Description

The FM6124 is specifically designed for LED display applications.it has 16 constant current output source channels and includes CMOS shift register and latch functions.The LED drive current is programmed by the installation of a single resistor per device.and is held constant across all 16 source outputs effectively compensating for the inherent circuit and component variables which affect the brightness of the LEDs.

The FM6124 uses the "output clamp" patented technology, which can effectively eliminate the first line of display darkness and prevent the LEDs from damaging. The FM6124 uses the blanking function design, which has excellent blanking. The FM6124 has excellent anti-interference characteristics, constant current and low gray scale are not affected by PCB design. And a external resistor can be used to adjust the output current to control the brightness of LED accurately. The FM6124 will cache 16bit display data in the during display process (the falling edge of OE), so the system can continue to store the 16bit serial data in the process of display , so the refresh frequency can be increased by more than 50% compared to the common LED constant current ICs.

Features

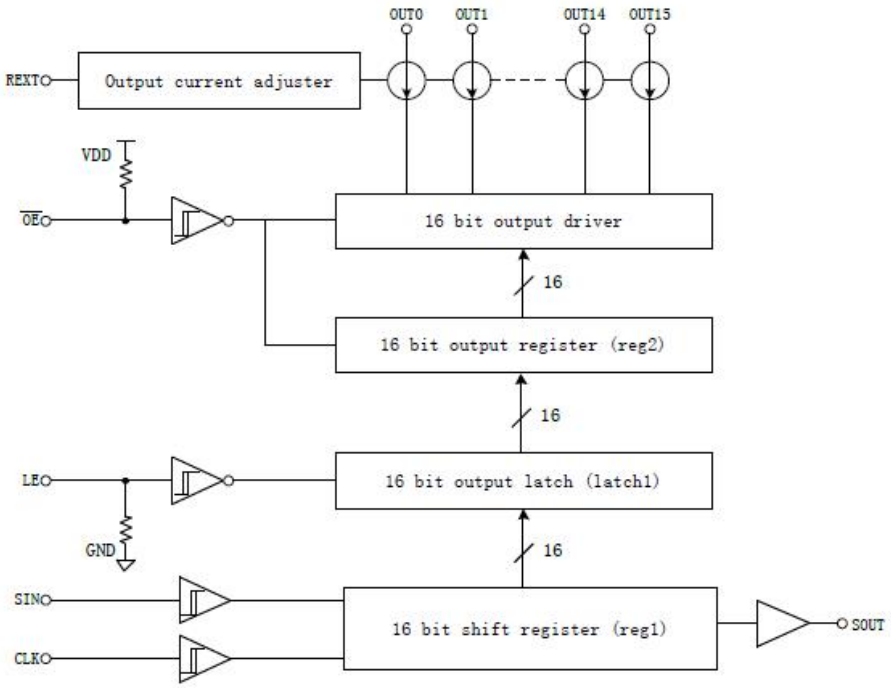
- 16 Constant Current Output Channels
- Current Programmable from：
  0.7～32mA×16@V_{DD}=5V
  0.5～25mA×16@V_{DD}=3.3V
- Excellent output Current Accuracy:
  Between channels：±1.25%(TPY.)
  ±2%(MAX.)
  Between ICs：±2%(TPY.)
  ±3.5%(MAX.)
- Fast response of output current,（MIN.）：30ns@V_{DD}=5V
- Schmitt trigger input
- Data transmission Frequency：f_{MAX}=30MHz(MAX.)
- ESD HBM PASS 4KV
- Supply voltage：V_{DD}=3.3～6V
- Operating temperature：T_{opr}=-40～85℃
- Reduce the LEDs to damage.
- Excellent blanking
- Eliminate the first line of darkness,low gray blocks, color blocks and brightened dots
- Excellent anti-interference characteristics,and low gray scale
- Reduce the so call caterpillar phenomenon on the display
- Integrated dual caches, the refresh frequency can be increased by more than 50%
- SSOP-24 package

Terminal Description & Pin Out

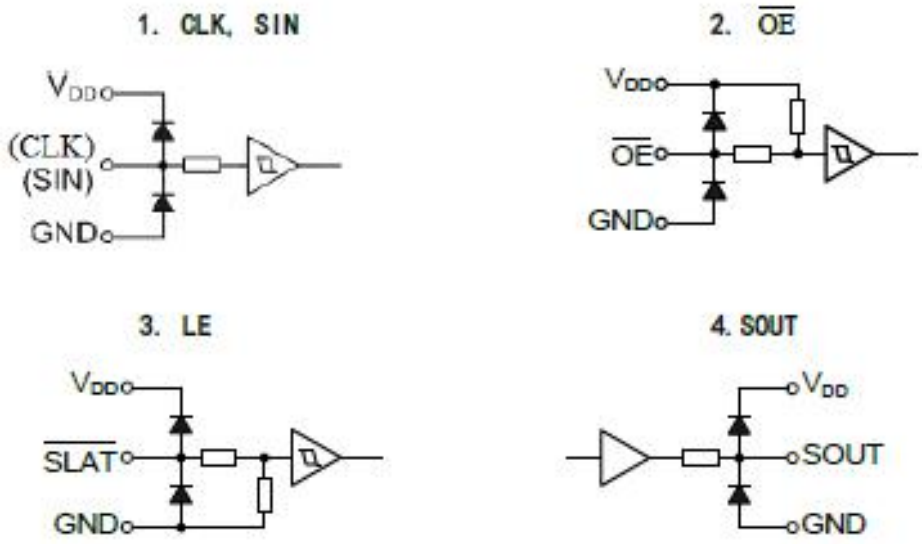
SSOP-24

PIN NO.	PIN NAME	FUNCTION
1	GND	GND terminal
2	SIN	Serial Data In Terminal
3	CLK	Clock Input terminal
4	LE	Latch Input Terminal
5-20	$\overline{OUT0}$—$\overline{OUT15}$	Output terminals
21	$\overline{OE}$	Output Enable Input Terminal
22	SDO	Serial Data Out Terminal
23	REXT	Constant Current Programming
24	VDD	3.3/5V Supply voltage terminal

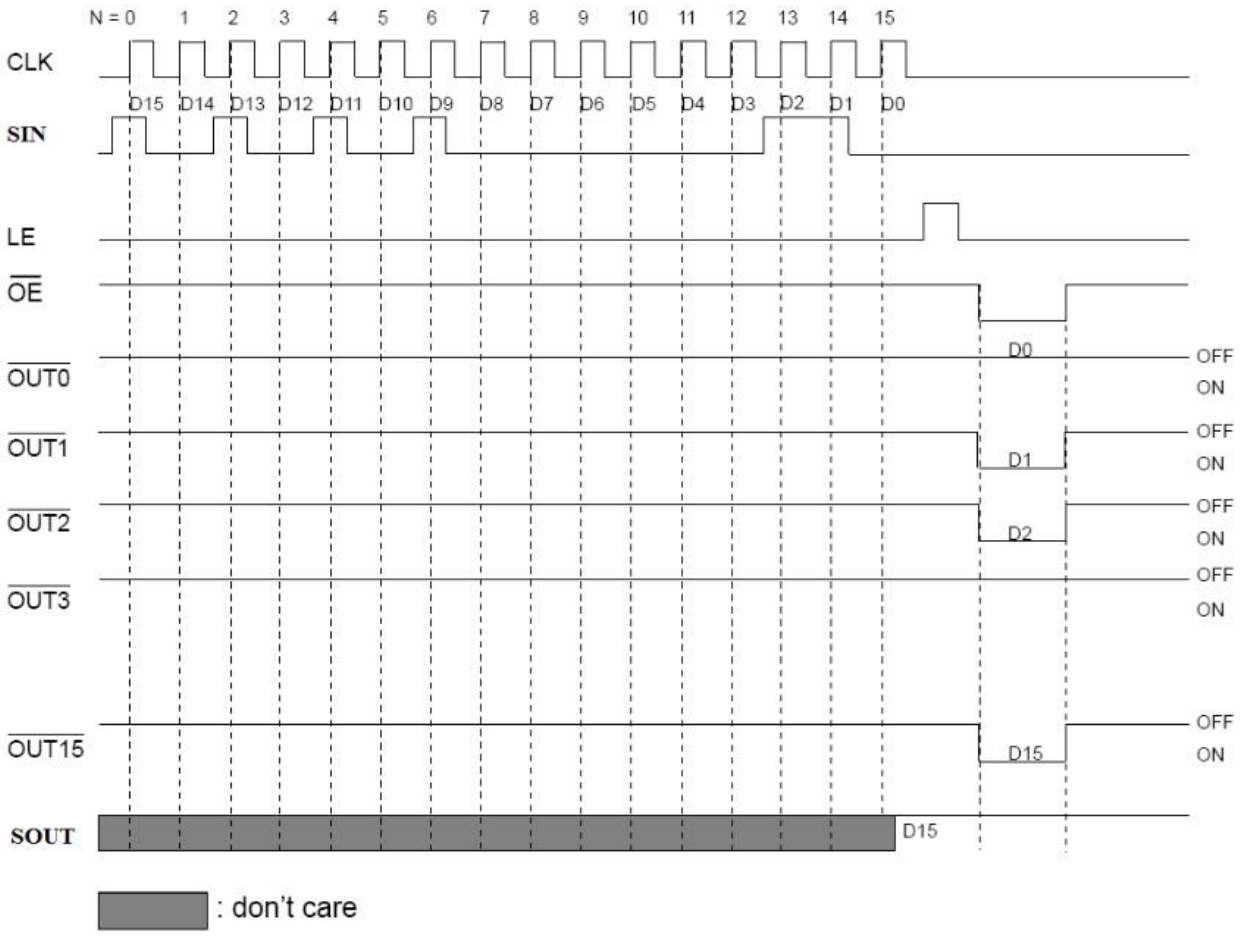
Block Diagram



Equivalent Circuit of Inputs and Outputs



Timing Diagram



True Table

CLK	LE	$\overline{OE}$	SIN	$\overline{OUT0}$ … $\overline{OUT7}$ … $\overline{OUT15}$	SOUT
	H	L	Dn	DN`…DN-7…DN-15	DN-15
	L	L	Dn+1	No Changed	DN-14
	H	L	Dn+2	DN+2…DN-5…DN-13	DN-13
	X	L	Dn+3	DN+2…DN-5…DN-13	DN-13
	X	H	Dn+3	OFF	DN-13

Maximum Ratings:(TA=25℃)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	VDD	0-7.0	V
Output Voltage	IO	32	mA
Input Voltage	VIN	-0.4—VDD+0.4	V
Output withstand voltage	VOUT	30	V
Clock Frequency	FCLK	30	MHZ
GND Current	IGND	512	mA
Power Dissipation	PD	3	W
Thermal Impedance	RTH(j-a)	39.15	℃/W
Operating Temperature	TOPR	-40—85	℃
Storage Temperature	TSTG	-55—150	℃

Recommended Operating Condition:(TA=40℃—85℃)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIX.	TYP.	MAX.	UNIT
Supply Voltage	VDD	-	3.3	5	6.0	V
ON Voltage	VO(ON)	$\overline{OUTn}$	0.6	-	4	V
Input Voltage H	VIH	-	0.7*VDD	-	VDD	V
Input Voltage L	VIL	-	GND	-	0.3*VDD	V
S_{OUT} Current H	IOH	VDD=5V	-	-1	-	mA
S_{OUT} Current L	IOL	VDD=5V	-	1	-	mA
Constant Current Output	IO	$\overline{OUTn}$	0.5	-	32	mA

Switching Characteristics (VDD=4.5—5.5V，TA=40℃—85℃)

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION	MIX.	TYP.	MAX.	UNIT
SID transmission frequency	FCLK	6	-	-	-	30	MHZ
CLOCK Pulse Width	TWCLK	6	SCK=H/L	20	-	-	nS
Caching Pulse Width	TWLE	6	LE=H	20	-	-	nS
ENABLE Pulse Width	TWOE	6	$\overline{OE}$ =H/L ， REXT=890Ω	30	-	-	nS
Hold Time	THOLD1	6	-	5	-	-	nS
	THOLD2	6	-	5	-	-	nS
Set-up Time	TSETUP1	6	-	5	-	-	nS
	TSETUP2	6	-	5	-	-	nS
Rising edge Time	TR	6		-	-	500	nS
Falling edge Time	TR	6		-	-	500	nS

Electrical Characteristics

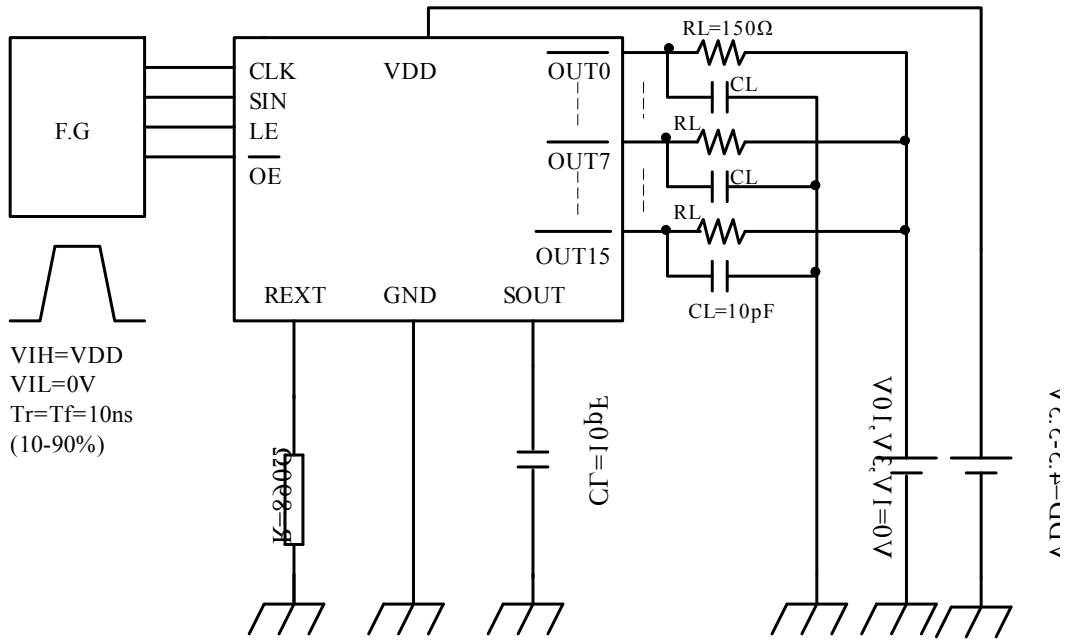
CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION	MIX.	TYP.	MAX.	UNIT
Output voltage level H	VOH	1	IOH=-1mA，SOUT	VDD-0.4	-	VDD	V
Output voltage level L	VOL	1	IOH=+1mA，SOUT	-	-	0.4	V
Output current H	IIH	2	VIN=VDD,OE,SIN，CLK	-	-	1	uA
Output current L	IIL	3	VIN=GND,LE,SIN，CLK	-	-	-1	uA
Supply Current	IDD1	4	REXT= NC，OUT OFF	-	2.0	5.0	mA
	IDD2	4	REXT=1200，OUT OFF	-	5.5	9	mA
	IDD3	4	REXT=600，OUT OFF	-	6.5	10	mA
	IDD4	4	REXT=1200，OUT ON	-	8.2	12	mA
	IDD5	4	REXT=600，OUT ON	-	10	15	mA
Constant Current Output	IO1	5	VDD=5.0V，VO=2.0V,REXT=1.19KΩ	-	15	-	mA
	IO2	5	VDD=5.0V，VO=2.0V,REXT=595Ω	-	30	-	mA

Constant Current Skew	△IO	5	VDD=5.0V， VO=2.0V,REXT=1.19KΩ	-	±0.15	±0.37	mA
Constant Current vs Voltage Regulation	%VDD	5	VDD=4.5-5.5V VO=2.0V,REXT=1.19KΩ	-	±0.2	-	%/V
Constant Current Voltage adjust	%VOUT	5	VDD=5.0V VO=1.0-3.0V,REXT=1.19KΩ	-	±0.1		%/V
Pull Up Resistor	RUP	3	$\overline{OE}$	200	240	350	KΩ
Pull Down Resistor	RDOWN	2	LE	250	340	450	KΩ

Switching Characteristics

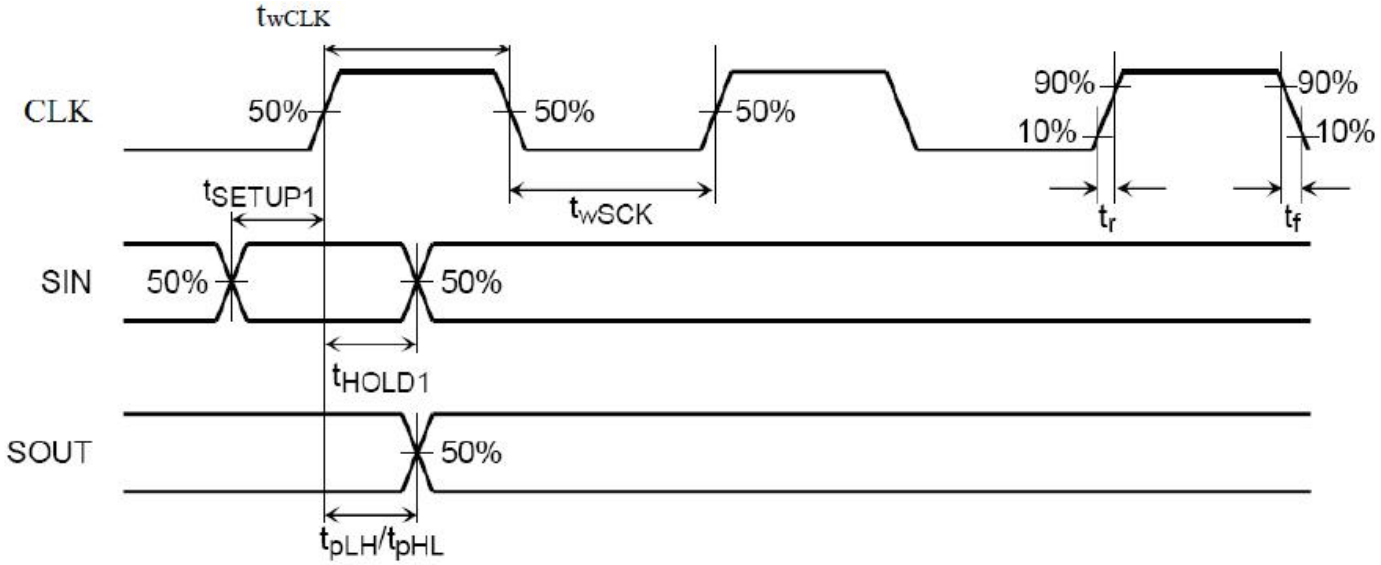
CHARACTERISTIC		Symbol	Test circuit	TEST CONDITION	MIX.	TYP.	MAX.	UNIT
Propagation Delay Time	$\overline{OE}$—$\overline{OUT0}$	TPLH3	6	LE=H	-	25	40	nS
	$\overline{OE}$—$\overline{OUT1}$	TPHL3	6	LE=H	-	30	50	
	CLK-SOUT	TPHL	6	-	-	25	30	
Output Rising edge Time		TOR	6	10-90% of Voltage Wave	-	15	20	nS
Output Falling edge Time		TOR	6	10-90% of Voltage Wave	-	26	31	nS

TEST CIRCUIT

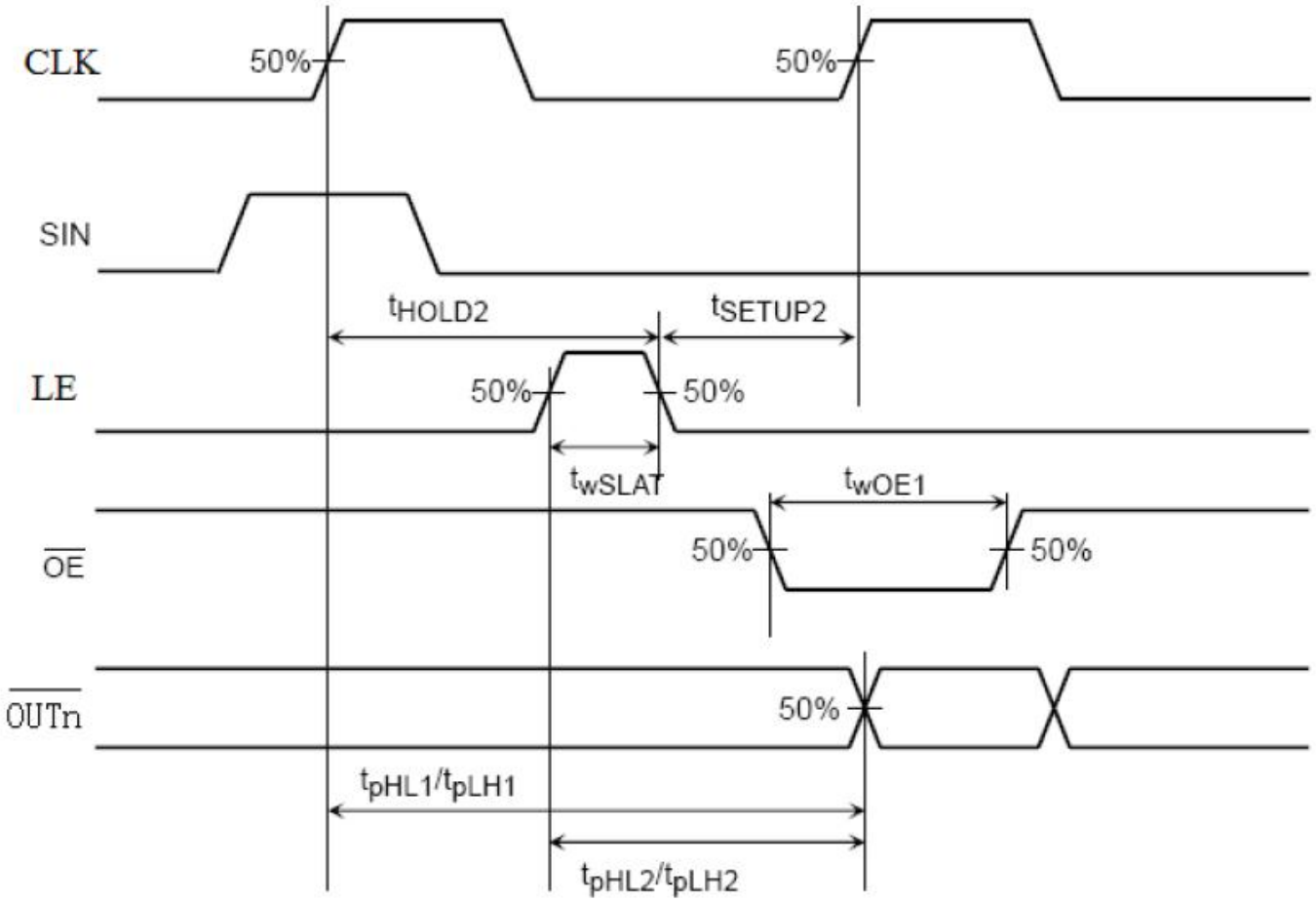


Timing Wave Form

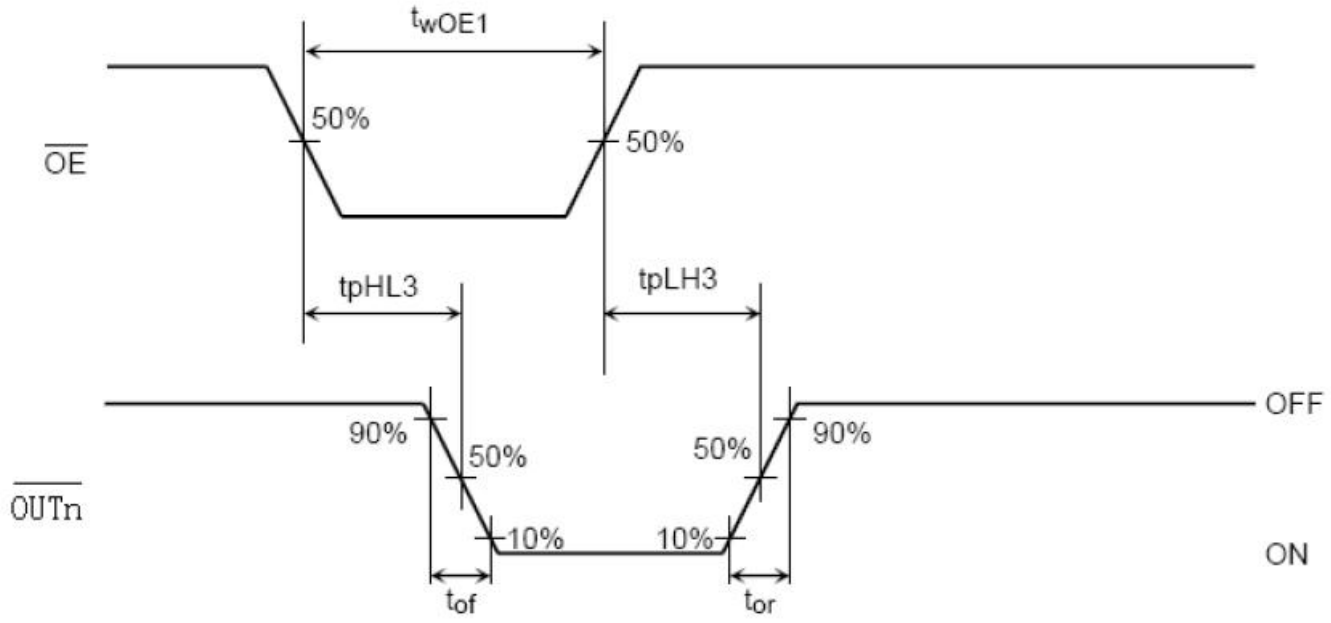
1.CLK，SIN，SOUT



2.CLK，SIN，LE，OE，OUTN



3.OUTN

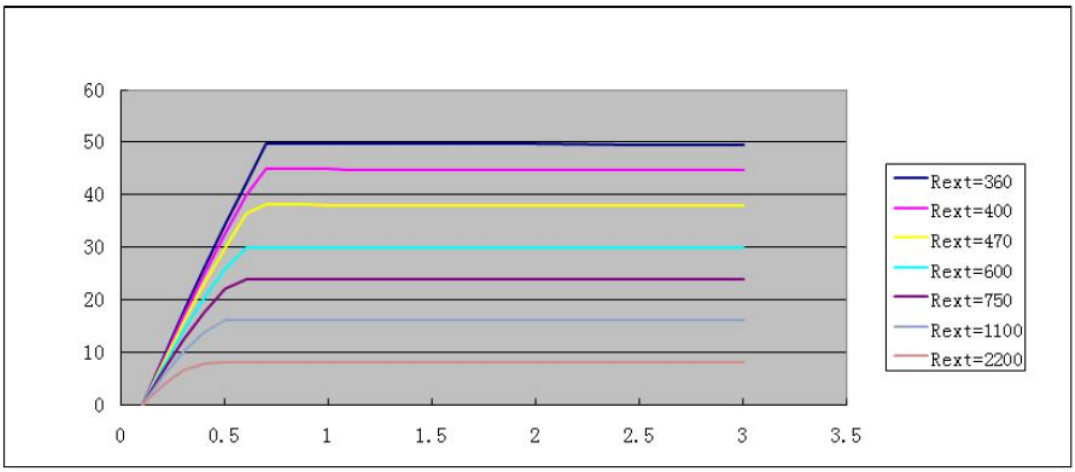


Application Information (Constant Current)

To design LED displays, FM6124 provides nearly no variations in current from channel to channel and from IC to IC. This can be achieved by:

1) The maximum current variation between channels is less than ±2%, and that between ICs is less than ±3.5%.

2) In addition, the current characteristic of output stage is flat and users can refer to the figure as shown below. The output current can be kept constant regardless of the variations of LED forward voltages (Vf). This performs as a perfection of load regulation.



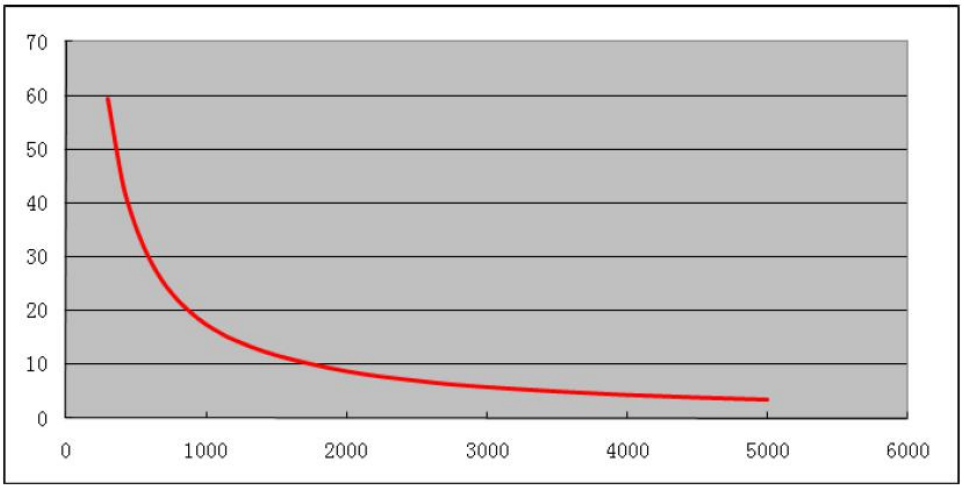
Ioutput(mA); VDS(V)

Adjusting Output Current

The output current of each channel (IOUT) is set by an external resistor, Rext. After a power-on status, the relationship between Iout and Rext is shown in the following figure. Also, the output current in milliamps can be calculated from the equation:

$V_{R\text{-}EXT}$=1.191V；

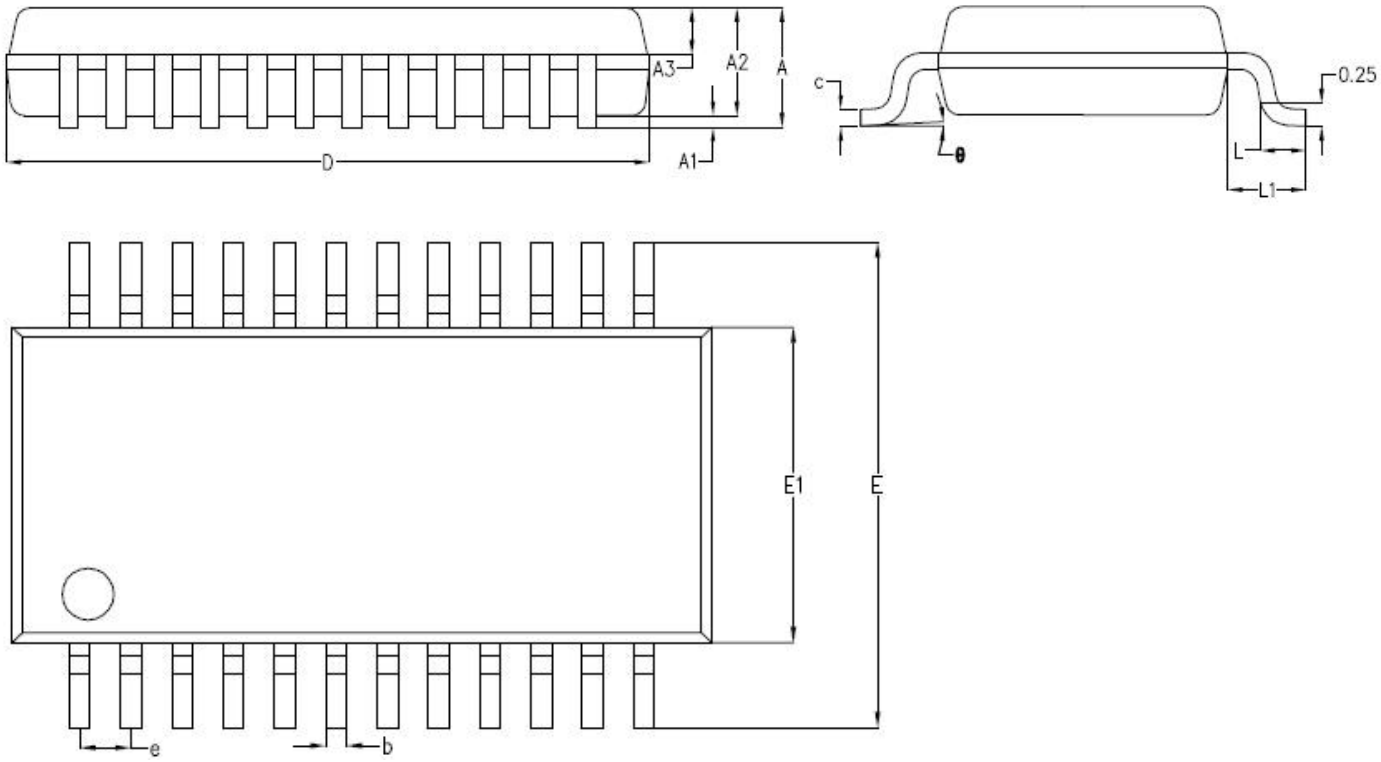
Iout=($V_{R\text{-}EXT}$/Rext)*15



Resistance of the external resistor, Rext, in Ω

Outline Drawing

SSOP-24



symbol	mm		
	MIN.	TYP.	MAX.
A	-	1.60	1.65
A1	-	0.15	0.20
A2	1.40	1.45	1.50
A3	0.60	0.65	0.70
b	0.22	0.25	0.30
c	0.17	0.22	0.25
D	8.55	8.65	8.75
E	5.90	6.00	6.10
E1	3.80	3.90	4.00
e	0.635BSC		
L	0.57	0.60	0.65
L1	1.05BSC		
θ	0°	3°	6°