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Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

Email & Skype: info@chipsmall.com Web: www.chipsmall.com

Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China



2SD300C17A3 Preliminary Datasheet

Dual-Channel High-quality and Low-cost SCALE™-2 Driver Core

Abstract

The SCALE™-2 dual-driver core 2SD300C17A3 is a second source to Infineon's 2ED300C17-S and 2ED300C17-ST. The driver is fully pin and function-compatible to the 2ED300C17-S/2ED300C17-ST and was designed for applications in which high reliability is expected.

The use of Power Integrations' highly integrated SCALE-2 chipset allows 63% of the components to be dispensed with compared to the 2ED300C17-S/2ED300C17-ST. This advantage is impressively reflected in increased reliability (function and MTBF) with simultaneously lower costs.

The 2SD300C17A3 combines a complete two-channel driver core with all components required for driving, such as an isolated DC/DC converter, short-circuit protection, failure soft shut down, short pulse suppression as well as supply voltage monitoring. Each of the two output channels is electrically isolated from the primary side and the other secondary channel.

The driver provides a gate voltage swing of $\pm 15V$. An output current of 30A and 4W drive power is available per channel.

Its outstanding EMC with a dv/dt strength of more than 50V/ns allows safe and reliable operation in even the demanding industrial applications

Product Highlights

- ✓ Dual channel driver
- ✓ Highly integrated SCALE-2 chipset
- ✓ Switching frequency up to 60kHz
- ✓ Gate current $\pm 30A$
- ✓ 4W output power per channel
- ✓ Direct and half-bridge mode
- ✓ IGBT short-circuit protection
- ✓ Failure soft shut down
- ✓ Isolated DC/DC converter
- ✓ Safe isolation to EN 50178
- ✓ UL compliant
- ✓ Reliable, long service life
- ✓ Lead free

Applications

- ✓ 1:1 replacement of 2ED300C17-S
- ✓ 1:1 replacement of 2ED300C17-ST
- ✓ IGBTs up to 1700V

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Safety Notice!

The data contained in this data sheet is intended exclusively for technically trained staff. Handling all high-voltage equipment involves risk to life. Strict compliance with the respective safety regulations is mandatory!

Any handling of electronic devices is subject to the general specifications for protecting electrostatic-sensitive devices according to international standard IEC 60747-1, Chapter IX or European standard EN 100015 (i.e. the workplace, tools, etc. must comply with these standards). Otherwise, this product may be damaged.

Important Product Documentation

This data sheet contains only product-specific data. For a detailed description, must-read application notes and important information that apply to this product, please refer to "2SD300C17 Description & Application Manual" on www.power.com/igbt-driver/go/2SD300C17.

Absolute Maximum Ratings

Parameter	Remarks	Min	Max	Unit
Supply voltage V_{DC}	VDC to GND	0	16	V
Supply voltage V_{DD}	VDD to GND	0	16	V
Logic input voltages	INA, INB and Mod to GND	-0.5	20	V
Logic output voltages	SOA and SOB to GND	-0.5	VDD+0.5	V
SOx current	Failure condition, total current		20	mA
Gate peak current I_{out}	Note 1	-30	+30	A
Gate resistance	Turn-on and turn-off	1		Ω
IGBT gate charge			50	μ C
Average supply current I_{DC}	Notes 2, 3		540	mA
Output power	Ambient temperature $\leq 70^{\circ}\text{C}$ (Notes 4, 5)		4	W
	Ambient temperature $\leq 85^{\circ}\text{C}$ (Note 4)		3	W
Switching frequency f			60	kHz
Test voltage (50Hz/1min.)	Primary to secondary (Note 11)		5000	$V_{AC(eff)}$
	Secondary to secondary (Note 11)		4000	$V_{AC(eff)}$
$ dV/dt $	Rate of change of input to output voltage		50	kV/ μ s
Operating voltage	Primary and secondary to secondary side		1700	V_{peak}
Operating temperature	Note 5	-40	+85	$^{\circ}\text{C}$
Storage temperature		-40	+90	$^{\circ}\text{C}$

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Recommended Operating Conditions

Power Supply	Remarks	Min	Typ	Max	Unit
Supply voltage V_{DC}	VDC to GND	14	15	16	V
Supply voltage V_{DD}	VDD to GND	14	15	16	V
Input logic level	INx and Mod to GND, high level		VDD		V
Input logic level	INx and Mod to GND, low level		0		V

Electrical Characteristics

All data refer to +25°C and $V_{DC} = V_{DD} = 15V$ unless otherwise specified.

Power supply	Remarks	Min	Typ	Max	Unit
Supply current I_{DC}	Without load		65		mA
Supply current I_{DD}	Direct mode, $f = 0Hz$		14		mA
Supply current I_{DD}	Direct mode, $f = 60kHz$		21		mA
Coupling capacitance C_{i0}	Primary to secondary, per channel		28		pF
	Secondary to secondary		17		pF

Power Supply Monitoring	Remarks	Min	Typ	Max	Unit
Supply threshold V_{DD}	Primary side, clear fault	11.9	12.6	13.3	V
	Primary side, set fault (Note 6)	11.3	12.0	12.7	V
Monitoring hysteresis	Primary side, set/clear fault	0.35			V
Supply threshold $V_{x+}-V_{COMx}$	Secondary side, clear fault	12.1	12.6	13.1	V
	Secondary side, set fault (Note 7)	11.5	12.0	12.5	V
Monitoring hysteresis	Secondary side, set/clear fault	0.35			V
Supply threshold $V_{COMx}-V_{x-}$	Secondary side, clear fault	5	5.15	5.3	V
	Secondary side, set fault (Note 7)	4.7	4.85	5	V
Monitoring hysteresis	Secondary side, set/clear fault	0.15			V

Logic Inputs and Outputs	Remarks	Min	Typ	Max	Unit
Input impedance	INx and Mod		3.9		k Ω
Turn-on threshold	V(INx)		8.1		V
Turn-off threshold	V(INx)		4.8		V
SOx output voltage	Failure condition, $I(SOx) < 20mA$			0.7	V

Short-Circuit Protection	Remarks	Min	Typ	Max	Unit
Rth value	Between RCx and COM x	2		70	k Ω
Blocking time	Note 10		27		ms

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External Fault input	Remarks	Min	Typ	Max	Unit
Threshold level	Between E.x and COM x		5		V
Timing Characteristics	Remarks	Min	Typ	Max	Unit
Turn-on delay $t_{d(on)}$	Direct mode (Note 8)		620		ns
Turn-off delay $t_{d(off)}$	Direct mode (Note 8)		480		ns
Short pulse suppression	Turn-on command pulse width		470		ns
	Turn-off command pulse width		300		ns
Dead time between channels	Half-bridge mode, with CA=CB=0pF (Note 13)		1.3		µs
Transmission delay of fault state	Note 9		450		ns
Output Voltage	Remarks	Min	Typ	Max	Unit
Turn-on voltage	Gate x to COM x		15		V
Turn-off voltage	Gate x to COM x		-15		V
Electrical Isolation	Remarks	Min	Typ	Max	Unit
Test voltage (50Hz/1s)	Primary to secondary side (Note 11)	5000	5050	5100	V_{eff}
	Secondary to secondary side (Note 11)	4000	4050	4100	V_{eff}
Partial discharge extinction volt.	Primary to secondary side (Note 12)	1768			V_{peak}
	Secondary to secondary side (Note 12)	1700			V_{peak}
Creepage distance	Primary to secondary side	16.2			mm
	Secondary to secondary side	14.2			mm
Clearance distance	Primary to secondary side	16.2			mm
	Secondary to secondary side	6.5			mm
Output	Remarks	Min	Typ	Max	Unit
Blocking capacitance	Vx+ to COM x		9.4		µF
	COM x to Vx-		9.4		µF

Footnotes to the Key Data

- 1) The maximum peak gate current refers to the highest current level occurring during the product lifetime. It is an absolute value and does also apply for short pulses.
- 2) The average supply input current is limited for thermal reasons. Higher values than specified by the absolute maximum rating are permissible (e.g. during power supply start up) if the average remains below the given value, provided the average is taken over a time period which is shorter than the thermal time constants of the driver in the application.
- 3) There is no means of actively controlling or limiting the input current in the driver. In the case of start-up with very high blocking capacitor values, or in case of short circuit at the output, the supply input current has to be limited externally.
- 4) The maximum output power must not be exceeded at any time during operation. The absolute maximum rating must also be observed for time periods shorter than the thermal time constants of the driver in the application.
- 5) An extended output power range is specified for maximum ambient temperatures of 70°C.

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- 6) Undervoltage monitoring of the primary-side supply voltage (V_{DD} to GND). If the voltage drops below this limit, a fault is transmitted to both outputs SOA and SOB and the IGBTs are switched off.
- 7) Undervoltage monitoring of the secondary-side supply voltage (V_{x+} to COM x and COM x to V_{x-} which correspond with the approximate turn-on and turn-off gate-emitter voltages). If the corresponding voltage drops below this limit, the IGBT is switched off and a fault is transmitted to the corresponding SOx output on the primary side.
- 8) The delay time is measured between 50% of the input signal and 10% (turn-on) or 90% (turn-off) of the corresponding output.
- 9) Transmission delay of fault state from the secondary side to the primary status output.
- 10) The blocking time sets a minimum time span between the end of any fault state and the start of normal operation (remove fault from pin SOx). The value of the blocking time is programmed on the driver and cannot be modified externally.
- 11) HiPot testing (= dielectric testing) must generally be restricted to suitable components. This gate driver is suited for HiPot testing. Nevertheless, it is strongly recommended to limit the testing time to 1s slots as stipulated by EN 50178. Excessive HiPot testing at voltages much higher than $1200V_{AC(eff)}$ may lead to insulation degradation. No degradation has been observed over 1min. testing at $5000V_{AC(eff)}$. Every production sample shipped to customers has undergone 100% testing at the given value for 1s.
- 12) Partial discharge measurement is performed in accordance with IEC 60270 and isolation coordination specified in EN 50178. The partial discharge extinction voltage between primary and either secondary side is coordinated for safe isolation to EN 50178.
- 13) The dead time is measured between 50% voltage swing of the gate-emitter voltage which is turned off and 50% voltage swing of the gate-emitter voltage which is turned-on.

RoHS Statement

Based on Annex II and III of the European Directive 2011/65/EC of 08 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS), we are stating that the products described in this datasheet do not contain lead (Pb), mercury (Hg), hexavalent chromium (Cr VI), cadmium (Cd), polibrometo of biphenyl (PBB) or polibrometo diphenyl ether (PBDE) in concentration exceeding the restrictions set forth in Annex II of 2011/65/EC under consideration of applicable exemptions as listed in Annex III of 2011/65/EC.

Legal Disclaimer

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Ordering Information

Our international terms and conditions of sale apply.

Type Designation	Description
2SD300C17A3	Dual-channel SCALE-2 driver core (PCB thickness: 1.55mm, increased EMI capability, lead free)

Product home page: www.power.com/igbt-driver/go/2SD300C17

Refer to www.power.com/igbt-driver/go/nomenclature for information on driver nomenclature

Information about Other Products

For other drivers, product documentation, and application support

Please click: www.power.com

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Power Integrations Sales Offices

WORLD HEADQUARTERS

5245 Hellyer Avenue
 San Jose, CA 95138 USA
 Tel: +1-408-414-9200
 Fax: +1-408-414-9765
 Email: usasales@power.com

AMERICAS WEST

5245 Hellyer Avenue
 San Jose, CA 95138 USA
 Tel: +1-408-414-8778
 Fax: +1-408-414-3760
 Email: usasales@power.com

GERMANY (AC-DC/LED Sales)

Lindwurmstrasse 114
 80337 München, Germany
 Tel: +49-89-5527-39100
 Fax: +49-89-1228-5374
 Email: eurosales@power.com

INDIA (Mumbai)

Unit: 106-107, Sagar Tech Plaza-B
 Sakinaka, Andheri Kurla Road
 Mumbai, Maharashtra 400072 India
 Tel 1: +91-22-4003-3700
 Tel 2: +91-22-4003-3600
 Email: indiasales@power.com

JAPAN

Kosei Dai-3 Bldg.
 2-12-11, Shin-Yokohama, Kohoku-ku
 Yokohama-shi, Kanagawa
 Japan 222-0033
 Tel: +81-45-471-1021
 Fax: +81-45-471-3717
 Email: japansales@power.com

TAIWAN

5F, No. 318, Nei Hu Rd., Sec. 1
 Nei Hu Dist.
 Taipei, 114 Taiwan
 Tel: +886-2-2659-4570
 Fax: +886-2-2659-4550
 Email: taiwansales@power.com

AMERICAS EAST

7360 McGinnis Ferry Road
 Suite 225
 Suwanee, GA 30024 USA
 Tel: +1-678-957-0724
 Fax: +1-678-957-0784
 Email: usasales@power.com

CHINA (Shanghai)

Room 2410, Charity Plaza
 No. 88 North Caoxi Road
 Shanghai, 200030 China
 Tel: +86-21-6354-6323
 Fax: +86-21-6354-6325
 Email: chinasales@power.com

GERMANY (IGBT Driver Sales)

HellwegForum 1
 59469 Ense, Germany
 Tel: +49-2938-64-39990
 Email: igbt-driver.sales@power.com

INDIA (New Dehli)

#45, Top Floor
 Okhla Industrial Area, Phase - III
 New Dehli, 110020 India
 Tel 1: +91-11-4055-2351
 Tel 2: +91-11-4055-2353
 Email: indiasales@power.com

KOREA

RM602, 6FL, 22
 Teheran-ro 87-gil, Gangnam-gu
 Seoul, 06164 Korea
 Tel: +82-2-2016-6610
 Fax: +82-2-2016-6630
 Email: koreasales@power.com

UNITED KINGDOM

Bulding 5, Suite 21
 The Westbrook Centre
 Milton Road
 Cambridge, CB4 1YG United Kingdom
 Tel: +44-7823-557-484
 Email: eurosales@power.com

AMERICAS CENTRAL

333 Sheridan Road
 Winnetka, IL 60093 USA
 Tel: +1-847-721-6293
 Email: usasales@power.com

CHINA (Shenzhen)

17/F, Hivac Building, No 2
 Keji South 8th Road, Nanshan District
 Shenzhen, 518057 China
 Tel: +86-755-8672-8689
 Fax: +86-755-8672-8690
 Email: chinasales@power.com

INDIA (Bangalore)

#1, 14th Main Road
 Vasanthangar
 Bangalore, 560052 India
 Tel 1: +91-80-4113-8020
 Tel 2: +91-80-4113-8028
 Fax: +91-80-4113-8023
 Email: indiasales@power.com

ITALY

Via Milanese 20
 20099 Sesto San Giovanni (MI), Italy
 Tel: +39-02-4550-8708
 Email: eurosales@power.com

SINGAPORE

51 Newton Road
 #19-01/05 Goldhill Plaza
 Singapore, 308900
 Tel 1: +65-6358-2160
 Tel 2: +65-6358-4480
 Fax: +65-6358-2015
 Email: singaporesales@power.com