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.

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※ 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

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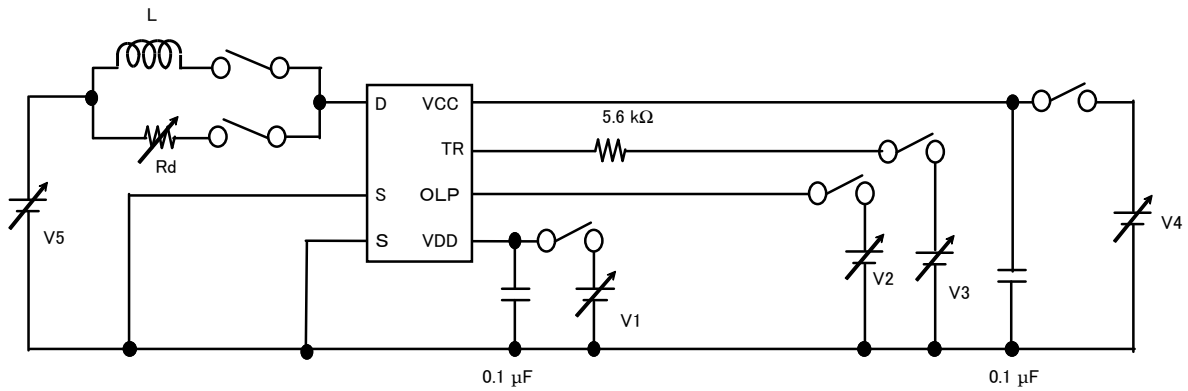
B. ELECTRICAL CHARACTERISTICS Measure condition (TC=25℃±3℃)

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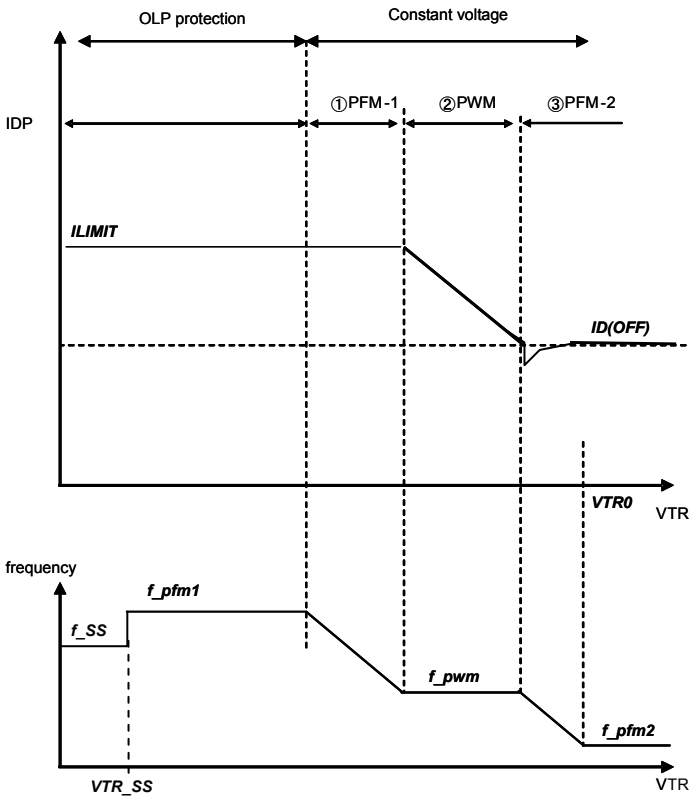
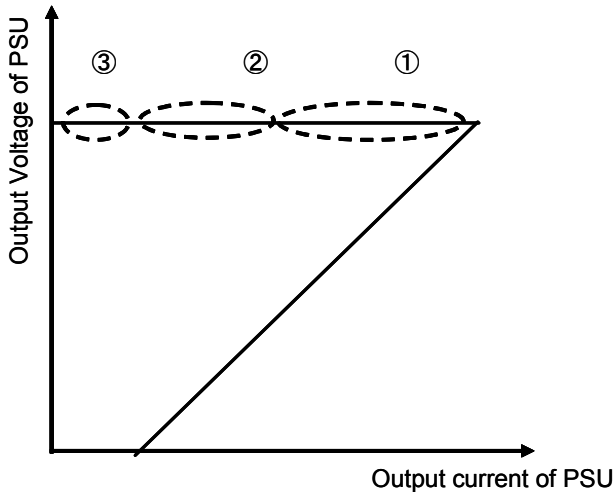
【Figure 2: TR terminal voltage vs operation fosc/IDp illustration】



(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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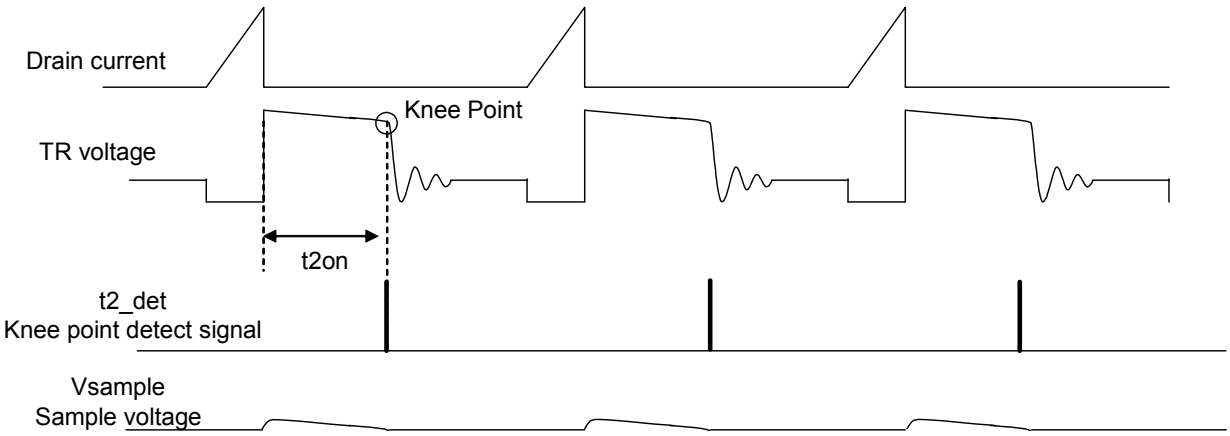
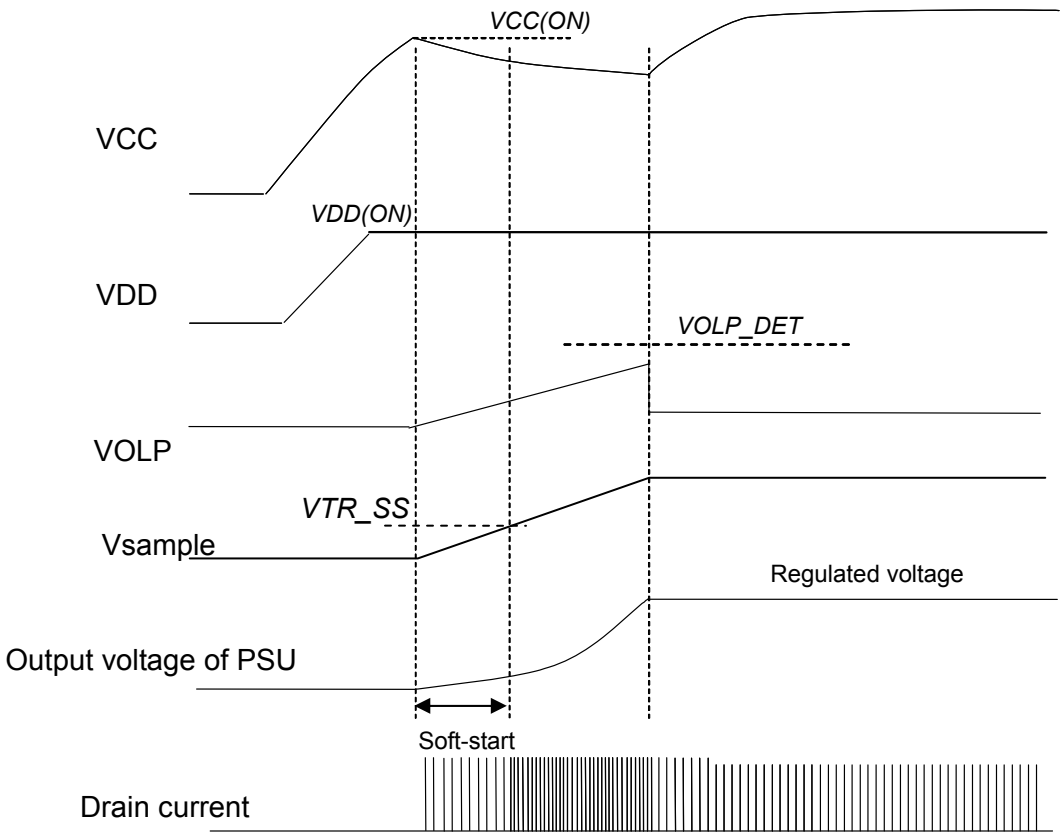
【Figure 3: TR sampling action】



【Figure 4 Output waveform when start-up】



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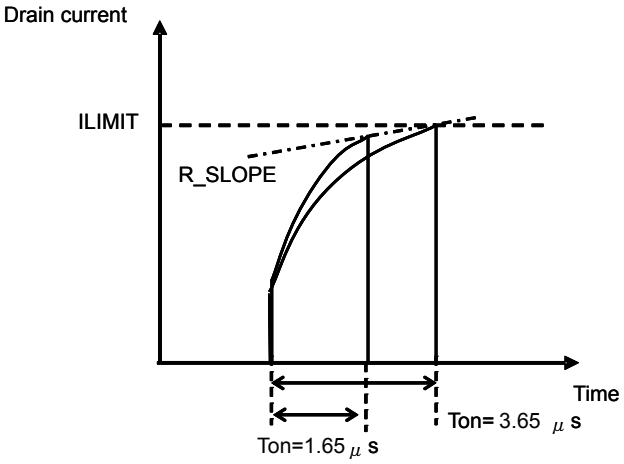
【Figure 5 ILIMIT、R_Slope Measurement waveform】



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

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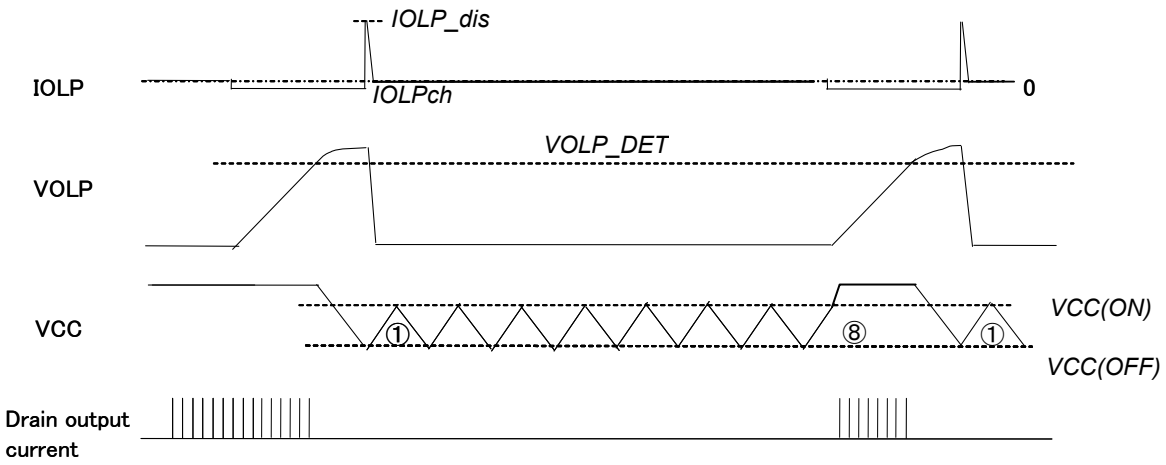
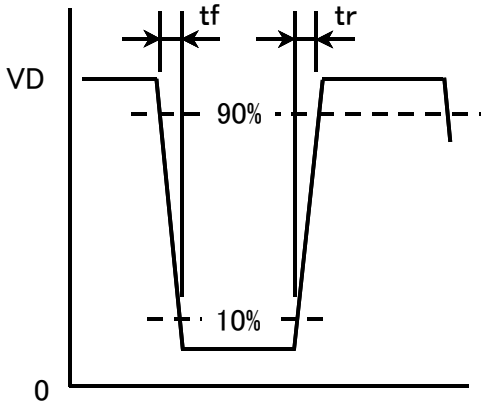
【Figure 6 OLP protection control –timer intermittent operation 】

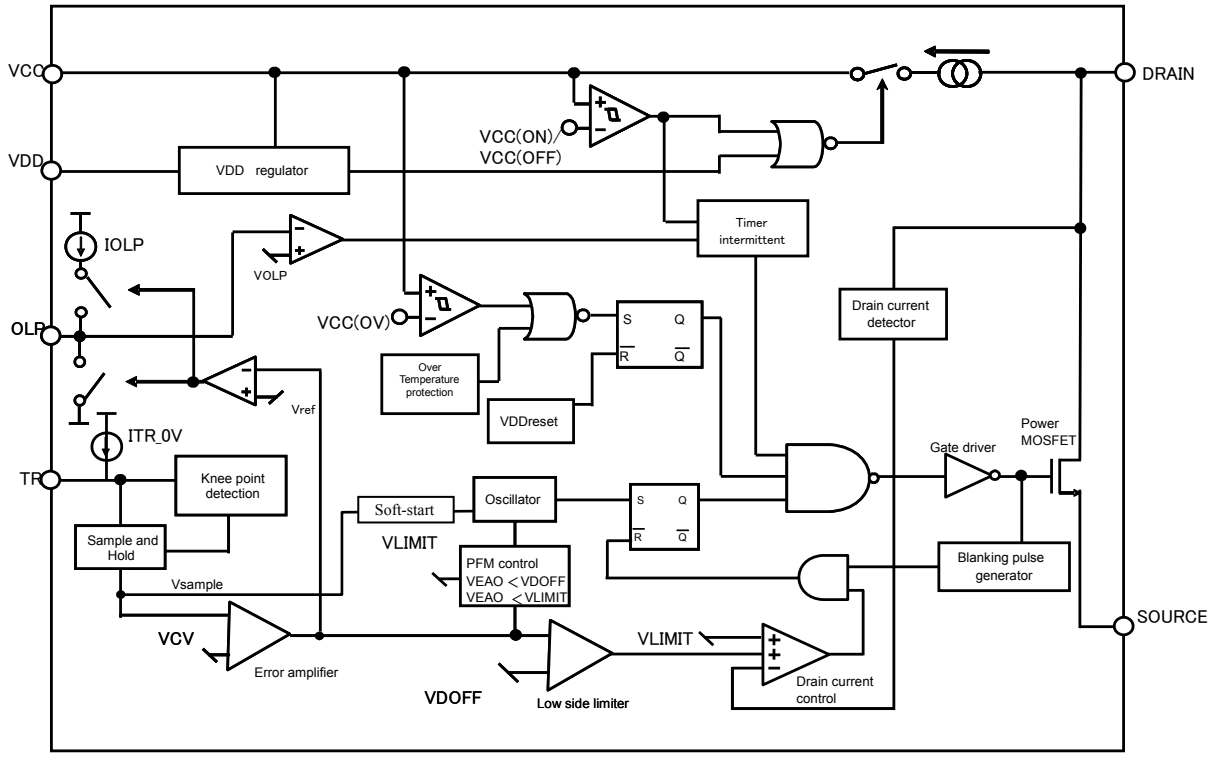


Overload operation

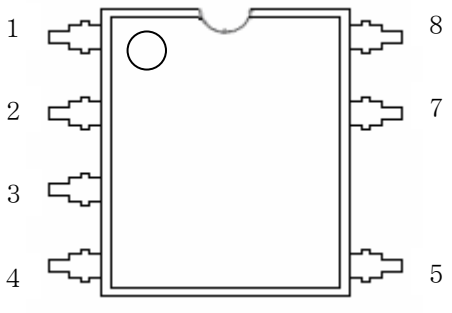
【Figure 7 tr, tf measurement waveform】



【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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