Ordering number : ENA1628B

SANYO Semiconductors
DATA SHEET

An ON Semiconductor Company

Bi-CMOS IC

LV5232VH — 16ch LED Driver

Overview

The LV5232VH is a semiconductor integrated circuit that incorporates a serial input and serial or parallel output 16-stage shift register that features a CMOS structure based on Bi-CMOS process technology. The LV5232VH also contains an n-channel CMOS construction high-withstand-voltage, large-current drive 16-stage parallel output driver.
The protection circuit of the output malfunction is built into.

Features

- Serial input and serial or parallel output
- Enable input for output control
- Serial output enables cascade connection
- Low supply current (30μA typ. during standby ICC≤40μA)
- Serial input/output levels compatible with typical CMOS devices
- High-withstand-voltage LED driver with open drain output
  High withstand voltage (VDS < 42V) High-current drive (I_O max = 100mA)
- Operating temperature range Ta = -25 to 75°C
- Output malfunction protection circuit
  Reset input pin V_{CC} decrease voltage confirmation

Specifications

Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{CC} max	SV_{CC}	6	V
Output voltage	V_O max	LEDO1 to LEDO16 off	42	V
Output current	I_O max		100	mA
Allowable power dissipation	Pd max	Ta ≤ 25°C *	1100	mW
Operating temperature	Topr		-25 to +75	°C
Storage temperature	Tstg		-40 to +125	°C

* Specified board : 114.3mm × 76.1mm × 1.6mm, glass epoxy board.

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Operating Conditions at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	V_{CC}	SV_{CC}	5.0	V
Operating supply voltage range	V_{CC} op	SV_{CC}	3.0 to 5.5	V
Output applied voltage	V_O		42	V
Output current	I_O	Duty = 45% to 55%	100	mA

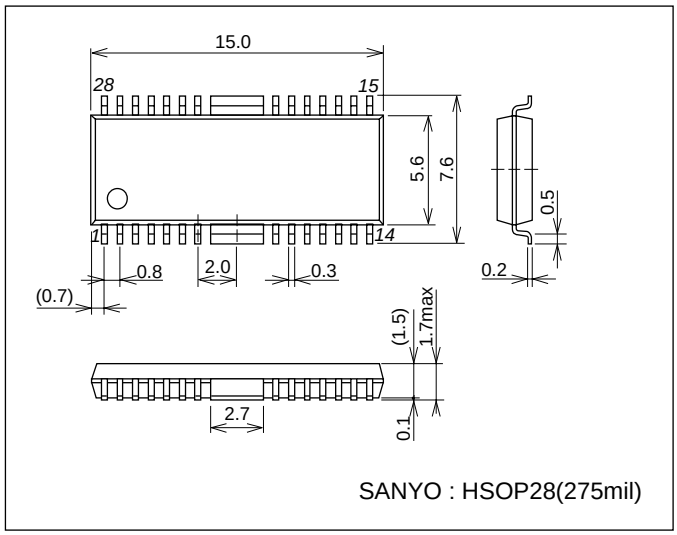
Electrical Characteristics at Ta = 25°C, V_{CC} = 5.0V

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Quiescent current drain	$I_{CC}1$	LEDO driver off (standby)		30	40	μA
LEDO output on resistance	Ron	I_O = 30mA		5		Ω
OFF leak current	Ileak	V_O = 42V		0	10	μA
Driver output malfunction prevention voltage	Vt		2.58	2.70	2.82	V
Control circuit block						
H level 1	$V_{IN}H1$	Input H level	V_{CC} × 0.8			V
L level 1	$V_{IN}L1$	Input L level	0		V_{CC} × 0.2	V
H level 2	V_OUTH1	SOUT I_O = -1mA	V_{CC} -0.3			V
L level 2	V_OUTL1	SOUT I_O = 1mA	0		0.3	V

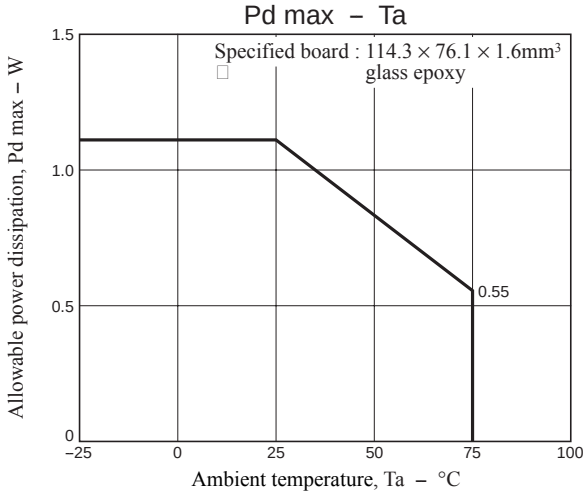
Package Dimensions

unit : mm (typ)

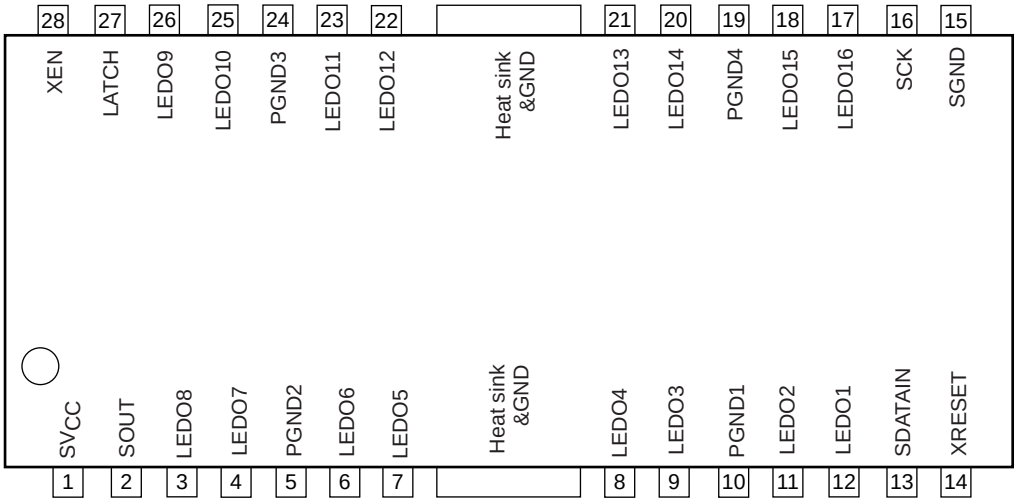
3222A



SANYO : HSOP28(275mil)



Pin Assignment

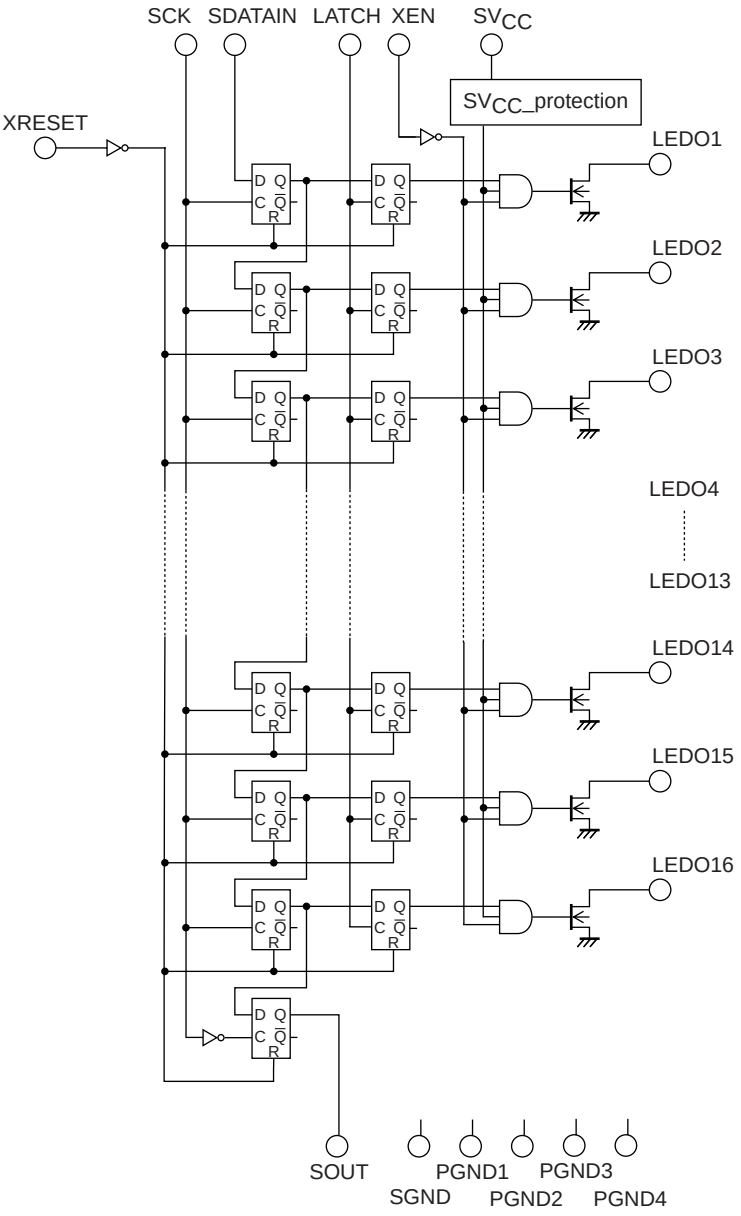


Top view

Pin Descriptions

Pin No.	Pin name	I/O	Description
1	SV_{CC}		Power supply
2	SOUT	O	shift register output (final-stage shift register)
3	LEDO8	O	LEDO8 Latch output (LEDO8 of shift register)
4	LEDO7	O	LEDO7 Latch output (LEDO7 of shift register)
5	PGND2		GND
6	LEDO6	O	LEDO6 Latch output (LEDO6 of shift register)
7	LEDO5	O	LEDO5 Latch output (LEDO5 of shift register)
Heat sink			
8	LEDO4	O	LEDO4 Latch output (LEDO4 of shift register)
9	LEDO3	O	LEDO3 Latch output (LEDO3 of shift register)
10	PGND1		GND
11	LEDO2	O	LEDO2 Latch output (LEDO2 of shift register)
12	LEDO1	O	LEDO1 Latch output (LEDO1 of shift register)
13	SDATAIN	I	Serial Input
14	XRESET	I	Reset input (shift register and latch)
15	SGND		GND
16	SCK	I	Clock input (for shift register)
17	LEDO16	O	LEDO16 Latch output (LEDO16 of shift register)
18	LEDO15	O	LEDO15 Latch output (LEDO15 of shift register)
19	PGND4		GND
20	LEDO14	O	LEDO14 Latch output (LEDO14 of shift register)
21	LEDO13	O	LEDO13 Latch output (LEDO13 of shift register)
Heat sink			
22	LEDO12	O	LEDO12 Latch output (LEDO12 of shift register)
23	LEDO11	O	LEDO11 Latch output (LEDO11 of shift register)
24	PGND3		GND
25	PGND10	O	LEDO10 Latch output (LEDO10 of shift register)
26	PGND9	O	LEDO9 Latch output (LEDO9 of shift register)
27	LATCH	I	Latch input When the latch input is held low, the LED0 output status is retained. When a high-level is input, the LED0 outputs change when the status of the shift register changes.
28	XEN	I	Enable inputs (LEDO1 to LEDO16) When a high-level is input, all the LED0 outputs are turned off. When a low-level is input, the shift register data is output to LED0.

Block Diagram



Function

The LV5232VH consists of 1) an 16-stage D-type flip-flop and 2) an 16-stage D-type flip-flop connected to the output of 1). When data is supplied to the serial data input (SDATAIN) and the clock pulse is supplied to the clock input (SCK), the serial data input signal is input to the internal shift register and the data already in the shift register shifted sequentially when the clock changes from low to high.

The serial output (SOUT) is used to connect multiple LV5232VH to expand the number of bits and is connected to the SDATAIN of the next stage. (Cascade connection supported.)

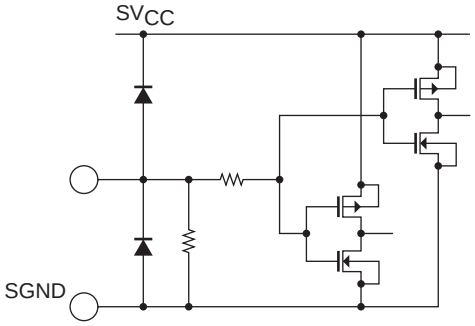
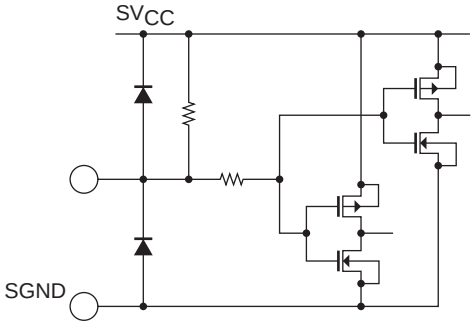
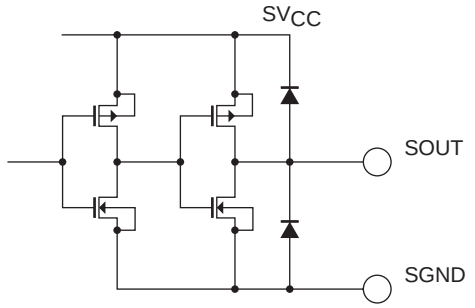
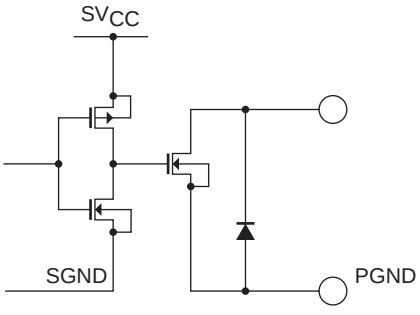
For parallel output, when the output control enable input (XEN) is low, the latch input (LATCH) changes from low to high and the clock pulse input changes from low to high, the serial data input signal is output to LED01, and the output is shifted sequentially. For parallel outputs (LED2 to LED16), the signals whose polarities inverted from those of the serial data input (SDATAIN) are output.

When the EN input is high, outputs LED01 through LED01 all turn off.

When the reset input is low, outputs LED01 through LED16 and SOUT outputs all turn off. The power must be turned on after checking that the reset input is low.

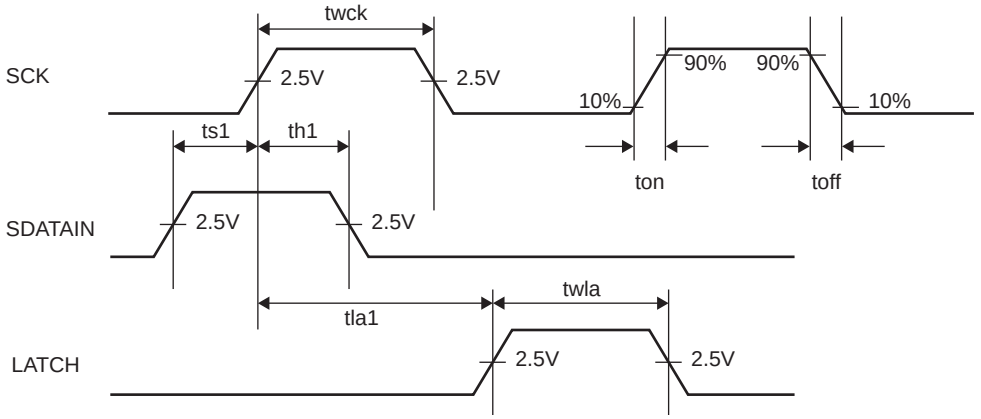
To prevent the malfunction, the output load protection circuit is built into. The output of LEDO1 to LEDO16 is compulsorily turned off when becoming below the voltage with a constant there is V_{CC}.

Pin Functions

Pin No.	Pin Name	Pin function	Equivalent Circuit
13 16	SDATAIN SCK	Pull-down input	
14 27 28	XRESET LATCH XEN	Pull-up input	
2	SOUT	SOUT output	
3 4 6 7 8 9 11 12 17 18 20 21 22 23 25 26	LEDO8 LEDO7 LEDO6 LEDO5 LEDO4 LEDO3 LEDO2 LEDO1 LEDO16 LEDO15 LEDO14 LEDO13 LEDO12 LEDO11 LEDO10 LEDO9	LEDO outputs LEDO1 to LEDO16	

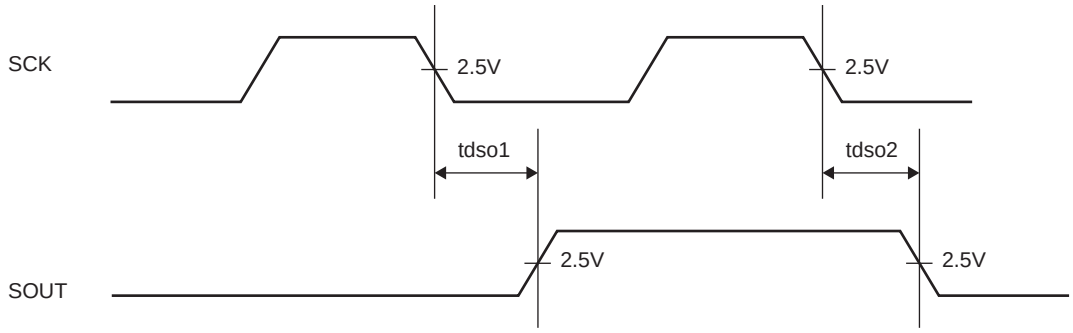
Timing conditions

Parameter	symbol	Conditions	min	typ	max	unit
Clock frequency	fs1	SCK Duty = 50%			10	MHz
Clock pulse width	twck	SCK	50			ns
Latch pulse width	twla	LATCH	50			ns
Data set up time	ts1	SDATAIN setup time relative to the rise of SCK	25			ns
Data hold time	th1	SDATAIN data hold time relative to the rise of SCK	25			ns
Clock latch time	tla1		100			ns
Input conditions 1	ton	SCK and SDATAIN rise time			100	ns
Input conditions 2	toff	SCL and SDATAIN fall time			100	ns



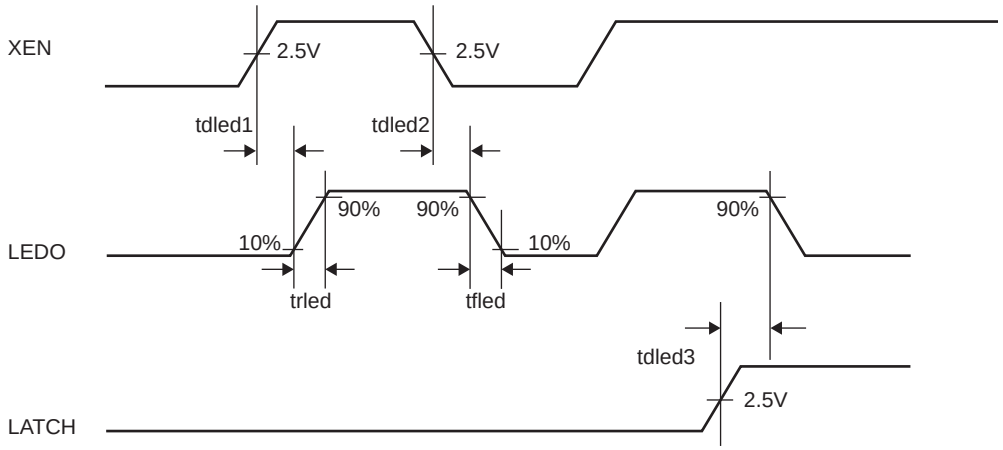
SOUT output timings

Parameter	symbol	Conditions	min	typ	max	unit
SOUT delay time 1	tdso1	The time from a SCK falling edge to SOUT rising edge			50	MHz
SOUT delay time 2	tdso2	The time from a SCK falling edge to SOUT falling edge			50	ns

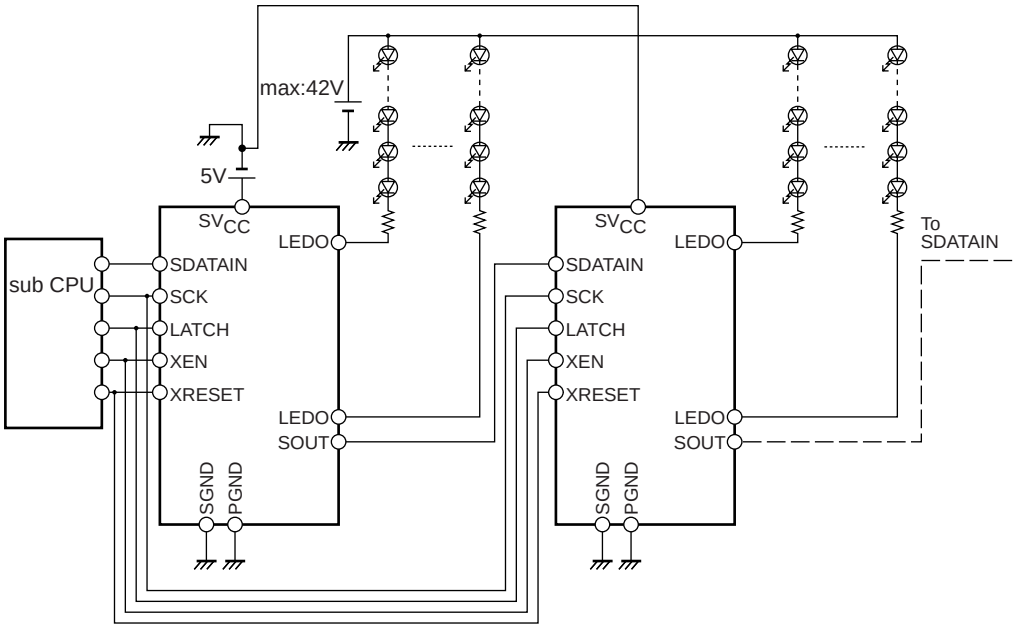


LEDO output timings

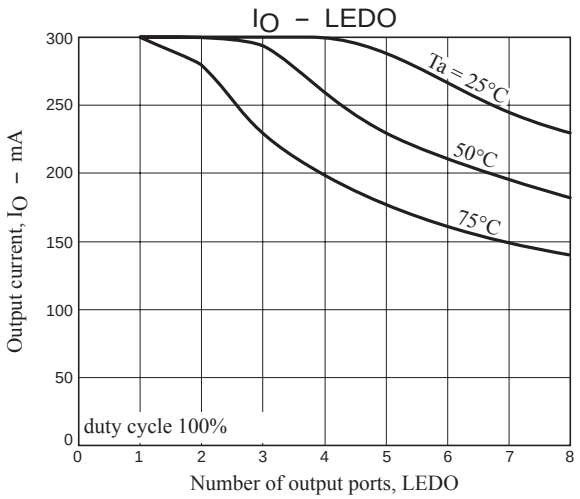
Parameter	symbol	Conditions	min	typ	max	unit
LEDO delay time 1	tdled1	The time from an XEN rising edge to LEDO rising edge CL = 30pF, I_O = 100mA, V_O = 42V		100		ns
LEDO delay time 2	tdled2	The time from an XEN falling edge to LEDO falling edge CL = 30pF, I_O = 100mA, V_O = 42V		100		ns
LEDO rise time	trled	LEDO rise time CL = 30pF, I_O = 100mA, V_O = 42V		200		ns
LEDO fall time	tfled	LEDO fall time CL = 30pF, I_O = 100mA, V_O = 42V		200		ns
LEDO delay time 3	tdled3	The time from a LATCH rising edge to LEDO falling edge CL = 30pF, I_O = 100mA, V_O = 42V		200		ns

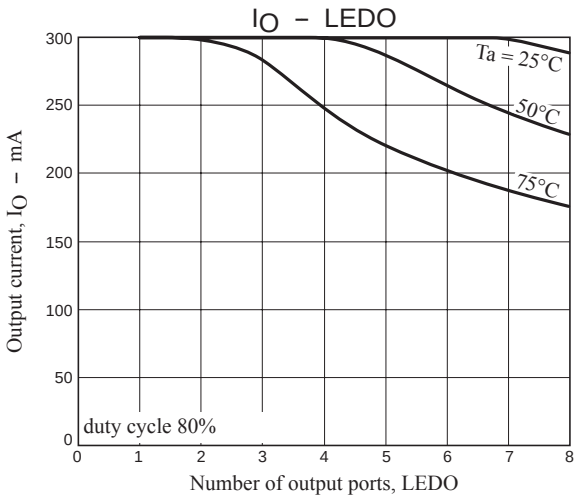


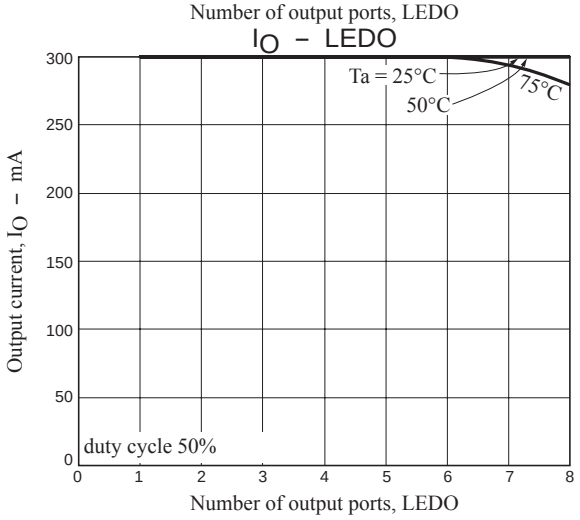
Application Circuit Example



Allowable output current characteristics







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