Panasonic

MIP3J2VMSSCF

Type	Silicon MOSFET type Integrated Circuit		
Application	Switching Power Supply Control		
Structure	CMOSType		
Equivalent Circuit	Refer Figure 8		
Package	DIP7-A1	Marking	MIP3J2V

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. Leading Edge Blanking Pulse + Over current protection delay ton(BLK)+td(OCL)
2	VCC Voltage	VCC	−0.3 ～ 45	V	
3	VDD Voltage	VDD	−0.3 ～ 8	V	
4	TR Voltage	VTR	−0.7 ～ VDD + 0.5	V	
5	TR Current	ITRrev	-5 ～ 0.6	mA	
6	OLP Voltage	VOLP	−0.3 ～ VDD + 0.5	V	
7	Output Peak Current	IDP	0.6(※1)	A	
8	Recommended Operating Temperature	Tj	-30 ～ +125	℃	
9	Channel Temperature	Tch	-30 ～ +150	℃	
10	Storage Temperature	Tstg	−55 ～ +150	℃	

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B. ELECTRICAL CHARACTERISTICS Measure condition (TC=25℃±3℃)

No.	Item	Symbol	Measure Condition (Refer Fig. 1)	Typ.	Min.	Max.	Unit
【Control function】 *Design Guarantee Item, ** Reference Item							
1	Highest PFM output frequency at heavy load	f_pfm1	V1=VDD(ON)+0.1 V, V3=2 V, V2=0 V, V4=VCC(ON)+0.1 V, V5=VDOCL	130	121	139	kHz
2	Lowest PFM output frequency at light load	f_pfm2	V1=VDD(ON)+0.1V, V3=4.8 V, V2=0 V, V4=VCC(ON)+0.1 V, V5=VDOCL	300	150	450	Hz
3	Soft start output frequency	f_SS	V1=VDD(ON)+0.1 V, V3=open , V2=0 V, V4=VCC(ON)+0.1 V, V5=VDOCL	70	56	84	kHz
4	Maximum Duty cycle	MaxDC	V1=VDD(ON)+0.1 V, V3=2 V, V2=0 V, V4=VCC(ON)+0.1 V, V5=VDOCL	58	55	61	%
5	Voltage reference for constant voltage control	VCV	V1=VDD(ON)+0.1 V, V2=0 V,	2.95	2.89	3.01	V
6	TR feedback voltage threshold	VTR0	V1=VDD(ON)+0.1 V, V3=2 V／ 9.0 μSpulse V4=0 V, V5=VDOCL	3.05	2.95	3.15	V
7	TR soft-start voltage threshold	VTR_SS	V1=VDD(ON)+0.1 V, V3=0 V／ 9.0 μSpulse V4=0 V, V5=VDOCL	1.4	1.2	1.6	V
8	VCC start voltage	VCC(ON)	V1=VDD(ON)+0.1 V, V3=2 V, V2=0 V, V5=15.0 V	11.6	10.6	12.6	V
9	VCC stop voltage	VCC(OFF)	V1=VDD(ON)+0.1 V, V3=2 V, V2=0 V, V5=15.0 V	8.1	7.35	8.85	V
10	VCC start/stop voltage hysteresis	VCC(HYS)	VCC(ON) − VCC(OFF)	3.5	3.0	4.0	V
11	VDD start voltage	VDD(ON)	V3=2 V, V2=0 V, V5=0.2 V	5.7	5.2	6.2	V
12	VDD stop voltage	VDD(OFF)	V3=2 V, V2=0 V, V5=0.2 V	4.9	4.4	5.4	V
13	Start-up current consumption	ICC(SB)	V4=6.5 V	0.55	0.40	0.70	mA
14	Operating current consumption	ICC	V4=13 V	0.71	0.57	0.92	mA
15	Drain-VDD charging current 1	Ich1	V1=0 V, V5=40 V,	−3.8	−5.7	−1.9	mA
16	Drain-VDD charging current 2	Ich2	V1=5.5 V, V5=40 V,	−1.1	−1.7	−0.5	mA
17	TR Open voltage	VTRopen	V1=VDD(ON)+0.1 V	4.5	3.2	6.2	V
18	TR short current	ITR_0V	V1= VDD(ON)+0.1 V, V3=0 V	−7.0	−11.6	−2.4	μA

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B. ELECTRICAL CHARACTERISTICS Measure condition (TC=25℃±3℃)

No.	Item	Symbol	Measure Condition (Refer Fig. 1)	Typ.	Min.	Max.	Unit
【CIRCUIT PROTECTIONS】*Design Guarantee Item, ** Reference Item							
19	Self Protection Current Limit	ILIMIT	V1=VDD(ON)+0.1V, V3=2 V, V2=0 V, V5=VDOCL V3=2 V/ 9.0 μSpulse ※Fig. 5	0.23	0.214	0.246	A
**20	ILIMIT Compensation slope	R_SLOPE	※Fig. 5	11	–	–	mA/μs
21	Drain current at light load	ID(OFF)	V1=VDD(ON)+0.1V, V3=4.8 V, V2=0 V, V5=VDOCL ※Fig. 5	150	136	164	mA
22	OLP charging current	IOLPch	V2=2.0 V, V3=2 V, V4=VCC(ON)+0.1 V, V5=VDOCL	−9	−11.7	−6.3	μA
23	OLP Protection voltage	VOLP_DET	V2=2.0 V, V3=2 V, V4=VCC(ON)+0.1V, V5=VDOCL	3.70	3.3	4.1	V
**24	OLP Protection hysteresis voltage	VOLPHYS		0.65	–	–	V
25	OLP discharging current in timer intermittent	IOLP_dis	V1=VDD(ON)+0.1 V , V2=25 V, V3=2 V, V4=VCC(OFF) ,V5=ILIMIT condition,	0.8	0.64	0.96	mA
26	OLP pull down current	IOLP_PDw	V1=VDD(ON)+0.1 V , V2=4 V, V3=4.8 V V4=15 V, V5=VDOCL	80	64	96	μA
27	OLP VCC oscillation count	OLP_CNT	V2=0 V, V3=6 V, V4=VCC(ON)⇔VCC(OFF), V5=VOCL, ※Fig. 6		8		
28	Over voltage protection Voltage	VCC(OV)	V1=VDD(ON)+0.1 V , V2=0 V, V3=2 V, V5=0.2 V	28.5	25.0	32.0	V
*29	Leading Edge Blanking Delay	ton(BLK)		350	280	420	ns
*30	Over current protection delay	td(OCL)		150	100	200	ns
*31	Thermal shutdown temperature	TOTP		140	130	150	℃
32	Latch reset voltage	VDDreset		2.7	1.8	3.5	V

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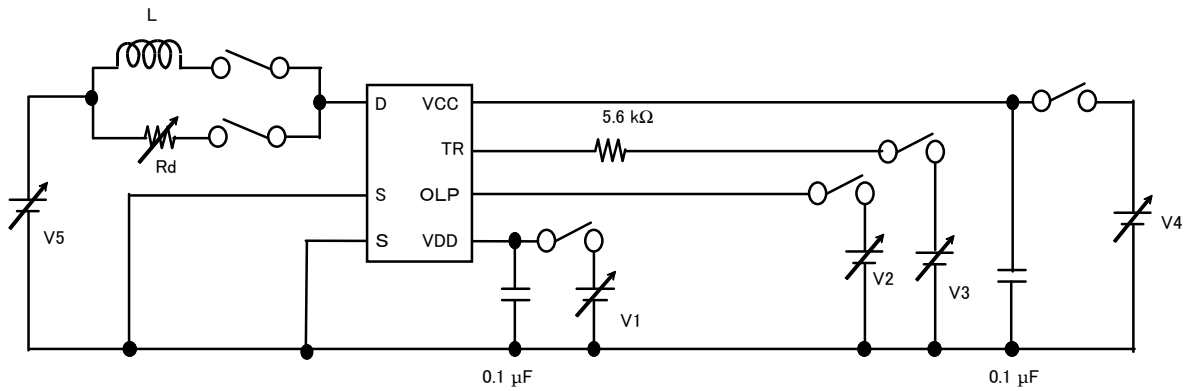
B. ELECTRICAL CHARACTERISTICS Measure condition (TC=25℃±3℃)

No.	Item	Symbol	Measure Condition (Refer Fig. 1)	Typ.	Min.	Max.	Unit
【Output】 *Design Guarantee Item, ** Reference Item							
33	Drain ON-State Resistance	RDS(ON)	V2=0 V, V3=2 V, V4=15 V, I5=100 mA,	24	–	31	Ω
34	Drain OFF-State Current	IDSS	V4=35 V, V5=650 V	10	–	20	μA
35	Drain Breakdown Voltage	VDSS	V4=35 V, I5=100 μA,	–	700	–	V
*36	Rise time	tr	V2= 0 V, V3=2 V, V4=15 V, V5=5 V ※Fig. 7	100	–	–	ns
*37	Fall time	tf	V2= 0 V, V3=2 V, V4=15 V, V5=5 V ※Fig. 7	50	–	–	ns
【High Voltage Input】							
38	Minimum Drain pin supply	VD(MIN)		–	50	–	V

【Figure 1: Measure Circuit】



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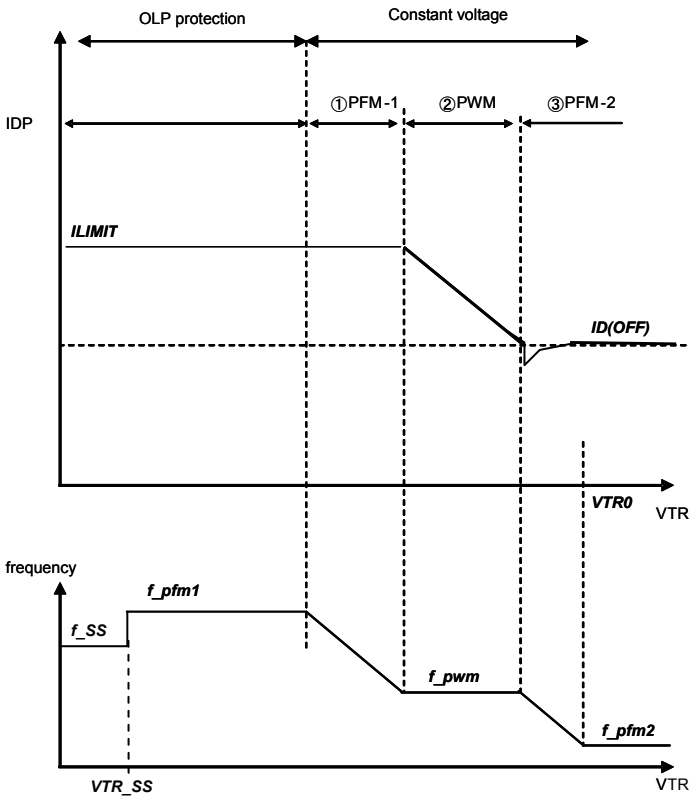
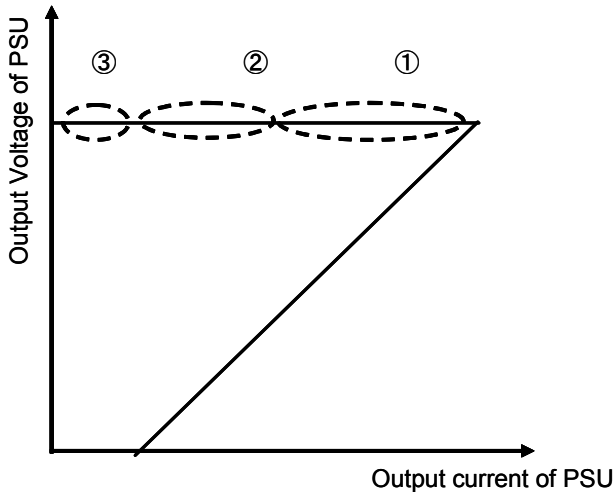
【Figure 2: TR terminal voltage vs operation fosc/IDp illustration】



(a) IPD circuit operation with TR voltage



(b) Charger type Power Supply Unit output

①	Heavy load PFM control	ILIMIT peak current, PFM control Maximum operation frequency - f_pfm1
②	PWM control	Peak current vary from ID(off) - ILIMIT, fic frequency control * Mixture of PFM and PWM control could happen
③	Light load PFM control	ID(OFF) peak current, PFM control Minimum operating frequency - f_pfm2
④	OLP detection point	IOLPch charging current start to flow when frequency become f_pfm1.
⑤	Over load protection	OLP timer intermittent operation

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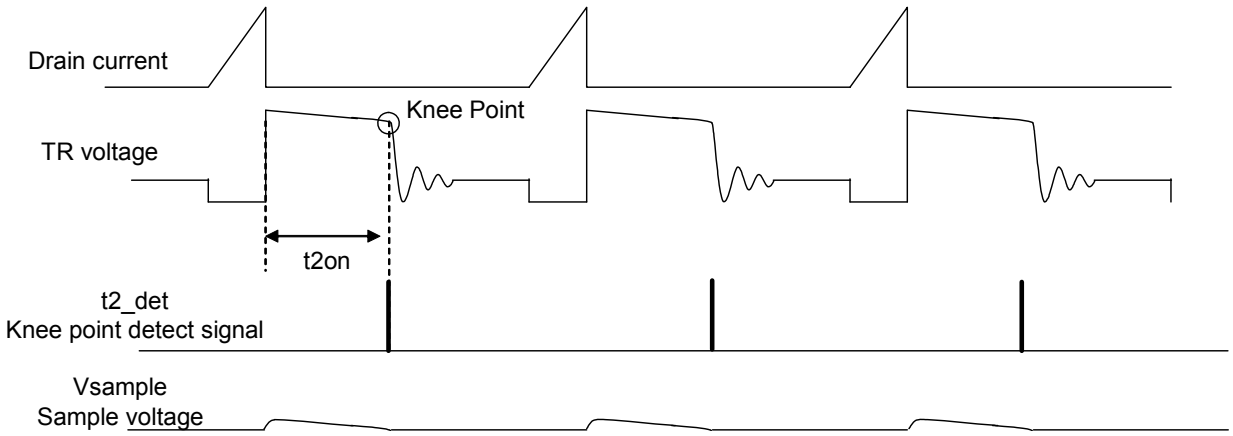
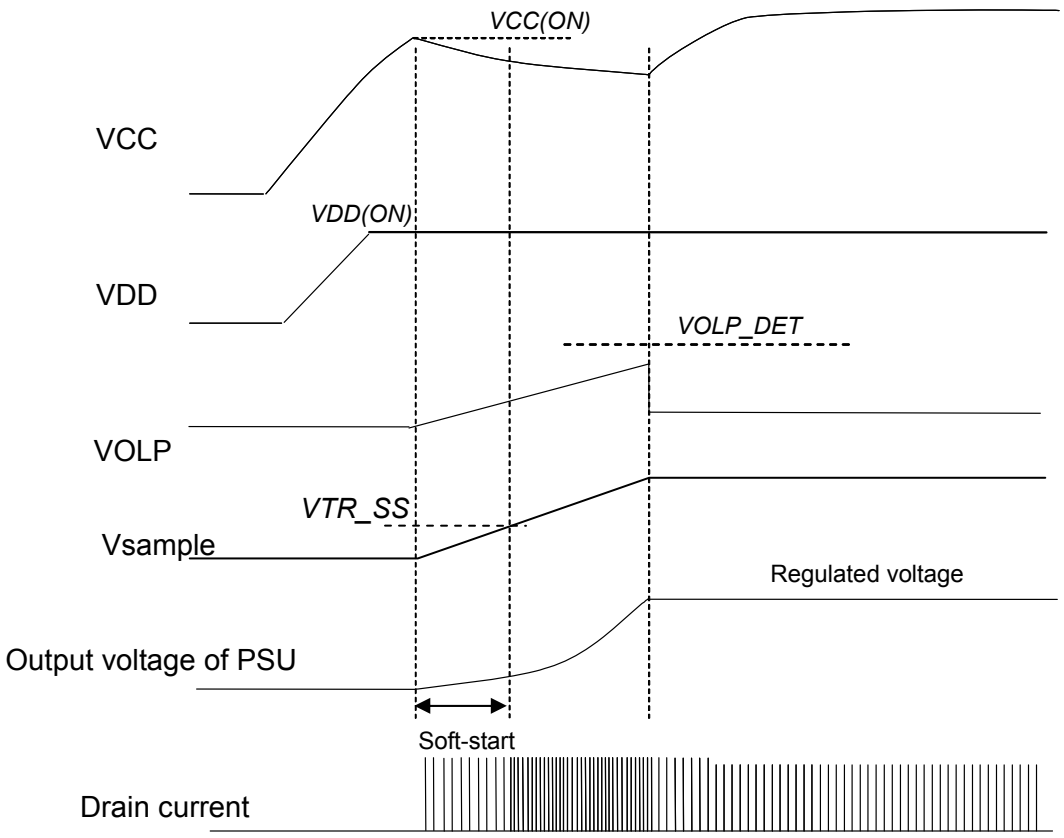
【Figure 3: TR sampling action】



【Figure 4 Output waveform when start-up】



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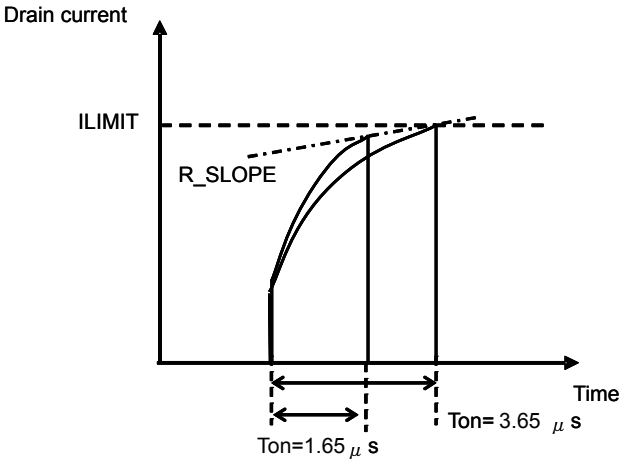
【Figure 5 ILIMIT、R_Slope Measurement waveform】



R_slope ; {(ILIMIT at Ton=3.65 μs) - (ILIMIT at Ton=1.65 μs)} / {3.65 μs - 1.65 μs}

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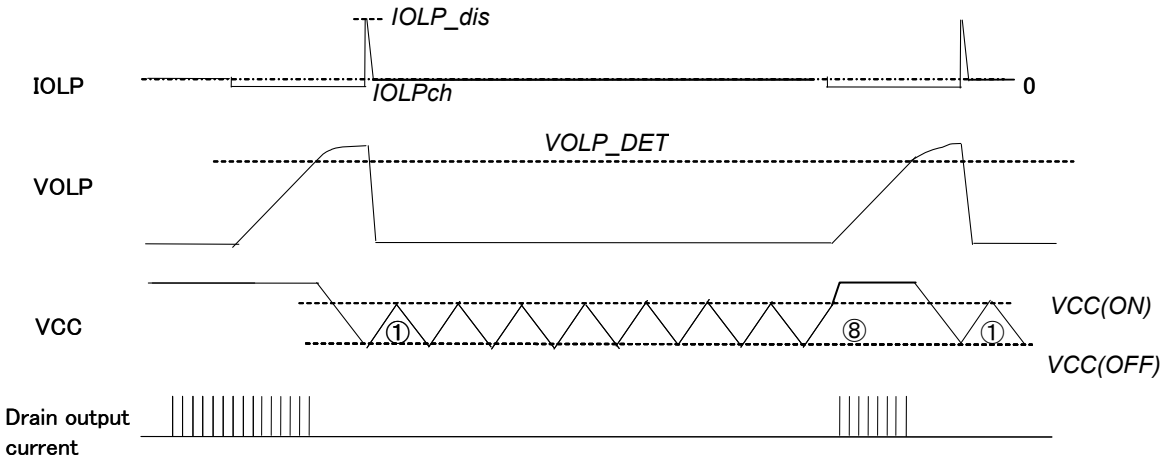
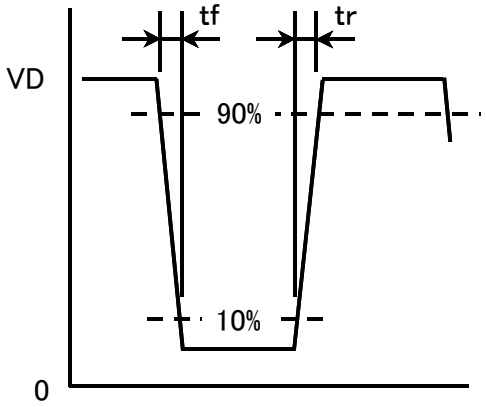
【Figure 6 OLP protection control –timer intermittent operation 】



Overload operation

【Figure 7 tr, tf measurement waveform】



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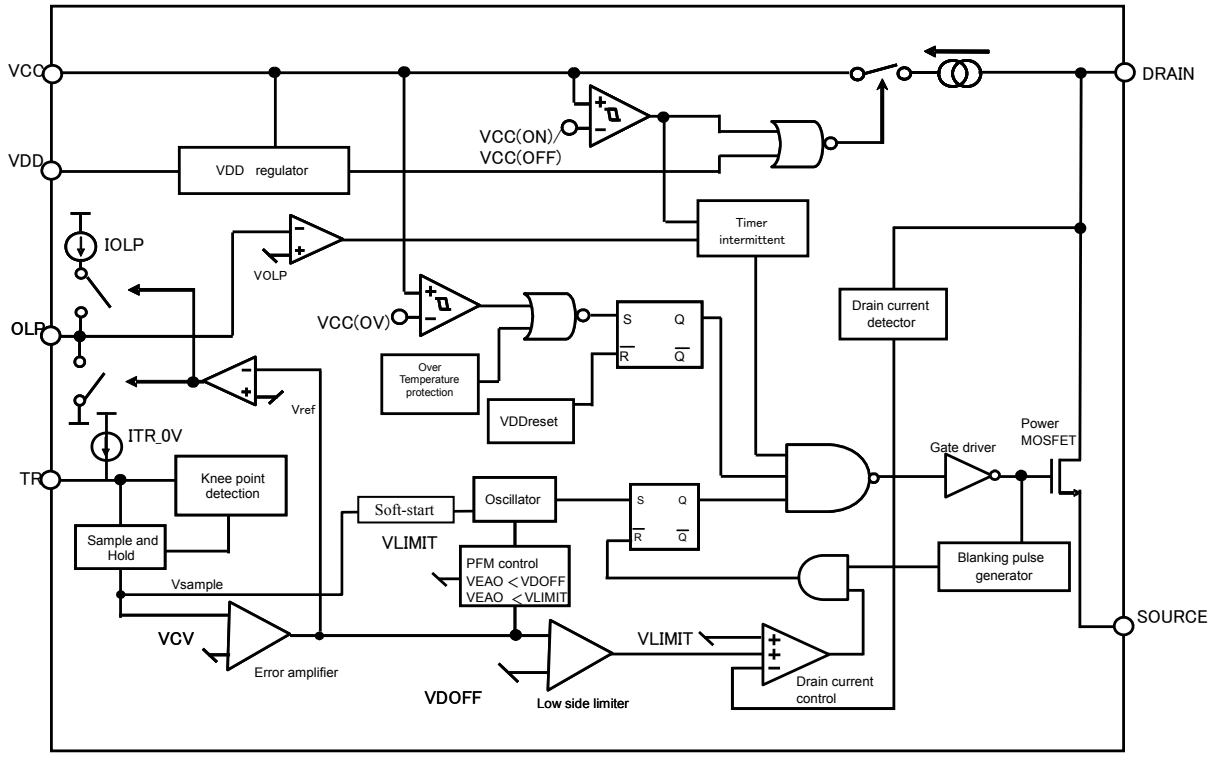
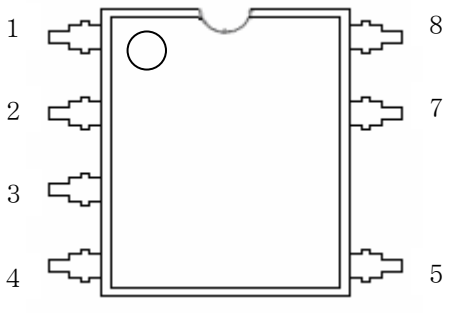
【Figure 8 Block Diagram】



【Figure 9 Pin Layout】



Pin No.	Terminal Name
1	VDD
2	OLP
3	TR
4	VCC
5	Drain
6	—
7	Source
8	Source

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【Precautions for Use 1】

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

【Precautions for Use 2】

Do pay attention to below as IPD has risks of smoking or igniting when subjected to below abnormal conditions especially during regulatory Safety Standard testing,

(1) DRAIN Pin and VDD Pin invert insertion in power supply board.
(2) DRAIN Pin and VDD Pin short circuit.
(3) DRAIN Pin and OLP Pin short circuit.
(4) DRAIN Pin and TR Pin short circuit.
(5) DRAIN Pin and VCC Pin short circuit.
(6) VCC Pin and VDD Pin short circuit.
(7) VCC Pin and OLP Pin short circuit.
(8) VCC Pin and TR Pin short circuit.

An example of safety measure to avoid smoking or ignition is adding fuse at the input side or connect zener diode between control pin and GND as a precaution. Do approach our sales staff if you need further support.

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(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.