SPS

The SPS product family is specially designed for an off-line SMPS with minimal external components. The SPS consist of high voltage power SenseFET and current mode PWM IC. Included PWM controller features integrated fixed oscillator, under voltage lock out, leading edge blanking, optimized gate turn-on/turn-off driver, thermal shut down protection, over voltage protection, and temperature compensated precision current sources for loop compensation and fault protection circuitry. Compared to discrete MOSFET and controller or RCC switching converter solution, a SPS can reduce total component count, design size, weight and at the same time increase efficiency, productivity, and system reliability. It has a basic platform well suited for cost effective design in either a flyback converter or a forward converter.

1.DRAIN 2. GND 3. V_{CC} 4. FB 5. S/S

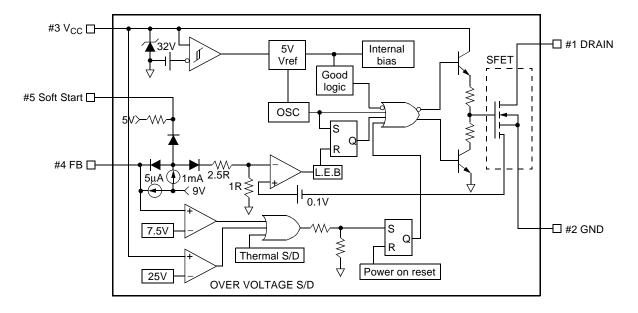
FEATURES

- Precision fixed operating frequency (70KHz)
- · Pulse by pulse over current limiting
- Over Current Protection
- Over Voltage Protection (Min. 23V)
- Internal thermal shutdown function
- Under voltage lockout
- Internal high voltage sense FET
- Auto restart
- Soft start

ORDERING INFORMATION

Device	Package	Operating Temperature
KA1M0680R	TO-3P-5L	–25°C to +85°C

BLOCK DIAGRAM





KA1M0680R SPS

ABSOLUTE MAXIMUM RATINGS

Characteristic	Symbol	Value	Unit
Drain-source (GND) voltage (1)	V _{DSS}	800	V
Drain-Gate voltage (R_{GS} =1 $M\Omega$)	V_{DGR}	800	V
Gate-source (GND) voltage	V _{GS}	±30	V
Drain current pulsed (2)	I _{DM}	24.0	A _{DC}
Single pulsed avalanche energy (3)	E _{AS}	455	mJ
Avalanche current (4)	I _{AS}	-	А
Continuous drain current (T _C =25°C)	I _D	6.0	A _{DC}
Continuous drain current (T _C =100°C)	I _D	4.0	A _{DC}
Supply voltage	V _{CC}	30	V
Analog input voltage range	V _{FB}	−0.3 to V _{SD}	V
Total power dissipation	P _D (watt H/S)	150	W
	Derating	1.21	W/°C
Operating temperature	T _{OPR}	-25 to +85	°C
Storage temperature	T _{STG}	−55 to +150	°C

NOTES:

- 1. Tj=25°C to 150°C
- 2. Repetitive rating: Pulse width limited by maximum junction temperature
- 3. L=24mH, V_{DD} =50V, R_G =27 Ω , starting Tj=25°C



ELECTRICAL CHARACTERISTICS (SFET part)

(Ta=25°C unless otherwise specified)

Characteristic	Symbol	Test condition	Min.	Тур.	Max.	Unit
Drain-source breakdown voltage	BV _{DSS}	V_{GS} =0V, I_D =50 μ A	800	_	_	V
Zero gate voltage drain current	I _{DSS}	V _{DS} =Max., Rating, V _{GS} =0V	_	_	50	μΑ
		V _{DS} =0.8Max., Rating, V _{GS} =0V, T _C =125°C	-	-	200	μΑ
Static drain-source on resistance (note)	R _{DS(ON)}	V _{GS} =10V, I _D =4.0A	_	1.6	2.0	Ω
Forward transconductance (note)	gfs	V _{DS} =15V, I _D =4.0A	1.5	2.5	_	mho
Input capacitance	Ciss	V _{GS} =0V, V _{DS} =25V,	_	1600	_	pF
Output capacitance	Coss	f=1MHz	_	140	_	
Reverse transfer capacitance	Crss	-	_	42	_	
Turn on delay time	td(on)	$V_{DD} = 0.5BV_{DSS}, I_{D} = 6.0A$	_	60	_	nS
Rise time	tr	(MOSFET switching time are essentially	_	150	_	
Turn off delay time	td(off)	independent of	_	300	_	
Fall time	tf	operating temperature)	_	130	_	
Total gate charge (gate-source+gate-drain)	Qg	V_{GS} =10V, I_D =6.0A, V_{DS} =0.5BV $_{DSS}$ (MOSFET	_	70	_	nC
Gate-source charge	Qgs	switching time are essentially independent of	_	16	_	
Gate-drain (Miller) charge	Qgd	operating temperature)	_	27	_	

NOTE: Pulse test: Pulse width $\leq 300 \mu S$, duty cycle $\leq 2\%$



KA1M0680R SPS

ELECTRICAL CHARACTERISTICS (Control part)

(Ta=25°C unless otherwise specified)

Characteristic	Symbol	Test condition	Min.	Тур.	Max.	Unit	
REFERENCE SECTION							
Output voltage (1)	Vref	Ta=25°C	4.80	5.00	5.20	V	
Temperature Stability (1)(2)	Vref/∆T	–25°C≤Ta≤+85°C	-	0.3	0.6	mV/°C	
OSCILLATOR SECTION	OSCILLATOR SECTION						
Initial accuracy	Fosc	Ta=25°C	61	67	73	kHz	
Frequency change with temperature (2)	ΔF/ΔΤ	–25°C≤Ta≤+85°C	-	±5	±10	%	
PWM SECTION	l	1					
Maximum duty cycle	Dmax	-	74	77	80	%	
FEEDBACK SECTION	l	1					
Feedback source current	I _{FB}	Ta=25°C, 0V≤Vfb≤3V	0.7	0.9	1.1	mA	
Shutdown delay current	Idelay	Ta=25°C, 5V≤Vfb≤V _{SD}	4.0	5.0	6.0	μΑ	
OVER CURRENT PROTECTION SECT	OVER CURRENT PROTECTION SECTION						
Over current protection	I _L (max)	Max. inductor current	3.52	4.00	4.48	А	
UVLO SECTION	•		•	•		•	
Start threshold voltage	Vth(H)	-	14	15	16	V	
Minimum operating voltage	Vth(L)	After turn on	9	10	11	V	
TOTAL STANDBY CURRENT SECTION	TOTAL STANDBY CURRENT SECTION						
Start current	I _{ST}	V _{CC} =14V	0.1	0.3	0.45	mA	
Operating supply current (control part only)	I _{OPR}	Ta=25°C	6	12	18	mA	
V _{CC} zener voltage	V _Z	I _{CC} =20mA	30	32.5	35	V	
SHUTDOWN SECTION	l	1					
Shutdown Feedback voltage	V _{SD}	-	6.9	7.5	8.1	V	
Thermal shutdown temperature (Tj) (1)	T _{SD}	-	140	160	-	°C	
Over voltage protection voltage	V _{OVP}	-	23	25	28	V	

NOTES:

- 1. These parameters, although guaranteed, are not 100% tested in production
- 2. These parameters, although guaranteed, are tested in EDS (wafer test) process



TYPICAL PERFORMANCE CHARACTERISTICS

(These characteristic graphs are normalized at Ta=25°C)

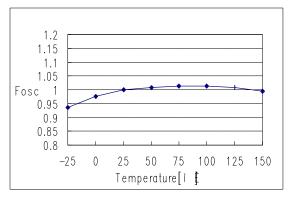


Figure 1. Operating Frequency

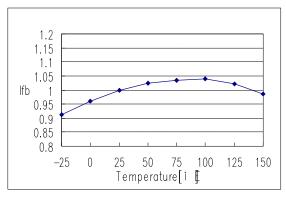


Figure 2. Feedback Source Current

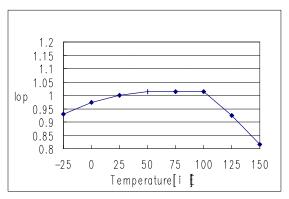


Figure 3. Operating Current

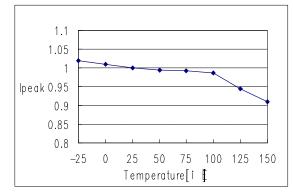


Figure 4. Max. Inductor Current

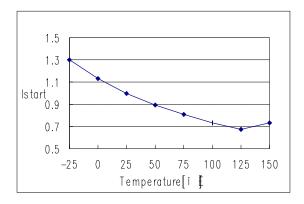


Figure 5. Start up Current

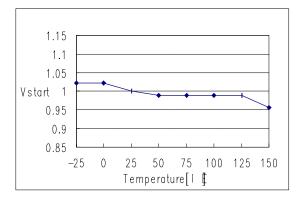


Figure 6. Start Threshold Voltage



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TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(These characteristic graphs are normalized at Ta=25°C)

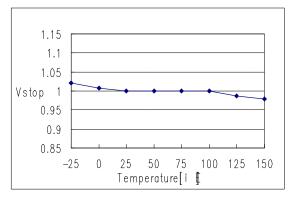


Figure 7. Stop Threshold Voltage

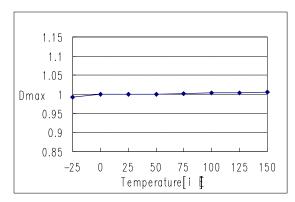


Figure 8. Maximum Duty Cycle

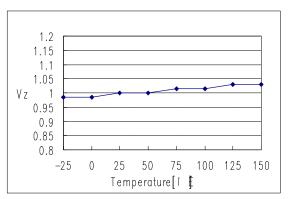


Figure 9. V_{CC} Zener Voltage

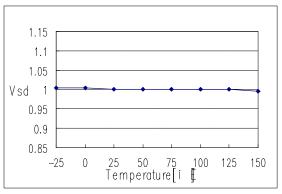


Figure 10. Shutdown Feedback Voltage

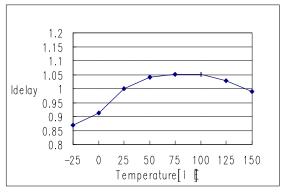


Figure 11. Shutdown Delay Current

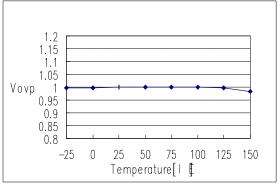


Figure 12. Over Voltage Protection



TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(These characteristic grahps are normalized at Ta=25°C)

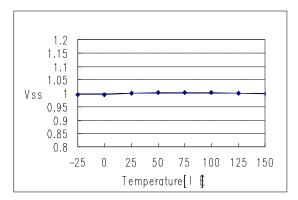


Figure 13. Soft Start Voltage

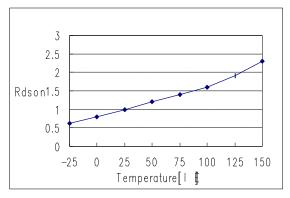


Figure 14. Drain Source Turn-on Resistance

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