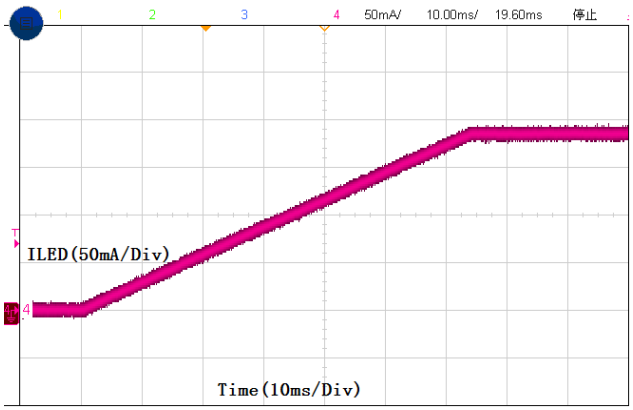


ILED=187.5mA Timeout=40ms(Reg0B(3:0)=0000)

Fig 28. Flash time out

Typical Characteristics (continued)

Ta=25°C, V_{IN}=3.8V, VLED=2.9V @ 375mA, IVFM=Off, unless otherwise noted .



ILED=187.5mA Torch Ramp up=64ms(Reg0B(7:4)=0011)

Fig 29. Torch Ramp up time

DETAILED FUNCTIONAL DESCRIPTION

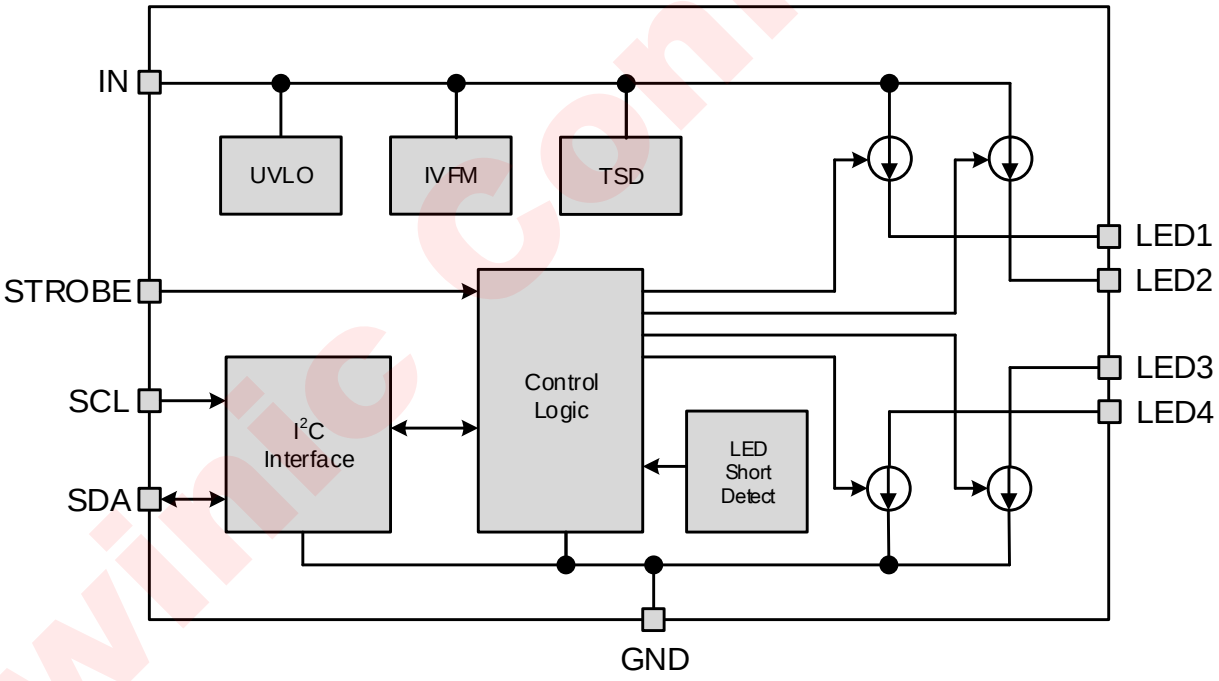
The AW36429 is a high-power four-channel LED flash driver capable of delivering up to 1.0A in either of the two source LEDs and up to 0.375A in either of the two sink LEDs over the 2.7V to 5.5V input voltage range.

The device has one logic input for a hardware flash enable(STROBE). This logic input has an internal 300kΩ(typical) pull-down resistor to GND.

The device is controlled via an I^2C-compatible interface which includes adjustment of the Flash and Torch current levels, changing the Flash Timeout Duration and IVFM level. Additionally, there are flag and status bits that indicate flash current timeout, LED over-temperature condition, LED failure (short), device thermal shutdown, and V_{IN} under-voltage conditions.

Additional features of the device include an automatically forced LED1/2 and LED3/4 enable mutually exclusive to avoid the OTP occurred when all four LEDs are ON. The function can be set by bit7 in the IVFM Register(0x02).

FUNCTION BLOCK DIAGRAM



FEATURE DESCRIPTION

FLASH MODE

In Flash Mode, the LED current sources (LED1/2) provide 256 target current levels from 3.9mA to 1.0A and the LED current sinks(LED3/4) provide 256 target current levels from 1.46mA to 375mA. The Flash currents are adjusted via the LED1,LED2,LED3 and LED4 Flash Brightness Registers. Flash mode is activated by the Enable Register(setting M1, M0 to '11'), or by pulling the STROBE pin HIGH when the pin is enabled (Enable Register). Once the Flash sequence is activated, the current sources (LED1/2) and the current sinks (LED3/4) ramp up to the programmed Flash current by stepping through all current steps until the programmed current is reached.

When the device is enabled in Flash Mode through the Enable Register, all mode bits in the Enable Register are cleared after a flash timeout event.

TORCH MODE

In Torch mode, the LED current sources (LED1/2) provide 256 target current levels from 1.46mA to 375mA and the LED current sinks(LED3/4) provide 256 target current levels from 1.46mA to 375mA. The Torch currents are adjusted via the LED1,LED2,LED3 and LED4 Torch Brightness Registers. Torch mode is activated by the Enable Register (setting M1, M0 to '10'). Once the TORCH sequence is activated, the active current sources (LED1/2) and the current sinks (LED3/4) ramp up to the programmed Torch current by stepping through all current steps until the programmed current is reached. The rate at which the current ramps is determined by the value chosen in the Flash & Torch Timing Register (0x0B 7:4). Torch Mode is not affected by Flash Timeout.

IR MODE

In IR Mode, the target LED current is equal to the value stored in the LED1/2/3/4 Flash Brightness Registers. When IR mode is enabled (setting M1, M0 to '01'), toggling the STROBE pin enables and disables the LED1/2 current sources and LED3/4 current sinks (if enabled). The strobe pin can only be set to be Level sensitive, meaning all timing of the IR pulse is externally controlled. In IR Mode, the current sources do not ramp the LED outputs to the target. The current transitions immediately from off to on and then on to off.

INPUT VOLTAGE FLASH MONITOR (IVFM)

The AW36429 has the ability to adjust the flash current based upon the voltage level present at the IN pin utilizing the Input Voltage Flash Monitor (IVFM). The adjustable threshold ranges from 2.9 V to 3.6 V in 100mV steps, with hold mode. The IVFM threshold are controlled by bits[3:0] in the IVFM Register(0x02). The Flags Register has the IVFM flag bit set when the input voltage crosses the IVFM threshold value and after 4us deglitch delay. Additionally, the IVFM threshold sets the input voltage boundary that forces the AW36429 to either stop ramping the flash current after 32 steps ramp up during the startup.

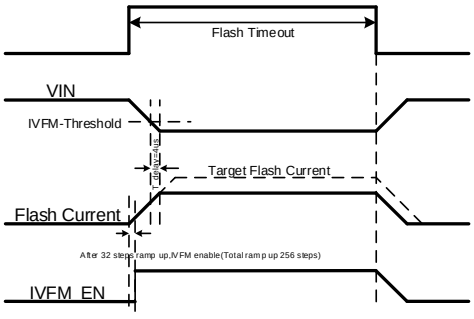


Fig 30 IVFM Timing

FLASH TIMEOUT

The Flash Timeout period sets the maximum time of one flash event, whether a flash stop command is received or not. The AW36429 has 16 timeout levels ranging from 40ms to 1.6s (see Flash & Torch TIMING CONFIGURATION REGISTER (0X0B) for more detail). Flash Timeout applies to both Flash and IR modes, The mode bits are cleared and bit[0] is set in the Flags register(0x0F) upon a Flash Timeout. This fault flag can be reset to '0' by reading back the Flags Register (0x0F), or by removing power to the AW36429.

UNDERVOLTAGE LOCKOUT (UVLO)

The AW36429 has an internal comparator that monitors the voltage at IN and forces the AW36429 into standby when the input voltage drops to 2.5 V. If the UVLO monitor threshold is tripped, the UVLO flag bit is set in the Flags Register (0x0F). If the input voltage rises above 2.5 V, the AW36429 is not available for operation until there is an I^2C read of the Flags Register (0x0F). Upon a read, the Flags register is cleared, and normal operation can resume if the input voltage is greater than 2.5 V.

LED SHORT FAULT

The LED Short Fault flags read back a '1' if the device is active in Flash or Torch or IR mode and either active LED output experiences a short condition. An LED short condition is determined if the voltage at LED1 or LED2 goes below 500mV (typ.) or the voltage between VIN and LED3 or LED4 less than 520mV(typ.) while the device is in Flash or Torch or IR mode. There is a deglitch time of 256μs before the LED Short Fault flag is valid. The mode bits are cleared upon an LED short fault. The AW36429 is not available for operation until the LED Short Fault flags is cleared. The LED Short Faults can be reset to '0' by reading back the Flags Register (0x0F), or by removing power to the AW36429.

THERMAL SHUTDOWN (TSD)

When the AW36429 die temperature reaches 155°C, the thermal shutdown detection circuit is trips, forcing the AW36429 into standby and writing a '1' to the Thermal Shutdown Fault flag of the Flags Register (0x0F) . The AW36429 is only allowed to restart after the Thermal Shutdown Fault flag is cleared. The Thermal Shutdown Faults can be reset to '0' by reading back the Flags Register (0x0F), or by removing power to the AW36429. Upon restart, if the die temperature is still above 155°C, the AW36429 resets the Fault flag and re-enters standby.

PROGRAMMING

I²C INTERFACE

Data Validation

When SCL is high level, SDA level must be constant. SDA can be changed only when SCL is low level.

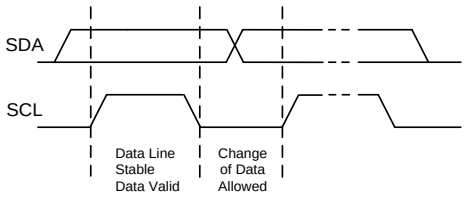


Fig 31 Data Validation Diagram

I²C Start/Stop

I²C start: SDA changes form high level to low level when SCL is high level.

I²C stop: SDA changes form low level to high level when SCL is high level.

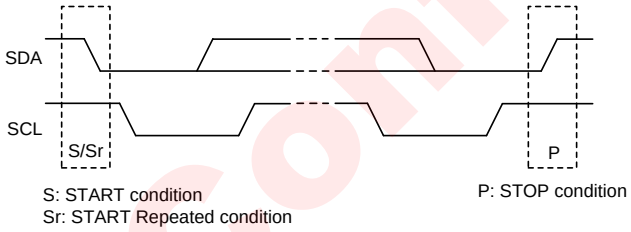


Fig 32 Start and Stop Conditions

ACK (Acknowledgement)

ACK means the successful transfer of I²C bus data. After master sends 8bits data, SDA must be released; SDA is pulled to GND by slave device when slave acknowledges.

When master reads, slave device sends 8bit data, releases the SDA and waits for ACK from master. If ACK is send and I²C stop is not send by master, slave device sends the next data. If ACK is not send by master, slave device stops to send data and waits for I²C stop.

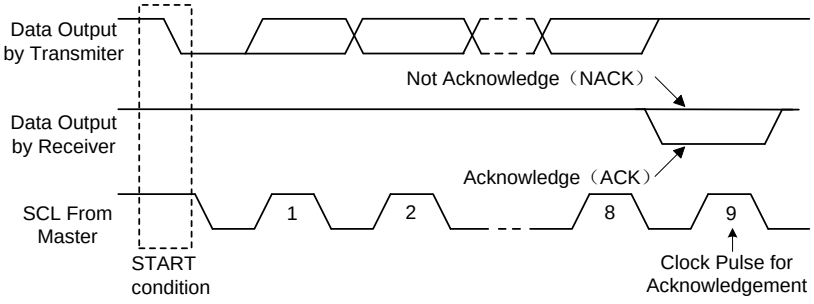


Fig 33 Acknowledgement Diagram

Write Cycle

One data bit is transferred during each clock pulse. Data is sampled during the high state of the serial clock (SCL). Consequently, throughout the clock's high period, the data should remain stable. Any changes on the SDA line during the high state of the SCL and in the middle of a transaction, aborts the current transaction. New data should be sent during the low SCL state. This protocol allows a single data line to transfer both command/control information and data using the synchronous serial clock.

Each data transaction is composed of a Start Condition, a number of byte transfers (set by the software) and a Stop Condition to terminate the transaction. Every byte written to the SDA bus must be 8 bits long and is transferred with the most significant bit first. After each byte, an Acknowledge signal must follow.

In a write process, the following steps should be followed:

1) Master device generates START condition. The "START" signal is generated by lowering the SDA signal while the SCL signal is high.
2) Master device sends slave address (7-bit) and the data direction bit (R/W = 0).
3) Slave device sends acknowledge signal if the slave address is correct.
4) Master sends control register address (8-bit)
5) Slave sends acknowledge signal
6) Master sends data byte to be written to the addressed register
7) Slave sends acknowledge signal
8) If master will send further data bytes the control register address will be incremented by one after acknowledge signal (repeat step 6, 7)
9) Master generates STOP condition to indicate write cycle end

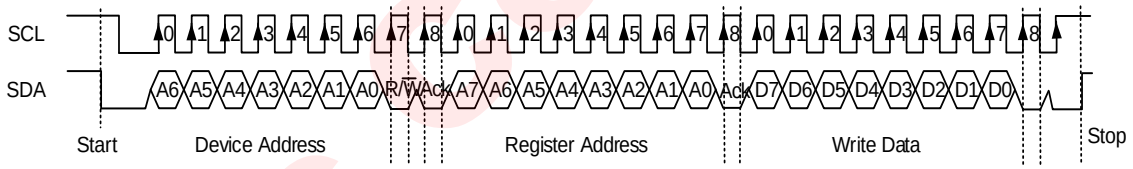


Fig 34 I²C Write Timing

Read Cycle

In a read cycle, the following steps should be followed:

1) Master device generates START condition
2) Master device sends slave address (7-bit) and the data direction bit (R/W = 0).
3) Slave device sends acknowledge signal if the slave address is correct.
4) Master sends control register address (8-bit)
5) Slave sends acknowledge signal
6) Master generates STOP condition followed with START condition or REPEAT START condition
7) Master device sends slave address (7-bit) and the data direction bit (R/W = 1).
8) Slave device sends acknowledge signal if the slave address is correct.
9) Slave sends data byte from addressed register.
10) If the master device sends acknowledge signal, the slave device will increase the control register

address by one, then send the next data from the new addressed register.

11) If the master device generates STOP condition, the read cycle is ended.

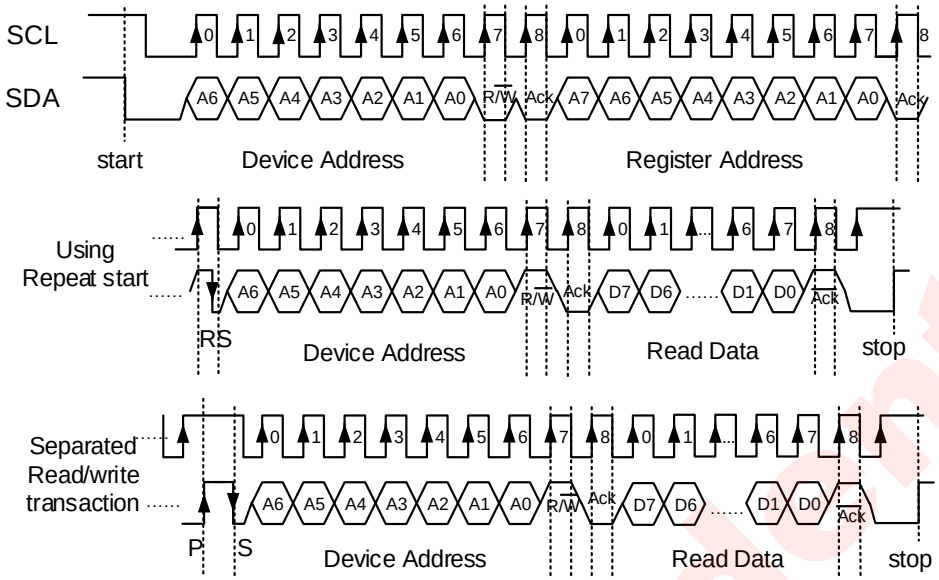


Fig 35 I²C Read Timing

REGISTER CONFIGURATION

REGISTER LIST

Register name	Address(HEX)	Read/Write	Default Value
Chip ID Register	0x00	Read	0x17
Enable Register	0x01	Read/Write	0x00
IVFM Register	0x02	Read/Write	0xE1
LED1 Flash Brightness Register	0x03	Read/Write	0x7F
LED1 Torch Brightness Register	0x04	Read/Write	0x7F
LED2 Flash Brightness Register	0x05	Read/Write	0x7F
LED2 Torch Brightness Register	0x06	Read/Write	0x7F
LED3 Flash Brightness Register	0x07	Read/Write	0x7F
LED3 Torch Brightness Register	0x08	Read/Write	0x7F
LED4 Flash Brightness Register	0x09	Read/Write	0x7F
LED4 Torch Brightness Register	0x0A	Read/Write	0x7F
Flash & Torch Timing Register	0x0B	Read/Write	0x1A
Flags Register	0x0F	Read	0x00
Device ID Register	0x10	Read	0xE3

REGISTER DETAILED DESCRIPTION

✧ Chip ID Register (0x00) , default(0x17)

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Chip ID: "0001 0111" Write 55H To Reset All Registers							

✧ Enable Register (0x01) , default(0x00)

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Strobe Type 0=Level Triggered (Default) 1=Edge Triggered	**Strobe Enable** 0=Disabled (Default) 1=Enabled	**Mode Bits: M1, M0** 00=Standby (Default) 01=IR Drive 10=Torch 11=Flash		**LED4 Enable** 0=OFF (Default) 1=ON	**LED3 Enable** 0=OFF (Default) 1=ON	**LED2 Enable** 0=OFF (Default) 1=ON	**LED1 Enable** 0=OFF (Default) 1=ON

Note:

In Edge or Level Strobe Mode, it is recommended that the trigger pulse width be set greater than 1ms to ensure proper turn-on of the device.

✧ IVFM Register (0x02) , default(0xE1)

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
LEDX Enable Setting 0= if LED1 or LED2 is Enabled, LED3 & LED4 is Disabled Internally 1=No Limitation (Default)	**LED3/4 Pin Short Fault Detect** 0=Disabled 1=Enabled (Default)	**LED1/2 Pin Short Fault Detect** 0=Disabled 1=Enabled (Default)	**UVLO Enable** 0=Disabled (Default) 1=Enabled	**IVFM Levels** 000=2.9 V (Default) 001=3.0 V 010=3.1 V 011=3.2 V 100=3.3 V 101=3.4 V 110=3.5 V 111=3.6 V			**IVFM Enable** 0=Disabled 1=Enabled (Default)

✧ LED1 Flash Brightness Register (0x03) , default(0x7F)

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
LED1 Flash Brightness Levels I_{FLASH}(mA)≈(Brightness Code*3.91mA)+3.91mA 00000000=3.91 mA …… 01111111=500 mA (Default) …… 11111111=1.0 A							

✧ LED1 Torch Brightness Register (0x04) , default(0x7F)

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
LED1 Torch Brightness Levels I_{TORCH}(mA)≈(Brightness Code*1.46mA)+1.46mA 00000000=1.46 mA …… 01111111=187.5 mA (Default) …… 11111111=375 mA							

✧ LED2 Flash Brightness Register (0x05) , default(0x7F)

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

LED2 Flash Brightness Levels
I_{FLASH}(mA)≈(Brightness Code*3.91mA)+3.91mA

00000000=3.91 mA
……
01111111=500 mA (Default)
……
11111111=1.0 A

✧ LED2 Torch Brightness Register (0x06) , default(0x7F)

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

LED2 Torch Brightness Levels
I_{TORCH}(mA)≈(Brightness Code*1.46mA)+1.46mA

00000000=1.46 mA
……
01111111=187.5 mA (Default)
……
11111111=375 mA

✧ LED3 Flash Brightness Register (0x07) , default(0x7F)

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

LED3 Flash Brightness Levels
I_{TORCH}(mA)≈(Brightness Code*1.56mA)+1.46mA

00000000=1.46 mA
……
01111111=187.5 mA (Default)
……
11111111=375 mA

✧ LED3 Torch Brightness Register (0x08) , default(0x7F)

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

LED3 Torch Brightness Levels
I_{TORCH}(mA)≈(Brightness Code*1.56mA)+1.46mA

00000000=1.46 mA
……
01111111=187.5 mA (Default)
……
11111111=375 mA

✧ LED4 Flash Brightness Register (0x09) , default(0x7F)

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

LED4 Flash Brightness Levels
I_{TORCH}(mA)≈(Brightness Code*1.56mA)+1.46mA

00000000=1.46 mA
……
01111111=187.5 mA (Default)
……
11111111=375 mA

✧ LED4 Torch Brightness Register (0x0A) , default(0x7F)

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
LED4 Torch Brightness Levels I_{TORCH}(mA)≈(Brightness Code*1.56mA)+1.46mA 00000000=1.46 mA …… 01111111=187.5 mA (Default) …… 11111111=375 mA							

✧ Flash & Torch Timing Register (0x0B) , default(0x1A)

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Torch Current Ramp time 0000=No Ramp 0001=1 ms (Default) 0010=32 ms 0011=64 ms 0100=128 ms 0101=256 ms 0110=384 ms 0111=512 ms 1000=768 ms 1001=1024 ms 1010=1280 ms 1011=1536 ms 1100=1792 ms 1101=2048 ms 1110=2048 ms 1111=2048 ms				**Flash Time-out Duration** 0000=40 ms 0001=80 ms 0010=120 ms 0011=160 ms 0100=200 ms 0101=240 ms 0110=280 ms 0111=320 ms 1000=360 ms 1001=400 ms 1010=600 ms (Default) 1011=800 ms 1100=1000 ms 1101=1200 ms 1110=1400 ms 1111=1600 ms			

✧ Flags Register (0x0F) , default(0x00)

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Flash Time-Out Flag	**IVFM Trip Flag**	**LED4 Short Fault**	**LED3 Short Fault**	**LED2 Short Fault**	**LED1 Short Fault**	**Thermal Shutdown (TSD) Fault**	**UVLO Fault**

✧ Device ID Register (0x10) , default(0xE3)

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Device ID: "1110 0011"							

PCB LAYOUT

LAYOUT GUIDELINES

The PCB layout of the high-power inductorless four channel LED driver AW36429 is important. The following steps should be used as a reference to ensure the device is stable and maintains proper LED current regulation across its intended operating voltage and current range.

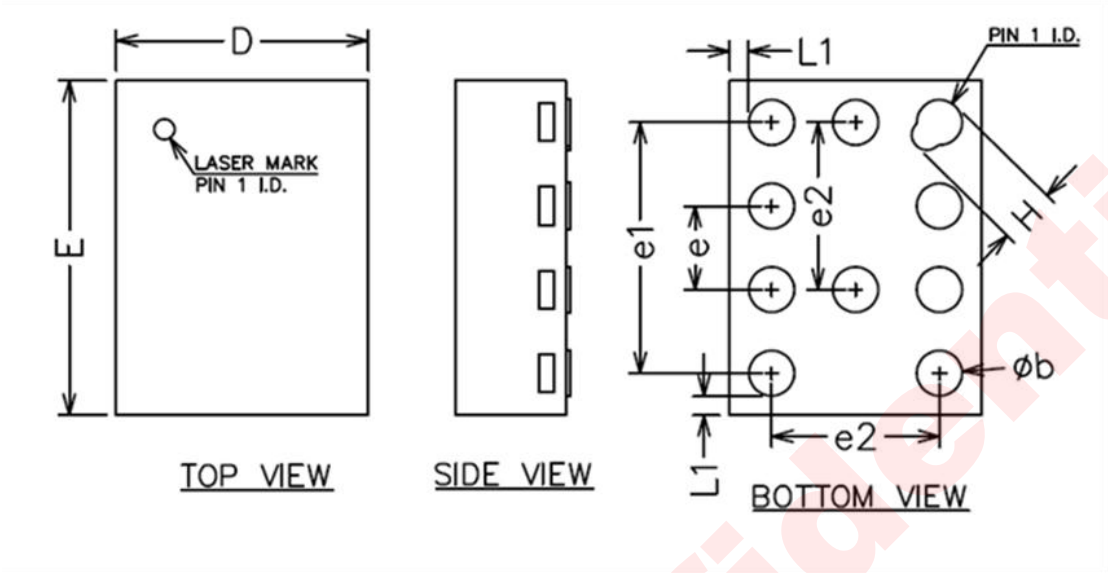
1. Place CIN on the top layer (same layer as the AW36429) and as close to the device as possible. The input capacitor conducts the driver currents during LED1/LED2/LED3/LED4 turn on and can detect current spikes over 2.8A in amplitude. Connecting the input capacitor through short, wide traces to both the IN and GND pins reduces the inductive voltage spikes that occur during switching which can corrupt the VIN line.

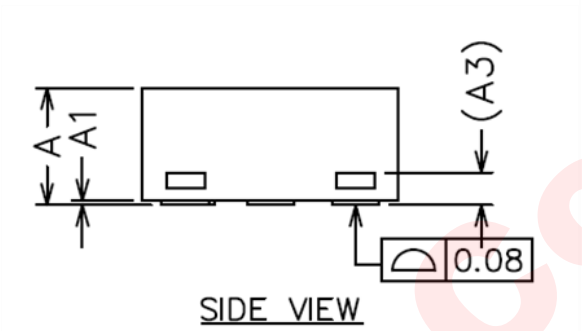
2. For LED1/LED2, terminate the Flash LED cathodes directly to the GND pin of the AW36429. If possible, route the LED returns with a dedicated path so as to keep the high amplitude LED currents out of the GND plane. For Flash LEDs that are routed relatively far away from the AW36429, a good approach is to sandwich the forward and return current paths over the top of each other on two layers. This helps reduce the inductance of the LED current paths.

3. For LED3/LED4, terminate the Flash LED cathodes directly to the LED3/LED4 pin of the AW36429. If possible, route the LED returns with a dedicated path so as to keep the high amplitude LED currents out of the IN plane. For Flash LEDs that are routed relatively far away from the AW36429, a good approach is to sandwich the forward and return current paths over the top of each other on two layers. This helps reduce the inductance of the LED current paths.

4. To optimize the VIN operation range, the IN and GND wire should as short and wide as possible to reduce the series resistor. Meanwhile, To optimize the heat dissipation performance, the GND pins should be connected to the PCB ground plane using as many vias as possible.

PACKAGE DESCRIPTION

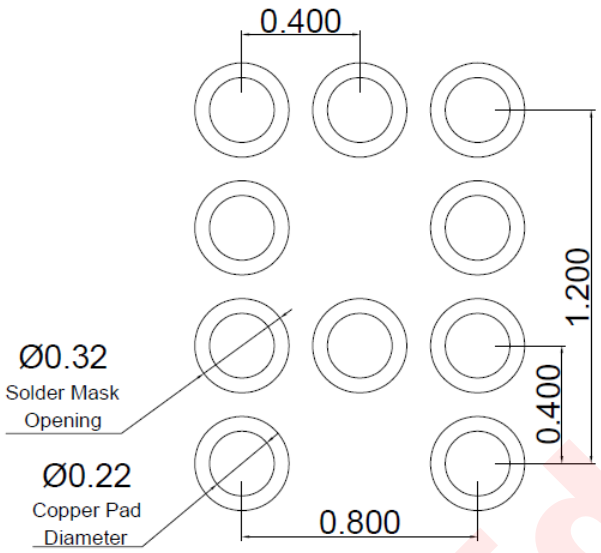




COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	0.50	0.55	0.60
A1	0.00	0.02	0.05
A3		0.15REF	
b	0.17	0.22	0.27
D	1.10	1.20	1.30
E	1.50	1.60	1.70
e		0.40REF	
e1		1.20REF	
e2		0.80REF	
H		0.27REF	
L1		0.09REF	

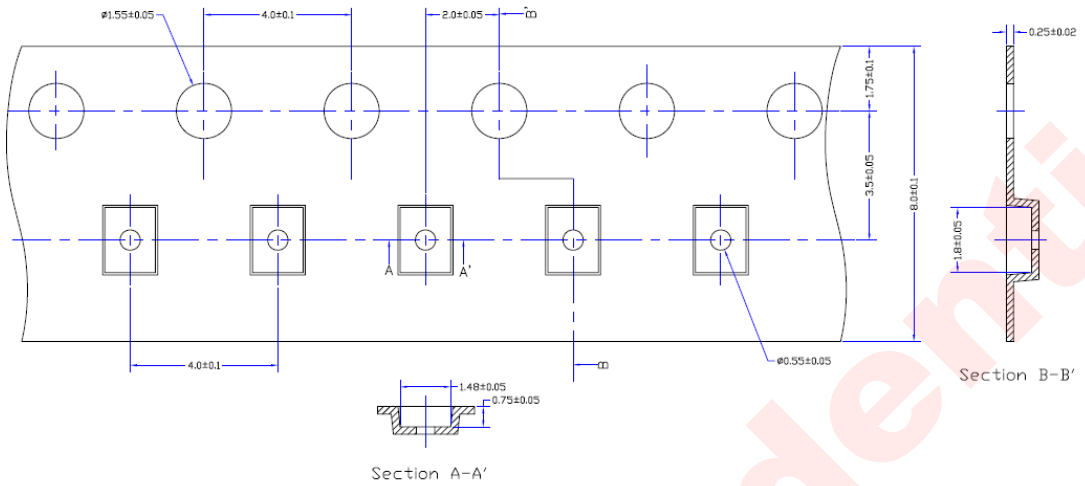
LAND PATTERN



Dimensions are all in millimeters

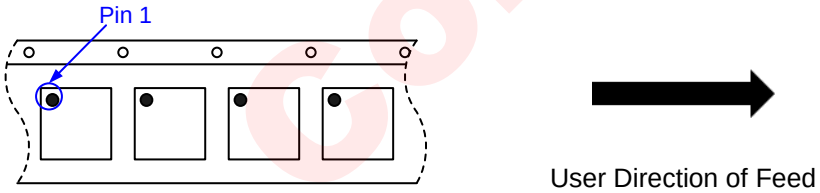
TAPE AND REEL INFORMATION

Carrier Tape



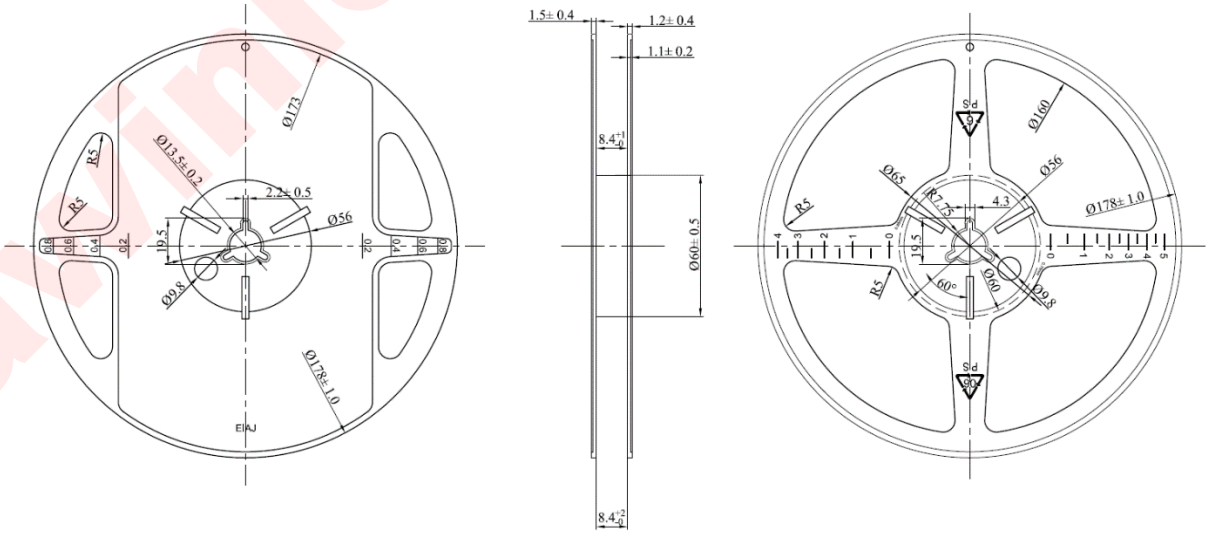
NOTES:
1.10 procket hole pitch cumulative tolerance ±0.2
2.The meander of the tape is assumed with 1mm or less every 100mm between 250mm
3.MATERIAL:CONDUCTIVE POYSTYRENE
4.ALL DIMS IN MM

Pin 1 direction



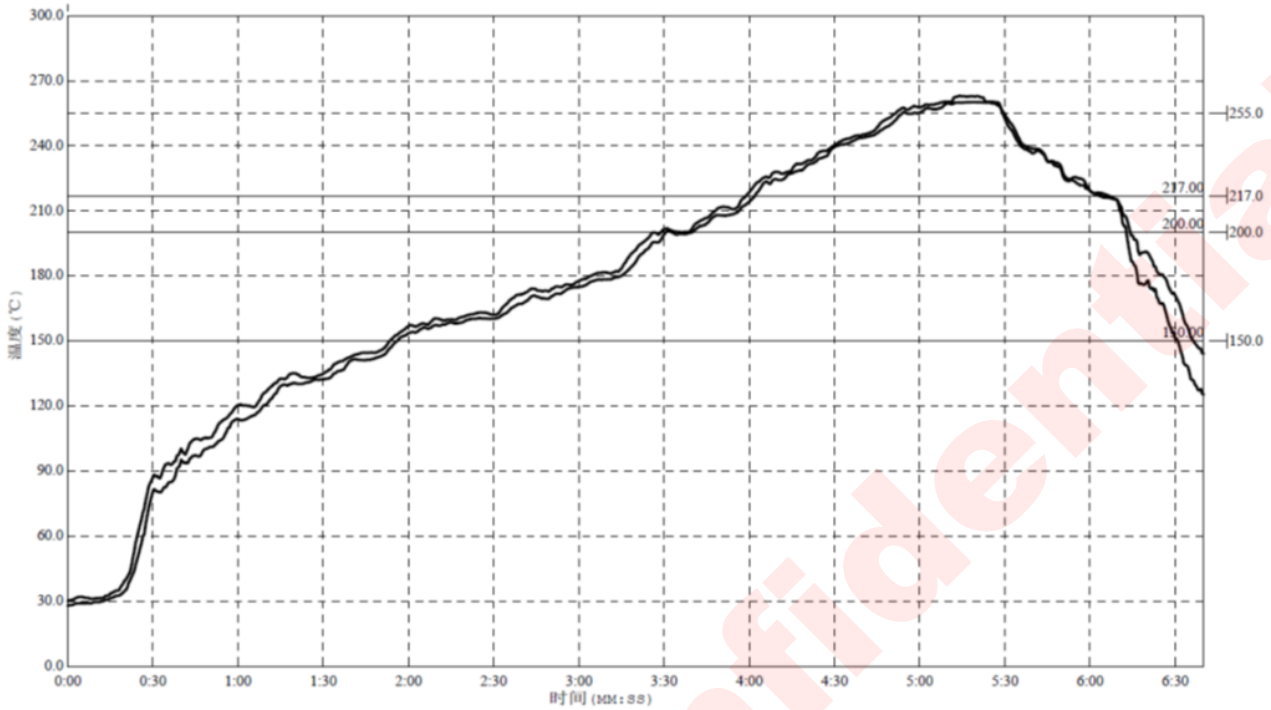
User Direction of Feed

REEL



Unit: mm

REFLOW PROFILE



Reflow Note	Spec
Average ramp-up rate (217°C to peak)	Max. 3°C /sec
Time of Preheat temp. (from 150°C to 200°C)	60-120sec
Time to be maintained above 217°C	60-150sec
Peak Temperature	>260°C
Time within 5°C of actual peak temp	20-40sec
Ramp-down rate	Max. 6°C /sec
Time from 25°C to peak temp	Max. 8min

REVISION HISTORY

Version	Date	Change Record
V1.0	Oct 2017	Product Datasheet V1.0 Released
V1.1	Apr 2018	Product Datasheet V1.1 Released-----add V_{HR}(max) value
V1.2	Sep 2018	Correction Package: FCQFN-10L

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