TO-247-4L
Half-Bridge Evaluation Board
Product Specification

User's Guide

＜High Voltage Safety Precautions＞

◇ Read all safety precautions before use

Please note that this document covers only the SiC MOSFET evaluation board (P02SCT3040KR-EVK-001) and its functions. For additional information, please refer to the Operation Manual.

To ensure safe operation, please carefully read all precautions before handling the evaluation board

Depending on the configuration of the board and voltages used,

Potentially lethal voltages may be generated.

Therefore, please make sure to read and observe all safety precautions described in the red box below.

Before Use

[1] Verify that the parts/components are not damaged or missing (i.e. due to the drops).
[2] Check that there are no conductive foreign objects on the board.
[3] Be careful when performing soldering on the module and/or evaluation board to ensure that solder splash does not occur.
[4] Check that there is no condensation or water droplets on the circuit board.

During Use

[5] Be careful to not allow conductive objects to come into contact with the board.
[6] **Brief accidental contact or even bringing your hand close to the board may result in discharge and lead to severe injury or death.**

Therefore, DO NOT touch the board with your bare hands or bring them too close to the board.
In addition, as mentioned above please exercise extreme caution when using conductive tools such as tweezers and screwdrivers.

[7] If used under conditions beyond its rated voltage, it may cause defects such as short-circuit or, depending on the circumstances, explosion or other permanent damages.
[8] Be sure to wear insulated gloves when handling is required during operation.

After Use

[9] The ROHM Evaluation Board contains the circuits which store the high voltage. Since it stores the charges even after the connected power circuits are cut, please discharge the electricity after using it, and please deal with it after confirming such electric discharge.
[10] Protect against electric shocks by wearing insulated gloves when handling.

This evaluation board is intended for use only in research and development facilities and should by handled **only by qualified personnel familiar with all safety and operating procedures.**
We recommend carrying out operation in a safe environment that includes the use of high voltage signage at all entrances, safety interlocks, and protective glasses.

SiC MOSFET Evaluation Board

TO-247- 4L Half-Bridge Evaluation Board Product Specification

For SiC MOSFET evaluation we are working with fast voltage and current slew rates, thus an appropriate evaluation environment is required. Unfortunately, it is almost impossible to get an evaluation board which fulfills all the required conditions when considering a device's new package.

Therefore, we have developed an evaluation board based on the most common circuit configuration known as a half-bridge circuit. In order to obtain appropriate evaluation conditions with simple preparation, this board is equipped with a driver circuit, an isolated power supply for the driver circuit, an over current protection circuit, Gate signal protection circuit and so forth.

In this application note the evaluation board operational guide for the TO-247- 4L package will be explained. Additionally the detail information regarding operation of this evaluation board is described in the other application note. (TO-247-4L Half-Bridge Evaluation Board Operation Manual: No.61UG047E Rev.001)

1. Appearance

Figure 1 shows a top view picture of this evaluation board. Dimensions and weight are shown in Table 1.

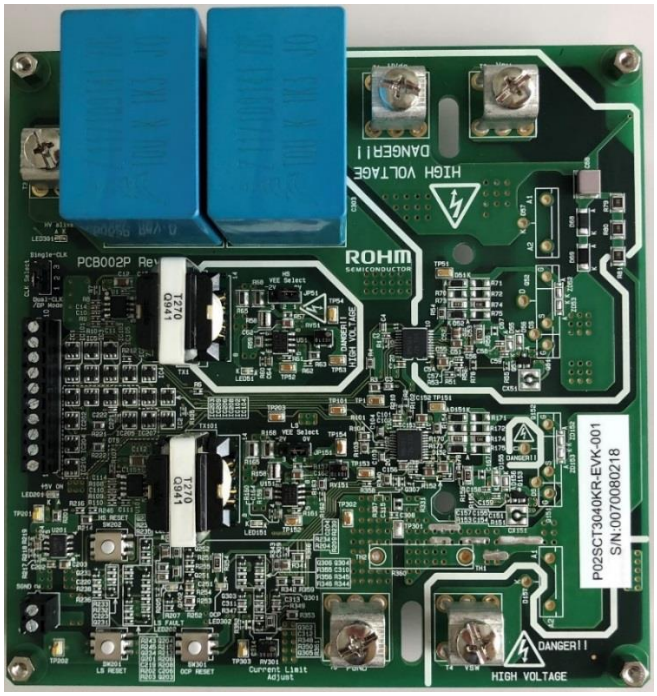

Figure 1. Top view picture

Table 1. Dimensions and Weight

Length	150 mm
Width	150 mm
Height	65 mm
Weight	0.335 kg

2. Main Features

This evaluation board for SiC MOSFET can demonstrate switching characteristics of two types of package such as TO-247-4L and TO-247N.

Main features are:

- Alternative mounting either TO-247-4L or TO-247-3L package
- Operate only by +12V power supply
- Maximum 150A double-pulse test
- Maximum 500 kHz switching operation
- Several power topologies supported (Buck, Boost, Half-Bridge)
- Built-in isolated adjustable output power supply for gate driving (output range is +12V up to +23V.)
- Alternative easy set up turn-off bias voltage either zero bias or minus bias (-2V up to -4V)
- Safety function to prevent both upper and lower MOSFETs from turning on at the same time
- Over current protection function (DESAT, OCP)

3. Order specification

Order form is as below. It is configured by board name, device Name, and serial number.

Minimum order quantity (MOQ) of this evaluation kit is just one piece.

Order specification is shown in Table1.

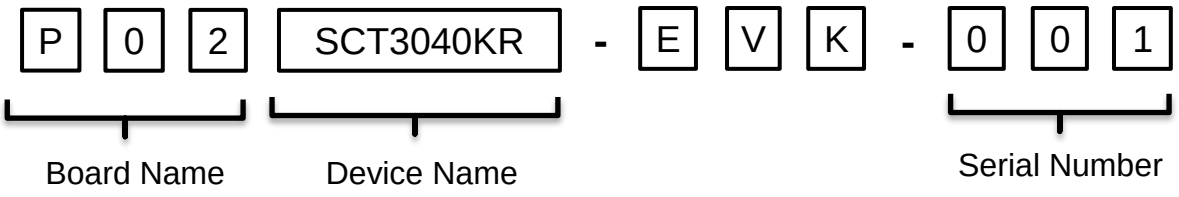

Table2. Order specification

Device	Package	Turn-off Bias voltage	Order specification
SCT3040KR	TO-247-4L	0V	P02SCT3040KR-EVK-001

4. Functional block diagram

Functional block diagram is shown in Figure 2. Four functions are possible, and each function has an HS_xxx or LS_xxx description. It means "HS" is upper arm, "LS" is lower arm. Functions without "HS" or "LS" are used in both arms.

- Driving — driving circuits to operate the switching power device
- Logic — logic circuit to control input TTL level signals
- Protection — protecting circuits to prevent damage to the switching power device
- Power component — high voltage and high current applied components

Table 3 has functional details. Each main function has several sub-functions.
Input or output signals are defined in Table 4.

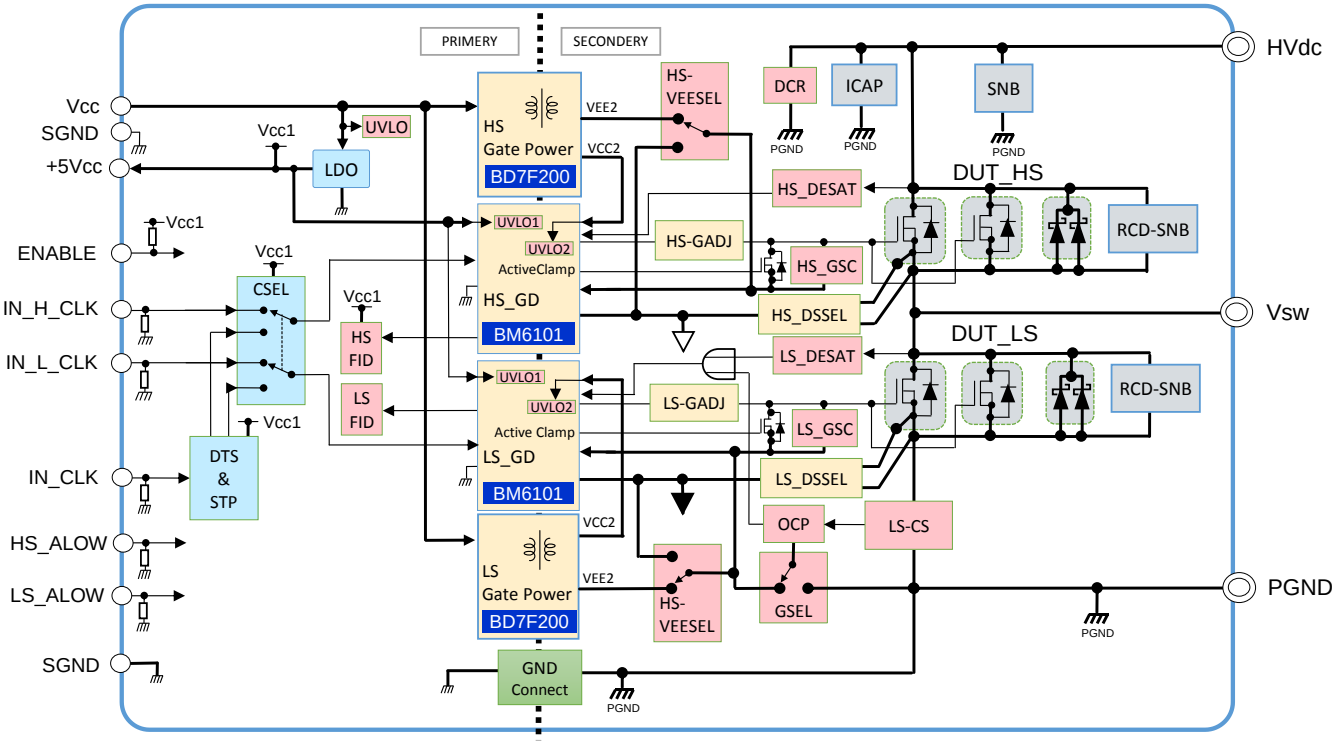

Figure 2. Function block diagram

Table 3. Functional details

Function	Sub-function	Symbol	Detail
Driving	Gate Driver	GD	Gate driving logic (included in BM6101FV-C)
	Gate Power	GP	Power controller and components for gate driving (includes in BD7F200FV-C)
	Gate Adjust	GADJ	Adjustment of gate resistor for MOSFET switching speed Individual adjustment of turn on and turn off
	Driver Source Select	DSSEL	Source return route selection by TO-247N(3L) orTO-247-4L(4L)
Logic	Low Drop-Out regulator	LDO	Power for logic circuit (included in BD450M2WEFJ)
	Clock Select	CSEL	Set up "Single-clock mode" or "Dual/DP-clock mode"
	Dead Time setup	DTS	Dead-time between HS and LS adjustment circuit (available in Single-clock mode)
	Shoot Through Prevention	STP	Circuit preventing HS and LS simultaneously ON (available in Single-clock mode)
Protection	Gate Surge Clamp	GSC	Eliminating surge voltage between gate and source Positive or negative surge is clamped by Schottky barrier diode (SBD) or MOSFET.
	VEE2 Select	VEESEL	VEE2 power set up circuit 0V or -2V of turn off bias is selected by jumper pin.
	GND Select	GSEL	GND level selection of OCP circuit "VEE2 Select" condition determines GND level of OCP circuit.
	Over Current Protection	OCP	Over current protection circuit (LS source current sensing) Detected level is adjustable with potentiometer.
	Device Under Test	DUT	SiC MOSFET or SiC SBD in HS and LS for evaluation
	Desaturation Circuit	DESAT	Over current detection circuit (individual device sensing) Detected V_{DS} voltage is adjustable by chip resistor Detect unmatched logic signal to gate signal
	Fault Indicator	FID	Indicator of OCP and DESAT status Red LED turns on when FLT signal is high.
	Current Sense	CS	Current Sense resistor circuit (4.7mΩ sensing resistor)
	Discharge Resistor	DCR	Discharge resistor circuit for input capacitor (68 kohm × 6 series)
Power component	Input Capacitor	ICAP	Input smoothing capacitor
	Snubber Capacitor	SNB	Snubber capacitor for DC link power line
	RDC Snubber Circuit	RCD_SNB	Non-discharged RDC snubber circuit for individual MOSFET of HS and LS
	Device Under Test	DUT	MOSFET or SBD in HS and LS for evaluation

Table 4. Definition of Input and Output signals

Connector	Pin	signal	I/O	Details
CN201	01	ENABLE	I	Driver IC Enable signal. When signal is "L", CLK signal is available. Individual control of HS and LS is invalid.
	02	SGND	--	Signal GND
	03	IN_CLK	I	HS and LS MOSFET drive signal with reversal. When signal is "H", HS side MOSFET is ON and LS side MOSFET is OFF. When signal is "L", HS side MOSFET is OFF and LS side MOSFET is ON. When Single-clock mode, available. When Open, level is "L".
	04	IN_L_CLK	I	LS side MOSFET drive signal. When signal is "H", MOSFET is ON. When DUAL/DP-clock mode, available. When Open, level is "L".
	05	SGND	--	Signal GND
	06	IN_H_CLK	I	HS side MOSFET drive signal. When signal is "H", MOSFET is ON. When DUAL/DP-clock mode, available. When Open, level is "L".
	07	HS_ALOW	I	Exclusive OR function signal for "IN_H_CLK"
	08	+5Vcc	--	Internal logic power output. Available supply current is max. 20mA.
	09	LS_ALOW	I	Exclusive OR function signal for "IN_H_CLK"
	10	SGND	--	Signal GND
CN202	01	Vcc	--	Driver IC and internal logic power. (No need for gate drive power)
	02	SGND	--	Signal GND
JP1	01	DUAL/DP	I	Dual/DP-clock Mode signal. When "L", IN_H/L_CLK signals are available. When Open, level is "H".
	02	SGND	--	Signal GND
	03	SINGLE	I	Single-clock Mode signal. When "L", IN_CLK signal is available. When Open, level is "H".
T1	--	HVdc	--	High voltage input terminal. In Buck topology, input function. In Boost topology, output function.
T2, T4	--	Vsw	--	HS side MOSFET source terminal and LS side MOSFET drain terminal. Internally connected between them
T3, T5	--	PGND	--	Power GND Possible to connect to SGND. (default is connected)

5. Electrical Characteristics

Table 5 lists major absolute maximum ratings of this evaluation board. This table shows limitations which should not be exceeded. You should pay attention to apply voltage or load within these limitations for safe and non-damaged operation.

Table 5. Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit	Remarks
Input Voltage DC	V_{HVdc}		1200	V	
Input Voltage slew rate	SR_{HVdc}		50	V/μs	Limited by input film capacitor
Output Voltage	V_{OUT}		1200	V	
Vcc Supply Voltage	V_{CC}	5.0	20	V	For isolated gate power and internal logic
Input Signal Voltage	V_{ENABLE} V_{HS_ALOW} V_{LS_ALOW} $V_{IN\_H\_CLK}$ $V_{IN\_L\_CLK}$ V_{IN_CLK}	- 0.3	5.3	V	
+5Vcc Output Current	I_{5Vcc}		20	mA	Auxiliary Power Source
Storage Temperature	T_{STG}	-10	40	℃	Limited by input film capacitor

Table 6 shows the recommended operating conditions of this board.

Table 6. Recommended Operating Conditions and Electrical Characteristics

Parameter	Symbol	Min.	TYP.	Max.	Unit	Remarks
Input Voltage DC	V_{HVdc}			900	V	
Output Voltage	V_{OUT}			900	V	
Vcc Supply Voltage	V_{CC}	10	12	15	V	
Output Current	I_{OUT}			30	A	
Double Pulse Current	I_{DP}			150	A	
CLK signal Pulse width	t_{PWDT}			10	μs	LS only, 0V bias
CLK Signal frequency	$f_{IN\_xx\_CLK}$			500	kHz	
Input signal Low level voltage	$V_{IN\_H\_CLK}$ $V_{IN\_L\_CLK}$ V_{IN_CLK} V_{HS_ALOW}	0		1.5	V	
Input signal High Level voltage	V_{LS_ALOW} V_{ENABLE}	3.5		5.1	V	
Operating Temperature	T_{OPR}		25		℃	
Cumulative operating Time	t_{CUM}		100		Hrs.	

6. Schematics

P02SCT3040KR-EVK-001 schematics with SCT3040KR are shown in Figure 3.

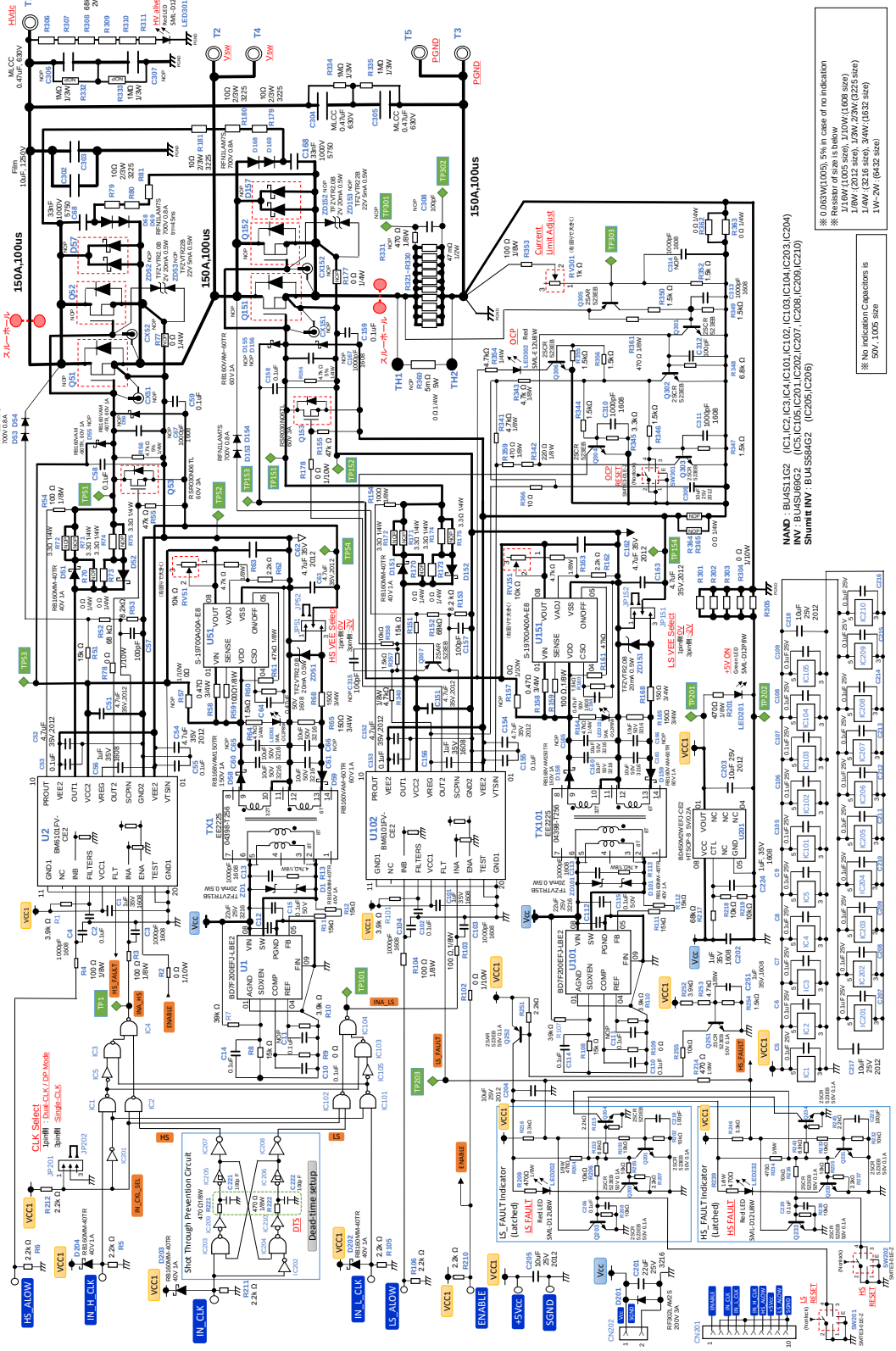

Figure 3. P02SCT3040KR-EVK-001 Schematics

7. BOM

Table 7. Bill of Materials

Device	Mounted	Symbol	Parts Number	Values	Manufacture	Package Size [mm]
PCB	--	--	PCB002P Rev.D	FR4, 4-layer, 3mm Thickness	ROHM	150 x 150
IC	Mounted	U1,U101	BD7F200EFJ-LB2	PWM IC	ROHM	HTSOP-J8
IC	Mounted	U2,U102	BM6101FV-CE2	Driver IC	ROHM	SSOP-20W
IC	Mounted	U201	BD450M2WEFJ-CE2	LDO(5V,0.2A)	ROHM	HTSOP-J8
IC	Mounted	U51,U151	S-19700A00A-E8	LDO(20V,0.4A)	SII	HSOP-8A
IC	Mounted	IC1,IC2,IC3,IC4, IC101,IC102,IC103,IC104, IC203,IC204	BU4S11G2TR	NAND(single)	ROHM	SSOP-5
IC	Mounted	IC5,IC105,IC201,IC202, IC207,IC208,IC209,IC210	BU4SU69G2TR	INV(single)	ROHM	SSOP-5
IC	Mounted	IC205,IC206	BU4S584G2TR	Schmitt INV(S)	ROHM	SSOP-5
Diode	Mounted	D1,D51,D52,D101,D151, D152,D202,D203,D204	RB160MM-40TR	40V,1A	ROHM	PMDU
Diode	Mounted	D59,D159	RB160VAM-60TR	60V,1A	ROHM	TUMD2M
Diode	NOP	D55,D56,D155,D156	RB160VAM-60TR	60V,1A	ROHM	TUMD2M
Diode	Mounted	D58,D158	RB168VAM150TR	150V,1A	ROHM	TUMD2M
Diode	Mounted	D53,D54,D153,D154, D68,D69,D168,D169	RFN1LAM7STR	700V,0.8A	ROHM	PMDTM
Diode	Mounted	D201	RF302LAM2STR	200V,3A	ROHM	PMDTM
Diode	NOP	D57,D157	DUT		TBD	TO-247
Transistor	NOP	Q51,Q151	DUT		TBD	TO-247-4L
Transistor	NOP	Q52,Q152	DUT		TBD	TO-247-3L
Transistor	Mounted	Q53,Q153	RSR030N06TL	60V,3A	ROHM	SC-96
Transistor	Mounted	Q201,Q202,Q203,Q204, Q231,Q232,Q233,Q234, Q301,Q302,Q303,Q304, Q306,Q251	2SCR523EBTL	50V,0.1A	ROHM	SC-89
Transistor	Mounted	Q305,Q307,Q252	2SAR523EBTL	50V,0.1A	ROHM	SC-89
Zener Diode	Mounted	ZD1,ZD101	TFZVTR15B	15V, 20mA	ROHM	TUMD2M
Zener Diode	Mounted	ZD51,ZD151	TFZVTR2.0B	2.0V, 20mA	ROHM	TUMD2M
Zener Diode	NOP	ZD52,ZD152	TFZVTR2.0B	2.0V, 20mA	ROHM	TUMD2M
Zener Diode	NOP	ZD53,ZD153	TFZVTR22B	22V, 5mA	ROHM	TUMD2M
LED	Mounted	LED201,LED51,LED151	SML-D12P8WT86L	Green, 20mA	ROHM	1.6 x 0.8
LED	Mounted	LED202,LED232,LED301, LED302	SML-D12U8WT86Q	Red, 20mA	ROHM	1.6 x 0.8
Switch	Mounted	SW201,SW202,SW301	SMTE3-01E-Z	SPST, 24V,30mA	Copal	6.8 x 7.0
Jumper pin	Mounted	JP201,JP51,JP151	929647-02-03-EU	Male,3-pin	3M	---
Jumper-pin shunt	Mounted	JP202,JP52,JP152	QPC02SXGN-RC	2-pin, black	Sullins	2.54 x 5
Terminal	Mounted	T1,T2,T3,T4,T5	7808	M5, 30A, 6P	Keystone	12 x 12
Terminal	Mounted	CN201	OSTTE100104	10pin, black	ON-SHORE	36 x 7
Terminal	Mounted	CN202	OSTTE020104	2pin, black	ON-SHORE	8 x 7
Test Pin	Mounted	TP1,TP101,TP201,TP202, TP203,TP51,TP52,TP53, TP54,TP151,TP152,TP153, TP154,TP302,TP303	HK-2-G	SMD	Mac8	3.2 x 1.6
Test Pin	NOP	TP301	HK-2-G	SMD	Mac8	3.2 x 1.6
Connector	NOP	CX51,CX52,CX151,CX152	73415-2061	Jack, SMD mount	Molex	φ3.45 3.45 x 3.45
Transformer	Mounted	TX1,TX101	EE2225 04398-T256	2-output	SUMIDA	20 x 18

Table 7. Bill of Materials

Device	Mounted	Symbol	Parts Number	Values	Manufacture	Package Size [mm]
Trimmer	Mounted	RV51,RV151	SM-3TW10kohm(103)	10k,1/8W,11turns	Copal	3.9 x 3.5
Trimmer	Mounted	RV301	SM-31W1kohm(102)	1k,1/8W,5turns	Copal	3.9 x 3.5
Resistor	Mounted	R5,R6,R105,R106, R62,R162,R207, R210,R211,R212,R237, R215,R245,R251	MCR01MZPF2201	2.2k,1/16W	ROHM	1.0 x 0.5
Resistor	Mounted	R366	MCR01MZPF10R0	10,1%,1/16W	ROHM	1.0 x 0.5
Resistor	Mounted	R52,R152,R217	MCR01MZPF6802	68k,1%,1/16W	ROHM	1.0 x 0.5
Resistor	Mounted	R8,R108,R51,R151, R11,R12,R111,R112	MCR01MZPF1502	15k,1%,1/16W	ROHM	1.0 x 0.5
Resistor	Mounted	R213,R243,R348	MCR01MZPF6801	6.8k,1%,1/16W	ROHM	1.0 x 0.5
Resistor	Mounted	R9,R109	MCR01MZPJ000	0ohm	ROHM	1.0 x 0.5
Resistor	Mounted	R10,R110,R252, R1,R101	MCR01MZPF3901	3.9k,1%,1/16W	ROHM	1.0 x 0.5
Resistor	Mounted	R345,R216,R246	MCR01MZPF3301	3.3k,1%,1/16W	ROHM	1.0 x 0.5
Resistor	Mounted	R55,R155,R61,R161	MCR01MZPF4702	47k,1%,1/16W	ROHM	1.0 x 0.5
Resistor	Mounted	R7,R107	MCR01MZPF3902	39k,1%,1/16W	ROHM	1.0 x 0.5
Resistor	Mounted	R53,R153	MCR01MZPF8201	8.2k,1%,1/16W	ROHM	1.0 x 0.5
Resistor	Mounted	R60,R160,R355,R356, R344,R346,R347,R357, R254,R349,R352,R350	MCR01MZPF1501	1.5k,1%,1/16W	ROHM	1.0 x 0.5
Resistor	Mounted	R202,R203,R205,R206, R232,R233,R235,R236, R218,R219,R358,R255, R208,R238	MCR01MZPF1002	10k,1%,1/16W	ROHM	1.0 x 0.5
Resistor	Mounted	R2,R102,R78,R178,R301, R302,R303,R304,R305	MCR03EZPJ000	0ohm	ROHM	1.6 x 0.8
Resistor	Mounted	R3,R4,R103,R104,R54, R154,R59,R159,R353	MCR10EZPJ101	100,5%,1/8W	ROHM	2.0 x 1.25
Resistor	Mounted	R342	MCR10EZPF2200	220,1%,1/8W	ROHM	2.0 x 125
Resistor	Mounted	R13,R113,R63,R163, R341,R343,R253,R340	MCR10EZPF4701	4.7k,1%,1/8W	ROHM	2.0 x 1.25
Resistor	Mounted	R201,R204,R209,R214, R234,R239,R221,R222, R359,R361	MCR10EZPF4700	470,1%,1/8W	ROHM	2.0 x 1.25
Resistor	Mounted	R65,R165,R68,R168	LTR18EZPF1500	150,1%,3/4W	ROHM	1.6 x 3.2
Resistor	Mounted	R58,R158	LTR18EZPFLR470	0.47,1%,1W	ROHM	1.6 x 3.2
Resistor	Mounted	R56,R156,R354, R64,R164	MCR18EZPJ472	4.7k,5%,1/4W	ROHM	3.2 x 1.6
Resistor	Mounted	R74,R174	ESR18EZPJ3R3	3.3,5%,1/2W	ROHM	3.2 x 1.6
Resistor	Mounted	R73,R173,R362,R363	MCR18EZPJ000	0ohm	ROHM	3.2 x 1.6
Resistor	Mounted	R334,R335	KTR25JZPJ105	1M,5%,1/3W	ROHM	3.2 x 2.5
Resistor	Mounted	R306,R307,R308,R309, R310,R311	LTR100JZPJ683	68k,5%,2W	ROHM	3.2 x 6.4
Resistor	Mounted	R321,R322,R323,R324, R325,R326,R327,R328, R329,R330	LTR10EVHFSR047	47m,1%,1/2W	ROHM	1.2 x 2.0
Resistor	NOP	R57,R157	MCR03EZPJ000	0ohm	ROHM	1.6 x 0.8
Resistor	NOP	R331	MCR10EZPF4700	470,1%,1/8W	ROHM	2.0 x 1.25
Resistor	NOP	R70,R170,R77,R177,R364,R365	MCR18EZPJ000	0ohm	ROHM	3.2 x 1.6
Resistor	NOP	R72,R75,R172,R175,R71,R171	ESR18EZPJ3R3	3.3,5%,1/4W	ROHM	3.2 x 1.6
Resistor	NOP	R332,R333	KTR25JZPJ105	1M,5%,1/3W	ROHM	3.2 x 2.5
Resistor	NOP	R360	PWR4412-2S-D-R0050F	5m,1% 5W	BOURNS	2.1 x 4.8
Resistor	Mounted	R79,R80,R81, R179,R180,R181	ESR25JZPJ100	10, 5%, 2/3W	ROHM	3.2 x 2.5

Table 7. Bill of Materials

Device	Mounted	Symbol	Parts Number	Values	Manufacture	Package Size [mm]
Capacitor	Mounted	C2,C102,C10,C14,C110, C114,C53,C55,C153,C155, C5,C6,C7,C8,C9,C105, C106,C107,C108,C109, C207,C208,C209,C210, C211,C212,C213,C214, C215,C216,C206, C220,C58,C59.C158, C159,C15,C115	CGA2B3X7R1H104K050BB	0.1u,50V,X7R	TDK	1.0 x 0.5
Capacitor	Mounted	C57,C157,C219,C223, C221,C222,C312	CGA2B2C0G1H101J050BA	100p,50V,C0G	TDK	1.0 x 0.5
Capacitor	Mounted	C202,C56,C156, C224,C1,C101,C251	CGA3E1X7R1V105K080AC	1u,35V,X7R	TDK	1.6 x 0.8
Capacitor	Mounted	C3,C4,C13,C103,C104, C113,C310,C311,C313	CGA3E2C0G1H102J080AA	1000p,50V,C0G	TDK	1.6 x 0.8
Capacitor	Mounted	C64,C164	CGA3E3X7R1H474K080AB	0.47u,50V,X7R	TDK	1.6 x 0.8
Capacitor	Mounted	C51,C52,C54,C151,C152, C154,C62,C63,C162,C163	CGA4J1X7R1V475K125AC	4.7u,35V,X7R	TDK	2.0 x 1.25
Capacitor	Mounted	C203,C204,C205, C217,C218,C309	CGA4J1X7S1E106KT0Y0N	10uF,25V,X7S	TDK	2.0 x 1.25
Capacitor	Mounted	C60,C61,C160,C161	CGA5L3X5R1H106K160AB	10uF,50V,X5R	TDK	3.2 x 1.6
Capacitor	Mounted	C12,C112,C201	C3216X5R1E226M160AB	22uF,25V,X5R	TDK	3.2 x 1.6
Capacitor	Mounted	C304,C305	CGA9P1X7T2J474M250KC	0.47u,630V,X7T	TDK	5.7 x 5.0
Capacitor	Mounted	C302,C303	B32776G1106K000	10uF,1250V	TDK	42 x 28
Capacitor	Mounted	C68,C168	C5750C0G3A333J280KC	33000pF,1000V	TDK	5.7 x 5.0
Capacitor	NOP	C11,C111	CGA2B3X7R1H104K	0.1u,50V,X7R	TDK	1.0 x 0.5
Capacitor	NOP	C308,C315	CGA2B2C0G1H101J050BA	100p,50V,C0G	TDK	1.0 x 0.5
Capacitor	NOP	C314,C67,C167	CGA3E2C0G1H102J080AA	1000p,50V,C0G	TDK	1.6 x 0.8
Capacitor	NOP	C65,C66,C165,C166	CGA5L3X5R1H106K160AB	10uF,50V,X5R	TDK	3.2 x 1.6
Capacitor	NOP	C306,C307	CGA9P1X7T2J474M250KC	0.47u,630V,X7T	TDK	5.7 x 5.0

8. PCB Layout

This PCB has four layers. Each layer routing of PCB is illustrated in Figure 4. (a), (b), (c), (d). The silkscreen top and bottom are shown in Figure 4 (e), (f).

Also, the Gerber-files can be provided. Get in contact with our application support team.

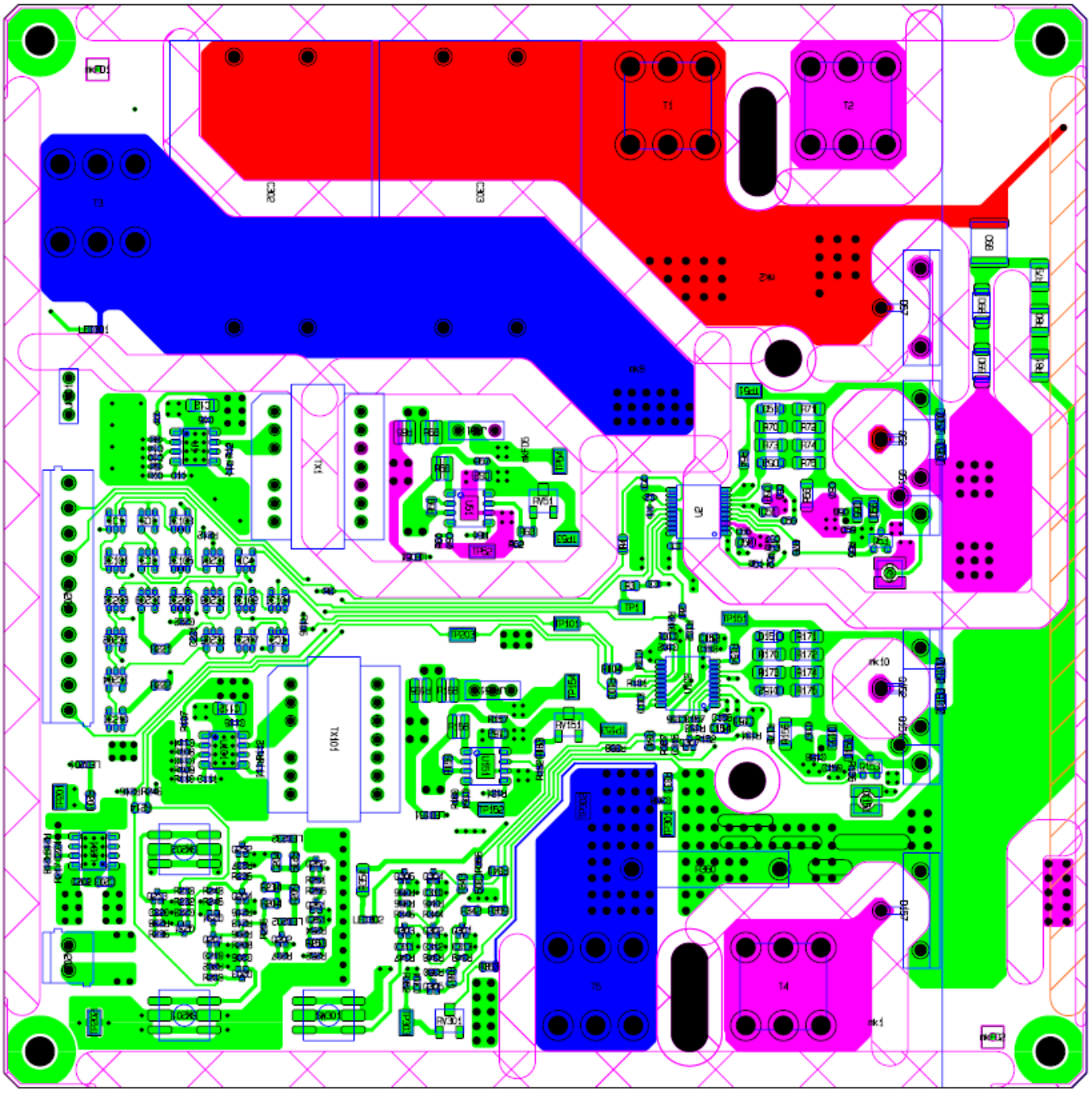

Figure 4. (a) Top Layer (Top view)

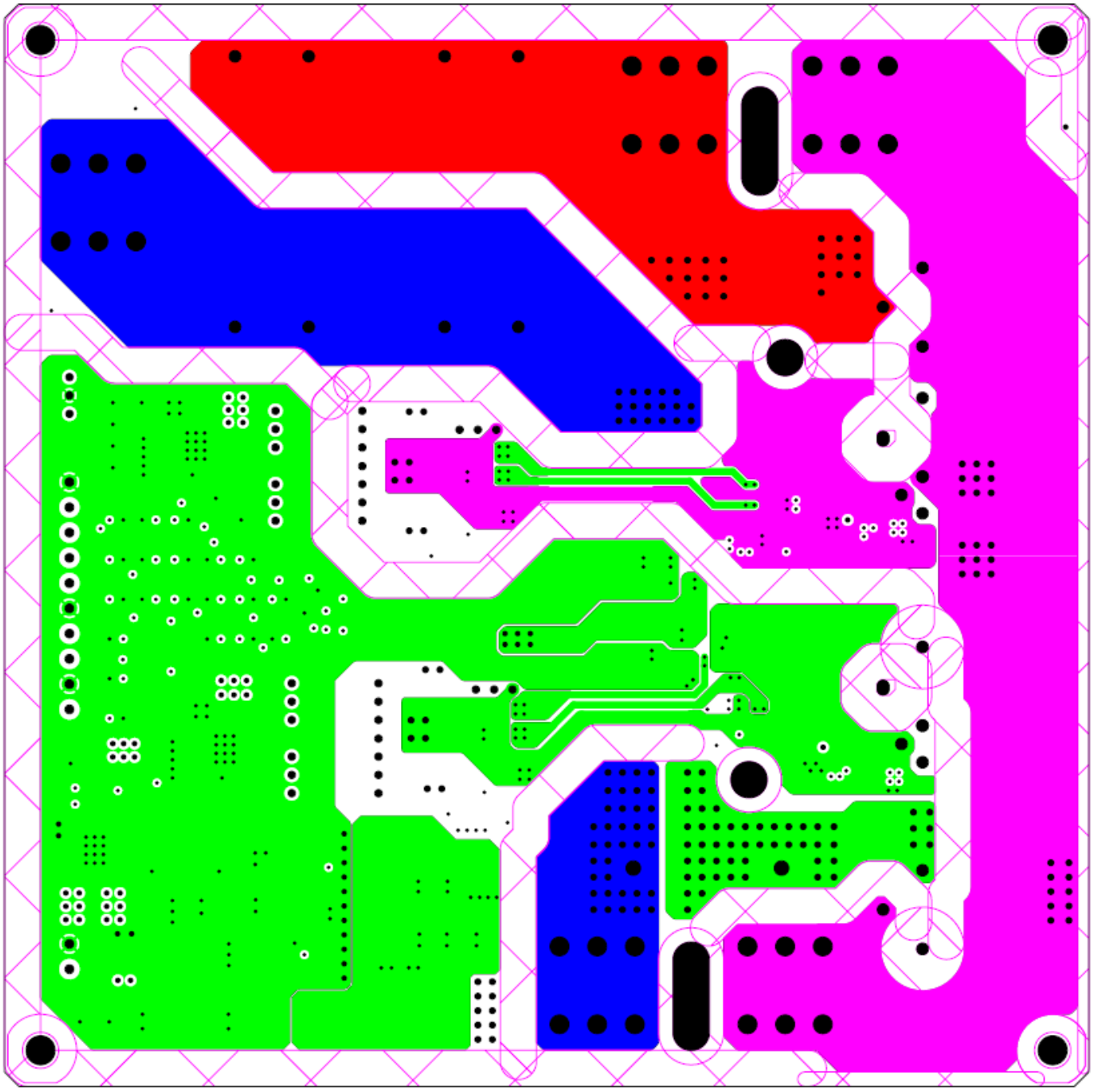

Figure 4. (b) Layer 2 (Top view)

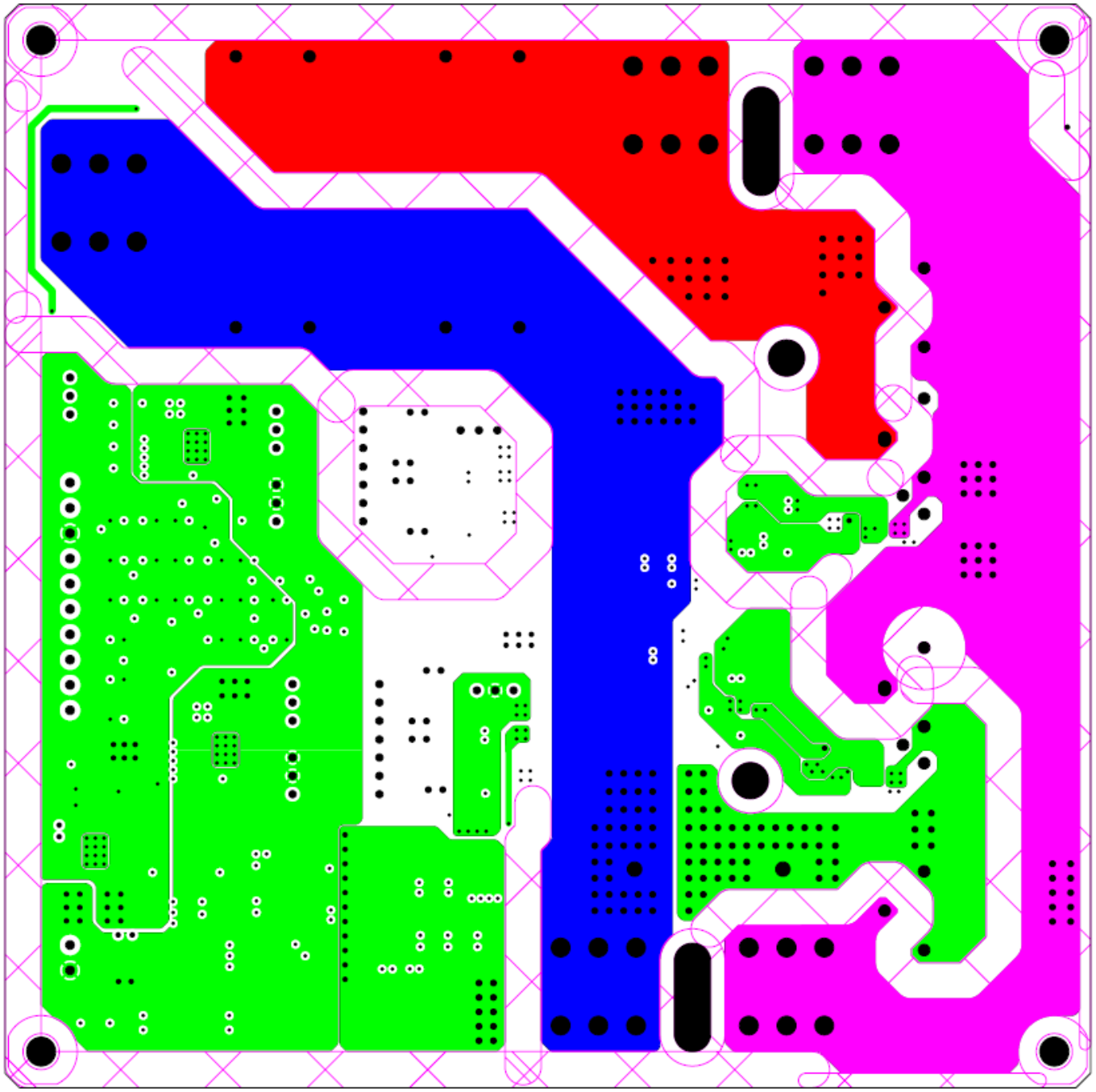

Figure 4. (c) Layer 3 (Top view)

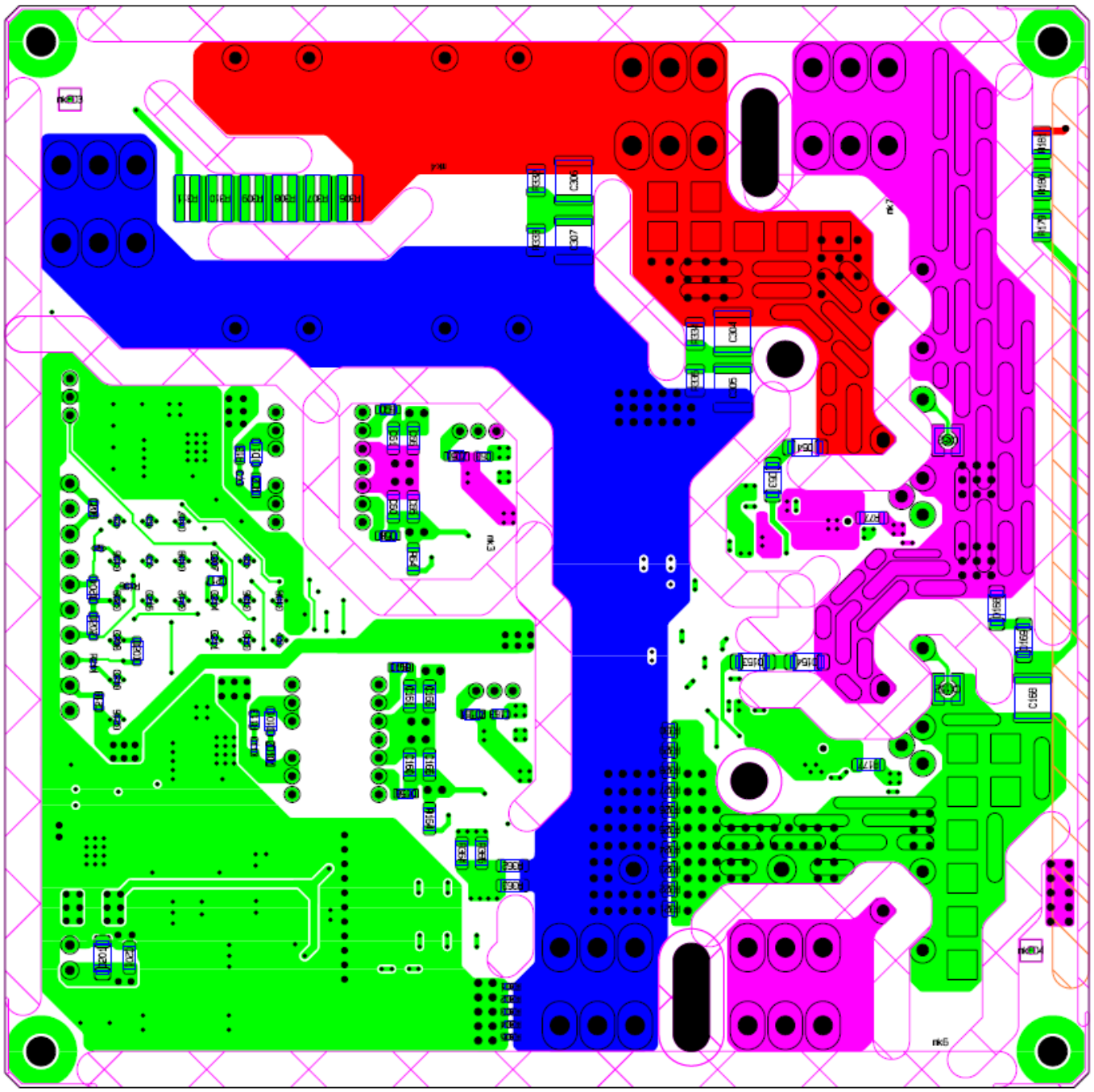

Figure 4. (d) Bottom Layer (Top view)

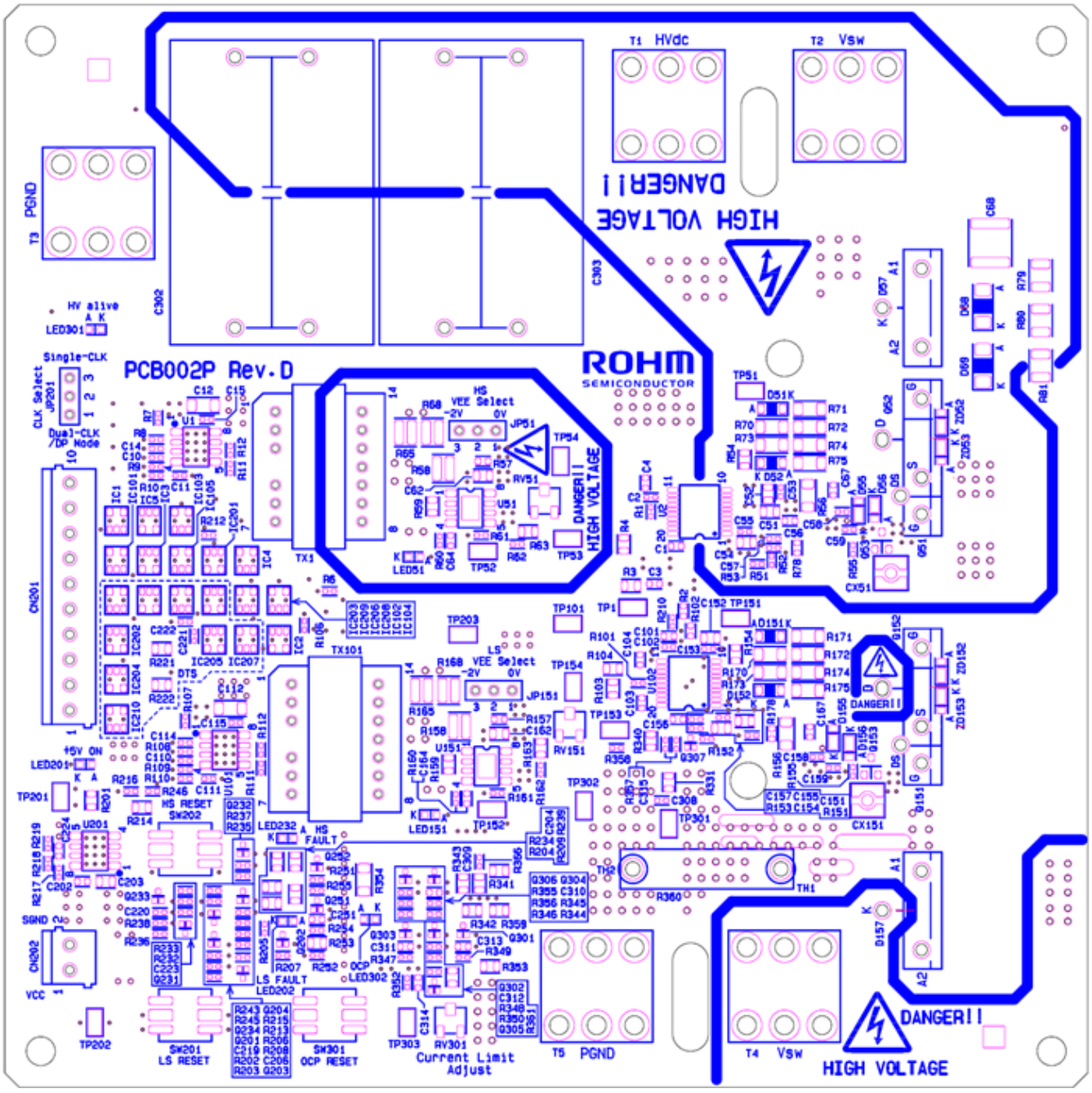

Figure 4. (e) Top assembly silkscreen

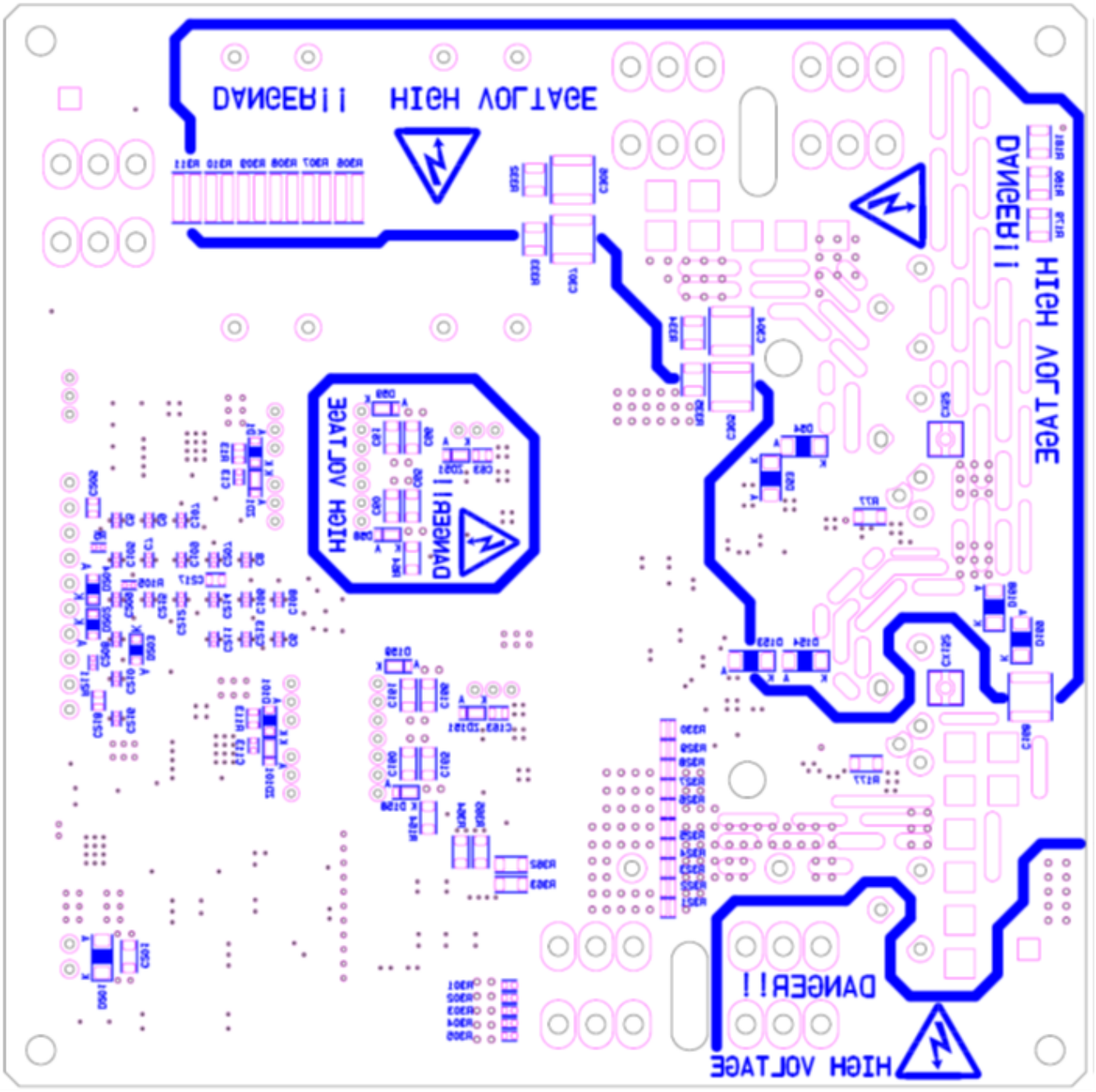

Figure 4. (f) Bottom assembly silkscreen

9. Precautions

In addition to the precautions listed throughout this manual and "Operation Manual" (No.61UG047E Rev.001), please read and understand the following conditions. This evaluation board can have over 1000V applied. Therefore, not only on-board-problems but also human failures by wrong operation must be removed completely.

In Table 8, the particular precautions about this board abnormal status are shown. In addition, after all safety steps are taken, this board may be used.

Table 8. Abnormal status of the evaluation board

Function	Items	Details
DCR	● LED non-lighted	Please check LED301 (Red) turns ON, when input-voltage is applied. If no LED turns ON, please check voltage-source, layout and so on. (LED turns ON, when in/output voltage gets over around 20V.)
FLT	● LED non-lighted	Please check that under FAULT-status, even inputting clock signal, MOSFET drive-signal does not come out and LED202 and LED232 (RED) turns ON. If clock signal over 20us is input without mounting MOSFET, it leads to FLT status.
OCP	● Protection circuit is not 100 % risk avoidance.	This OCP cannot avoid danger completely. This function is for emergency-stop when protection operation does not work in case of accidental output short-circuit under open-loop control. Thus during HVdc application, please conduct constant monitoring so that instant action against abnormal status is possible such as power cut-off.
	● FLT LED lighted during LS DPT	In the default condition (0V bias), a pulse width of the double pulse test should be utilized within 10μs and 30A of drain current. However, this limitation is LS MOSFET DPT only. If this evaluation board is utilized out of this limitation, LS_FAULT LED (LED202) will be turned on. In case that over 10μs pulse width is applied, the level-shift condition of OCP circuit should be changed. Get detailed information from the operation Manual of this evaluation board (No.61UG047E Rev.001).
HVdc Vsw	● Over-spec voltage application ● Miss-layout	Please let an expert handle the board. Over-spec voltage must not applied. Please make sure that there is no miss-connection of layout. Please never touch it when it is under operation.
Vcc	● Miss-layout ● Over-spec voltage application	Please pay attention to layout not to apply positive and negative Vcc in reverse. Note that a diode is connected between Vcc to SGND (D201) in order to prevent destruction of the TTL logic circuit. The maximum current rating is 3 A. Therefore, an OCP level of Vcc power supply should be set up to 3A. Also unspecified voltage-application leads to malfunction. Please operate with full-check.
SNB RDC_SNB	● MLCC Burn-out	Large size MLCCs are used. Mechanical stress easily leads to short-circuit malfunction due to cracks. Please pay attention when handling the board to prevent over-stress.

Notes

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2) Before you use our Products, please contact our sales representative and verify the latest specifications :

3) Although ROHM is continuously working to improve product reliability and quality, semiconductors can break down and malfunction due to various factors.
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4) Examples of application circuits, circuit constants and any other information contained herein are provided only to illustrate the standard usage and operations of the Products. The peripheral conditions must be taken into account when designing circuits for mass production.

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