Notification about the transfer of the semiconductor business

The semiconductor business of Panasonic Corporation was transferred on September 1, 2020 to Nuvoton Technology Corporation (hereinafter referred to as "Nuvoton"). Accordingly, Panasonic Semiconductor Solutions Co., Ltd. became under the umbrella of the Nuvoton Group, with the new name of Nuvoton Technology Corporation Japan (hereinafter referred to as "NTCJ").

In accordance with this transfer, semiconductor products will be handled as NTCJ-made products after September 1, 2020. However, such products will be continuously sold through Panasonic Corporation.

Publisher of this Document is NTCJ.
If you would find description “Panasonic” or “Panasonic semiconductor solutions”, please replace it with NTCJ.

※ Except below description page
“Request for your special attention and precautions in using the technical information and semiconductors described in this book”

Nuvoton Technology Corporation Japan

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 edge blanking delay + Current limit delay ton(BLK) + td(OCL)

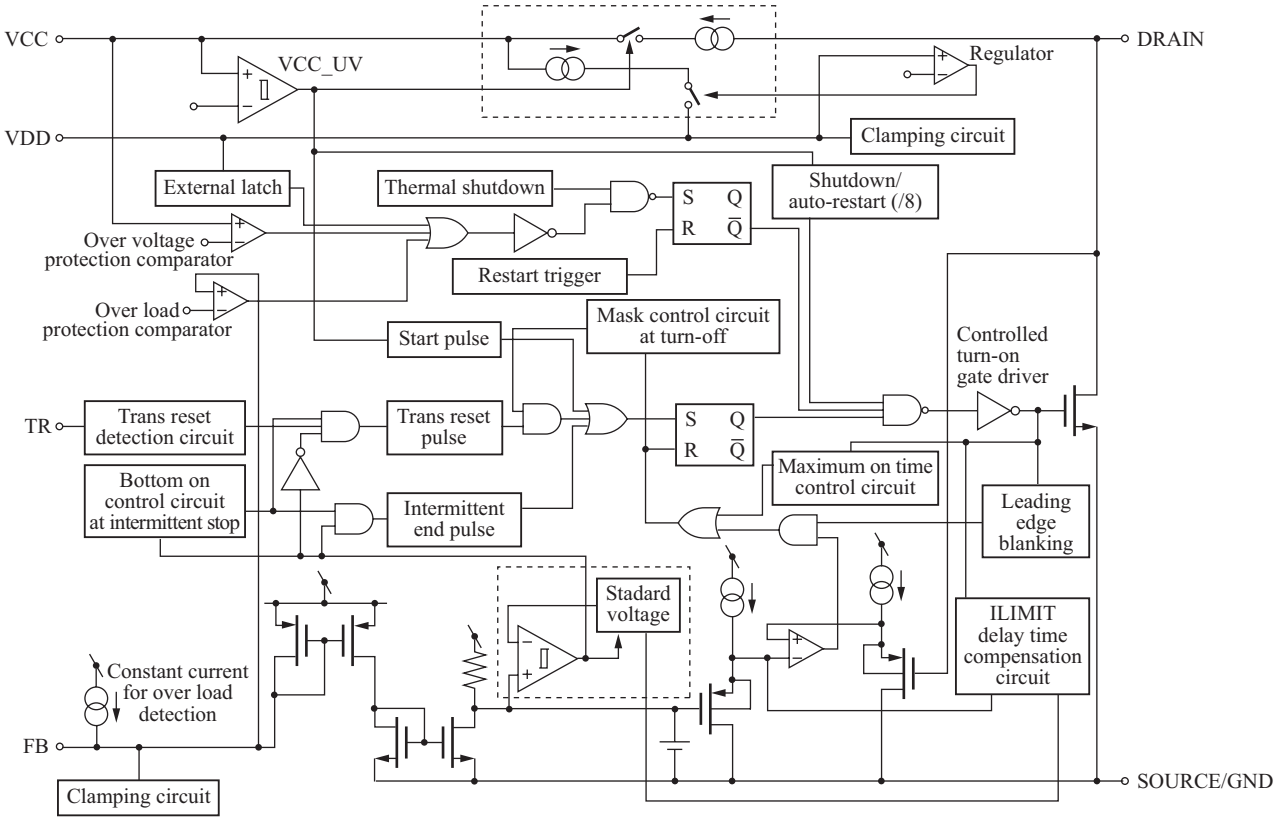
■ Package

- 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

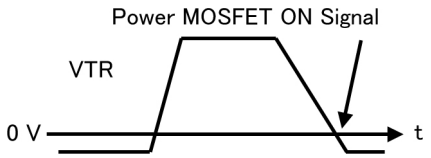
■ Electrical Characteristics (continued) T_C = 25°C±3°C

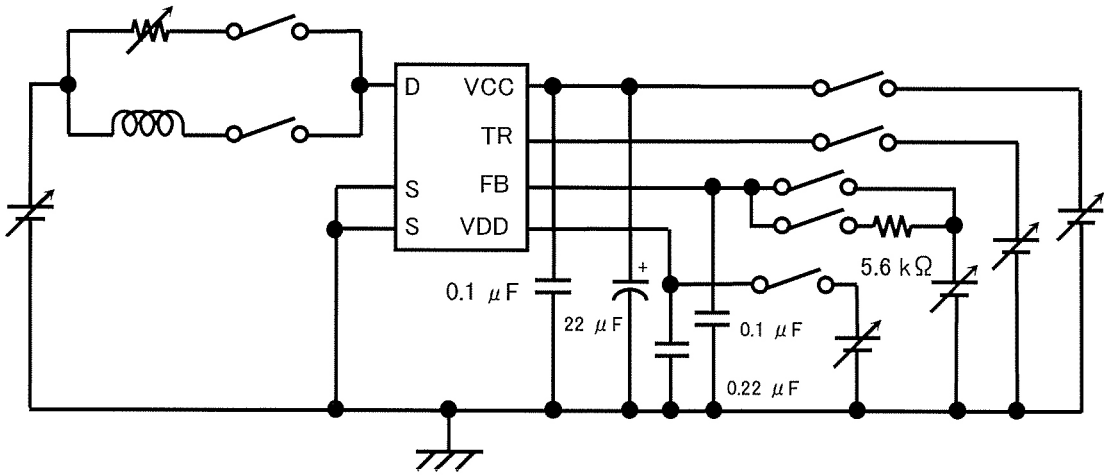
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Control functions (continued)						
VCC charging current	ICCH1	VCC = 0 V, VD = 40 V, FB: Open, VDD: Open	–5.7	–3.7	–1.7	mA
	ICCH2	VCC = 10 V, VD = 40 V, FB: Open, VDD: Open	–2.8	–1.3	– 0.5	
VDD charging current	IDCH1	VDD = 0 V, VD = 40 V, FB: Open, VCC: Open	–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

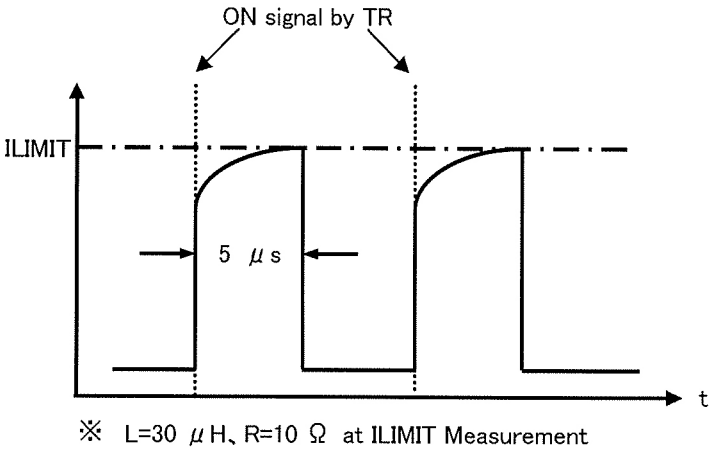
When there is especially no description about the measurement conditions of VD and VTR, VD is applied more than voltage which ILIMIT operate and VTR is taken as the state which power MOS FET can be turned on.



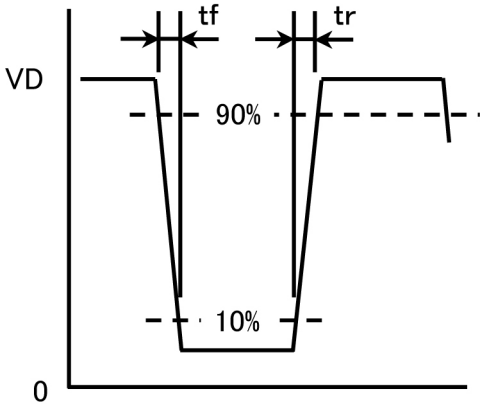


2. *1: Design guarantee item

*2: ILIMIT measurement



*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.

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, Nuvoton Technology Corporation Japan 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 de-scribed 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.
Please consult with our sales staff in advance for information on the following applications, moreover please exchange documents separately on terms of use etc.: Special applications (such as for in-vehicle equipment, airplanes, aerospace, automotive equipment, traffic signaling equipment, combustion equipment, medical equipment 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.
Unless exchanging documents on terms of use etc. in advance, 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.

(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. We do not guarantee quality for disassembled products or the product re-mounted after removing from the mounting board.
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.

(7) When reselling products described in this book to other companies without our permission and receiving any claim of request from the resale destination, please understand that customers will bear the burden.

(8) This book may be not reprinted or reproduced whether wholly or partially, without the prior written permission of our company.

No.070920

单击下面可查看定价，库存，交付和生命周期等信息

>>Panasonic(松下)