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

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Type	Silicon MOSFET type Integrated Circuit		
Application	For LED Driver		
Structure	CMOS type		
Equivalent Circuit	Figure 6		
Out Line	DIP7-A1-B	Marking	MIP554

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

NO.	Item	Symbol	Ratings	Unit	Note
1	DRAIN	VD-S	−0.3 ～ 400	V	
2	VIN Voltage	VIN-S	−0.3 ～ 400	V	
3	VDD Voltage	VDD-S	−0.3 ～ 8.0	V	
4	EX Voltage	VEX-S	−0.3 ～ 7.2	V	
5	CL Voltage	VCL-S	−0.3 ～ 7.2	V	※1
6	Output Peak Current	IDP	3.0(※1)	A	IDP is guaranteed at the pulse width narrower than MIN(PW).
7	Channel Temperature	Tch	150	℃	
8	Storage Temperature	Tstg	−55 ～ +150	℃	

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

No.	Item	Symbol	Measure Condition (Figure 1)	Typ	Min	Max	Unit
【CONTROL FUNCTIONS】							
1	Constant OFF Time	Toff	VDD=VDD(ON)+0.1 V、VD=5 V、VIN=30 V IEX=0 μA、ICL=ICLmax+50 μA	15	13.65	16.35	μs
2	Maximum ON Time	MAXon	VDD=VDD(ON)+0.1 V、VD=5 V、VIN=30 V IEX=0 μA、ICL=ICLmax+50 μA	58	49.3	66.7	μs
3	VDD Start Voltage	VDD(ON)	VD=5 V IEX=0 μA、ICL=ICLmax+50 μA	6.60	6.10	7.10	V
4	VDD Stop Voltage	VDD(UV)	VD=5 V、 IEX=0 μA、ICL=ICLmax+50 μA	5.55	5.05	6.05	V
5	Circuit Current before start	IS1	VDD=VDD(ON)−0.2 V、VD=5 V IEX=0 μA、ICL=ICLmax+50 μA	0.95	0.56	1.34	mA
6	Circuit Current under switching	IS2	VDD=VDD(ON)+0.1 V、VD=5 V IEX=0 μA、ICL=ICLmax+50 μA	1.00	0.59	1.41	mA

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No.	Item	Symbol	Measure Condition (Figure 1)	Typ	Min	Max	Unit
【CONTROL FUNCTIONS】							
* 7	EX Pin Current for setting ILIMITmin	IEXH	VDD=VDD(ON)+0.1 V、ICL=ICLmax+50 μA ILIMIT＝ILIMITmin ※Figure 3	244			μA
8	EX Pin Current at oscillation stop	IEXoff	VDD=VDD(ON)+0.1 V、ICL=ICLmax+50 μA ※Figure 3	385	280	510	μA
9	EX Pin Current Hysteresis at oscillation restart	IEXhys	VDD=VDD(ON)+0.1 V、ICL=ICLmax+50 μA ※Figure 3	45			μA
10	Difference of IEXoff and IEXH	Delta_IEX	Delta_IEX=IEXoff-IEXH ※Figure 3	141	30	250	μA
11	EX Pin Voltage	VEXM	VDD=VDD(ON)+0.1 V、ICL=ICLmax+50 μA IEX=150 μA	2.80	2.13	3.47	V
		VEXH	VDD=VDD(ON)+0.1 V、ICL=ICLmax+50 μA IEX=IEXH	2.90	2.23	3.57	V
		VEXoff	VDD=VDD(ON)+0.1 V、ICL=ICLmax+50 μA IEX=IEXoff	3.10	2.35	3.85	V
12	EX Pin Short Current	IEXSVDD	VDD=VDD(ON)+0.1 V、ICL=ICLmax+50 μA VEX=VDD	1.1	0.615	1.585	mA
		IEX0	VDD=VDD(ON)+0.1 V、ICL=ICLmax+50 μA VEX=0 V	0			μA
13	CL Pin Current for setting ILIMITmax	ICLmax	VDD=VDD(ON)+0.1 V、IEX=0 μA ILIMIT＝ILIMITmax ※Figure4	400	360	440	μA
* 14	CL Pin Current at minimum ILIMIT	ICLL	VDD=VDD(ON)+0.1 V、IEX=0 μA ※Figure4	160			μA
15	CL Pin Current at oscillation stop	ICLoff	VDD=VDD(ON)+0.1 V、IEX=0 μA ※Figure4	25	4	50	μA
16	CL Pin Current Hysteresis at oscillation restart	ICLhys	VDD=VDD(ON)+0.1 V、IEX=0 μA ※Figure4	15			μA
17	CL Pin Voltage	VCLmax	VDD=VDD(ON)+0.1 V、IEX=0 μA ICL=ICLmax	3.15	2.42	3.88	V
		VCLoff	VDD=VDD(ON)+0.1 V、IEX=0 μA ICL=ICLoff	2.5	1.92	3.08	V
18	CL Pin Short Current	ICLSVDD	VDD=VDD(ON)+0.1 V、IEX=0 μA VCL=VDD	1.1	0.615	1.585	mA
		ICL0	VDD=VDD(ON)+0.1 V、IEX=0 μA VCL=0 V	0			μA
【PROTECT FUNCTION: ＊ Design guaranteed item】							
19	Maximum Peak Current Limit	ILIMITmax	VDD=VDD(ON)+0.1 V、ICL=ICLmax+50 μA IEX=0 μA ※Figure2、3、4	1.0	0.915	1.085	A
20	ILIMIT at IEX150	ILIMITexm	VDD=VDD(ON)+0.1 V、ICL=ICLmax+50 μA IEX=150 μA ※Figure2、3	0.6	0.54	0.66	A
21	Minimum Clamp ILIMIT	ILIMITmin	VDD=VDD(ON)+0.1 V、ICL=ICLmax+50 μA IEX=IEXH+20 μA ※Figure2、3	0.33	0.19	0.42	A
22	ILIMIT at ICL300	ILIMCL300	VDD=VDD(ON)+0.1 V、ICL=300 μA IEX=0 μA ※Figure2、4	0.592	0.533	0.651	A
23	ILIMIT at ICL350	ILIMCL350	VDD=VDD(ON)+0.1 V、ICL=350 μA IEX=0 μA ※Figure2、4	0.796	0.716	0.876	A
* 24	Leading Edge Blanking Delay	ton(BLK)	VDD=VDD(ON)+0.1 V、ICL=ICLmax+50 μA IEX=0 μA	200	150	250	ns

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No.	Item	Symbol	Measure Condition (Figure 1)	Typ	Min	Max	Unit
【PROTECT FUNCTION: ＊ Design guaranteed item】							
＊ 25	Peak Current Limit Delay	td(OCL)	VDD=VDD(ON)+0.1 V、ICL=ICLmax+50 μA IEX=0 μA	200			ns
26	Minimum On-pulse Width	MIN(PW)	VIN=30 V、VD=35 V、IEX=0 μA ICL=ICLmax+50 μA	400		510	ns
＊ 27	Thermal Shutdown Junction Temperature	TOTPJ		140	130	150	℃
＊ 28	Thermal Shutdown Hysteresis	TOTPJ(hys)		70			℃
【OUTPUT】							
29	ON-State Resistance	RDS(ON)	VDD=VDD(ON)+0.1 V、ICL=ICLmax+50 μA IEX=0 μA、IDS=300 mA	3.7		4.5	Ω
30	OFF-State leakage Current of DRAIN Pin	IDSS	VDD=VDD(ON)+0.1 V, VEX=VCL=0 V VD=400 V	5.0		20	μA
31	Breakdown Voltage of DRAIN Pin	VDSS	VDD=VDD(ON)+0.1 V, VEX=VCL=0 V ID=100 μA		400		V
32	Rise Time	tr	VDD=VDD(ON)+0.1 V、ICL=ICLmax+50 μA IEX=0 μA、VD=5 V ※Figure5	100			ns
33	Fall Time	tf	VDD=VDD(ON)+0.1 V、ICL=ICLmax+50 μA IEX=0 μA、VD=5 V ※Figure5	50			ns
【HIGH VOLTAGE INPUT】							
34	OFF-State leakage Current of VIN Pin	IIN(LEAK)	VDD=VDD(ON)+0.1 V, VEX=VCL=0 V VIN=400 V	22		50	μA
35	Breakdown Voltage of VIN Pin	BVVIN	VDD=VDD(ON)+0.1 V, VEX=VCL=0 V IIN=100 μA		400		V
36	VDD Charging Current	CHRG10	VIN=40 V, VDD=0 V、EX、CL:open	−10	−14.6	−5.4	mA
		CHRG15	VIN=40 V, VDD=5.5 V、EX、CL:open	−6.15	−9.2	−3.1	mA
37	VIN Supply Voltage	VIN(MIN)	VDD:open、VD=5 V IEX=0 μA、ICL=ICLmax+50 μA	13		20	V

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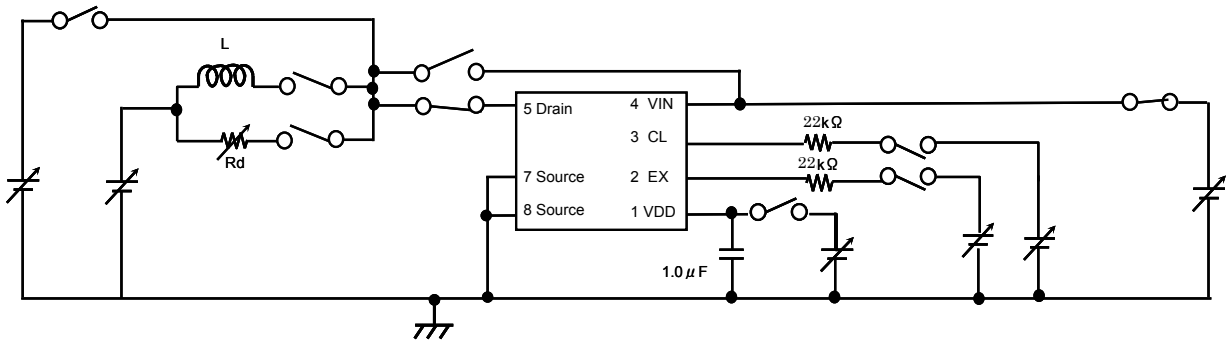
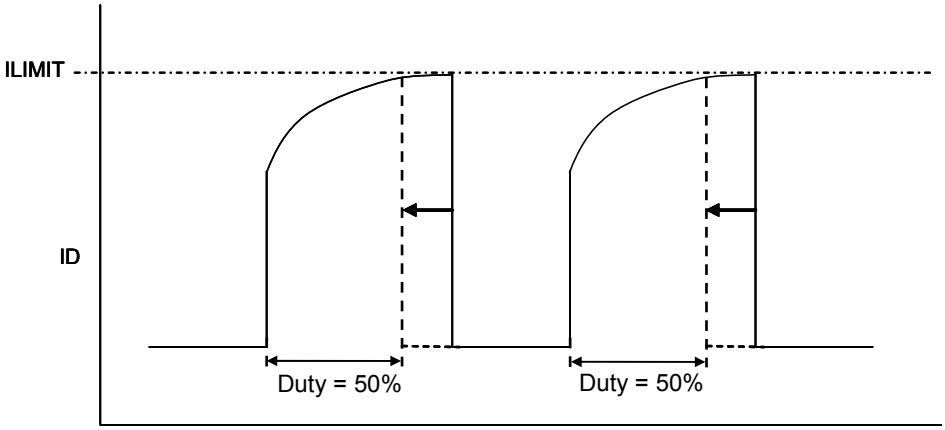
【Figure1 : Measure circuit】

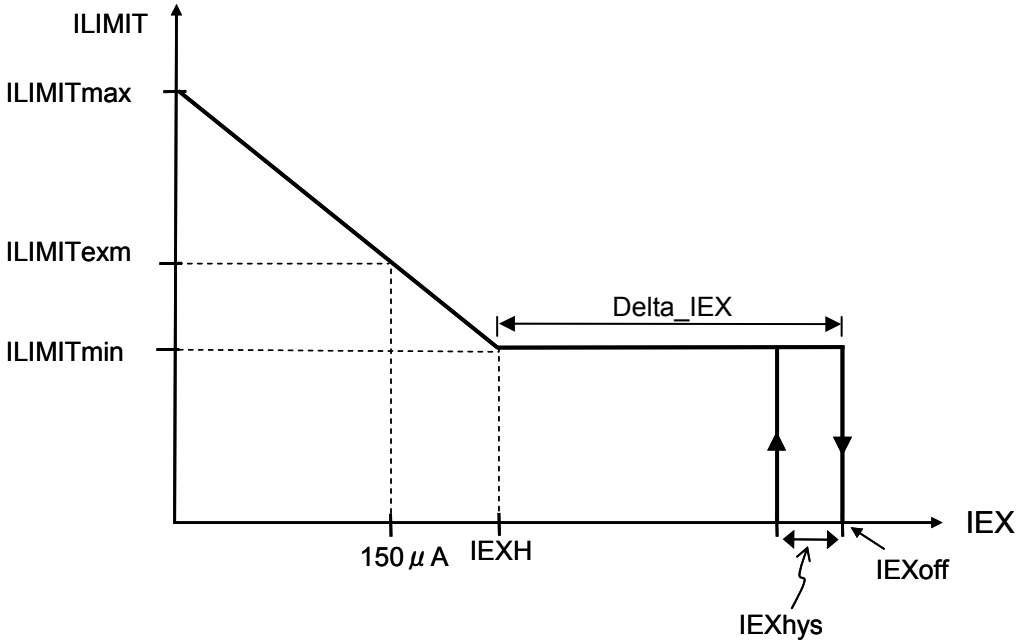


【 Figure2 : ILIMIT measurement】



＊ The load condition of ILIMIT measurement is L=100 μH, Rd=130 Ω.

【Figure3 : IEX-ILIMIT characteristic】



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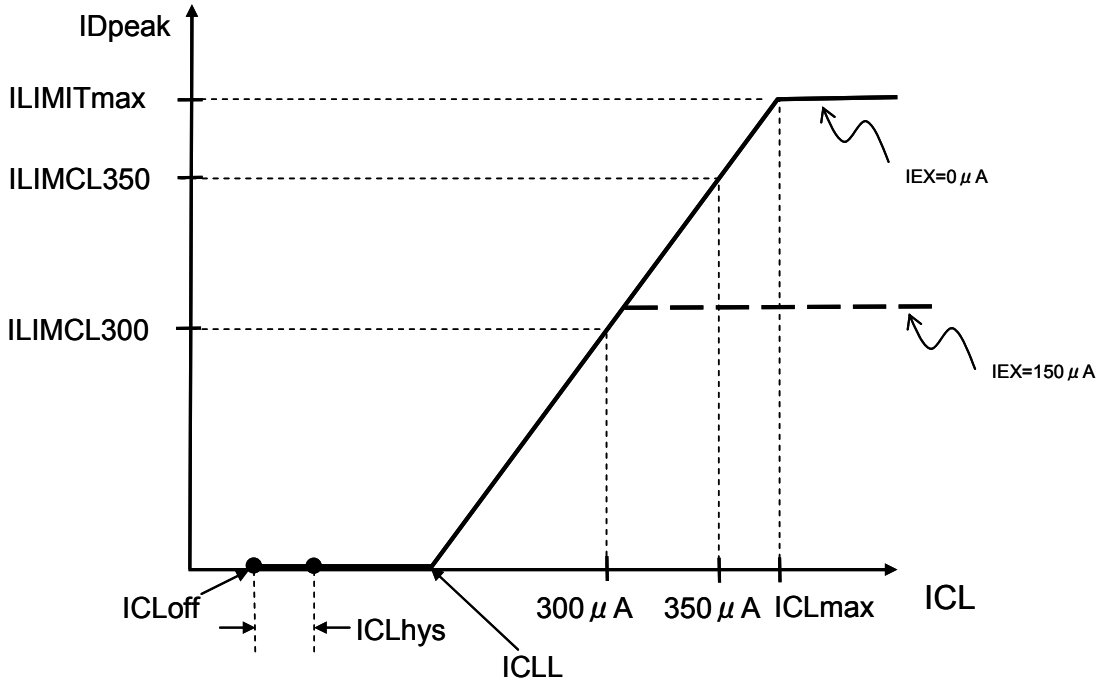
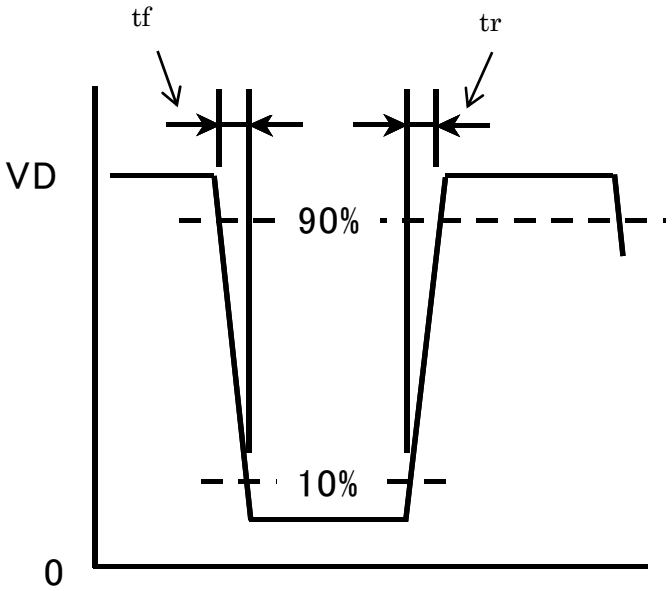
【Figure4：ICL-ILIMIT characteristic】



【Figure5：tr, tf characteristic 】



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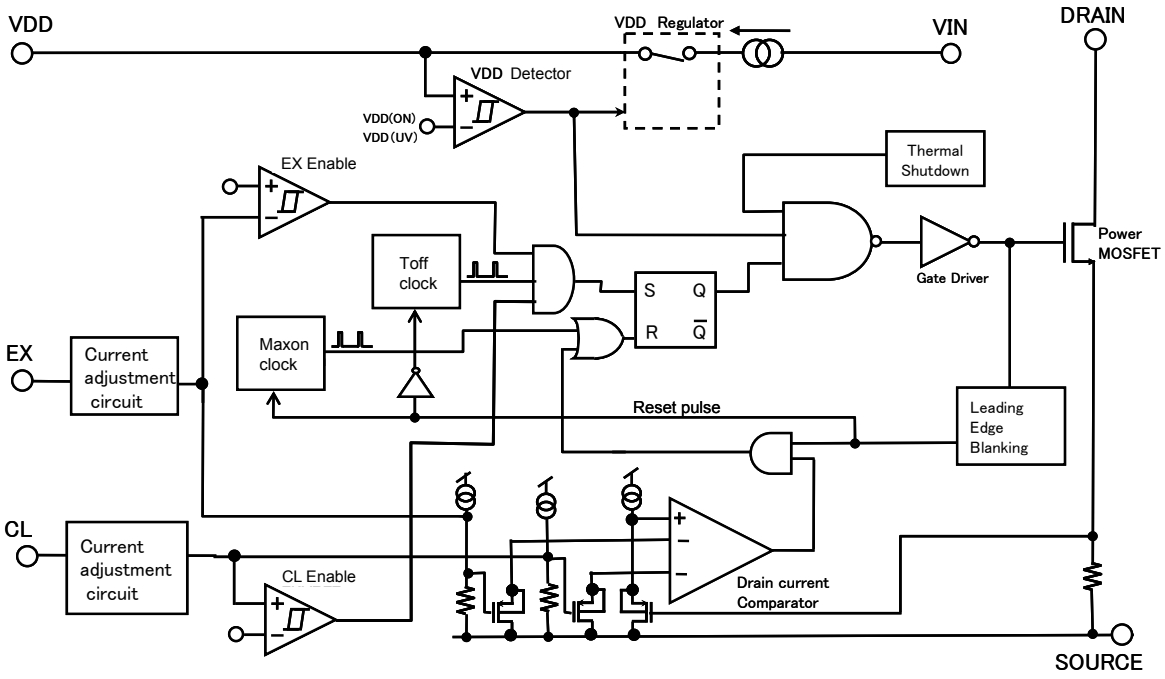
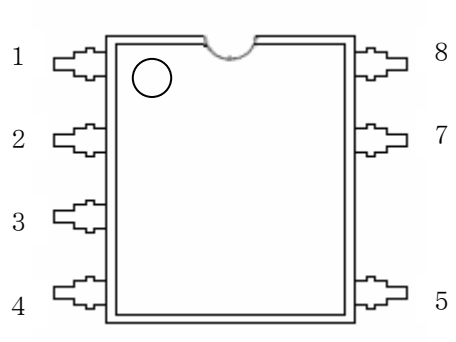
【Figure6 : Block Diagram】



【Figure7:Pin Layout】



Pin No.	Terminal Name
1	VDD
2	EX
3	CL
4	VIN
5	DRAIN
6	—
7	SOURCE
8	SOURCE

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【Precautions for Use 1】
Connect a ceramic capacitor with value >1.0 μF between VDD pin and GND.

【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 VDD pin connection to the power supply board.
(2) DRAIN pin short to low voltage pin (VDD, EX, CL).
(3) VIN pin short to low voltage pin (VDD, EX, CL).
(4) VIN pin short to DRAIN pin under switching.
(5) DRAIN pin short to SOURCE pin.

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