iC-HB

TRIPLE 155 MHz LASER SWITCH

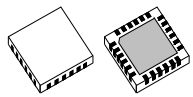
FEATURES

- Laser switch for frequencies from CW up to 155 MHz
- Spike-free switching of the laser currents
- Three channels with independent current control at pins CIx
- Operates as a voltage-controlled current sink
- LVDS/TTL switching inputs with TTL monitor outputs
- Pulsed operation with up to 300 mA per channel
- CW operation with up to 65 mA per channel
- Laser current monitor output
- Thermal shutdown with open drain error output
- Protective ESD circuitry

APPLICATIONS

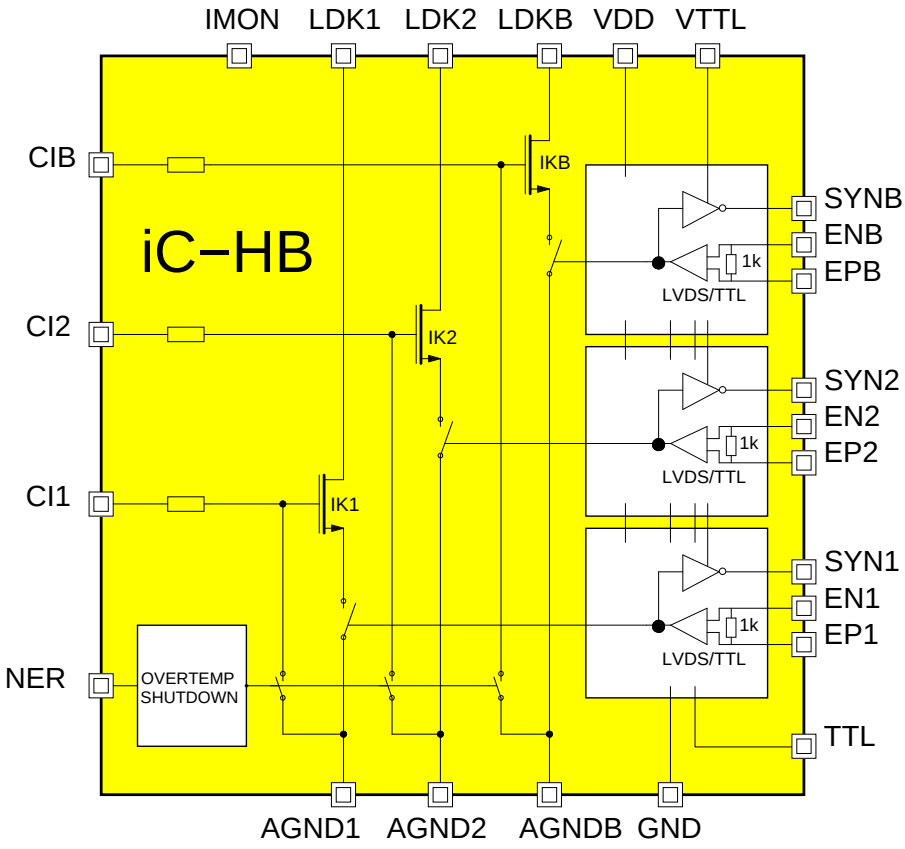
- Laser printers
- Data transmission
- Laser scanning devices

PACKAGES



QFN24
4 mm x 4 mm

BLOCK DIAGRAM



DESCRIPTION

Triple Laser Switch iC-HB enables the spike-free switching of laser diodes with well-defined current pulses at frequencies ranging from DC to 155 MHz.

The diode current is determined by the voltages at pins CIx.

The three fast switches are controlled independently via LVDS/TTL inputs. Input TTL = hi selects TTL type inputs. The laser diode can thus be turned on and off or switched between different current levels (LDKx connected) defined by the voltages at CI1, CI2 and CIB. Channel *B* is preferably used for biasing.

For current monitoring purpose IMON sinks a fraction of the sum of currents into LDKx:

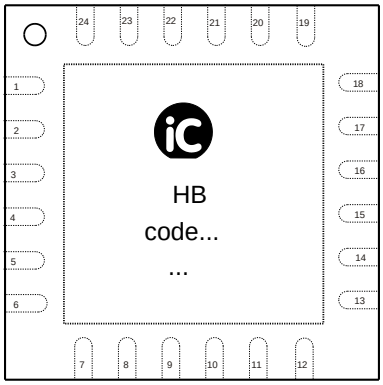
$$I(IMON) = \frac{I(LDK_1) + I(LDK_2)}{92} + \frac{I(LDK_B)}{75}$$

Each channel can be operated at 65 mA DC (channel *B*: 60 mA) and up to 300 mA (channel *B*: 275 mA) pulsed current depending on the frequency, duty cycle and heat dissipation.

The integrated thermal shutdown feature protects the IC from damage by excessive temperature.

PACKAGES QFN24 to JEDEC

PIN CONFIGURATION QFN24 4 mm x 4 mm



PIN FUNCTIONS

No.	Name	Function
1	AGND2	Analogue ground channel 2
2	LDK2	Laser diode cathode channel 2
3	LDKB	Laser diode cathode channel B
4	AGNDB	Analogue ground channel B
5	LDK1	Laser diode cathode channel 1
6	AGND1	Analogue ground channel 1

PIN FUNCTIONS

No.	Name	Function
7	EP1	Positive LVDS/TTL switching input channel 1
8	EN1	Negative LVDS switching input channel 1
9	SYN1	Sync output channel 1
10	VTTL	Sync TTL output supply voltage
11	SYNB	Sync output channel B
12	CI1	Current control voltage channel 1
13	ENB	Negative LVDS switching input channel B
14	EPB	Positive LVDS/TTL switching input channel B
15	VDD	+5 V supply voltage
16	GND	Ground
17	CIB	Current control voltage channel B
18	IMON	Laser diode current monitor output
19	CI2	Current control voltage channel 2
20	NER	Temperature shutdown monitor output
21	TTL	TTL inputs selector (EPx)
22	SYN2	Sync output channel 2
23	EN2	Negative LVDS switching input channel 2
24	EP2	Positive LVDS/TTL switching input channel 2

For improved heat dissipation the *thermal pad* is to be connected to a ground plane on the PCB.
Only pin 1 marking on top or bottom defines the package orientation (iC HB label and coding is subject to change).

ABSOLUTE MAXIMUM RATINGS

Beyond these values damage may occur; device operation is not guaranteed.

Item No.	Symbol	Parameter	Conditions	Min.	Max.	Unit
G001	VDD	Voltage at VDD		-0.7	6	V
G002	I(VDD)	Current in VDD		-10	150	mA
G003	V(CIx)	Voltage at CI1, CI2, CIB		-0.7	6	V
G004	I(LDKc)	Current in LDK1, LDK2, LDKB	DC current	-10	300	mA
G005	I(AGND1)	Current in AGND1, AGND2, AGNDB	DC current	-150	10	mA
G006	V()	Voltage at EN1, EN2, AGND1, AGND2, AGNDB		-0.7	6	V
G007	V(LDKx)	Voltage at LDK1, LDK2, LDKB		-0.7	6	V
G008	Vd()	Susceptibility to ESD at all pins	HBM, 100 pF discharged through 1.5 kΩ		4	kV
G009	Tj	Operating Junction Temperature		-40	150	°C
G010	Ts	Storage Temperature Range		-40	150	°C

THERMAL DATA

Operating Conditions: VDD = 3.5...5.5 V, VTTL = 3.15...5.5 V

Item No.	Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
T01	Ta	Operating Ambient Temperature Range (extended range on request)		-25		85	°C
T02	Rthja	Thermal Resistance Chip/Ambient	soldered to PCB, therm. pad soldered to approx. 2 cm² cooling area		30	60	K/W

All voltages are referenced to ground unless otherwise stated.
All currents into the device pins are positive; all currents out of the device pins are negative.

ELECTRICAL CHARACTERISTICS

Operating Conditions: VDD = 3.5...5.5 V, VTTL = 3.15...5.5 V, Tj = -25...125 °C unless otherwise stated

Item No.	Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Total Device							
001	VDD	Permissible Supply Voltage		3.5		5.5	V
002	VTTL	Permissible Supply Voltage at VTTL		3.15		5.5	
003	I(VDD)	Supply Current in VDD	CW operation	2		8	mA
004	I(VDD)	Supply Current in VDD	pulsed operation, f(ENx, EPx) = 150 MHz			80	mA
005	I(VTTL)	Supply Current in VTTL				1	mA
006	V(LDKx)	Permissible Voltage at LDK1, LDK2, LDKB		0		5.5	V
007	Vc(CIx)hi	Clamp Voltage hi at CI1, CI2, CIB	Vc(CIx) = V(CIx) − VDD, I(CIx) = 10 mA, other pins open	0.4		1.25	V
008	Vc()hi	Clamp Voltage hi at EN1, EN2, ENB, EP1, EP2, EPB, TTL	Vc()hi = V() − VDD, I() = 0.1 mA, other pins open	0.4		1.25	V
009	Vc(SYNx)hi	Clamp Voltage hi at SYN1, SYN2, SYNB	Vc(SYNx)hi = V(SYNx) − VTTL, I(EN) = 1 mA, other pins open	0.4		1.25	V
010	Vc()lo	Clamp Voltage lo at VDD, LDK, CI1, CI2, CIB, EN1, EN2, ENB, EP1, EP2, EPB, TTL, AGND1, AGND2, AGNDB, NER, VTTL, SYN1, SYN2, SYNB, IMON	I() = -10 mA, other pins open	-1.25		-0.4	V
011	Ipd()	Pull-Down Current at CI1, CI2, CIB, TTL	V() = 0.7...5.5 V	0.5		5	µA
012	Ipd(EPx)	Pull-Down Current at EP1, EP2, EPB	TLL = hi, V() = 0.7...5.5 V	0.5		5	µA
013	Toff	Overtemperature Shutdown		120		165	°C
Laser Control							
101	Icw(LDKx)	Permissible CW Current in LDK1, LDK2				65	mA
102	Icw(LDKB)	Permissible CW Current in LDKB				60	mA
103	Ipk(LDKx)	Permissible Pulsed Current in LDK1, LDK2	f > 100 kHz, t_{hi} / T < 1:10			300	mA
104	Ipk(LDKB)	Permissible Pulsed Current in LDKB	f > 100 kHz, t_{hi} / T < 1:10			275	mA
105	Vsat(LKDx)	Saturation Voltage at LKD1, LKD2, LDKB	I(LDKx) = 30 mA I(LDKx) = 60 mA			0.8 1.2	V V
106	Imon()	Switching Channels 1, 2	V(IMON) > 1.5 V, V(LDKx) > 1.5 V	1/105		1/85	I(LDKx)
107	Imon()	Bias Channel	V(IMON) > 1.5 V, V(LDKx) > 1.5 V	1/80		1/70	I(LDKB)
108	I0(LDKx)	Leakage Current in LDK1, LDK2, LDKB	V(EPx) < V(ENx), V(LDKx) = VDD	0		10	µA
109	tr()	Current Rise Time at LDK1, LDK2, LDKB	Iop(LDKx) = 55 mA, I(LDKx): 10% → 90%Iop, cf. Fig. 1			1.5	ns
110	tf()	Current Fall Time at LDK1, LDK2, LDKB	Iop(LDKx) = 55 mA, I(LDKx): 90% → 10%Iop, cf. Fig. 1			1.5	ns
111	tp()	Propagation Delay V(EPx, ENx) → I(LDKx)			10		ns
112	Vcm()	Common Mode Input Voltage Range at ENx, EPx	TLL = lo; VDD = 3.5...5.5 V VDD = 4.5...5.5 V	 0.8 0.6		 2.3 2.3	 V V
113	Vd()	Input Differential Voltage at ENx, EPx	TLL = lo	-100		100	mV
114	R()	Differential Input Impedance at ENx, EPx	TLL = lo, V(ENx) < VDD − 2 V, V(EPx) < VDD − 2 V	0.6		3	kΩ
115	Vt(TTL)hi	Input Threshold Voltage hi				2	V
116	Vt(TTL)lo	Input Threshold Voltage low	VDD = 5 V	0.8			V
117	Vhys(TTL)	Hysteresis			100		mV

ELECTRICAL CHARACTERISTICS

Operating Conditions: VDD = 3.5...5.5 V, VTTL = 3.15...5.5 V, Tj = -25...125 °C unless otherwise stated

Item No.	Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
118	Vt(EPx)hi	Input Threshold Voltage hi at EP1, EP2, EPB	TTL = hi, ENx = open			2	V
119	Vt(EPx)lo	Input Threshold Voltage low at EP1, EP2, EPB	TTL = hi, ENx = open	0.8			
120	Vhys(EPx)	Hysteresis			20		mV
121	Vt(CIx)	Threshold Voltage at CI1, CI2, CIB	I(LDKx) < 5 mA	0.9		1.4	V
122	CR()	Current Matching Channel1 / Channel2	V(CI1) = V(CI2) = 0...VDD, I(LDKx) = tbd	0.9		1.1	
123	I(NER)	Current in NER	Tj > Toff, V(NER) > 0.6 V	1		20	mA
124	Vsat(NER)	Saturation Voltage at NER	Tj > Toff, I(NER) = 1 mA			600	mV
125	Vs(SYNx)hi	Saturation Voltage hi at SYN1, SYN2, SYNB	Vs(SYNx)hi = VDD − V(SYNx), I() = -1 mA, V(EPx) < V(ENx)			0.4	V
126	Vs(SYNx)lo	Saturation Voltage lo at SYN1, SYN2, SYNB	I() = 1 mA, V(EPx) > V(ENx)			0.4	V
127	Isc(SYNx)hi	Short-Circuit Current hi at SYN1, SYN2, SYNB	V(EPx) < V(ENx), V(SYNx) = 0 V, VTTL = 3.3 V	-20		-3	mA
128	Isc(SYNx)lo	Short-Circuit Current lo at SYN1, SYN2, SYNB	V(EPx) > V(ENx), V(SYNx) = VTTL, VTTL = 3.3 V	3		20	mA

ELECTRICAL CHARACTERISTICS DIAGRAMS

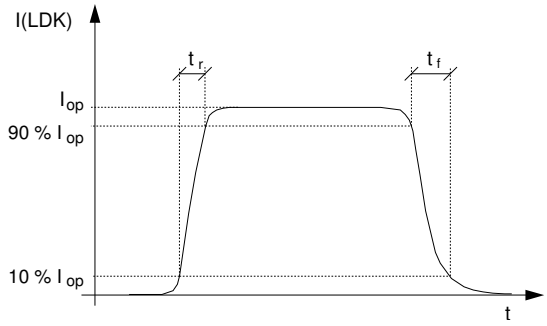


Figure 1: Laser current pulse in LDK

DEMO BOARD

iC-HB comes with a demo board for test purpose. Figures 2 and 3 show both the schematic and the component side of the demo board.

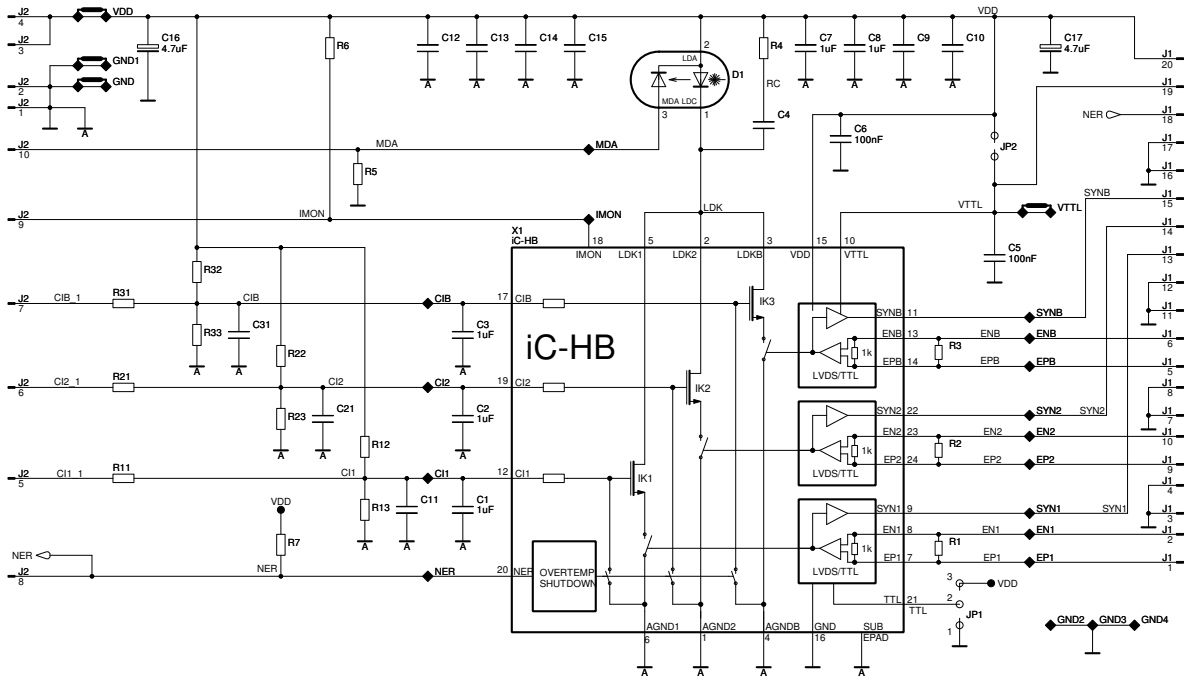


Figure 2: Schematic of the demo board

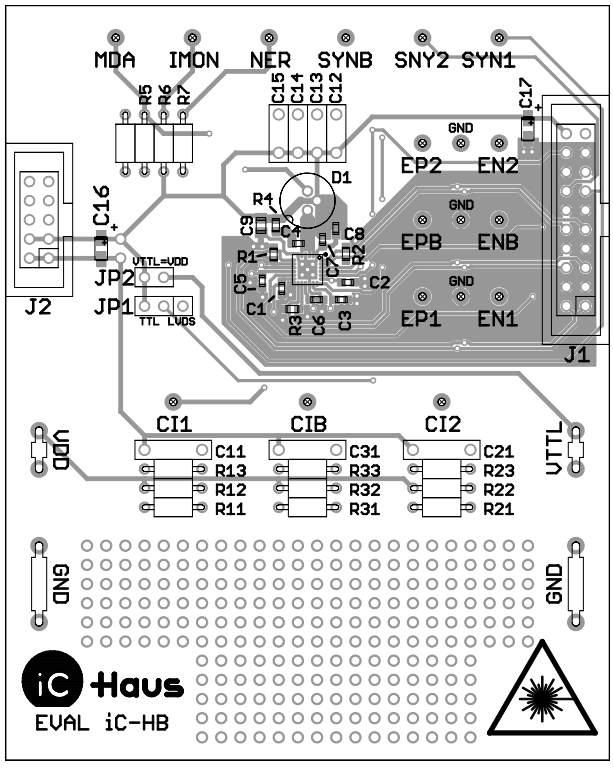


Figure 3: Demo board (component side)

ORDERING INFORMATION

Type	Package	Order Designation
iC-HB	QFN24 4 mm x 4 mm	iC-HB QFN24

For technical support, information about prices and terms of delivery please contact:

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