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Future of Power Electronics and the Earth



3-phase Brushless Motor Driver ICs (Built-in 250 V–650 V Power Transistors) Selection Guide



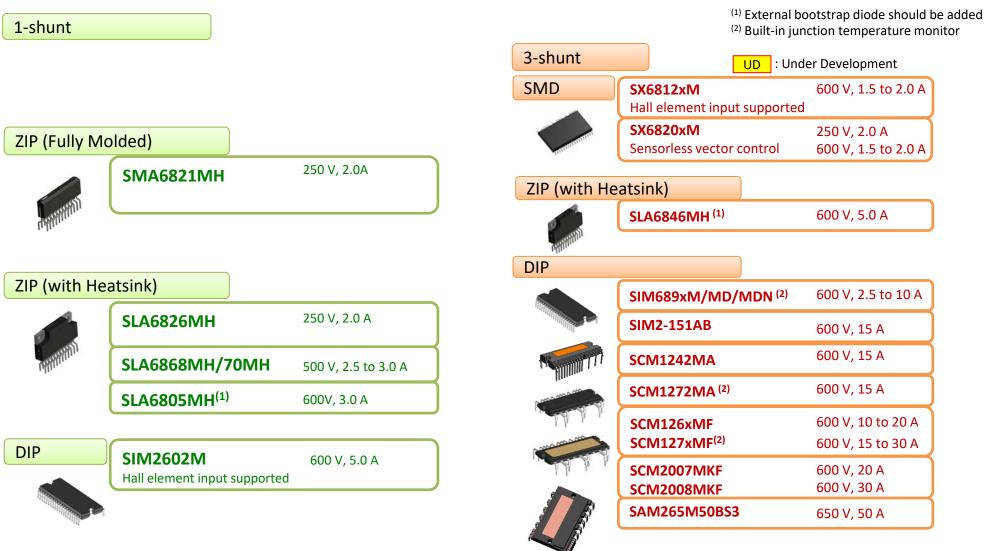
All information in this guide is as of the date of publication. Please make sure that you are using the latest version of the guide. If you need more product information, please refer to our data sheets.

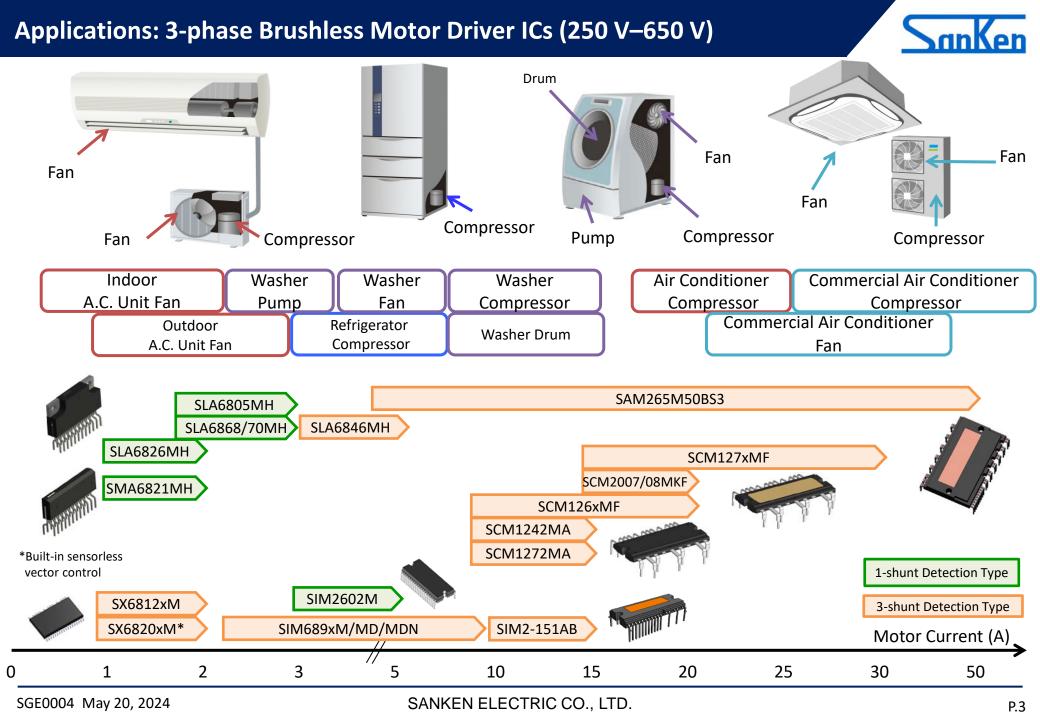
https://www.sanken-ele.co.jp/en

Motor Driver ICs for 3-phase Brushless Motors (250 V-650 V Transistors)



This guide introduces Sanken's motor driver ICs, which integrate the following components into a single package: 3-phase inverter bridges using power transistors, gate driver circuits and bootstrap diodes. Your motor circuit can be downsized effectively with these ICs. Our large selection of ICs will help you find the best match for your application.





Product Lists: 3-phase Brushless Motor Driver ICs (250 V-650 V) (1/3)



The following tables show our 3-phase brushless motor driver ICs that have 250–1200 V power transistors. Our extensive range of ICs will give you application-based choices.

1-shunt Detection Type

*Bootstrap diodes with current limiting resistors

l _o	Series	Breakdown voltage	Package	Input voltage level	D _{воот} *	ОСР	TD	TSD	Features	Page
2.0 A	SMA6821MH	250 V	ZIP24	3.3 V /5.0 V	Built-in	_	150 °C	ı	> Regulator output	<u>p.7</u>
2.0 A	SLA6826MH	250 V	ZIP24 (Heatsink)	3.3 V /5.0 V	Built-in	_	150 °C	1	> Regulator output	<u>p.7</u>
2.5 to 3 A	SLA6868MH SLA6870MH	500 V	nymmin in	3.3 V /5.0 V	Built-in	Built-in	_	135 °C	> Overcurrent limiting	p.8
3 A	SLA6805MH	600 V	ZIP23 (Heatsink)	3.3V /5.0V	ı	Built-in	_	-		p.9
5 A	SIM2602M	600 V	DIP40	_	Built-in	Built-in	I	130 °C	 Hall element input supported Regulator output Overcurrent limiting 	p.10

Product Lists: 3-phase Brushless Motor Driver ICs (250 V-650 V) (2/3)



◆ 3-shunt Detection Type

*Bootstrap diodes with current limiting resistors

I _O	Series	Breakdown voltage	Package	Input voltage Ievel	D _{BOOT} *	ОСР	TD	TSD	Features	Page
1.5 to 2 A	SX6812xM	600 V	SOP36	-	Built-in	Built-in	_	130 °C	Hall element input supportedRegulator output	p.11
1.5 to 2 A	SX6820xM	250 V 600 V	The state of the s		Built-in	Built-in	_	135 °C	 Built-in sensorless vector control Simultaneous On-state prevention 	p.13
2.5 to 10 A	SIM689xM/ MD/MDN	600 V	DIP40	3.3 V /5.0 V	Built-in	√	_	150 °C	➤ Built-in temperature monitor	p.16
5 A	SLA6846MH	600 V	ZIP24 (Heatsink)	3.3V /5.0V		ı	150 °C	ı	> Regulator output	p.18
15 A	SIM2-151AB	600 V	DIP40	3.3 V /5.0 V	Built-in	>	ı	120 °C	➤ Built-in temperature monitor	p.19
15 A	SCM1242MA	600 V	DIP33	3.3 V /5.0 V	Built-in	~	_	150 °C		<u>p.20</u>
15 A	SCM1272MA	600 V		3.3 V /5.0 V	Built-in	>		150 °C	➤ Built-in temperature monitor	<u>p.21</u>
10 to 20 A	SCM126xMF	600 V	DIP33 (Heatsink)	3.3 V /5.0 V	Built-in	Built-in	_	150 °C	Simultaneous on-state prevention	<u>p.22</u>
15 to 30 A	SCM127xMF	600 V	The same of the sa	3.3 V /5.0 V	Built-in	Built-in	_	_	Built-in temperature monitorSimultaneous on-state prevention	p.23
20 to 30 A	SCM200xMKF	600 V	The last	3.3V /5.0V	Built-in	Built-in	_		➤ Built-in NTC thermistor	p.24

Product Lists: 3-phase Brushless Motor Driver ICs (250 V-650 V) (3/3)



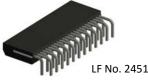
♦ 3-shunt Detection Type

*Bootstrap diodes with current limiting resistors

l _o	Series	Breakdown voltage	Package	Input voltage Ievel	D _{BOOT} *	ОСР	TD	TSD	Features	Page
50 A	SAM265M50BS3	650 V	DIP30	3.3 V /5.0 V	Built-in	√	ı	-	➤ Built-in thermistor	p.25

ZIP24

Fully molded



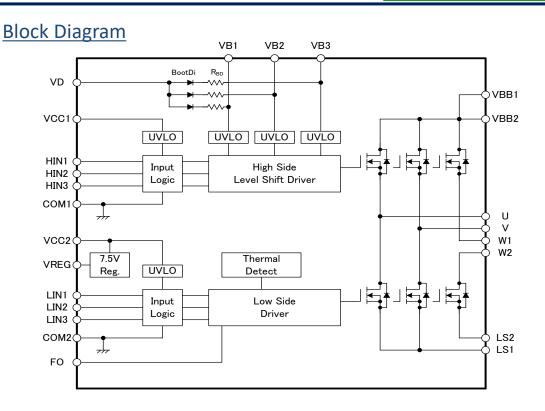




Features

- Built-in Bootstrap Diodes with Current Limiting Resistors
- Built-in Low Dissipation Power MOSFETs
- ◆ 7.5 V Regulator Output
- CMOS-compatible Input (3.3 V or 5 V)
- Protections:

Thermal Detection (TD): 150 °C (typ.)
Undervoltage Lockout for Power Supply (UVLO)



Package	Part Number	$V_{ m DSS}$	I _D	R _{DS(ON)} max.
With heatsink	SLA6826MH	250 V	2.0 A	1.5 Ω
Fully molded	SMA6821MH	250 V	2.0 A	1.5 Ω

SLA6868MH, SLA6870MH

1-shunt Detection Type

<u>Package</u>

ZIP24

with aluminum heatsink





LF No. 2175

Features

- ◆ Built-in Bootstrap Diodes with Current Limiting Resistors
- ◆ CMOS-compatible Input (3.3 V or 5 V)
- Protections:

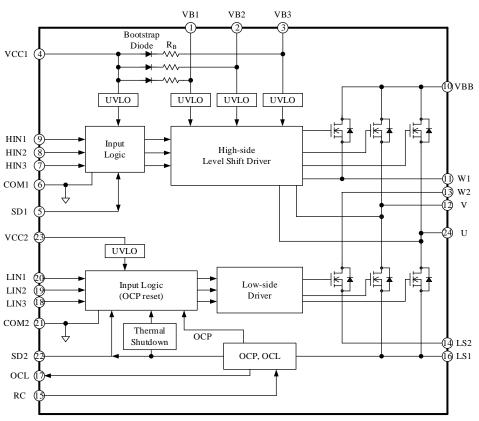
Overcurrent Protection (OCP)

Overcurrent Limit (OCL)

Undervoltage Lockout for Power Supply (UVLO)

Thermal Shutdown (TSD): 135 °C (typ.)

Block Diagram (Power MOSFET Type)



Part Number	V _{DSS}	I _D	R _{DS(ON)} max.
SLA6868MH	E00.V	2.5 A	2.4 Ω
SLA6870MH	500 V	3.0 A	1.7 Ω

ZIP23 with aluminum heatsink





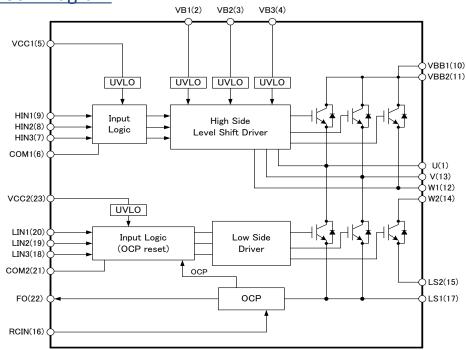
<u>Features</u>

- ◆ CMOS-compatible Input (3.3 V or 5 V)
- Protections:

Overcurrent Protection (OCP) with Adjustable OCP Hold Time

Undervoltage Lockout for Power Supply (UVLO)

Block Diagram



Part Number	V _{CES}	I _c	V _{CE(SAT)} typ.
SLA6805MH	600 V	3.0 A	1.75 V

SIM2602M

1-shunt Detection Type

<u>Package</u>

DIP40



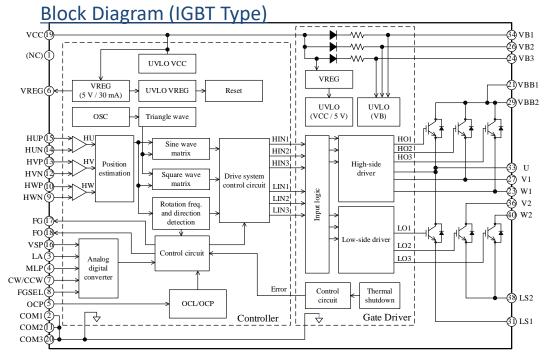
Size: 36.0×14.8×4.0 mm LF No. 2972

<u>Features</u>

- Built-in Bootstrap Diodes with Current Limiting Resistors
- Hall Element Input Supported
- 5 V Reference Voltage Output for Power Supply such as Hall Sensor
- Overcurrent Limit (OCL)
- Protections:

Overcurrent Protection (OCP)
Undervoltage Lockout for Power Supply (UVLO)
Thermal Shutdown (TSD): 130 °C (typ.)

Locked Motor Protection



Part Number	Output Transistor	V _{CES}	I _c	V _{CE(SAT)} typ.
SIM2602M	IGBT + FRD	600 V	5.0 A	1.75 V

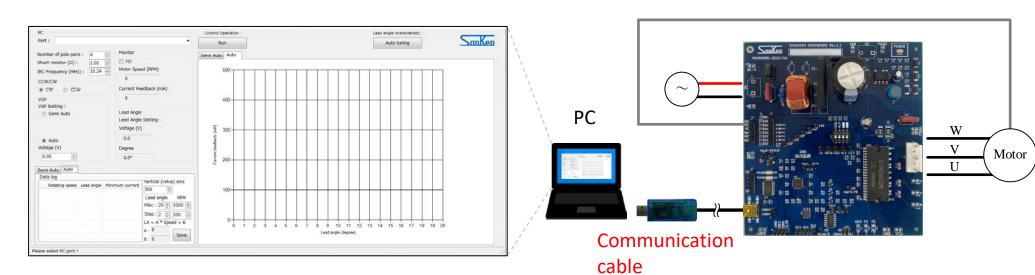
SIM2602M

1-shunt Detection Type

◆ Schematic View of System

We offer the dedicated GUI (Graphical User Interface) for this product to help you set parameters effortlessly. You can easily tune a phase advance angle by connecting the SIM2602M and your PC directly with a communication cable.

◆ GUI for SIM2602M



SIM2602M Special Page

SX6812xM Series

3-shunt Detection Type

<u>Package</u>



Features

- Sine-wave Current Waveform for High-efficient and Quiet Motor Operation
 - PCB Area and Component Count Reduced
 - Hall Element Input Supported
 - Built-in Bootstrap Diodes with Current Limiting Resistors
- Phase Advance by External Input Signal
- Fault Signal Output
- Motor Rotation Direction Switch
- Adjustable Switching Frequency
- ◆ 5 V Reference Voltage Output (Such as for Hall Sensor Drive)
- ◆ 3-shunt Current Detection
- Protections:

Motor Lock Protection

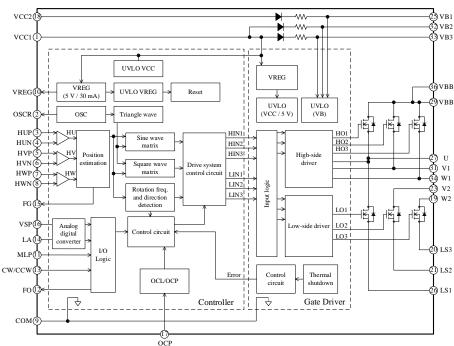
Overcurrent Protection (OCP)

Overcurrent Limit (OCL)

Undervoltage Lockout for Power Supply (UVLO)

Thermal Shutdown (TSD): 130 °C (typ.)

Block Diagram



Part Number	V _{DSS}	I _D	R _{DS(ON)} max.	Rotation Pulse Signal
SX68128MA		1.5 A	3.6 Ω	3.0 ppr
SX68128MB	600 V	1.5 A	3.6 Ω	2.4 ppr
SX68127MA		2.0 A	2.5 Ω	3.0 ppr

SX6820xM Series

3-shunt Detection Type

<u>Package</u>

SOP36

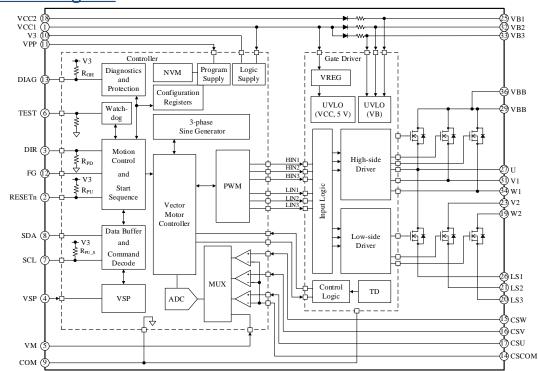


Size: 22×14.1×2.1mm

Features

- High Efficiency at Load Variation
- Sine-wave Current Waveform for High-efficient and Quite Motor Operation
- PCB Area and Component Count Reduced
 - · Built-in Sensorless Vector Control
 - Built-in Bootstrap Diodes with Current Limiting Resistors
- Simplified Setting
 - EEPROM as a Control Parameter Storage
 - PI Control with 2 Speed Control Modes
 - Analog Voltage Control by V_{SP}
 - Serial Communications Control (I²C Compatible)
- 3-shunt Current Detection
- DIAG Pin Fault Signal Output
- Protections:
 - V3, VCCx, and VBx Pins Undervoltage Protection
 - Watchdog Timeout Detection
 - Memory Error Detection
 - Overvoltage Protection and Undervoltage Lockout for Main Power Supply (VM Pin)
 - Soft/Hard Overcurrent Protection
 - Thermal Warning: 135 °C (typ.)
 - Thermal Shutdown: 150 °C (typ.)
 - Loss-of-Synchronization Protection

Block Diagram



Selection Guide

UD : Under Development

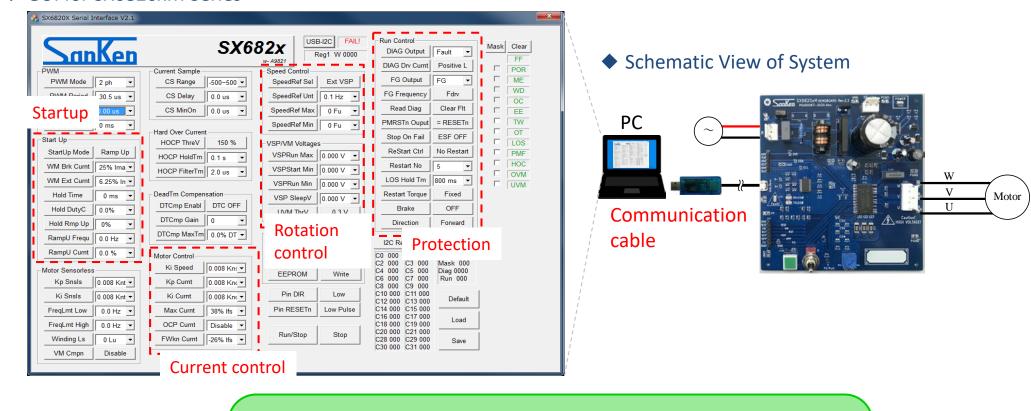
Part Number	V_{DSS}	l _D	R _{DS(ON)} max.
SX68201M	250 V	2.0 A	1.5 Ω
UD SX68204M	600 \	1.5 A	3.6 Ω
SX68205M	600 V	2.0 A	2.5 Ω

SX6820xM Series

3-shunt Detection Type

We offer the dedicated GUI (Graphical User Interface) that allows you to set optimal parameters even during motor rotation. You can easily write parameters by connecting an SX6820xM series device and your PC directly with a communication cable.

◆ GUI for SX6820xM Series



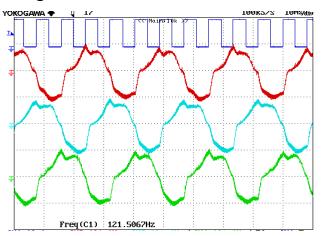
SX6820xM Series Special Page

SX6820xM Series

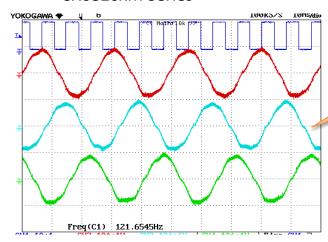
3-shunt Detection Type

◆ Achieves High-efficient and Quiet Motor Operation

■ Existing Product



■ SX6820xM Series



The motor current is nearly a sine wave.

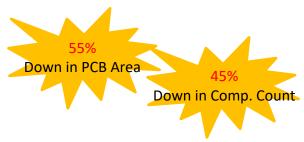
♦ Reduces PCB Area and Component Count

- Small and Thin Package
- Built-in Sensorless Vector Control
- Built-in Bootstrap Diodes with Current Limiting Resistors

■ Existing Product

Outer diameter: 75 mm Inner diameter: 20 mm (Area: 4102 mm²) Component count: 72



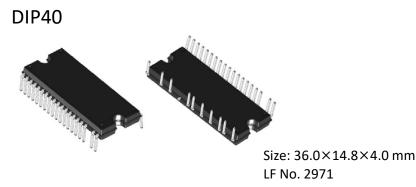


■ SX6820xM Series



Area: $46 \text{ mm} \times 40 \text{ mm} = 1840 \text{ mm}^2$

Component count: 39



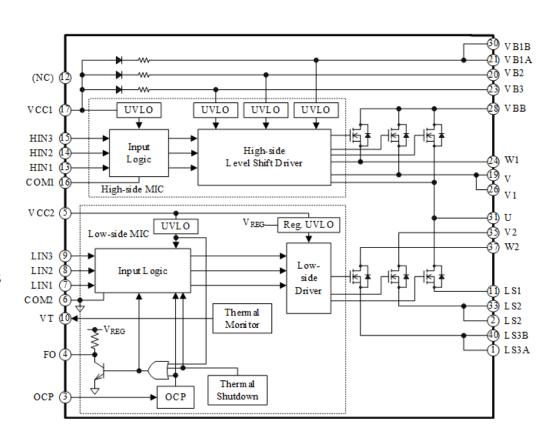
Features

- Built-in Bootstrap Diodes with Current Limiting Resistors
- 3-shunt Current Detection
- ◆ CMOS-compatible Input (3.3 V or 5 V)
- Overcurrent Limit (OCL)
- Built-in Temperature Monitor
- Protections:

Overcurrent Protection (OCP)
Undervoltage Lockout for Power Supply (UVLO)
Thermal Shutdown (TSD): 150 °C (typ.)

Isolation Voltage: 1500 V for 1 min, UL-recognized Component

Block Diagram (Power MOSFET Type)



SIM689xM/MD/MDN Series

3-shunt Detection Type

Selection Guide

UD : Under Development

Part Number	Output Transistor	V _{DSS} /V _{CES}	I _D /I _C	R _{DS(ON)} max./ V _{CE(SAT)} typ.	Remarks
UD SIM6891MD	Power		2.5 A	2.5 Ω	Low switching dissipation
SIM6893M	MOSFET		5.0 A	0.6 Ω	Low noise
SIM6896M		600 V	3.0 A	1.85 V	
SIM6892M	IGBT + FRD		5.0 A	1.75 V	Low switching dissipation
SIM6895M			5.0 A	1.75 V	Low noise

SLA6846MH

3-shunt Detection Type

<u>Package</u>

ZIP24 with aluminum heatsink



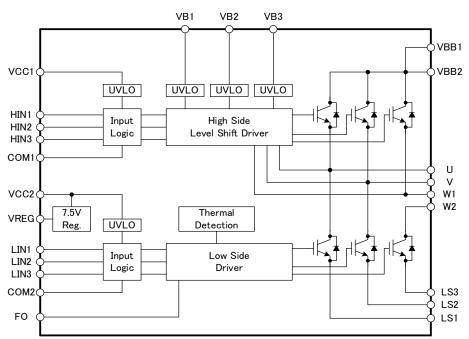


Features

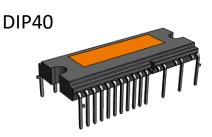
- ◆ CMOS-compatible Input (3.3 V or 5 V)
- ◆ 7.5 V Regulator Output
- 3-shunt Current Detection
- Protections:

Undervoltage Lockout for Power Supply (UVLO) Thermal Detection (TD): 150 °C (typ.)

Block Diagram



Part Number	V _{CES}	I _c	V _{CE(SAT)} typ.
SLA6846MH	600 V	5.0 A	1.75 V

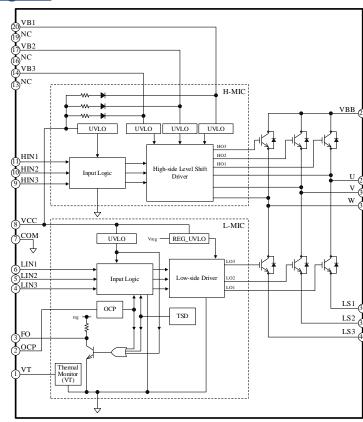


Size: 35.7×14.6×4.2 mm

Features

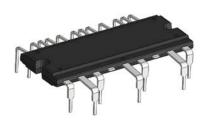
- Pb-free (RoHS Compliant)
- Isolation Voltage: 2000 V (for 1 min)
 UL-recognized Component (File No.: E118037)
- ◆ Temperature Sensing Function
- lacktriangle Built-in Bootstrap Diodes with Current Limiting Resistors (250 Ω)
- ◆ CMOS-compatible Input (3.3 V or 5 V)
- Fault Signal Output at Protection Activation
- Protections:
 - Undervoltage Lockout for Power Supply
 High-side (UVLO_VB): Auto-restart
 Low-side (UVLO_VCC): Auto-restart
 - Overcurrent Protection (OCP): Auto-restart
 - Thermal Shutdown (TSD): Auto-restart with an Operating Range of ±5 °C

Block Diagram



Part Number	Output Transistor	V _{CES}	l _c	V _{CE(SAT)} typ.
SIM2-151AB	FS-IGBT + FRD	600 V	15 A	1.6 V

DIP33



Size: 47×19×4.4 mm LF No. 2551

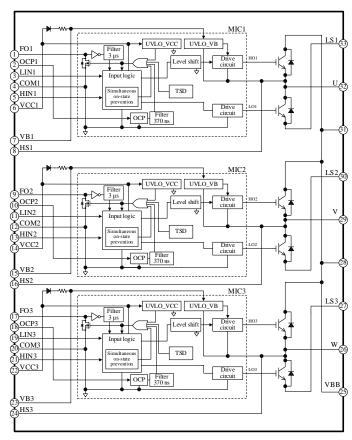
Features

- Built-in Bootstrap Diodes with Current Limiting Resistors
- 3-shunt Current Detection
- ◆ CMOS-compatible Input (3.3 V or 5 V)
- Protections:

Overcurrent Protection (OCP)
Undervoltage Lockout for Power Supply (UVLO)
Thermal Shutdown (TSD): 150 °C (typ.)

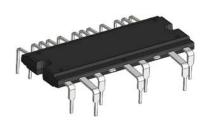
 Isolation Voltage: 2000 V for 1 min, UL-recognized Component

Block Diagram



Part Number	Output Transistor	V _{CES}	l _c	V _{CE(SAT)} typ.
SCM1242MA	IGBT + FRD	600	15 A	1.7 V

DIP33



Size: 47×19×4.4 mm LF No. 2551

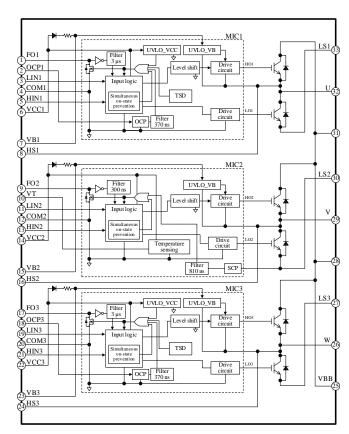
Features

- ◆ Built-in Bootstrap Diodes with Current Limiting Resistors
- 3-shunt Current Detection
- ◆ CMOS-compatible Input (3.3 V or 5 V)
- Temperature Sensing Function (V-phase)
- Protections:

Overcurrent Protection (OCP) (U- and W-phases)
Undervoltage Lockout for Power Supply (UVLO)
Thermal Shutdown (TSD): 150 °C (typ.) (U- and W-phases)

 Isolation Voltage: 2000 V for 1 min, UL-recognized Component

Block Diagram



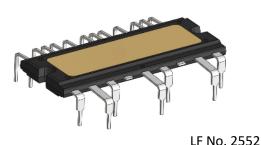
Part Number	Output Transistor	V _{CES}	l _c	V _{CE(SAT)} typ.
SCM1272MA	IGBT + FRD	600	15 A	1.7 V

SCM126xMF Series

3-shunt Detection Type

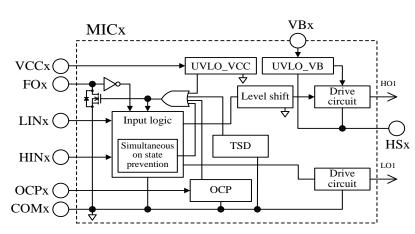
<u>Package</u>

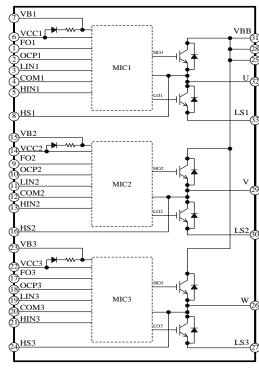
DIP33



Size: 47 mm × 19 mm

Block Diagram





Features

- Built-in Bootstrap Diodes with Current Limiting Resistors
- ◆ CMOS-compatible Input (3.3 V or 5 V)
- 3-shunt Current Detection
- Protections:

Overcurrent Protection (OCP)
Simultaneous On-state Prevention
Undervoltage Lockout for Power Supply (UVLO)
Thermal Shutdown (TSD): 150 °C (typ.)

 Isolation Voltage: 2500 V for 1 min, UL-recognized Component

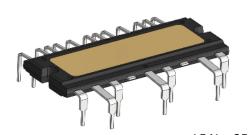
Part Number	V _{CES}	I _c	V _{CE(SAT)} typ.
SCM1261MF		10 A	
SCM1263MF	600 V	15 A	1.7 V
SCM1265MF		20 A	

SCM127xMF Series

3-shunt Detection Type

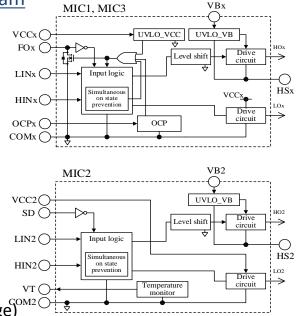
<u>Package</u>

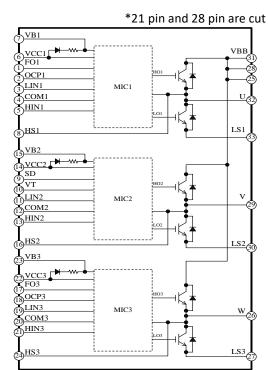
DIP33



LF No. 2552 Size: 47 mm × 19 mm

Block Diagram





Features

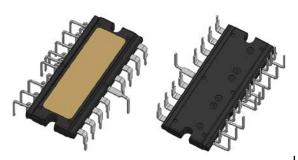
◆ Temperature Sensing Voltage Output (Analog Voltage) Temperature Sensing Voltage Output (Analog Voltage)

Undervoltage Lockout for Power Supply (UVLO)

- ◆ Built-in Bootstrap Diodes with Current Limiting Resistors
- ◆ CMOS-compatible Input (3.3 V or 5 V)
- 3-shunt Current Detection
- Protections:
 Overcurrent Protection (OCP)
 Simultaneous On-state Prevention
- Isolation Voltage: 2500 V for 1 min, UL-recognized Component

Part Number	V _{CES}	I _C	V _{CE(SAT)} typ.
SCM1272MF		15 A	
SCM1274MF	600 V	20 A	1.7 V
SCM1276MF		30 A	

DIP33



LF No. 2563 Size: 47 mm \times 19 mm

Features

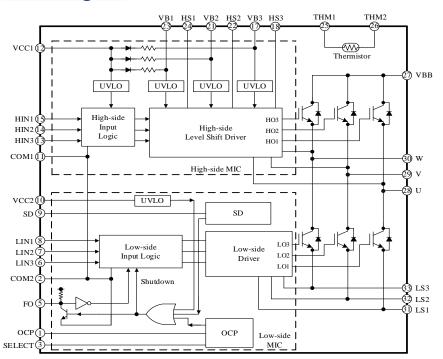
- Built-in Bootstrap Diodes with Current Limiting Resistors
- ◆ CMOS-compatible Input (3.3 V or 5 V)
- 3-shunt Current Detection
- Protections:

Overcurrent Protection (OCP): Selectable OCP Hold Time (34 μs or 8 ms)

Undervoltage Lockout for Power Supply (UVLO)

Built-in NTC Thermistor

Block Diagram



Part Number	V _{CES}	I _C	V _{CE(SAT)} typ.
SCM2007MKF	600 V	20 A	1.7 V
SCM2007MKF	600 V	30 A	1.7 V

DIP30



Size: 52.5×31×5.6 mm

LF No. 2541

Features

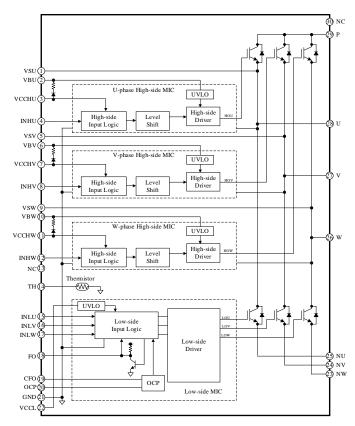
- ◆ Isolation Voltage: 2500 V (for 1 min) (UL Recognition Pending)
- Built-in Thermistor
- Built-in Bootstrap Diodes
- CMOS-compatible Input (3.3 V or 5 V)
- ◆ Fault Signal Output at Protection Activation
- Shutdown Signal Input
- Adjustable OCP Hold Time
- Protections:

Undervoltage Lockout for Power Supply

- VBx Pin (UVLO_VBx): Auto-restart
- VCCL Pin (UVLO_VCCL): Auto-restart

Overcurrent Protection (OCP): Auto-restart

Block Diagram

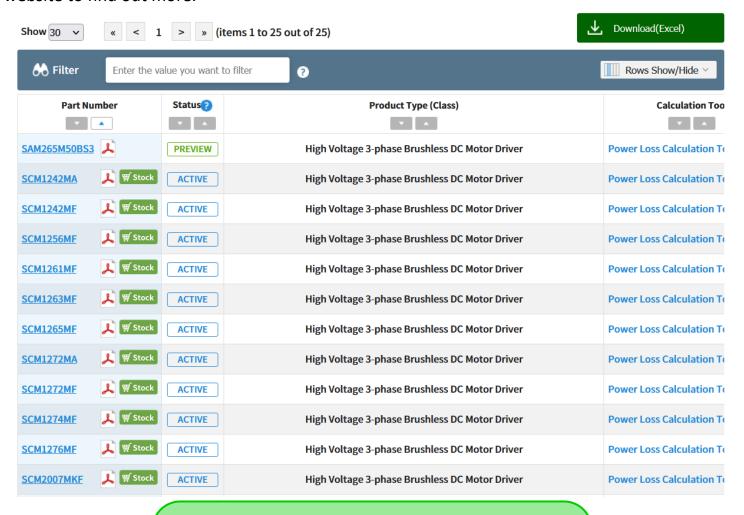


Part Number	Output Transistor	V _{CES}	l _c	V _{CE(SAT)} typ.
SAM265M50BS3	IGBT + FRD	650 V	50 A	1.7 V (TBD)

Calculation Tools



Our online calculation tools quickly tell you output transistor losses and estimated junction temperatures. Please visit our website to find out more.



Calculation Tools List Page

Important Notes

- •All data, illustrations, graphs, tables and any other information included in this document (the "Information") as to Sanken's products listed herein (the "Sanken Products") are current as of the date this document is issued. The Information is subject to any change without notice due to improvement of the Sanken Products, etc. Please make sure to confirm with a Sanken sales representative that the contents set forth in this document reflect the latest revisions before use.
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