

Industrial and General-Purpose Gate Driver ICs

Selection Guide 2017

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Infineon Gate Driver IC Technologies

Leveraging the application expertise and advanced technologies of Infineon and International Rectifier, the Industrial and General-Purpose Gate Driver ICs are well suited for many application such as major home appliances, industrial motor drives, solar inverters, UPS, switched-mode power supplies, and high-voltage lighting. Infineon offers a comprehensive portfolio with a variety of configurations, voltage classes, isolation levels, protection features, and package options. These flexible gate driver ICs are complementary to Infineon IGBTs, Silicon and Silicon Carbide MOSFETs (CoolMOS™ and CoolSiC™), and other power switches in discrete gate drive applications or as part of integrated power modules. Every switch needs a driver.



Level-Shifting p-n Junction Isolation (LS-JI) technology is a mature, proven MOS/CMOS fabrication technique where silicon is used to produce the transistor. Infineon's proprietary HVIC and latch immune CMOS technologies enable ruggedized monolithic construction. The advanced process allows monolithic high-voltage and low-voltage circuitry construction with the best price per performance.

	<p>Main Benefits of JI Technology:</p> <ul style="list-style-type: none">➢ High current capability➢ Precision analog circuitry (Tight timing/propagation delay)➢ Most comprehensive portfolio with industry standard gate drivers<ul style="list-style-type: none">- Voltage Classes: 1200 V, 700 V, 600 V, 200 V, and 100 V- Configurations: Three-Phase, Half-Bridge, Single channel, and more➢ Industry-largest portfolio of drivers tailored towards the best price per performance
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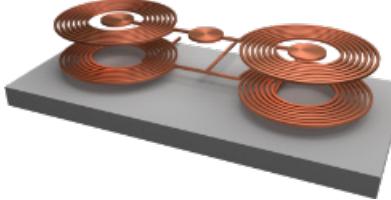


Level-Shifting Silicon-on-Insulator (LS-SOI) technology is an advanced fabrication technique used for EiceDRIVER™ with Infineon SOI products. The silicon is separated by a buried silicon dioxide layer. The top layer, which is the silicon film, is used to produce the transistor. The bottom layer is used as the silicon substrate. The buried silicon dioxide provides an insulation barrier between the active layer and silicon substrate. The advanced process allows monolithic high-voltage and low-voltage circuitry construction with additional technology-enhanced features.

	<p>Main Benefits of SOI Technology:</p> <ul style="list-style-type: none">➢ Best-in-class immunity to negative transients prevents erratic operation and latch-up while improving reliability➢ Low-Ohmic integrated bootstrap diode has the lowest reverse recovery losses resulting in reduced power losses➢ Minimum level-shift losses improve driver efficiency and allows flexible housing designs➢ 600 V and higher withstand voltages for operating margin➢ Integrated filters
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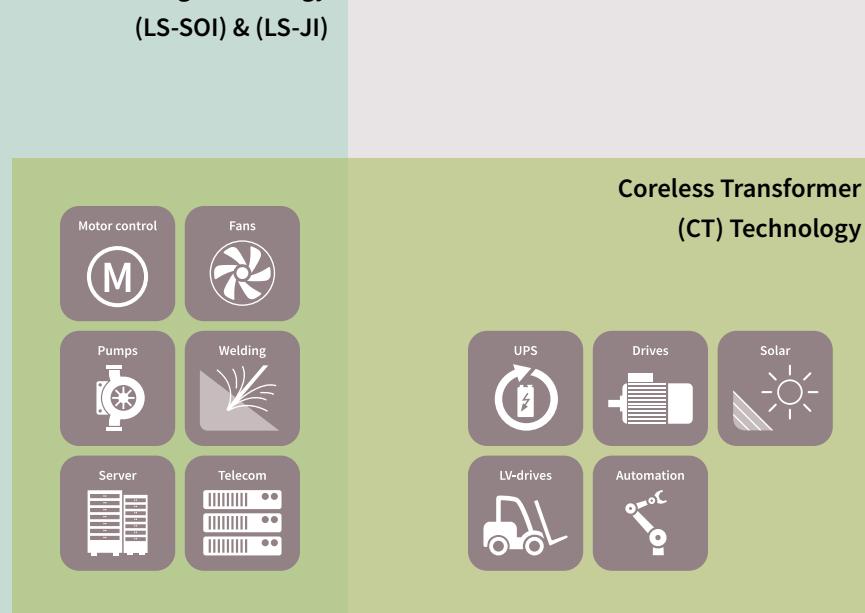
Coreless transformer (CT) technology is an isolated technology which uses semiconductor manufacturing process to integrate an on-chip transformer consisting of metal spirals and silicon oxide insulation. These coreless transformers are used for transmitting switching information between input chip and output chip. Two isolated chips ensure galvanic isolation.

	<p>Main Benefits of CT Technology:</p> <ul style="list-style-type: none"> › Galvanic isolation › Allows very large voltage swings of ± 1200 V or larger › Immunity against negative and positive transients › Increases reliability of the end product › Low losses and low power dissipation
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Non-Isolated (NI) technology refers to gate drivers utilizing low voltage circuitry. Infineon's world-class fabrication techniques enable tiny low side drivers in DSO8 and SOT23 packages with high current capabilities.

Typical applications

	<p>Level-Shifting Technology (LS-SOI) & (LS-JI)</p> 
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Infineon SOI Technology

EiceDRIVER™ products with Infineon SOI technology provides unique, measurable, best-in-class advantages.

Negative VS Transient (-VS) Operation Robustness

In today's high-power switching converters carrying a large load current, the VS voltage swing does not stop at the level of the negative DC bus but instead swings below the level of the negative DC bus due to the parasitic inductances in the power circuit from the die bonding to the PCB tracks. This undershoot voltage is called "negative VS transient". High-volt-

age EiceDRIVER™ products using Infineon SOI have the best-in-the-industry operational robustness. In figure 2, the safe operating line is shown at VBS = 15 V for pulse widths up to 1000 ns. Above this line, the products do not show unwanted functional anomalies or permanent damage to the IC.

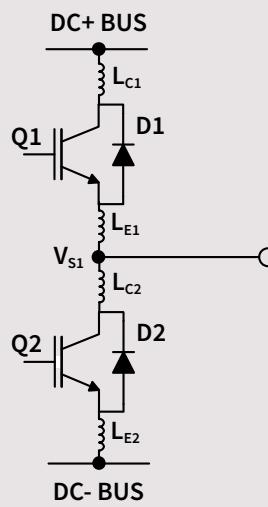


Figure 1: Parasitic elements

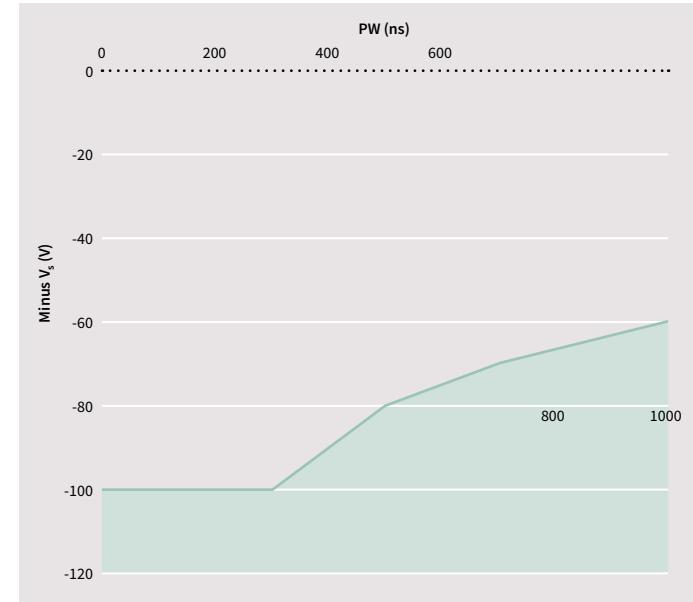


Figure 3: Negative Vs transient SOA Characterization @ VBS=15V



Integrated Bootstrap Diode

The bootstrap power supply is one of the most common techniques for supplying power to the high-side driver circuitry due to its simplicity and low cost. As shown in Figure 3, the bootstrap power supply consists of a bootstrap diode and capacitor. The floating channel of JI drivers is typically designed for bootstrap operation. With Infineon's advance SOI technology, and ultra-fast, best-in-class low-Ohmic bootstrap diodes of $R_{BS} \leq 40 \Omega$ is monolithically integrated to establish the high side supply. With the integrated diode's lowest reverse recover losses and minimal self-heating, the Infineon SOI drivers with this feature can drive larger IGBTs without the risk of self-heating, and minimize BOM count and reduce system cost.

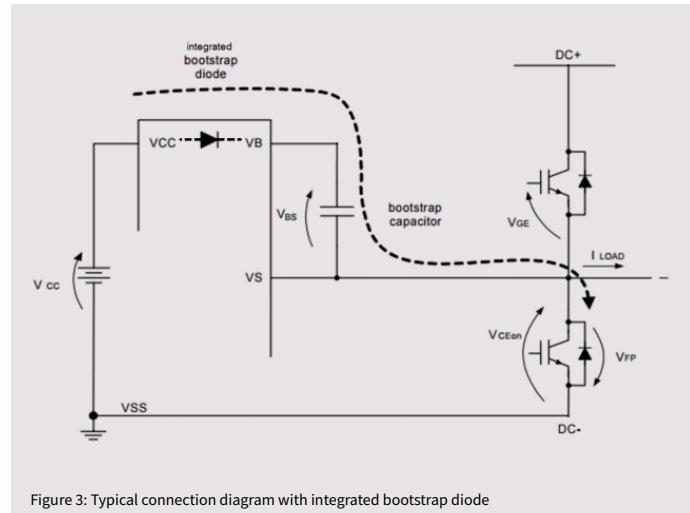


Figure 3: Typical connection diagram with integrated bootstrap diode

Level Shift Losses

In a driver with a high-side circuit, level-shift losses can be very significant part as the operating frequency increases. A level-shift circuit is used to transmit the information in the form of set- and reset-pulses from the low-side to the high-side. The necessary charge of the set- and reset-pulse determines the level-shift losses. EiceDRIVER™ high-voltage prod-

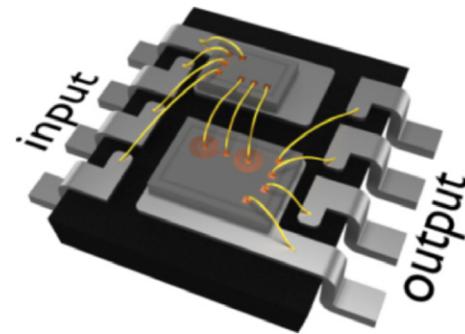
ucts using the Infineon SOI technology require a very low charge to transmit the information. Minimizing level-shifting power consumption allows design flexibility of higher frequency operations, as well as longer lifetime, improved system efficiency and application reliability.

Infineon Isolation CT Technology

Infineon EiceDRIVER™ Isolated products uses the magnetically-coupled coreless transformer (CT) technology to provide signal transfer across galvanic isolation. The technology provides high performance, long stability, and strong robustness. The isolation allows very large voltage swings (e.g. ± 1200 V).

Robustness

- › Extremely robust signal transfer as a function of di/dt separating of signals from common mode noise
- › ≥ 100 kV/micros CMTI prevents erroneous driver switching in an electrically noise environment
- › Tight Propagation delay variation Tolerance improves application robustness without variations due to age, current, and temperature



Design Flexibility

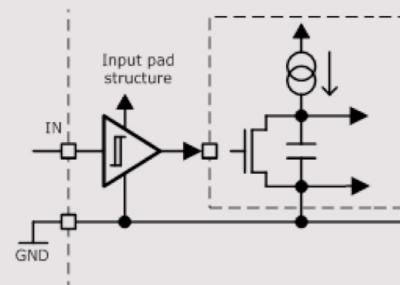
- › Wide range of gate voltages including negative gate voltage
- › Closed-loop gate current control option

High Efficiency

- › Precise integrated filter reduces propagation delay and propagation delay variation over wide operating conditions

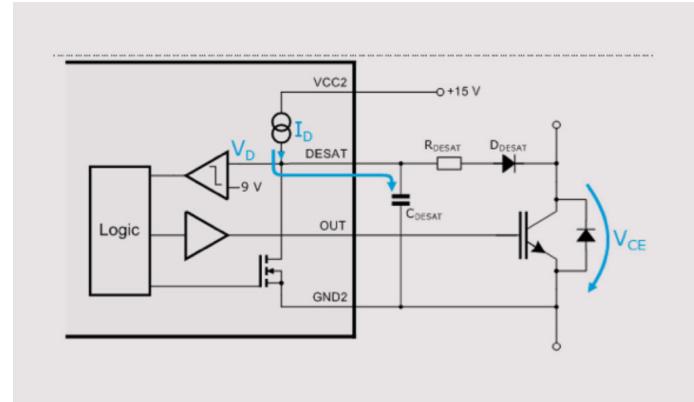
Coupling method	Tolerance I_b	Tolerance V_b
Magnetic	$\pm 10\%$	$-8/+6\%$
Capacitive	$\pm 18\%$	$-8/+6\%$
Optical	$-48/+32\%$	$\pm 11\%$

Integrated ramp-based filter



Protection

- › Short dead times with tight propagation delay matching and precise integrated filters over wide operating conditions
- › Fast overload shut down using optional fast DESAT detection and Two-level turn-off for short circuit current protection
- › Reliable short circuit detection via a fast and accurate desaturation (DESAT) detection circuit protects the power switches from damage during short circuit condition
- › Active Miller clamping option



Lifetime Certification

- › Significantly lowers aging effects expected in alternative solutions



For SiC MOSFET Switching

- › Ideal for ultra-fast switching 1200 V power transistors such as CoolSiC™ MOSFETs
- › Temperature Compensation for SiC MOSFETs
- › The drivers incorporate most important key features and parameters for SiC driving:
 - Tight propagation delay matching,
 - Precise input filters,
 - Wide output side supply range,
 - Negative gate voltage capability, and
 - Extended CMFI capability.



Silicon Carbide Gate Drivers

CoolSiC™ MOSFETs and Modules

Infineon's CoolSiC™ Silicon Carbide (SiC) MOSFETs open new degrees of freedom for designers to improve efficiency and system flexibility.

The SiC MOSFET offers advantages of the lowest gate charge and device capacitance levels in 1200 V switches, no reverse recovery losses of the internal body diode, temperature-independent low switching losses, and threshold-free on-state characteristics. Infineon's unique 1200 V SiC MOSFET adds additional advantages of superior gate-oxide reliability enabled by state-of-the-art trench design, best in class switch-

ing and conduction losses, highest transconductance level (gain), full turn-on capability with gate voltage of only +12 V and short-circuit robustness.

The result is a robust SiC MOSFET which is ideal for hard- and resonant-switching topologies. It can be driven like an IGBT using standard drivers delivering the highest level efficiency at switching frequencies unreachable by Si based switches allowing for system size reduction, higher power density and improved lifetime reliability. This is the revolution you can rely on.

Lead products

Schematic	Type	R _{DSON}	V _{DS}	Package
Single switch	IMW120R045M1	45 mOhm	1200 V	TO247-3pin
Single switch	IMZ120R045M1	45 mOhm	1200 V	TO247-4pin
Half bridge with NTC	FF11mR12W1M1_B11	11 mOhm	1200 V	Easy1B PressFIT
	FF23mR12W1M1_B11	23 mOhm	1200 V	
Booster with NTC	DF11mR12W1M1_B11	11 mOhm	1200 V	
	DF23mR12W1M1_B11	23 mOhm	1200 V	

Selectively sampling on request.

Recommended Gate Drivers

Ultra-fast switching 1200 V power transistors such as CoolSiC™ MOSFETs can be easier handled by means of isolated gate output sections. Therefore, the following galvanically isolated EiceDRIVER™ ICs based on Infineon's coreless transformer technology are recommended as most suitable. For a larger selection of isolated gate drivers, please refer to other

section of the selection guide. The drivers incorporate most important key features and parameters for SiC driving such as tight propagation- delay matching, precise input filters, wide output-side supply range, negative gate-voltage capability, and extended CMTI capability.

Headline						
Product	Part Number	Typ. Peak Drive Current	VCC2-VEE2	Typ. Prop. Delay	Other Key Features	Package
1EDI Compact Isolated High-Side Driver Family	1EDI20N12AF	3.5 A	35 V	≤ 120 ns	Functional Isolation	DSO-8 150 mil
	1EDI60N12AF	9.4 A	35 V	≤ 120 ns		
	1EDI20I12MF	3.5 A	20 V	≤ 300 ns	Functional Isolation, Miller Clamp	
	1EDI20H12AH	3.5 A	35 V	≤ 125 ns	8 mm Creepage Clearance	DSO-8 300 mil
	1EDI60H12AH	9.4 A	35 V	≤ 125 ns		
	1EDI20I12MH	3.5 A	20 V	≤ 300 ns	8 mm Creepage Clearance, Miller Clamp	
1ED-F2 Isolated High-Side Driver with Integrated Protection	1ED020I12-F2	2.0 A	20 V	≤ 170 ns	Short circuit clamping; DESAT protection; Active shutdown, Miller Clamp	DSO-16
2ED-F2 Isolated Dual High-Side Driver with Integrated Protection	2ED020I12-F2	2.0 A	20 V	≤ 170 ns		DSO-36
1ED Slew Rate Control (SRC) Isolated High-Side Driver	1EDI20I12SV	2.0 A	20 V	≤ 450 ns	Real-time adjustable gate current control; Over-current protection, Soft turn-off shut down, Two-level turn-off	DSO-36

Product Portfolio Overview

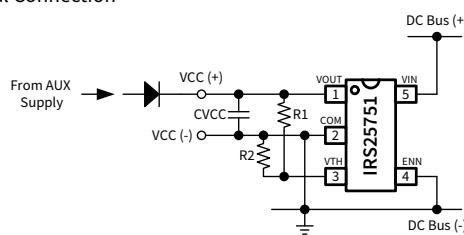
Infineon's Gate Driver IC solutions are the expert's choice. With more than 200 reliable and efficient Gate Driver Solutions, we provide a comprehensive portfolio for virtually any application. To ease the selection process, this overview is structured along the configurations of the Gate Driver ICs, as opposed to by application topology.

Single high-side				Technology	Features (See page xx)										Package (See page xx)											
Typical Connection			Base PN		Active Miller clamp	Current sense	Dedicated control for JFET	Desaturation protection	Enable	Error reporting with shutdown	Fault reporting	Fault reset	Over-current protection	Separate pin for logic ground	Separate sink/source outputs	Soft over-current shutdown	Two-level turn-off	Under voltage lockout	DSO-8	DSO-8 300mil	DSO-16	DSO-16 WB	DSO-19	DSO-36	DIP-8	SOT23-6
Voltage Class [V]	I _{o+} /I _{o-} typ [mA]	typ prop delay: off/on [ns]																								
1200	1300/900	300/300	1EDI05I12A	CT						✓	✓					✓	✓	✓								
	165/170	165/170	1EDI020I12-(B,F)2	CT	✓		✓			✓	✓	✓				✓	✓			✓						
	2000/2000	1750/1750	1EDI020I12-(B,F)T	CT	✓		✓			✓	✓	✓				✓	✓			✓						
	2200/2300	300/300	1EDI10I12M	CT	✓								✓					✓	✓	✓						
	4000/3500	120/115	1EDI20N12A	CT									✓	✓			✓	✓	✓							
		125/120	1EDI20H12A	CT									✓	✓			✓	✓	✓							
		300/300	1EDI20I12A	CT									✓	✓			✓	✓	✓							
		125/120	1EDI20I12M	CT	✓								✓				✓	✓	✓							
		4000/4000	80/80	1EDI30J12C	CT		✓	✓									✓				✓					
		5900/6200	300/300	1EDI30I12M	CT	✓							✓				✓	✓	✓							
		7500/6800	300/300	1EDI40I12A	CT								✓	✓			✓	✓	✓							
		SRC/2000	460/460	1EDI20I12SV*	CT		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓					
10000/9400	125/120	1EDI60H12A	CT									✓	✓			✓	✓	✓								
	300/300	1EDI60I12A	CT									✓	✓			✓	✓	✓								
600	160/240	215/140	IRS25752	JI												✓									✓	
	250/500	105/125	IR2117	JI													✓	✓							✓	✓
			IR2118	JI														✓	✓							✓
			IR2127	JI	✓													✓	✓							✓
	290/600	150/200	IR21271	JI	✓												✓	✓							✓	
			IR2128	JI	✓												✓	✓							✓	
			IRS211(7,8)	JI																✓	✓				✓	✓
	500	105/125	IRS2127	JI	✓												✓	✓							✓	
		150/150	IRS21271	JI	✓		✓										✓	✓								✓
			IRS21271	JI	✓		✓										✓	✓								✓
200	160/240	215/140	IRS20752	JI												✓									✓	
100	160/240	215/140	IRS10752	JI												✓									✓	

SRC = Turn on slew rate control

Complementary: High-Voltage Start-Up IC

Typical Connection



Technology

Enable	✓
High voltage start-up	✓
Over temperature shutdown	✓

SOT23-5

Voltage Class [V]

Base PN

480

IRS25751

Features (See page xx)

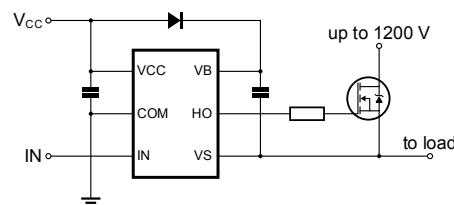
NI	✓	✓	✓
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Package (See page xx)

✓

Single low-side

Typical Connection



Technology

Current sense	✓
Enable	✓
Error reporting with shutdown	✓
Fault reporting	✓
Over-current protection	✓
Separate sink/source outputs	✓
Under voltage lockout	✓

DIP-8

SOT23-5

SOT23-6

WSON-6

Voltage Class [V]

I_{O+}/I_{O-} typ [mA]

25

300/550

1500/1500

1700/1500

20

5

1600/3300

typ prop delay: off/on [ns]

50/50

50/50

50/50

19/19

200/150

Base PN

IR44252

IRS44273

IR44272

IR44273

1EDN(7,8)511B**

1EDN7512*

IR2121

Features (See page xx)

NI	✓	✓	✓	✓	✓
NI				✓	✓
NI		✓		✓	✓
NI				✓	✓

Package (See page xx)

✓

✓

✓

✓

✓

✓

*New **Coming Soon



Dual high-side

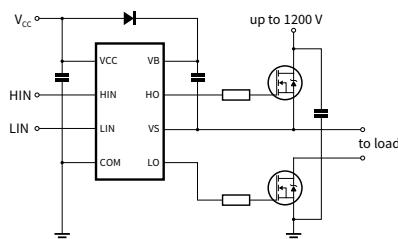
Typical Connection					Technology	Features (See page xx)				Package (See page xx)
Voltage Class [V]	I _{O+} /I _{O-} typ [mA]	typ prop delay: off/on [ns]	Base PN	CT		✓	✓	✓	✓	
1200	2000/2000	165/170	2ED020I12-F2							✓

Dual low-side

Typical Connection					Technology	Features (See page xx)				Package (See page xx)
Voltage Class [V]	I _{O+} /I _{O-} typ [mA]	typ prop delay: off/on [ns]	Base PN	NI		✓	✓	✓	✓	
25	2300/3300	50/50	IRS4426	NI				✓		
			IRS44262	NI			✓	✓		
			IRS4427	NI			✓	✓		
		65/85	IR25600	NI			✓	✓		
			IR442(6,7)	NI			✓	✓		
20	5000/5000	19/19	2EDN752(3,4)	NI	✓	✓	✓	✓	✓	✓
			2EDN852(3,4)	NI	✓	✓	✓	✓	✓	✓

High-side and Low-side

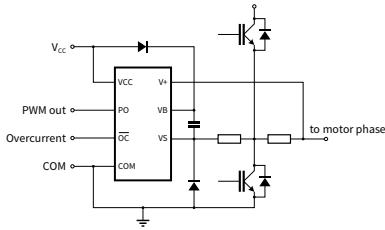
Typical Connection



Technology	Features (See page xx)							Package (See page xx)						
	Integrated bootstrap diode	Separate pin for logic ground	Shutdown	Under voltage lockout	DSO-8	DSO-14	DSO-16 WB	DIP-8	DIP-14	VQFN-14	CHIP			
IR2213	JL	✓	✓	✓				✓	✓		✓			
IR7106	JL			✓	✓									
600	IR2106	JL			✓	✓					✓			
	IR21064	JL	✓		✓		✓				✓			
	IR2301	JL			✓	✓			✓					
	IR25604	JL			✓	✓								
	IRS2301	JL			✓	✓								
	IR2101	JL			✓	✓			✓					✓
	IR2102	JL			✓	✓			✓					
	IR2112	JL			✓	✓			✓		✓			
	IRS2112	JL	✓	✓	✓				✓		✓			✓
	IRS2101	JL			✓	✓			✓					✓
500	IRS2106	JL			✓	✓			✓					✓
	IRS21064	JL	✓		✓				✓					
	2EDL05I06BF	SOI	✓		✓	✓								
	IRS2181	JL			✓	✓			✓					✓
	IR2181	JL			✓	✓			✓					✓
	IR21814	JL	✓		✓		✓		✓					
	IRS21814	JL	✓		✓				✓		✓			✓
	IR2113	JL	✓	✓	✓				✓		✓			✓
	IR25607	JL	✓	✓	✓				✓					
	IR2113	JL	✓	✓	✓				✓		✓		✓	✓
200	IRS2186	JL			✓	✓			✓					✓
	IRS21864	JL	✓		✓		✓		✓					
	IRS21867	JL			✓	✓								
	IR2110	JL	✓	✓	✓				✓		✓			
	IRS2110	JL	✓	✓	✓				✓		✓			✓
200	IRS2005	JL			✓	✓								✓
	IRS2011	JL			✓	✓				✓				✓
	IR2011	JL			✓	✓				✓				
	IR2010	JL	✓	✓	✓				✓		✓			✓

Complementary: Current sense

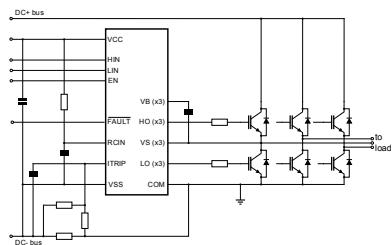
Typical Connection



Voltage Class [V]	Base PN	Technology	Features (See page xx)			Package (See page xx)		
			Current sense	Over-current protection	Separate pin for logic ground	DSO-8	DSO-16 WB	DIP-8
1200	IR2277(1)	JL	✓	✓	✓	✓		
	IR2172	JL		✓		✓	✓	
	IR2175	JL	✓	✓		✓	✓	
	IR2177(1)	JL	✓	✓	✓	✓	✓	
	IR25750	JL		✓				✓

Three Phase

Typical Connection



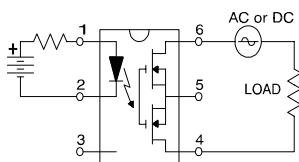
Voltage Class [V]	I_{O+}/I_{O-} typ [mA]	typ prop delay: off/on [ns]	Base PN	Technology	Features (See page xx)					Package (See page xx)										
					Current amplifier	Desaturation protection	Enable	Fault reporting	Integrated bootstrap diode	Output for brake chopper	Over-current protection	Separate pin for logic ground	Shutdown	Under voltage lockout	DSO-20 WB	DSO-28 WB	DIP-28	LCC-32	MQFP-64	TSSOP-28
1200	250/500	700/750	IR2233	JL	✓		✓		✓	✓	✓	✓	✓	✓	✓	✓	✓			✓
			IR2235	JL	✓		✓		✓	✓	✓	✓	✓	✓	✓	✓	✓			
	350/450	550/550	IR2238	JL	✓		✓		✓	✓	✓	✓	✓	✓				✓		
600	165/375	490/530	6ED003L06-F2	SOI		✓	✓		✓	✓		✓	✓	✓						✓
			6EDL04I06(N,P)	SOI		✓	✓	✓	✓	✓		✓	✓	✓						✓
		530/530	6EDL04N06P	SOI		✓	✓	✓	✓	✓		✓	✓	✓						✓
	200/350	400/425	IR2136	JL		✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓
			IR21363	JL		✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓
			IR21365	JL		✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓
			IR21368	JL		✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓
		530/500	IR21364	JL		✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓
	250/500	530/530	IRS2334	JL								✓	✓					✓		
			IRS2336	JL		✓	✓		✓	✓		✓	✓	✓	✓	✓	✓			
			IRS2336D	JL		✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	
			IRS23364D	JL		✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	
			IRS23365D	JL		✓	✓	✓	✓	✓		✓	✓	✓	✓				✓	
200	165/375	490/530	6ED003L02-F2	SOI		✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	
		530/530	6EDL04N02P	SOI		✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	

Half-bridge

Typical Connection				Technology	Features (See page xx)										Package (See page xx)											
Voltage Class [V]	I _o /I _o -typ [mA]	typ prop delay: off/on [ns]	Base PN		Comparator	Current amplifier	Desaturation protection	Enable	Fault reporting	Integrated bootstrap diode	Over-current protection	Programmable dead time	Programmable shutdown	Self-oscillating	Separate pin for logic ground	Shoot-through protection	Shutdown	Soft over-current shutdown	Undervoltage lockout	DSO-8	DSO-14	DSO-18	DIP-8	DIP-14	SSOP-24	VQFN-14
1200	1500/2500	85/85	2ED020I12-F1	CT	✓	✓										✓	✓	✓	✓	✓						
	2000/3000	440/440	IR2214	JL			✓	✓								✓	✓	✓	✓						✓	
700	78/169	220/220	IR7304	JL												✓		✓	✓							
	1900/2300	270/680	IR7184	JL												✓	✓	✓	✓							
650	1500/2500	85/85	2ED020I06-F1	CT												✓	✓	✓								
	78/169	220/220	IR2304	JL												✓		✓	✓						✓	
			IR25601	JL												✓		✓	✓							
			IR21531	JL											✓	✓	✓	✓	✓						✓	
			IR21531D	JL					✓						✓	✓	✓	✓							✓	
			IR25603	JL											✓	✓	✓	✓	✓						✓	
			IRS2153(1)D	JL					✓						✓	✓	✓	✓	✓						✓	
			IR2108	JL												✓		✓	✓							✓
			IR21084	JL												✓		✓	✓							✓
			IR2308	JL													✓		✓	✓						✓
			IR25606	JL													✓		✓	✓						✓
			IR2109	JL													✓	✓	✓	✓						✓
			IR21091	JL													✓	✓	✓	✓						✓
			IR21094	JL													✓	✓	✓	✓						✓
			IR2302	JL													✓	✓	✓	✓						✓
			IR2103	JL													✓		✓	✓						✓
			IR2104	JL													✓	✓	✓	✓						✓
			IR25602	JL													✓	✓	✓	✓						✓
	220/480	500/500	IRS2890D*	JL				✓	✓	✓							✓		✓	✓						
	250/500	150/750	IR2111	JL													✓		✓	✓						✓
			150/150	IRS2304	JL												✓		✓	✓						✓
			150/680	IRS2103	JL												✓		✓	✓						✓
			IRS2104	JL													✓	✓	✓	✓						✓
			150/750	IRS2111	JL												✓		✓	✓						✓
			290/600	IRS2108	JL												✓		✓	✓						✓
			200/220	IRS2308	JL												✓		✓	✓						✓
			200/750	IRS21084	JL												✓	✓	✓	✓						✓
			200/750	IRS2109	JL												✓	✓	✓	✓						✓
			200/750	IRS21091	JL												✓		✓	✓						✓
			360/700	IRS21094	JL												✓	✓	✓	✓						✓
			300/310	2EDL05N06P	SOI					✓							✓		✓	✓						✓
			400/420	2EDL05I06P	SOI					✓							✓		✓	✓						✓
			220/180	IRS2183	JL												✓		✓	✓						✓
			1900/2300	IR2183	JL												✓		✓	✓						✓
			270/680	IR(S)21834	JL												✓	✓	✓	✓						✓
			1900/2300	IRS2184	JL												✓	✓	✓	✓						✓
			1900/2300	IR2184	JL												✓	✓	✓	✓						✓
			1900/2300	IR21844	JL												✓	✓	✓	✓						✓
			2000/3000	IR21844	JL												✓	✓	✓	✓						✓
			2300/2800	440/440	IR2114	JL		✓	✓								✓	✓	✓	✓						✓
			400/420	300/310	2EDL23N06P	SOI		✓	✓	✓	✓						✓	✓	✓	✓						✓
			290/600	150/680	2EDL23I06P	SOI		✓	✓	✓	✓						✓	✓	✓	✓						✓
			290/600	150/680	IRS2003	JL											✓		✓	✓						✓
			290/600	150/680	IRS2008*	JL											✓		✓	✓						✓
			290/600	150/680	IRS2004	JL											✓	✓	✓	✓						✓

Complementary: Opto-Isolated Solid State Relays

Typical Connection



Microelectronic relays are power MOSFET or IGBT output photovoltaic relays where the output switch is controlled by radiation from a GaAlAs light emitting diode (LED) optically isolated from the output to replace mechanical relays

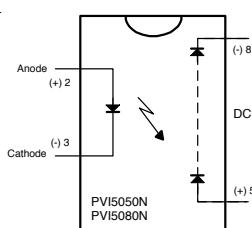
					DIP-4-902	DIP-6	SM DIP-6	DIP-8	SM DIP-8	DIP-4	SM DIP-4	DIP-10
Load Voltage [V]	Load Current [mA]	R _{DS(on)} [Ω]	Isolation Voltage [V _{RMS}]	Base PN	Package (See page xx)							
400	1000 AC/DC	---	3750	PVX6012	✓							
	140 AC/DC	27/7	4000	PVU414		✓	✓					
	120 AC/DC	35/9	4000	PVT412L	✓	✓						
	240 AC/DC	6/2	4000	PVT412A		✓	✓					
	140 AC/DC	27/7	4000	PVT412		✓	✓					
	120 AC/DC	35	4000	PVT422				✓	✓			
300	150 AC/DC	24	4000	PVA3354N						✓	✓	
	50 AC/DC	160		PVA3324N						✓	✓	
				PVA3055N						✓	✓	
				PVA3054N						✓	✓	
250	170 AC/DC	15/4.25	4000	PVT312L	✓	✓						
	190 AC/DC	10/3	4000	PVT312		✓	✓					
	170 AC/DC	8	4000	PVT322A				✓	✓			
	170 AC/DC	10	4000	PVT322			✓	✓				
200	150 AC/DC	24	4000	PVA2352N						✓	✓	
150	550 AC/DC	0.7/0.25	4000	PVT212		✓	✓					
100	360 AC	5	1500	PVR130(0,1)								✓
	550 DC	1,5	4000	PVD1354N						✓	✓	
				PVD1352N						✓	✓	
	375 AC/DC	5		PVA1354N						✓	✓	
				PVA1352N						✓	✓	
60	1500 DC	0,25	4000	PVDZ172N						✓	✓	
	1000 AC	0,5	4000	PVAZ172N						✓	✓	
	1000 AC/2000 DC	0.5/0.15	4000	PVG613*	✓	✓						
	2000 AC/4000 DC	0.1/0.035	4000	PVG612A	✓	✓						
	1000 AC/2000 DC	0.5/0.15	4000	PVG612	✓	✓						
20	2500 AC/4500 DC	0.1/0.04	4000	PVN013*	✓	✓						
	4000 AC/6000 DC	0.05/0.015	4000	PVN012A	✓	✓						
	2500 AC/4500 DC	0.1/0.04	4000	PVN012	✓	✓						

*10 nA leakage current



Complementary: Opto-Isolated Solid State Relays

Typical Connection



Photovoltaic Isolators generate an electrically isolated DC voltage upon receipt of a DC input signal and are capable of directly driving MOSFET or IGBT gates. The output is controlled by radiation from a GaAlAs light emitting diode (LED) optically isolated from the output

	DIP-8	SM DIP-8	DIP - 4	SM DIP-4
PVI5033R	✓	✓		
PVI5013R	✓	✓		
PVI1050N	✓	✓		
PVI5080N			✓	✓
PVI5050N			✓	✓

Output Voltage DC [V]	Short Current [μ A]	Nominal Control Current (DC) [mA]	Isolation Voltage [V _{RMS}]	Base PN	Package (See page xx)			
5/10	10/5	5	5	PVI5033R	✓	✓		
3/6	2/1	5	5	PVI5013R	✓	✓		
5/10	10/5	10	10	PVI1050N	✓	✓		
5	8	10	10	PVI5080N			✓	✓
5	5	10	10	PVI5050N			✓	✓

Features

Addressing various application requirements, Infineon delivers solutions with an assortment of features intended to optimize performance, minimize size and reduce cost. Below is a table of additional Gate Driver IC features available in the current portfolio

Feature	Benefits
Active Miller Clamp	Protection against inadvertent dynamic turn-on because of parasitic effects
Brake Chopper	Integrated brake IGBT driver with protection
Comparator	General purpose comparator included
Current Amplifier	An independent opamp for current measurement or over-current detection
Current Sense	Dedicated input detects over-current events
Dedicated JFET Control	Optimized to drive SiC JFET
Desaturation Protection	Protects the switch (IGBT) at short circuit
Enable	Dedicated pin terminates all outputs
Error Reporting with Shutdown	Pin indicates fault conditions and programs shutdown time
Fault Reporting	Indicates an over-current or Under Voltage shutdown has occurred
Fault Reset	Dedicated pin resets the DESAT-FAULT-state of the chip
High Voltage Start-Up	Provides easy and fast circuit start-up while enabling low circuit standby losses
Integrated Bootstrap Diode	Integrated bootstrap reduces BOM
Over Temperature Shutdown	Internal over temperature protection circuit protects the IC against excessive power loss and overheating
Over-current Protection	Ensures safe application operation in case of over-current
Programmable Dead Time	Dead Time is programmable with external resistor for flexible design
Programmable Shutdown	A shutdown feature has been designed into a pin
Self-Oscillating	Integrated front end oscillator
Separate Pin for Logic Ground	Dedicated pin or logic ground for improved noise immunity
Separate Sink/Source Outputs	Simplifies gate resistor selection, reduces BOM, and improves dV/dt control
Shoot-through Protection	Functionality such as deadtime and interlock
Shutdown	Dedicated pin disables the IC outputs
Soft Over-current Shutdown	Dedicated pin turns off the desaturated transistor, preventing over-voltages
Two-Level Turn-Off	Lowers VCE overshoots at turn off during short circuits or over current events
Under Voltage Lockout	Ensures safe application operation by avoiding unexpected driver behavior

Package Options

Infineon offers a multitude of packages. Below is a list of Gate Driver IC package options which are currently available.



New Product Highlights

The following segment features Infineon's latest gate driver IC families at a glance. Visit the family pages for more information.

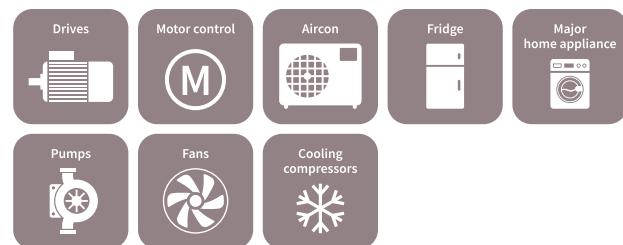
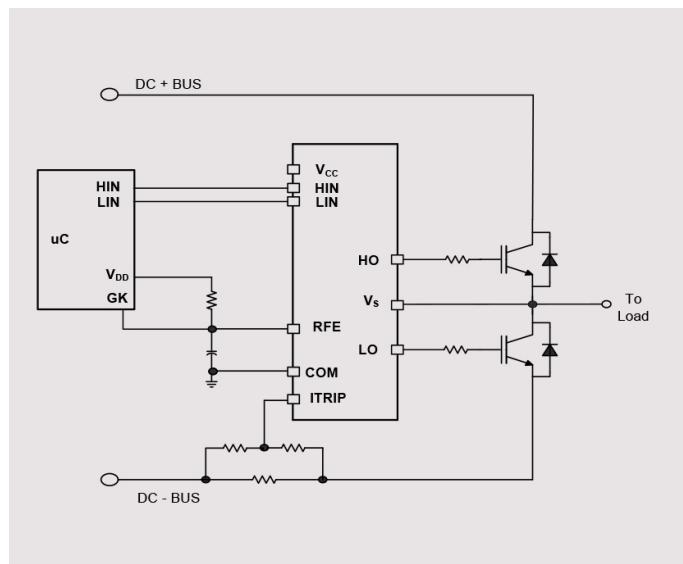
IRS2890DS 600 V Gate Driver IC

600 V half-bridge driver IC with overcurrent protection

The new 600 V half-bridge driver IC is optimized for high voltage motor drive applications in major home appliance applications requiring rigorous standards for reliability and quality.

Designers are constantly challenged with developing compact, energy-efficient solutions while maintaining a high level of reliability and ruggedness. The IRS2980DS is tailored for motor drive applications requiring over current protection and best in class default reporting accuracy in a small form-factor with high voltage IC process to realize a compact, efficient and robust monolithic construction while integrating several features.

The IRS890DS achieves high-power density by integrating the bootstrap FET, Undervoltage (UVLO) protection, shoot-through protection, overcurrent protection, fault reporting, and fault clear function. The overcurrent protection feature has an internal threshold of $\pm 5\%$ for accurate reporting. Additionally, the IRS2890DS has V_s operational logic of -8 V and is tolerant to negative transient voltages. The IRS2890DS is offered in fourteen-pin SOIC and requires the use of less pins than comparable parts on the market.



For more information visit www.infineon.com/IRS2890DS

IRS200x 200 V IC Family

Now including IRS2008

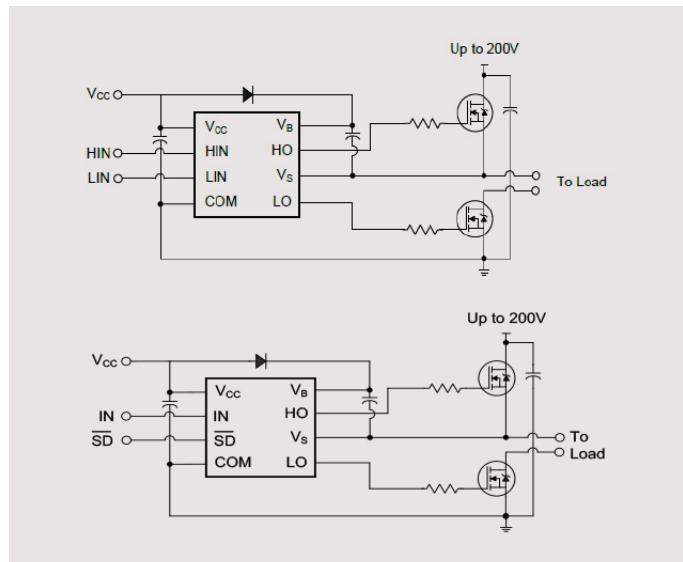
Infineon offers 200 V half-bridge and high- and low- side driver ICs tailored for low-voltage (24 V, 36 V, and 48 V) and mid-voltage (60 V, 80 V, and 100 V) motor drive applications.

The IRS200x family utilizes our advanced high-voltage IC process to realize a compact, efficient and robust monolithic construction.

The IRS200x family consists of seven devices with a typical output sink current of 600 mA and typical output source current of 290 mA. The 200 V devices are 3.3, 5 and 15 V logic compatible. VCC Undervoltage Lockout (UVLO) protection is a standard feature provided across the family while IRS2008 and IRS2005 also include VBS UVLO protection. Additionally,

the IRS2008 has V_s operational logic of -8 V. The IRS2008, IRS2004, and IRS2003 include integrated deadtime and shoot-through protection. The 200 V devices feature low quiescent currents. IRS2008 and IRS2004 also features a shutdown input pin.

The 200 V devices are offered in eight-pin SOIC, eight-pin DIP or fourteen-pin 4 x 4 mm MLPQ packages with various logic input options and standard pin-out configurations for high design flexibility and fast time to market.



For more information visit www.infineon.com/IRS2890DS

2EDL EiceDRIVER™ Compact

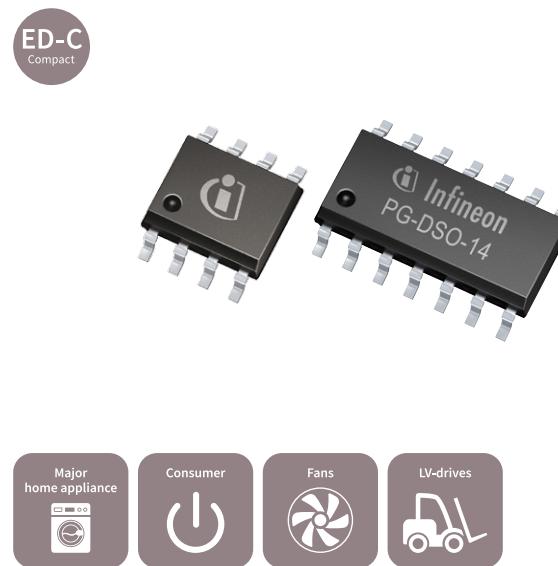
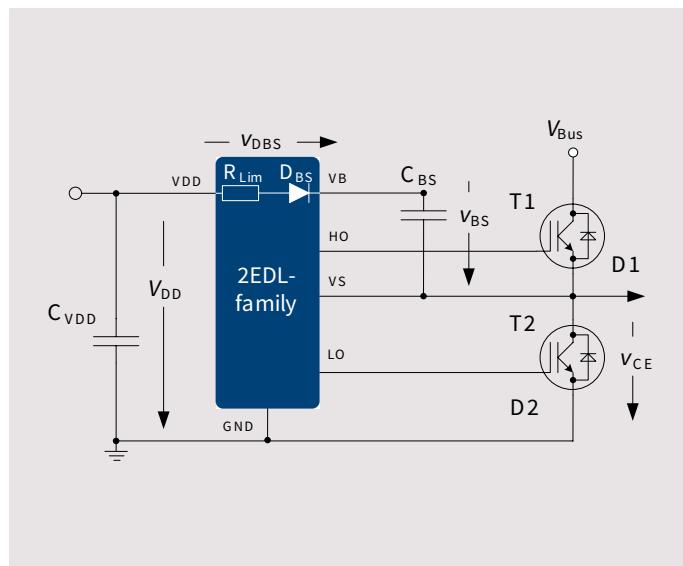
600 V half-bridge gate driver ICs with rugged Infineon SOI technology

The new 2EDL EiceDRIVER™ Compact high-voltage gate driver family meets the ever growing need for higher application efficiency and smaller form factors in consumer electronics and home appliances. It is optimized for the switching behavior and power losses of today's power supplies using IGBT and MOSFETs with dramatically reduced gate charges such as the latest generation of Infineon's CoolMOS™. With a monolithically integrated ultrafast low-ohmic bootstrap diode, the 2EDL Compact sets the benchmark for driver ICs needed in applications with more than 2 A output currents.

The 2EDL Compact family comprises seven 600 V drivers with output currents of 0.5 A and 2.3 A in DSO-8 and DSO-14 150 mil packages for applications based on IGBT or MOSFET switches:

- › The 2EDL05I06BF in DSO-8, optimized for IGBTs, comes without interlock or dead time. It is ideal for switched reluctance motor drives and two-transistor forward switched-mode power supply topologies.
- › The 2EDL05I06PF in DSO-8 and the 2EDL05I06PJ in DSO-14 are optimized for IGBTs and include interlock and dead time. They are recommended for applications such as fans, pumps, major home appliances, power tools, and general purpose inverters. The DSO-14 version is recommended for industrial applications with higher creepage distance requirements.

- › The 2EDL05N06PF in DSO-8 and the 2EDL05N06PJ in DSO-14 boast the same features as the IGBT driver versions and an undervoltage lockout adapted for MOSFETs. They are recommended for servers and telecommunications equipment, low-voltage drives, e-bikes, battery chargers, and half-bridge based switched-mode power supply applications.
- › The 2EDL23I06PJ and 2EDL23N06PJ are 2.3 A half-bridge driver ICs in DSO-14 with interlock, dead time, fault enable, and overcurrent protection. The 2EDL23I06PJ for IGBTs is ideal for applications such as multi-oven IH cookers, fans, pumps, and drives. The 2EDL23N06PJ for MOSFETs is best suited for TV, switched-mode power supplies, servers and telecommunications equipment, e-scooters, forklifts, and battery chargers.



For more information visit www.infineon.com/eicedriver-compact

1EDI20I12SV EiceDRIVER™

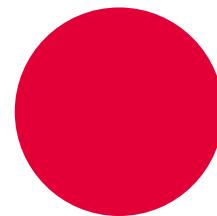
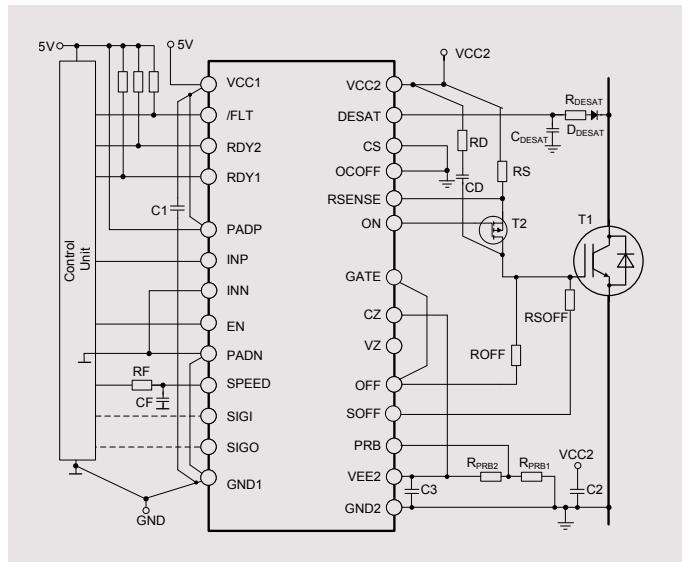
1200 V single-channel driver IC

Features

- › 1200 V single-channel IGBT driver IC
- › Unique: precise dynamic gate current control
- › Unique: selective short circuit protection for 3-level inverters
- › Overcurrent protection for sense IGBTs and conventional IGBTs
- › Protection: DESAT, soft turn-off and two-level turn-off

Benefits

- › Low EMI during low load conditions and high efficiency during high load conditions
- › Reduction or elimination of dv/dt filter



For more information visit www.infineon.com/???

1EDI EiceDRIVER™ Compact 150-mil and 300-mil

1200 V galvanically isolated single-channel wide body gate driver IC family

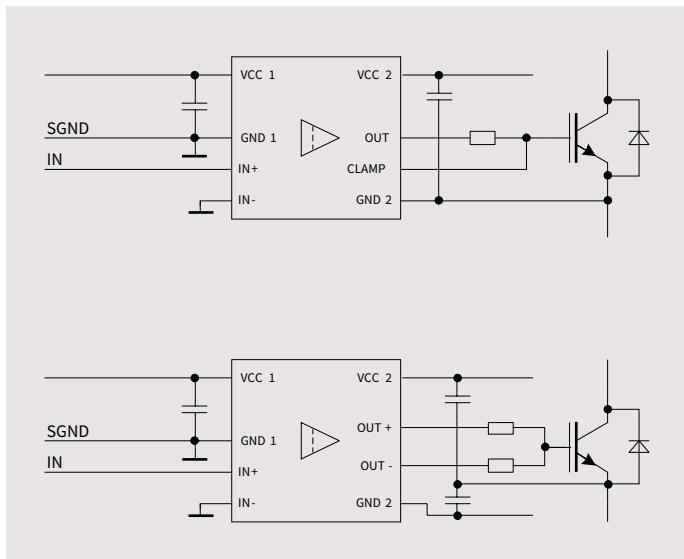
Our new 1EDI EiceDRIVER™ Compact family complements our extensive range of high-voltage driver ICs for a market that demands easy-to-use drivers with a small footprint for quick design-in cycles. The driver family is based on Infineon's coreless transformer technology, enabling a benchmark setting minimum common mode transient immunity (CMTI) of 100 kV/μs with drive strengths of up to 6 A on separate output pins for sourcing and sinking. They are ideal for IGBT based applications such as photovoltaic string inverters, charge stations for electric vehicles, industrial drives, welding equipment, induction heating appliances and power supplies for servers and telecommunication systems

Features

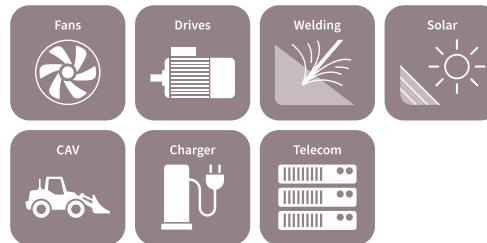
- › Single channel isolated high-voltage gate driver IC
- › 12 V input-to-output isolation voltage
- › Drives high voltage power MOSFETs and IGBTs
- › Up to 6 A minimum peak rail-to-rail output
- › Separate source and sink outputs or active Miller clamp
- › DSO-8 300 mil wide body package option with 8 mm creepage distance

Benefits

- › Best in class Common Mode Transient Immunity (CMTI): 100kV/μs
- › Wide input operating range (3...17 V)
- › No voltage/signal adaptation between μC and driver necessary



ED-C
Compact



For more information visit www.infineon.com/300mill

1EDN and 2EDN EiceDRIVER™ Families

Rugged, cool and fast, 1-channel low-side 4/8 A gate driver ICs

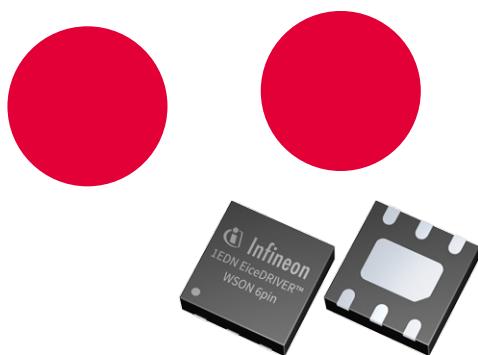
1-channel (1EDN) and 2-channel (2EDN) MOSFET gate driver ICs are the crucial link between control ICs and powerful MOSFET and GaN switching devices. Gate driver ICs enable high system level efficiencies, excellent power density and consistent system robustness.

Fast, precise, strong and compatible

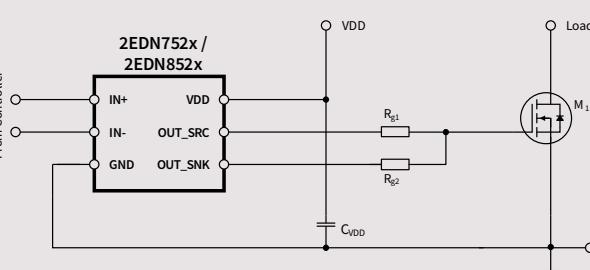
- › Highly efficient SMPS enabled by 5ns short slew rates and ± 5 ns propagation delay precision for fast MOSFET and GaN switching
- › Separate source and sink outputs simplify the application design
- › Industry standard packages and pinout ease system design upgrades

The new reference in ruggedness and low power dissipation

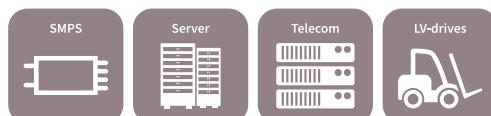
- › -10V robustness of control and enable inputs provides crucial safety margin when driving pulse transformers
- › 5A reverse output current robustness eliminates the need for Schottky switching diodes when driving MOSFETs in T0-220 and T0-247 packages
- › Cool driver ICs from true rail-to-rail low impedance output stages
- › 4V and a8v UVLO (Under Voltage Lock Out) options for instant MOSFET protection during start-up and under abnormal conditions



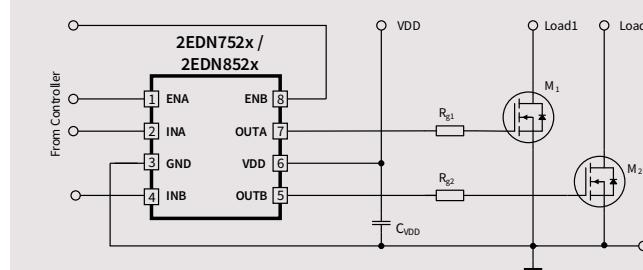
1EDN



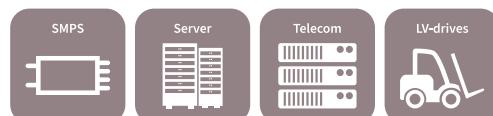
For more information visit www.infineon.com/1edn



2EDN



For more information visit www.infineon.com/2edn



Infineon's Powerful Gate Driver IC Support

Useful links and helpful tools

Gate Driver IC Selection Tool

To simplify the gate driver selection process, Infineon offers an online easy-to-use Gate Driver Selection Tool. By selecting a few key parameters, the tool quickly guides you in finding the right driver for your application.

Selection Criteria

- 1** Voltage Class
- 2** Driver Current
- 3** Driver Configuration
- 4** Switch Type
- 5** Isolation Requirement
- 6** Qualification Level



Start Exploring Today! Visit www.infineon.com/gatedriver

Infineon Designer

Select gate driver prototypes are available on www.infineon.com/ifxdesigner. Infineon Designer is an online prototyping engine combining analog and digital simulation functionalities in an internet application. Requiring web browser only, it is a perfect match for supporting customers in selecting the right product for a defined application.

Start here >

be smart. prototype online.

Welcome to Infineon Designer

Infineon Designer is the first online prototyping engine combining analog and digital simulation functionalities in an internet application. Requiring a web browser only, it is a perfect match for supporting customers in selecting the right product for a defined application. Infineon Designer works intuitively in a very short time, and neither installation nor licenses are needed. Please start with one of the following application circuits.

Why to use Infineon Designer

• Why to use Infineon Designer

Tools

- Multicopter BLDC Motor
- LED Lighting and Dimming
- Industrial DC Motor
- PWM generator
- User System test

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INFUS BOARD V2 with IR2301 Driver and BSG0925ND Optoisolator

This circuit is used to drive brushed DC motors in a servomotor configuration via Hall detection and back EMF commutation. The maximum speed is determined by the motor parameters and the driver current limit. The driver can be controlled via PWM or analog input. The driver has two channels with a total output current of 10...1500 mA.

Bus online

Product info: IR2301
Datasheet: BSG0925ND
Infineon's solutions for multicopters
MGFET Finder
Other circuits

Motor

The delta connection equates the circuit below:

Simulate Transient

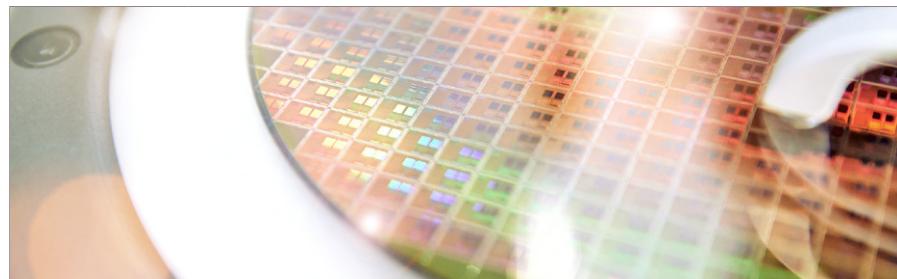
Gate Driver IC Evaluation Boards

EiceDRIVER™ Evaluation Boards are available on www.infineon.com/tool. The boards enable fast evaluation, prototyping and system design by demonstrate key characteristics and benefits of Infineon Gate Driver ICs.

Evaluation Board	 <p>EVAL-6EDL04I06PT Single EiceDRIVER™ with six 600 V Trenchstop™ Infineon IGBTs in full-bridge configuration</p>	 <p>EVAL-6EDL04N02PR Single EiceDRIVER™ with six 80 V OptimOS™ Infineon MOSFETs in full-bridge configuration</p>	 <p>EVAL-2EDL23I06PJ Single EiceDRIVER™ with two 600 V Infineon IGBTs in half-bridge configuration</p>	 <p>EVAL-2EDL23N06PJ Single EiceDRIVER™ with two 600 V Infineon COOLMOS™ MOSFETs in half-bridge configuration</p>
Featured Gate Driver	 <p>6EDL04I06PT LS-SOI 600 V Three-Phase gate driver IC with ultra fast bootstrap diode and integrated protective features (interlock, over-current protection, fault reporting, and under voltage lock out)</p>	 <p>6EDL04N02PR LS-SOI 200 V Three-Phase gate driver IC with ultra fast bootstrap diode and integrated protective features (interlock, over-current protection, fault reporting, and under voltage lock out)</p>	 <p>2EDL23I06PJ LS-SOI 600 V half bridge gate driver IC with ultra fast bootstrap diode and integrated protective features (interlock, over-current protection, fault reporting, and under voltage lockout)</p>	 <p>2EDL23N06PJ LS-SOI 600 V half bridge gate driver IC with ultra fast bootstrap diode and integrated protective features (interlock, over-current protection, fault reporting, and under voltage lockout)</p>
Evaluation Board	 <p>EVAL-1EDI60I12AF Two EiceDRIVER™s with two 600 V TRENCHSTOP™ Infineon IGBTs in half-bridge configuration</p>	 <p>EVAL-1ED020I12-BT Two EiceDRIVER™s with two 1200 V Infineon IGBTs in half-bridge configuration</p>	 <p>EVAL-1ED020I12-B2 Two EiceDRIVER™s with two 1200 V Infineon IGBT module</p>	
Featured Gate Driver	 <p>1EDI60I12AF Galvanically Isolated CT 1200 V single channel gate driver IC for high voltage power IGBTs</p>	 <p>1ED020I12-BT Galvanically Isolated CT 1200 V single channel gate driver IC for high voltage power IGBTs with integrated protective features (desaturation detection, two-level turn-off, active miller clamping)</p>	 <p>1ED020I12-B2 Galvanically Isolated CT 1200 V single channel gate driver IC for high voltage power IGBTs with integrated protective features (desaturation detection, two-level turn-off, active miller clamping)</p>	<p>Contact your local Infineon sales team for evaluation board availability information.</p>

Gate Driver IC Chips for Integrators

Infineon offers gate driver IC chips to address the on-going trend of integrating the driver, power stages, controllers and other components into a smaller, more efficient single package.



Driver Configuration	Voltage Class [V]	I_{O+}/I_{O-} typ [mA]	typ prop delay: off/on [ns]	Base PN	Technology	Features (See page xx)								Chip				
						Current amplifier	Current sense	Enable	Fault reporting	Integrated bootstrap diode	Over-current protection	Programmable shutdown	Self-oscillating	Separate pin for logic ground	Shoot-through protection	Shutdown	Under voltage lockout	
Single High-Side Driver	600	250/500	105/250	IR2117	J1											✓	✓	
			150/200	IR2127	J1	✓	✓		✓						✓	✓	✓	
			IR2128	J1	✓	✓		✓							✓	✓	✓	
		290/600	105/125	IRS211(7,8)	J1											✓	✓	✓
			150/150	IRS2127	J1	✓	✓	✓	✓						✓	✓	✓	
High-side and low-side	600	1200	2000/2500	225/280	IR2213	J1								✓		✓	✓	✓
		290/600	210/360	150/160	IR2101	J1										✓	✓	✓
			130/135	IRS2112	J1									✓	✓	✓	✓	
			150/160	IRS2101	J1									✓	✓	✓	✓	
			200/220	IRS2106	J1										✓	✓	✓	
			1900/2300	220/180	IRS2181	J1								✓	✓	✓	✓	
			2500/2500	94/120	IR2113	J1							✓		✓	✓	✓	
			120/130	IRS2113	J1								✓	✓	✓	✓	✓	
		4000/4000	170/170	IRS2186	J1										✓	✓	✓	
		500	2500/2500	120/130	IRS2110	J1							✓		✓	✓	✓	
		200	1000/1000	60/60	IRS2011	J1									✓	✓	✓	
			3000/3000	65/95	IR2010	J1							✓		✓	✓	✓	
Half Bridge	600	290/600	180/260	na	IR21531	J1					✓	✓	✓	✓	✓	✓	✓	
			150/150	IRS2304	J1						✓	✓	✓	✓	✓	✓	✓	
			150/680	IRS2103	J1								✓		✓	✓	✓	
			150/750	IRS2104	J1								✓	✓	✓	✓	✓	
			200/220	IRS2111	J1								✓		✓	✓	✓	
			200/750	IRS2108	J1								✓		✓	✓	✓	
			200/750	IRS2308	J1								✓		✓	✓	✓	
		1900/2300	220/180	IRS2109	J1								✓	✓	✓	✓	✓	
			270/680	IRS2183	J1								✓		✓	✓	✓	
				IRS2184	J1								✓	✓	✓	✓	✓	
Three-Phase	600	1200	250/500	700/750	IR2233	J1	✓		✓	✓			✓		✓	✓	✓	✓
		165/375	490/530	6ED003L06-F2	SOI		✓	✓		✓			✓		✓	✓	✓	
			530/530	6EDL04I06(N,P)	SOI		✓	✓	✓	✓			✓		✓	✓	✓	
			530/530	6EDL04N06P	SOI		✓	✓	✓	✓			✓		✓	✓	✓	
		200/350	400/425	IR2136	J1		✓	✓		✓			✓		✓	✓	✓	
			IR21363	J1		✓	✓		✓				✓		✓	✓	✓	
			IR21368	J1		✓	✓		✓				✓		✓	✓	✓	
			530/500	IR21364	J1		✓	✓		✓			✓		✓	✓	✓	
		250/500	530/530	IRS2336D	J1		✓	✓	✓	✓			✓		✓	✓	✓	
			425/675	IRS23364D	J1		✓	✓	✓	✓			✓		✓	✓	✓	
		700/750	IR213(0,2)	IR2135	J1	✓			✓	✓			✓		✓	✓	✓	

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