16-bit Parallel-In/Parallel-Out Constant Current Driver

Features

. Fast output current control, the minimum output enable pulse width = 80ns
. Current regulated output channels, constant current range: 5 – 60mA
. Built-in data latches and output enable function
. Excellent output current matching:

Current Skew		Conditions
Bit Skew	Chip Skew	
< ±3%	< ±6%	10mA < Iout < 60mA, Output pulse width > 80nS
< ±4%	< ±8%	5mA < Iout < 10mA, Output pulse width > 80nS

. All output current are adjusted through one external resistor
. Programmable input interface:
  - 5V CMOS level schmitt trigger interface
  - Discrete 3V input interface
. 5V supply voltage
. Package: SSOP48

Product Description

The SCT2280 is designed to be a simple but effective solution for lighting LED. It drives up to sixteen LED clusters with regulated constant current for uniform intensity.

In applications, an external resistor is used to set the full-scale LED current from 5mA to 60mA. The SCT2280 guarantees each output can endure maximum 7V DC voltage stress. The on/off state of outputs are controlled directly by signals of input data bit (DIN0~DIN15), signals of latch (LA/) and output enable (OE/). Combing schemes of parallel data inputs and the finest output current pulse, the SCT2280 can easily realize high quality LED displays which are used to display true color motion pictures.

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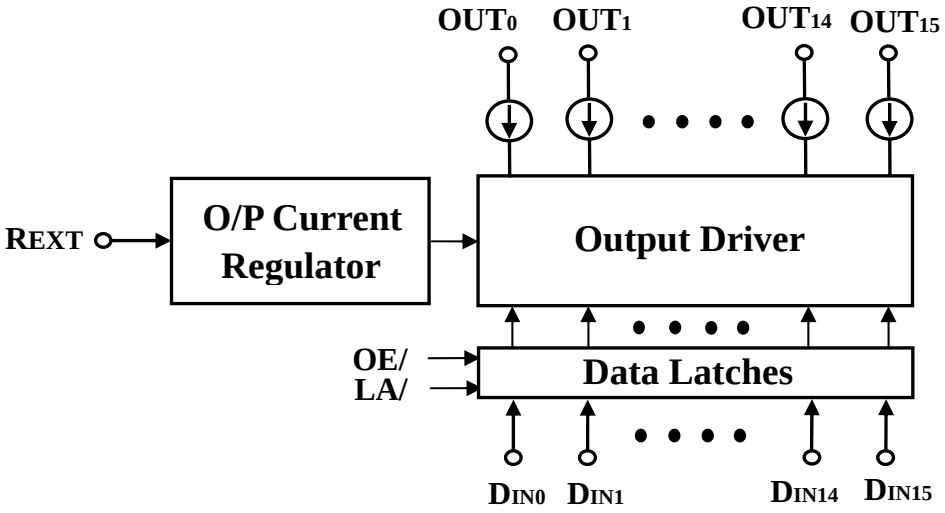
Block Diagram



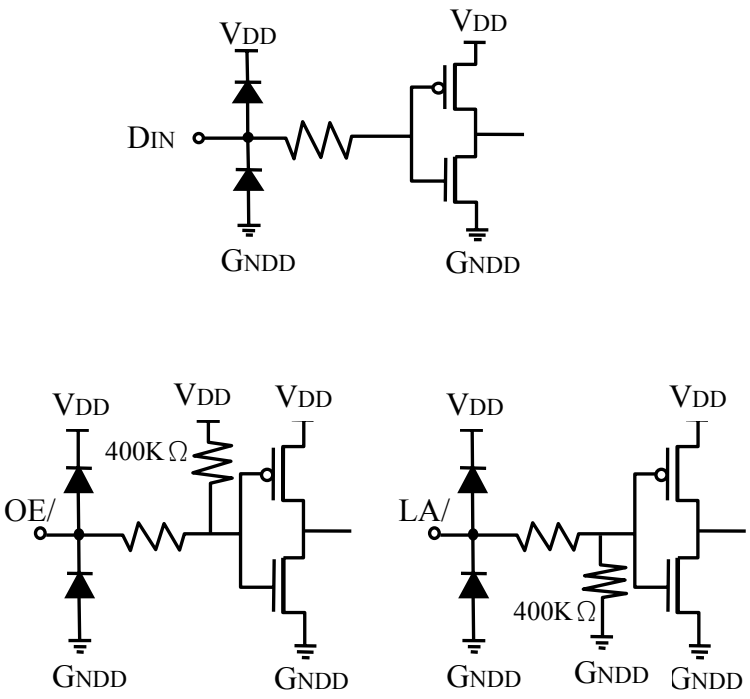
Terminal Description

Pin No.	Pin Name	Function
1	OE/	Output enabled when OE/=’L’ and all outputs are disabled when OE/=’H’.
3	GNDA	Analog ground terminal.
5, 17, 19, 24, 25, 30, 32, 44	NC	Pins reserved.
2, 31	GNDD	Digital ground terminals.
4, 6, 7, 8, 20, 21, 22, 23, 26, 27, 28, 29, 41, 42, 43, 45	DIN0~DIN15	Digital data inputs.
9, 10, 11, 12, 13, 14, 15, 16, 33, 34, 35, 36, 37, 38, 39, 40	OUT0~OUT15	Output terminals.
18	INS	Interface select input signal. When INS=’L’, select 5V CMOS schmitt trigger interface. When INS=’H’, select discrete 3V interface.
46	LA/	LA/=’H’ data transparent to output, and LA/ = ’L’ data are latched.
47	REXT	Output terminal. Connect to an external resistor for setting up all output current.
48	VDD	5V supply voltage terminals.

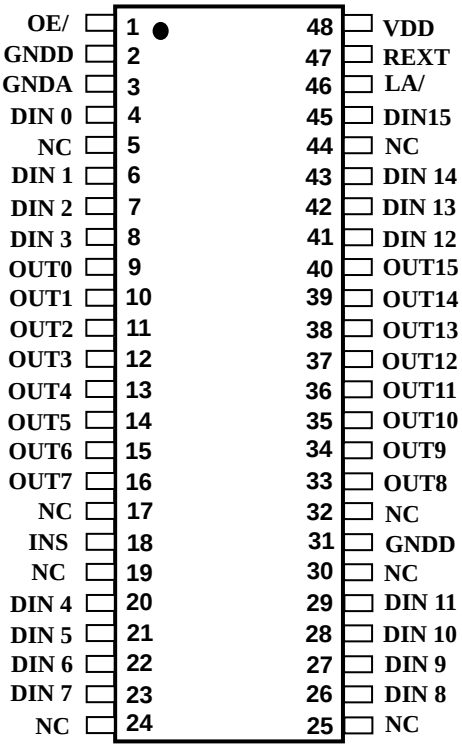
Truth Table

DIN	LA/	OE/	OUTPUT Function
X	L	L	Q_N ; previous state
L	H	L	OFF ; LED off
H	H	L	ON ; LED on
X	X	H	OFF ; LED off

Equivalent Circuits of Inputs



Pin Configuration



Ordering information

Part Number	Marking	Package
SCT2280ASSN	SCT2280ASSN	Normal SSOP48
SCT2280ASSG	SCT2280ASSG	Pb free SSOP48

Maximum Ratings

Characteristic	Symbol	Rating	Unit
Supply voltage	V_{DD}	4.0 ~ 7.0	V
Input voltage	V_{IN}	-0.4 ~ V_{DD}+0.4	V
Output current	I_{OUT}	80	mA
Output voltage	V_{OUT}	0.8~7.0	V
Data switching rate	F_{DIN}	8	MHz
Total GND terminals current	I_{GND}	1400	mA
Operating temperature	T_{OPR}	-40~+85	°C
Storage temperature	T_{STG}	-55~+150	°C

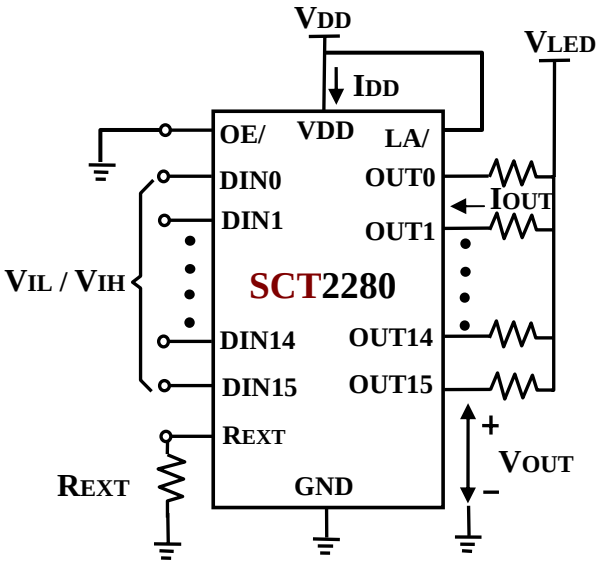
Recommended Operating Conditions (Ta=-40 to 85 °C unless otherwise noted)

Characteristic	**Symbol**	**Condition**	**Min.**	**Typ.**	**Max.**	**Unit**
Supply voltage	V_{DD}	-	4.5	5.0	5.5	V
Output voltage	V_{OUT}	OUT0 ~ OUT15	1.0	-	V_{DD}	V
Output current	I_{OUT}	DC test circuit	5	-	60	mA
Input voltage (INS='L')	V_{IH}	-	0.8V_{DD}	-	V_{DD}	V
	V_{IL}	-	0	-	0.2V_{DD}	V
Input voltage (INS='H')	V_{IH}	-	2.0	-	V_{DD}	V
	V_{IL}	-	0		0.4	V
OE/ pulse width	t_{w2}	-	80	-	-	ns

Electrical Characteristics

Characteristic		Symbol	Condition		Min.	Typ.	Max.	Unit
Input voltage	"H" level	V_{IH}	Ta = -40~85ºC		2	-	V_{DD}	V
	"L" level	V_{IL}	Ta = -40~85ºC		0	-	0.4	V
Output leakage current		I_{OL}	V_{OUT} = VDD		-	-	0.5	μA
Output current		I_{OUT}	V_{OUT}=1.0V	R_{EXT}=900 Ω	-	20	-	mA
Current bit skew		dI_{OUT}	I_{OUT}=20mA V_{OUT}=1.0V	R_{EXT}=900 Ω	-	±1	±3	%
Output current vs. supply voltage regulation		$\%/dV_{DD}$	4.5V <V_{DD} < 5.5V V_{OUT} > 1.0 V		-	-	±1	%/V
Output current vs. output voltage regulation		%/dVOUT	1.0V < V_{OUT} < 4.0V I_{OUT}=20mA, V_{DD} = 5V		-	-	±1	%/V
Supply current	OFF	$I_{DD(off)\ 1}$	R_{EXT} = Open ,V_{DD} = 5V OUT0~OUT15=Off		-	12	15	mA
		$I_{DD(off)\ 2}$	R_{EXT} = 900 Ω,V_{DD} = 5V OUT0~OUT15=Off		-	13	15	
	ON	$I_{DD(on)}$	R_{EXT} = 900 Ω,V_{DD} = 5V OUT0~OUT15=On		-	13	15	

Test Circuit for Electrical Characteristics

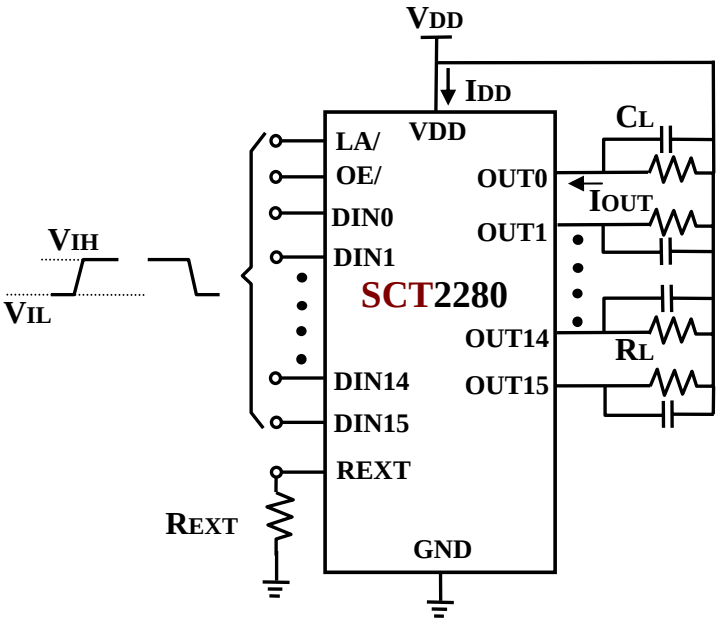


Switching Characteristics

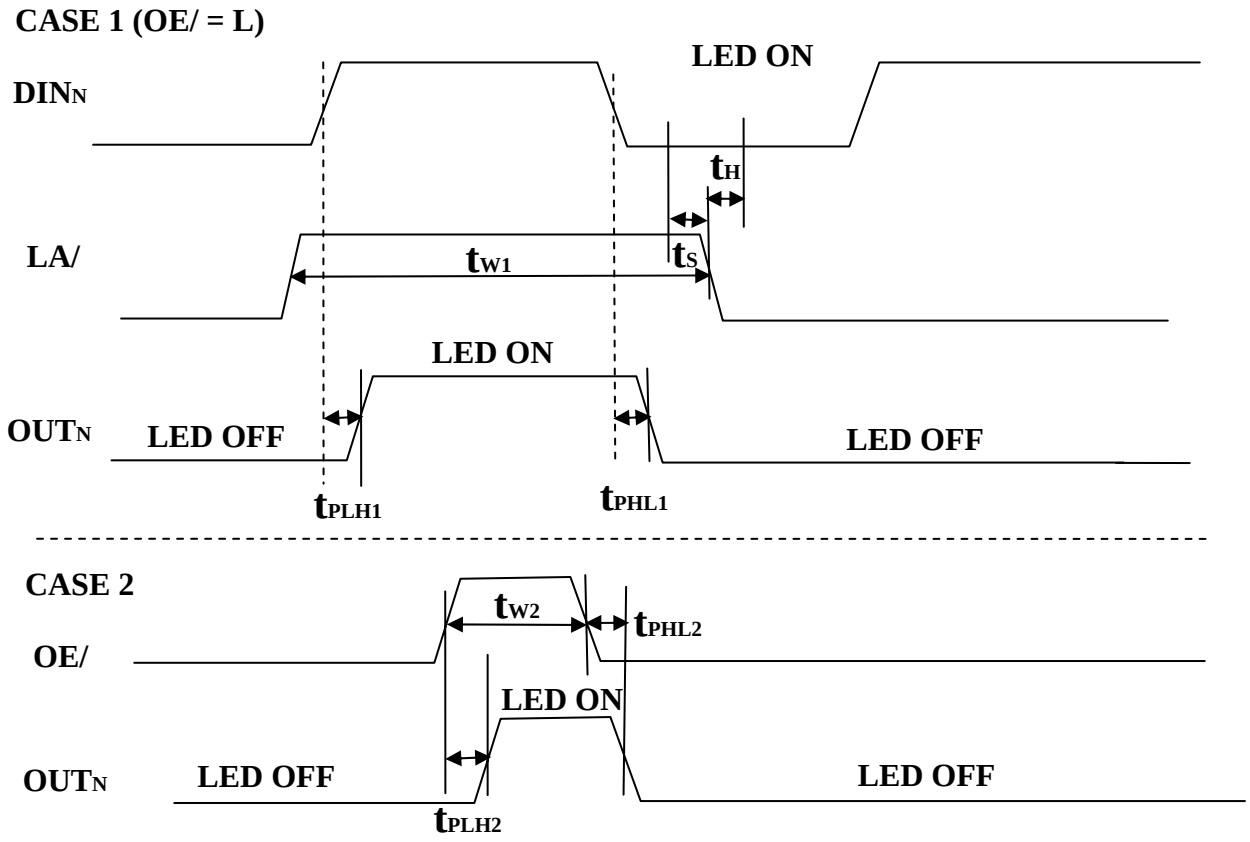
(VDD=5.0V, Ta=25ºC unless otherwise noted)

Characteristic		Symbol	Condition	Min.	Typ.	Max.	Unit
Propagation Delay Time (“L” to “H”)	LA/ - OUTn	t_{PLH1}	V_{DD} = 5.0 V V_{LED} = V_{DD} V_{IH} = V_{DD} V_{IL} = GND R_{EXT} = 900 Ω R_L = 200 Ω C_L = 10 pF	-	50	100	ns
	OE/ - OUTn	t_{PLH2}		-	30	60	ns
Propagation Delay Time (“H” to “L”)	LA/ - OUTn	t_{PHL1}		-	50	100	ns
	OE/ - OUTn	t_{PHL2}		-	30	60	ns
Pulse Width	LA/	t_{w1}		20	-	-	ns
	OE/	t_{w2}		80			ns
Hold Time for LA/		t_H		5	-	-	ns
Setup Time for LA/		t_S		5	-	-	ns
Output Rise Time of Iout				-	10	20	ns
Output Fall Time of Iout				-	10	20	ns

Test Circuit for Switching Characteristics

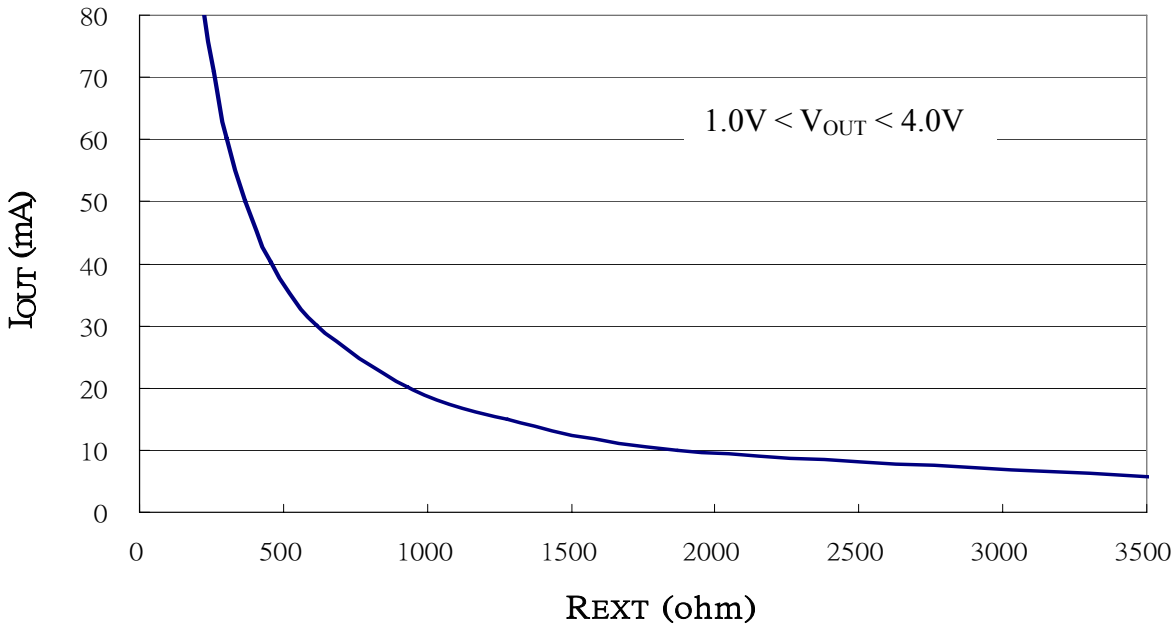


Timing Waveform



Adjusting Output Current

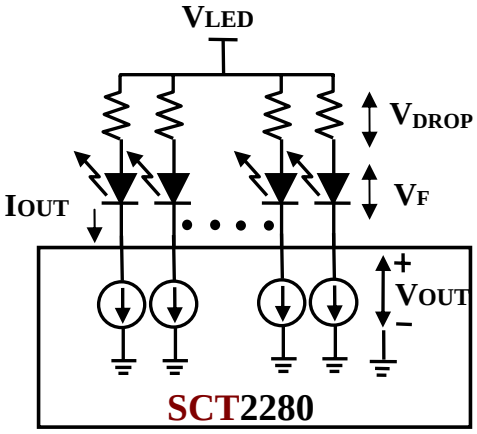
All SCT2280's output current (I_{OUT}) are set by one external resistor at pin REXT. The relationship between I_{OUT} and resistance R_{EXT} is shown as the following figure.

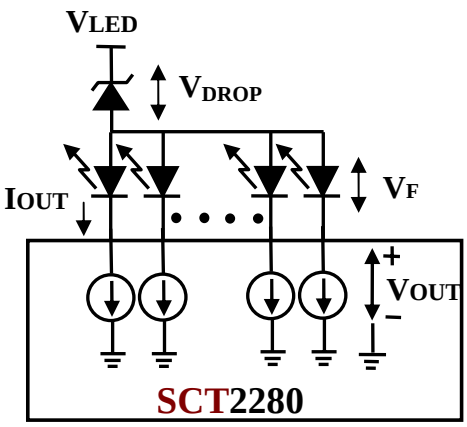


Also, when SCT2280's output voltage is set between 1.0 Volt and 4.0 Volt, the output current can be estimated approximately by : $I_{OUT} = 30(620 / R_{EXT})$ (mA) Thus the output current are all set to be about 20.6mA at $R_{EXT} = 900\Omega$.

Load Supply Voltage (V_{LED})

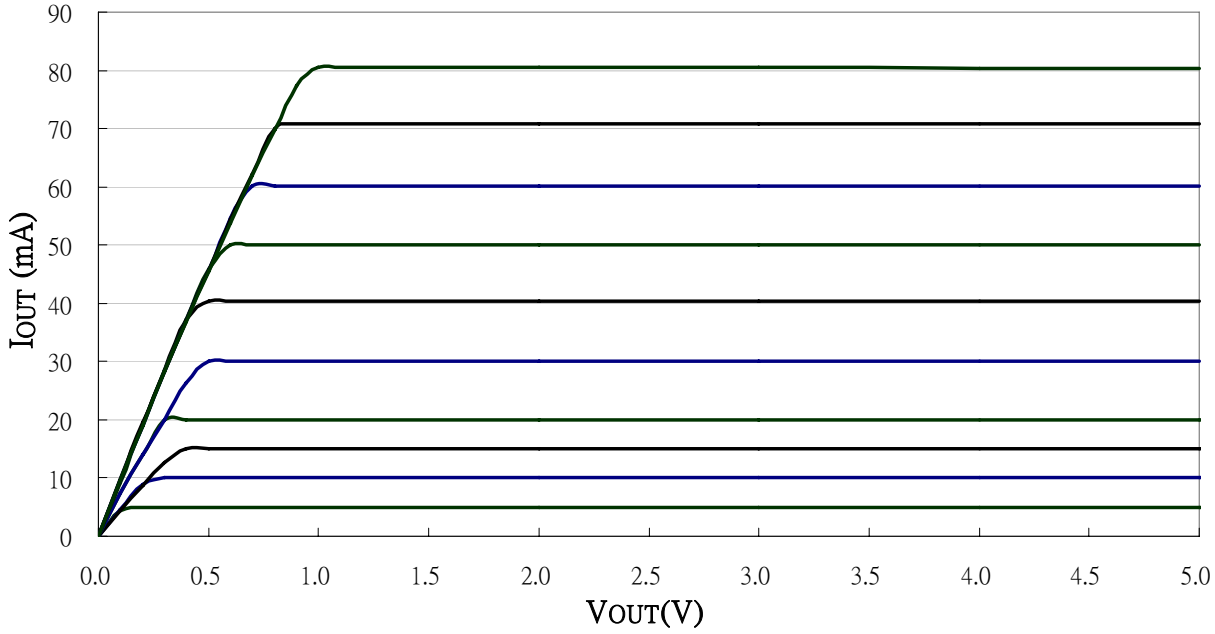
SCT2280 can operate very well when V_{OUT} ranging from 1.0V to 4.0V. So it is recommended to use the lowest possible supply voltage or set a voltage reducer to reduce the V_{OUT} voltage. A voltage reducer lets $V_{OUT} = V_{LED} - V_{DROP} - V_F$. Resistors or Zener diode can be used in the applications as shown in the following figures.





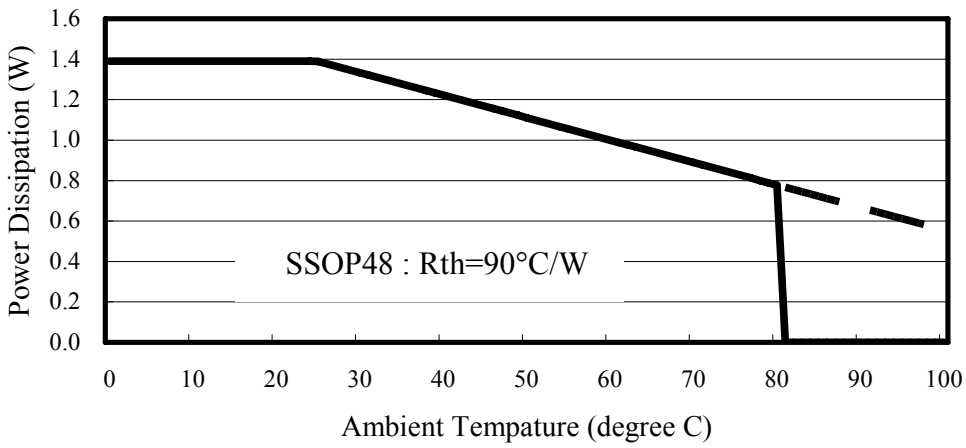
Constant Current

The current characteristic of output stage is flat. The output current can kept constant regardless of the variations of LED forward voltage when V_{OUT} is larger than 1.0V. The relationship between I_{OUT} and V_{OUT} is shown as :



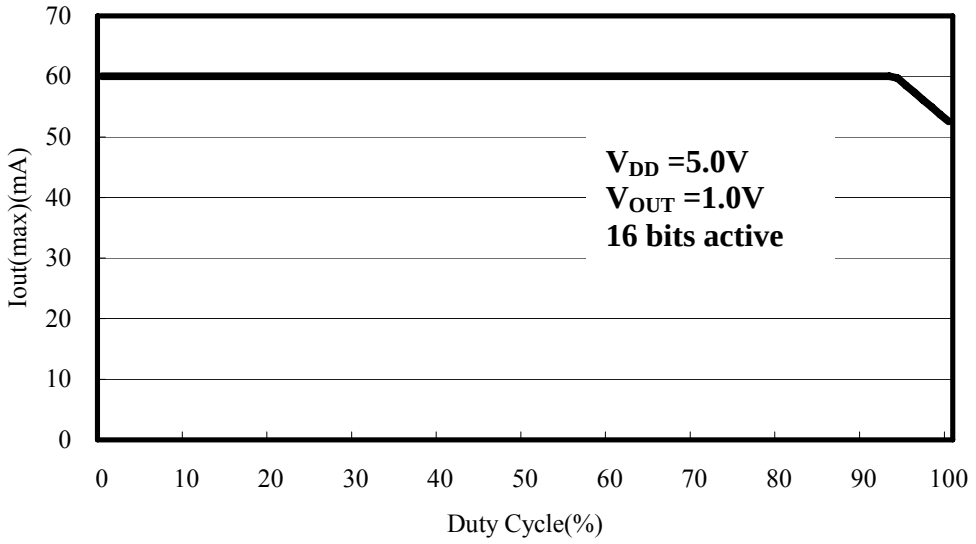
Power Dissipation

The power dissipation (P_D) of a semiconductor chip is limited by its package and ambient temperature. The maximum allowable power dissipation (P_D) is determined as $P_D(max) = (Tj - Ta)/R_{th(j-a)}$ where Tj: the chip junction temperature, Ta: ambient temperature, $R_{th(j-a)}$: thermal resistance. For SSOP packages, the relationship between P_D and Ta is shown as the following figure.



Maximum Output Current

In practical case, the SCT2280 turn on the output in partial period. So the actual package power dissipation is P_D (act)=(I_{DD} • V_{DD}) + (# outputs • I_{OUT} • V_{OUT} • Duty). Therefore, to keep P_D (act) ≦ P_D(max), the allowed maximum output current be calculated from the equation: I_{OUT} = (P_D - I_{DD} • V_{DD})/(# outputs • V_{OUT} • Duty)
So the relationship between I_{OUT} (max) and Ta is shown as the following figure:



Layout Guide

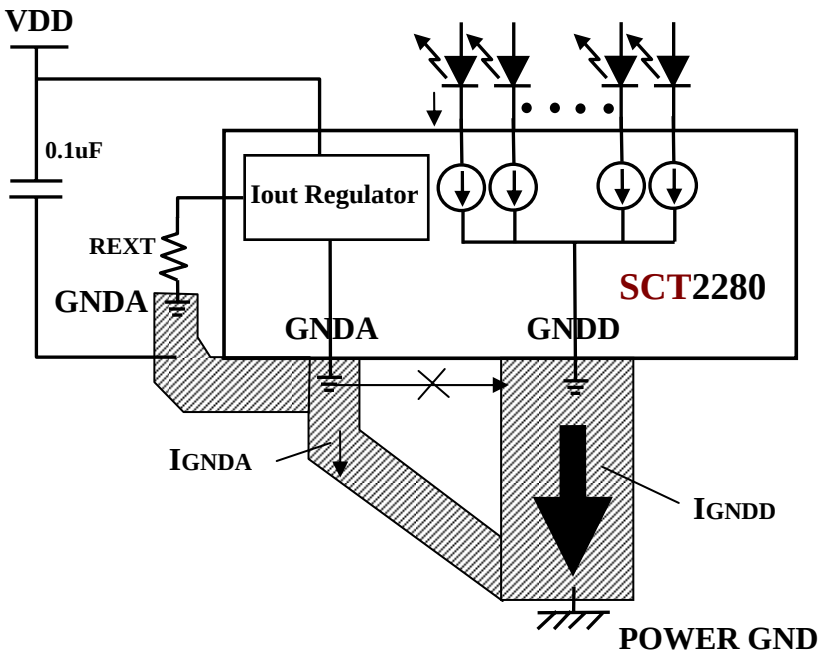
Use the following general guide-line when designing printed circuit boards (PCB**) :**

Decoupling Capacitor
Place a 0.1uF decoupling capacitor between VDD and GND pins of SCT2280. Locate the capacitor as close to the pins as possible.

External Resistor (REXT)
Locate the external resistor as close to the REXT pin as possible to avoid the noise influence.

Current-limited Resistor
It is recommended to use 22/33 Ohm series resistors in the power connections of offending SCT2280s in conjunction with decoupling capacitors shunting the ICs.

Ground
Split the ground connection. Use separate traces or planes for the analog, digital grounds (GNDA, GNDD pins of SCT2280) and tie them together at a single point, preferably close to the system power return. The GNDA pin of SCT2280 has little current flow through it and is likely to be treated as a clean ground in SCT2280. The GNDD pins have to accept all the output current and hence to be named "dirty ground".



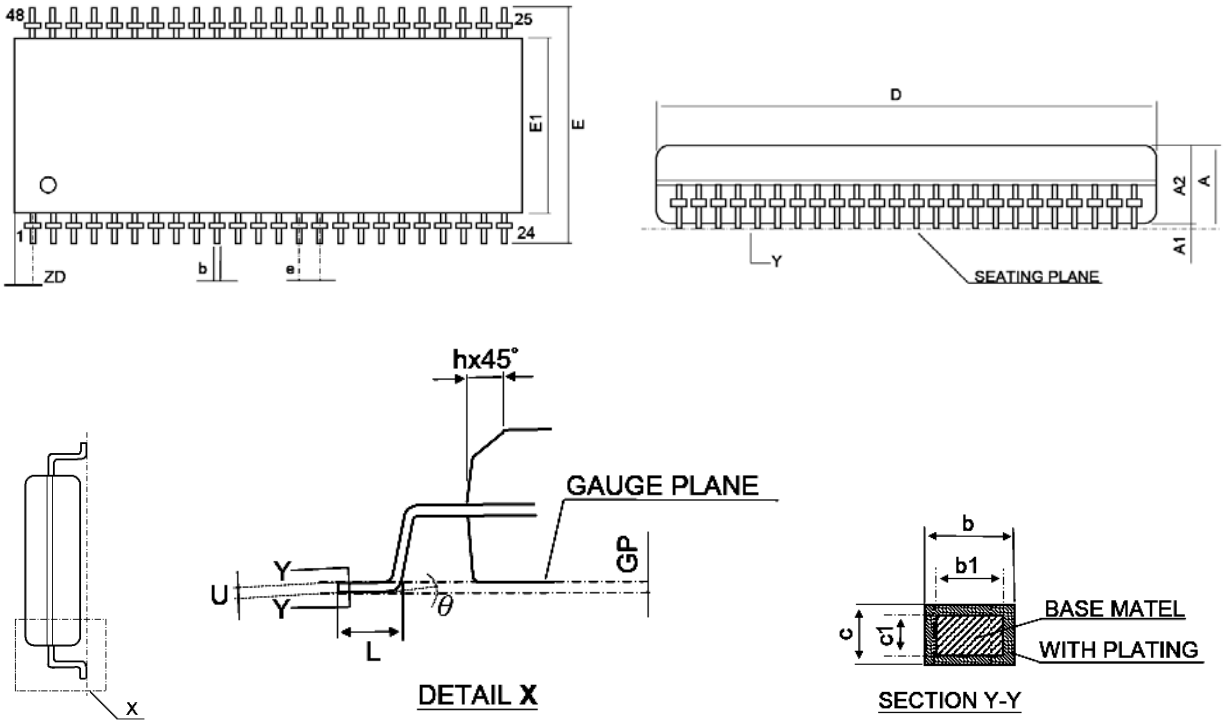
When split the ground connections, note that GNDD traces should be made shorter and wider. Maximizing the width and minimizing the length improves

efficiency and ground bouncing by reducing both ground parasitic resistance and inductance. GNDA trace can be relatively narrow in application of SCT2280.

Information provided by StarChips Technology is believed to be accurate and reliable. Application circuits shown, if any, are typical examples illustrating the operation of the devices. Starchips can not assume responsibility and any problem raising out of the use of the circuits. Starchips reserves the right to change product specification without prior notice.

Package Dimension

SSOP48



	MIN	NOM	MAX	MIN	NOM	MAX
A	2.413	2.591	2.794	95	102	110
SYMBOL	DIMENSION (mm)			DIMENSION (mil)		
A1	0.203	0.305	0.406	8	12	16
A2	2.235	2.286	2.337	88	90	92
b	0.203		0.343	8		13.5
b1	0.203	0.254	0.305	8	10	12
c	0.127		0.254	5		10
c1	0.127	0.203	0.216	5	8	8.5
D	15.748	15.875	16.002	620	625	630
E	10.033	10.312	10.668	395	406	420
E1	7.391	7.493	7.595	291	295	299
e	0.635 BSC			25 BSC		
GP	0.254 BASIC			10 BASIC		
ZD	0.635 REF			25 REF		
h	0.381	0.508	0.635	15	20	25
L	0.508	0.762	1.016	20	30	40
Y			0.102			4
θ	0°	4°	8°	0°	4°	8°