

Quasi-Resonant Power Supply ICs **MS1003SH**

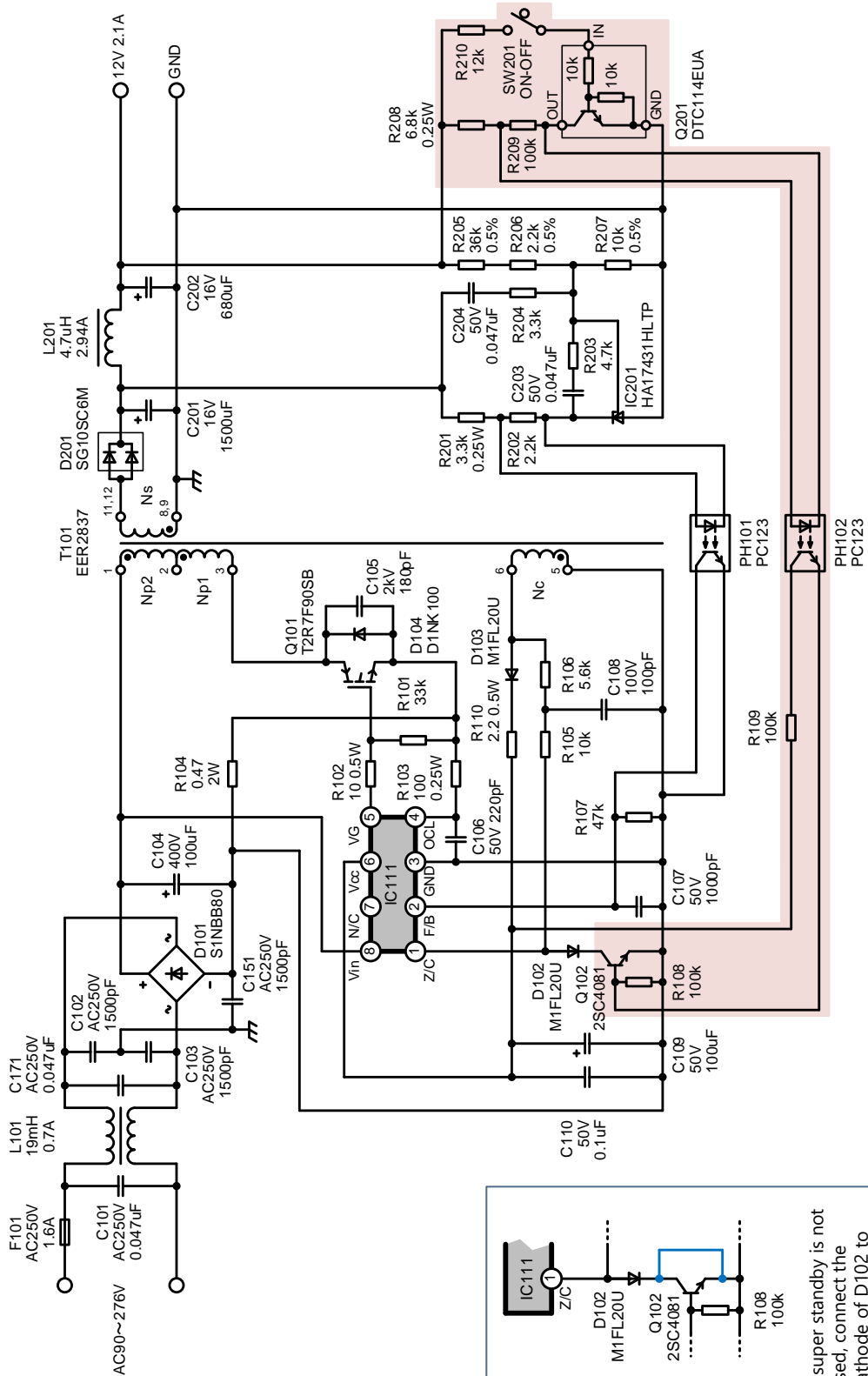
Input voltage : AC 90 ~ 276V

Output	Voltage [V]	Output Current [A]		
		min	typ	max
1	+12	0.0	2.1	2.1
Total Power [W]		0.0	25.2	25.2

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Reference circuit diagram



The components in the red box are additional circuits when using super standby.

If super standby is not used, connect the cathode of D102 to GND.

Bill Of Material

No.	Type	Qt'y	Spec		Model Name	Vendor	Remarks
F101	Fuse	1	AC250V	1,6A	392 series	Littelfuse	-
L101	Line Filter	1	19mH	0.7A	LF2020BNP-R193	SUMIDA	-
L201	Choke Coil	1	4.7µH	2.94A	RCR875DNP-4R7L	SUMIDA	-
T101	Transformer	1			EER2837	SUMIDA	-
IC111	Control IC	1			MS1003SH	SHINDENGEN	-
IC201	Shunt Regulator	1			HA17431HLTP	RENESAS	-
PH101	Opto Coupler	1			PC123	SHARP	-
PH102	Opto Coupler	1			PC123	SHARP	-
Q101	IGBT		900V	2.7A	T2R7F90SB	SHINDENGEN	-
Q102	Transistor	1	50V	0.15A	2SC4081	ROHM	-
Q201	Digital Transistor	1	50V	100mA	DTC114EUA	ROHM	-
D101	Bridge Diode	1	800V	1A	S1NBB80	SHINDENGEN	-
D102	FRD	1	200V	1.1A	M1FL20U	SHINDENGEN	-
D103	FRD	1	200V	1.1A	M1FL20U	SHINDENGEN	-
D104	FRD	1	1000V	1A	D1NK100	SHINDENGEN	-
D201	SBD	1	60V	10A	SG10SC6M	SHINDENGEN	-
C101	Film Capacitor	1	AC250V	0.047µF	ECQUL2A473KL	Panasonic	-
C102	Ceramic Capacitor	1	AC250V	1500pF	CD85-E2GA152MY	TDK	-
C103	Ceramic Capacitor	1	AC250V	1500pF	CD85-E2GA152MY	TDK	-
C104	Electrolytic Capacitor	1	400V	100µF	BXW series	Rubycon	-
C105	Ceramic Capacitor	1	2kV	180pF	CC45SL3AD471JYNM	TDK	-
C106	MLCC	1	50V	220pF	C1608CH1H221J	TDK	-
C107	MLCC	1	50V	1000pF	C1608CH1H102J	TDK	-
C108	MLCC	1	100V	100pF	C1608CH2A101J	TDK	-
C109	Electrolytic Capacitor	1	50V	100µF	ZLH series	Rubycon	-
C110	MLCC	1	50V	0.1µF	C1608X7R1H104K	TDK	-
C151	Ceramic Capacitor	1	AC250V	1500pF	CD12-E2GA152MYNS	TDK	-
C171	Film Capacitor	1	AC250V	0.047µF	ECQUL2A473KL	Panasonic	-
C201	Electrolytic Capacitor	1	16V	1500µF	ZLK series	Rubycon	-
C202	Electrolytic Capacitor	1	16V	680µF	ZLK series	Rubycon	-
C203	MLCC	1	50V	0.047µF	C1608X7R1H473K	TDK	-
C204	MLCC	1	50V	0.047µF	C1608X7R1H473K	TDK	-
R101	Chip Resistor	1	1/10W	33kΩ	RK73B1JTBK333J	KOA	-
R102	Chip Resistor	1	1/2W	10Ω	RK73B2ETBK100J	KOA	-
R103	Chip Resistor	1	1/4W	100Ω	RK73B2BTBK101J	KOA	-
R104	Metal Plate Resistor	1	2W	0.47Ω	BPR26CFR47J	KOA	-
R105	Chip Resistor	1	1/10W	10kΩ	RK73B1JTBK103J	KOA	-
R106	Chip Resistor	1	1/10W	5.6kΩ	RK73B1JTBK562J	KOA	-
R107	Chip Resistor	1	1/10W	47kΩ	RK73B1JTBK473J	KOA	-
R108	Chip Resistor	1	1/10W	100kΩ	RK73B1JTBK104J	KOA	-
R109	Chip Resistor	1	1/10W	100kΩ	RK73B1JTBK104J	KOA	-
R110	Chip Resistor	1	1/2W	2.2Ω	RK73B2ETBK2R2J	KOA	-

Bill Of Material

No.	Type	Qt'y	Spec	Model Name	Vendor	Remarks
R201	Chip Resistor	1	1/4W 3.3kΩ	RK73B2BTBK332J	KOA	-
R202	Chip Resistor	1	1/10W 2.2kΩ	RK73B1JTBK222J	KOA	-
R203	Chip Resistor	1	1/10W 4.7kΩ	RK73B1JTBK472J	KOA	-
R204	Chip Resistor	1	1/10W 3.3kΩ	RK73B1JTBK332J	KOA	-
R205	Chip Resistor	1	1/10W 36kΩ	RK73H1JTBK363D	KOA	0.5%
R206	Chip Resistor	1	1/10W 2.2kΩ	RK73H1JTBK222D	KOA	0.5%
R207	Chip Resistor	1	1/10W 10kΩ	RK73H1JTBK103D	KOA	0.5%
R208	Chip Resistor	1	1/4W 6.8kΩ	RK73B2BTBK682J	KOA	-
R209	Chip Resistor	1	1/10W 100kΩ	RK73B1JTBK104J	KOA	-
R210	Chip Resistor	1	1/10W 12kΩ	RK73B1JTBK123J	KOA	-
HS101	Heat Sink	1	53.2°C/W	PH-0124A-S	RYOSAN	-
HS201	Heat Sink	1	41°C/W	OSH-1025-SFL	RYOSAN	-
SW201	Switch	1	AC/DC48V 50mA	ASE1D-2M-10-Z	FUJISOKU	-

QRC Transformer

Vin= AC90~276V
Po= 25.2W

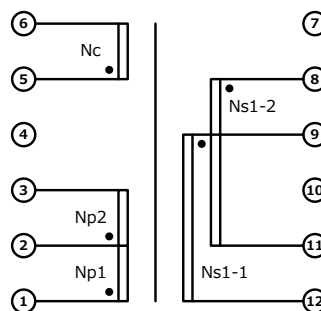
fmin= 45kHz

Inductance (Np) 1-3pin 1.16mH

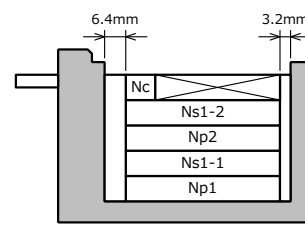
Core
EER2837 Material : PC40 Manufacturer : SUMIDA

Bobbin
EER2837 Pin Number : 12 Manufacturer : SUMIDA

< Pin assignment >



< Structure drawing >



< Winding Specifications >

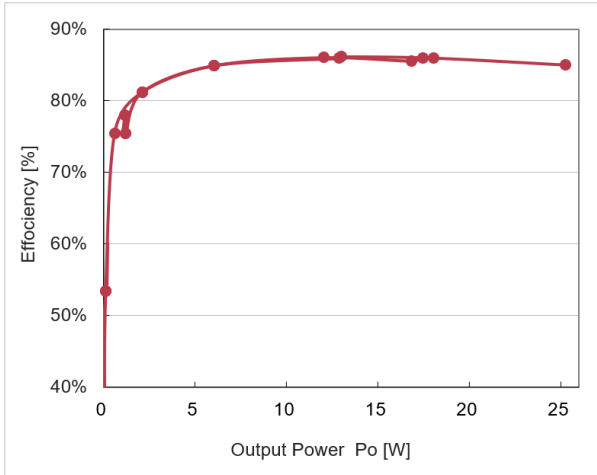
Winding Order	Current Name	Pin Number		Turn [T]	diameter [mm dia]	Material	Output		Notes
		Start	End				Voltage	Current	
1	Np1	1	2	37	0.3	1UEW	-	-	
2	Ns1-1	9	12	6	0.4×4	1UEW	12.0V	2.1A/2	
3	Np2	2	3	37	0.3	1UEW	-	-	
4	Ns1-2	8	11	6	0.4×4	1UEW	12.0V	2.1A/2	
5	Nc	5	6	9	0.23	1UEW	-	-	

Full Load Performance Data

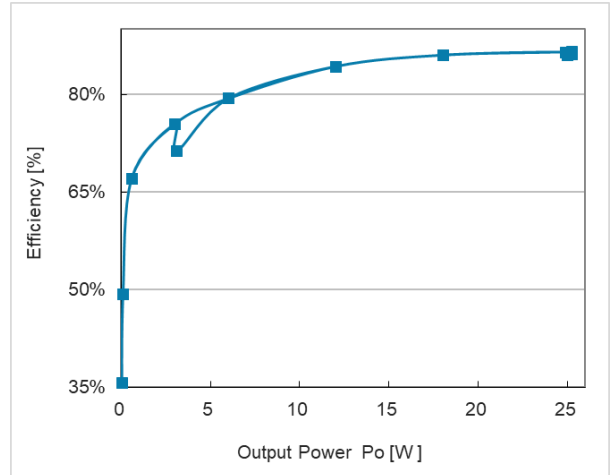
Auto Burst mode or Normal mode (Circuit with Super Standby function)

Efficiency

AC110V

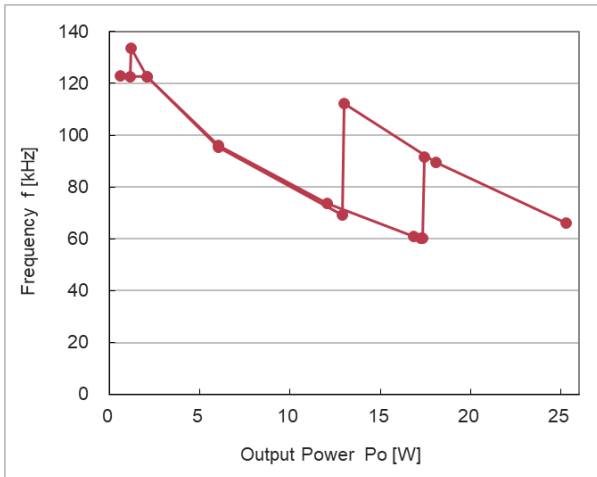


AC230V

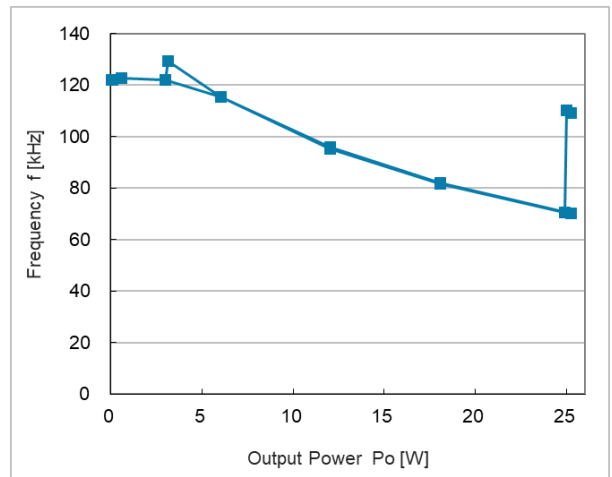


Active Frequency

AC110V



AC230V



Light Load Performance Data

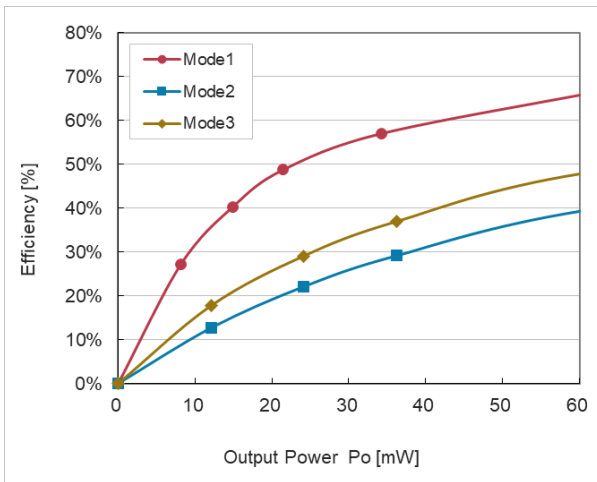
Mode1 : Super Standby mode

Mode2 : Auto Burst mode or Normal mode (Circuit with Super Standby function)

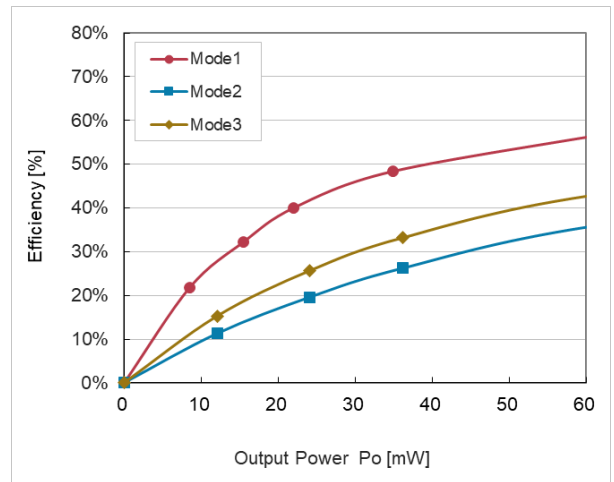
Mode3 : Auto Burst mode or Normal mode (Circuit without Super Standby function)

Efficiency ($P_o < 60\text{mW}$)

AC110V

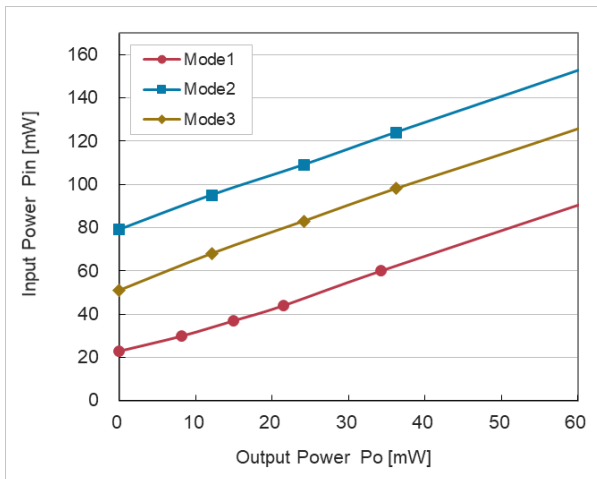


AC230V

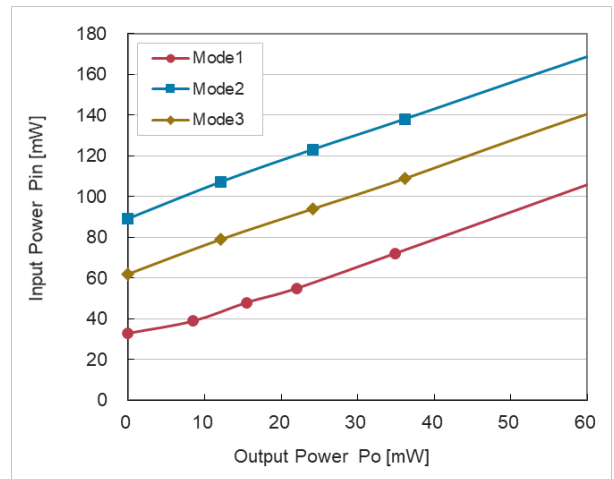


Input Power ($P_o < 60\text{mW}$)

AC110V



AC230V



Operation waveform

CH1	: V_{CE}	500V/div	+	: Q101 Collector	-	: C104(GND)
CH2	: V_{VG}	10V/div	+	: IC111 5pin	-	: IC111 3pin
CH3	: I_C	1A/div		Q101 Collector Current		
CH4	: $V_{Z/C}$	5V/div	+	: IC111 1Pin	-	: IC111 3pin
CH5	: $V_{F/B}$	2V/div	+	: IC111 2pin	-	: IC111 3pin

Photo.1 Maximum load waveform

Time : 10us/div

AC110V $I_o=2.1A$

AC230V $I_o=2.1A$

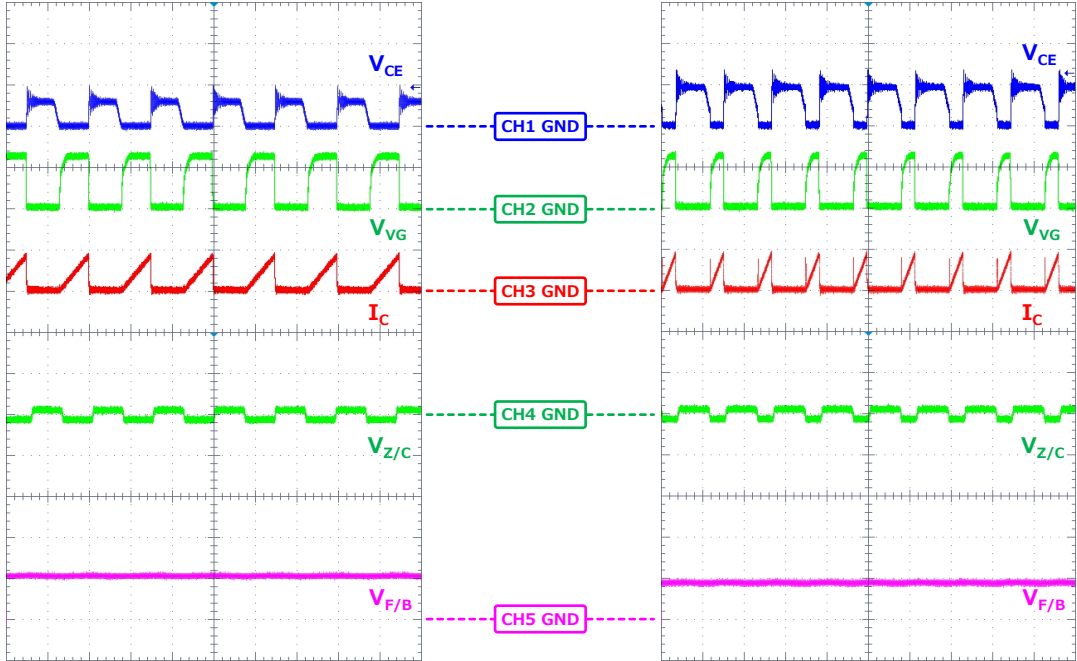
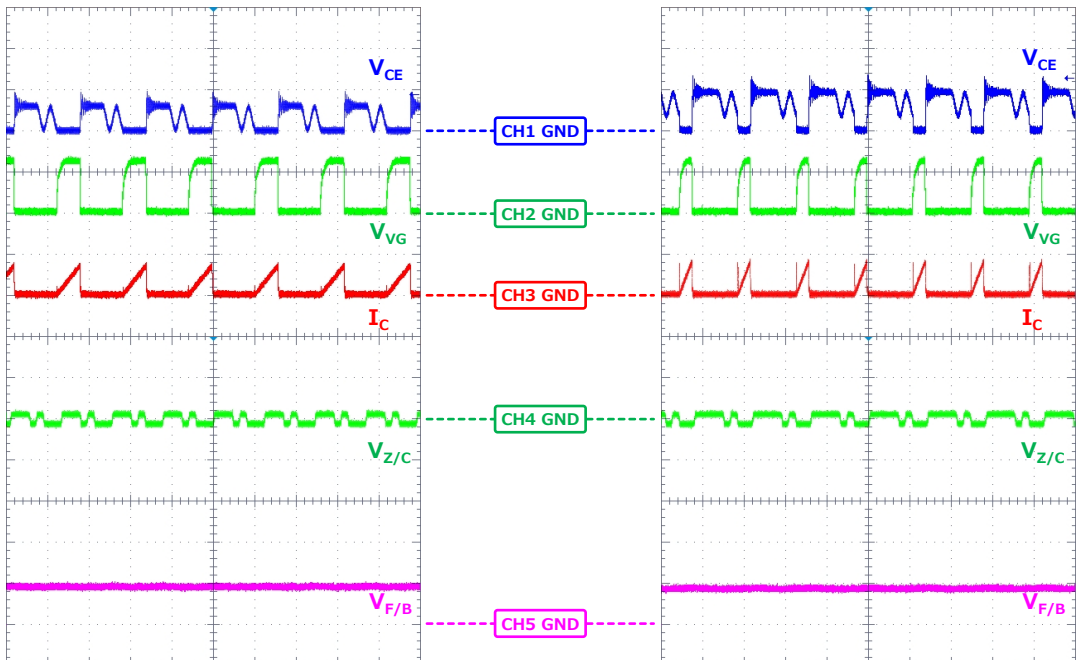


Photo.2 Bottom skip waveform

Time : 10us/div

AC110V $I_o=0.8A$

AC230V $I_o=0.8A$



Operation waveform

CH1	: V_{CE}	500V/div	+	: Q101 Collector	-	: C104(GND)
CH2	: V_{VG}	10V/div	+	: IC111 5pin	-	: IC111 3pin
CH3	: I_C	1A/div		Q101 Collector Current		
CH4	: $V_{Z/C}$	5V/div	+	: IC111 1Pin	-	: IC111 3pin
CH5	: $V_{F/B}$	2V/div	+	: IC111 2pin	-	: IC111 3pin

Photo.3 Auto Burst mode waveform

Time : 10ms/div

AC110V $I_o=10mA$

AC230V $I_o=10mA$

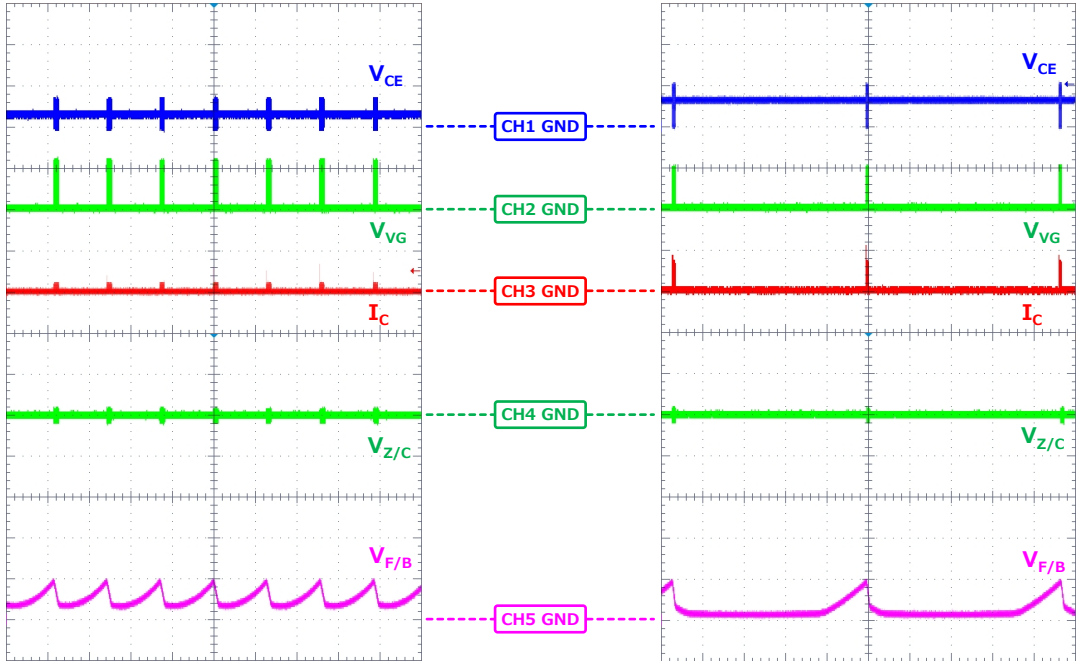
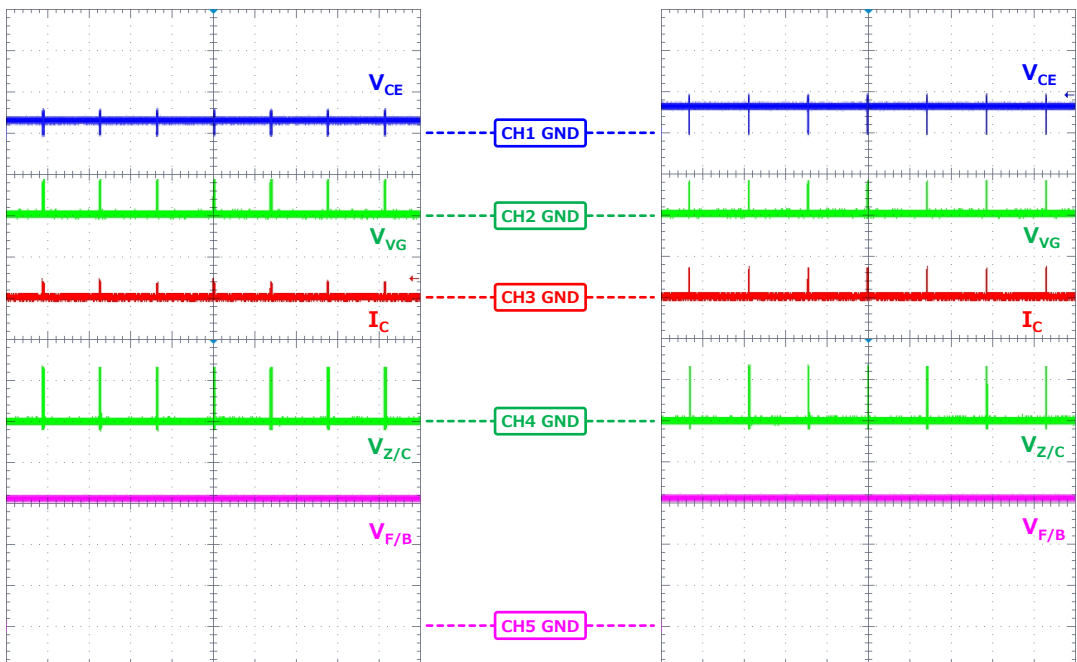


Photo.4 Super Standby mode waveform

Time : 40ms/div

AC110V $I_o=10mA$

AC230V $I_o=10mA$



Temperature

Maximum load temperature

12V/2.1A

Vin(AC) [V]	Bridge diode D101 ΔT [deg]	IGBT Q101 ΔT [deg]	transformer Core ΔT [deg]	transformer Wire ΔT [deg]	Rectifier diode D201 ΔT [deg]	Control IC MS1003SH ΔT [deg]	Ambient temperature ΔT [deg]
90	27.2	37.1	21.4	22.2	40.5	12.2	25.0
100	22.1	33.5	21.8	21.6	39.2	12.0	25.0
230	13.3	43.0	22.1	20.9	37.2	12.8	25.0
276	12.1	43.8	22.5	22.3	39.4	12.2	25.0

Auto Burst mode or Normal mode (Circuit with Super Stanby function)

Note

These parts are set heatsinks as follows.

- ① Q101 (T2R7F90SB)
Type : OSH-7050-SFL 41°C/W
Maker : Ryosan
- ② D201 (SG10SC6M)
Type : PH-0124A-S 53.2°C/W
Maker : Ryosan