



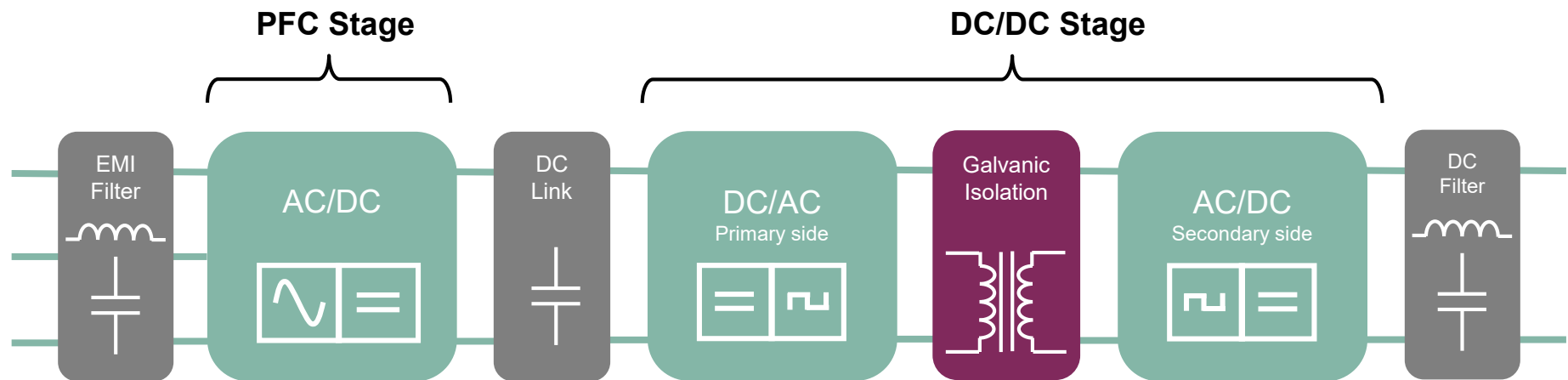
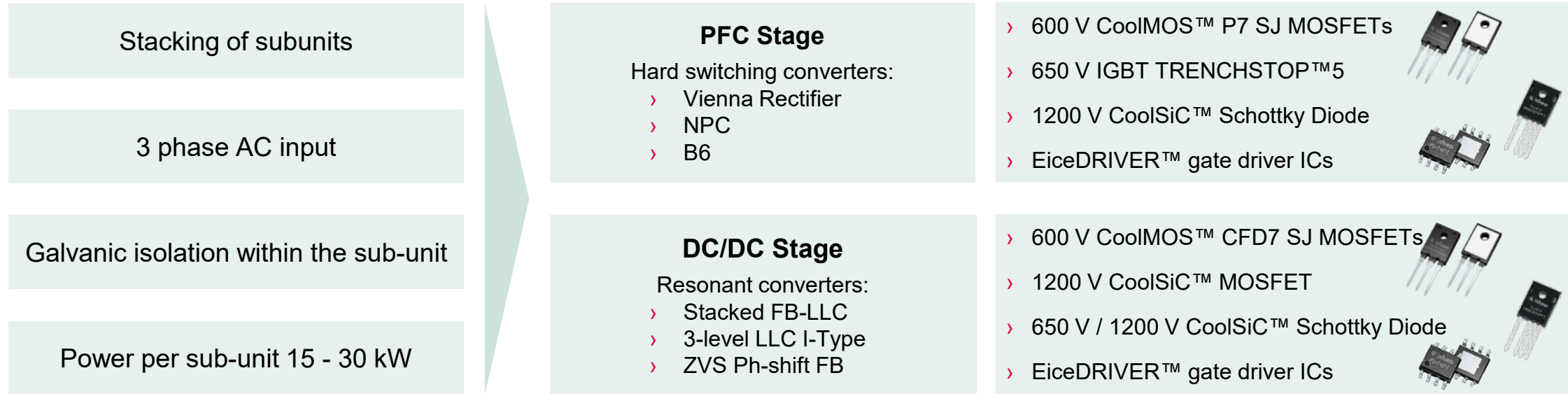
Gate Driver ICs for EV charging stations and wall boxes

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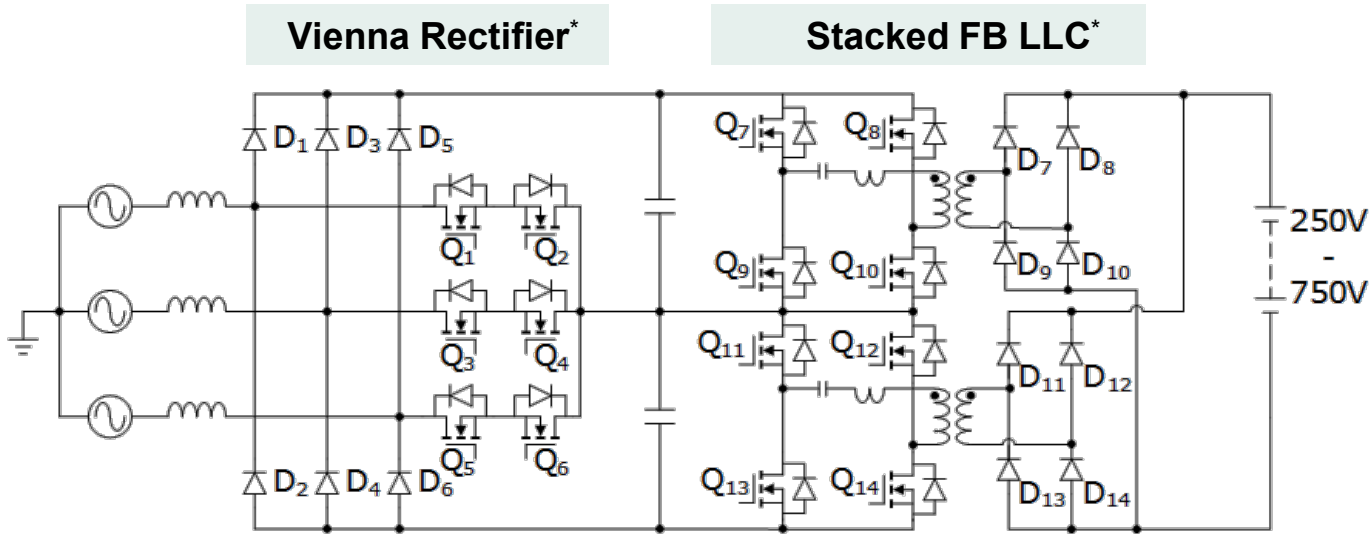
Fast charging stations from 20 kW to 350 kW

Functional block diagram overview



Solution for 30 kW EV-charging module / wall-box

- example -



Key features and benefits

- > High efficiency
 - Super Junction CoolMOS™
 - CoolSiC™ Schottky diode
- > Low design complexity
- > Fast time to market

Stage	Switching Frequency	Devices	Product	Part number	Qty
AC/DC	40 kHz	Q ₁ - Q ₆	650 V IGBT TRENCHSTOP™ 5 H5	IKW75N65EH5	12
		D ₁ - D ₆	1200 V CoolSiC™ Schottky diode	IDWD20G120C5	12
		Driver IC	EiceDRIVER™ X3 Compact	1ED3121MC12H	6
DC/DC	up to 300kHz	Q ₇ - Q ₁₄	600 V CoolMOS™ CFD7 SJ MOSFET	IPW60R037CSFD	16
		D ₇ - D ₁₄	1200 V CoolSiC™ Schottky diode	IDWD30G120C5	16
		Driver IC	EiceDRIVER™ 2EDi	2EDS8265H	4

Application example

- > 50 A max.
- > 20 kW, 50 A @400 V
- > Air cooled
- > Vienna rectifier for PFC with 2 paralleled MOSFETs
- > 2 stacked FB LLC with 2 paralleled MOSFETs
- > DC Link Voltage 780 V - 840 V

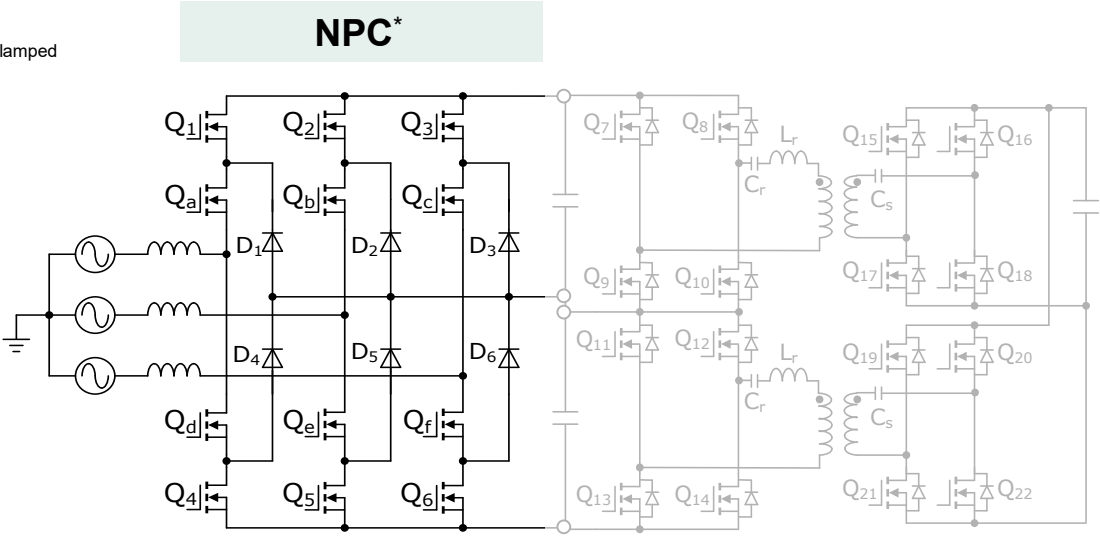
*) Simplified schematic diagram. Symbols for the schematic diagram are only for illustration purposes and does not refer to the proposed bill of material.

#) with digital isolator for PWM signal

NPC PFC-stage for Bidirectional charging station / wall-box



NPC =
Neutral Point Clamped



Key features and benefits

- › Bi-directional (reactive power, e-storage)
- › Low ripple inductor-current
- › Fixed switching frequency
- › Using 650 – 600 V break-down voltage devices for high input and high output voltage
- › Isolated gate driver ICs

Power	Product type	Devices	Product	Part number	Qty
20 kW	MOSFET	Q ₁ - Q ₆	650 V CoolSiC™	IMW65R048M1H	6
		Q _a - Q _f	600 V CoolMOS™	IPW60R060P7/C7	6
	Diode	D ₁ - D ₆	650 V CoolSiC™ G6	IDH10G65C6	6
30 kW	MOSFET	Q ₁ -Q ₆	650 V CoolSiC™	IMW65R027M1H	6
		Q _a -Q _f	600 V CoolMOS™	IPW60R037P7/040C7	6
	Diode	D ₁ -D ₆	650 V CoolSiC™ G6	IDH16G65C6	6
	Driver IC		EiceDRIVER™ for CoolSiC™	1ED3122MC12H	3
			EiceDRIVER™ for CoolMOS™	2EDF7275F	3

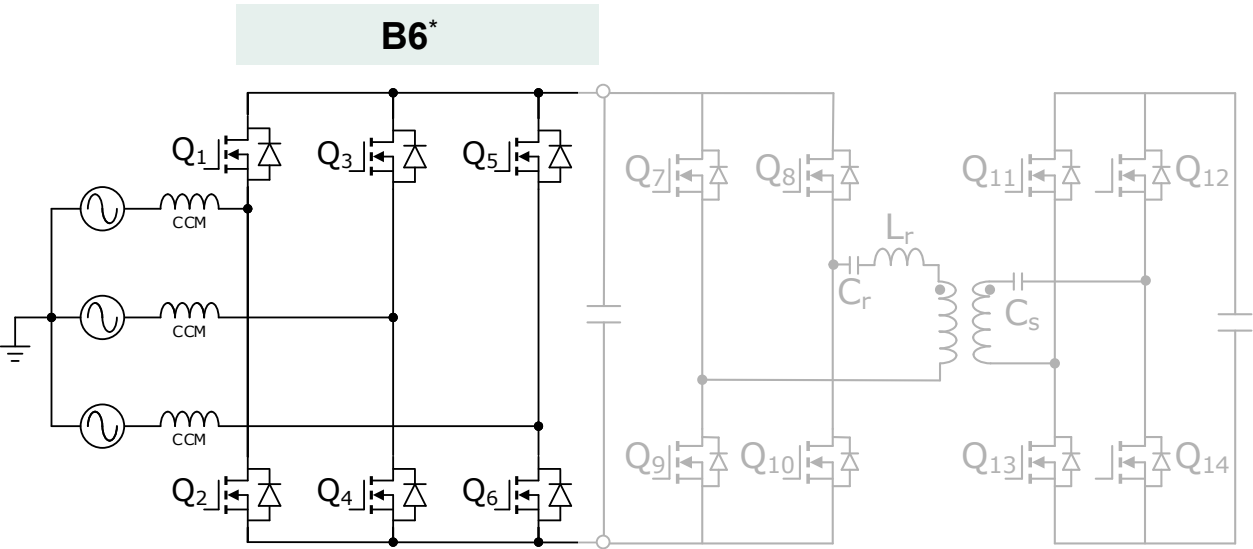
Application example

- › CCM operation 3-level active neutral clamping converter requires:
 - Low reverse characteristic body diode at Q₁ - Q₆ and D₁ - D₆ SiC diode
 - Q_a - Q_f are operated at switching frequency. Q_a and Q_d are operated as complementary switch
- › Input voltage is 3-phase 380 Vac
- › Output voltage is +380 to 0 V to - 380 V

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B6 in PFC stage in charging station / wall-box

- example -



Key features and benefits

- › Low component count
- › Bi-directional (reactive power, e-storage)
- › Fixed switching frequency
- › Simple control method
- › Isolated gate driver ICs

Power	Product type	Devices	Product	Part number	Qty
20 kW	MOSFET / IGBT	Q ₁ - Q ₆	1200V CoolSiC™	IMW120R045M1	6
		Q ₁ - Q ₆	1200V IGBT HighSpeed 3	IGW40N120H3	6
	IGBT Diode		1200V CoolSiC™ G5	IDWD30G120C5	6
30 kW	MOSFET	Q ₁ - Q ₆	1200V CoolSiC™	IMW120R030M1H	6
		Q ₁ - Q ₆	1200V IGBT HighSpeed 3	IGW25N120H3	12
	IGBT Diode		1200V CoolSiC™ G5	IDWD20G120C5	12
	Driver IC		EiceDRIVER™ for CoolSiC™	1ED3122MC12H	6
			EiceDRIVER™ for HighSpeed 3	1ED3121MC12H	3

Application example

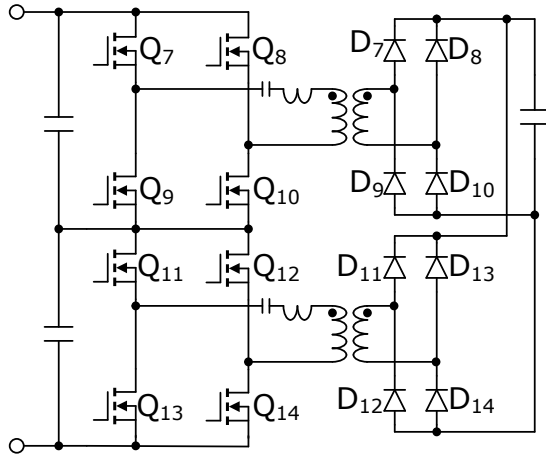
- › CCM operation: 1200V CoolSiC™ or 1200V IGBT with anti-parallel SiC diode required in all switches
- › Q₁ - Q₆ operate at switching frequency
- › Q₁ - Q₆ anti-parallel diodes required to conduct forward current
- › Input voltage: 3-phase 380 Vac
- › Output voltage is 0 V to 800 V
- › Bi-directional power flow possible

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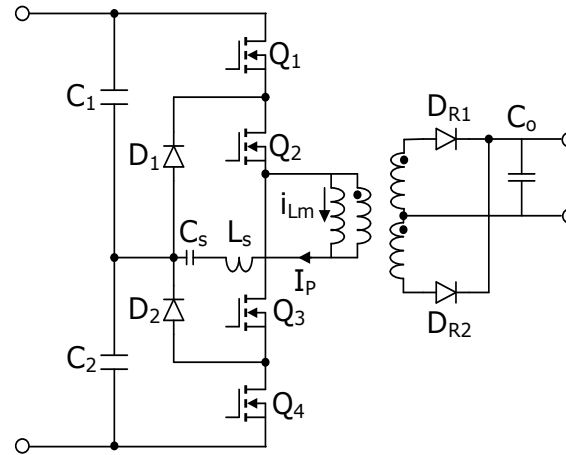
Unidirectional DC/DC stage alternatives

- example -

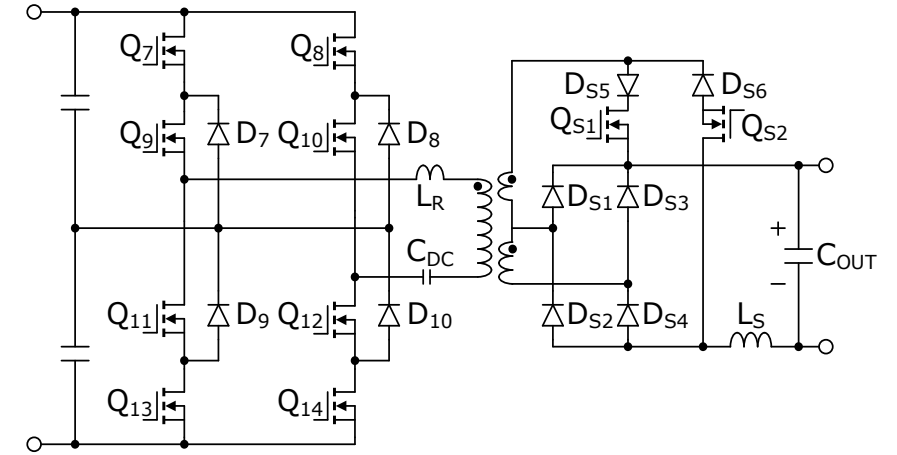
Stacked FB LLC*



3-level LLC I-type*



Phase-shift ZVS FB*



Topology	Product type	Devices	Product	Part number
Stack full-bridge LLC ▪ Traditional approach	MOSFET	Q ₇ - Q ₁₄	600/650 V CoolMOS™ CFD7	IPW60R0XXCFD7
	Reinforced Isolated driver		EiceDRIVER™ for CoolMOS™	2EDS8265H
Three-level LLC ▪ for <u>continuous</u> wide range output voltage, e.g. for PRC and ROK	MOSFET	Q ₁ - Q ₄	600/650 V CoolMOS™ CFD7	IPW60R0XXCDF7
	Reinforced Isolated driver		EiceDRIVER™ for CoolMOS™	2EDS8265H
Phase-shift ZVS full-bridge ▪ most frequently used today: straight forward design	MOSFET	Q ₇ - Q ₁₄ Q _{s1} - Q _{s2}	600/650 V CoolMOS™ CFD7 600 V CoolMOS™ C7	IPW60R0XXCFD7 IPW60R0XXC7
	Reinforced Isolated driver Functional Isolated driver		EiceDRIVER™ for CoolMOS™	2EDS8265H 1EDB8275F

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Gate-Driver ICs for EV Charging Stations and Wall Boxes

- examples -

EiceDRIVER™ 1ED3121

1-channel galvanically isolated gate-driver IC



- › Source current: 5.5 A (0.95 Ω)
- › Sink current: 5.5 A (0.75 Ω)
- › V_{IOTM} : 8000 V_{peak}
- › $UVLO_{VDD_on}$: 12.5 V
- › Package: DSO 8-pin 300 mil
- › Separate source and sink output

www.infineon.com/1ED3121

EiceDRIVER™ 1EDB

1-channel galvanically isolated gate-driver IC



- › Source current: 5.4 A (0.95 Ω)
- › Sink current: 9.8 A (0.48 Ω)
- › V_{IOTM} : 4242 V_{peak}
- › $UVLO_{VDD_on}$: 4.2 / 8.0 / 12.2 / 14.9 V
- › Prop. delay accuracy: + 4 ns / - 4 ns
- › Package: DSO 8-pin 150 mil

www.infineon.com/1edb

EiceDRIVER™ 2EDF

2-channel galvanically isolated gate-driver IC



- › Source current: 4 A (0.85 Ω)
- › Sink current: 8 A (0.35 Ω)
- › V_{IO} : 1500 V
- › $UVLO_{VDD_on (typ.)}$: 4.2 V, 13.7V
- › Prop. delay accuracy: + 7 ns / - 6 ns
- › Package: DSO 16-pin 150 mil

www.infineon.com/2edi

EiceDRIVER™ 1ED3122

1-channel galvanically isolated gate-driver IC



- › Source current: 10 A (0.55 Ω)
- › Sink current: 9 A (0.45 Ω)
- › V_{IOTM} : 8000 V_{peak}
- › $UVLO_{VDD_on (typ.)}$: 10.0 V
- › Packages: DSO 8-pin 300 mil
- › Miller clamp

www.infineon.com/1ED3122

EiceDRIVER™ 2EDN

2-channel low-side gate-driver IC



- › Source current: 5 A (0.65 Ω)
- › Sink current: 5 A (0.5 Ω)
- › $UVLO_{VDD_on (typ.)}$: 4.2 V, 8.0 V
- › Prop. delay accuracy: + 6 ns / - 4 ns
- › Packages: DSO, TSSOP, WSON

www.infineon.com/2edn

EiceDRIVER™ 2EDS

2-channel galvanically isolated gate-driver IC



- › Source current: 4 A (0.85 Ω)
- › Sink current: 8 A (0.35 Ω)
- › V_{IOTM} : 8000 V_{peak}
- › $UVLO_{VDD_on (typ.)}$: 4.2 V, 8.0 V, 13.7 V
- › Prop. delay accuracy: + 7 ns / - 6 ns
- › Package: DSO 16-pin 300 mil

www.infineon.com/2edi



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