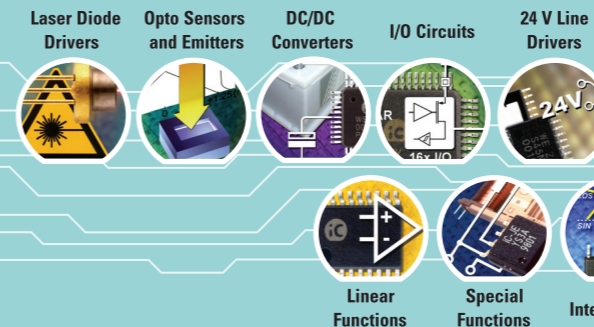


# Product Selection Guide



# Product Selection Guide

## Integrated Opto Encoders

		Sensors	Package	OTR
Optical Position Encoders, integrated photosensors, TTL-/CMOS-compatible I/O, 5(4) V supply				
<b>iC-LS</b> A/B/C	2/4/6-Track active photosensors with analog current outputs, low dark current	4, 8, 12	optoBGA LS2C	I, E
<b>iC-LSH</b> series	Multi-track active photosensors with analog voltage outputs, low noise iC-LSHB: 1-track diff. sine/cosine, pos. index, neg. index iC-LSHC: 3-track diff. sine/cosine	6 12	optoBGA LSH2C	A, E
<b>iC-PN</b> series	3-Track phased array nonius encoder, sine/cosine analog outputs; iC-PN2656: 255/256/240 PPR for disc of 26 mm in diameter iC-PN4248: 2047/2048/2016 PPR for disc of 42 mm in diameter (preliminary)	24+	optoQFN32, optoBGA LSH2C	A, E
<b>iC-LV</b>	5-Track single beam scanning, 5 bit / 360°, LED control, parallel and serial SSI interface (cascadable)	6	BLCC LV4C, COB	I, E
<b>iC-LG</b> <b>iC-LGC</b>	13+2 Track differential and leading/trailing scanning, 21 bit / 360°, interpolation (3 to 8 bit), LED control, parallel µC and serial interfaces (BiSS, EEPROM, SSI to multiturm slaves), sine/cosine analog output; iC-LGC: BiSS C Interface	62+	BLCC LG5C, optoBGA LG21C, COB	I, E
<b>iC-OF</b>	3x2 Track differential scanning, signal-tracked evaluation	6	BLCC OF3C, optoBGA OF4C	I (+)
<b>iC-OW</b>	2+1 Track differential/single beam scanning, gated index, LED control	5	optoBGA OW1C	I (+)
<b>iC-OV</b>	5-Track single beam scanning, 5 bit / 360°, LED control, parallel output	6	BLCC OVC	I (+)
<b>iC-OG</b>	8x2 Track differential scanning, signal-tracked evaluation, LED control	16	BLCC OGC	I (+)
<b>iC-WG</b>	14x2 Track differential scanning, signal-tracked evaluation, LED control	28+	BLCC WGC	I (+)

Applications Motion control (optical position encoders)

## Magnetic Sensors

		Package	OTR
Hall Sensors			
<b>iC-MA</b>	Hall angle encoder, 8 bit / 360° (256 CPT), bus capable outputs: quadrature, sawtooth, triangle, sine/cosine, counter signals	DFN10 4x4	E
<b>iC-MH</b>	Fast Hall angle encoder (to 120000 rpm), 12 bit / 360°, non-volatile setup, RS422 quadrature outputs (to 2 MHz), commutation signals, serial I/O interface	QFN28 5x5	E
<b>iC-MHA</b>	Hall angle encoder (to 20000 rpm), 1 Vpp differential sine/cosine outputs (20 mA, 100 Ω)	QFN28 5x5	E
<b>iC-ML</b>	Linear Hall encoder, 8 bit / 2.56 mm (20 µm resolution), bus capable outputs: quadrature, sawtooth, triangle, sine/cosine, counter signals	TSSOP20	E
<b>iC-MP</b>	Hall angle encoder with ratiometric output, 8 bit / 360°, serial I/O interface, adjustable zero position, linear ramp output (0.5 to 4.5 V / 0 to 5 V), selectable full scale range 360° / 270° / 180° / 90°	DFN10 4x4	E
<b>iC-MV</b> preliminary	Programmable Hall angle encoder, 2 to 8 bit / 360°, cascaded shift-register (SSI), program. position offset, power save mode, EEPROM interface	DFN10 4x4	E
<b>iC-MZ</b>	Differential Hall switch (DC to 40 kHz, pitch 2 mm), diff. analog signal outputs/inputs, hysteresis comparator, 1-Ch. diff. line driver (4.5 to 36 V, 30 mAdc, 300 mApeak push-pull, short-circuit-proof)	DFN10 4x4	E
Magneto-Resistive Sensors			
<b>iC-SM2L</b>	Linear AMR Sensor (2 mm), SMT compatible 7.6 x 2.8 mm package	LGA SM2C	I (+), E
<b>iC-SM5L</b>	Linear AMR Sensor (5 mm), SMT compatible 7.6 x 2.8 mm package	LGA SM2C	I (+), E

Applications Robotics, motion control, flow control, vehicle control, inclination sensing, office equipment, vending machines, power tools (brushless DC motor commutation), joystick and panel knobs (HMI), household appliances

OTR: Operational Temperature Range C: 0 to +70 °C, I: -20 to +85 °C, A: -40 to +85 °C, E: -40 to +125 °C, M: -55 to 125 °C, +: extended Package: bare dice on request

This tentative information shall not be considered as a guarantee of characteristics. Rights to technical changes reserved.

## Laser Diode Drivers

		LD pinout	Package	OTR
Laser Switch, burst/transient protection, thermal shutdown, high-speed spike-free switching				
<b>iC-HB</b>	CW to 155 MHz, triple lowside current sink, individual current control, up to 65 mAdc and 300 mApeak per channel, tr/td 1 ns, LVDS switching inputs, 3.5 to 5.5 V	N, M, P	QFN24	I
<b>iC-HK</b> <b>iC-HKB</b>	CW to 155 MHz, dual lowside current sink, dual enable inputs, 4 power levels adjustable up to 300 mAdc and 1.4 Apeak per channel, tr/td 1 ns, 3.5 to 5.5 V (iC-HKB: for blue laser diodes)	N, M, P	SO8Ntp, MSOP8tp	I

## Digital Laser Power Calibration Potentiometer

<b>iC-HL</b>	Logarithmic 1024-tap 300 Ω to 80 kΩ digital potentiometer with non-volatile memory, serial programming interfaces (1-wire, optical, up/down), 3.3 to 5 V		DFN10 4x4	I
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## Power Controllers, adjustable averaging APC, soft-start, burst/transient protection, thermal shutdown, undervoltage lockout

<b>iC-NZ</b>	CW to 155 MHz, adjustable peak-value APC (4 levels), 3x 100 mAdc, 3x 700 mApeak, tr/td 1.5 ns, overcurrent reset, thermal shutdown, safety monitor diode input, single failure proof, self test, 3.5 to 5.5 V	N, M, P	QFN28 5x5	I
<b>iC-VJ</b> <b>iC-VJZ</b>	Pulse Transmitter, 1...200 kHz, duty cycle 50 %, laser current 250 mA, 5 V	N, M	SO16N	I
<b>iC-WJB</b>	CW to 300 kHz, input watchdog, 100 mA, reverse polarity protection, 2.7 to 6 V	N, M	SO8N, MSOP8	I
<b>iC-WJ</b> <b>iC-WJZ</b>	CW to 300 kHz, input watchdog, 250 mA, 5 V	N, M	SO8N, MSOP8	I

## CW Power Controllers, adjustable averaging APC, soft-start, burst/transient protection, thermal shutdown

<b>iC-WK</b> <b>iC-WKL</b>	CW to 70 mA (to 4 A by ext. transistor), quick start, 1 % accuracy, fail-safe, overcurrent lockout, reverse polarity protection, 2.4 to 6 V	N, M, P	SO8N, MSOP8	A
<b>iC-WKM</b> <b>iC-WKN</b> <b>iC-WKP</b>	CW to 350 mA, 3 % accuracy, fail-safe, overcurrent lockout, reverse polarity protection, low Rth package, 3.6 to 15 V	M, N, P N, M, P P, N	SO8Ntp, DFN10 4x4	A

Applications Bar-code readers, triangulation sensors, displacement sensors, safety light scanners (area-guarding systems), leveling lasers, laser alignment tools, eye-safe laser pointers

## Opto Sensors and Emitters (IR LEDs)

		Pitch	Package	OTR
Linear Image Sensors, light-to-voltage conversion, undervoltage reset, shift logic, TTL-/CMOS-compatible I/O, 5 V supply				
<b>iC-OC</b>	2x1, 10 MHz, serial cascading	1 mm	COB	C (+)
<b>iC-LA</b>	64x1, 5 MHz, serial cascading, temperature sensor	200 µm (127 dpi)	optoBGA LA3C	I (+)
<b>iC-LFS</b>	32x1, 5 MHz, shutter function, analog push-pull output	63.5 µm (400 dpi)	optoDFN10	I, A (+)
<b>iC-LF 1401</b>	128x1, 5 MHz, shutter function, analog push-pull output	63.5 µm (400 dpi)	optoLGA LF2C, optoBGA LF3C	I, A (+)
<b>iC-LF 1402</b>	256x1, 5 MHz, shutter function, analog push-pull output	63.5 µm (400 dpi)	optoBGA LFL1C	I, A

Applications Contact image sensing (fax, copiers), identification systems (text and code reader), spectroscopy, machine vision systems, optical inspection, edge detection, triangulation sensor, vending machines (coin recognition, bank note reader)

		Sensor Size	Package	OTR
Photo ICs				
<b>iC-LQNP</b>	Pulse receiver (1.4 µs), 140 kHz bandpass, 70(10) klx DC, 250 A/W (850 nm), 5 to 12 V	1 x 1 mm	T018-4 L/F, optoBGA LQ1C, optoDFN6	I, E
<b>iC-OD</b> , <b>iC-ODL</b>	Position-sensitive pulse receiver (PSD), 100 kHz bandpass, DC light suppression, 3.9 to 12 V	2.6 x 0.9 mm 8.4 x 0.9 mm	optoLGA OD4C, optoBGA ODL2C	I, E
<b>iC-VP</b>	Photoswitch, adjustable output switch threshold, 4.5 to 16 V	0.4 x 0.4 mm	T018-4 L/F	I, E

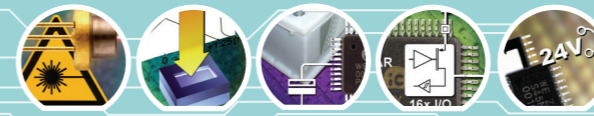
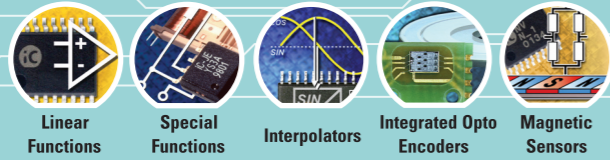
Applications Photoelectric sensors (reflective and retro-reflective light barriers, triangulation sensors)

		Suitable Sensors	Package	OTR
LEDs, optimized beam pattern for high resolution code reading				
<b>iC-TL33</b>	740 nm IR LED, spot size to 3.5 mm	iC-LS, iC-OW	T046	E
<b>iC-SD</b>	740 nm IR LED, spot size to 3.5 mm	iC-LS, iC-OW	SMD SD1C	I, E
<b>iC-SG</b>	740 nm IR LED, spot size to 8 mm	iC-LG	BLCC SG1C-1, SG1C-2	E

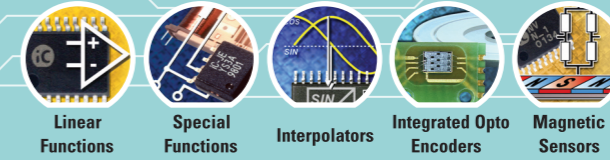
Applications Optical encoders



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## DC/DC Converters

	Output Voltage	Package	OTR
Combined Switching-Linear Regulators, undervoltage lockout, current limited outputs, thermal shutdown			
<b>iC-WD</b>	SMPS 90 kHz, Vin 8 to 36 V, low noise	+5 V (25 mA), +5 V (200 mA)	SO8N(tp), (DFN10 4x4)
<b>iC-WDA</b> <b>iC-WDB</b> <b>iC-WDC</b>		+3.3 V (25 mA), +3.3 V (200 mA) +5 V (25 mA), +3.3 V (200 mA) +3.3 V (25 mA), +5 V (200 mA)	DFN10 4x4 DFN10 4x4 DFN10 4x4

Applications Industrial sensors, photoelectric sensors, laser sensors, position encoders

## I/O Circuits

		Package	OTR
Sensor and $\mu$ C Peripheral Devices			
<b>iC-DN</b> <b>iC-DP</b>	1-Ch. Lowside 200 mA drive, active freewheeling, short-circuit-proof, 4 to 36 V, level shift, thermal shutdown 1-Ch. Highside 200 mA drive, active freewheeling, short-circuit-proof, 4 to 36 V, level shift, thermal shutdown	SC59/SOT23, SOT223	E
<b>iC-GF</b>	2-Ch. Low-/Highside/Push-Pull 150 mA drive, reverse polarity proof, feedback channel with communication request function, 9 to 30 V, 3.3/5 V SMPS with linear regulators, SPI interface	QFN24 4x4	E
<b>iC-MFL</b> <b>iC-MFLT</b>	8-Ch. Fail-safe N-FET driver, 1.8 to 5 V logic level shift, supply and ground monitoring 12-Ch. Fail-safe N-FET driver, 1.8 to 5 V logic level shift, supply and ground monitoring	QFN24 4x4 QFN28 5x5	E (+) E (+)
<b>iC-MFN</b> <b>iC-MFP</b>	8-Ch. Fail-safe N-FET driver, logic level shift of up to 40 V; supply and ground monitoring 8-Ch. Fail-safe P-FET driver, logic level shift of up to 40 V; supply and ground monitoring	QFN24 4x4 QFN24 4x4	E (+) E (+)
<b>iC-MD</b> preliminary	3-Ch. RS422 ABZ receiver, configurable high-speed counter (to 48 bit, 40 MHz) with SPI and BiSS Interface, pin triggered touch probe function	TSSOP	

	$\mu$ C I/O with High-/Lowside Drivers, programmable: I/O function, input filter, PWM mode, flash mode, pull-up/down pin loads	Package	OTR
<b>iC-JX</b>	4x4 Ch. I/O, 24 V highside drive, 150 mA (0.5 Apeak), load diagnosis, 10-bit ADC, temperature sensor, interrupt controller, 8-bit and SPI bus interface	MQFP52	C, A
<b>iC-JRX</b>	2x4 Ch. I/O, 24 V highside drive, 100 mA (0.5 Apeak), interrupt controller, 8 bit bus	PLCC44	C (+)
<b>iC-VR</b>	2x4 Ch. I/O, lowside drive, 100 mA (0.5 Apeak), short-circuit-proof to 48 V, 8 bit bus	PLCC44	C (+)

Applications Industrial sensors, microcontroller periphery, HMI of industrial controls (for control panel, dashboard, pushbutton reader, indicator lamp driver etc.)

		Package	OTR
<b>BiSS INTERFACE</b>			
<b>iC-MB3</b>	1-Ch. BiSS and SSI interface master, 8-bit and SPI compatible controller interface	TSSOP24	I
<b>MB3A</b>	PC LPT BiSS adapter, BiSS (C Mode; SSI)		
<b>MB3U</b>	PC USB 1.1 BiSS adapter, BiSS (C Mode; SSI)		
<b>MB3U-I2C</b>	PC USB 1.1 BiSS adapter, BiSS (C Mode; I2C and SSI)		

Applications Motion control sensors, motor feedback, drive systems, servo controls, robotics, digital smart sensor networking

## 24 V Line Drivers

	Line Length	Package	OTR
Industrial Automation Signal Transmitters, TTL-/CMOS-compatible hysteresis inputs, short-circuit-proof outputs, thermal shutdown			
<b>iC-DL</b>	6x1 / 3x2 Ch., 4 to 36 V, internal low power logic bias, 30 mAdc, typ. 0.2 Apeak push-pull, RS-422A, tri-state, line adaptation, error channel, undervoltage lockout, low Rth package	50 m @ 200 kHz	QFN28 5x5
<b>iC-HD2</b> <b>iC-HD7</b>	4-Ch. diff., 4.5 to 35 V, 40 mAdc, typ. 0.2 Apeak push-pull, 2 MHz, line adaptation, RS422, tri-state, footprint of 26LS31, xx7272 or xx2068	25 m @ 200 kHz 10 m @ 200 kHz	TSSOP20 SO16N
<b>iC-HX</b>	6x1 / 3x2 Ch., 4 to 36 V, novel power saving mode for extended driving capability, RS-422A, tri-state, line adaptation, error channel, undervoltage lockout, low Rth package	100 m @ 200 kHz	QFN28 5x5
<b>iC-VX</b>	3-Ch. diff., 4.5 to 30 V separate logic bias, 30/100 mAdc, typ. 170 mApeak push-pull, tri-state, output clamp	10 m @ 200 kHz 100 m @ 20 kHz	SO16W
<b>iC-WE</b>	3-Ch., 4.5 to 30 V, separate logic bias, 30 mAdc, typ. 300 mApeak push-pull, RS-422A, tri-state, line adaptation, error channel, undervoltage lockout	100 m @ 1 MHz	SO16W, SO20W, TSSOP20tp
<b>26ET31</b>	4-Ch. diff., 4.75 to 30 V, 70 mApeak sink, RS-422A		SO16N
<b>ET7272</b>	4-Ch. diff., 3.5 to 30 V, separate logic bias, 80 mApeak push-pull, 800 kHz, RS-422A, tri-state		SO16N
<b>ET9600</b>	3-Ch. diff., 4.5 to 30 V, push-pull 70 mApeak, 800 kHz, RS-422A, LED drive		SO14N

Applications Linear and rotary position encoders

OTR: Operational Temperature Range C: 0 to +70 °C, I: -20 to +85 °C, A: -40 to +85 °C, E: -40 to +125 °C, M: -55 to 125 °C, +: extended Package: bare dice on request

## Linear Functions

		Package	OTR
<b>iC-HC</b> preliminary	Fast dual high-voltage comparator for ATE systems, 40 V differential input voltage, 8 ns propagation delay, programmable hysteresis/hold function, 4 mA CMOS outputs	TSSOP16	E
<b>iC-HQ</b>	High-performance quad OPAMP, ultra low offset (< 1 $\mu$ V) and offset drift, unity gain stability, 3.5 MHz gain-bandwidth product, 140 dB open loop gain, 130 dB common mode rejection ratio, 135 dB power supply rejection ratio, supply current typ. 350 $\mu$ A/OPAMP, 1 mA rail-to-rail output	TSSOP14	E

Applications Instrumentation, ATE, high-performance ADC drive

## Special Functions

		Package	OTR
<b>iC-JE</b>	PWM Relay/Solenoid Driver, 10 to 45 V, 40 to 300 mA, energize and hold mode, status output	SO8	I

Applications Power saving drive for (safety) relays, electrovalves, door mechanisms

	Light Grid Photo Receiver / LED Driver, undervoltage reset, TTL-/CMOS-compatible I/O, 5 V supply	ADC	Package	OTR
<b>iC-NE (NK)</b>	1-Ch. Pulse Receiver, photocurrent amp. 54 dB (iC-NK: 48 dB), bandpass 300 kHz (iC-NK: 1.2 MHz), shift logic for serial cascading, tri-state current sink output	n/a	SO8, MSOP8	C, I
<b>iC-NT (NL)</b>	1-Ch. Pulse Driver, LED sink 1 Apeak (iC-NL: 1.2 Apeak), tr/ft 150 ns, shift logic, thermal shutdown	n/a	SO8, MSOP8	C, I
<b>iC-NX (NXL)</b>	8-Ch. Pulse Driver, LED sink 1.8 Apeak, tr/ft 150 ns, shift logic, serial cascading	n/a	TSSOP16	C, I

Applications Machine safeguarding systems (ESPE level 2 and 4)

## Interpolators

	Signal Conditioning, differential (single-ended) inputs, TTL-/CMOS-compatible I/O	ADC	Package	OTR
Sine-to-Digital Converters, differential (single-ended) inputs, TTL-/CMOS-compatible I/O, 5 V supply				
<b>iC-MSB</b>	Sin/Cos and index signal conditioning, current or voltage input, 1 Vpp differential analog outputs (20 mA, 100 $\Omega$ ), short-circuit-proof, signal stabilization by sensor power controller (to 50 mA), selectable alarm messages, single 5 V supply	n/a	TSSOP20 TSSOP20-TP	I (+), A (+)
<b>iC-TW3</b>	Sin/Cos sensor signal conditioner with 1 Vpp output driver, LUT temperature compensation, internal/external temperature sensing, I2C and 1-wire $\mu$ C Interface, 3.3 to 5 V	n/a	QFN32 5x5	I, E

		ADC	Package	OTR
<b>iC-NV</b> <b>iC-NVH</b>	6 bit, x1 to x16 (64 angle steps), encoder quadrature output to 3.4 MHz, gated index (length 90°, 180° with iC-NVH)	30 ns flash	TSSOP20	I, E
<b>iC-TW2</b>	8-bit, x0.25 to x64, integrated EEPROM, incremental encoder quadrature output, commutation output, 2-wire and 1-wire $\mu$ C interface, 3.3 to 5 V	30 Msps	QFN24 4x4	I, E
<b>iC-TW4</b>	8-bit, x2 to x64, pin-selectable configuration, automated offset correction, encoder quadrature output, 3.3 to 5 V	20 Msps	QFN24 4x4	I, E
<b>iC-MG</b>	8 bit, x1 to x50 (200 angle steps), fail-safe RS422 (20 mA) encoder quadrature output to 1.25 MHz, serial I2C interface	5 Msps	TSSOP20	I, A
<b>iC-MQ</b>	9 bit, x1 to x100 (400 angle steps), signal path multiplexer, fail-safe RS422 (50 mA) encoder quadrature output to 1.25 MHz, serial I2C multi-master interface	5 Msps	TSSOP20	I, A
<b>iC-NG</b>	8 bit, x1 to x64 (256 angle steps), waveform adaptation, encoder quadrature output to 400 kHz, EEPROM and $\mu$ C interface	800 ksps	SO28, SSOP28	I, E
<b>iC-NQ</b> <b>iC-NQL</b> <b>iC-NQC</b>	13 bit, x2 to x2048 (8192 angle steps), signal conditioning, encoder quadrature output to 425 kHz (2.1 MHz), EEPROM and BiSS Interface (up to 10 Mbit/s) iC-NQL: Fast SSI to 4 Mbit/s iC-NQC: BiSS C Interface	1.7 Msps	TSSOP20	I, E
<b>iC-MN</b>	3-Ch. S&H, 13 bit SAR ADC (8192 angle steps), signal conditioning, Nonius calculation to 25 bit, multturn capable, I2C and BiSS slave and master interfaces	7 $\mu$ s (21 $\mu$ s) @ 25 bits	QFN48 7x7	A, E

Applications Motion control, IPC interface boards, optical and magnetic encoders, drive systems, servo controls, robotics, position measuring systems (gauges), vehicle controls