MIP4170MD

Silicon MOS FET type integrated circuit

■ Features

- Highly effective and low noise at a regular load are achieved. Power consumption at a light load is reduced. Transformer sound measures are unnecessary.
- Reduces circuit power consumption by supplying IPD inner circuit current from input terminal of auxiliary winding voltage (VCC)
- Detects over voltage protection when auxiliary winding voltage exceeds setting value, which stops oscillation at latch mode.
- Built-in timer latching function and over heating protective function under over load.

■ Applications

- For artificial resonance power source

■ 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 +9	V
FB voltage	VFB	– 0.3 to +6	V
TR voltage	VTR	– 0.4 to +10	V
Drain peak current *	IDP	4.8	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)

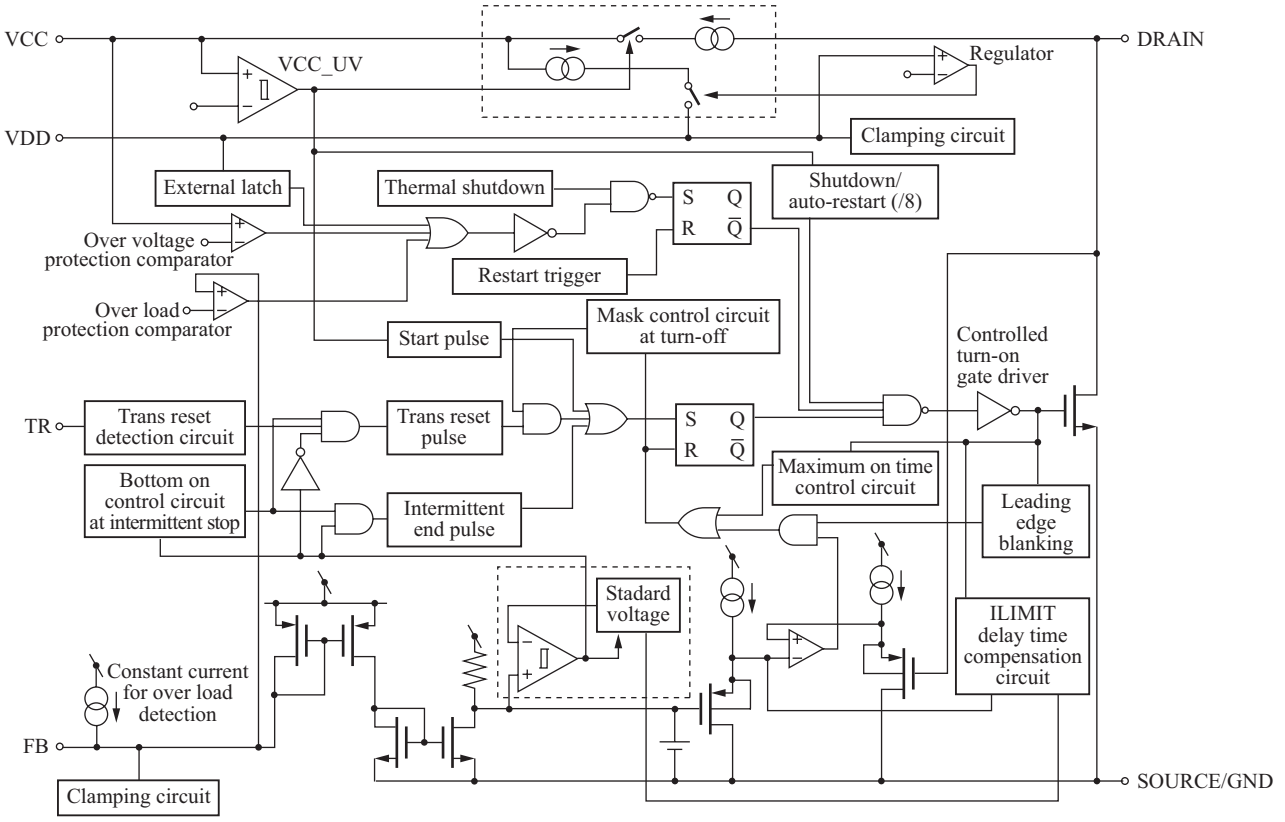
■ Package

- Code
  TO-220IPD7-A2
- Pin Name

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

■ Marking Symbol: MIP417MD

■ Block Diagram



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

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Control functions						
VDD voltage	VDD(REG)	VCC = 15 V, IFB = –150 µA, TR: Open	5.4	5.9	6.4	V
VCC start voltage	VCC(ON)	IFB = –150 µA, TR: Open	11.1	12.1	13.1	V
VCC stop voltage	VCC(OFF)	IFB = –150 µA, TR: Open	6.7	7.7	8.7	V
VCC auto-restart hysteresis voltage	VCCHYS	VCC(ON) – VCC(OFF)	3.4	4.4	5.4	V
Supply current	ICC	VCC = 15 V, IFB = –150 µA	0.1	0.6	1.1	mA
Supply current before start-up	ICC(SB)	VCC = VCC(ON) – 0.2 V, FB: Open, TR: Open	0.10	0.35	0.60	mA
Feedback threshold current	IFB1	ON → OFF VCC = 15 V	–370	–310	–250	µA
Feedback hysteresis current	IFBHYS	VCC = 15 V		10.0		µA
FB pin voltage	VFB	VCC = 15 V, IFB = –150 µA, TR: Open	1.5	1.8	2.1	V
FB pin short-circuit current	IFB0	VCC = 15 V, VFB = 0 V, TR: Open	–640	–490	–340	µA
Supply current at light load	ICC(OFF)	VCC = 15 V, IFB = IFB1 – 5 µA, TR: Open		0.85	1.35	mA
Trans reset voltage	VTH(TR)	VCC = 15 V, IFB = –150 µA	– 0.1	0	0.1	V
Trans reset delay time *	td(TR)	VCC = 15 V, IFB = –150 µA		220		ns
Auto-restart duty cycle	TSW/TTIM	VCC = 15 V, FB: Open		13.5		%
Auto-restart frequency	fTIM	VCC = 15 V, FB: Open		0.68		Hz

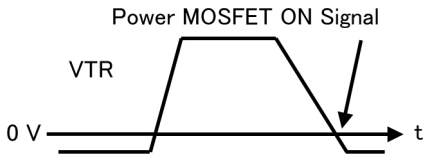
■ Electrical Characteristics (continued) T_C = 25°C±3°C

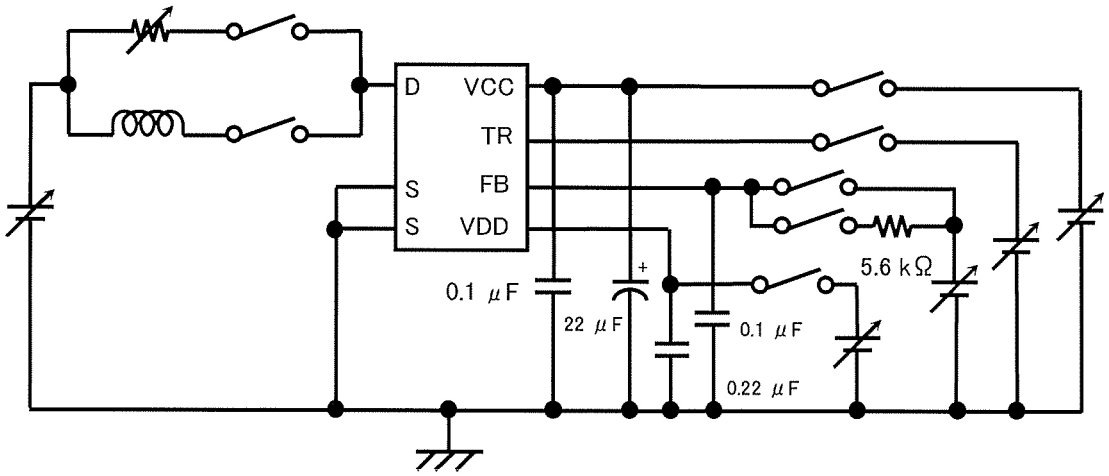
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Control functions (continued)						
VCC charging current	ICCH1	VCC = 0 V, VD = 40 V, FB: Open, VDD: Open	–5.7	–3.7	–1.7	mA
	ICCH2	VCC = 10 V, VD = 40 V, FB: Open, VDD: Open	–2.8	–1.3	– 0.5	
VDD charging current	IDCH1	VDD = 0 V, VD = 40 V, FB: Open, VCC: Open	–5.3	–3.3	–1.3	mA
	IDCH2	VDD = 5 V, VD = 40 V, FB: Open, VCC: Open	–3.3	–1.8	– 0.5	
Mask time after turn-off *1	td(OFF)	VCC = 15 V, IFB = –150 µA		8.0		µs
TR detection time at intermittent mode *1	Toff(TR)	VCC = 15 V		10.0		µs
Circuit protections						
Self protection current limit *2	ILIMIT	VCC = 15 V, FB = 3 V	2.43	2.7	2.97	A
Drain current at light load *1	ID(OFF)	VCC = 15 V, IFB = IFB1 + IFBHYS + 8 µA		400		mA
Leading edge blanking delay *1	ton(BLK)	VCC = 15 V, VFB = 3 V		500		ns
Current limit delay *1	td(OCL)	VCC = 15 V, VFB = 3 V		150		ns
Over voltage protection	VCC(OV)	IFB = –150 µA	28.5	31.5	34.5	V
VDD over voltage protection detection current	IDD(OV)	VCC = 15 V, IFB = –150 µA	6.5	9.5	12.5	mA
VDD clamp voltage	VDD(OV)	VCC = 15 V, IDD = IDD(OV), IFB = –150 µA	VDD(REG)	6.6	7.6	V
Over load protection detection FB voltage	VFB(OL)	VCC = 15 V, IFB < |IFB(OL)|	3.9	4.4	4.9	V
Over load protection detection FB current	IFB(OL)	VCC = 15 V, VFB = 3.5 V	–82	–62	–42	µA
Maximum on time	MAX(ON)	VD = 5 V, VCC = 15 V, FB = –150 µA	18	25	32	µs
Thermal shutdown temperature *1	TOTP		130	140	150	°C
Power-up reset threshold voltage *1	VDDreset		1.7	2.7	3.7	V
Output						
On-state resistance	RDS(ON)	VCC = 15 V, ID = 300 mA, VFB = 3 V		2.4	3.0	Ω
Off-state drain pin leakage current	IDSS	VCC = 35 V, VD = 650 V, FB: Open, TR: Open		5.5	20	µA
Breakdown voltage	VDSS	VCC = 35 V, ID = 100 µA, FB: Open, TR: Open	700			V
Rise time *3	tr	VCC = 15 V, FB = –150 µA, VD = 5 V		130		ns
Fall time *3	tf	VCC = 15 V, FB = –150 µA, VD = 5 V		30		ns
Supply voltage characteristics						
Drain supply voltage	VD(MIN)	VCC: Open, FB: Open, TR: Open	50			V

■ Electrical Characteristics (continued) $T_C = 25°C \pm 3°C$

Note) 1. Measurement circuit

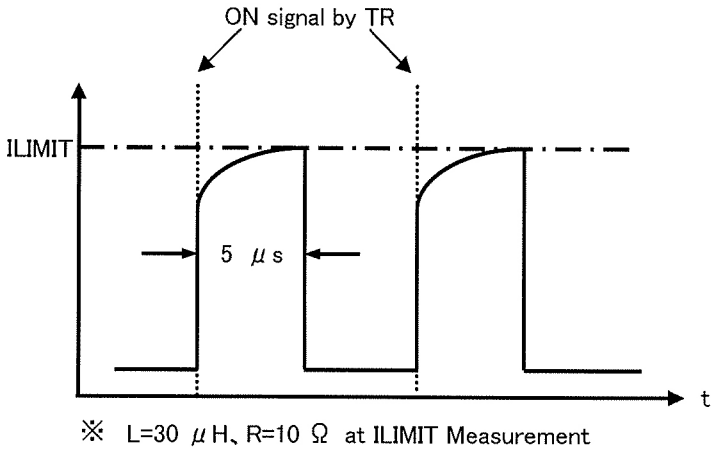
When there is especially no description about the measurement conditions of VD and VTR, VD is applied more than voltage which ILIMIT operate and VTR is taken as the state which power MOS FET can be turned on.





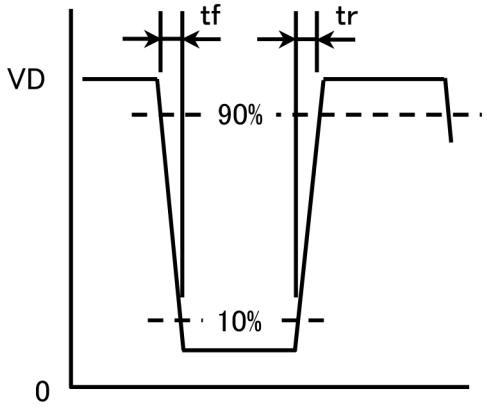
2. *1: Design guarantee item

*2: ILIMIT measurement



※ L=30 μH、R=10 Ω at ILIMIT Measurement

*3: tr, tf measurement



■ Usage Notes

1. Connect a ceramic capacitor (over 0.1 μF) between VDD and SOURCE.
2. Connect a ceramic capacitor over 0.1 μF between VCC and SOURCE. As protection of a secondary side output rise against the open test of the electrolytic capacitor connected to VCC pin.
3. IPD has danger of breaking-down, and then bursting or getting off smoke under the use of the following conditions. Do not use at such conditions.
   1) DRAIN pin short to VDD pin.
   2) DRAIN pin short to FB pin.
   3) DRAIN pin short to TR pin.
   4) DRAIN pin short to VCC pin.
   5) VCC pin short to VDD pin.
   6) VCC pin short to FB pin.
   7) VCC pin short to TR 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** 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.