

## Quasi-Resonant Power Supply ICs **MS1007SH**

**Input voltage : AC 90 ~ 276V**

Output	Voltage [V]	Output Current [A]		
		min	typ	max
1	+24	0.0	2.5	3.0
Total Power [W]		0.0	60.0	72.0

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**Bill Of Material**

No.	Type	Qt'y	Spec		Model Name	Vendor	Remarks
F101	Fuse	1	AC250V	5A	-	Littelfuse	-
L101	Line Filter	1	8.2mH	2.0A	-	SUMIDA	-
L201	Choke Coil	1	4.7uH	7.2A	-	TDK	-
T101	Transformer	1	-	-	EER3547	SUMIDA	-
IC111	Control IC	1	-	-	MS1007SH	SHINDENGEN	-
PC111	Opto Coupler	1	-	-	PC123	SHARP	-
IC261	Shunt Regulator	1	-	-	HA17431GPA	RENESAS	-
Q111	MOSFET	1	900V	4A	P4F90VX3	SHINDENGEN	-
D101	Bridge Diode	1	800V	4A	D4SB80	SHINDENGEN	-
D112	FRD	1	200V	1A	D1NL20U	SHINDENGEN	-
D171	FRD	1	1000V	1A	D1NK100	SHINDENGEN	-
D181	FRD	1	200V	1A	D1NL20U	SHINDENGEN	-
D201	SBD	1	100V	20A	SG20TC10M	SHINDENGEN	-
DZ181	Zenor diode	1	16V	1W	KDZV16B	ROHM	-
C101	Film Capacitor	1	AC250V	0.22uF	-	-	-
C102	Film Capacitor	1	AC250V	0.22uF	-	-	-
C103	Ceramic Capacitor	1	AC250V	1000pF	-	-	-
C104	Ceramic Capacitor	1	AC250V	1000pF	-	-	-
C105	Ceramic Capacitor	1	AC250V	1000pF	-	-	-
C106	Electrolytic Capacitor	1	400V	330uF	MXC series	Rubycon	-
C111	Film Capacitor	1	50V	220pF	-	-	-
C112	Ceramic Capacitor	1	2kV	470pf	-	-	low dissipation
C113	Electrolytic Capacitor	1	50V	100uF	ZLH series	Rubycon	-
C114	Ceramic Capacitor	1	50V	47pf	-	-	-
C115	Film Capacitor	1	50V	1000pF	-	-	-
C118	Film Capacitor	1	50V	0.1uF	-	-	-
C119	Ceramic Capacitor	1	100V	33pF	-	-	-
C171	Ceramic Capacitor	1	1kV	2200pF	-	-	low dissipation
C201	Electrolytic Capacitor	1	35V	2200uF	ZLH series	Rubycon	-
C204	Electrolytic Capacitor	1	35V	680uF	ZLH series	Rubycon	-
C261	Film Capacitor	1	50V	0.047uF	-	-	-
C262	Film Capacitor	1	50V	0.047uF	-	-	-
R111	Carbon Resistor	1	1/4W	33kΩ	-	-	-
R112	Carbon Resistor	1	1/2W	10Ω	-	-	-
R113	Carbon Resistor	1	1/4W	100Ω	-	-	-
R114	Metal Plate Resistor	1	2W	0.18Ω	-	-	-
R115	Carbon Resistor	1	1/4W	10kΩ	-	-	-
R116	Carbon Resistor	1	1/4W	3.9kΩ	-	-	-
R117	Carbon Resistor	1	1/4W	47kΩ	-	-	-
R118	Carbon Resistor	1	1/2W	10Ω	-	-	-
R171	Metal Oxide Film Resistor	1	1W	100kΩ	-	-	-
R172	Metal Oxide Film Resistor	1	1W	100kΩ	-	-	-
R181	Carbon Resistor	1	1/2W	390Ω	-	-	-
R201	Carbon Resistor	1	1/2W	5.6kΩ	-	-	-
R202	Carbon Resistor	1	1/4W	2.2kΩ	-	-	-
R261	Metal Film Resistor	1	1/4W	39kΩ	-	-	1%
R262	Metal Film Resistor	1	1/4W	1.5kΩ	-	-	1%
R263	Metal Film Resistor	1	1/4W	4.7kΩ	-	-	1%
R265	Carbon Resistor	1	1/4W	4.7kΩ	-	-	-
R266	Carbon Resistor	1	1/4W	3.3kΩ	-	-	-
HS101	Heat Sink	1	-	8.9°C/W	BPUE46-30	MIZUDEN	-
HS201	Heat Sink	1	-	11.2°C/W	BPUE36-25	MIZUDEN	-

## QRC Transformer

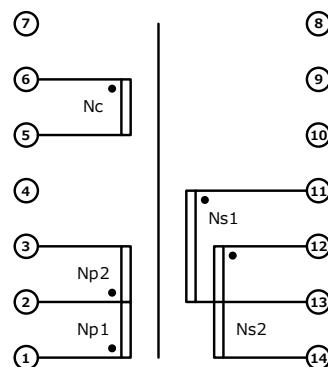
Vin= AC90~276V      fmin= 36kHz  
Po= 72W

Inductance (Np)      1-3pin    0.59mH

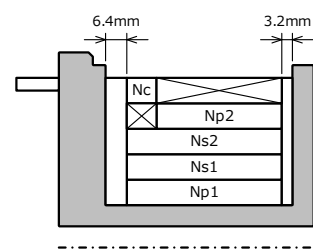
Core  
EER3547      Material : PC40    Manufacturer : SUMIDA

Bobbin  
EER3547      Pin Number : 14    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	2	3	31	0.45×2	1UEW	-	-	Aligned Winding
2	Ns1	11	13	7	0.45×4	1UEW	24V	3.00 A	Aligned Winding
3	Ns2	12	14	7	0.45×4	1UEW			Aligned Winding
4	Np2	1	2	26	0.45×2	1UEW	-	-	Aligned Winding
5	Nc	6	5	6	0.23	1UEW	16V	-	Aligned Winding

## Temperature

### Maximum load temperature

24V/3A

Vin(AC) [V]	Bridge diode D101 ΔT [deg]	MOSFET Q111 ΔT [deg]	transformer Core ΔT [deg]	transformer Wire ΔT [deg]	Rectifier diode D201 ΔT [deg]	Control IC MS1007SH ΔT [deg]
90	27.1	37.4	27.3	34.4	18.9	17.9
110	21.1	24.4	27.1	34.1	18.5	15.5
230	8.5	19.2	31.7	39.4	18.0	16.5
276	6.7	26.8	33.4	41.9	18.2	18.2

### Maximum oscillation frequency (Before bottom skip)

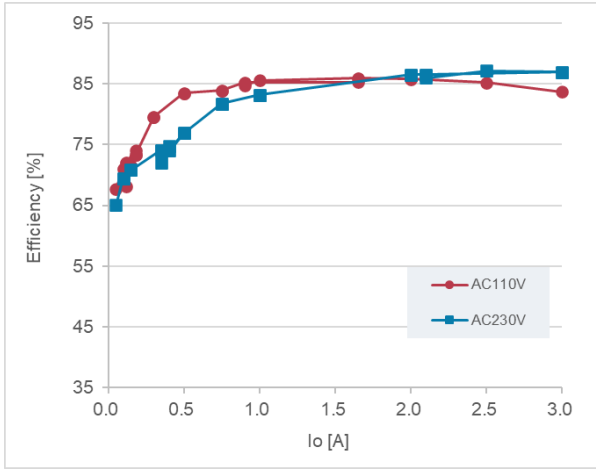
24V/2.39A

Oscillation frequency : 134kHz

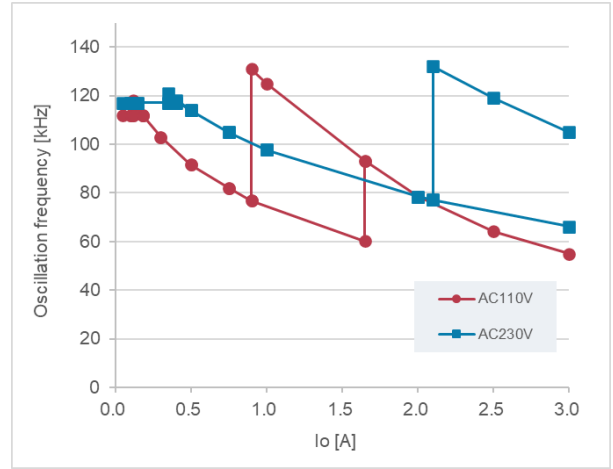
Vin(AC) [V]	MOSFET Q111 ΔT [deg]
276	27.8

**Efficiency**

**Efficiency**



**Oscillation frequency**



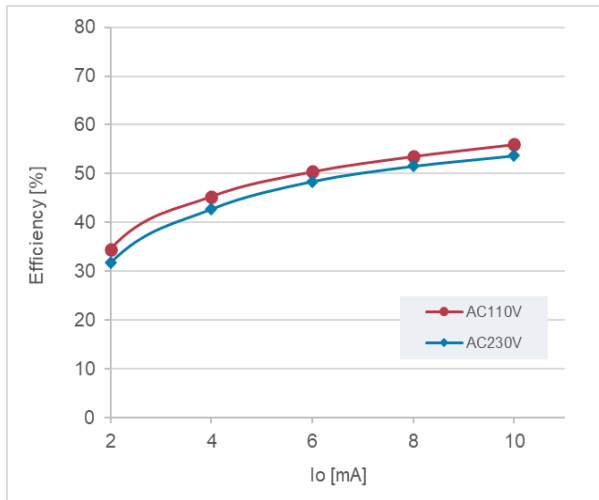
Vin [V]	Pin [W]	Po [W]	$\eta$ [%]	24V Vo [V]	24V Io [A]	f [kHz]	mode
AC110	85.70	71.75	83.72	23.916	3.00	54.9	Quasi resonant
	70.24	59.84	85.19	23.934	2.50	64.1	Quasi resonant
	55.78	47.87	85.82	23.934	2.00	78.4	Quasi resonant
	45.98	39.51	85.92	23.944	1.65	93.3	Quasi resonant
	28.05	23.99	85.54	23.994	1.00	125.0	Quasi resonant
	25.48	21.60	84.78	24.003	0.90	131.0	Quasi resonant
	25.35	21.61	85.24	24.009	0.90	76.9	Bottom skip
	21.48	18.02	83.88	24.022	0.75	82.0	Bottom skip
	14.40	12.02	83.49	24.046	0.50	91.6	Bottom skip
	9.07	7.22	79.60	24.065	0.30	103.0	Bottom skip
	5.91	4.33	73.32	24.075	0.18	112.0	Bottom skip
	5.04	3.61	71.66	24.078	0.15	114.0	Bottom skip
	4.24	2.89	68.15	24.079	0.12	118.0	Bottom skip
	4.01	2.89	72.06	24.079	0.12	112.0	Burst mode
	3.39	2.41	71.07	24.080	0.10	112.0	Burst mode
	1.78	1.20	67.77	24.084	0.05	112.0	Burst mode
	3.39	2.41	71.07	24.080	0.10	112.0	Burst mode
	4.01	2.89	72.06	24.079	0.12	112.0	Burst mode
	5.85	4.33	74.07	24.074	0.18	112.0	Burst mode
	5.91	4.33	73.32	24.075	0.18	112.0	Bottom skip
9.07	7.22	79.60	24.065	0.30	103.0	Bottom skip	
14.40	12.02	83.49	24.046	0.50	91.6	Bottom skip	
21.48	18.02	83.88	24.022	0.75	82.0	Bottom skip	
25.35	21.61	85.24	24.009	0.90	76.9	Bottom skip	
46.38	39.54	85.26	23.966	1.65	60.2	Bottom skip	
45.98	39.51	85.92	23.944	1.65	93.3	Quasi resonant	
AC230	82.30	71.55	86.94	23.851	3.00	105.0	Quasi resonant
	68.52	59.72	87.16	23.888	2.50	119.0	Quasi resonant
	58.32	50.16	86.02	23.888	2.10	132.0	Quasi resonant
	58.06	50.24	86.52	23.922	2.10	77.2	Bottom skip
	55.34	47.86	86.48	23.928	2.00	78.4	Bottom skip
	28.84	24.00	83.20	23.996	1.00	97.7	Bottom skip
	22.03	18.01	81.77	24.019	0.75	105.0	Bottom skip
	15.63	12.02	76.92	24.044	0.50	114.0	Bottom skip
	11.68	8.42	72.09	24.058	0.35	121.0	Bottom skip
	11.36	8.42	74.12	24.057	0.35	117.0	Burst mode
	5.10	3.61	70.81	24.074	0.15	117.0	Burst mode
	3.47	2.41	69.43	24.078	0.10	117.0	Burst mode
	1.85	1.20	65.09	24.083	0.05	117.0	Burst mode
	3.47	2.41	69.43	24.078	0.10	117.0	Burst mode
	5.10	3.61	70.81	24.074	0.15	117.0	Burst mode
	11.36	8.42	74.12	24.057	0.35	117.0	Burst mode
	12.87	9.62	74.75	24.052	0.40	117.0	Burst mode
	12.98	9.62	74.12	24.052	0.40	118.0	Burst mode
	15.63	12.02	76.92	24.044	0.50	114.0	Bottom skip
	22.03	18.01	81.77	24.019	0.75	105.0	Burst mode
28.84	24.00	83.20	23.996	1.00	97.7	Bottom skip	
55.34	47.86	86.48	23.928	2.00	78.4	Bottom skip	
58.06	50.24	86.52	23.922	2.10	77.2	Bottom skip	
82.41	71.67	86.96	23.889	3.00	66.1	Bottom skip	

## Standby power

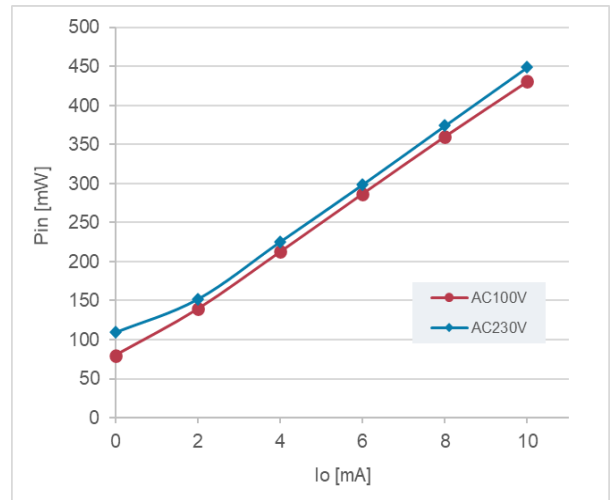
### Auto burst mode

Vin [V]	Pin [mW]	Po [mW]	$\eta$ [%]	24V Vo [V]	24V Io [mA]
AC110	80.0	0.0	0.0	24.088	0
	139.4	48.2	34.6	24.086	2
	212.5	96.3	45.3	24.086	4
	286.7	144.5	50.4	24.086	6
	360.0	192.7	53.5	24.086	8
	430.4	240.9	56.0	24.085	10
AC230	109.4	0.0	0.0	24.088	0
	152.0	48.2	31.7	24.086	2
	225.4	96.3	42.7	24.086	4
	298.6	144.5	48.4	24.086	6
	374.0	192.7	51.5	24.086	8
	448.9	240.9	53.7	24.085	10

### Efficiency



### Standby power



**Operation waveform**

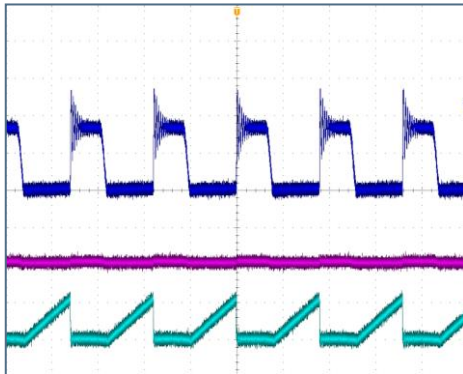
**CH1** : MOSFET  $V_{DS}$  200V/div  
**CH2** : MOSFET  $I_D$  2A/div  
**CH3** :  $V_{CC}$  terminal voltage 10V/div

**Photo.1 Maximum load waveform**

Time : 10us

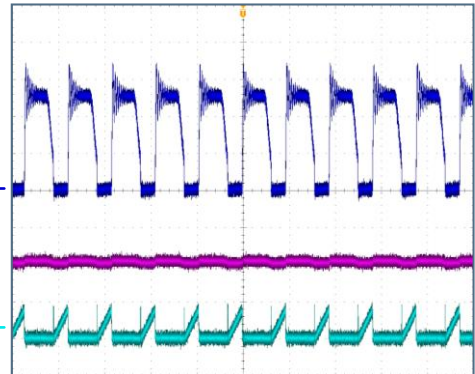
$I_o=3A$

**AC110V Maximum load**



$I_o=3A$

**AC230V Maximum load**

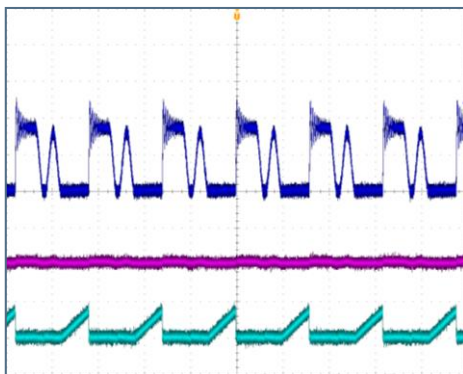


**Photo.2 Bottom skip waveform**

Time : 10us

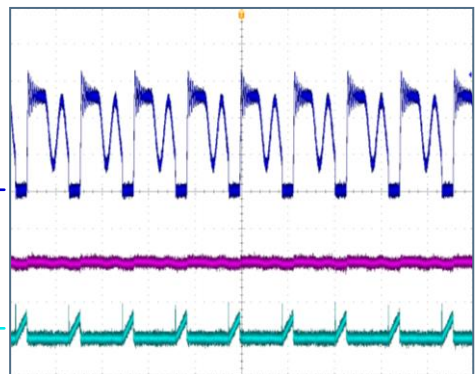
$I_o=1.5A$

**AC110V Bottom skip**



$I_o=1.5A$

**AC230V Bottom skip**

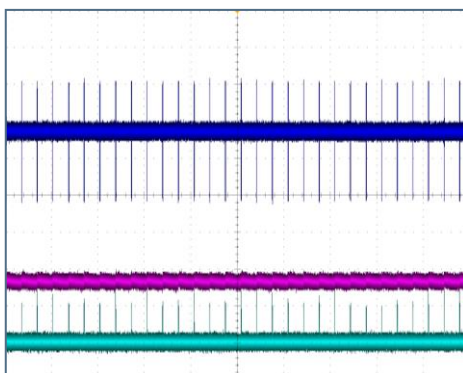


**Photo.3 Minimum load waveform**

Time : 100ms

$I_o=6mA$

**AC110V Minimum load**



$I_o=0A$

**AC230V Minimum load**

