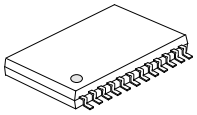
16-BIT CONSTANT CURRENT LED SINK DRIVER



SSOP-24

■ DESCRIPTION

The UTC **L16B45B** is designed for LED displays. UTC **L16B45B** contains a serial buffer and data latches which convert serial input data into parallel output format. at UTC **L16B45B** output stage, sixteen regulated current ports are designed to provide uniform and constant current sinks for driving LEDs within a large range of V_F variations.

UTC **L16B45B** provides users with great flexibility and device performance while using UTC **L16B45B** in their system design for LED display applications, e.g. LED panels. Users may adjust the output current from 0.6mA to 45mA through an external resistor, R-EXT, which gives users flexibility in controlling the light intensity of LEDs. UTC **L16B45B** guarantees to endure maximum 11V at the output port. The high clock frequency, 35MHz, also satisfies the system requirements of high volume data transmission.

■ FEATURES

* 16 constant-current output channels
* Constant output current invariant to load voltage change:
  Constant output current range:
  0.6~45mA @ V_{DD}=5V
  0.6~35mA @ V_{DD}=3.3V
* Output current adjusted through an external resistor
* Fast response of output current, $\overline{OE}$: 20ns @ V_{DD}=3.3V
* Schmitt trigger input
* 3.3V, 5V supply voltage

■ ORDERING INFORMATION

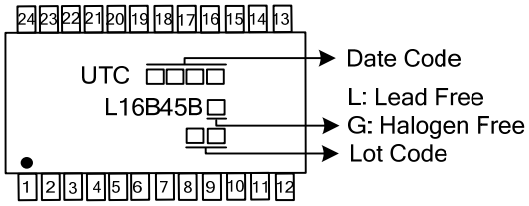
Ordering Number		Package	Packing
Lead Free	Halogen Free		
L16B45BL-R24-R	L16B45BG-R24-R	SSOP-24	Tape Reel

L16B45BG-R24-R

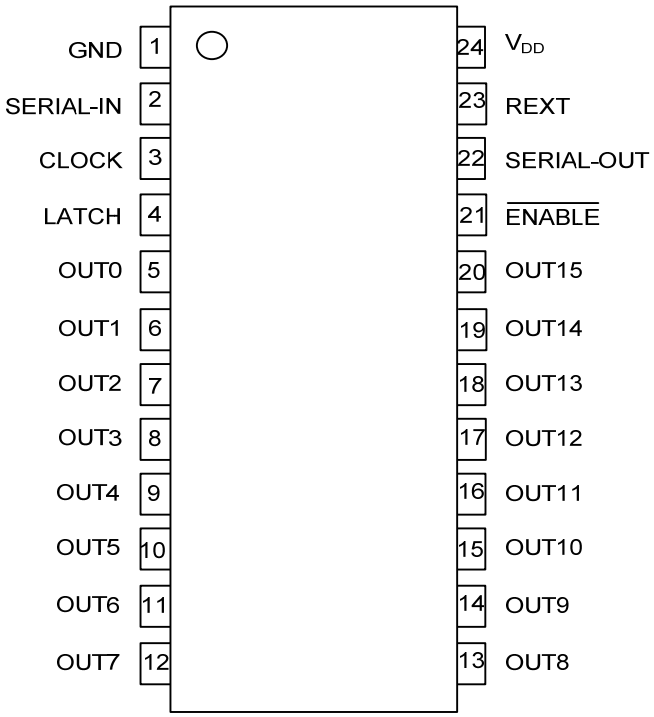
(1) Packing Type	(1) R: Tape Reel
(2) Package Type	(2) R24: SSOP-24
(3) Green Package	(3) G: Halogen Free and Lead Free, L: Lead Free

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■ MARKING



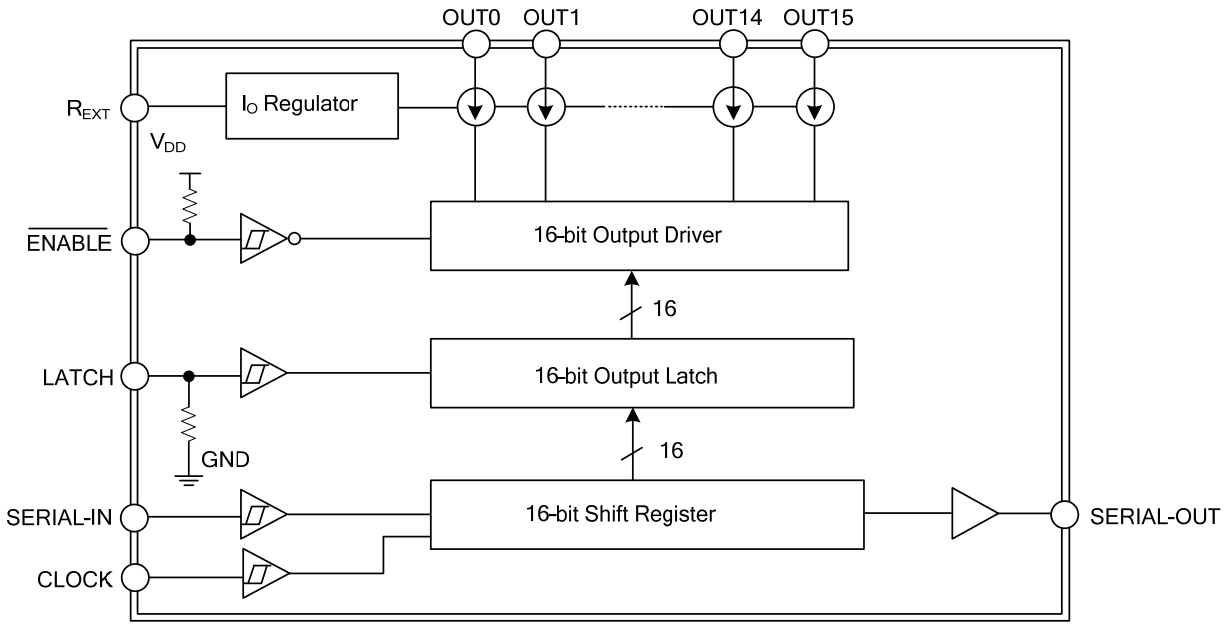
■ PIN CONFIGURATION



■ PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION
1	GND	Ground terminal for control logic and current sink
2	SERIAL-IN	Serial-data input to the shift register
3	CLOCK	Clock input terminal for data shift on rising edge
4	LATCH	Data strobe input terminal Serial data is transferred to the output latch when LE is high. The data is latched when LE goes low.
5~20	OUT0~15	Constant current output terminals
21	$\overline{\text{ENABLE}}$	Output enable terminal When (active) low, the output drivers are enabled; when high, all output drivers are turned OFF (blanked).
22	SERIAL-OUT	Serial-data output to the following SDI of next driver IC
23	R_{EXT}	Input terminal used to connect an external resistor for setting up output current for all output channels
24	V_{DD}	3.5V/5V supply voltage terminal

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V_{DD}	0~7.0	V
Input Voltage	V_{IN}	-0.4 ~ V_{DD}+0.4	V
Output Current	I_{OUT}	45	mA
Output Voltage	V_{OUT}	-0.5 ~ +11	V
Clock Frequency	F_{CLK}	35	MHz
GND Terminal Current	I_{GND}	720	mA
Power Dissipation (T_A=25°C)	P_D	0.9	W
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.

■ DC ELECTRICAL CHARACTERISTICS (V_{DD}=5.0V, T_A=25°C)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Voltage	"H" Level	V_{IH}		0.7×V_{DD}		V_{DD}	V
	"L" Level	V_{IL}		GND		0.3×V_{DD}	
Output Leakage Current		I_{OH}	V_{OH}=9V			0.2	uA
Output Voltage (S-OUT)		V_{OL}	I_{OL}=1.0mA			0.4	V
		V_{OH}	I_{OH}=-1.0mA	4.6			
Output Current (Bit to Bit)		I_{OL1}	V_{OUT}=1V, R_{EXT}=910Ω		±2		%
		I_{OL2}	V_{OUT}=1V, R_{EXT}=420Ω		±2		
Output Current (chip to chip)		I_{OL3}	V_{OUT}=1V, R_{EXT}=910Ω		±4		%
		I_{OL4}	V_{OUT}=1V, R_{EXT}=420Ω		±4		
Output Current vs. Supply Voltage Regulation		%/V_{DD}	R_{EXT}=420Ω, T_A=-40~85°C		±1		%/V
Output Current vs. Output Voltage Regulation		%/V_{DS}	R_{EXT}=420Ω, T_A=-40~85°C		±0.1		%/V
Pull-Up Resistor		$R_{IN\ (up)}$			500		KΩ
Pull-Down Resistor		$R_{IN\ (down)}$			500		KΩ
Supply Current	"OFF"	$I_{DD\ (off)\ 1}$	R_{EXT}=OPEN, OUT0~15=off		5	8	mA
		$I_{DD\ (off)\ 2}$	R_{EXT}=420Ω, OUT0~15=off		10	15	
	"ON"	$I_{DD\ (on)\ 1}$	R_{EXT}=420Ω, OUT0~15=on		10	15	

■ DC ELECTRICAL CHARACTERISTICS (V_{DD}=3.3V, T_A=25°C)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Voltage	"H" Level	V_{IH}		0.7×V_{DD}		V_{DD}	V
	"L" Level	V_{IL}		GND		0.3×V_{DD}	
Output Leakage Current		I_{OH}	V_{OH}=9V			0.2	uA
Output Voltage (S-OUT)		V_{OL}	I_{OL}=1.0mA			0.5	V
		V_{OH}	I_{OH}=-1.0mA	2.8			
Output Current (Bit to Bit)		I_{OL1}	V_{OUT}=1V, R_{EXT}=2720Ω		±2		%
		I_{OL2}	V_{OUT}=1V, R_{EXT}=910Ω		±2		
Output Current (chip to chip)		I_{OL3}	V_{OUT}=1V, R_{EXT}=2720Ω		±4		%
		I_{OL4}	V_{OUT}=1V, R_{EXT}=910Ω		±4		
Output Current vs. Supply Voltage Regulation		%/V_{DD}	R_{EXT}=910Ω, T_A=-40~85°C		±1		%/V
Output Current vs. Output Voltage Regulation		%/V_{DS}	R_{EXT}=910Ω, T_A=-40~85°C		±0.1		%/V
Pull-Up Resistor		$R_{IN\ (up)}$			500		KΩ
Pull-Down Resistor		$R_{IN\ (down)}$			500		KΩ
Supply Current	"OFF"	$I_{DD\ (off)\ 1}$	R_{EXT}=OPEN, OUT0~15=off		4	6	mA
		$I_{DD\ (off)\ 2}$	R_{EXT}=910Ω, OUT0~15=off		6	10	
	"ON"	$I_{DD\ (on)\ 1}$	R_{EXT}=910Ω, OUT0~15=on		6	10	

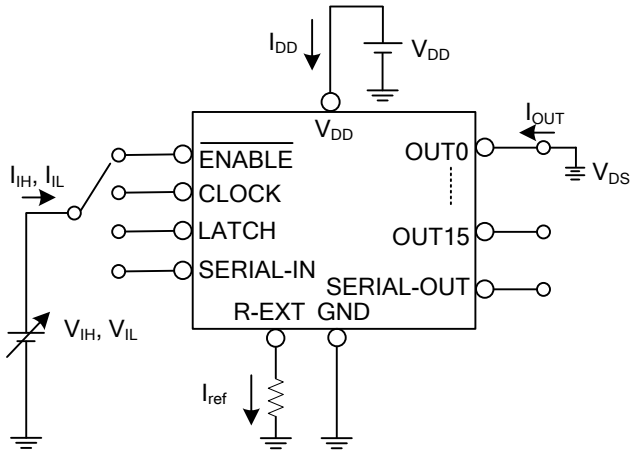
■ SWITCHING CHARACTERISTICS (V_{DD}=5V, T_A=25°C)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Propagation Delay Time ("L" to "H")	CLOCK-OUT0	t_{pLH}	V_{DD}=5V, V_{IH}=V_{DD} V_{IL}=GND, R_{EXT}=1KΩ V_L=4.5V, R_L=150Ω C_L=10pF		20		ns
	LATCH-OUT0				20		
	ENABLE-OUT0				20		
	CLOCK-SERIAL_OUT				10		
Propagation Delay Time ("H" to "L")	CLOCK-OUT0	t_{pHL}			30		ns
	LATCH-OUT0				30		
	ENABLE-OUT0				30		
	CLOCK-SERIAL_OUT				10		
Setup Time for SDI		t_{setup}			5		ns
Hold Time for SDI		t_{hold}			8		ns
Setup Time for LE		$t_{setup\ (L)}$			15		ns
Hold Time for LE		$t_{hold\ (L)}$			10		ns
Propagation Delay Time	Group1-Group2	t_{GD1}			2		ns
	Group1-Group3	t_{GD2}			4		ns
	Group1-Group4	t_{GD3}			6		ns
Pulse Width	CLOCK	t_{wCLK}			15		ns
	LATCH	t_{wLATCH}			15		ns
	ENABLE	t_{wEN}			20		ns
Output Rise Time of I_{OUT}		t_{or}			10		ns
Output Fall Time of I_{OUT}		t_{of}			10		ns

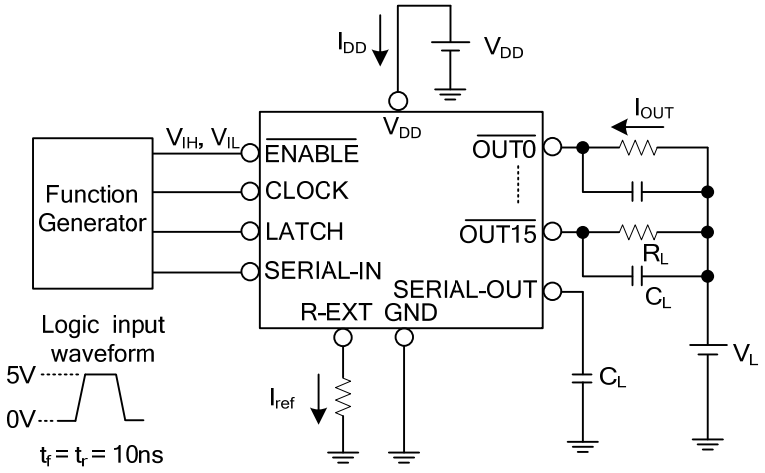
■ SWITCHING CHARACTERISTICS (V_{DD}=3.3V, T_A=25°C)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Propagation Delay Time (“L” to “H”)	CLOCK-OUT0	t_{pLH}	V_{DD}=3.3V, V_{IH}=V_{DD}, V_{IL}=GND, R_{EXT}=1KΩ, V_L=3V, R_L=100Ω, C_L=10pF		20		ns
	LATCH-OUT0				20		
	ENABLE-OUT0				20		
	CLOCK-SERIAL_OUT				10		
Propagation Delay Time (“H” to “L”)	CLOCK-OUT0	t_{pHL}			30		ns
	LATCH-OUT0				30		
	ENABLE-OUT0				30		
	CLOCK-SERIAL_OUT				10		
Setup Time for SDI		t_{setup}			5		ns
Hold Time for SDI		t_{hold}			8		ns
Setup Time for LE		$t_{setup\ (L)}$			15		ns
Hold Time for LE		$t_{hold\ (L)}$			15		ns
Propagation Delay Time	Group1-Group2	t_{GD1}			2		ns
	Group1-Group3	t_{GD2}			4		ns
	Group1-Group4	t_{GD3}			6		ns
Pulse Width	CLOCK	t_{wCLK}			20		ns
	LATCH	t_{wLATCH}			20		ns
	ENABLE	t_{wEN}			40		ns
Output Rise Time of I_{OUT}		t_{or}			20		ns
Output Fall Time of I_{OUT}		t_{of}			20		ns

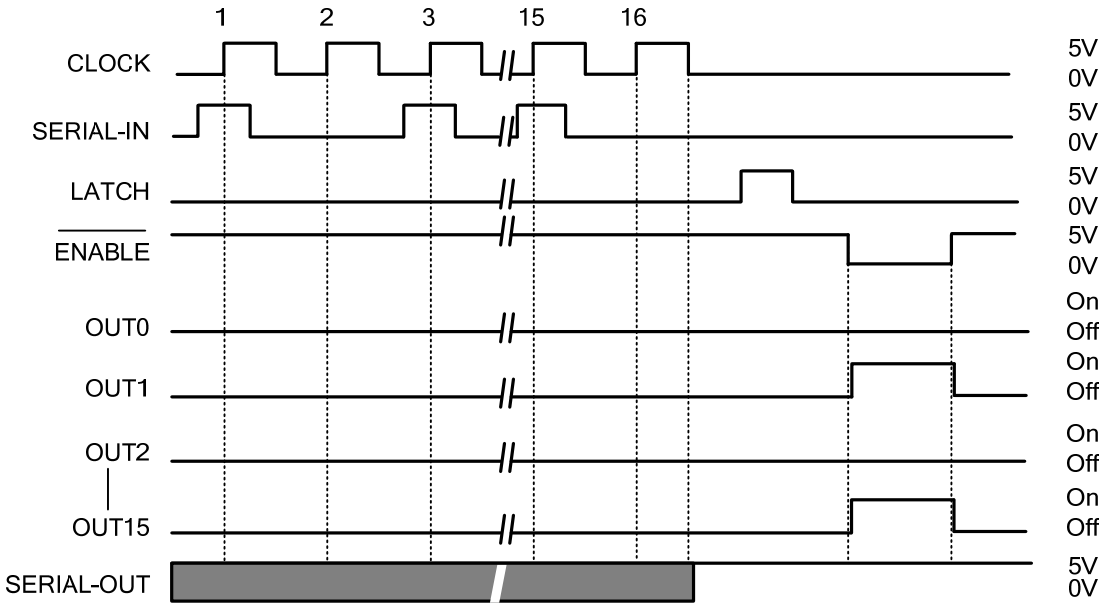
■ TEST CIRCUIT FOR DC ELECTRICAL CHARACTERISTICS



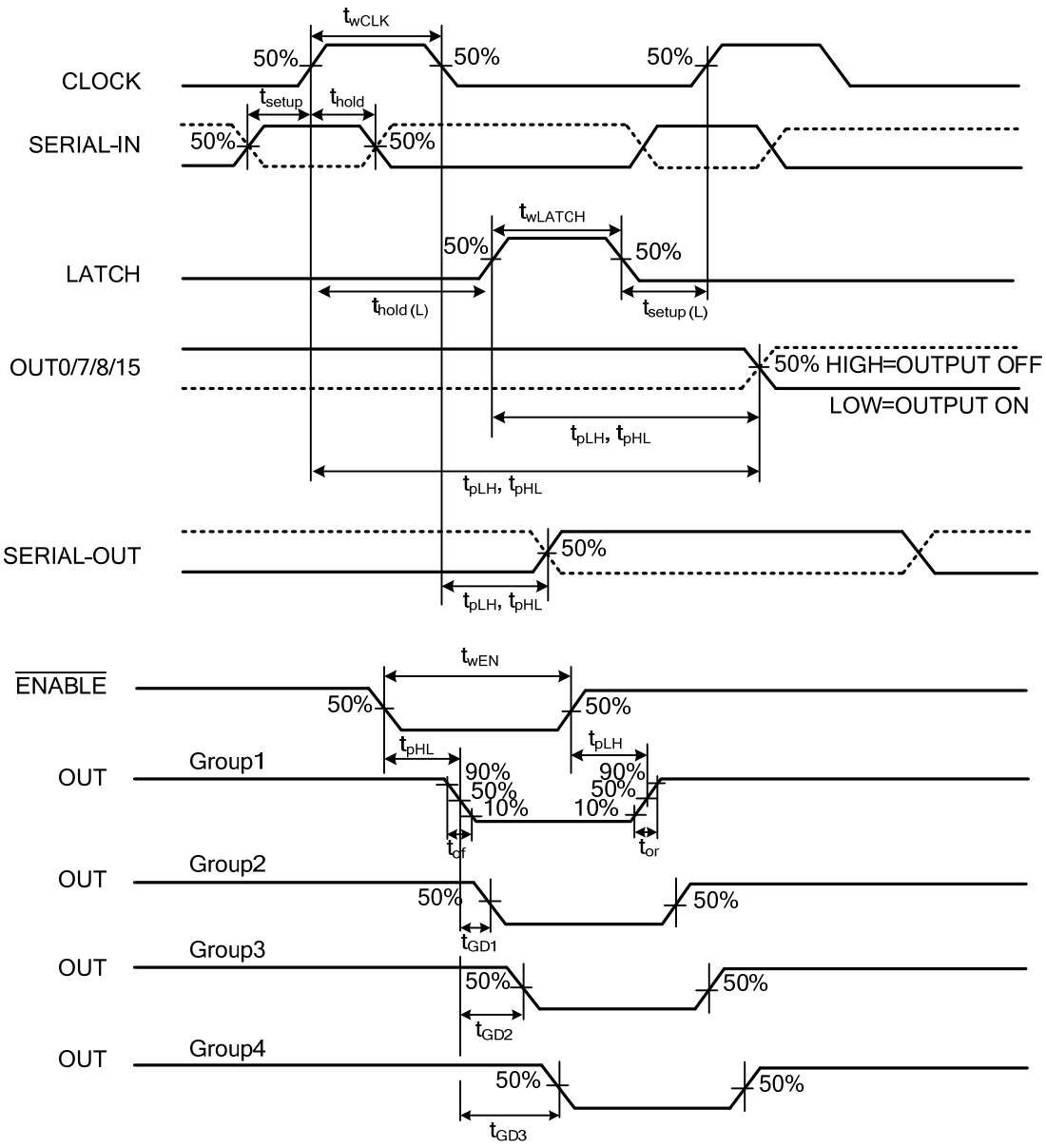
■ TEST CIRCUIT FOR SWITCHING ELECTRICAL CHARACTERISTICS



■ TIMING DIAGRAM

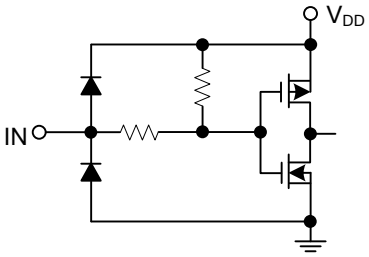


■ TIMING WAVEFORM

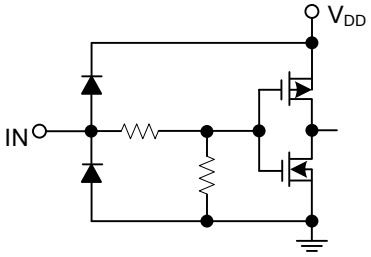


■ EQUIVALENT CIRCUITS OF INPUTS AND OUTPUTS

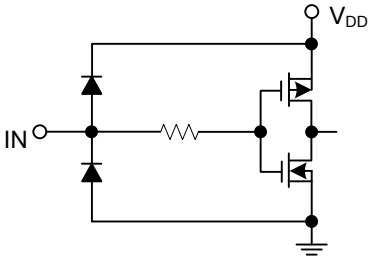
$\overline{\text{ENABLE}}$ Terminal



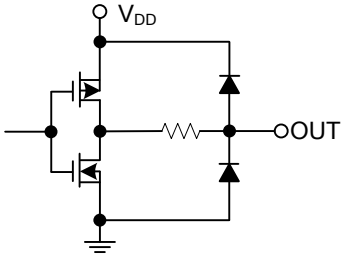
LATCH Terminal



CLOCK, SERIAL-IN Terminal



SERIAL-OUT Terminal



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