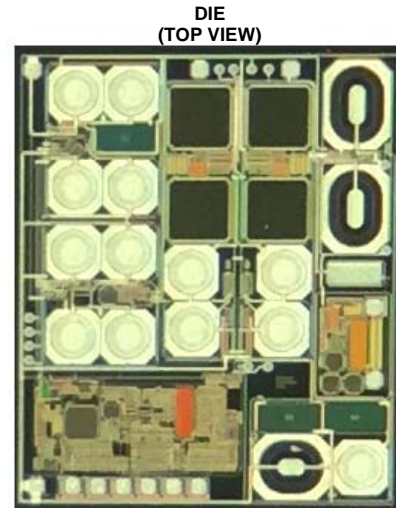


# 16SCT001 1kV DIRECT-COUPLED MOSFET / IGBT GATE DRIVER

16SCT001 - PRELIMINARY SPECIFICATION - REVISION MAY 1, 2017

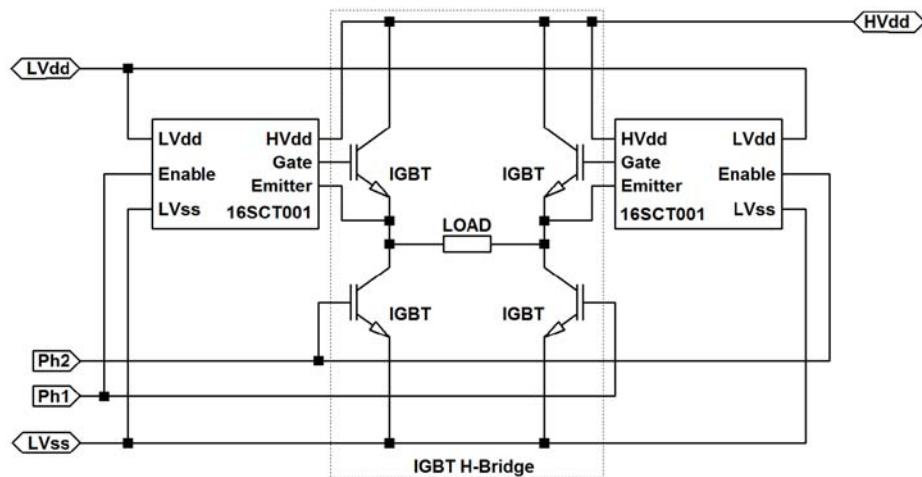
- Maximum Voltage. . . 1100 V
- Zero External Components
- Direct Drive From Low-Voltage Control Signals
- MOSFET / IGBT Gate-Emitter Overdrive Circuitry
- Fast IGBT Turn-On & Turn-Off Times
- Low HV Current
- Ultra-Low Idle Current



## Description

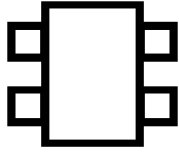
The 16SCT001 is a high-voltage (1KV max) direct coupled MOSFET / IGBT gate driver typically used in systems requiring the ability to control the conduction state of a high-voltage (HV) MOSFET / IGBT switch. The chip has built-in circuitry to drive the MOSFET / IGBT gate above the HV supply to ensure that the transistor is adequately saturated.

## Typical application



## Absolute maximum ratings

High Voltage Power Supply ( $HV_{dd} - LV_{ss}$ )	1100 V
Low Voltage Power Supply ( $LV_{dd} - LV_{ss}$ )	20 V
Operating temperature	-40 C to 100 C
Storage temperature	-65 C to 125 C



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## Recommended operating conditions

PARAMETER	MIN	MAX	UNIT
Operating voltage (HV <sub>dd</sub> - LV <sub>ss</sub> )	0	1000	V
Operating voltage (LV <sub>dd</sub> - LV <sub>ss</sub> )	6	20	V

## Pin definitions

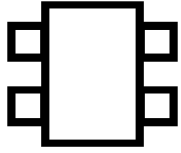
SYMBOL	DESCRIPTION
HV <sub>dd</sub>	High Voltage Supply; 0 - 1000V
LV <sub>dd</sub>	Low Voltage Supply; 6.0 - 20V
LV <sub>SS</sub>	Low Voltage Supply; 0V
IntClkE	Internal Clock Enable; asserted high (LV <sub>dd</sub> ) enables internal oscillator
ClkSel	Selects Internal or External clock source; asserted high (LV <sub>dd</sub> ) selects internal clock
Clk	External clock source; 0 - LV <sub>dd</sub> , 500kHz - 1.2MHz
ClkBar	External clock source (complement to Clk, non-overlapping); ; LV <sub>dd</sub> - 0, 600kHz - 1.2MHz
Gate	Gate terminal of the high-side IGBT, drives above HV <sub>dd</sub> to ensure IGBT saturation
Emitter	Emitter terminal of the high-side IGBT

## Static electrical characteristics (37°C ± 2°C unless specified)

SYMBOL	PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
I <sub>HV<sub>dd</sub></sub>	HV <sub>dd</sub> off state current	HV <sub>dd</sub> = 750V LV <sub>dd</sub> = 8.0V			85	μA
I <sub>LV<sub>dd</sub></sub>	LV <sub>dd</sub> off state current	LV <sub>dd</sub> = 8V	-10		10	nA

## Dynamic electrical characteristics (IGBT: IXGP12N120A3, R<sub>load</sub>: 10kΩ, 37°C ± 2°C)

SYMBOL	PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
V <sub>ge</sub>	IGBT Gate - Emitter Voltage	LV <sub>dd</sub> = 8V	13.2	14.4	15.5	V
t <sub>rdV<sub>ge</sub></sub>	V <sub>ge</sub> Rise Time Delay	LV <sub>dd</sub> = 8V	0.55	0.86	1.25	μS
t <sub>rV<sub>ge</sub></sub>	V <sub>ge</sub> Rise Time (to 90%)	LV <sub>dd</sub> = 8V	20.0	40.0	55.0	μS
t <sub>fdV<sub>ge</sub></sub>	V <sub>ge</sub> Fall Time Delay	LV <sub>dd</sub> = 8V	0.85	1.28	1.75	μS
t <sub>fV<sub>ge</sub></sub>	V <sub>ge</sub> Fall Time (to 10%)	LV <sub>dd</sub> = 8V	0.01	0.2	0.5	μS
t <sub>rdI<sub>Load</sub></sub>	Load Current Rise Time Delay	HV <sub>dd</sub> = 500V, LV <sub>dd</sub> = 8V	0.6	0.65	0.8	μS
t <sub>rlI<sub>Load</sub></sub>	Load Current Rise Time	HV <sub>dd</sub> = 500V, LV <sub>dd</sub> = 8V	0.3	0.5	1.0	μS
t <sub>fdI<sub>Load</sub></sub>	Load Current Fall Time Delay	HV <sub>dd</sub> = 500V, LV <sub>dd</sub> = 8V	1.5	1.65	2.0	μS
t <sub>flI<sub>Load</sub></sub>	Load Current Fall Time	HV <sub>dd</sub> = 500V, LV <sub>dd</sub> = 8V	1.5	1.65	1.8	μS
I <sub>HV<sub>dd</sub></sub>	HV <sub>dd</sub> pulse-on current	LV <sub>dd</sub> = 8V			6.0	mA
I <sub>LV<sub>dd</sub></sub>	LV <sub>dd</sub> pulse-on current	LV <sub>dd</sub> = 8V			1.0	mA

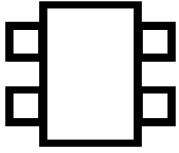


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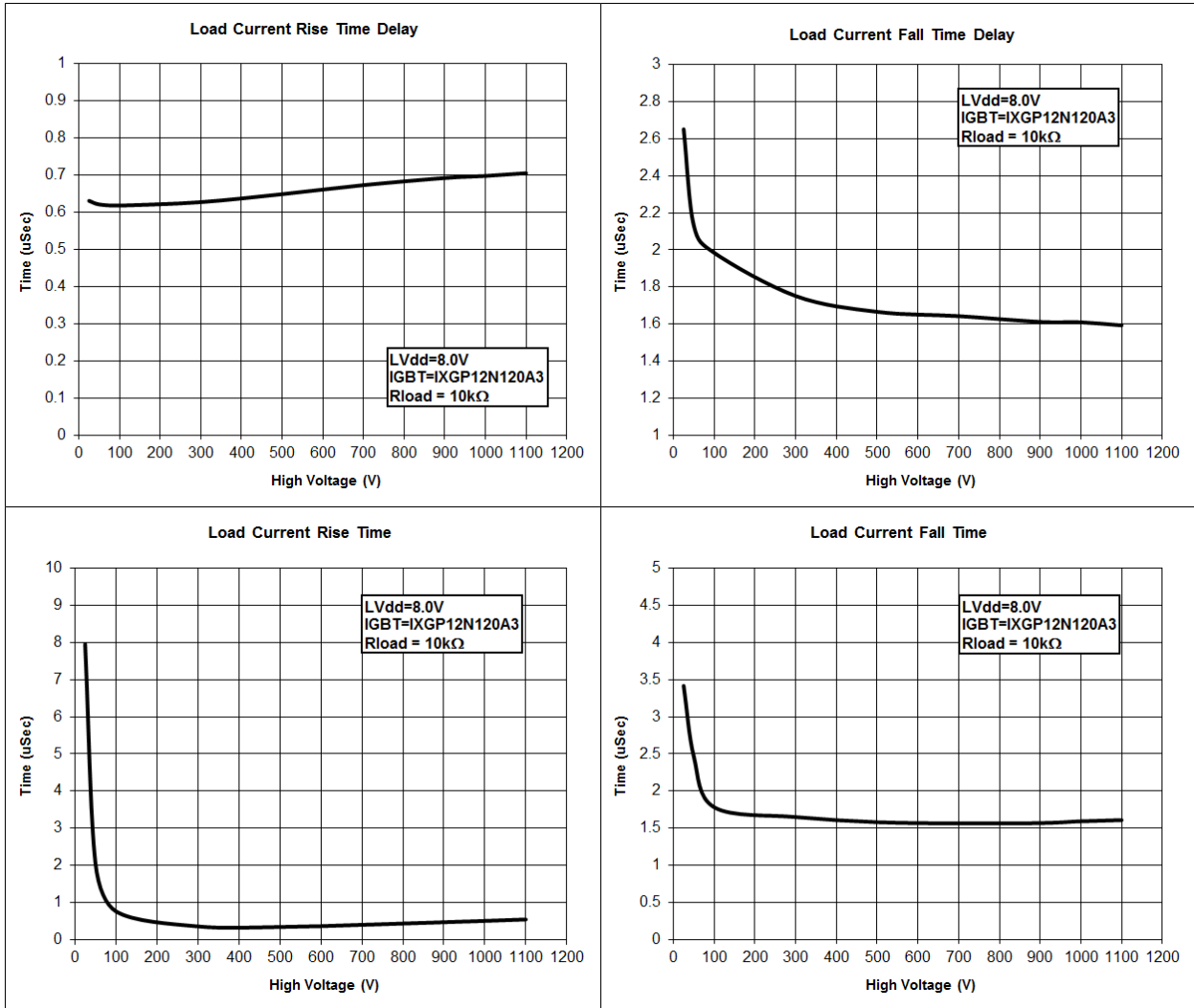
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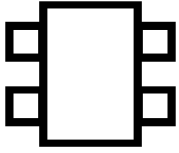
SYMBOL	PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
tsc	Turn-off time	$V_{dd} = 8V$ , $HV_{dd} = 100V$ $R_{load} = 3.9\Omega$			2.2	$\mu S$



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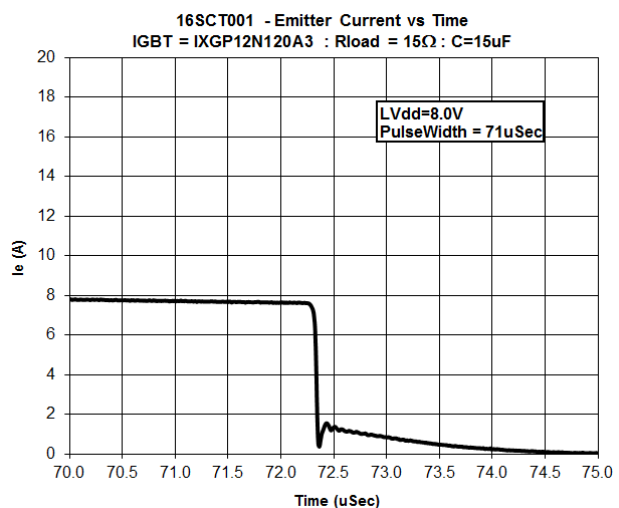
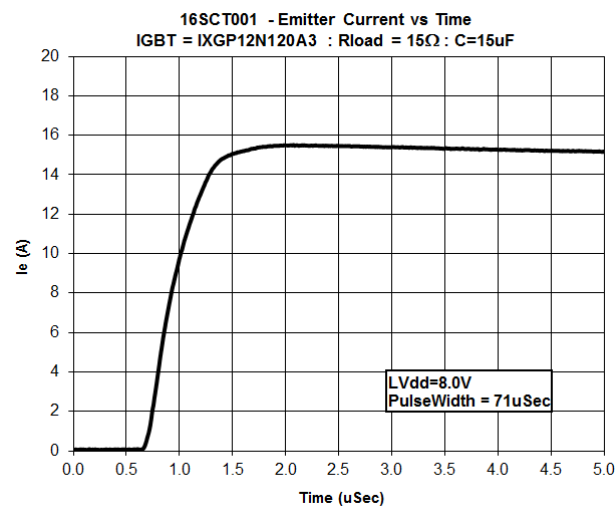
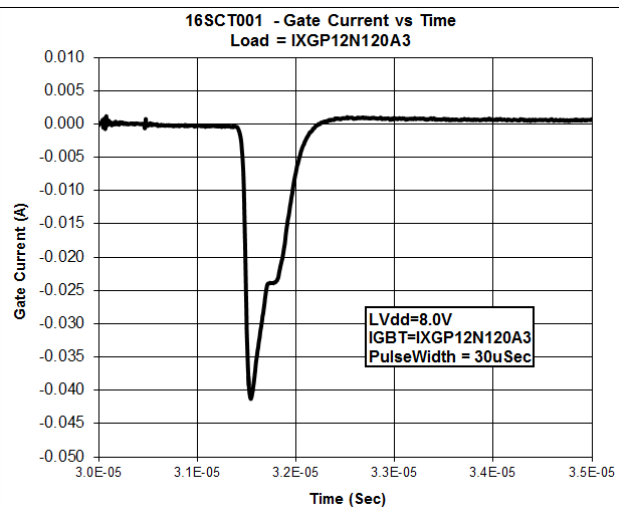
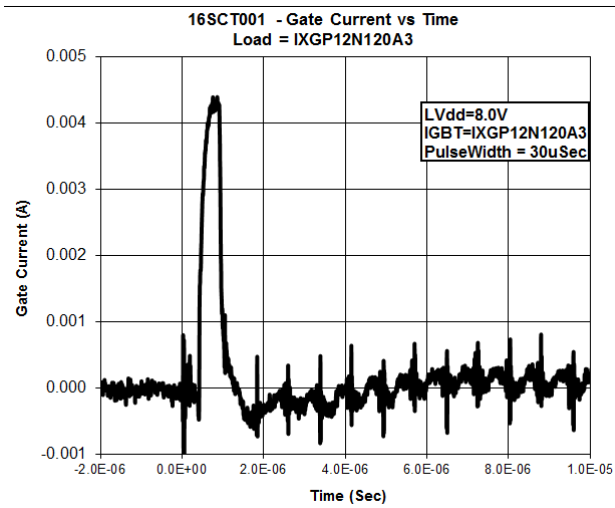
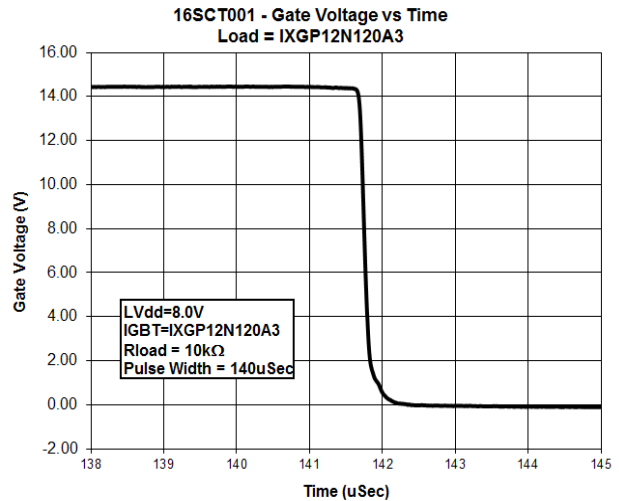
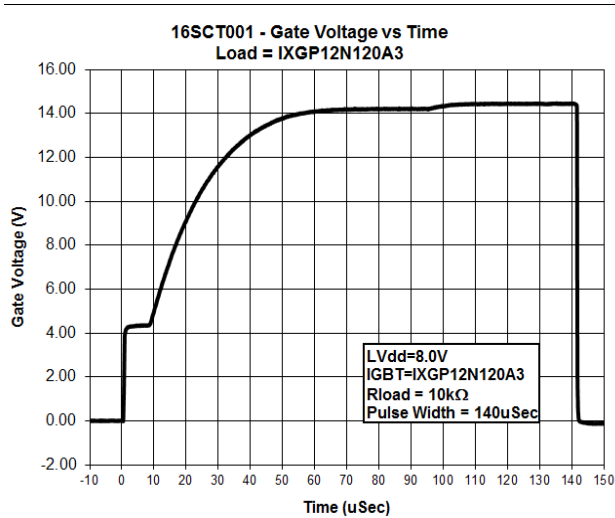
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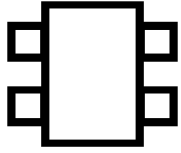




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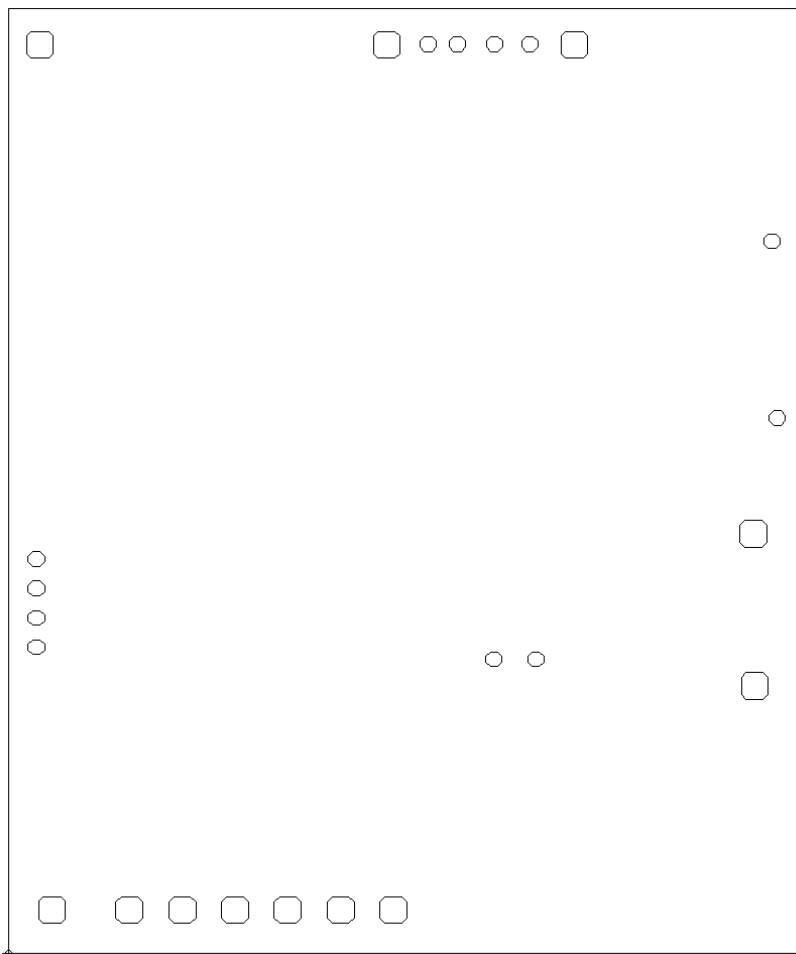


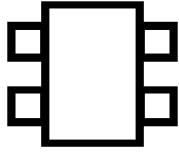
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## Die Dimensions

PARAMETER		MIN	TYP	MAX	UNIT
Y <sub>SIZE</sub>	Long Side Dimensions	3160	3260	3360	μm
X <sub>SIZE</sub>	Short Side Dimensions	2650	2750	2850	μm
Z <sub>SIZE</sub>	Die Thickness	260	285	310	μm





# 16SCT001 1kV DIRECT-COUPLED MOSFET / IGBT GATE DRIVER

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## Visual inspection

PARAMETER	Lot Sampled	Sample Size	Fails Allowed	UNIT
100% Visual Inspection per MIL STD 883H Method 2010 Condition B.	ALL	100%	n/a	n/a

## Product qualification tests

PARAMETER	Lot Sampled	Sample Size	Fails Allowed	UNIT
Static burn-in 504hrs @ $V_{HV}=1000V$ ; MIL STD 883 method 1015	3	22	0	n/a
Physical dimensions	3	11	0	n/a
Wire Bond Evaluation (Gold Ball Bond) per MIL STD 883 method 2011	3	20	1	n/a

## Lot acceptance tests

PARAMETER	Lot Sampled	Sample Size	Fails Allowed	UNIT
Static burn-in 168hrs @ $V_{HV}=1000V$ ; MIL STD 883 method 1015	each	22	0	n/a
Physical dimensions	each	11	0	n/a
Wire Bond Evaluation (Gold Ball Bond) per MIL STD 883 method 2011	each	20	1	n/a

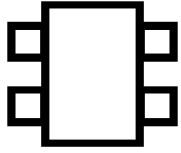
Product qualification tests are performed on 3 lots while a Lot Acceptance Test (LAT) is performed on each "diffusion lot". LAT is considered complete if the lot was used for product qualification.

All samples used for qualification and LAT burn-in test are assembled in a open cavity ceramic DIL package with a dielectric silicone gel filling the cavity. The chip is mounted to provide isolation between the wirebonds and the substrate and to eliminate surface conduction and polarization as possible means of unwanted failure.

## Application notes

To make best use of the 16SCT001, the chip should be molded before high voltage is applied to it. This can either be done with a standard mold compound or with silicone gel. Care should be taken when selecting an encapsulant to ensure proper dielectric strength and resistance. We recommend that the dielectric strength of the dielectric used be greater than 10kV/mm at a thickness of 50um.

Care should also be taken to properly isolate the chips substrate which is biased at about half  $V_{HV}$ . In no circumstance should the chip be mounted over layers providing less than 1kV of dielectric isolation. It is also strongly recommended to use non-conducting epoxy for attaching the chip.



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Ball bonding should be used for attaching conductors to the chip's pad. Wedge bonding is not recommended because of the shorter distance between the wirebond and the chip's edge, increasing the risk of arcing. When using ball bonding the wire should extend vertically for at least 150um before going horizontal toward the substrate or package pad.