HITACHI
Inspire the Next

Data sheet 5SYA 1193-01 Jul. 22

5SDF 34L4520 (Preliminary)

Fast Recovery Diode

- V_{RRM} = 4500 V
- $I_{F(AV)M}$ = 2690 A
- I_{FSM} = 40·10^3 A
- V_{F0} = 1.46 V
- r_F = 0.480 mΩ
- $V_{DC\text{-}Link}$ = 2800 V
- Industry standard housing
- Cosmic radiation withstand rating
- Optimized low switching losses
- Optimized for IGCT and IGBT operation
- High RBSOA up to high di/dt
- Patented free floating technology

Blocking

Maximum rated values [1)]

Parameter	Symbol	Conditions	5SDF 34L4520	Unit
Repetitive peak reverse voltage	V_{RRM}	f = 50 Hz, t_p = 10 ms, T_{vj} = 140 °C	4500	V
Permanent DC voltage for 100 FIT failure rate	$V_{DC\text{-}link}$	Ambient cosmic radiation at sea level in open air. 100% Duty	2800	V

Characteristic values

Parameter	Symbol	Conditions	min	typ	max	Unit
Reverse leakage current	I_{RRM}	V_{RRM}, T_{vj} = 140 °C			80	mA

Mechanical data

Maximum rated values [1)]

Parameter	Symbol	Conditions	min	typ	max	Unit
Mounting force	F_M		50	55	60	kN
Acceleration	a	Device unclamped			50	m/s^2
Acceleration	a	Device clamped			200	m/s^2

Characteristic values

Parameter	Symbol	Conditions	min	typ	max	Unit
Weight	m				1.4	kg
Housing thickness	H	F_M = 55 kN, T_a = 25 °C	25.4		25.8	mm
Surface creepage distance	D_S		33			mm
Air strike distance	D_a		14			mm

1) Maximum rated values indicate limits beyond which damage to the device may occur

On-state

Maximum rated values [1)]

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Average on-state current	$I_{F(AV)M}$	Half sine wave, Tc = 70 °C			2690	A
RMS on-state current	$I_{F(RMS)}$				4220	A
Peak non-repetitive surge current	I_{FSM}	t_p = 10 ms, T_{vj} = 140 °C, sine half wave, VR = 0 V, after surge			$40 \cdot 10^3$	A
Limiting load integral	I^2t				$8.0 \cdot 10^6$	A^2s

Characteristic values

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
On-state voltage	V_F	I_F = 4000 A, T_{vj} = 140 °C		3.2	3.4	V
Threshold voltage	V_{F0}	I_F = 1000...4000 A, T_{vj} = 140 °C		1.41	1.46	V
Slope resistance	r_F			0.448	0.480	mΩ

Turn-on

Characteristic values

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Peak forward recovery voltage	V_{FRM}	dI_F/dt = 3000 A/µs, I_{FM} = 6500 A, T_{vj} = 140 °C		230		V

Turn-off

Maximum rated values [1)]

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Max. decay rate of on-state current	di/dt_{crit}	I_{FM} = 6500 A, T_{vj} = 140 °C, $V_{DC\text{-}Link}$ = 2800 V			1700	A/µs

Characteristic values

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
Reverse recovery charge	Q_{rr}	I_{FQ} = 4000 A, $V_{DC\text{-}Link}$ = 2800 V, L_{CL} = 230 nH, C_{CL} = 10 µF, R_{CL} = 0.625 Ω, D_{CL} = 5SDF 10H4503, T_{vj} = 140 °C	$-di_F/dt$ = 1700 A/µs		6020		µAs
Reverse recovery current	I_{RM}				2680		A
Turn-off energy	E_{rr}			10.75	12.0	14.0	J
Reverse recovery charge	Q_{rr}		$-di_F/dt$ = 1000 A/µs		5475		µAs
Reverse recovery current	I_{RM}				2020		A
Turn-off energy	E_{rr}				10.0		J
Reverse recovery charge	Q_{rr}		$-di_F/dt$ = 700 A/µs		5100		µAs
Reverse recovery current	I_{RM}				1705		A
Turn-off energy	E_{rr}				9.0		J

1) Maximum rated values indicate limits beyond which damage to the device may occur.

Hitachi Energy Switzerland Ltd
Semiconductors
Fabrikstrasse 3
5600 Lenzburg
Switzerland
Tel: +41 58 586 10 00

E-Mail: salesdesksem@hitachienergy.com
www.hitachienergy.com/semiconductors

Thermal

Maximum rated values [1)]

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Operating junction temperature range	T_{vj}		0		140	°C
Storage temperature range	T_{stg}		-40		125	°C

Characteristic values

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Thermal resistance junction to case	$R_{th(j-c)}$	Double-side cooled F_m = 50... 60 kN			5.6	K/kW
	$R_{th(j-c)A}$	Anode-side cooled F_m = 50... 60 kN			12.2	K/kW
	$R_{th(j-c)C}$	Cathode-side cooled F_m = 50... 60 kN			10.4	K/kW
Thermal resistance case to heatsink	$R_{th(c-h)}$	Double-side cooled F_m = 50... 60 kN			2.2	K/kW
	$R_{th(c-h)}$	Single-side cooled F_m = 50... 60 kN			4.4	K/kW

1) Maximum rated values indicate limits beyond which damage to the device may occur.

Analytical function for transient thermal impedance:

$$Z_{th(j-c)}(t) = \sum_{i=1}^{n} R_i (1 - e^{-t/\tau_i})$$

i	1	2	3
R_i(K/kW)	2.915	2.255	0.440
$\tau_i(\sigma)$	0.800	0.100	0.005

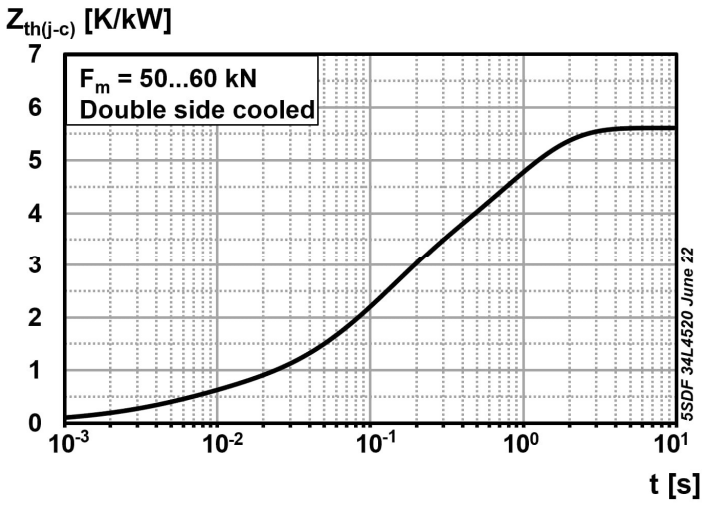

Fig. 1 Transient thermal impedance (junction-to-case) vs. time

Hitachi Energy Switzerland Ltd
Semiconductors
Fabrikstrasse 3
5600 Lenzburg
Switzerland
Tel: +41 58 586 10 00

E-Mail: salesdesksem@hitachienergy.com
www.hitachienergy.com/semiconductors

Max. on-state characteristic model:

$$V_{F25} = A_{Tvj} + B_{Tvj} \cdot I_F + C_{Tvj} \cdot \ln(I_F + 1) + D_{Tvj} \cdot \sqrt{I_F}$$

Valid for I_F = tbd

A_{25}	B_{25}	C_{25}	D_{25}
tbd	tbd	tbd	tbd

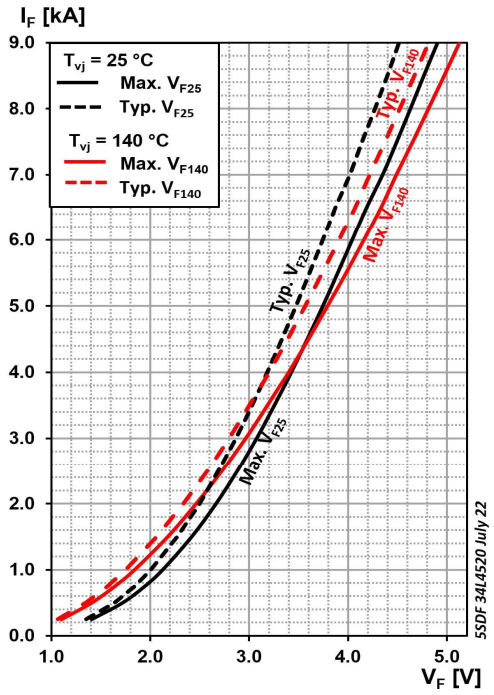

Fig. 2 On-state voltage characteristics

Max. on-state characteristic model:

$$V_{F140} = A_{Tvj} + B_{Tvj} \cdot I_F + C_{Tvj} \cdot \ln(I_F + 1) + D_{Tvj} \cdot \sqrt{I_F}$$

Valid for I_F = tbd

A_{140}	B_{140}	C_{140}	D_{140}
tbd	tbd	tbd	tbd

tbd

Fig. 3 On-state voltage characteristics

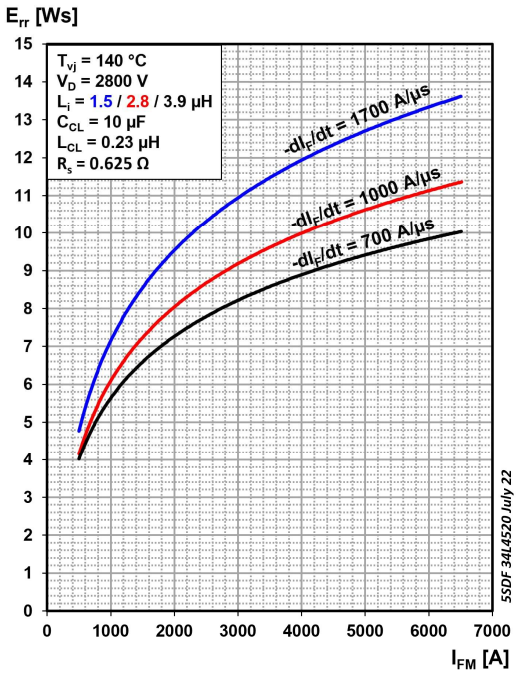

Fig. 4 Turn-off energy per pulse vs. turn-off current (typical values)

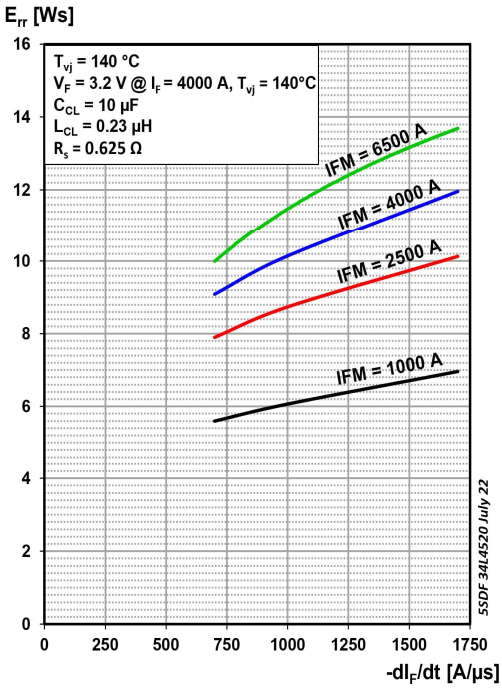

Fig. 5 Turn-off energy per pulse vs. reverse current rise rate (typical values)

Hitachi Energy Switzerland Ltd
Semiconductors
Fabrikstrasse 3
5600 Lenzburg
Switzerland
Tel: +41 58 586 10 00

E-Mail: salesdesksem@hitachienergy.com
www.hitachienergy.com/semiconductors

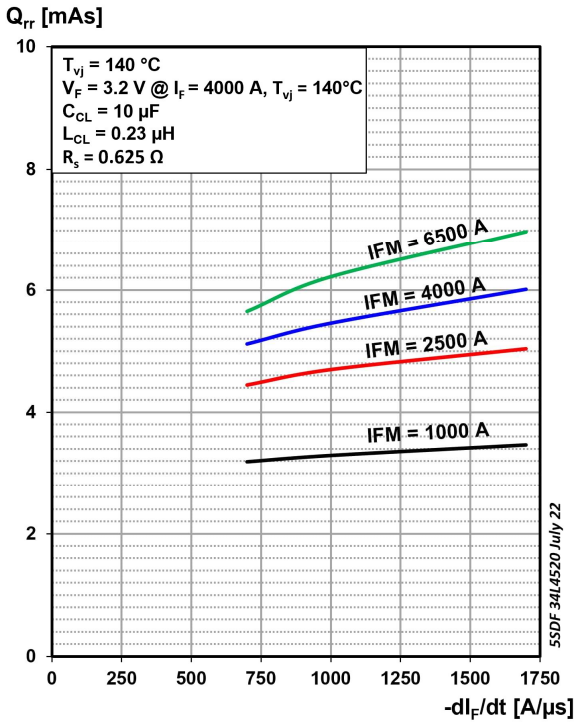

Fig. 6 Repetitive reverse recovery charge vs. reverse current rise rate (typical values)

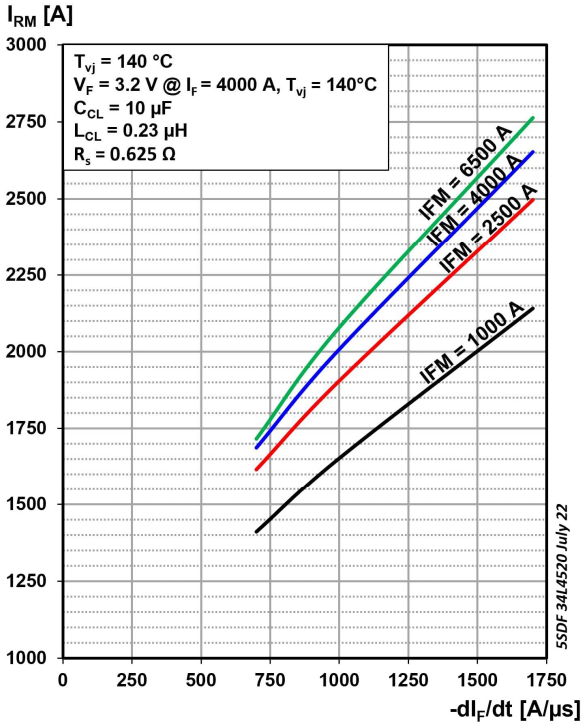

Fig. 7 Reverse recovery current vs. reverse current rise rate (typical values)

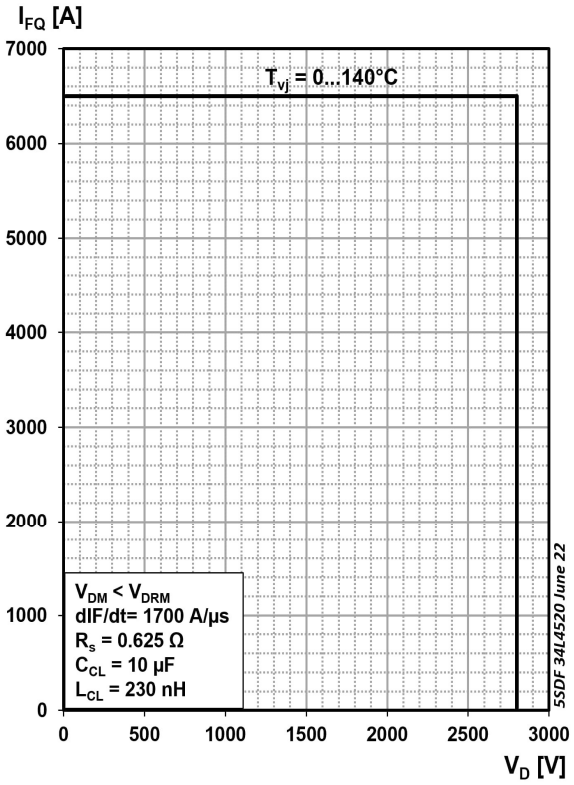

Fig. 8 Diode Safe Operating Area

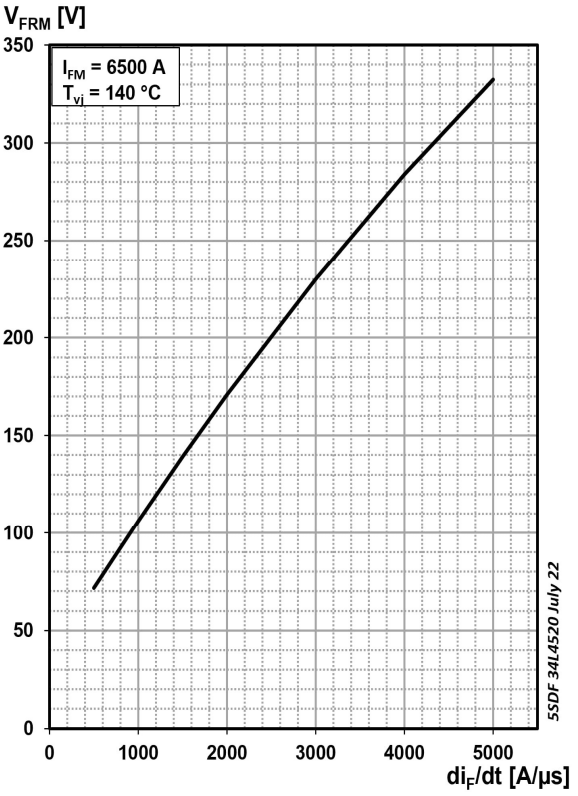

Fig. 9 Peak forward recovery voltage (typical values)

Hitachi Energy Switzerland Ltd
Semiconductors
Fabrikstrasse 3
5600 Lenzburg
Switzerland
Tel: +41 58 586 10 00

E-Mail: salesdesksem@hitachienergy.com
www.hitachienergy.com/semiconductors

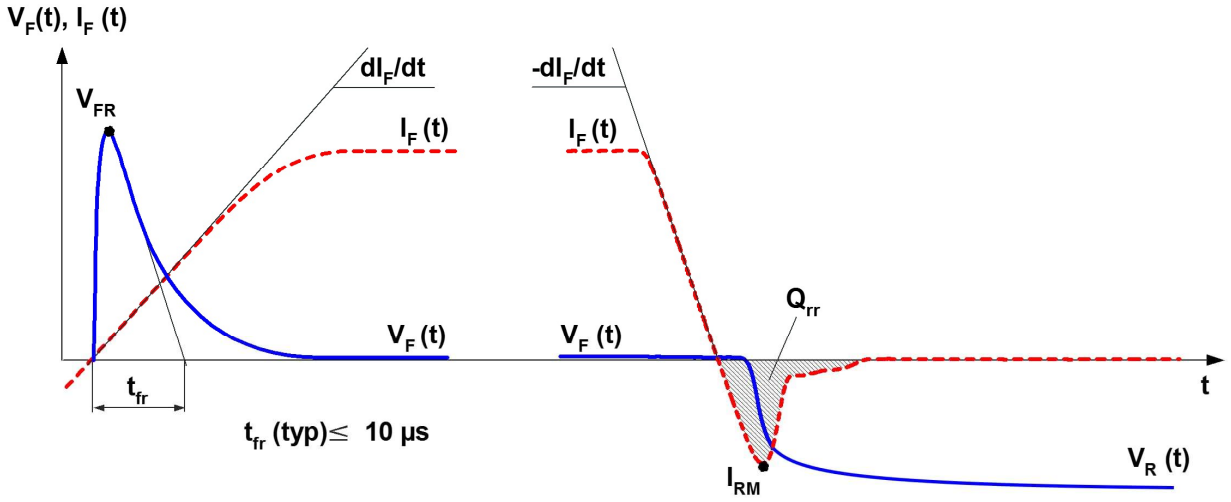

Fig. 10 General current and voltage waveform

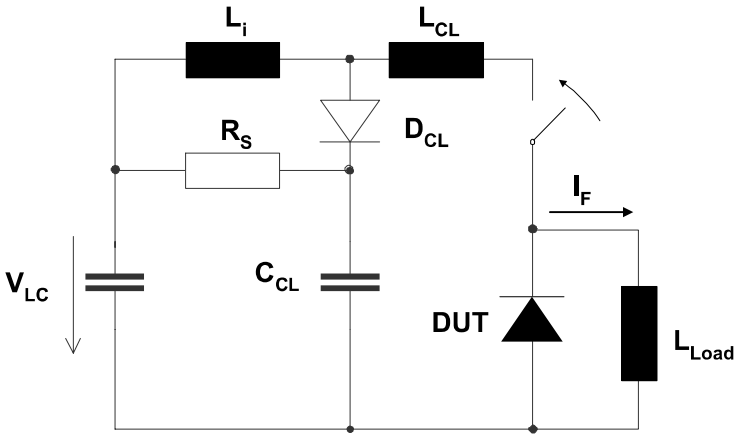

Fig. 11 Test Circuit

Hitachi Energy Switzerland Ltd
Semiconductors
Fabrikstrasse 3
5600 Lenzburg
Switzerland
Tel: +41 58 586 10 00

E-Mail: salesdesksem@hitachienergy.com
www.hitachienergy.com/semiconductors

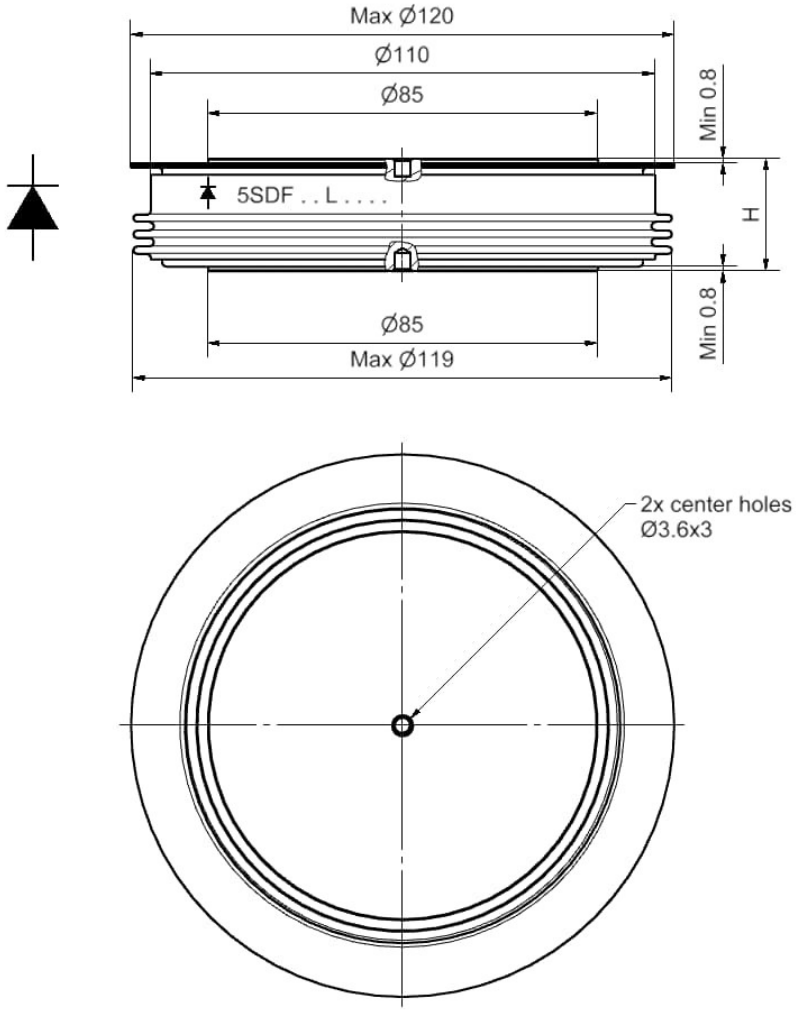

Fig. 12 Device Outline Drawing

Related documents:

5SYA 2036	Recommendations regarding mechanical clamping of Press Pack High Power Semiconductors
5SYA 2064	Applying Fast Recovery Diodes
5SZK 9104	Specification of environmental class for pressure contact diodes, PCTs and GTO, STORAGE
5SZK 9105	Specification of environmental class for pressure contact diodes, PCTs and GTO, TRANSPORTATION
5SZK 9115	Specification of environmental class for presspack Diodes, PCTs and GTOs, OPERATION (Industry)
5SZK 9116	Specification of environmental class for presspack Diodes, PCTs and GTOs, OPERATION (Traction)

Hitachi Energy Switzerland Ltd
Semiconductors
Fabrikstrasse 3
5600 Lenzburg
Switzerland
Tel: +41 58 586 10 00

E-Mail: salesdesksem@hitachienergy.com
www.hitachienergy.com/semiconductors