MIP2K40MS

Silicon MOS FET type integrated circuit

■ Features

- Built-in jitter function
- Built-in charge protection circuit
  Built-in overheating, loadshorting and overvoltage protection circuits

■ Applications

- Chargers (for DSC, etc.)
- AC adapter

■ Package

- Code
  DIP7-A1
- Pin Name

1. VDD	5. DRAIN
2. FB	6. —
3. CL	7. SOURCE
4. VCC	8. SOURCE

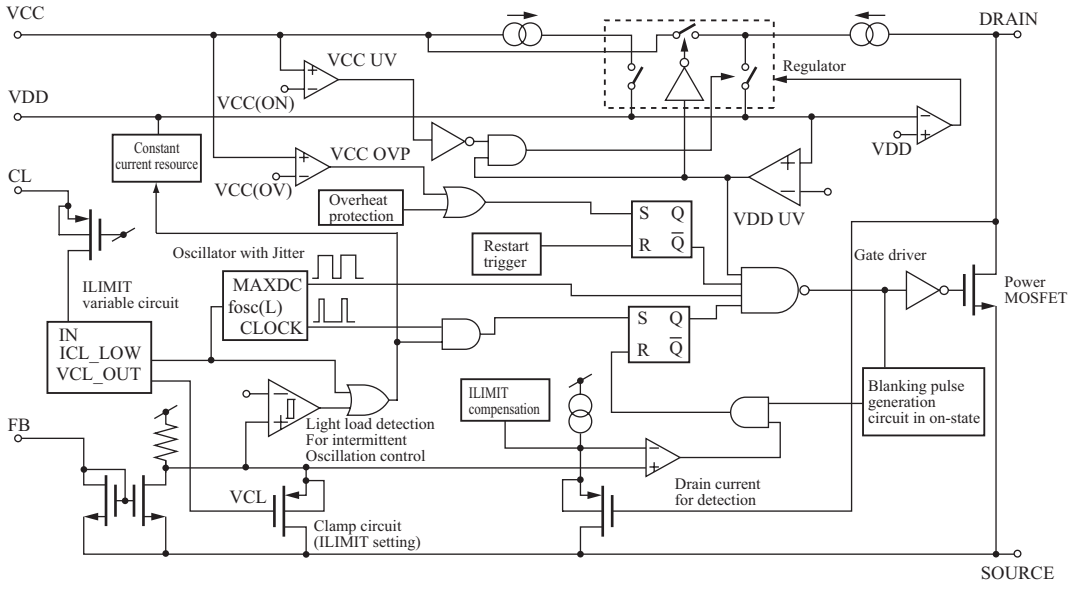
■ Marking Symbol: MIP2K4

■ Absolute Maximum Ratings $T_a = 25°C \pm 3°C$

Parameter	Symbol	Rating	Unit
DRAIN voltage	VD	– 0.3 to +700	V
VCC voltage	VCC	– 0.3 to +45	V
VDD voltage	VDD	– 0.3 to +8	V
Feedback voltage	VFB	– 0.3 to +8	V
Feedback current	IFB	500	μA
CL pin voltage	VCL	– 0.3 to +8	V
CL pin current	ICL	150	μA
Output peak current *	IDP	2.2	A
Channel temperature	Tch	150	°C
Storage temperature	Tstg	–55 to +150	°C

Note) *: The guarantee within the following pulse width.
Leading edge blanking delay + Current limit delay ton(BLK) + td(OCL)

■ Block Diagram



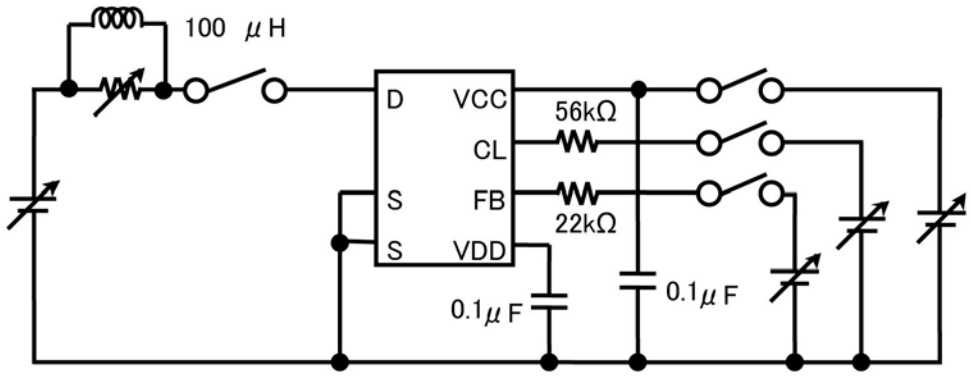
■ Electrical Characteristics T_C = 25°C±2°C

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Control functions						
Output frequency	fosc	VCC = 15 V, VD = 5 V, IFB = 20 µA, ICL = 50 µA	90	100	110	kHz
	fosc(L)	VCC = 15 V, VD = 5 V, IFB: Open, ICL < ICL1	9	12	15	kHz
Jitter frequency deviation	Δf	VCC = 15 V, VD = 5 V, IFB = 20 µA, ICL = 50 µA		5.5		kHz
Jitter frequency modulation rate	fM	VCC = 15 V, VD = 5 V, IFB = 20 µA, ICL = 50 µA		260		Hz
Maximum duty cycle	MAXDC	VCC = 15 V, VD = 5 V, IFB = 20 µA, ICL = 50 µA	45	47.5	50	%
VDD voltage	VDD	VCC = 15 V, VD = 5 V, IFB = 20 µA, ICL = 50 µA	5.4	5.9	6.4	V
UV lockout threshold voltage	VUV	VD = 5 V, IFB = 20 µA, ICL = 50 µA	4.6	5.1	5.6	V
VCC start voltage	VCC(ON)	VD = 5 V, IFB = 20 µA, ICL = 50 µA	5.9	6.9	7.9	V
VCC charge stop threshold voltage	VCC1	VD = 40 V, FB: Open, CL: Open	10	11	12	V
Feedback threshold voltage	IFB1	ON → OFF VCC = 15 V, VD = 5 V, ICL = 50 µA	78	130	182	µA
Feedback hysteresis current	IFBHYS	VCC = 15 V, VD = 5 V, ICL = 50 µA		6		µA
FB pin current at heavy load	IFB0	ICC0 → ICC VCC = 15 V, VD = 5 V, ICL = 50 µA	10	15	20	µA
FB pin voltage	VFB	VCC = 15 V, VD = 5 V, IFB = 20 µA, ICL = 50 µA	0.7	1.0	1.3	V
Supply current	ICC	VCC = 15 V, VD = 5 V, IFB = 20 µA, ICL = 50 µA	0.27	0.47	0.57	mA
Supply current at light load	ICC(OFF)	VCC = 15 V, VD = 5 V, IFB = IFB1 + 5 µA, ICL = 50 µA	0.28	0.35	0.43	mA
Supply current at heavy load	ICC0	VCC = 15 V, VD = 5 V, IFB: Open, ICL = 50 µA	0.48	0.63	0.78	mA
VDD charging current	Ich1	VDD = 0 V, VD = 40 V, FB: Open, CL: Open	–9	–6	–4	mA
	Ich2	VDD = 4 V, VD = 40 V, FB: Open, CL: Open	–4.5	–2.3	–1	mA
CL pin voltage	VCL	VCC = 15 V, VD = 5 V, FB: Open, ICL = ICL1	2.0	2.3	2.6	V
Dropped fosc CL pin current *2	ICL1	fosc → fosc(L) VCC = 15 V, VD = 5 V, FB: Open	16.5	22	27.5	µA
CL pin hysteresis current *2	ICLHYS	VCC = 15 V, VD = 5 V, FB: Open		1.5		µA

■ Electrical Characteristics (continued) T_C = 25°C±2°C

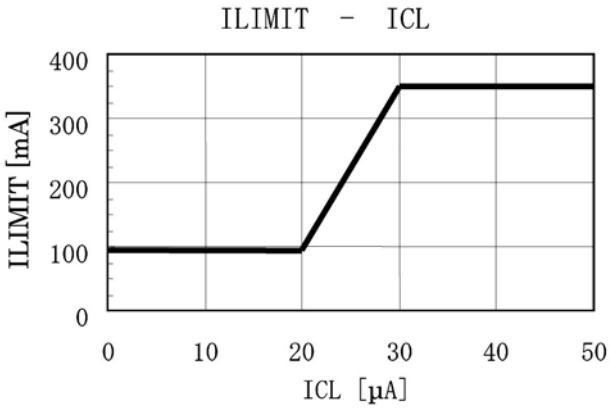
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Circuit protections						
Self protection current limit *1, 3	ILIMIT	VCC = 15 V, FB: Open, ICL = 50 µA, DUTY = 30%	0.63	0.70	0.77	A
ILIMIT modified coefficient *1, 3	R_slope	VCC = 15 V, FB: Open, ICL = 50 µA		44		mA/µs
Minimum ILIMIT	ILIMITmin	Ton = 3 µs, VCC = 15 V, FB: Open, ICL = 0 µA	110	190	270	mA
Drain current at light load	ID(OFF)	Ton = 3 µs, VCC = 15 V, IFB = IFB1 + IFBHYS, ICL = 50 µA	50	140	230	mA
Leading edge blanking delay	ton(BLK)	VCC = 15 V, FB: Open, ICL = 50 µA	280	350	420	ns
Current limit delay	td(OCL)		100	150	200	ns
Over voltage protection	VCC(OV)	VD = 5 V, FB: Open, ICL = 50 µA	21	23.5	26	V
Thermal shutdown temperature	TOTP		130	140	150	°C
Output						
Power up reset threshold voltage	VDDreset		1.8	2.6	3.5	V
ON state resistance	RDS(ON)	ID = 100 mA		7	9.5	Ω
OFF state current	IDSS	VCC = 26 V, VD = 650 V, FB: Open, CL: Open		10	20	µA
Breakdown voltage	VDSS	VCC = 26 V, ID = 100 µA, FB: Open, CL: Open	700			V
Rise time *4	tr	VCC = 15 V, VD = 5 V, FB: Open, ICL = 50 µA		100		ns
Fall time *4	tf	VCC = 15 V, VD = 5 V, FB: Open, ICL = 50 µA		50		ns
Supply voltage characteristics						
Drain supply voltage	VD(MIN)	VCC: Open, FB: Open, CL: Open	50			V

Note) 1. Measurement circuit

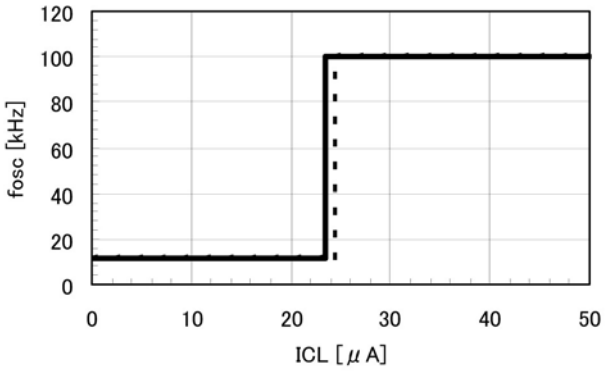


■ Electrical Characteristics (continued) T_C = 25°C±2°C

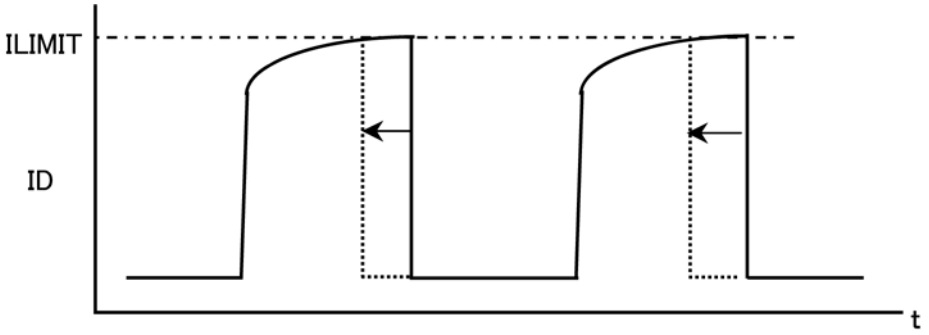
2. *1: ILIMIT vs. ICL Typical characteristic



*2: fosc vs. ICL Typical characteristic

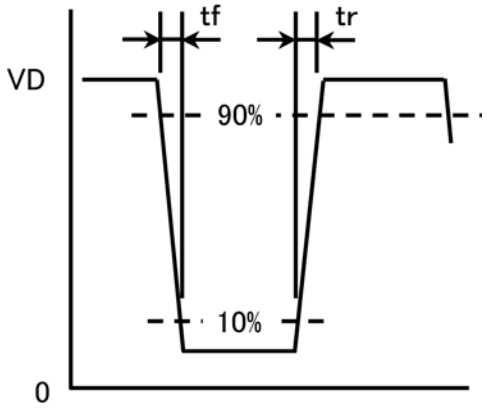


*3: ILIMIT Measurement



R_slope ; {(ILIMIT at Duty=30%) – (ILIMIT at Duty=10%)} / {(Ton at Duty=30%) – (Ton at Duty=10%)}

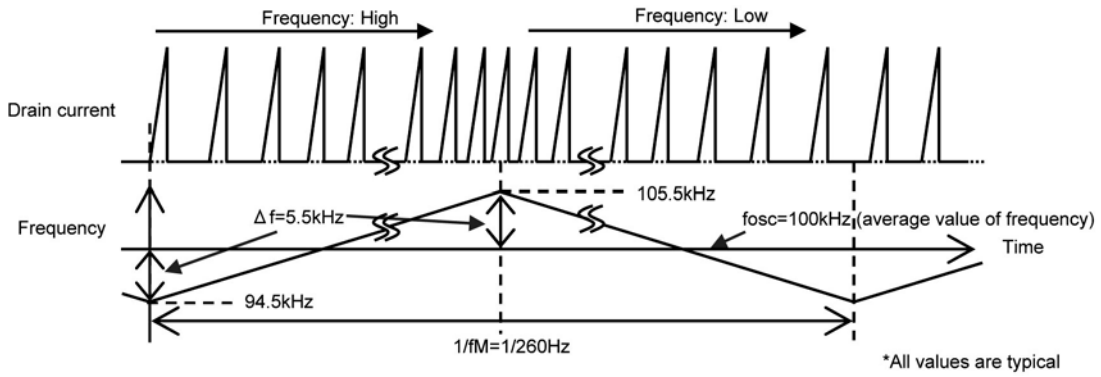
*4: tr, tf Measurement



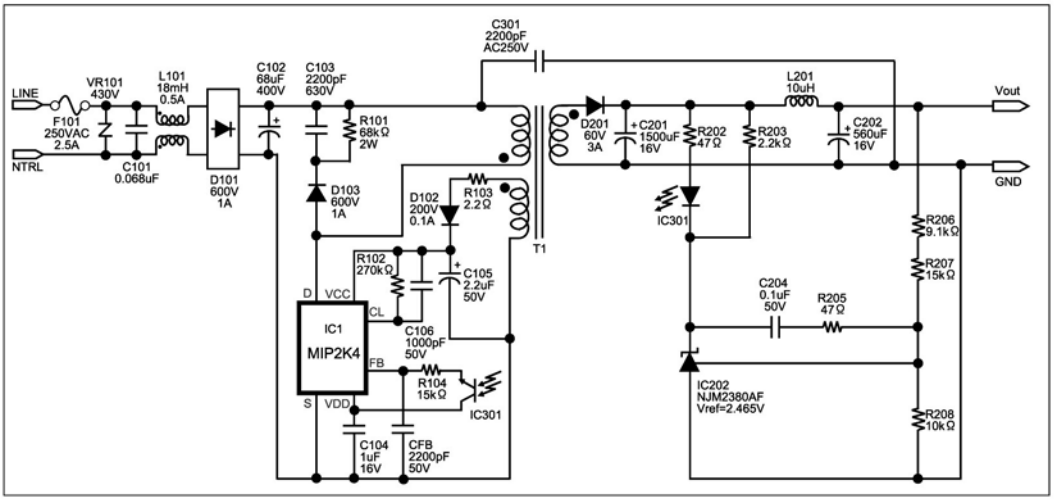
■ Frequency jitter function

By frequency jitter function, frequency jitter variation(Δf) changes periodically, by frequency of frequency jitter modulation factor (fM) as shown below.

fosc = 100 kHz (typ.), Δf = 5.5 kHz (typ.), fM = 260 Hz (typ.)

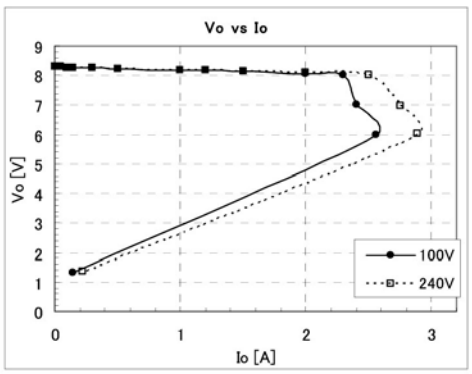


■ Adapter circuit sample (MIP2K4)

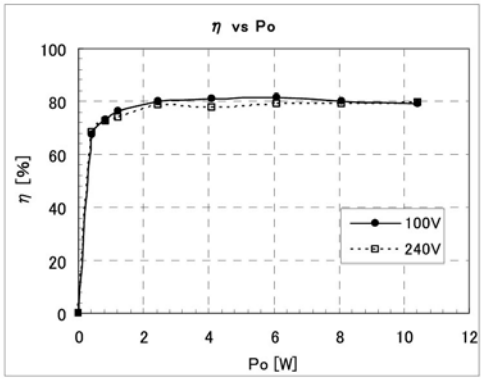


■ Electric characteristics (MIP2K4 : Worldwide input, 8.3V/1.5A output)

VI characteristics of adapter circuit



Power efficiency



Request for your special attention and precautions in using the technical information and semiconductors described in this book

(1) If any of the products or technical information described in this book is to be exported or provided to non-residents, the laws and regulations of the exporting country, especially, those with regard to security export control, must be observed.

(2) The technical information described in this book is intended only to show the main characteristics and application circuit examples of the products. No license is granted in and to any intellectual property right or other right owned by Panasonic Corporation or any other company. Therefore, no responsibility is assumed by our company as to the infringement upon any such right owned by any other company which may arise as a result of the use of technical information described in this book.

(3) The products described in this book are intended to be used for general applications (such as office equipment, communications equipment, measuring instruments and household appliances), or for specific applications as expressly stated in this book.
Consult our sales staff in advance for information on the following applications:
- Special applications (such as for airplanes, aerospace, automotive equipment, traffic signaling equipment, combustion equipment, life support systems and safety devices) in which exceptional quality and reliability are required, or if the failure or malfunction of the products may directly jeopardize life or harm the human body.

It is to be understood that our company shall not be held responsible for any damage incurred as a result of or in connection with your using the products described in this book for any special application, unless our company agrees to your using the products in this book for any special application.

(4) The products and product specifications described in this book are subject to change without notice for modification and/or improvement. At the final stage of your design, purchasing, or use of the products, therefore, ask for the most up-to-date Product Standards in advance to make sure that the latest specifications satisfy your requirements.

(5) When designing your equipment, comply with the range of absolute maximum rating and the guaranteed operating conditions (operating power supply voltage and operating environment etc.). Especially, please be careful not to exceed the range of absolute maximum rating on the transient state, such as power-on, power-off and mode-switching. Otherwise, we will not be liable for any defect which may arise later in your equipment.
Even when the products are used within the guaranteed values, take into the consideration of incidence of break down and failure mode, possible to occur to semiconductor products. Measures on the systems such as redundant design, arresting the spread of fire or preventing glitch are recommended in order to prevent physical injury, fire, social damages, for example, by using the products.

(6) Comply with the instructions for use in order to prevent breakdown and characteristics change due to external factors (ESD, EOS, thermal stress and mechanical stress) at the time of handling, mounting or at customer's process. When using products for which damp-proof packing is required, satisfy the conditions, such as shelf life and the elapsed time since first opening the packages.

Precautions on the Sales of IPDs

1) The sale and/or the export of IPD products to customers located in certain countries is restricted by the Agreement made and executed by and between Power Integrations, Inc. and Panasonic Corporation. For details, refer to the following Attached table "IPD availability by customer."
2) IPD products purchased from our company, or its authorized agents, hereinafter referred to as our company, shall be used only for production purposes by those parties who have duly purchased IPD products. Those who have purchased IPD products shall not use such IPD products in unmodified form for re-sale, loan, or sample shipment for evaluation purposes to any other parties.
3) If a party who has duly purchased IPD products subcontracts its production to any other parties, including its subsidiaries or any other third parties inside and/or out of Japan, and the IPD products are consigned to such subcontracting parties thereat, such party is obligated to monitor and control the quantity of IPD products to prevent any of the aforementioned re-sale, loan or sample shipments from taking place.
4) In the event that any actual or threatened breach or violation of any of the above mentioned 2) or 3) has occurred or is about to occur, our company will hold all shipments of IPD products and may request the customer to disclose necessary documentation describing the status of our end-users and/or distribution channels.
Note) The products of MIP50**, MIP51**, and MIP7** are excluded from above-mentioned precautions, 1) to 3).

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
MIP01** MIP2** MIP9A**	MIP02** MIP3** MIP9L**	MIP1** MIP4**	· 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
MIP00** MIP55** MIP816/826	MIP52** MIP56** MIP9E**	MIP53** MIP803/804	· 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

Note) For details, contact our sales division.