

# MIP160, MIP162, MIP163, MIP164, MIP165, MIP166

## Silicon MOS IC

### ■ Features

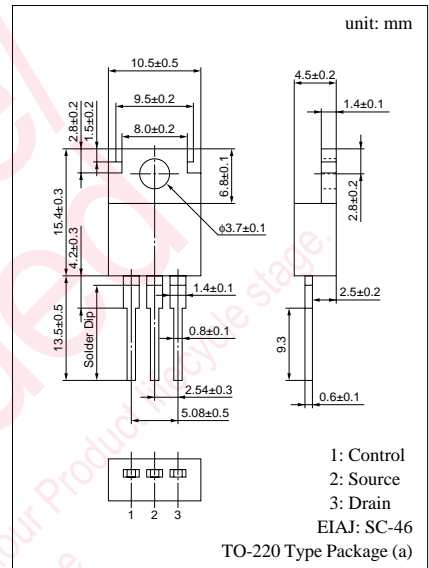
- Single chip IC with high breakdown voltage power MOS FET and CMOS control circuits
- Allowing to input worldwide mains (AC 85 to 274V)
- An over voltage protection circuit for the secondary side, a pulse-by-pulse overcurrent protection circuit and a timer auto-restart circuit are integrated.

### ■ Applications

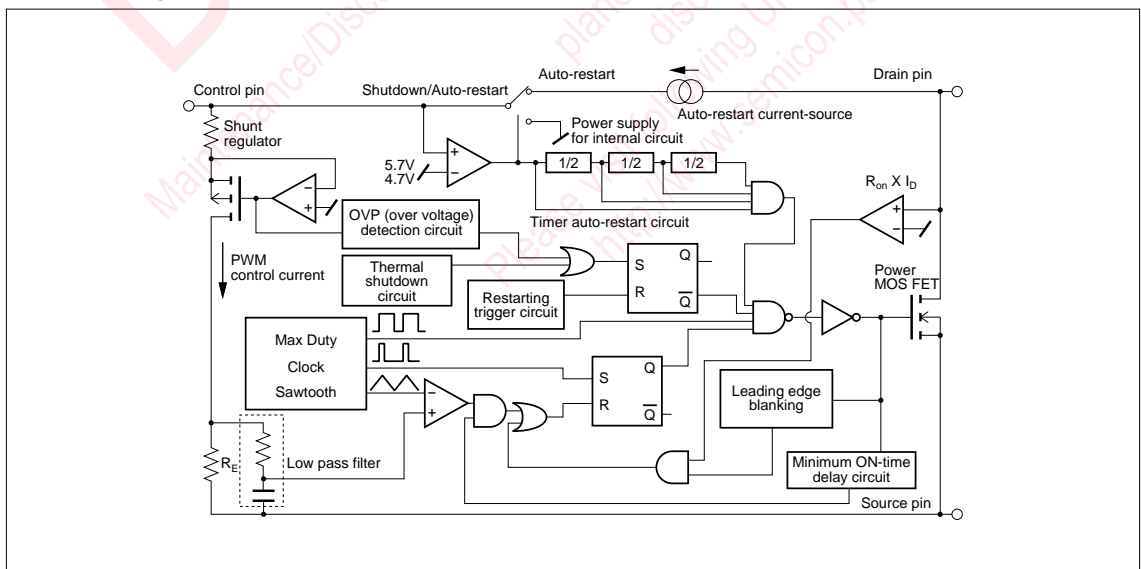
- Switching power supply (to 65W)
- AC adaptor
- Battery charger

### ■ Absolute Maximum Ratings (Ta = 25 ± 3°C)

Parameter	Symbol	Ratings	Unit
Drain voltage	V <sub>D</sub>	700	V
Control voltage	V <sub>C</sub>	8	V
Output current	I <sub>D</sub>	I <sub>LIMIT MAX</sub>	A
Control current	I <sub>C</sub>	0.1	A
Channel temperature	T <sub>ch</sub>	150	°C
Storage temperature	T <sub>stg</sub>	-55 to +150	°C



### ■ Block Diagram



■ Electrical Characteristics ( $T_C = 25 \pm 2^\circ\text{C}$ )

	Parameter	Symbol	Conditions	min	typ	max	Unit	
Control functions	Output frequency	$f_{\text{OSC}}$	$I_C = 2\text{mA}$	90	100	110	kHz	
	Maximum duty cycle	MAXDC	$I_C = 2\text{mA}$	64	67	70	%	
	Minimum duty cycle	MINDC	$I_C = 10\text{mA}$	1	2	3	%	
Auto-restart	Control pin charging current	$I_C$	$V_C = 0$	-2.4	-1.9	-1.2	mA	
			$V_C = 5\text{V}$	-2	-1.5	-0.8		
	Auto-restart threshold voltage	$V_{C(\text{on})}$		5	5.7	6.3	V	
	Lockout threshold voltage	$V_{C(\text{off})}$		4	4.7	5.3	V	
	Auto-restart hysteresis voltage	$\Delta V_C$		0.5	1	1.5	V	
	Auto-restart duty cycle	$T_{\text{SW}}/T_{\text{TIM}}$			5	8	%	
	Auto-restart frequency	$f_{\text{TIM}}$		0.5	1.2	2	Hz	
Circuit protection	Self-protection current limit	$I_{\text{LIMIT}}$	MIP160		0.415	0.5	0.585	A
			MIP162		0.75	0.9	1.05	
			MIP163		1.12	1.35	1.57	
			MIP164		1.35	1.62	1.89	
			MIP165		1.88	2.25	2.63	
			MIP166		2.4	2.8	3.2	
	Leading edge blanking delay	$t_{\text{on(BLK)}}$	$I_C = 3\text{mA}$		0.25		$\mu\text{s}$	
	Current limit delay	$t_{\text{d(OCL)}}$	$I_C = 3\text{mA}$		0.1		$\mu\text{s}$	
	Thermal shutdown temperature	$T_{\text{OTP}}$	$I_C = 3\text{mA}$	130	140	150	$^\circ\text{C}$	
	Latched shutdown trigger current	$I_{\text{OVP}}$		25	45	75	mA	
	Power-up reset threshold voltage	$V_{C \text{ reset}}$		2.3	3.3	4.2	V	
	Output	ON-state resistance	$R_{\text{DS(on)}}$	MIP160	$I_D = 0.1\text{A}$		15	18
MIP162				$I_D = 0.2\text{A}$		8.5	10	
MIP163				$I_D = 0.3\text{A}$		5.8	6.7	
MIP164				$I_D = 0.5\text{A}$		4.5	5.5	
MIP165				$I_D = 0.8\text{A}$		3	3.8	
MIP166				$I_D = 0.8\text{A}$		2.6	3.3	
OFF-state current		$I_{\text{DSS}}$	$V_{\text{DS}} = 650\text{V}, I_C = 3\text{mA}$ latch mode		0.5	0.9	mA	
Breakdown voltage		$V_{\text{DSS}}$	$I_C = 3\text{mA}, I_D = 0.25\text{mA}$ latch mode	700			V	
Rise time		$t_r$			0.1	0.2	$\mu\text{s}$	
Fall time		$t_f$			0.1	0.2	$\mu\text{s}$	
Power Supply voltage	Drain supply voltage	$V_{\text{D(MIN)}}$		36			V	
	Shunt regulator voltage	$V_C$	$I_C = 3\text{mA}$	5.5	5.8	6.1	V	
	Control supply/discharge current	$I_{\text{CD1}}$	Output MOS FET enabled	0.7	1.4	1.8	mA	
			Output MOS FET disabled	0.5	0.8	1.1	mA	

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Attached table "IPD availability by customer"

Parts No.			Companies/areas to which products can be sold	Companies/areas to which products cannot be sold	Application
MIP13□ MIP14□ MIP15□ MIP16□	MIP17□ MIP18□ MIP01□□ MIP02□□	MIP2□□□ MIP3□□□ MIP4□□□ MIP9A□□	· Japanese companies in Japan · Japanese companies in Asia (50% or more owned)	· Companies in European and American countries · Asian companies in Asia · Other local companies	· For power supply · For DC-DC converter
MIP10□ MIP11□ MIP803/804/806 MIP9E□□	MIP811/812 MIP814/815/816 MIP82□ MIP55□		· Japanese companies in Japan · Japanese companies in Asia (50% or more owned) · Asian companies in Asia	· Companies in European and American countries · Other local companies	· For power supply · For EL driver · For LED lighting driver
MIP50□ MIP51□	MIP7□□		· No restrictions in terms of contract	· No restrictions in terms of contract	· For lamp driver/ car electronics accessories

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