

# MS1003SH

## Quasi-Resonant Power Supply IC

### Feature

- Quasi-resonant mode
- Four-step soft-start function
- HV startup circuit
- The automatic bottom-skip function (1time)
- Auto-burst mode
- Super-standby mode
- Soft drive circuit reduces noise
- Vcc-GND short circuit protection function
- Overload protection (timer latch 2sec.)
- Overvoltage protection (latch)
- Thermal shutdown (latch)
- Pb free
- RoHS:Yes

### Outline

House Name: SOP8/7J



**1 Absolute Maximum Ratings (at Tc=25°C)****1 絶対最大定格(at Tc=25°C)****1-1 Thermal Ratings****1-1 熱規格**

Item 項目	Symbol 記号	Ratings 規格値	Unit 単位
Storage temperature 保存温度	Tstg	-55~150	°C
Junction temperature 接合部温度	Tj	-20~150	°C
Total power dissipation 許容損失	Pt	1.5	W

**1-2 Electrical Ratings****1-2 電氣的規格**

Item 項目	Symbol 記号	Ratings 規格値	Unit 単位
Vin maximum applied voltage Vin端子最大印加電圧	Vin	500	V
Vin reverse bias voltage Vin端子逆バイアス電圧	-----	-0.3	V
VCC maximum applied voltage VCC端子最大印加電圧	VCC	30	V
VCC reverse bias voltage VCC端子逆バイアス電圧	-----	-0.3	V
Z/C into maximum current Z/C端子最大流入電流	IZ/C	±5	mA
F/B into maximum current F/B端子最大流入電流	IF/B	±5	mA
OCL into maximum current OCL端子最大流入電流	IOCL	±5	mA

Notes : Using with parameters, condition of use and logic controls that are not specified in the specifications are not assured.

When used with the conditions that are not specified, please consult us in advance.

The contents described herein are subject to change without notice.

注意 : 本仕様書に記載されていない項目、使用条件、論理の組み合わせでの使用は保証していません。

記載されている以外の条件で使用する場合は必ず事前に当社担当営業部門までご相談下さい。

記載内容は改良などのためにお断り無しに変更することがあります。

## 2 Recommended Operation Conditions

### 2 推奨動作条件

Item 項目	Symbol 記号	Recommended value 推奨値			Unit 単位
		min	typ	max	
Operating temperature 動作温度	$T_{op}$	-20	---	125	°C
Vin applied voltage Vin端子印加電圧	Vin	95	---	450	V
VCC applied voltage VCC端子印加電圧	VCC	11	---	24	V
Z/C into current Z/C端子入力電流	I <sub>Z/C</sub>	-4.5	---	4.5	mA

Notes : The product life depends on the condition of use even within the above operating conditions.  
Using at  $T_j = 100^{\circ}\text{C}$  or less is recommended for the equipment where a long life is expected.

Refer to the electrical characteristic mentioned in item 3-4 regarding the operation during super standby,  
since the operation conditions recommended as above is the conditions during regular operation.

注意 : 上記の規格範囲内においても、製品寿命に関しましてはお客様の使用環境により異なりますので、長寿命を期待される製品に、ご使用される場合には  $T_j=100^{\circ}\text{C}$  以下でご使用頂く事を推奨致します。

3-1 Electrical/Thermal Characteristics (at Ta=25°C)

3-1 電氣的・熱的特性 (at Ta=25°C)

Item 項目	Symbol 記号	Condition 条件	Ratings 規格値			Unit 単位
			min	typ	max	

VCC端子 (VCC Terminal)

On-State voltage 発振開始電圧	VCC(start)	VOCL=0V VF/B=2.5V	10.8	12.0	13.2	V
Under-Voltage lockout 発振停止電圧	VCC(stop stby)	VOCL=0V VF/B=2.5V	6.3	7.0	7.7	V
	VCC(stop normal)	VOCL=0.4V VF/B=2.5V	7.2	8.0	8.8	V
Latch circuit reset voltage フリップ解除電圧	VJUL	VOCL=0V VF/B=2.5V	2.5	3.2	4.5	V
Start-Up circuit cut off voltage 起動回路OFF電圧	VCC(stup off)	VOCL=0V VF/B=12kΩ Vin=100V	10.8	12.0	13.2	V
Start-Up circuit on voltage 起動回路ON電圧	VCC(stup on stby)	VOCL=0V VF/B=12kΩ Vin=100V	7.2	8.0	8.8	V
	VCC(stup on normal)	VOCL=0.4V VF/B=12kΩ Vin=100V	8.1	9.0	9.9	V
Over-Voltage threshold 過電圧フリップ電圧	VOVP	VOCL=0V VF/B=2.5V	24.7	26.0	27.3	V
VCC current (Active mode) VCC電流(動作時)	ICC(active)	VCC=14V VOCL=0.1V VF/B=2.5V fZ/C=50kHz	1.0	1.9	3.0	mA
VCC current (Auto standby mode) VCC電流(自動スタンバイモード発振停止時)	ICC(auto stby)	VCC=14V VOCL=0V VF/B=0V	0.7	1.3	2.0	mA
VCC current (Start-Up mode) VCC電流(起動モード時)	ICC(stup)1	Vin=100V VCC=0 to 1.5V	-2.5	-1.8	-1.2	mA
	ICC(stup)2	Vin=100V VCC=1.5V to VCC(stop off)-0.8V	-13.0	-8.0	-3.0	mA

3-2 Electrical/Thermal Characteristics (at Ta=25°C)

3-2 電氣的・熱的特性 (at Ta=25°C)

Item 項目	Symbol 記号	Condition 条件	Ratings 規格値			Unit 単位
			min	typ	max	

Z/C端子 (Z/C Terminal)

Zero current detection voltage ゼロ検出電圧	VZ/C	VCC=14V VOCL=0.1V VF/B=2.5V	0.15	0.25	0.35	V
Clamping voltage (High) クランプ電圧(High)	VCL(H)	IZ/C=1mA	5.8	6.2	6.6	V
Clamping voltage (Low) クランプ電圧(Low)	VCL(L)	IZ/C=-1mA	-1.0	-0.7	-0.5	V

F/B端子 (F/B Terminal)

F/B Output current F/B定電流源	IF/B(nomal)	VOCL=0.1V VCC=14V VF/B=0V	-235	-200	-165	μ A
F/B Minimum on time F/Bオン幅min	TonF/B(min)	VCC=14V VOCL=0.1V fZ/C=20kHz	0	0.7	1.4	μ s
F/B Maximum on time F/Bオン幅max	TonF/B(max)	VCC=14V VOCL=0.1V fZ/C=20kHz	25	31	37	μ s

電流検出 (Current Detection)

Over current limit correction start voltage 垂下入力補正スタート電圧	VTH(OCL start)	VCC=14V VF/B=3.0V fZ/C=20kHz	0.342	0.380	0.418	V
Over current limit correction clamp voltage 垂下入力補正クランプ電圧	VTH(OCL)clamp	VCC=14V VF/B=3.0V fZ/C=20kHz	0.486	0.540	0.594	V
Over current limit correction time width 垂下入力補正幅	TOCL	VCC=14V VF/B=3.0V fZ/C=20kHz VOCL=VTH(OCL start) ⇒ VTH(OCL)clamp	6.2	7.3	8.4	us
Leading edge blanking time リーディングエッジブランクタイム	TLEB	VCC=14V VF/B=2.5V VOCL=0.4V	---	300	---	ns

3-3 Electrical/Thermal Characteristics (at Ta=25°C)

3-3 電氣的・熱的特性 (at Ta=25°C)

Item 項目	Symbol 記号	Condition 条件	Ratings 規格値			Unit 単位
			min	typ	max	

自動スタンバイ(Auto standby mode)

Standby switch time スタンバイ切替時間	Tstby	VCC=14V VF/B=2.5V VOCL=0V fZ/C=25kHz	200	250	300	ms
On-State voltage 発振開始電圧	VF/B(stby start)	VCC=14V VOCL=0V fZ/C=25kHz	1.6	1.8	2.0	V
Under-Voltage lockout 発振停止電圧	VF/B(stby stop)	VCC=14V VOCL=0V fZ/C=25kHz	0.6	0.8	1.0	V
Standby reset F/B voltage スタンバイ解除F/B電圧	VF/B(stby reset)	VCC=14V VOCL=0V fZ/C=25kHz	2.7	3	3.3	V
Standby switch voltage スタンバイ切替電圧	VOCL(stby)	VCC=14V VF/B=2.5V fZ/C=25kHz	---	45	---	mV
Standby threshold voltage スタンバイ電流しきい値電圧	VTH(stby)	VCC=14V VF/B=2.5V fZ/C=25kHz	51	60	69	mV

3-4 Electrical/Thermal Characteristics (at Ta=25°C)

3-4 電氣的・熱的特性 (at Ta=25°C)

Item 項目	Symbol 記号	Condition 条件	Ratings 規格値			Unit 単位
			min	typ	max	

スーパースタンバイ(Super standby mode)

SP Standby switch Z/C voltage SPスタンバイ切替Z/C電圧	VZ/C(sp stby)	VCC=14V VF/B=2.0V VOCL=0.1V	2.7	3.0	3.3	V
SP Standby VCC dummy circuit drawing-out current SPスタンバイVCCダミー回路引き抜き電流	ICC(sp stby dummy)	VCC=21V VF/B=2.0V VOCL=0.1V VZ/C=5V	200	---	---	mA
SP Standby VCC dummy circuit cut off voltage SPスタンバイVCCダミー回路オフ電圧	VCC(sp stby dummy off)	VF/B=2.0V VOCL=0.1V VZ/C=5V	8.3	8.7	9.1	V
SP Standby On-State voltage SPスタンバイ発振開始VCC電圧	VCC(sp stby start)	VF/B=2.0V VOCL=0.1V VZ/C=5V	8.3	8.7	9.1	V
SP Standby Under-voltage lockout SPスタンバイ発振停止VCC電圧	VCC(sp stby stop)	VF/B=2.0V VOCL=0.1V VZ/C=5V	8.9	9.3	9.7	V
SP Standby Under-F/B Voltage lockout SPスタンバイ発振停止F/B電圧	VF/B(sp stby stop)	VCC=VCC(sp stby start)-0.1V VOCL=0.1V VZ/C=5V	0.6	0.8	1.0	V
SP Standby On-State F/B voltage SPスタンバイ発振停止F/B電圧	VF/B(sp stby start)	VCC=VCC(sp stby start)-0.1V VOCL=0.1V VZ/C=5V	1.6	1.8	2.0	V

自動谷飛び(Bottom skip)

Bottom skip start time 谷飛び開始周期	T(bottom skip start)	VCC=14V VF/B=1.5V VOCL=0.1V	6.75	7.50	8.25	μs
Bottom skip stop time 谷飛び停止周期	T(bottom skip stop)	VCC=14V VF/B=1.5V VOCL=0.1V	11.00	13.00	14.50	μs
Bottom skip time hysteresis 谷飛び周期ヒステリシス	T(bottom skip hys)	VCC=14V VF/B=1.5V VOCL=0.1V	---	5.50	---	μs
Bottom skip count 谷飛び回数	C(bottom skip)	VCC=14V VF/B=1.5V VOCL=0.1V	---	1	---	回

タイマーラッチ(Timer latch)

Timer latch count ラッチカウント	T(latch count)	VCC=14V VF/B=5V VOCL=0V fZ/C=20kHz	1.7	2.0	2.3	s
Timer latch count start voltage ラッチカウント開始電圧	VF/B(latch count)	VCC=14V VOCL=0V fZ/C=20kHz	4.2	4.6	4.9	V

3-5 Electrical/Thermal Characteristics (at Ta=25°C)

3-5 電氣的・熱的特性 (at Ta=25°C)

Item 項目	Symbol 記号	Condition 条件	Ratings 規格値			Unit 単位
			min	typ	max	

ソフトドライブ(Soft drive)

Clamp voltage クランプ電圧	VG(clamp)	VCC=14V VF/B=2.5V VOCL=0V	10.7	12.0	13.2	V
Trigger voltage トリガー電圧	VG(trigger)	VCC=14V VF/B=2.5V VOCL=0V	6.3	7.0	7.7	V
Trigger current トリガー電流	IG(trigger)	VCC=14V VF/B=2.5V VOCL=0V VG=4V	-36	-29	-22	mA
Source current ソース電流	IG(source)	VCC=14V VF/B=2.5V VOCL=0V VG=10V	-4.5	-3.6	-2.5	mA
Sink current シンク電流	IG(sink)	VCC=14V VF/B=0V VOCL=0V VG=5V	150	230	310	mA

ソフトスタート(Soft start mode)

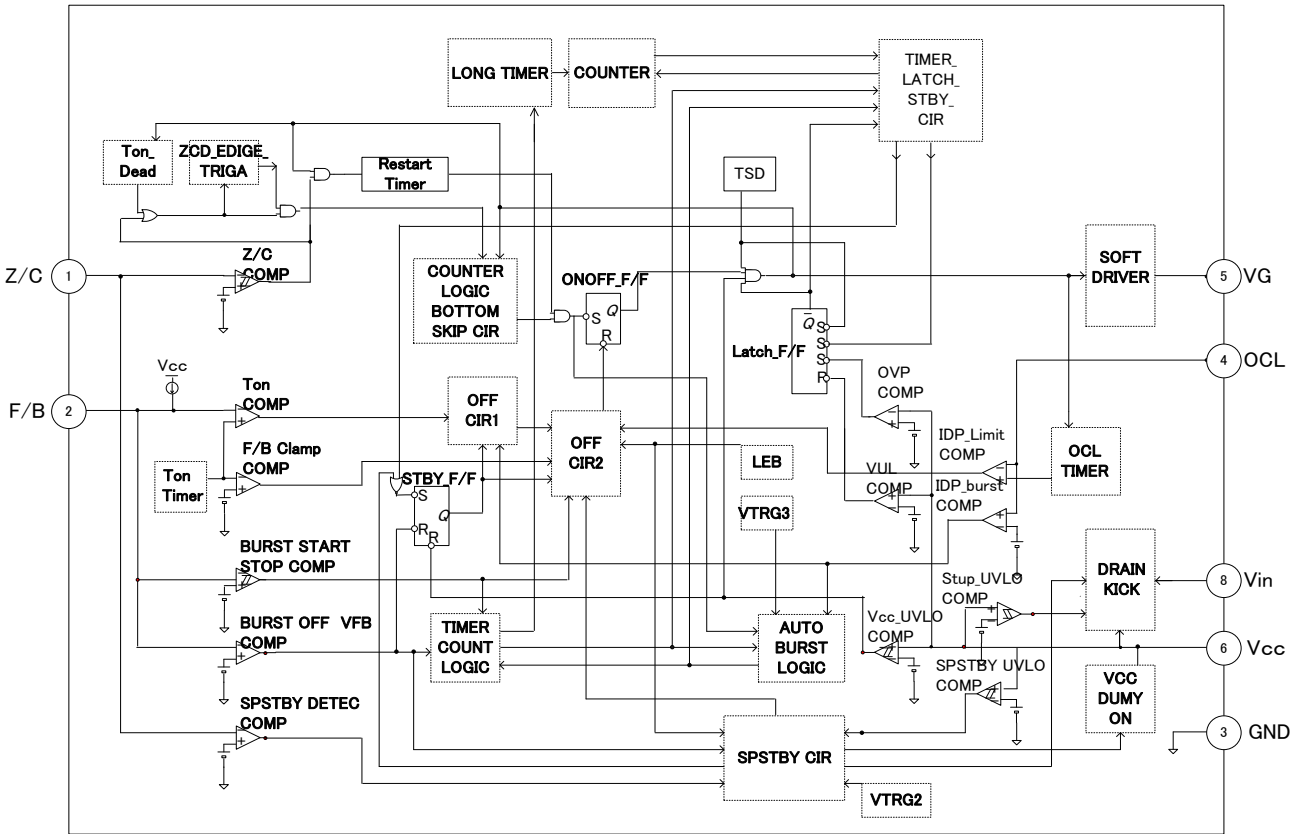
SS threshold voltage1 ソフトスタートしきい値電圧1	Vss1	VCC=14V VF/B=2.5V fZ/C=25kHz t=Tss1, Tss(stby return)1	40	50	60	mV
SS threshold voltage2 ソフトスタートしきい値電圧2	Vss2	VCC=14V VF/B=2.5V fZ/C=25kHz t=Tss2 t=Tss2, Tss(stby return)2	120	150	180	mV
SS threshold voltage3 ソフトスタートしきい値電圧3	Vss3	VCC=14V VF/B=2.5V fZ/C=25kHz t=Tss1 t=Tss3, Tss(stby return)3	280	350	420	mV
SS time ソフトスタート時間	Tss1	VCC=14V VF/B=2.5V fZ/C=25kHz VOCL=Vss1	30	45	60	ms
	Tss2	VCC=14V VF/B=2.5V fZ/C=25kHz VOCL=Vss2	20	35	50	ms
	Tss3	VCC=14V VF/B=2.5V fZ/C=25kHz VOCL=Vss3	20	35	50	ms
Soft start time when standby returns スタンバイ復帰時ソフトスタート時間	Tss(stby return)1	VCC=14V VF/B=3.5V fZ/C=25kHz VOCL=Vss1	---	0.7	---	ms
	Tss(stby return)2	VCC=14V VF/B=3.5V fZ/C=25kHz VOCL=Vss2	---	0.5	---	ms
	Tss(stby return)3	VCC=14V VF/B=3.5V fZ/C=25kHz VOCL=Vss3	---	0.5	---	ms

その他 (Others)

Restart time リスタートタイム	Trestart	VCC=14V VF/B=2.5V VOCL=0.1V	30	55	80	μs
	Trestart(ocl)	VCC=14V VF/B=2.5V VOCL=0.4V	130	190	250	μs
On dead time オンデッドタイム	Tondead	VCC=14V VF/B=2.5V VOCL=0.4V	1	2	3	μs
Thermal shutdown temperature サーマルシャットダウン	TSD	VCC=14V VF/B=2.5V	---	150	---	°C
Thermal resistance 熱抵抗	θ jc	ガラスエポキシ基板: 114.3mm×76.2mm, 厚さ: 1.6mm, 内面銅箔サイズ 74.2mm×74.2mm, 厚さ: 35μm	---	---	13	°C/W
	θ ja	Glass-Epoxy Board : 114.3mm×76.2mm, Thickness: 1.6mm inside copper foil 74.2mm×74.2mm, Thickness: 35μm	---	---	83.3	°C/W

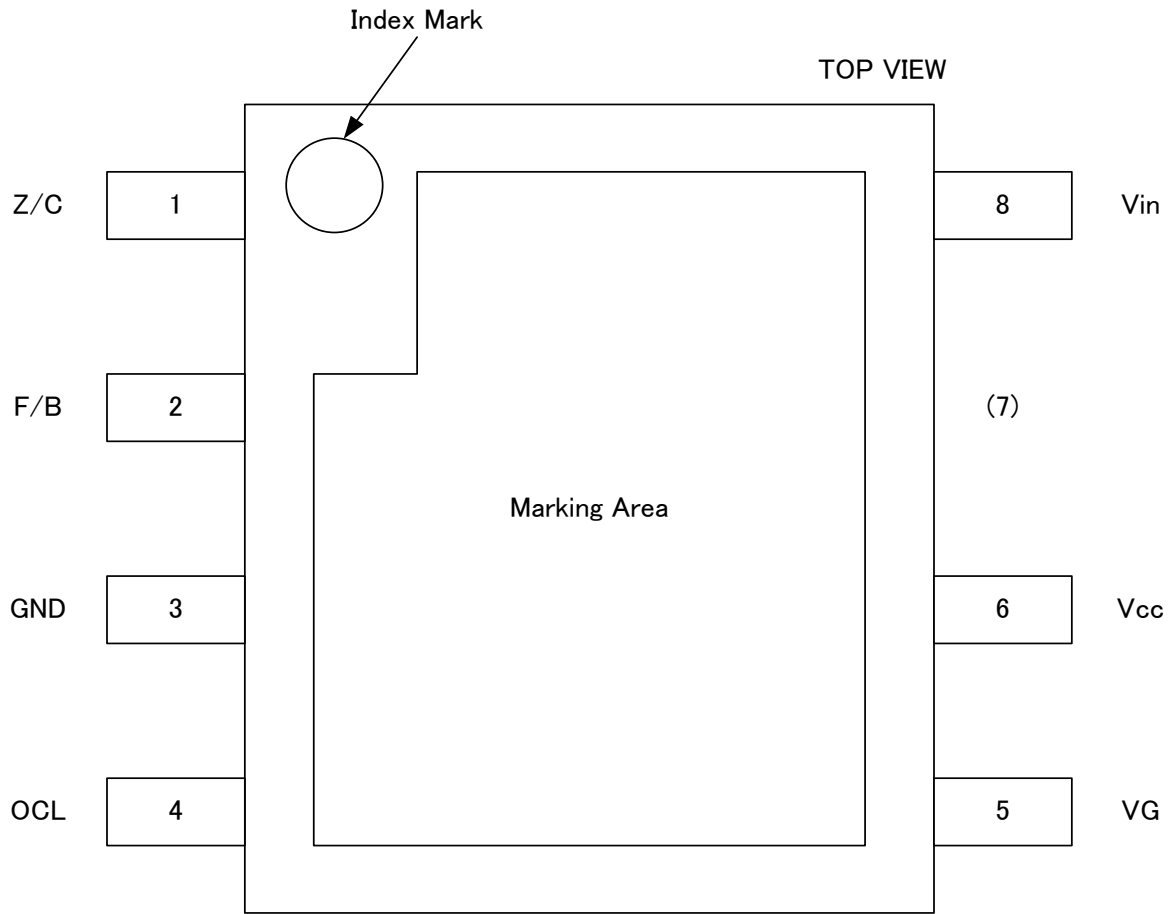


4 Block Diagram  
4 ブロック図



Terminal No. 端子番号	Symbol 記号	Terminal Name 端子名称
1	Z/C	Zero Current Detection Terminal ゼロ電流検出端子
2	F/B	Feed Back Terminal フィードバック端子
3	GND	Ground Terminal グラウンド端子
4	OCL	Over Current Limit Terminal オーバーカレントリミット端子
5	V <sub>G</sub>	V <sub>G</sub> Terminal V <sub>G</sub> 端子
6	V <sub>cc</sub>	V <sub>cc</sub> Terminal V <sub>cc</sub> 端子
8	V <sub>in</sub>	V <sub>in</sub> Terminal V <sub>in</sub> 端子

5 Pin Assignment  
5 端子配置

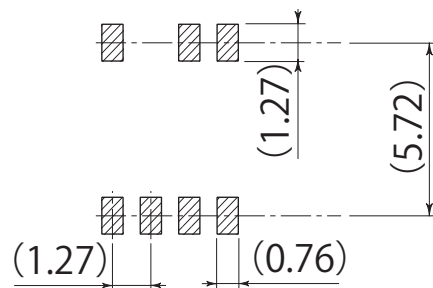
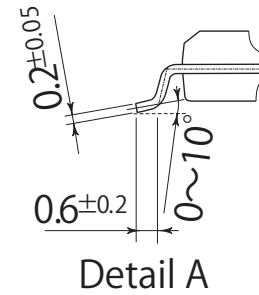
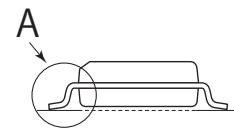
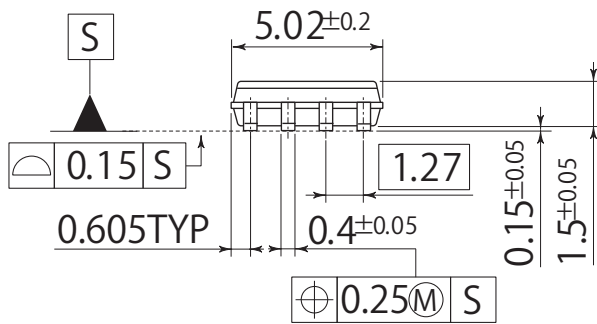
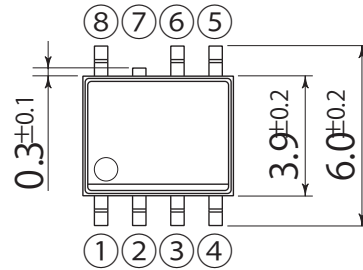


# Package Outline-Dimensions

unit : mm  
scale: 4/1

L3

JEDEC Code	-
JEITA Code	-
House Name	SOP8/7J



Referential Soldering Pad

- 量産時には、適正化を図って下さい
- Optimize soldering pad to the board design and soldering condition.

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U182(2019.02)

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