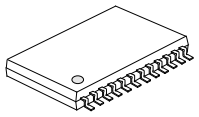
16-BIT CONSTANT CURRENT LED DRIVER WITH BUILT-IN TO ELIMINATE THE GHOSTING



SSOP-24

■ DESCRIPTION

UTC **L16B40** is a new 16-bit constant current LED driver IC with 20V output rating. Output currents with high accuracy and consistency can be preset through an external resistor. The output current ranges from 2mA to 40mA.

Moreover, the fast current response time and built-in to eliminate the ghosting make UTC **L16B40** performing better in output current and display image.

■ FEATURES

* Built-in to eliminate the ghosting
* Supply voltage range: 3.3V ~ 5.5V
* Constant output current range: 2 ~ 40mA
* Output voltage: 20V (Max.)
* Operating temperature range: -40°C ~ 85°C
* Output current accuracy:
  ICs: ±3.0% (Typ.)

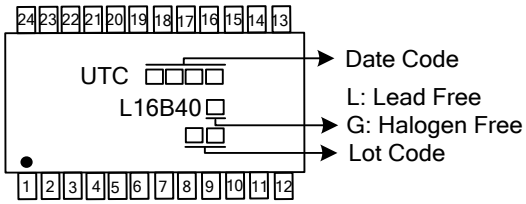
■ ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
L16B40L-R24-R	L16B40G-R24-R	SSOP-24	Tape Reel

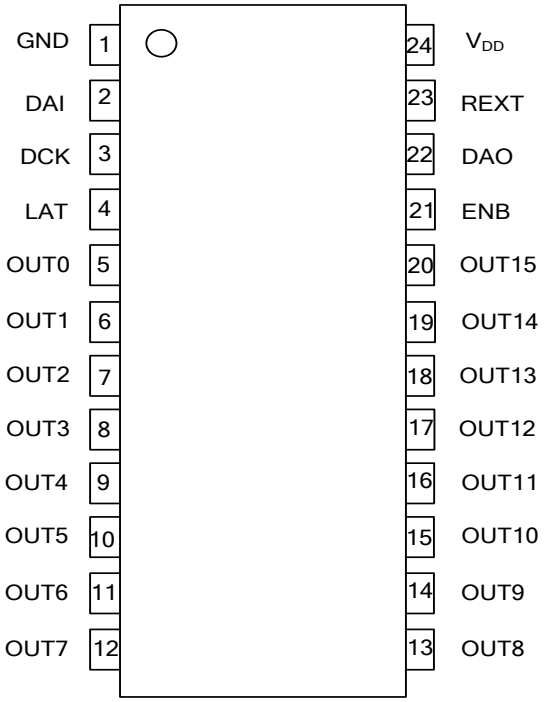
L16B40G-R24-R

(1) Packing Type	(1) R: Tape Reel
(2) Package Type	(2) R24: SSOP-24
(3) Green Package	(3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING



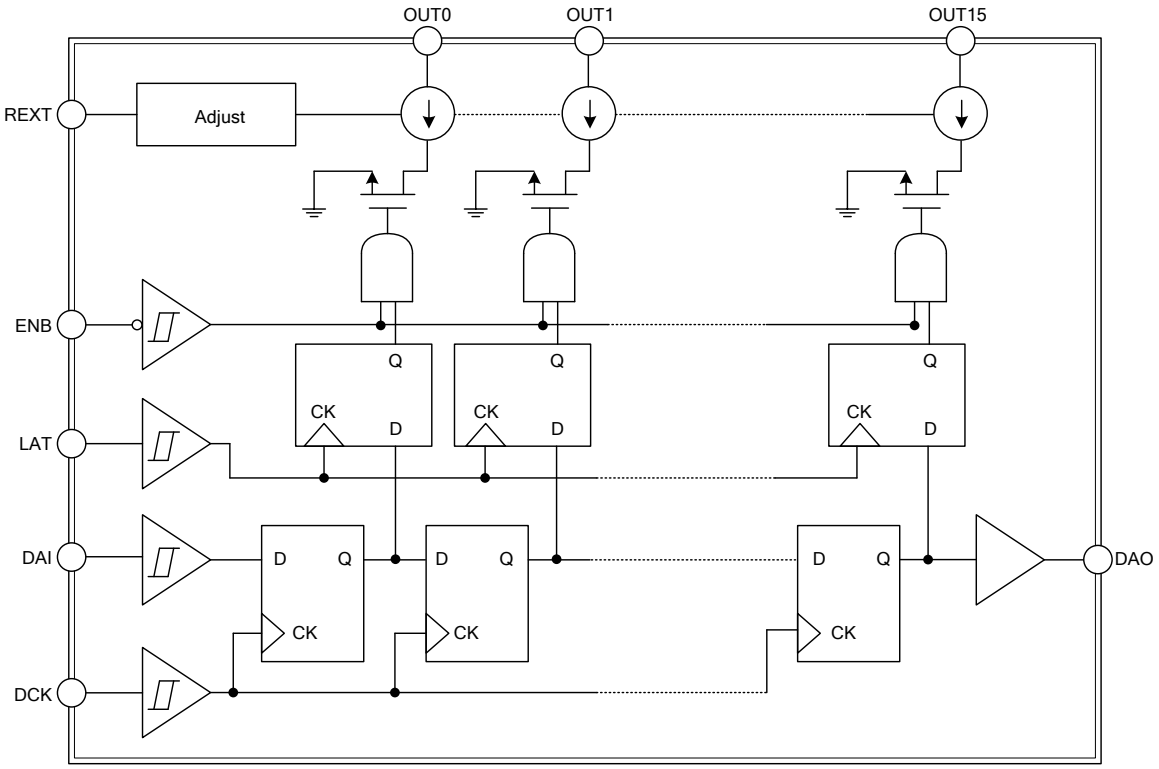
■ PIN CONFIGURATION



■ PIN DESCRIPTION

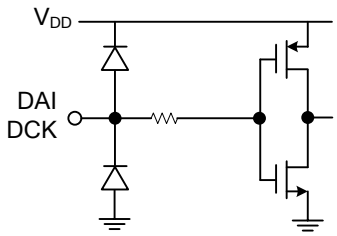
PIN NO.	PIN NAME	DESCRIPTION
1	GND	Ground
2	DAI	Serial-data input
3	DCK	Clock input
4	LAT	Data strobe signal input
5~20	OUT0 ~15	Constant current outputs
21	ENB	Enable signal input
22	DAO	Serial-data output
23	REXT	Input terminal used to connect an external resistor for setting up output current
24	V_{DD}	Supply voltage

■ BLOCK DIAGRAM

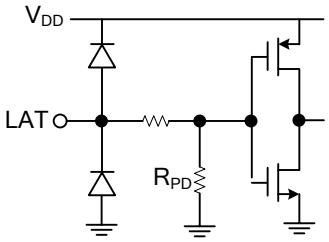


■ EQUIVALENT CIRCUITS OF INPUTS AND OUTPUTS

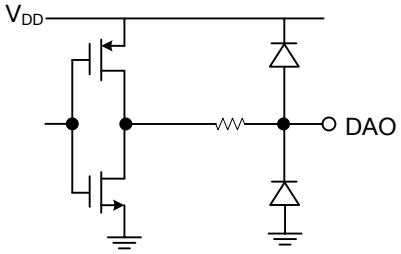
DAI/DCK



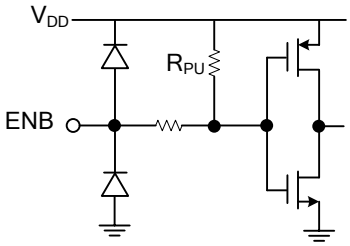
LAT



DAO



ENB



■ ABSOLUTE MAXIMUM RATING (T_A=25°C, unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage Range	V_{DD}	0 ~ 7.0	V
Input Voltage Range	V_{IN}	-0.4 ~ V_{DD}+0.4	V
Output Current (OUT15 ~ 0)	I_{OUT}	40	mA
Output Voltage (OUT15 ~ 0)	V_{OUT}	-0.3 ~ 20	V
Clock Frequency	F_{DCK}	30	MHz
GND Pin Current	F_{GND}	1000	mA
Power Dissipation (on PCB)	P_D	0.9	W
Thermal Resistance (on PCB)	$R_{TH\ (j\text{-}a)}$	75	°C/W
Operating Temperature	T_{OPR}	-40 ~ +85	°C
Storage Temperature	T_{STG}	-55 ~ +150	°C

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

■ RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Supply Voltage	V_{DD}		3.3	5.0	5.5	V
Output Voltage (OUT15 ~ 0)	V_{OUT}	I_{OUT} off			20	V
		I_{OUT} on	0.7		0.5×V_{DD}	V
Output Current	I_{OUT}	OUT15 ~ 0	2		40	mA
	I_{OH}	V_{OH}=V_{DD}-0.2V		-0.66		
	I_{OL}	V_{OL}=0.2V		2.0		
Input Voltage (DAI/ENB/LAT/DCK)	V_{IH}	V_{DD}=3.3V~5.5V	0.7×V_{DD}		V_{DD}	V
	V_{IL}		0		0.3V_{DD}	

■ ELECTRICAL CHARACTERISTICS (V_{DD}=5.0V)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Supply Voltage		V_{DD}		4.5	5.0	5.5	V
Sustaining Voltage At OUT Ports		V_{OUT}	OUT15 ~ 0			20	V
Output Leakage Current		I_{LEAK}	V_{OUT}=20V		1.0		μA
Input Voltage	"H" level	V_{IH}	Logic Level	0.7×V_{DD}		V_{DD}	V
	"L" level	V_{-IL}		0		0.3×V_{DD}	
DAO Voltage		V_{OH}	I_{OH}=−0.66mA	V_{DD}-0.2			V
		V_{OL}	I_{OL}=1.0mA			0.2	
Output Current Accuracy	ICs	I_{OSC}	V_{OUT}=1.0V, R_{EXT}=2045Ω		±3.0		%
Output Current Vs.	Output Voltage Regulation	%/ΔV_{OUT}	R_{EXT}=2045Ω, V_{OUT}=1V~2V		±0.1		%/V
	Supply Voltage Regulation	%/ΔV_{DD}	R_{EXT}=2045Ω, V_{DD}=4.5V~5.5V		±1.0		
Supply Current		$I_{DD\ OFF1}$	R_{EXT} open, OUT15 ~ 0 off		3.1		mA
		$I_{DD\ OFF2}$	R_{EXT}=2045Ω, OUT15 ~ 0 off		6.2		
		$I_{DD\ ON}$	R_{EXT}=2045Ω, OUT15 ~ 0 on		7.1		

■ ELECTRICAL CHARACTERISTICS (V_{DD}=3.3V)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Supply Voltage		V_{DD}		3.0	3.3	3.6	V
Sustaining Voltage At OUT Ports		V_{OUT}	OUT15 ~ 0			20	V
Output Leakage Current		I_{LEAK}	V_{OUT}=20V		1.0		μA
Input Voltage	"H" level	V_{IH}	Logic Level	0.7×V_{DD}		V_{DD}	V
	"L" level	V_{-IL}		0		0.3×V_{DD}	
DAO Voltage		V_{OH}	I_{OH}=−0.66mA	V_{DD}-0.2			V
		V_{OL}	I_{OL}=1.0mA			0.2	
Output Current Accuracy	ICs	I_{OSC}	V_{OUT}=1.0V, R_{EXT}=2045Ω		±3.0		%
Output Current Vs.	Output Voltage Regulation	%/ΔV_{OUT}	R_{EXT}=2045Ω, V_{OUT}=1V~2V		±0.1		%/V
	Supply Voltage Regulation	%/ΔV_{DD}	R_{EXT}=2045Ω, V_{DD}=3.0V~3.6V		±1.0		
Supply Current		I_{DD_OFF1}	R_{EXT} open, OUT15 ~ 0 off		3.1		mA
		I_{DD_OFF2}	R_{EXT}=2045Ω, OUT15 ~ 0 off		6.2		
		I_{DD_ON}	R_{EXT}=2045Ω, OUT15 ~ 0 on		7.1		

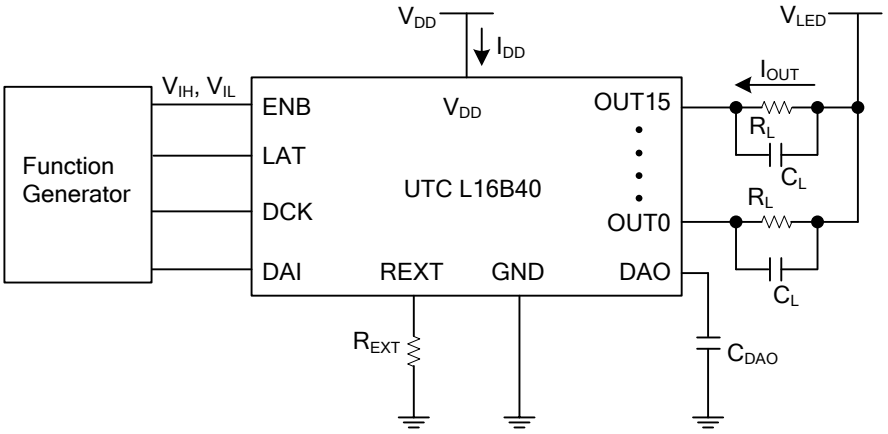
■ SWITCHING CHARACTERISTICS (V_{DD}=5.0V)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Delay Response Time (Low to High)	DCK to DAO	t_{pLH}	R_{EXT}=872Ω, V_{IH}=V_{DD}, V_{IL}=0, V_{LED}=5.0V, R_L=47Ω, C_L=12pF		33		ns
	LAT to OUT15~0	t_{pLH1}			53		
	ENB to OUT15~0	t_{pLH2}			52		
Delay Response Time (High to Low)	DCK to DAO	t_{pHL}			23		
	LAT to OUT15~0	t_{pHL1}			54		
	ENB to OUT15~0	t_{pHL2}			53		
Output Rise Time Of OUT Ports		t_{or}			45		
Output Fall Time Of OUT Ports		t_{of}			44		

■ SWITCHING CHARACTERISTICS (V_{DD}=3.3V)

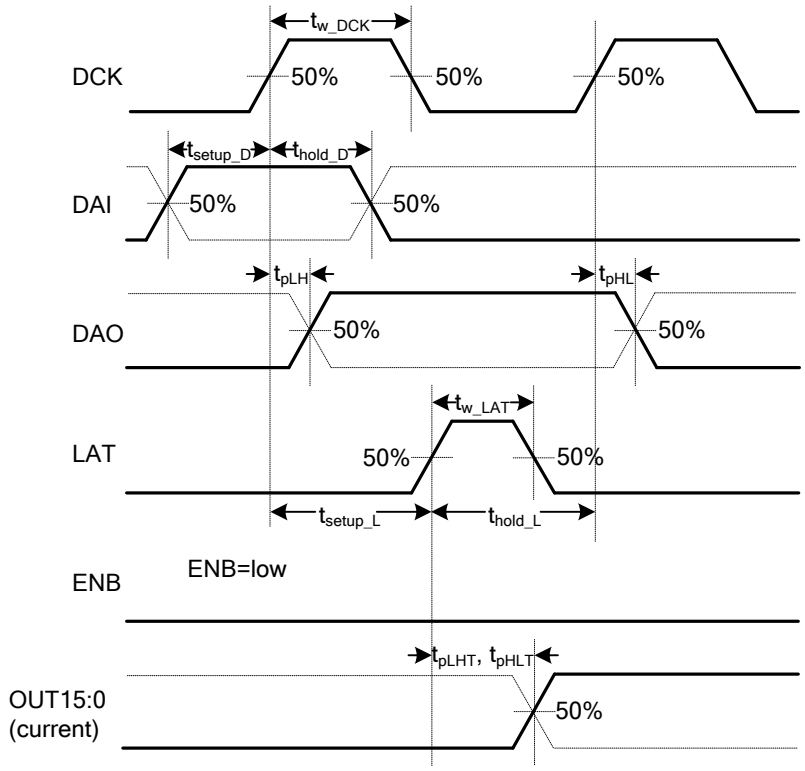
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Delay Response Time (Low to High)	DCK to DAO	t_{pLH}	R_{EXT}=872Ω, V_{IH}=V_{DD}, V_{IL}=0, V_{LED}=5.0V, R_L=47Ω, C_L=12pF		34		ns
	LAT to OUT15~0	t_{pLH1}			55		
	ENB to OUT15~0	t_{pLH2}			54		
Delay Response Time (High to Low)	DCK to DAO	t_{pHL}			26		
	LAT to OUT15~0	t_{pHL1}			56		
	ENB to OUT15~0	t_{pHL2}			55		
Output Rise Time Of OUT Ports		t_{or}			47		
Output Fall Time Of OUT Ports		t_{of}			46		

■ TEST CRICUIT FOR SWITCHING CHARACTERISTICS

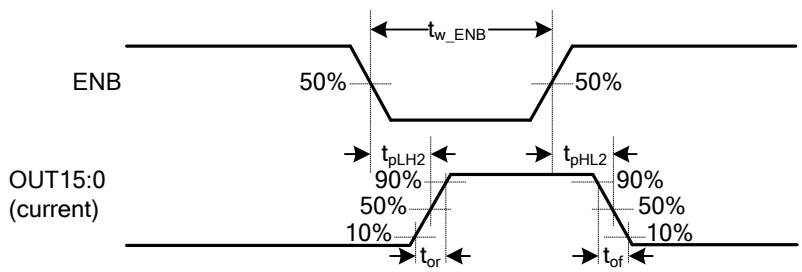


■ TIMING WAVEFORM

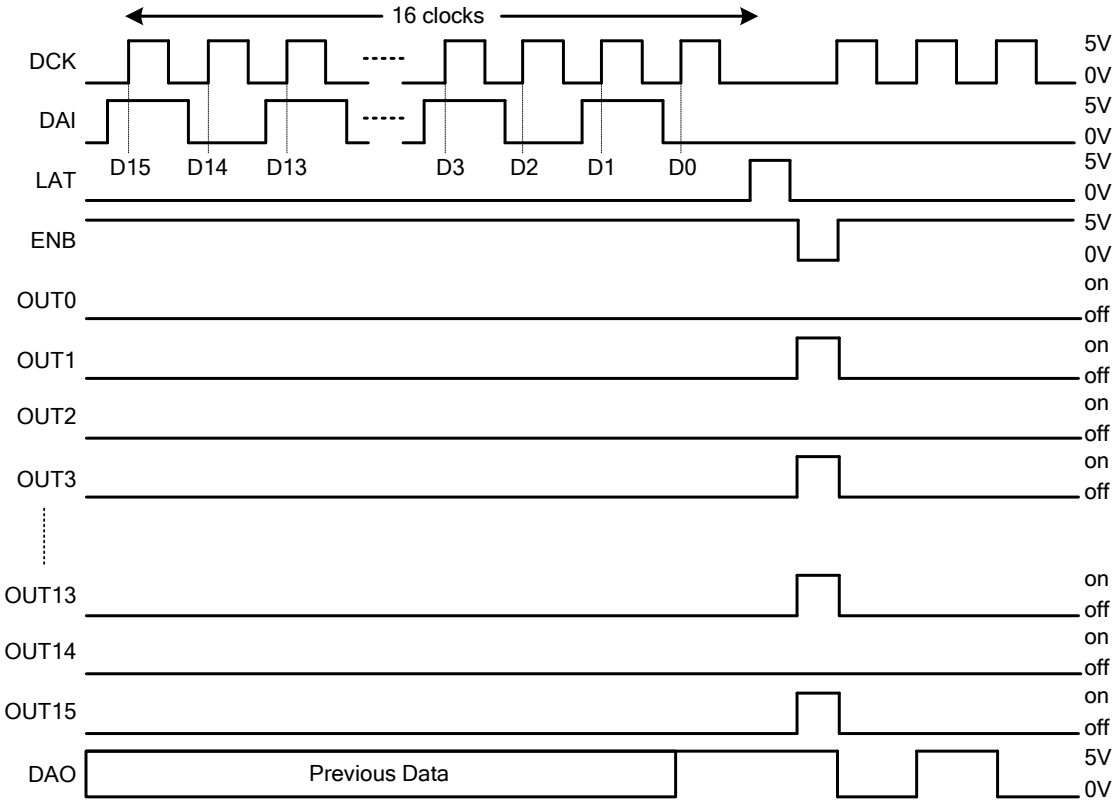
1. DCK, DAI, DAO, LAT, ENB, OUT15:0



2. ENB, OUT15:0



■ SEQUENCE DIAGRAM



■ TYPICAL APPLICATION CIRCUIT