

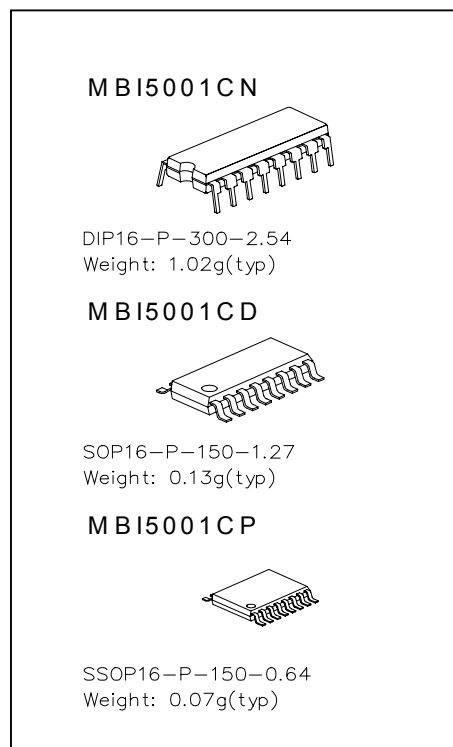
Features

- 8 constant current output channels
- adjustable output current through external resistor
- serial data in/parallel data out
- output current: 5-90 mA
- 20 MHz clock freq.

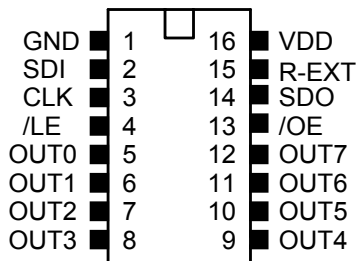
Product Description

The MBI5001, utilizing the most advanced Si technology, is targeted for LED panel display. The MBI5001 contains CMOS shift registers and latch functions, converting serial input data into parallel output format. At output stage, eight regulated current sources were designed to provide 5-90 mA constant current for driving the LEDs.

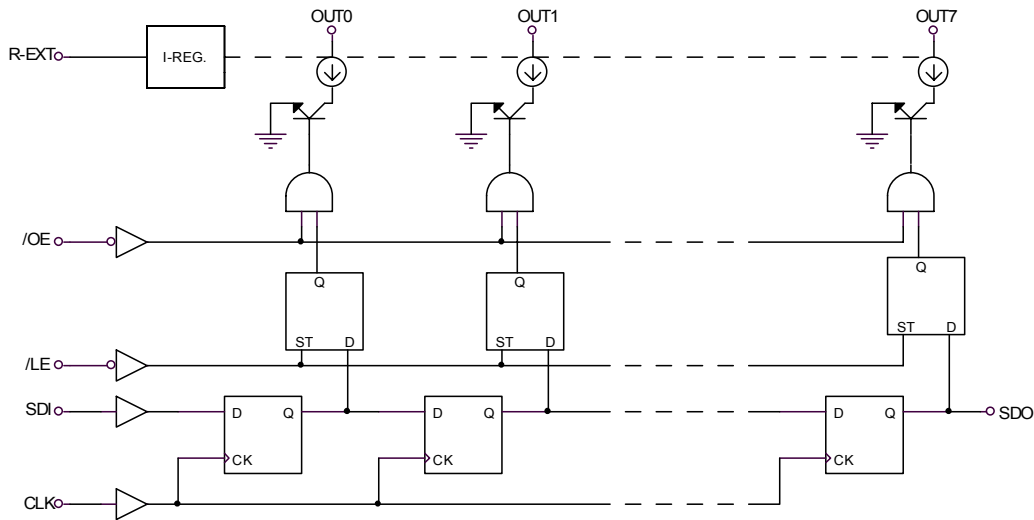
The MBI5001 provides users great flexibility and device performance while using the MBI5001 in their LED panel system design. Users may adjust the output current of the MBI5001 through an external resistor R-ext, which gives users flexibility in controlling the light intensity of LEDs. The MBI5001 guarantees 17V output driving capability, allowing users to connect more LEDs in series. The high clock frequency, 20 MHz, also satisfies the system requirement of high volume data transmission.



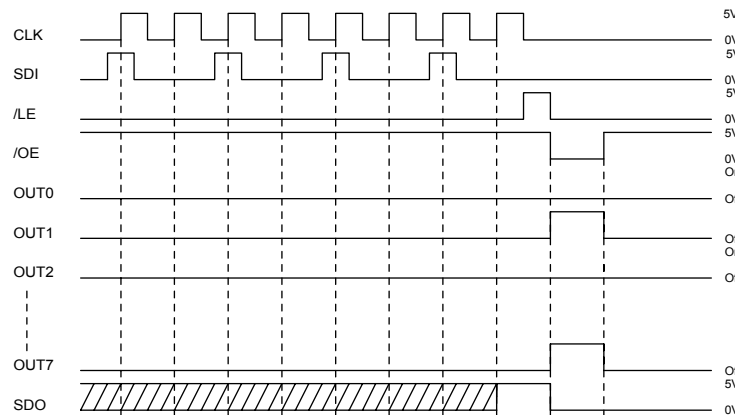
Pin Out



Block Diagram



Timing Diagram



Terminal Description

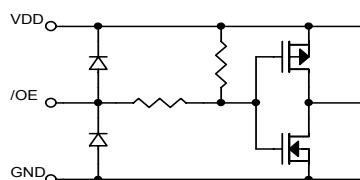
PIN NO.	PIN NAME	FUNCTION
1	GND	GND terminal
2	SDI	Serial data input terminal
3	CLK	Clock input terminal
4	/LE	Latch input terminal
5-12	OUT0-7	Output terminal
13	/OE	Output enable input terminal
14	SDO	Serial data out terminal
15	R-EXT	Constant current programming
16	VDD	5V supply voltage terminal

Truth table

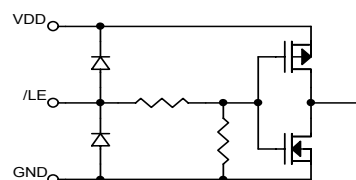
CLK	/LE	/OE	SDI	OUT0	OUT5	OUT7	SDO
UP	H	L	D_n	D_n	D_{n-5}	D_{n-7}	D_{n-7}
UP	L	L	D_{n+1}	NO CHANGE			D_{n-6}
UP	H	L	D_{n+2}	D_{n+2}	D_{n+3}	D_{n+5}	D_{n-5}
DOWN	X	L	D_{n+3}	D_{n+2}	D_{n+3}	D_{n+5}	D_{n-5}
DOWN	X	H	D_{n+3}	Off			D_{n-5}

Equivalent Circuit of Inputs and Outputs:

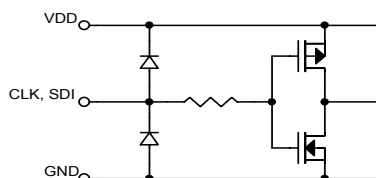
1. /OE terminal



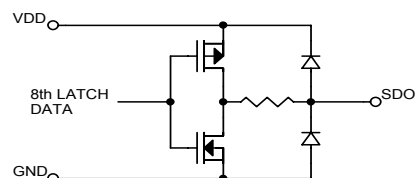
2. /LE terminal



3. CLK, SDI terminal



4. SDO terminal



Maximum Ratings

CHARACTER		SYMBOL	RATING	UNIT
Supply Voltage		V_{DD}	0~+7.0	V
Output Voltage		V_{OUT}	-0.5~+17.0	V
Output Current		I_{OUT}	+90	mA
Input Voltage		V_{IN}	-0.4~ $V_{DD}+0.4$	V
GND Terminal Current		I_{GND}	720	mA
Clock Frequency		F_{CLK}	20	MHZ
Power Dissipation (ON PCB, $T_a=25^{\circ}C$)	CN – type	P_D	1.64	W
	CD – type		1.06	
	CP – type		0.88	
Thermal Resistance (ON PCB, $T_a=25^{\circ}C$)	CN – type	$R_{th(j-a)}$	76	$^{\circ}C/W$
	CD – type		117	
	CP – type		141	
Operating Temperature		T_{opr}	-40~+85	$^{\circ}C$
Storage Temperature		T_{stg}	-55~+150	$^{\circ}C$

Recommended Operating Condition

CHARACTERISTIC		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Voltage		V_{DD}	-	4.5	5.0	5.5	V
Output Voltage		V_{OUT}	-	-	-	17.0	V
Output Current		I_{OUT}	DC Test Circuit	-	-	90	mA
		I_{OH}	SERIAL-OUT	-	-	-1.0	mA
		I_{OL}	SERIAL-OUT	-	-	1.0	mA
Input Voltage		V_{IH}	-	$0.7V_{DD}$	-	$V_{DD}+0.3$	V
		V_{IL}	-	-0.3	-	$0.3V_{DD}$	V
/LE Pulse Width		tw LAT	$V_{DD}=4.5\sim 5.5V$	25	-	-	ns
CLK Pulse Width		tw CLK		25	-	-	ns
/OE Pulse Width		tw EN		400	-	-	ns
Setup Time for DATA		tsetup(D)		20	-	-	ns
Hold Time for DATA		thold(D)		15	-	-	ns
Setup Time for LATCH		tsetup(L)		20	-	-	ns
Hold Time for ENABLE		thold(E)		60	-	-	ns
Clock Frequency		F_{CLK}	Cascade Operation	-	-	20.0	MHz
Power Dissipation	CN – type	P_D	$T_a=85^{\circ}C$	-	-	0.86	W
	CD – type					0.56	
	CP – type					0.46	

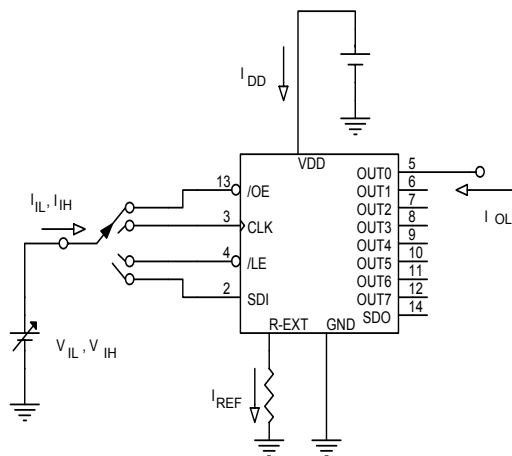
Electrical Characteristics

CHARACTERISTIC		SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT
Input Voltage	“H” level	V _{IH}	-		0.7V _{DD}	-	V _{DD}	V
	“L” level	V _{IL}	-		GND	-	0.3V _{DD}	
Output Leakage Current		I _{OH}	V _{OH} =17.0V		-	-	10	μA
Output Voltage	SERIAL-OUT	V _{OL}	I _{OL} =+1.0mA		-	-	0.4	V
		V _{OH}	I _{OH} =-1.0mA		-	-	-	V
Output Current 1		I _{OL1}	V _{CE} = 0.8V	REXT=865 Ω (include Skew)	-	40.0	-	mA
	Current Skew	dI _{OL1}	IO = 40mA V _{CE} = 0.8V	REXT=865 Ω	-	±1.5	±6.0	%
Output Current 2		I _{OL2}	V _{CE} =1.2V	REXT=330 Ω (include Skew)	-	80.0	-	mA
	Current Skew	dI _{OL2}	IO = 80mA V _{CE} = 1.2V	REXT=330 Ω	-	±1.5	±6.0	%
Pull-up Resistor		RIN(up)	-		150	300	600	KΩ
Pull-down Resistor		RIN(down)	-		85	200	400	KΩ
Supply Current	“OFF”	I _{DD} (off) 1	REXT=OPEN OUT0~7=Off		-	0.1	1.0	mA
		I _{DD} (off) 2	REXT=865 Ω OUT0~7=Off		0.1	0.2	1.0	
		I _{DD} (off) 3	REXT=330 Ω OUT0~7=Off		0.1	0.2	1.0	
	“ON”	I _{DD} (on) 1	REXT=865 Ω OUT0~7=On		7.0	12.0	18.0	
		I _{DD} (on) 2	REXT=330 Ω OUT0~7=On		10.0	22.0	32.0	

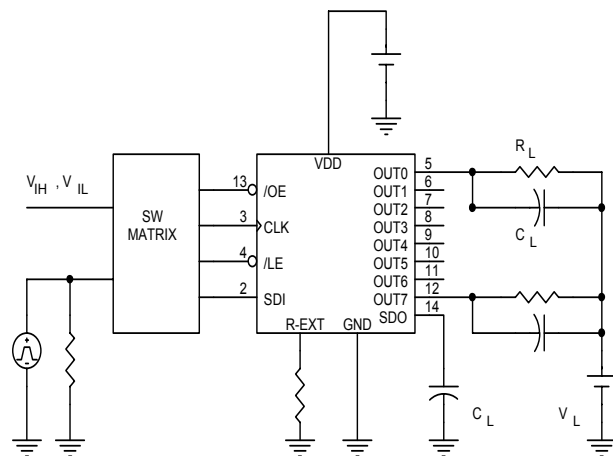
Switching Characteristics

CHARACTERISTIC		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Propagation Delay Time (“L” to “H”)	INn-OUTn	tpLH	$V_{DD}=5.0V$ $V_{CE}=0.8V$ $V_{IH}=V_{DD}$ $V_{IL}=GND$ $R_{EXT}=865\ \Omega$ $I_{OUT}=40mA$ $V_L=3.4V$ $R_L=65\Omega$ $C_L=10.5pF$	-	200	300	ns
	/LE-OUTn			-	200	300	ns
	/OE-OUTn			-	200	300	ns
	CLK-SOUT			20	50	70	ns
Propagation Delay Time (“H” to “L”)	INn-OUTn	tpHL		-	200	300	ns
	/LE-OUTn			-	200	300	ns
	/OE-OUTn			-	200	300	ns
	CLK-SOUT			20	50	70	ns
Pulse Width	CLK	tw CLK-CLK		15	-	20	ns
	/LE	tw LAT-LAT		20	-	30	ns
Set-up Time for LATCH		tswtup LAT		10	-	20	ns
Hold Time for ENABLE		thold LAT		10	-	25	ns
Maximum CLK Rise Time		tr		-	-	5	ns
Maximum CLK Fall Time		tf		-	-	5	ns
Output Rise Time		tor		-	150	200	ns
Output Fall Time		tof		-	150	200	ns

DC Characteristic Test Circuit

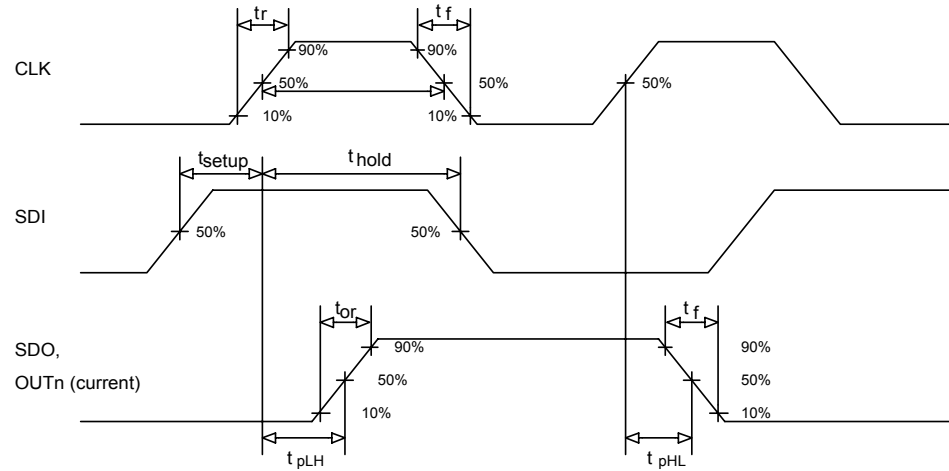


AC Characteristic Test Circuit

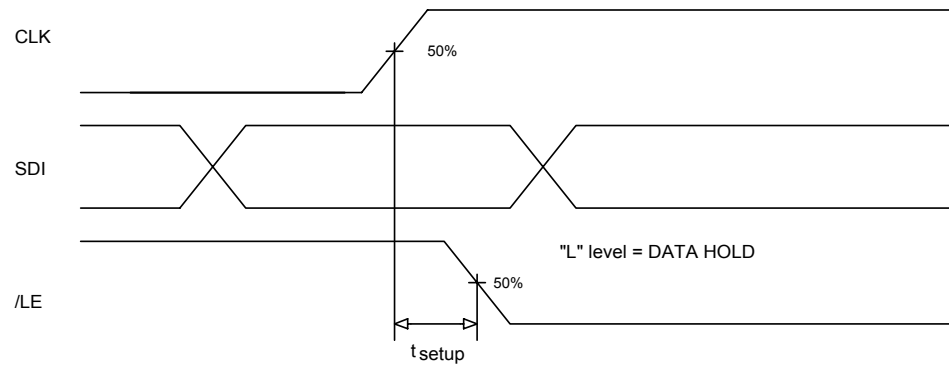


Timing Wave Form

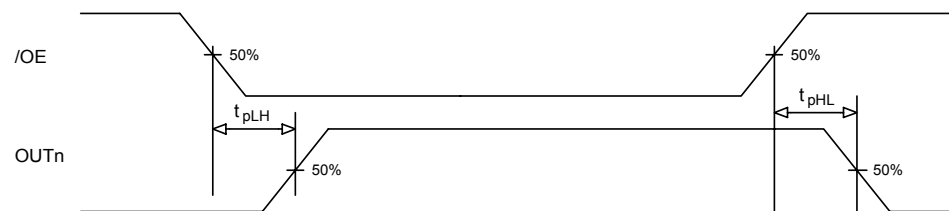
1. CLK, SDI, SDO, OUTn



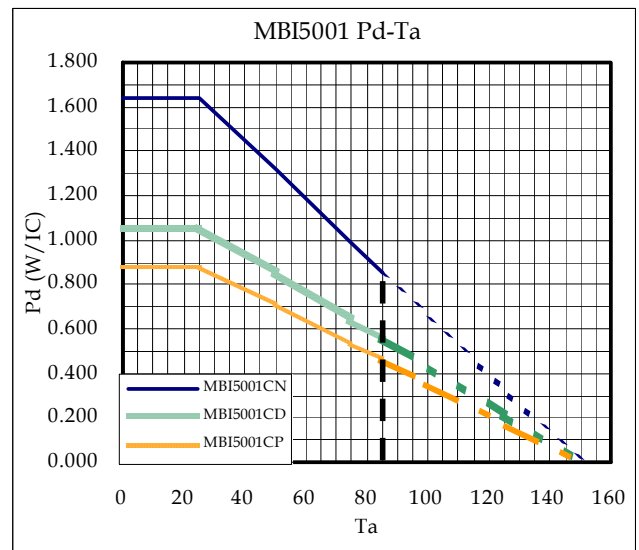
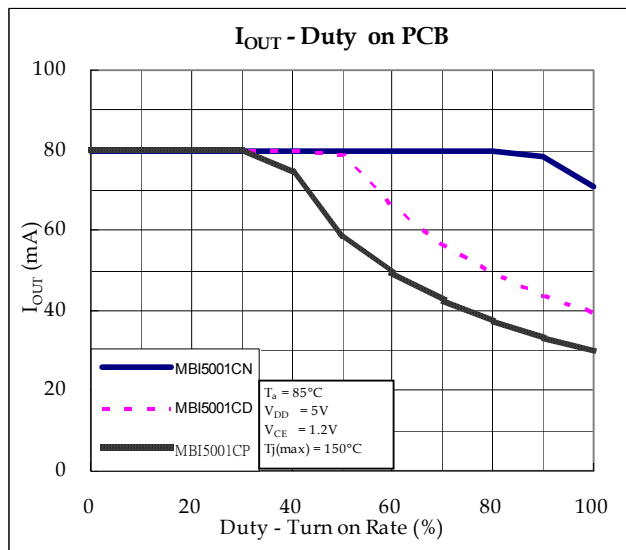
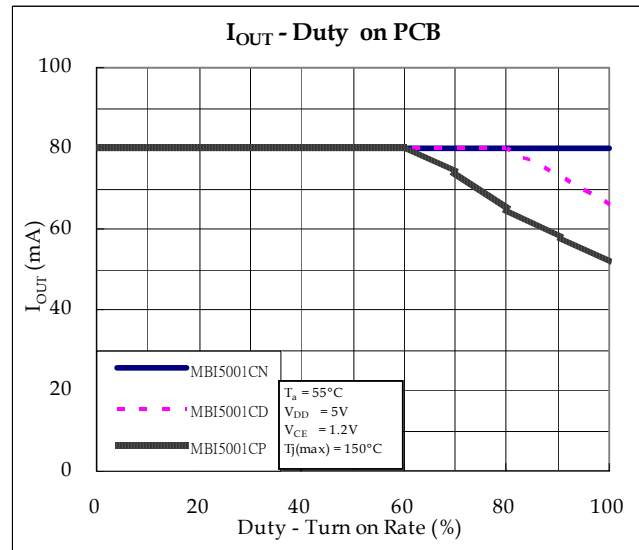
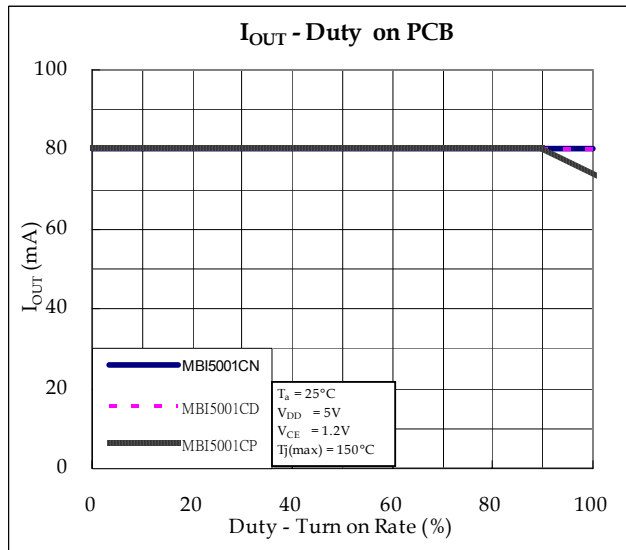
2. CLK - /LE



3. /OE - OUTn



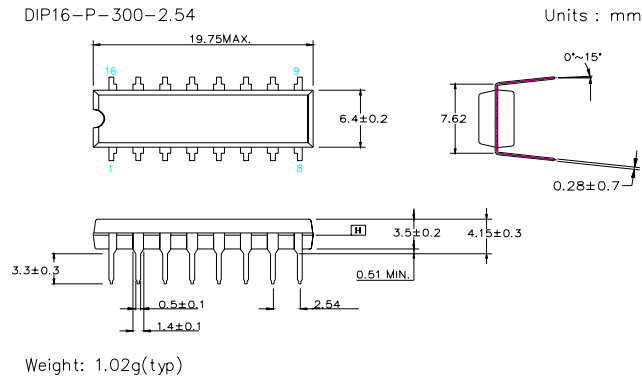
Graphs



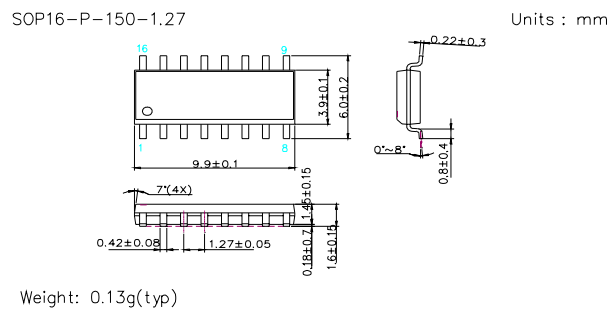
Outline Drawings

MBI5001C N/D/P

MBI5001CN Outline Drawing



MBI5001CD Outline Drawing



MBI5001CP Outline Drawing

