iC-HK, iC-HKB

155 MHz LASER SWITCH

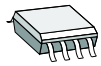
FEATURES

- Laser switch for frequencies from CW up to 155 MHz
- Spike-free switching of the laser current
- Dual switching inputs with independent current control
- Operates as a voltage-controlled current source
- Pulsed operation with up to 700 mA per channel
- CW operation with up to 150 mA per channel
- Simple power control at pin CI
- Control to the mean of the laser power in conjunction with iC-WK/L (CW laser diode driver)
- Supplement to iC-WK/L for pulsed operation
- Thermal shutdown
- Protective ESD circuitry
- **iC-HKB** for driving **blue laser diodes**
- Option: extended temperature range

APPLICATIONS

- Data transmission
- Laser scanning devices
- Optical storage devices

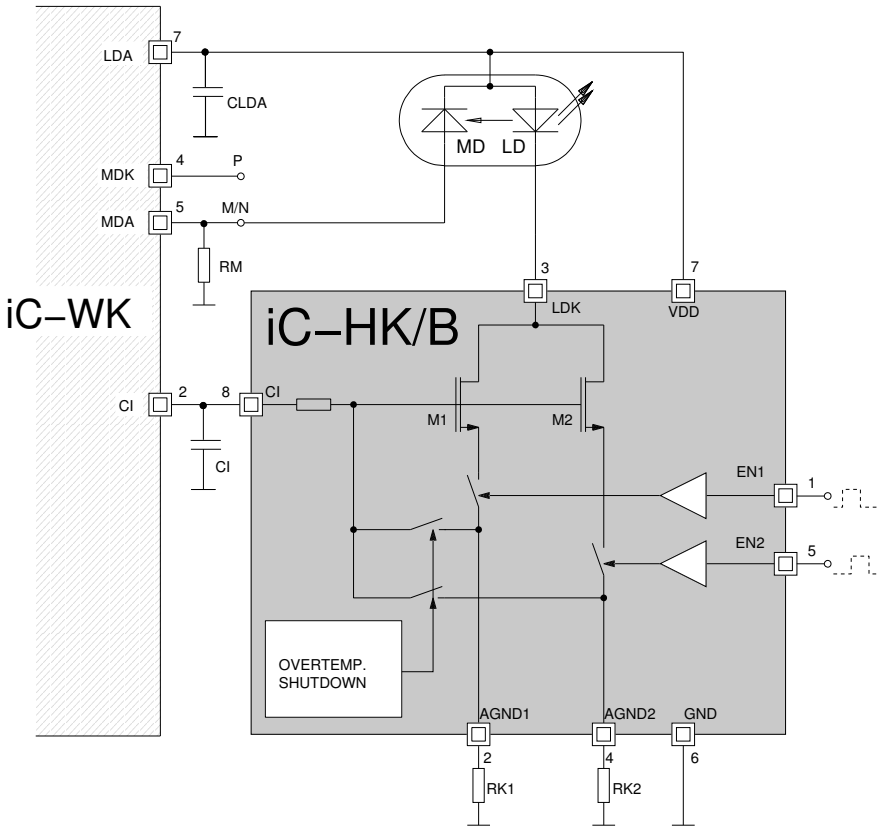
PACKAGES



SO8
thermal pad

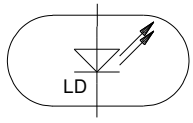
MSOP8
thermal pad

BLOCK DIAGRAM

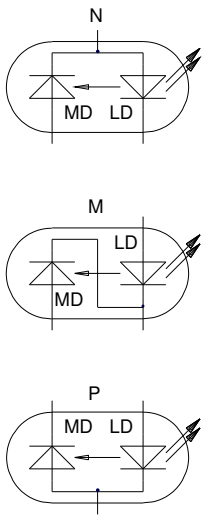


Suitable laser diode configurations:

Operation with constant current (uncontrolled):



Operation in conjunction with iC–WK (power controlled):



DESCRIPTION

Laser Switch iC-HK/B 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 voltage at pin CI and by the resistors RK1 and RK2. The two fast switches are controlled independently via CMOS inputs EN1 and EN2. The laser diode can thus be turned on and off or switched between different current levels defined by the ratio of RK1 and RK2.

Each channel can be operated on 150 mA DC and up to 700 mA pulsed current depending on the frequency, duty cycle and heat dissipation.

The integrated thermal shutdown feature prevents damage from excessive temperature.

iC-HK/B supplements the laser diode driver iC-WK which uses the monitor current of the laser diode to control the laser power. iC-WK therefore controls the voltage at pin CI in such a way that the mean value of the emitted laser power is constant (APC), providing there is a constant duty cycle and a switching frequency higher than 100 kHz.

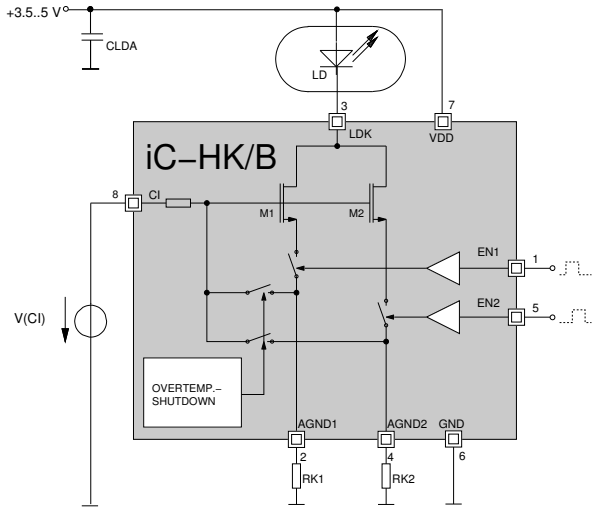


Figure 1: Operation as a voltage-controlled current source

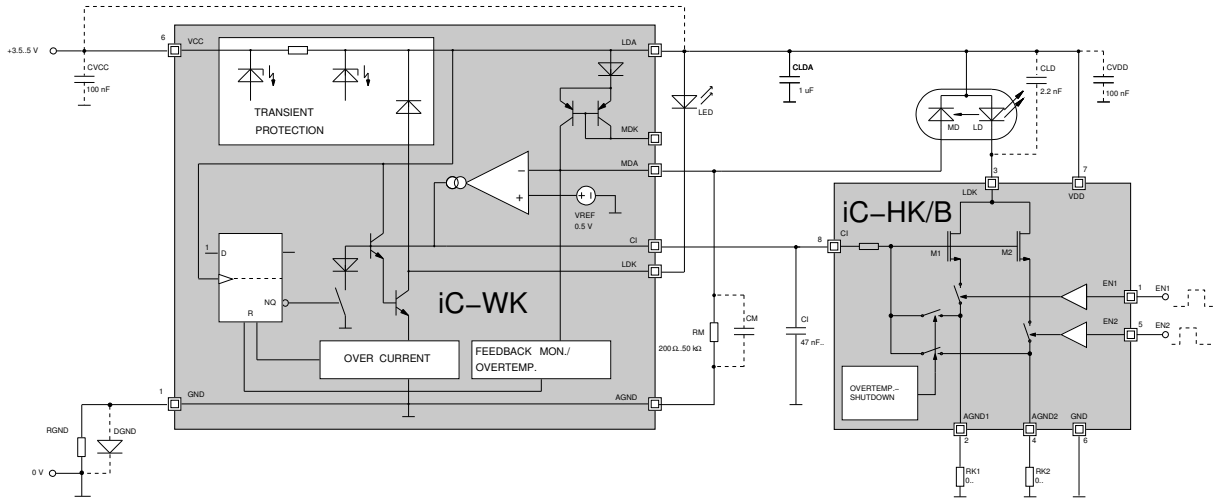
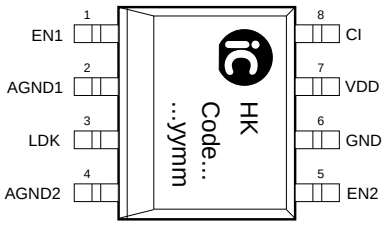


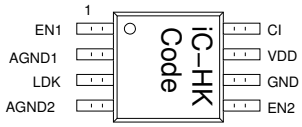
Figure 2: Operation of iC-HK/B in conjunction with CW driver iC-WK (see application information on optional parts/connections)

PACKAGES SO8tp, MSOP8tp to JEDEC

PIN CONFIGURATION SO8tp



PIN CONFIGURATION MSOP8tp



PIN FUNCTIONS

No.	Name	Function
1	EN1	Channel 1 Switching Input
2	AGND1	Channel 1 Reference Ground
3	LDK	Driver Output (LD Cathode)
4	AGND2	Channel 2 Reference Ground
5	EN2	Channel 2 Switching Input
6	GND	Ground
7	VDD	+5 V Supply Voltage
8	CI	Voltage Reference for Current Control

The *Thermal Pad* is to be connected to a Ground Plane on the PCB.

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(CI)	Voltage at CI		-0.7	6	V
G004	I(LDK)	Current in LDK	DC current	-10	300	mA
G005	I(AGND1)	Current in AGND1	DC current	-150	10	mA
G006	I(AGND2)	Current in AGND2	DC current	-150	10	mA
G007	V()	Voltage at EN1, EN2, AGND1 and AGND2		-0.7	6	V
G008	V(LDK)	Voltage at LDK	**iC-HK** **iC-HKB**	-0.7 -0.7	6 15	V V
G009	Vd()	Susceptibility to ESD at all pins	HBM, 100 pF discharged through 1.5 kΩ		1	kV
G010	Tj	Operating Junction Temperature		-40	150	°C
G011	Ts	Storage Temperature Range		-40	150	°C

THERMAL DATA

Operating Conditions: VDD = 3.5...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 (SO8)	soldered to PCB, no additional cooling areas therm. pad soldered to approx. 2 cm² cooling area		 30	170 50	K/W K/W
T03	Rthja	Thermal Resistance Chip/Ambient (MSOP8)	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, Tj = -25...125 °C unless otherwise stated

Item No.	Symbol	Parameter	Conditions	Tj °C	Fig.	Min.	Typ.	Max.	Unit
Total Device									
001	VDD	Permissible Supply Voltage				3.5		5.5	V
002	I(VDD)	Supply Current in VDD	CW operation			0		80	µA
003	I(VDD)	Supply Current in VDD	pulsed operation, f(EN1, EN2) = 150 MHz			0		150	mA
004	V(LDK)	Permissible Voltage at LDK	**iC-HK** **iC-HKB**			0 0		5.5 12	V V
005	Vc(CI)hi	Clamp Voltage hi at CI	Vc(CI) = V(CI) – VDD, I(CI) = 10 mA, other pins open			0.4		1.25	V
006	Vc(EN)hi	Clamp Voltage hi at EN1, EN2	Vc(EN) = V(EN) – VDD, I(EN) = 1 mA, other pins open			0.4		1.25	V
007	Vc()lo	Clamp Voltage lo at VDD, LDK, CI, EN1, EN2, AGND1, AGND2	I() = -10 mA, other pins open			-1.25		-0.4	V
008	Ipd()	Pull-Down Current at CI, EN1, EN2				1		5	µA
009	Toff	Overtemperature Shutdown				110		150	°C
Laser Control LDK, CI, EN1, EN2									
101	Icw(LDK)	Permissible CW Current in LDK (per channel)						150	mA
102	Ipk(LDK)	Permissible Pulsed Current in LDK (per channel)	f > 100 kHz, thi/T < 1:10					700	mA
107	Vs(LDK)	Saturation Voltage at LDK	I(LDK) = 40 mA I(LDK) = 60 mA I(LDK) = 150 mA, **iC-HK** I(LDK) = 150 mA, **iC-HKB**					1.2 1.3 1.5 1.8	V V V V
108	I0(LDK)	Leakage Current in LDK	ENx = lo, V(LDK) = VDD				0	10	µA
109	tr()	LDK Current Rise Time	Iop = 150 mA, I(LDK): 10% → 90%Iop		3			1.5	ns
110	tf()	LDK Current Fall Time	Iop(LDK) = 150 mA, I(LDK): 90% → 10%Iop		3			1.5	ns
111	tp()	Propagation Delay V(ENx) → I(LDK)	ENx hi ↔ lo, V(50%) → I(50%)			1		3	ns
112	Vt(ENx)	Input Threshold Voltage				33	50	67	%VDD
113	V(CI)	Permissible Voltage at CI				0		5.5	V
114	Vt(CI)	Threshold Voltage at CI	I(LDK) < 5 mA			0.75		1.15	V
115	CR()	Current Matching Channel1/Channel2	V(CI) = 0...VDD, I(LDK) = 30...300 mA, RK1 = RK2			0.9	1	1.1	

ELECTRICAL CHARACTERISTICS DIAGRAMS

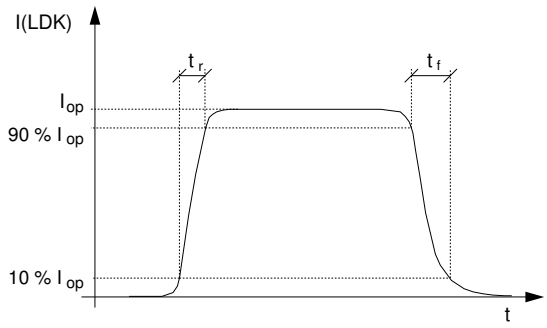


Figure 3: Laser current pulse in LDK

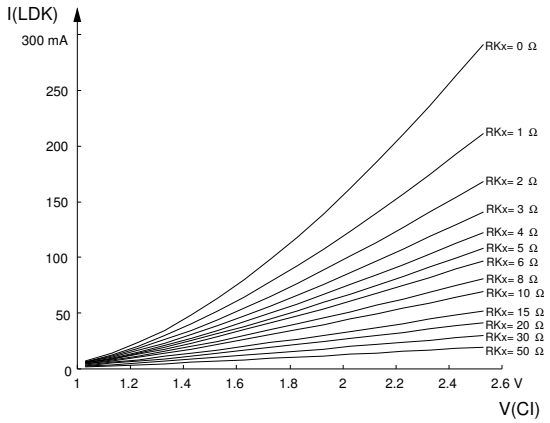


Figure 4: Diode current vs. V(Cl) at Tj = 27 °C

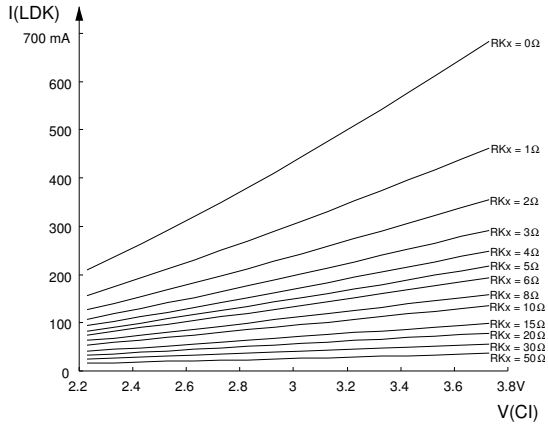


Figure 5: Diode current vs. V(Cl) at Tj = 27 °C

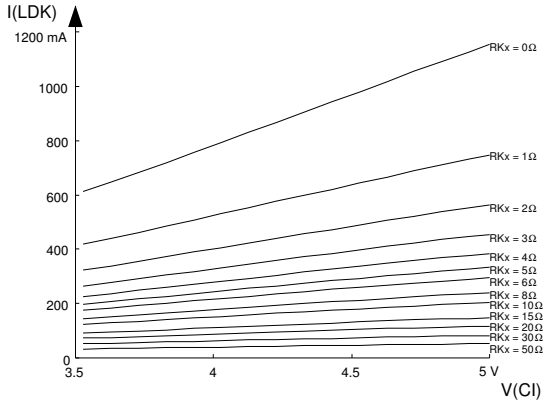


Figure 6: Diode current vs. V(Cl) at Tj = 27 °C

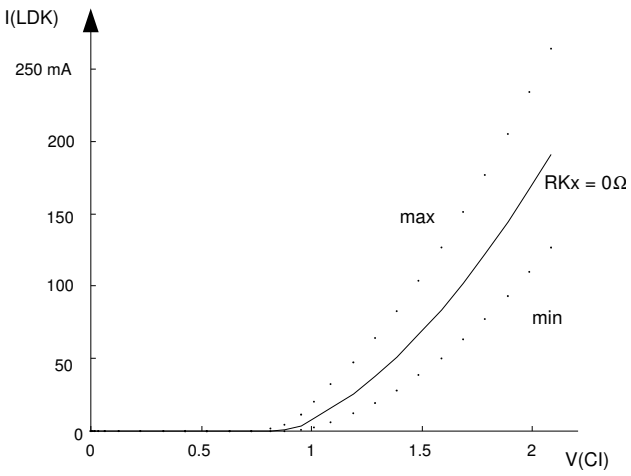


Figure 7: Diode current variation vs. V(Cl) at V(LDK) = 3 V

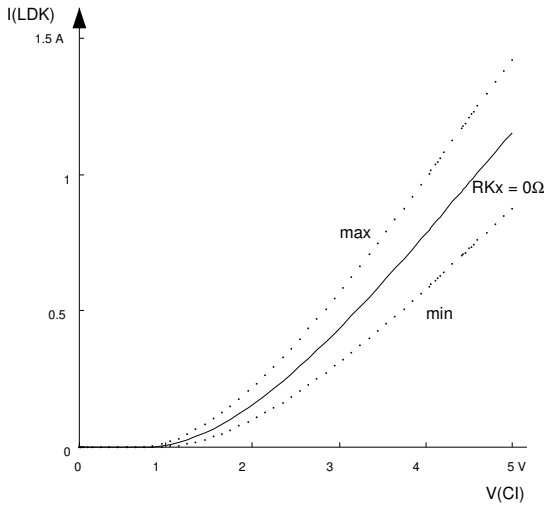


Figure 8: Diode current variation vs. V(Cl) at V(LDK) = 3 V

DESCRIPTION OF FUNCTIONS

Laser current dependency of V(Cl), RK1, RK2
Depending on the laser diode different diode currents are necessary to obtain the required laser power. The values for V(Cl), RK1 and RK2 can be determined for the required diode current at room temperature from the opposite diagram. A parallel to the x axis must be drawn through the desired diode current. Either RKx can be obtained for a required value of V(Cl) or the respective value of V(VI) can be achieved for a given RKx.

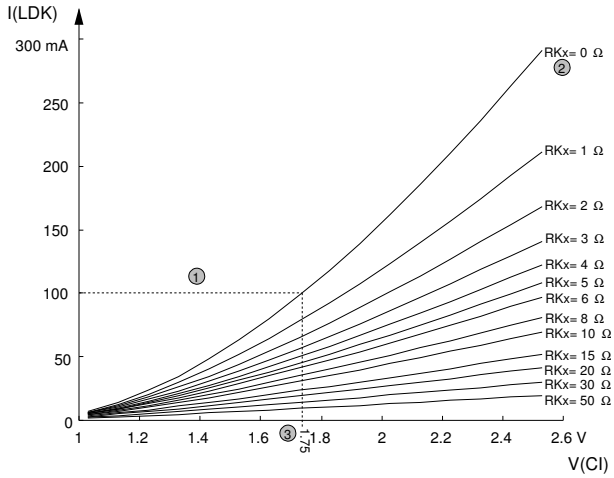


Figure 9: Diode current vs. V(Cl) at Tj = 27 °C

Thermal Shutdown
iC-HK/B is protected by an integrated thermal shutdown feature. When the shutdown temperature is reached both channels are locked.

APPLICATION NOTES

Application notes for iC-HK are available as a separate document.

ORDERING INFORMATION

Type	Package	Order Designation
iC-HK	SO8tp	iC-HK SO8
	MSOP8tp	iC-HK MSOP8
iC-HKB	SO8tp	iC-HKB SO8
	MSOP8tp	iC-HKB MSOP8

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