Panasonic

MIP2L40MTSCF

Type	Silicon MOSFET type Integrated Circuit		
Application	For Switching Power Supply Control		
Structure	CMOS type		
Equivalent Circuit	Figure. 7		
Out Line	DIP7-A1-B	Marking	MIP2L4

A. ABSOLUTE MAXIMUM RATINGS (Ta=25℃±3℃)

NO.	Item	Symbol	Ratings	Unit	Note
1	DRAIN Voltage	VD	−0.3 ～ 700	V	※1 : It is guaranteed within the pulse as below.
2	CONTROL Voltage	VC	-0.3 ～ 8	V	
3	Output Peak Current	IDP	2.7(※1)	A	Leading Edge Blanking Pulse + Current Limit Delay ton(BLK)+td(OCL)
4	Junction Temperature	Tj	150	℃	
5	Storage Temperature	Tstg	−55 ～ +150	℃	

B. Recommended Operating Conditions

No.	Item	Symbol	Conditions	Unit	Note
1	Junction Temperature	Tj	−40 ～ +125	℃	

C. ELECTRICAL CHARACTERISTICS

Measure condition (TC=25℃±3℃)

No.	Item	Symbol	Measure Condition (Figure 1)	Typ.	Min	Max	Unit
【CONTROL FUNCTIONS/ ✱ Design Guarantee Item】							
1	Output Frequency	fosc	VC=VCCNT)-0.2V, VD=5 V	100	92	108	kHz
2	Jitter Frequency Deviation	Δf	VC=VC(CNT)-0.2V, VD=5 V	5.5			kHz
*3	Jitter Frequency Modulation Rate	fM	VC=VC(CNT)-0.2V, VD=5 V	270			Hz
4	Maximum Duty Cycle	MAXDC	VC=VC(CNT)-0.2V, VD=5 V	53	50	56	%
*5	PWM Gain	GPWM	VC=VC(CNT)	12.5			dB
6	Before Auto-restart Current	IC(SB)1	VC<VC(ON),VD=5 V	0.5	0.2	0.8	mA
7	After Off-state Current	IC(SB)2	VC>VC(CNT),VD=5 V	0.5	0.2	0.8	mA
8	Operating Current	IC(OP)	VC=VC(CNT) -0.2V,VD=5 V	0.7	0.25	1.15	mA
9	Auto-restart Threshold Voltage	VC(ON)	VD=5 V	6.25	5.75	6.75	V

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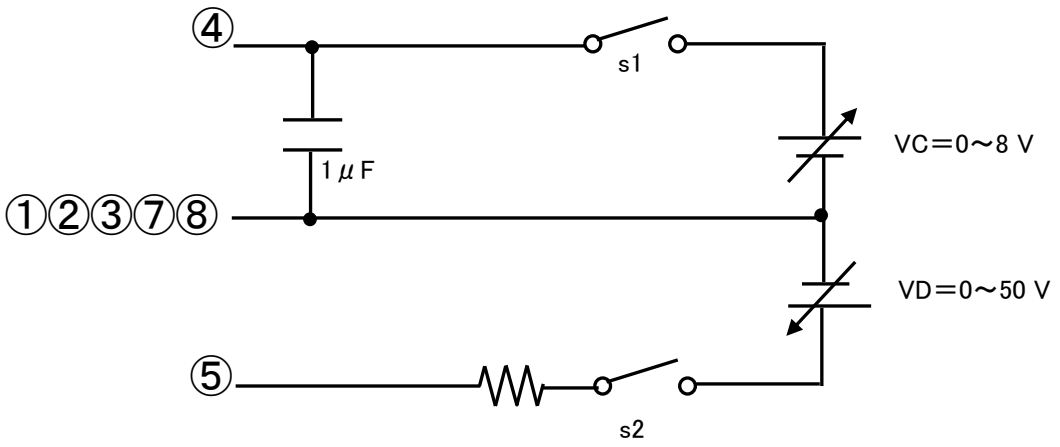
10	UV Lockout Threshold Voltage	VC(OFF)	VD=5 V	4.8	4.35	5.25	V
11	Auto-restart maintain Voltage	VC_m	S1=OPEN	5.45	4.95	5.95	V
12	Auto-restart maintain Time	Tm	S1=OPEN	45			ms
13	Auto-restart hysteresis Voltage	⊿VC	VC(ON)-VC(OFF)	1.45	1.05	1.85	V
14	Control Clamp Voltage	VC(CLP)	IC=3mA	6.8	6.2	7.4	V
15	Auto-restart duty cycle	TSW/TTIM	※Figure 5 S1=OPEN	12			%
16	Auto-restart frequency	fTIM	※Figure 5 S1=OPEN	2.6			Hz
17	Control Pin Charging Current	IC(CHG)1	VC=0V,VD=50 V	-9	-14	-6	mA
		IC(CHG)2	VC=5V,VD=50 V	-5.7	-11.2	-2.4	mA
18	Control Pin Voltage	VC(CNT)	VD=5 V	5.9	5.3	6.5	V
*19	Control Pin Voltage hysteresis	⊿VC(CNT)	VD=5 V	10			mV

No.	Item	Symbol	Measure Condition (Figure 1)	Typ.	Min	Max	Unit
【CIRCUIT PROTECTIONS:/ * Design Guarantee Item】							
20	Self Protection Current Limit	ILIMIT	※Figure 2/Figure 3 DUTY=30%	1.35	1.24	1.46	A
21	ILIMIT modified coefficient	R_slope	※Figure 2/Figure 3 VC=VC(CNT)-0.2 V	37			mA/μS
*22	Leading Edge Blanking Delay	ton(BLK)		300	240	360	ns
*23	Current Limit Delay	td(OCL)		210	140	280	ns
*24	Thermal Shutdown Temperature	TOTP		140	130	150	℃
*25 .	Thermal Shutdown Temperature Hysteresis	⊿TOTP		70			℃
【OUTPUT／* Design Guarantee Item】							
*26	Power-up Reset Threshold Voltage	VCreset		2.6	1.8	3.5	V
27	ON-State Resistance	RDS(ON)	ID=0.3 A	5.2		6.7	Ω
28	OFF-State Current	IDSS	VD=650V, VC=6.5 V	10		20	μA
29	Breakdown Voltage	VDSS	ID=100 μA, VC=6.5 V		700		V
30	Rise Time	tr	※Figure4 VC=VC(CNT)-0.2V, VD=5 V	95			ns
31	Fall Time	tf	※Figure4 VC=VC(CNT)-0.2V, VD=5 V	30			ns

【SUPPLY】							
32	Drain Supply Voltage	VD(MIN)	S1=OPEN		36		V

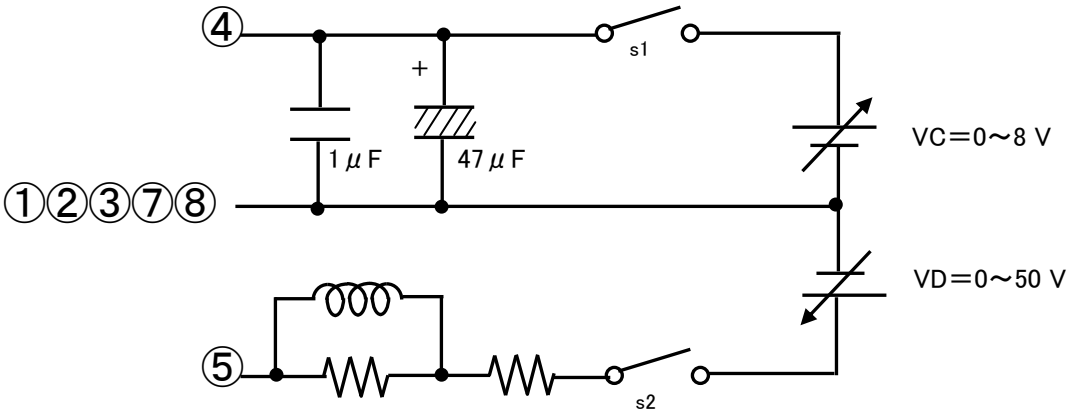
【Figure. 1:Measure Circuit】



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

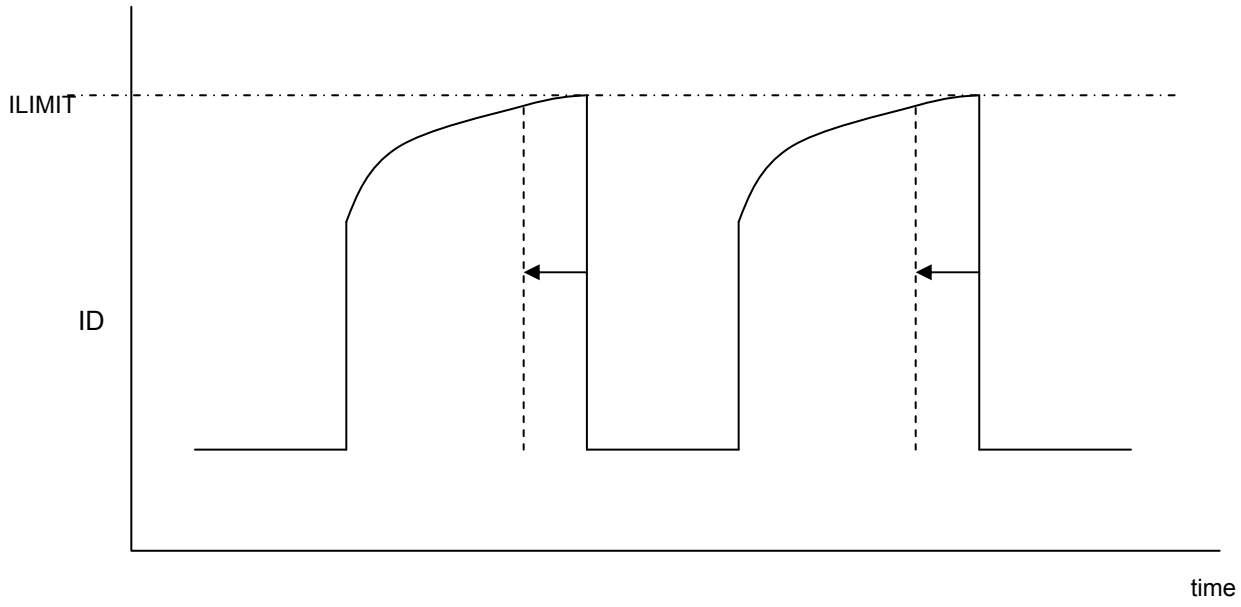
Terminal explanation
④ : CONTROL
①②③⑦⑧ : SOURCE
⑤ : DRAIN

【Figure. 2:Measure Circuit】



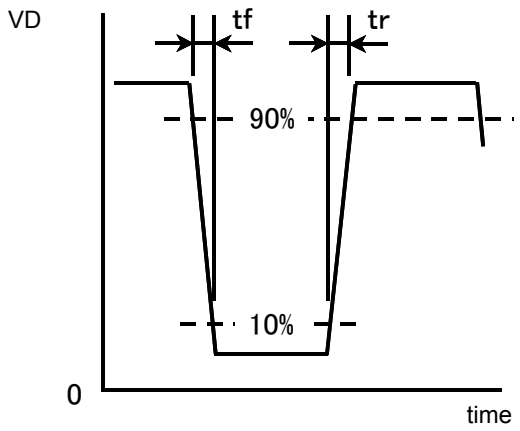
Terminal explanation
④ : CONTROL
①②③⑦⑧ : SOURCE
⑤ : DRAIN

【Figure. 3: ILIMIT Measurement】

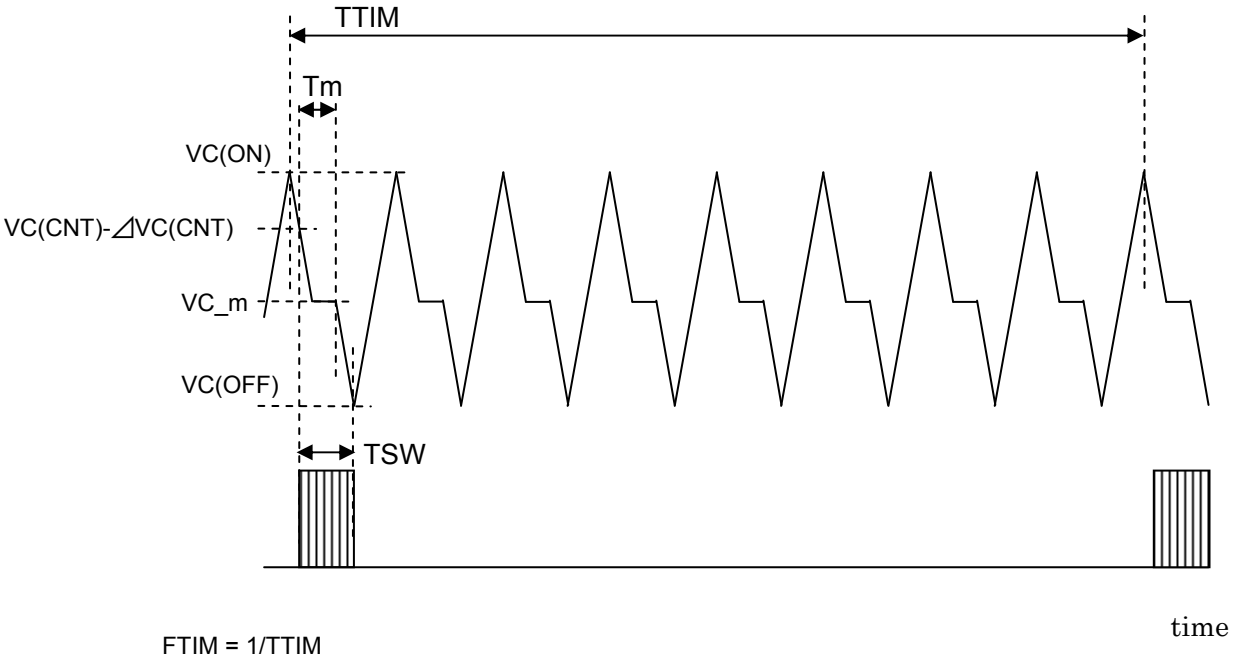


R_slope = {(ILIMIT at Duty=30%)-(ILIMIT at Duty=20%)} / {(Ton at Duty=30%)-(Ton at Duty=20%)}

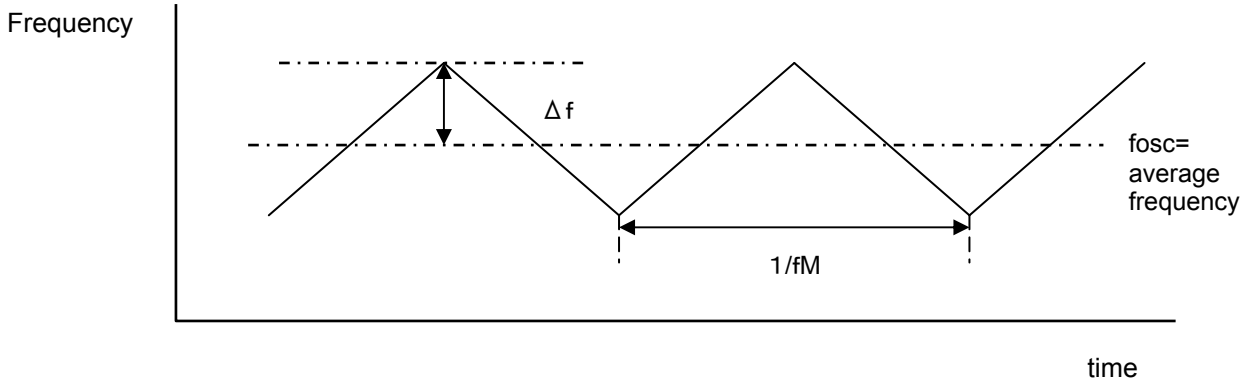
【Figure. 4 : tr、tf Measurement】



【Figure. 5 : VC_m, Tm, TTSW. TTIM, FTIM Measurement】



【Figure. 6 : Δf、fM Measurement】



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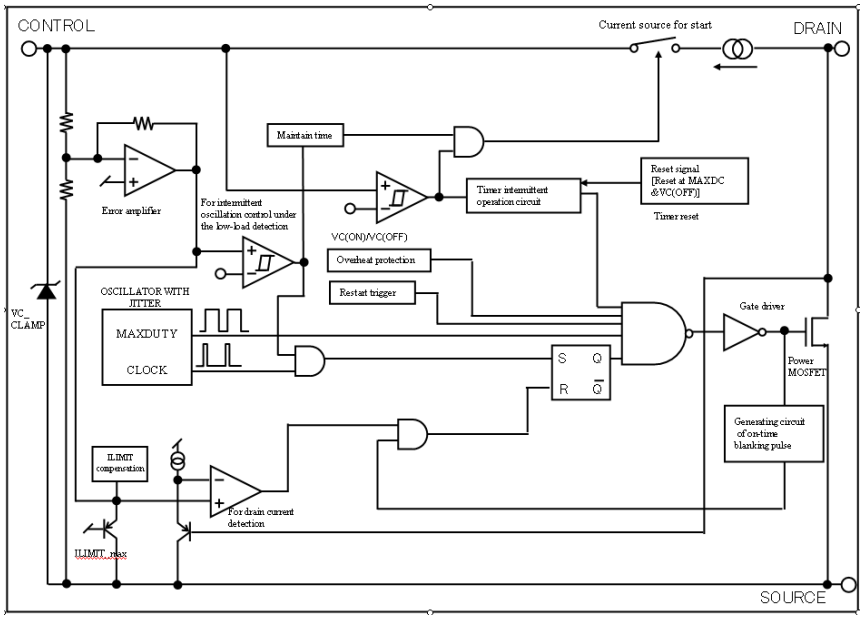
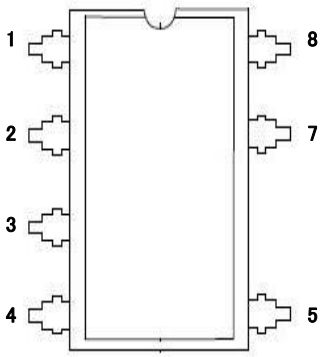
【Figure. 7: Block Diagram】



【Figure. 8: Pin Layout】



Pin No.	Terminal Name
1	SOURCE
2	SOURCE
3	SOURCE
4	CONTROL
5	DRAIN
6	-
7	SOURCE
8	SOURCE

【Precautions for Use 1】

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

【Precautions for Use 2】

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.

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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.

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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** MIP803/804	MIP52** MIP56** MIP816/826	MIP53** MIP5S** MIP9E**	· 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.