

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

| | | | |
|-------------------------|------------------------------------------------------|---------------------|--------|
| 種別/Type | シリコン MOS形集積回路/Silicon MOSFET type Integrated Circuit | | |
| 用途/Application | スイッチング電源制御用/For Switching Power Supply Control | | |
| 構造/Structure | CMOS形/CMOS type | | |
| 等価回路/Equivalent Circuit | 添付図/See Figure. 6 | | |
| 外形/Out Line | DIP7-A1-B | マーク記号/マーキング/Marking | MIP2F5 |

A. 絶対最大定格/ABSOLUTE MAXIMUM RATINGS (Ta=25°C±3°C)

| NO. | 項目/Item | 記号/Symbol | 定格/Ratings | 単位/Unit | 備考/Note |
|-----|---------------------------------|-----------|------------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | ドレイン電圧 DRAIN Voltage | VD | -0.3 ~ 700 | V | ※1: 下記パルス幅以内での 保証とする (It is guaranteed within the pulse as below.) オン時ブランキング幅 + 過電流保護遅れ時間 Leading Edge Blanking Pulse + Current Limit Delay ton(BLK)+td(OCL) |
| 2 | VCC電圧 VCC Voltage | VCC | -0.3 ~ 45 | V | |
| 3 | VDD電圧 VDD Voltage | VDD | -0.3 ~ 8 | V | |
| 4 | フィードバック電圧 FEEDBACK Voltage | VFB | -0.3 ~ 8 | V | |
| 5 | フィードバック電流 FEEDBACK Current | IFB | 500 | μA | |
| 6 | CL端子電圧 CL Voltage | VCL | -0.3 ~ 8 | V | |
| 7 | CL端子電流 CL Current | ICL | 150 | μA | |
| 8 | 出力ピーク電流 Output Peak Current | IDP | 4.0(※1) | A | |
| 9 | チャンネル部温度 Channel Temperature | Tch | 150 | °C | |
| 10 | 保存温度 Storage Temperature | Tstg | -55 ~ +150 | °C | |

B. 電気的特性/ELECTRICAL CHARACTERISTICS

測定条件/Measure condition (TC=25°C±2°C)

| No. | 項目/Item | 記号/Symbol | 測定条件/Measure Condition (測定図-1 参照/See Figure 1) | Typ. | Limit | | Unit |
|-----|---------|-----------|---------------------------------------------------|------|-------|-----|------|
| | | | | | Min | Max | |

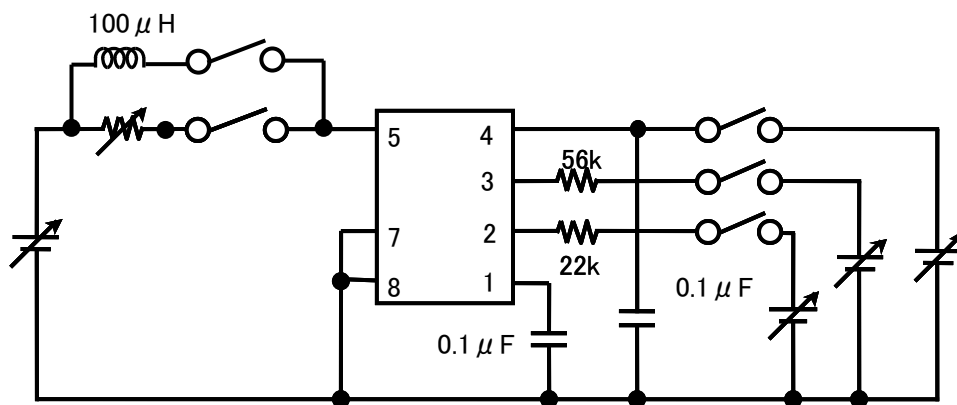
【コントロール機能/CONTROL FUNCTIONS】

| | | | | | | | |
|---|-----------------------------------------|---------|----------------------------------------|------|-----|-----|-----|
| 1 | 出力周波数 Output Frequency | fosc | VCC=15 V, VD=5 V, IFB=20 μA, ICL=50 μA | 100 | 90 | 110 | kHz |
| | | fosc(L) | VCC=15 V, VD=5 V, IFB:OPEN, ICL<ICL1 | 12 | 9 | 15 | kHz |
| 2 | 最大デューティサイクル Maximum Duty Cycle | MAXDC | VCC=15 V, VD=5 V, IFB=20 μA, ICL=50 μA | 47.5 | 45 | 50 | % |
| 3 | VDD基準電圧 VDD Voltage | VDD | VCC=15 V, VD=5 V, IFB=20 μA, ICL=50 μA | 5.9 | 5.4 | 6.4 | V |
| 4 | VDD停止電圧 UV Lockout Threshold Voltage | VUV | VD=5 V, IFB=20 μA, ICL=50 μA | 5.1 | 4.6 | 5.6 | V |

| No. | 項目/Item | 記号/ Symbol | 測定条件/Measure Condition (測定図-1 参照/See Figure 1) | Typ. | Limit | | Unit |
|-------------------------------------------------------------------|--------------------------------------------------|---------------|-------------------------------------------------------------------|------|-------|------|--------------|
| | | | | | Min | Max | |
| 【コントロール機能/CONTROL FUNCTIONS】 | | | | | | | |
| 5 | VCC起動電圧 VCC Start Voltage | VCC(ON) | VD=5 V, IFB=20 μ A, ICL=50 μ A | 7.5 | 6.5 | 8.5 | V |
| 6 | VCC充電停止電圧 VCC Charge Stop Threshold Voltage | VCC1 | VD=40 V, FB:OPEN, CL:OPEN | 12 | 11 | 13 | V |
| 7 | フィードバック電流 Feedback Threshold Current | IFB1 | ON \rightarrow OFF VCC=15 V, VD=5 V, ICL=50 μ A | 175 | 95 | 255 | μ A |
| 8 | フィードバック電流ヒステリシス Feedback Hysteresis Current | IFBHYS | VCC=15 V, VD=5 V, ICL=50 μ A | 8 | | | μ A |
| 9 | 重負荷時FB端子電流 FB Pin Current at Heavy Load | IFB0 | ICC0 \rightarrow ICC VCC=15 V, VD=5 V, ICL=50 μ A | 11 | 7 | 15 | μ A |
| 10 | FB端子電圧 FB Pin Voltage | VFB | VCC=15 V, VD=5 V, IFB=20 μ A, ICL=50 μ A | 0.9 | 0.6 | 1.2 | V |
| 11 | 回路消費電流 Supply Current | ICC | VCC=15 V, VD=5 V, IFB=20 μ A, ICL=50 μ A | 0.67 | 0.37 | 0.97 | mA |
| 12 | 軽負荷時回路消費電流 Supply Current at Light Load | ICC(OFF) | VCC=15 V, VD=5 V IFB=IFB1+5 μ A, ICL=50 μ A | 0.45 | 0.32 | 0.58 | mA |
| 13 | 重負荷時回路消費電流 Supply Current at Heavy Load | ICC0 | VCC=15 V, VD=5 V, IFB=OPEN, ICL=50 μ A | 0.86 | 0.65 | 1.07 | mA |
| 14 | VDD充電電流 VDD Charging Current | Ich1 | VDD=0 V, VD=40 V, FB:OPEN, CL:OPEN | 7.3 | 5.2 | 9.4 | mA |
| | | Ich2 | VDD=4 V, VD=40 V, FB:OPEN, CL:OPEN | 2.3 | 1.6 | 3.0 | mA |
| 15 | CL端子電圧 CL Pin Voltage | VCL | VCC=15 V, VD=5 V, FB:OPEN, ICL=15 μ A | 2.3 | 2.0 | 2.6 | V |
| 16 | fosc 低下時CL端子電流 Dropped fosc CL Pin Current | ICL1 | fosc \rightarrow fosc(L) ※Figure 3 VCC=15 V, VD=5 V, FB:OPEN | 12 | 9 | 15 | μ A |
| 17 | fosc 低下時CL端子電流ヒステリシ CL Pin Hysteresis Current | ICLHYS | ※Figure 3 VCC=15 V, VD=5 V, FB:OPEN | 1 | | | μ A |
| 【保護機能/CIRCUIT PROTECTIONS: *は設計保証項目/Design Guarantee Item】 | | | | | | | |
| 18 | 過電流保護検出 Self Protection Current Limit | ILIMIT | ※Figure 2/Figure 4 VCC=15 V, FB:OPEN, ICL=50 μ A, DUTY=30% | 1.0 | 0.9 | 1.1 | A |
| 19 | ILIMIT 補正係数 ILIMIT modified coefficient | R_slope | ※Figure 2/Figure 4 VCC=15 V, FB:OPEN, ICL=50 μ A | 60 | | | mA/ μ s |
| 20 | 最小ILIMIT Minimum ILIMIT | ILIMITmi | Ton=3 μ sec VCC=15 V, FB:OPEN, ICL=0 μ A | 250 | 130 | 370 | mA |
| * | 軽負荷時ドレイン電流 Drain Current at Light Load | ID(OFF) | Ton=3 μ sec VCC=15 V, IFB=IFB1-IFBHYS, ICL=50 μ A | 70 | 10 | 200 | mA |
| * | オン時ブランキング幅 Leading Edge Blanking Delay | ton(BLK) | VCC=15 V, FB:OPEN, ICL=50 μ A | 240 | 170 | 310 | ns |
| * | 過電流保護遅れ時間 Current Limit Delay | td(OCL) | | 150 | 100 | 200 | ns |
| 24 | 過電圧保護検出 Over Voltage Protection | VCC(OV) | VD=5 V, FB:OPEN, ICL=50 μ A | 24 | 21 | 27 | V |
| * | 過熱保護温度 Thermal Shutdown Temperature | TOTP | | 140 | 130 | 150 | $^{\circ}$ C |

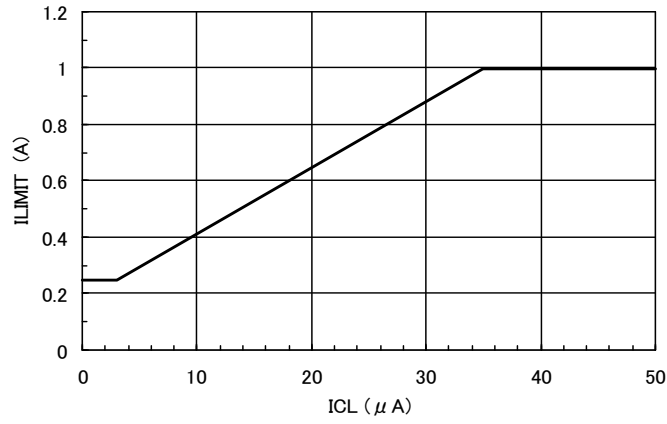
| No. | 項目 / Item | 記号 / Symbol | 測定条件 / Measure Condition (測定図-1 参照 / See Figure 1) | Typ. | Limit | | Unit |
|------------------------|-----------------------------------------------|-------------|-------------------------------------------------------|------|-------|-----|------|
| | | | | | Min | Max | |
| 【出力 / OUTPUT】 | | | | | | | |
| 26 | ラッチリセット電圧 Power-up Reset Threshold Voltage | VDDreset | | 2.6 | 1.8 | 3.5 | V |
| 27 | オン抵抗 ON-State Resistance | RDS(ON) | ID=100 mA | 3.0 | | 3.8 | Ω |
| 28 | オフ時ドレイン端子リーク電流 OFF-State Current | IDSS | VCC=27 V, VD=650 V, FB:OPEN, CL:OPEN | 10 | | 20 | μA |
| 29 | ドレイン耐圧 Breakdown Voltage | VDSS | VCC=27 V, ID=100 μA, FB:OPEN, CL:OPEN | | 700 | | V |
| 30 | 立ち上がり時間 Rise Time | tr | ※Figure 5 VCC=15 V, VD=5 V, FB:OPEN, ICL=50 μA | 100 | | | ns |
| 31 | 立ち下がり時間 Fall Time | tf | ※Figure 5 VCC=15 V, VD=5 V, FB:OPEN, ICL=50 μA | 50 | | | ns |
| 【電源電圧 / SUPPLY】 | | | | | | | |
| 32 | 最小ドレイン電圧 Drain Supply Voltage | VD(MIN) | VCC: OPEN, FB:OPEN, CL:OPEN | | 50 | | V |

【Fig. 1 : 測定回路図 / Measure Circuit】

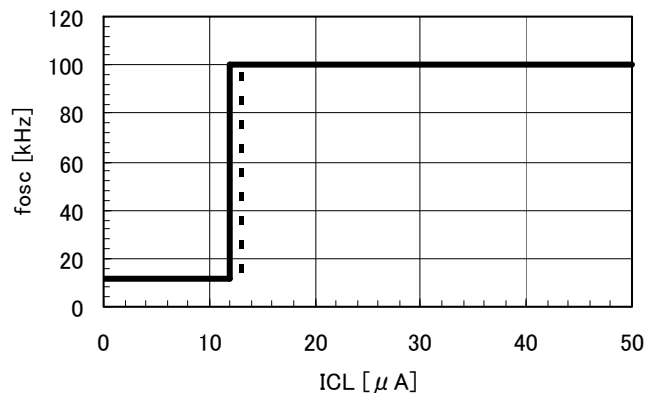


| Pin No. | Pin Name |
|---------|----------|
| 1 | VDD |
| 2 | FB |
| 3 | CL |
| 4 | VCC |
| 5 | DRAIN |
| 6 | - |
| 7 | SOURCE |
| 8 | SOURCE |

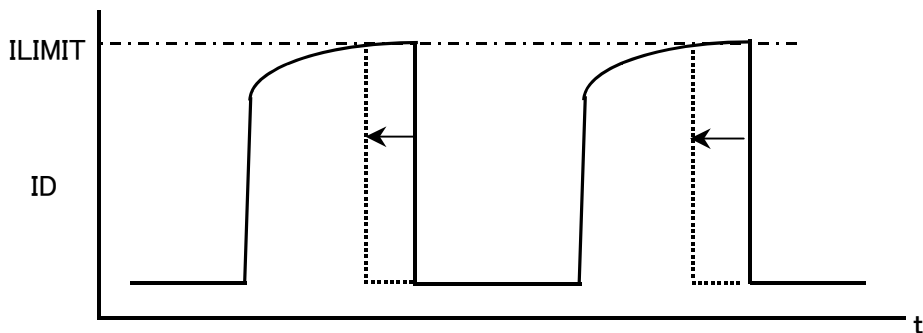
【Fig. 2: ILIMIT vs. ICL Typical Characteristic】



【Fig. 3: fosc vs. ICL

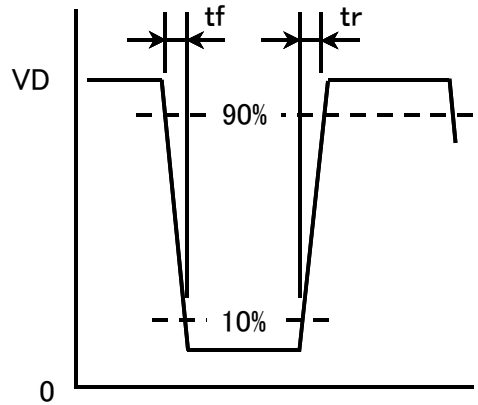


【Fig. 4: ILIMIT Measurement】

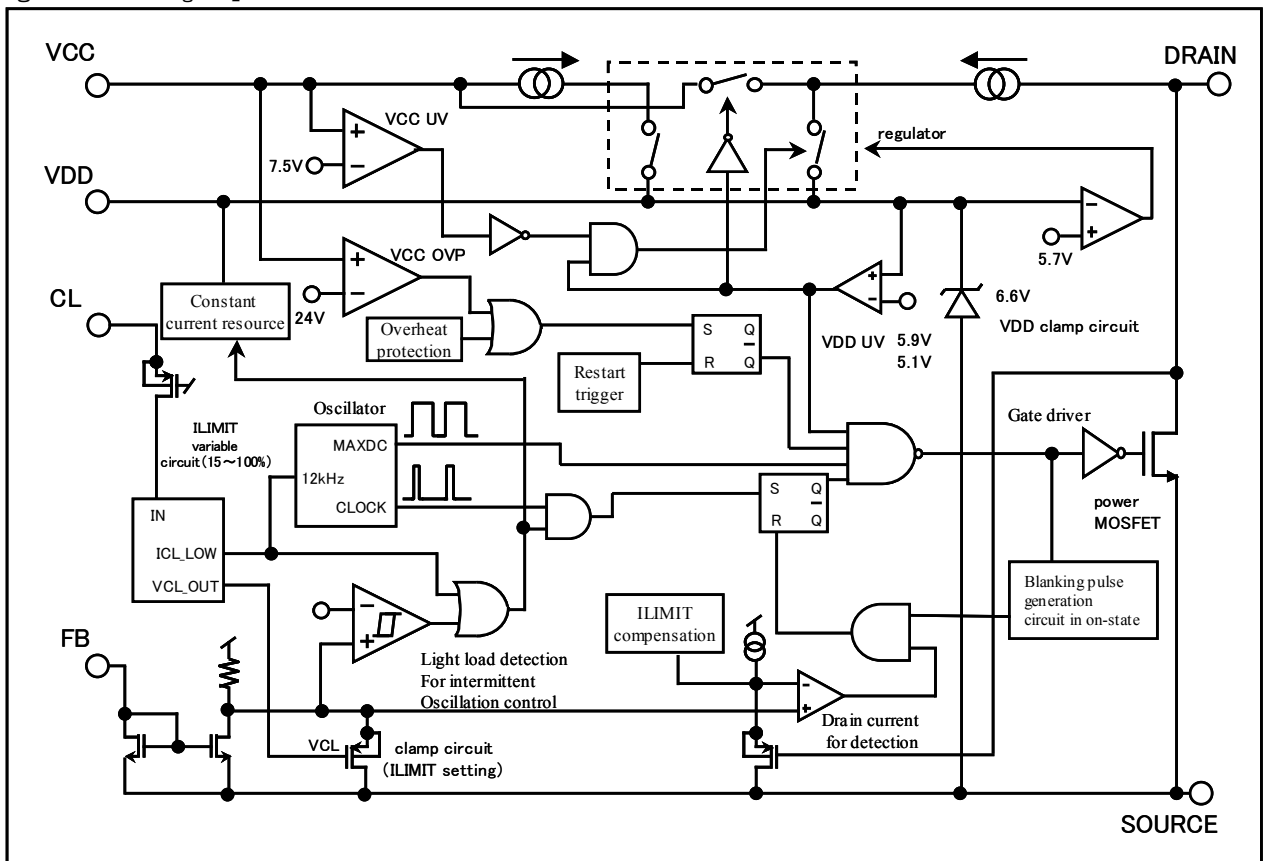


$$R_{\text{slope}} ; \{(\text{ILIMIT at Duty=30\%}) - (\text{ILIMIT at Duty=10\%})\} / \{(\text{Ton at Duty=30\%}) - (\text{Ton at Duty=10\%})\}$$

【Fig. 5 : tr, tf Measurement】



【Fig. 6: Block Diagram】



【使用上の注意1／Precautions for Use 1】

VDD 端子－GND間には、0.1 μ Fのセラミックコンデンサを使用してください。
Connect a 0.1 μ F ceramic capacitor between VDD pin and GND.

【使用上の注意2／Precautions for Use 2】

以下のような条件では破損し、場合によっては破裂、発煙の可能性があります。以下の使用は避けてください。

The IPD has risks for break-down or burst or giving off smoke in following conditions. Avoid the following use.

- (1) DRAIN 端子と VDD 端子を逆にして、電源基板へ挿入する。
Reverse the DRAIN pin and VDD pin connection to the power supply board.
- (2) DRAIN 端子と VDD 端子をショートする。
DRAIN pin short to VDD pin.
- (3) DRIN端子と FB 端子をショートする。
DRAIN pin short to FB pin.
- (4) DRIN端子とCL端子をショートする。
DRAIN pin short to CL pin.
- (5) DRIN端子と VCC 端子をショートする。
DRAIN pin short to VCC pin.
- (6) VCC 端子と VDD 端子をショートする。
VCC pin short to VDD pin.
- (7) VCC 端子と CL 端子をショートする。
VCC pin short to CL pin.
- (8) VCC 端子と FB 端子をショートする。
VCC pin short to FB pin.

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