

SI-5201

March 2007

■General Description

SI-5201 is an intelligent high-side switch with N-channel power MOSFET available in Sanken's TO220S-7 package. Over current and thermal shutdown circuits are integrated with control logic circuit in proprietary BCD process, and the output current limiting point can be externally set at two points of 30 A and 60 A. The DG output shows proportional current to the load current, so it can be used for output current monitoring and open load detection.

■Package

TO220S-7



■Applications

- Replacing a mechanical relay, fuse and discretely constructed power switch circuit in automotive and industrial applications with diagnostic feedback.

■Key Specifications

Parameter	Symbol	Rating	Unit
Operating power supply voltage	V _{BB}	30 max	V
Output current (DC)	I _o	60 max	A
Output current (pulse)	I _o (pulse)	120 max	A
Output on-resistance	R _{DS(ON)}	7 typ	mΩ
Quiescent circuit current	I _q	5 typ	μA

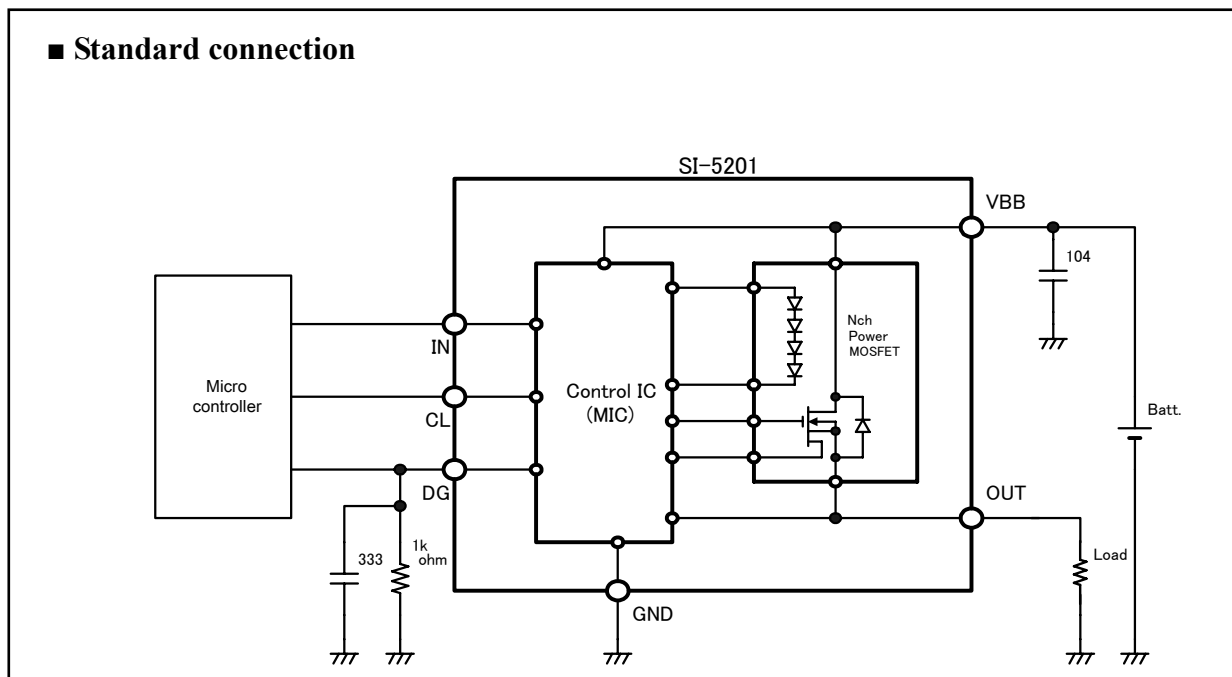
■Features

- Hybrid structure of N-channel MOSFET and control logic circuit
- Proprietary BCD process for control chip
- Sanken's TO220S-7 surface mount package
- N-channel MOSFET : V_{DSS} 40V, R_{DS(on)} : 7mΩ(typ) @25°C
- Over current protection: two current limiting points can be selected, 30 or 60 A by CL input.
- Protections :
 - thermal shutdown
 - Over voltage
 - Over current: 30A at CL input is high, 60A at CL input low
 - Reverse battery
- DG output : proportional current to load current (up to either 30A or 60A by CL input) for monitoring current and Detecting open load
- Very low quiescent current : 5μA(typ) at low input

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■ Standard connection



■ Absolute maximum ratings (Ta=25°C)

Parameter	Symbol	Ratings	Unit	
Supply Voltage	VBB	32	V	
Drain to Source Breakdown Voltage	VDS	40	V	
Output Current	Iout	60	A	
Logic Input Voltage	VIN	-0.3 to 7	V	
CL Pin Voltage to Select Current-Limitation Value	VCL	-0.3 to 7	V	
Junction Temperature	Tj	150	°C	
Storage Temperature	Tstg	-40 to +150	°C	
Thermal Resistance	Junction to Case	θj-c	1.1	°C /W

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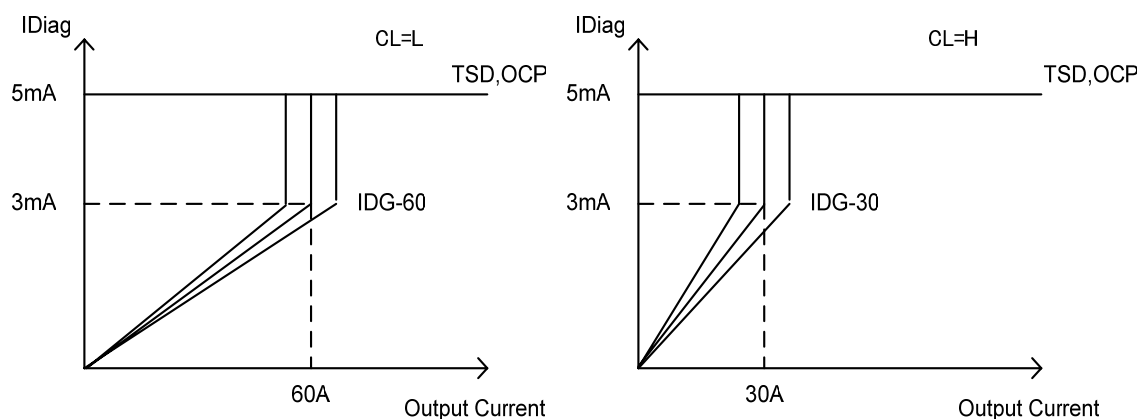
■ Electrical characteristics (VBB=14V, Ta=25°C unless otherwise specified.)

Parameter	Symbol	Ratings			Unit	Remarks
		MIN	TYP	MAX		
Operating Voltage	VBB	6.0		30	V	
Quiescent Current	Iq		5.0	20	μA	VIN=0V, Vout=0V
IN Input Voltage	VthH	3.5			V	RL=2.8Ω
	VthL			1.5		
IN Input Current	IINH		50	75	μA	VIN=5V
CL Input Voltage	VthH-CL	3.5			V	RL=2.8Ω
	VthL-CL			1.5		
CL Input Current	ICLH		50	75	μA	VIN=5V, VCL=5V
ON State Resistance	RDS(ON)		7	8	mΩ	Ta=25°C, Io=12A
			11	13	mΩ	Ta=125°C, Io=12A
Output Leakage Current	Ileak		3.0	20	μA	VIN=0V, Vout=0V
Output Clamp Voltage	Vclamp	30	35	40	V	VIN=0V
Rise Time	tr	40		150	μs	Rout=2.8Ω
Fall Time	tf	40		120	μs	Rout=2.8Ω
Output Transition Time	ton		20	70	μs	Rout=2.8Ω
	toff		70	150	μs	Rout=2.8Ω
DG Pin Output Current	IDG	0	50	200	μA	Io=1A, VCL=0V (open)
		0.35	0.5	0.65	mA	Io=10A, VCL=0V (open)
		2.55	3.0	3.45	mA	Io=60A, VCL=0V (open)
		0	100	400	μA	Io=1A, VCL=5V
		0.7	1.0	1.3	mA	Io=10A, VCL=5V
		2.55	3.0	3.45	mA	Io=30A, VCL=5V
		4.0	5.0	5.5	mA	TSD or OCP is operating
DG Output Leakage Current	IDGleak			150	μA	Io=0A, VCL=0V,5V
DG Output Voltage	VDG			7	V	Io=10A, VCL=5V RDG=10kΩ
Over-current-Protection Starting current	Iocp	120			A	VCL=0V (open), t < tol
		60			A	VCL=0V (open), t > tol
		60			A	VCL=5V, t < tol
		30			A	VCL=5V, t > tol
OCP Level Changing Time	tol	65	100	135	ms	
OCP Reset Time	tocpr	2.6	4.0	5.4	ms	
OCP delay time	tocpr	0.26	0.4	0.8	ms	
Thermal Shutdown Starting temperature	TTSD	150			°C	
Over-voltage Protection Starting Voltage	VOVP	30	32.5	35	V	
Under-voltage Lockout Voltage	VUVLO	2	5	6	V	

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■DG Output Characteristics



■Truth table

Operating Condition	Input	Output	DG Output Status	Remarks
Normal Operation	H	H	Linear	
	L	L	L	
Over-voltage	H	L	L	
	L	L	L	
Over-current Condition	H	L	H	
	L	L	L	
Thermal Overload	H	L	H	
	L	L	L	
Output Short to VB	H	VB	L	
	L	VB	L	
Output Short to GND	H	GND	H	
	L	GND	L	
Load Open	H	H	L	
	L	L	L	

●Linear=Linear Output Operation ●DG output status : H = High output level L = Low output level

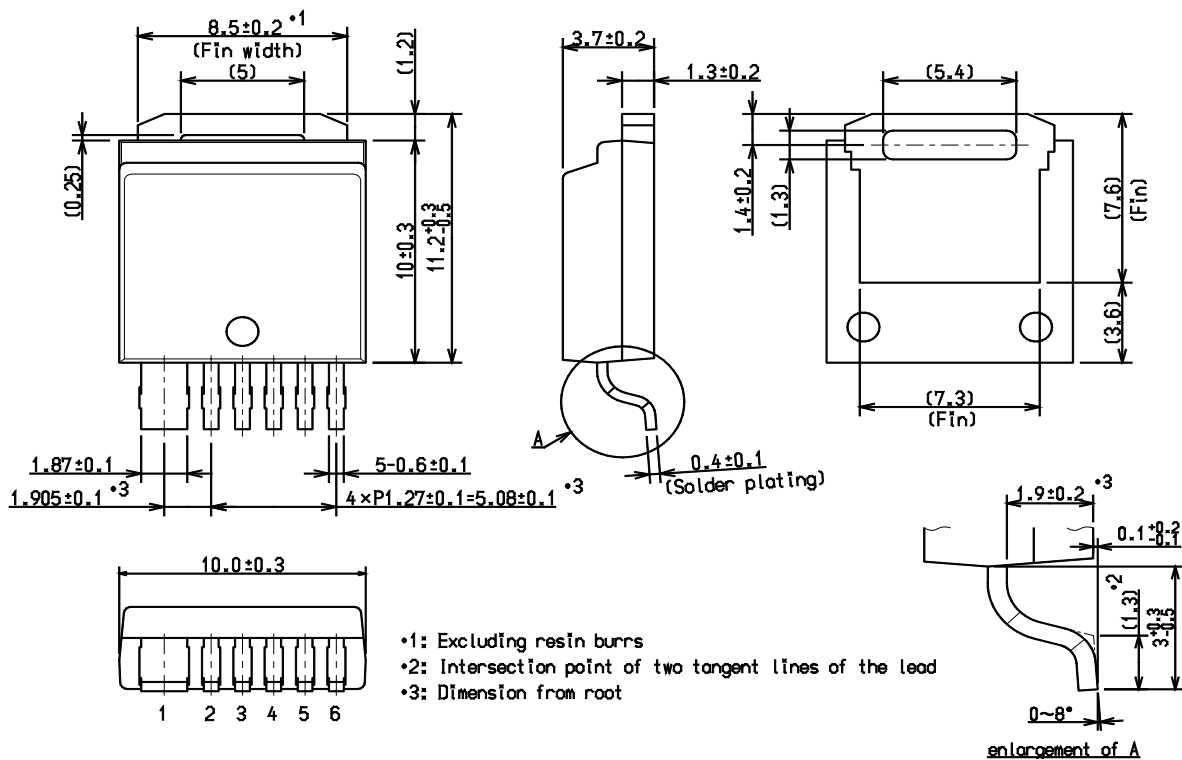
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■ Pins function description

Symbol	Pin#	Function
OUT	1	Output (internally connected to the source of N-channel MOSFET)
OUT		
VBB	2	Supply voltage (internally connected to the Fin) / Drain of N-channel MOSFET
IN	3	Signal input
CL	4	Sets the current-limiting point at either 60A or 30A
DG	5	Monitors output current proportional to load current and diagnosis for load short to GND and TSD
GND	6	Ground

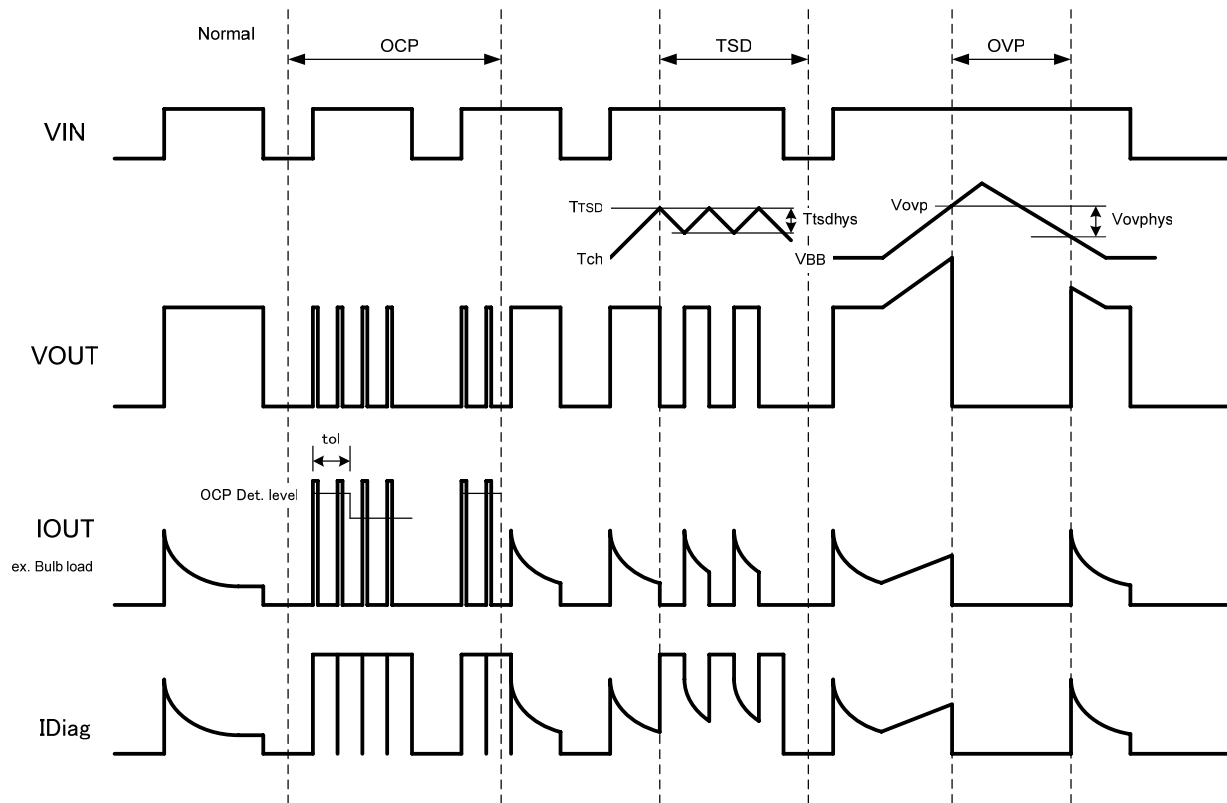
■ Package information



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■Operation timing



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