MIP2L40MY

Silicon MOS FET type integrated circuit

■ Features

- Reducing the average noise
  Adding a frequency jitter function to MIP2E/3E* series to dramatically reduce the average noise and simplify EMI parts
- Stabilization of maximum electric power by input correction
  Correcting the input voltage dependency of I LIMIT reduces the input voltage dependency of maximum output current
- Overheating protection function
  Changed from stopping in latch mode to self reset type
- Protecting function
  Overload protection, overheat protection

■ Package

- Code
  TO-220-A2
- Pin Name
  1. CONTROL
  2. SOURCE
  3. DRAIN

■ Marking Symbol: MIP2L4MY

■ Applications

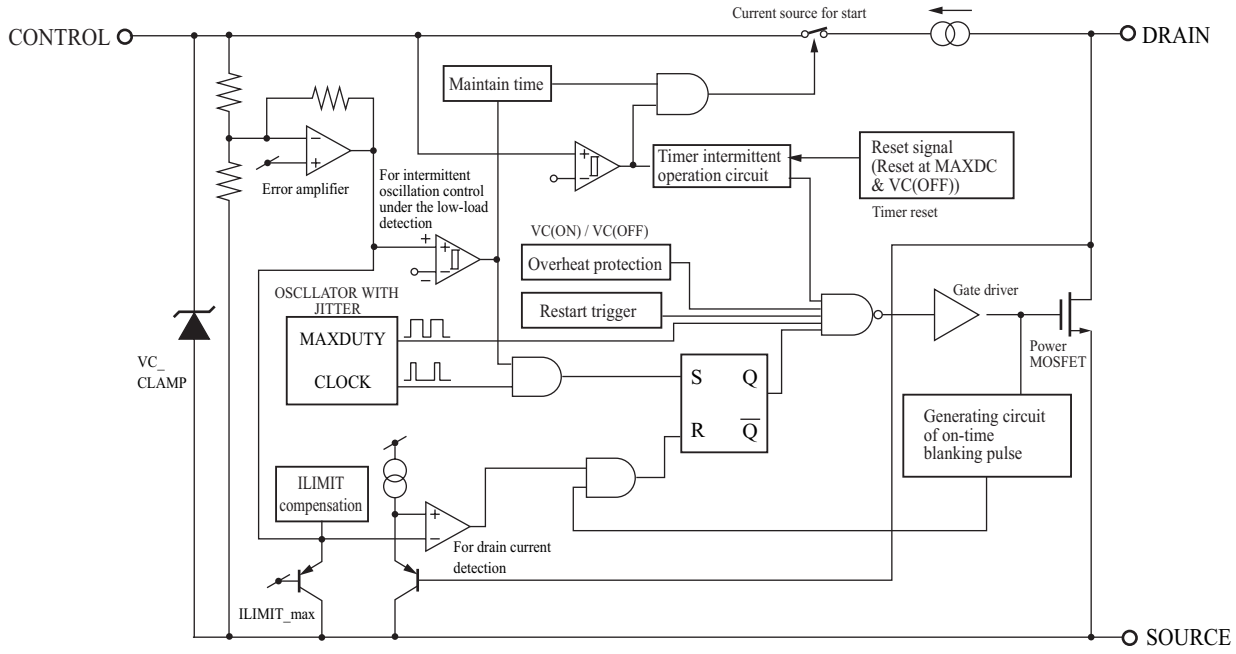
- Flat-screen TV, audio and others

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

Parameter	Symbol	Rating	Unit
DRAIN voltage	VD	– 0.3 to +700	V
CONTROL voltage	VC	– 0.3 to +8	V
Output peak current *	IDP	2.7	A
Channel temperature	Tch	150	°C
Storage temperature	Tstg	−55 to +150	°C

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

■ Block Diagram



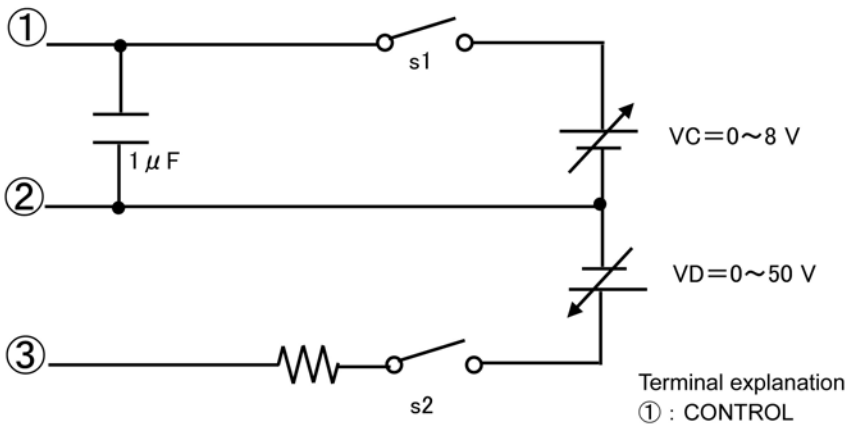
■ Electrical Characteristics T_C = 25°C±3°C

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Control functions						
Output frequency	fosc	VC = VC(CNT) – 0.2 V, VD = 5V	92	100	108	kHz
Jitter frequency deviation	Δf	VC = VC(CNT) – 0.2 V, VD = 5V * Fig. 5		5.5		kHz
Jitter frequency modulation rate *	fM	VC = VC(CNT) – 0.2 V, VD = 5V * Fig. 5		270		Hz
Maximum duty cycle	MAXDC	VC = VC(CNT) – 0.2 V, VD = 5V	50	53	56	%
PWM gain *	GPWM	VC = VC(CNT)		12.5		dB
Before auto-restart current	IC(SB)1	VC < VC(ON), VD = 5 V	0.2	0.5	0.8	mA
After off-state current	IC(SB)2	VC > VC(CNT), VD = 5 V	0.2	0.5	0.8	mA
Operating current	IC(OP)	VC = VC(CNT) – 0.2 V, VD = 5V	0.25	0.7	1.15	mA
Auto-restart threshold voltage	VC(ON)	VD = 5V	5.75	6.25	6.75	V
UV lockout threshold voltage	VC(OFF)	VD = 5V	4.35	4.8	5.25	V
Auto-restart maintain voltage	VC_m	S1 = OPEN	4.95	5.45	5.95	V
Auto-restart maintain time	Tm	S1 = OPEN		45		ms
Auto-restart hysteresis voltage	ΔVC	VC(ON) – VC(OFF)	1.05	1.45	1.85	V
Control clamp voltage	VC(CLP)	IC = 3 mA	6.2	6.8	7.4	V
Auto-restart duty cycle	TSW/TTIM	S1 = OPEN * Fig. 4		12		%
Auto-restart frequency	fTIM	S1 = OPEN * Fig. 4		2.6		Hz
Control pin charging current	IC(CHG)1	VC = 0 V, VD = 50 V	–14	–9	–6	mA
	IC(CHG)2	VC = 5 V, VD = 50 V	–11.2	–5.7	–2.4	mA
Control pin voltage	VC(CNT)	VD = 5 V	5.3	5.9	6.5	V
Control pin voltage hysteresis *	ΔVC(CNT)	VD = 5 V		10		mV
Circuit protections						
Self protection current limit	ILIMIT	Duty = 30% * Fig. 1, 2	1.24	1.35	1.46	A
ILIMIT modified coefficient	R_slope	VC = VC(CNT) – 0.2 V * Fig. 1, 2		37		mA/μs
Leading edge blanking delay *	ton(BLK)		240	300	360	ns
Current limit delay *	td(OCL)		140	210	280	ns
Thermal shutdown temperature *	TOTP		130	140	150	°C
Thermal shutdown temperature hysteresis *	ΔTOTP			70		°C
Output						
Power-up reset theshold voltage *	VCreset		1.8	2.6	3.5	V
ON-state resistance	RDS(ON)	ID = 0.2 A		5.2	6.7	Ω
OFF-state leakage current	IDSS	VD = 650 V, VC = 6.5 V		10	20	μA
Breakdown voltage	VDSS	ID = 100 μA, VC = 6.5 V	700			V
Rise time	tr	VC = VC(CNT) – 0.2 V, VD = 5 V * Fig. 3		95		ns
Fall time	tf	VC = VC(CNT) – 0.2 V, VD = 5 V * Fig. 3		30		ns
Supply voltage characteristics						
Drain supply voltage	VD(MIN)	S1 = OPEN	36			V

Note) *: Design guaranteed item

■ Electrical Characteristics (continued) T_C = 25°C±3°C

1. Measurement circuit



∗ This measurement circuit can't be useful for ILIMIT measurement

2. Figure 1. Measurement circuit 2

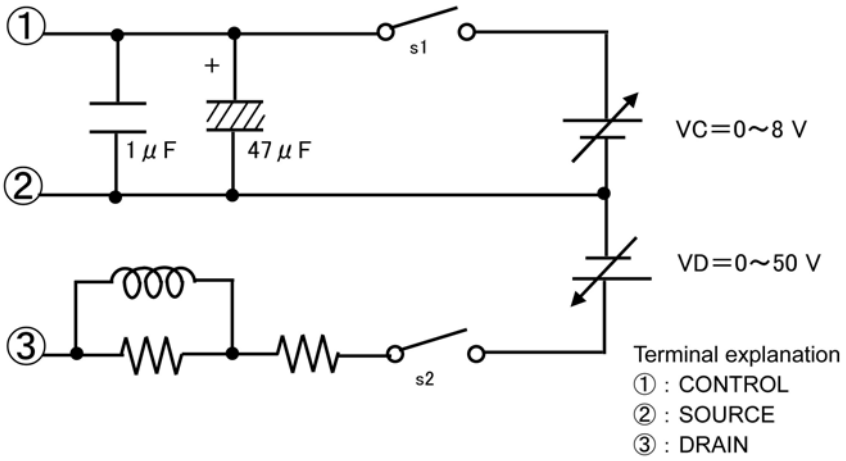
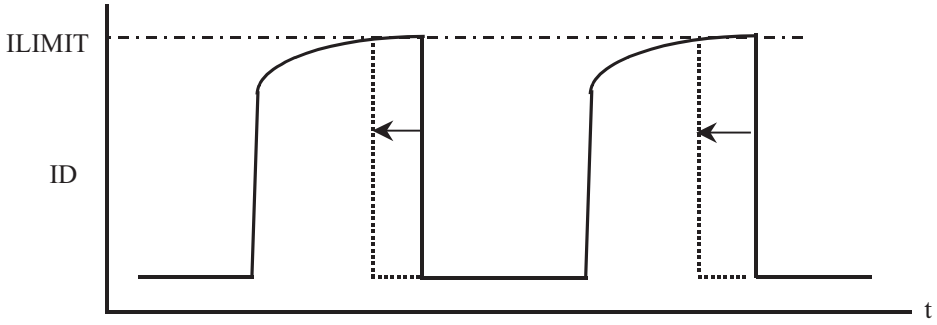


Figure 2. ILIMIT measurement



R_slope = {(ILIMIT at Duty = 30%) – (ILIMIT at Duty = 20%)} / {(Ton at Duty = 30%) – (Ton at Duty = 20%)}

■ Electrical Characteristics (continued) T_C = 25°C±3°C

2. Figure 3. tr, tf measurement

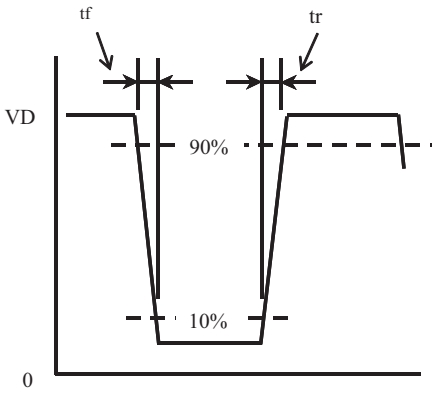


Figure 4. VC_m, Tm, TTSW. TTIM, FTIM measurement

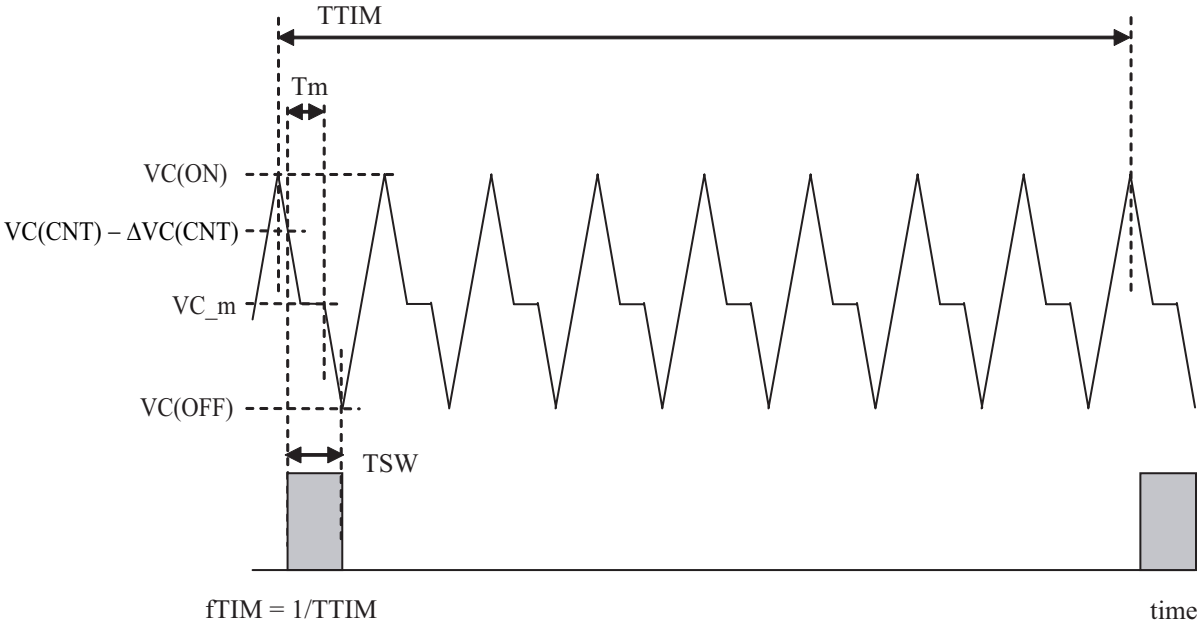
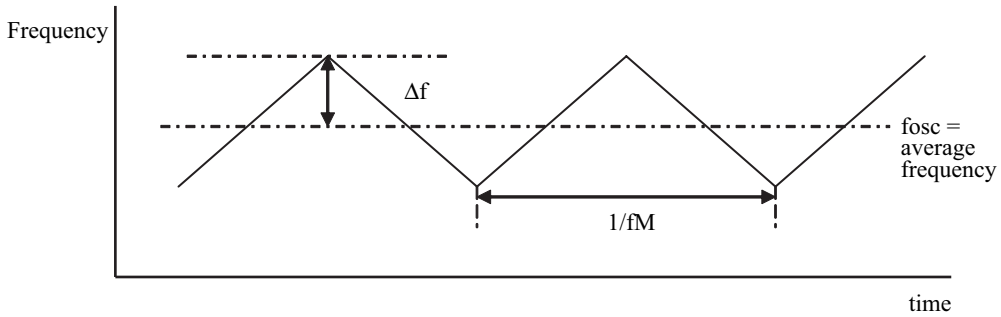


Figure 5. Δf, fM measurement



■ Usage Notes

Connect a Ceramic Capacitor (over 0.1 μF) between CONTROL and SOURCE.

The IPD has risks for break-down or burst or giving off smoke in following conditions. Avoid the following use.
Fuse should be added at the input side or connect zener diode between control pin and GND, etc as a countermeasure to pass regulatory Safety Standard. Concrete countermeasure could be provided individually. However, customer should make the final judgment.

(1) Reverse the DRAIN pin and SOURCE pin connection to the power supply board.
(2) DRAIN pin short to CONTROL pin.
(3) DRAIN pin short to SOURCE pin.

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

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(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.