Service robotics and automated guided vehicles (AGVs)

Powerful. Smart. Secure.

www.infineon.com/service-robotics
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Ushering Infineon's solutions for service robotics and AGVs that enable everyday life and work simplification

Disruptive technologies have significantly changed our lifestyle in the past few decades. Computers, the internet, mobile devices rapidly affected the way we work and live. Now a new era is on the horizon – the age of robots. Robotics will definitely revolutionize our habits, way of living, work processes and the environment that surrounds us.

A technology that will change the future of humankind

Robotics can generally be categorized into four general types such as industrial robots, collaborative robots (cobots), service robots and AGVs; and further divided into subcategories based on activity fields, functionality and market demands. The industry segment employs static robots and mobile robots, AGVs – including warehouse and delivery robots - amongst them. Service robots are to simplify a human's life and work with a special focus on one's personal physical and data protection. In professional environments, many robots are already integrated today in various areas such as hospitality, agriculture, medicine or surgery. In domestic environments, on the one hand, service robots significantly improved our quality of life by reducing the household work (e.g. vacuuming, lawn mowing, mopping and pool cleaning). Furthermore, they can be deployed as personal service robots for nursing elderly people, supporting parents entertaining and educating their kids, and even for securing. Another use case is in health applications, for example for therapeutic purposes.

We are sensing the trends

Service robotics applications and AGVs are affected by many emerging trends and challenges like artificial intelligence (AI), the Internet of Things (IoT), smart environments, increased connectivity, human machine interface (HMI) and wireless power. We, at Infineon - with our unique capabilities, outstanding robotics expertise and dedicated development support – offer a comprehensive portfolio of robotics solutions that meets and exceeds even your most rigorous requirements.

Infineon's solutions and their benefits for emerging trends affecting service robotics and AGVs

Artificial intelligence

Algorithms are key to this technology, but the computer power system demands are stretching the boundaries of the existing power delivery technology.

› Infineon offers an excellent selection of components for power management and consumption, as well as for voltage regulation, including low-voltage MOSFETs OptiMOS™/StrongIRFET™, high-voltage MOSFETs CoolMOS™, XMC microcontrollers, EiceDRIVER™ gate driver ICs, and iMOTION™ motion control ICs.

› All our products guarantee the highest possible energy efficiency along with top precision for increasingly efficient devices resulting in power loss reduction and superior power density.

Internet of things, smart home, cloud-based services and connectivity

Connectivity level and the need of data security correlate, so security must be integrated into all existing and new systems.

› Security solutions, OPTIGA™ Trust X and OPTIGA™ Trust B combine innovative hardware security and state-of-the-art encryption technology fulfilling all your authorization and authentication requirements.

› Our customers enjoy full protection from attackers, malevolent manipulation, espionage, and data theft. We grant highest levels of security via battery authentication.

Wireless power

Flexible movement and long operating time are key to optimize effectiveness. Cut the cables and charge without wires!

› We at Infineon have sophisticated inductive and resonant wireless charging solutions and reference designs ready for your robotics applications that use electromagnetic fields to transfer power from a transmitter to a receiver application.

› Make the end users benefit from innovative high performance wireless charging. No more struggles with plug compatibility issues and limited movement. No contact with exposed electrical connectors increases the user's safety. Reliability in harsher environments, seamless on-the-go charging, and the charging of multiple devices in parallel are additional advantages.

Human machine interface and sensing

Sensing **Voice** **Radar**

Safety is key when robots interact with their environment with a special focus on human safety, work safety, routing accuracy and collision avoidance. Smooth communication between people and machines requires interfacing (e.g. voice user interfaces) and accurate sensing.

› A wealth of sensors can be fused into a robot to allow it to better understand its environment. Radar or laser sensors for collision avoidance, pressure or 3D sensors to extend the robot's capabilities. Get to know Infineon's XENSIV™ portfolio designed for HMI features:
– XENSIV™ radar ICs (e.g. 24 GHz radar technology)
– XENSIV™ MEMS microphones
– XENSIV™ 3D image sensors (REAL3™)
– Environmental sensors such as XENSIV™ barometric pressure sensors
  (e.g. DPS310)
 Beside many more components, they support industrial and consumer robotics applications together with the XENSIV™ family's magnetic speed, Hall and angle sensors.
› Test and evaluate our best-in-class pressure sensors for highly sensitive airflow and pressure measurement, indoor navigation and temperature measurement. Get to know our radar solutions for collision avoidance, gesture sensing and motion/presence detection, outperforming by far alternatives like infrared or cameras. Consider our 3D imager chips for face recognition and navigation for taking your robotics project to the next level, together with our MEMS microphone technology for predictive maintenance and voice-user interface connection.
› Service robots' and AGVs' communication capabilities are very dependent on the area in which they are deployed. CAN, Wi-Fi or location services with GPS or mobile communication like LTE modules can be implemented.

Our experience, your benefits

Unique application insight	As a user and an enabler, our unique application insight adds value to every robotic system.
Real functional safety	Certified safety products combined with advanced security solutions ensure your robotic system is actually functionally safe.
Broadest product portfolio	Our broadest portfolio features leading products with a proven track record, for the entire control loop, and accelerate your time to market.

Drawing on our insight into all facets of the robotics field, and with a comprehensive portfolio of power products and sensors on offer, we are able to provide reliable system solutions that address the latest trends in robotics, and add value to nearly every robot design.

This translates directly into economic and technical benefits for our customers. When choosing Infineon's high-quality components and system solutions, you can be certain they will work together seamlessly and error free. Furthermore, our ready-to-use robotic hardware building blocks let you bring a project to market quickly by reducing the effort required for the design-in. The valuable time you save in that way can be spent developing algorithms to differentiate from competitors.

How our offering enhances your project?

Infineon can help you in multiple ways to overcome your design, construction, sensing, energy efficiency and information processing challenges.

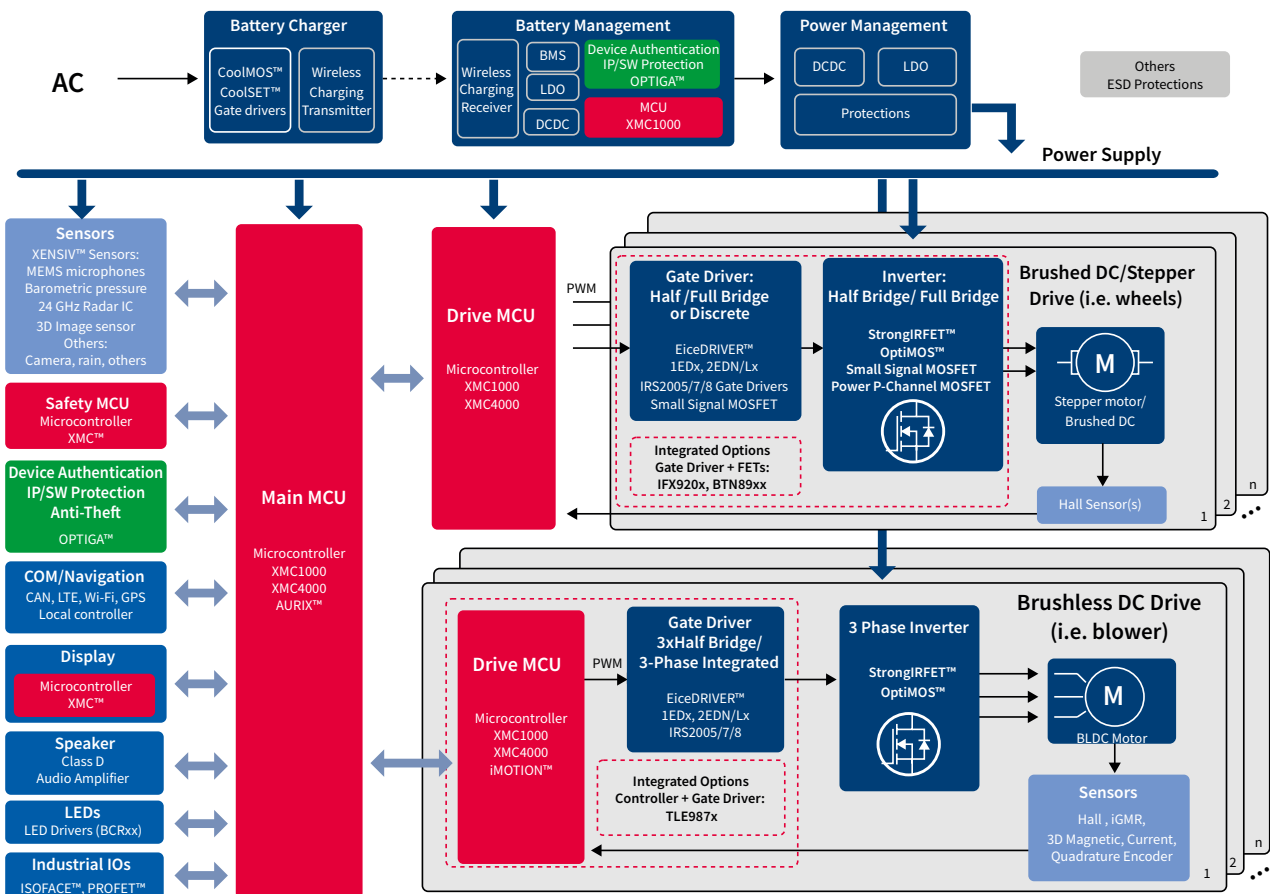| Size reduction	Securing business	Highest level of integration	Managing safety
Decrease the control box size using IGBTs, IPMs, MOSFETS, and gate drivers	Protect intellectual property in the IoT era with embedded security solutions	Misc. topologies and control functions in power modules and microcontrollers	Sensors and safety controllers: torque, position, pressure, 3D image

Infineon – Your one-stop-shop for a broad service robotics and AGV portfolio

The block diagram below visualizes what we mean when we call ourselves a one-stop-shop for your service robotics and AGVs projects. We are prepared to make your applications go-to-market ready, are you too?

Battery Charger
- CoolMOS™ CoolSET™ Gate drivers
- Wireless Charging Transmitter

Battery Management
- Wireless Charging Receiver
- BMS
- LDO
- DCDC
- Device Authentication IP/SW Protection OPTIGA™
- MCU XMC1000

Power Management
- DCDC
- LDO
- Protections

Others
ESD Protections

AC →

Power Supply

Sensors
XENSIV™ Sensors:
MEMS microphones
Barometric pressure
24 GHz Radar IC
3D Image sensor
Others:
Camera, rain, others

Safety MCU
Microcontroller
XMC™

Device Authentication
IP/SW Protection
Anti-Theft
OPTIGA™

COM/Navigation
CAN, LTE, Wi-Fi, GPS
Local controller

Display
Microcontroller
XMC™

Speaker
Class D
Audio Amplifier

LEDs
LED Drivers (BCRxx)

Industrial IOs
ISOFACE™, PROFET™

Main MCU
Microcontroller
XMC1000
XMC4000
AURIX™

Drive MCU
Microcontroller
XMC1000
XMC4000

PWM

Gate Driver: Half /Full Bridge or Discrete
EiceDRIVER™
1EDx, 2EDN/Lx
IRS2005/7/8 Gate Drivers
Small Signal MOSFET

Integrated Options Gate Driver + FETs:
IFX920x, BTN89xx

Inverter: Half Bridge/ Full Bridge
StrongIRFET™
OptiMOS™
Small Signal MOSFET
Power P-Channel MOSFET

Brushed DC/Stepper Drive (i.e. wheels)
M
Stepper motor/
Brushed DC

Hall Sensor(s)

1 2 ... n

Drive MCU
Microcontroller
XMC1000
XMC4000
iMOTION™

PWM

Gate Driver 3xHalf Bridge/ 3-Phase Integrated
EiceDRIVER™
1EDx, 2EDN/Lx
IRS2005/7/8

Integrated Options Controller + Gate Driver:
TLE987x

3 Phase Inverter
StrongIRFET™
OptiMOS™

Brushless DC Drive (i.e. blower)
M
BLDC Motor

Sensors
Hall , iGMR,
3D Magnetic, Current,
Quadrature Encoder

1 2 ... n

Product portfolio – Infineon's offering for service robotics and AGVs

We at Infineon always welcome innovative ideas and challenging projects. Turn us into your robotics partner and we will assist you in realizing them. Refer to the following portfolio table and convince yourself of our broad offering. Listed are our key enabling parts for reliable chargers, efficient power / battery management, compact motor control, indispensable sensors and more. [1]

Click on the part number to learn more and buy online.

Charger

Product family	Voltage class [V_{DS} max]	Package	Part number	$R_{DS(on),max.}$ @V_{GS}=10 V [mΩ]
CoolMOS™ SJ MOSFET P7	600	DPAK	IPD60R600P7S	600
			IPD60R360P7S	360
			IPD60R280P7S	280
			IPD60R180P7S	180
		SOT-223	IPN60R600P7S	600
			IPN60R360P7S	360
		TO-220FP	IPA60R280P7S	280
			IPA60R180P7S	180
	700	DPAK	IPD70R360P7S	360
			IPD70R600P7S	600
		SOT-223	IPN70R600P7S	600
			IPN70R360P7S	360
		TO-220FP	IPA70R600P7S	600
			IPA70R360P7S	360
	800	DPAK	IPD80R600P7	600
			IPD80R360P7	360
		TO-220FP	IPA80R600P7	600
			IPA80R360P7	360
OptiMOS™	100	TO-220	IPP045N10N3 G	4.5
	150	D2PAK	IPB048N15N5	4.8
		TO-220	IPP051N15N5	5.1
StrongIRFET™	100	TO-220	IRFB4110PBF	4.5
	150	TO-247	IRFP4568	5.9
CoolSET™	800	DSO-12	ICE5QR0680AG	800
			ICE5AR0680AG	800
PWM flyback controller	ICE5QSAG, ICE5ASAG, ICE5GSAG, ICE2QS03G			
Gate Driver ICs	EiceDRIVER™: 2EDS8265H, 2EDN852x			
	Low Side Drivers: IR44273L			
Wireless charging	Find wireless charging portfolios for inductive and resonant solutions at: www.infineon.com/wirelesscharging			

Battery Management

Product family	Voltage class [V_{DS} max]	Package	Part number	$R_{DS(on),max.}$ @V_{GS}=10 V [mΩ]
OptiMOS™	40	SuperSO8	BSC026N04LS	2.6
	60	TD-SON-8	BSC028N06NS	2.8
		HSOF-8-1	IPT007N06N	0.75
	100	TO-220-3	IPP045N10N3 G	4.5
		D²PAK 7pin	IPB017N10N5LF	1,7
		D²PAK	IPB020N10N5LF	2.0
			IPB033N10N5LF	3.3
StrongIRFET™	30	DPAK	IRLR8726	5.8
		PQFN	IRFH8311	2.1
	40	DirectFET	IRL7472L1	0.45
		PQFN	IRFH7440	2.4
		TO-220	IRF1404Z	3.7
			IRFB7437	2.0
			IRFB7434	1.6
		DirectFET2	IRF7739L1	0.7
		TO-220	IRFB7440	2.5
	75	TO-220	IRFB7730	2.2
Small Signal MOSFETs	20	SOT-23	IRLML6244	21
		TSOP-6	BSL202SN	22
		SC59	BSR802N	23
	60	SOT-89	BSS606N	60
	100	SOT-223	BSP373N	240
	-20	TSOP-6	BSL207SP	41
		SOT-23	IRLML2244	54
	-30	SOT-23	BSS308PE	80
	-60	SOT-223	BSP612P	130
Gate Driver ICs	EiceDRIVER™: 2EDN752x, 1EDN751x			
	High voltage Gate drivers 200 V - 600 V: 6ED003L02-F2, 6ED003L06-F2, 6EDL04N02PR, 6EDL04N06PT, 2EDL05N06PF, 2ED2304S06F, IRS2005S, IRS2005M, IRS2007S, IRS2008S, IRS2011S			
Microcontroller XMC1000 family	XMC1100			
Voltage regulators: LDO and DCDC switching regulators	IFX1763, IFX54441, IFX54211, IFX30081, IFX90121, IFX91041			
Authentication	OPTIGA™ Trust B SLE95250			

Motor control

Product family	Voltage class [V_{DS} max]	Package	Part number	$R_{DS(on),max.}$ @V_{GS}=10 V [mΩ]
OptiMOS™	30	SC59	BSR302N	23
	40	SuperSO8	BSC010N04LSI	1.5
			BSC014N04LSI	1.45
			BSC022N04LS	2.2
			BSC030N04NS G	3
		S3O8 (3x3mm style SuperSO8)	BSZ025N04LS	2.5
	60	SuperSO8	BSC014N06NS	1.45
			BSC027N06LS5	2.7
		PQFN 5x6	BSC014N06NS	1.45
	80	SuperSO8	BSC026N08NS5	2.6
			BSZ123N08NS3G	12.3
		TOLL	IPT012N08N5	1.2
		D²PAK 7pin (TO-263 7pin)	IPB015N08N5	1.5
		D²PAK (TO-263)	IPB017N08N5	1.7
	100	TOLL (HSOF-8)	IPT015N10N5	1.5
		D²PAK 7pin (TO-263 7pin)	IPB017N10N5	1.7
		D²PAK	IPB020N10N5	2
	200	TOLL	IPT111N20NFD	11.1
SIPMOS™	60	D²PAK	SPB80P06PG	23
StrongIRFET™	30	PQFN 2x2	IRFHS9301	37
		SO8	IRF9389	N 27, P 64
	40	TSOP-6	IRF5803	112
		DPAK	IRFR7446PbF	3.9
		DirectFET ME	IRF7480M	1.2
		DirectFET MF	IRF7483M	2.3
		PQFN 5 x 6 B	IRFH7084	1.25
			IRFH7004	1.4
		PQFN 5 x 6 E/G	IRFH7440	2.4
		PQFN 5 x 6 B/G	IRFH5004	2.6
	60	PQFN 5x6	IRFH7085	3.2
Small Signal MOSFETs	20	SOT-23	IRLML6244	21
		TSOP-6	BSL202SN	22
		SC59	BSR802N	23
	60	SOT-89	BSS606N	60
	100	SOT-223	BSP373N	240
	-20	TSOP-6	BSL207SP	41
		SOT-23	IRLML2244	54
	-30	SOT-23	BSS308PE	80
	-60	SOT-223	BSP612P	130
Gate Driver ICs	EiceDRIVER™ 1EDN7550, 2EDL811x			
	High voltage Gate Drivers 200 V - 600 V: 6ED003L02-F2, 6ED003L06-F2, 6EDL04N02PR, 6EDL04N06PT, 2EDL05N06PF, IRS2005S, IRS2005M, IRS2007S, IRS2008S, IRS2011S			
	Integrated Gate Driver ICs: IFX9201/2, NovalithIC™ BTN8982, Trilith IC BTM7752			
	Automotive Embedded Power ICs: TLE986x family, TLE987x family			
Microcontroller XMC1000/4000 families	XMC1100, XMC1200, XMC1300, XMC1400, XMC4200, XMC4400, XMC4500,XMC4700,XMC4300,XMC4800			
iMOTION™	IRMCK099M, IMC101T-T038, IMC101T-Q048, IMC101T-F064			
Hall switches	TLE496x: TLI4961-1M, TLI4963-1M			
Angle sensor	TLI5012B, TLE5501			
Current sensor	TLI4970			

Sensors and peripherals

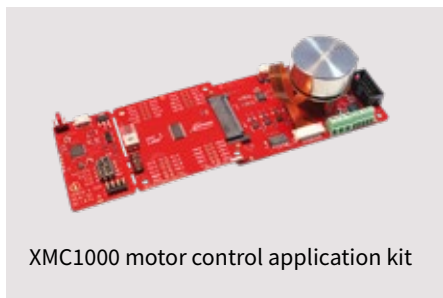| Product family	Part number
Hall switches	TLE496x: TLE4964-1M, TLI4965-5M
Angle sensor	TLI5012B, TLE5501
3D Magnetic sensor	TLx493D: TLI493D-A2B6, TLE493D-A2B6, TLE493D-W2B6 A0
Interface	Industrial CAN transceiver IFX1050, IFX1051
ISOFACE™ industrial interface ICs	ISO1H81xG family, ISO2H823V, ISO1I81xT family
PROFET™ Smart high side switches	BTT6200-4EMA, BTT6200-1EJA, BTT6100-2EKA, BTT6050-1EKA, BTT6050-2EKA, BTT6030-2EKA, BTT6030-1EKA, BTT6030-2EKB, BTT6020-1EKA, BTT6010-1EKA, BTT6010-1EKB
XENSIV™ Pressure sensor	DPS310, DPS422
XENSIV™24GHz radar	BGT24M/L family
XENSIV™ MEMS microphone	IM69D130
Class D Audio Amplifier	IR43x1M, IR43x2M
Security device authentication, data and IP protection	OPTIGA™ family: OPTIGA™ Trust X SLS32AIA..X4, OPTIGA™ Trust B SLE 95250, OPTIGA™ TPM
LNAs	BFP842ESD, BFR840L3RHESD, BFR843EL3
LED drivers	Linear driver ICs: BCR3xx family, BCR4xx family
	DCDC switch mode: ILD4xxx family, ILD6xxx family

1) Please, note that only key enabling products are listed here. For complete portfolio, please visit www.infineon.com/service-robotics. Through this page, you will be linked to different product pages offering the full portfolio of the specific products you are interested in.
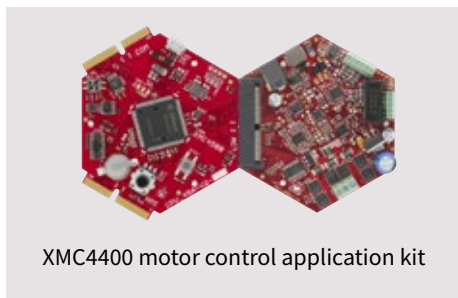
Demoboards and evaluation kits

Find the right board or evaluation kit for the development, prototyping and testing of your future service robotics and AGV applications.

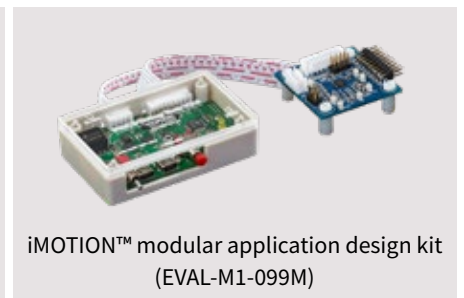**Click on the board names to learn more about each of them.**

Microcontrollers

XMC1000 motor control application kit
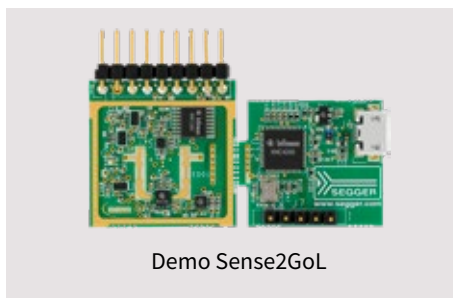

XMC4400 motor control application kit

iMOTION™ modular application design kit (EVAL-M1-099M)
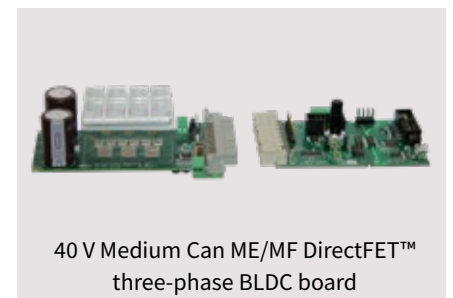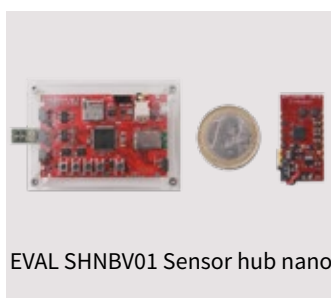
XENSIV™ radar sensor ICs

Demo Distance2Go

Demo Sense2GoL

Motor drive

40 V Medium Can ME/MF DirectFET™ three-phase BLDC board

XENSIV™ pressure sensors

EVAL SHNBV01 Sensor hub nano

S2GO PRESSURE DPS310

XENSIV™ MEMS microphones

EVAL AUDIOHUBV01

EVAL IM69D130 flexkit

XENSIV™ magnetic position sensors

TLV493D-A1B6 MS2GO
TLE493D-A2B6 MS2GO
TLE493D-W2B6 MS2GO

XENSIV™ magnetic current sensor

TLI4970050 2 GO KIT

Security

OPTIGA™ Trust X EVAL kit

OPTIGA™ Trust B EVAL kit

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www.infineon.com/service-robotics

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› India .... 000 800 4402 951 (English)
› USA .... 1-866 951 9519 (English/German)
› Other countries .... 00* 800 951 951 951 (English/German)
› Direct access .... +49 89 234-0 (interconnection fee, German/English)

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Please note!

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Except as otherwise explicitly approved by us in a written document signed by authorized representatives of Infineon Technologies, our products may not be used in any life-endangering applications, including but not limited to medical, nuclear, military, life-critical or any other applications where a failure of the product or any consequences of the use thereof can result in personal injury.