☆Green Operation Compatible

■GENERAL DESCRIPTION

The MYRGP-WB series is a synchronous step-down mini DC/DC converter
which integrates an inductor and a control IC in one tiny package (2.5 x 2.0 x 1.04mm).
An internal coil simplifies the circuit and enables minimization of noise
and other operational trouble due to the circuit wiring.
The output voltage is internally set in a range from 0.8V to 3.6V increments of 0.05V.
High Speed Transient Response-COT is a proprietary high-speed transient response technology for DC/DC converter which
minimized output voltage during load fluctuations. It is Ideal for the applications with large instantaneous load fluctuations
such as FPGAs and equipment that requires stable output voltage.

(*)High Speed Transient Response-COT is a proprietary high-speed transient response technology for DC/DC converter which was
developed by Murata. It is Ideal for the LSI's that require high precision and high stability power supply voltage.

■APPLICATIONS

- ●Communication equipment / modules
  (Bluetooth/Wi-Fi/GPS etc.)
- ●Power supply for MCU/FPGA/ASIC
  (POL power supply)
- ●Smart phones/Mobile phones
- ●DSC/Camcorder
- ●Portable game consoles
- ●Wearable devices
- ●Active cable/Active optical cable

■FEATURES

|		
Input Voltage Range	:	2.5V ~ 5.5V
Output Voltage Range	:	0.8V ~ 1.0V (±20mV)
		1.05V ~ 3.6V (±2.0%)
Output Current	:	1.0A
Efficiency	:	90% (V_{IN}=3.8V, V_{OUT}=1.8V, I_{OUT}=200mA)
Oscillation Frequency	:	3.0MHz
Quiescent Current	:	25uA (MYRGP-B)
Control Methods	:	High Speed Transient Response-COT Control
		PWM Control (MYRGP-W)
		PWM/PFM Auto (MYRGP-B)
Protection Functions	:	Thermal Shutdown
		Current Limit
		Short Protection
Functions	:	Soft-Start
		UVLO
		C_L Discharge
Input/Output Capacitor	:	Ceramic Capacitor
Operating Ambient Temperature	:	-40℃ ~ 105℃
Size (L x W x H)	:	2.5 x 2.0 x 1.04 mm
Environmentally Friendly	:	EU RoHS Compliant, Pb Free
		Halogen Free

■TYPICAL APPLICATION CIRCUIT

■TYPICAL PERFORMANCE CHARACTERISTICS
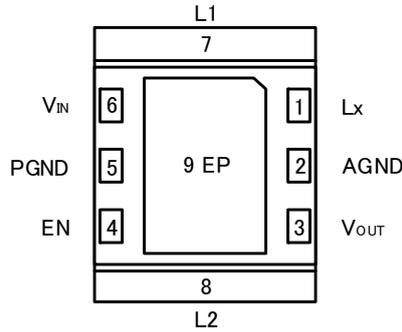

MYRGP-WB (V_{OUT}=1.8V)
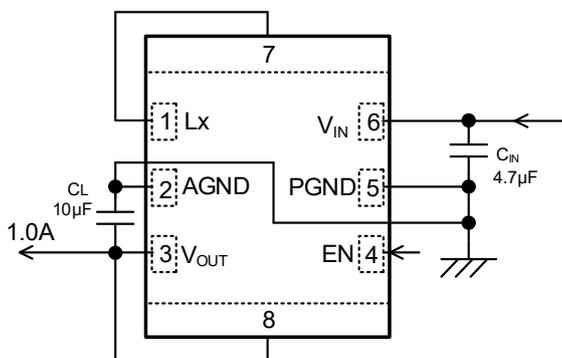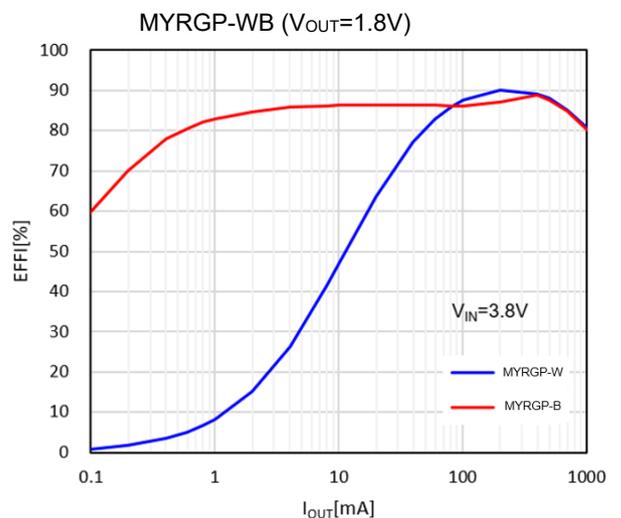
■BLOCK DIAGRAM
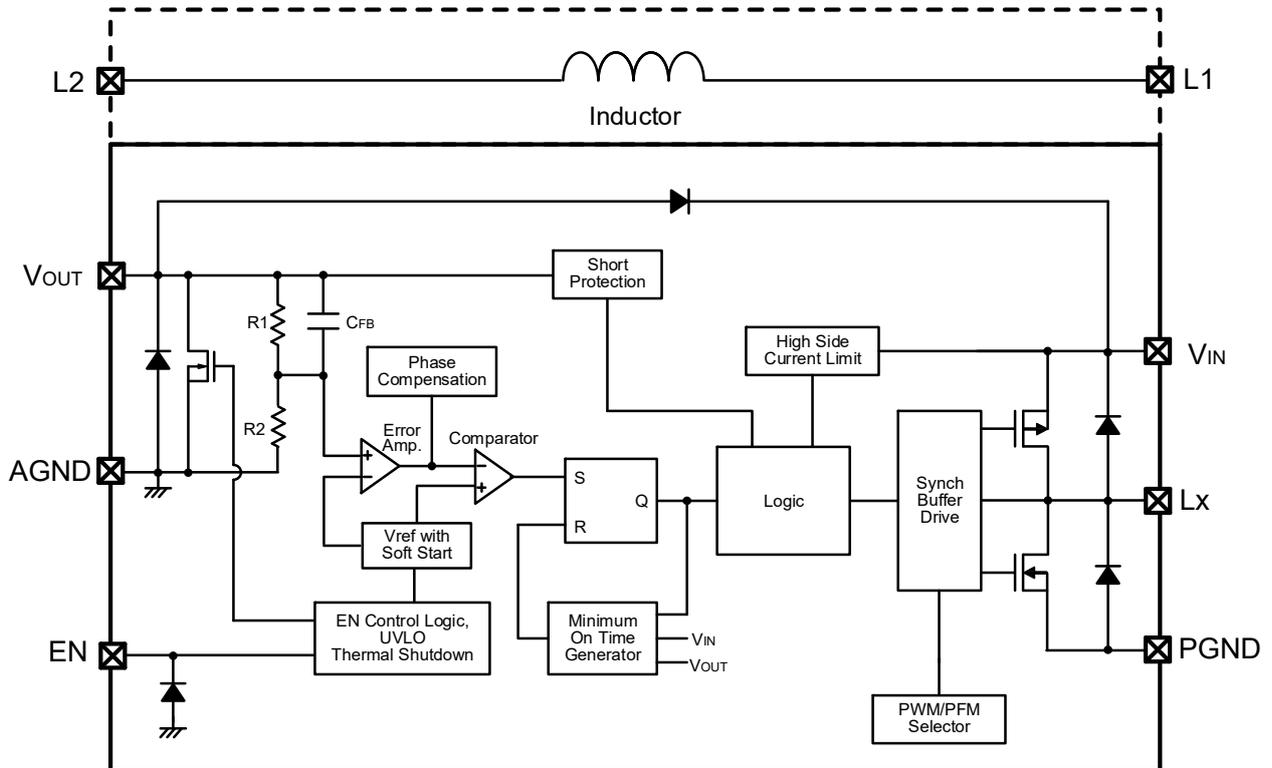
*"PWM/PFM Selector" in the MYRGP-W series is fixed to PWM control.

"PWM/PFM Selector" in the MYRGP-B series is fixed to PWM/PFM automatic switching control.

Diodes inside the circuit are ESD protection diodes and parasitic diodes.

■PIN CONFIGURATION

```
                        L1
                        7
          V_IN    [6]        [1]   Lx
          PGND    [5]  9 EP  [2]   AGND
          EN      [4]        [3]   V_OUT
                        8
                        L2
```

< BOTTOM VIEW >

* PIN2 and PIN5 terminals must be connected to GND.

■ PIN ASSIGNMENT

PIN NUMBER	PIN NAME	FUNCTIONS
1	Lx	Switching
2	AGND	Analog Ground
3	V_OUT	Output Voltage
4	EN	Enable
5	PGND	Power Ground
6	V_IN	Input Voltage
7	L1	Inductor Electrodes
8	L2	Inductor Electrodes
9	EP	Exposed thermal pad. The Exposed pad must be connected to GND(Pin2, Pin5)

■ FUNCTION TABLE

PIN NAME	SIGNAL	STATUS
EN	L	Stand-by
	H	Active
	OPEN	Undefined State [*]

* Please do not leave the EN pin open.

■ ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATINGS	UNITS
V_{IN} Pin Voltage	V_{IN}	-0.3 ~ 6.2	V
L_X Pin Voltage	V_{Lx}	-0.3 ~ V_{IN} + 0.3 or 6.2 [*1]	V
V_{OUT} Pin Voltage	V_{OUT}	-0.3 ~ V_{IN} + 0.3 or 4.0 [*2]	V
EN Pin Voltage	V_{EN}	-0.3 ~ 6.2	V
Power Dissipation(Ta=25℃)	Pd	1000 (High heat dissipation board) [*3]	mW
Junction Temperature	Tj	-40 ~ 125	℃
Storage Temperature	T_{stg}	-55 ~ 125	℃

All voltages are described based on the GND (AGND and PGND) pin.

[*1] The maximum value should be either V_{IN}+0.3V or +6.2V in the lowest voltage.

[*2] The maximum value should be either V_{IN}+0.3V or +4.0V in the lowest voltage.

[*3] The power dissipation figure shown is PCB mounted and is for reference only.
Please refer to PACKAGING INFORMATION for the mounting condition.

■RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNITS
Input Voltage	V_{IN}	2.5	-	5.5	V
EN Pin Voltage	V_{EN}	0.0	-	5.5	V
Output Current	I_{OUT}	-	-	1.0	A
Operating Ambient Temperature	Topr	-40	-	105	℃
Input Capacitor (Effective Value) [*1]	C_{IN}	2.5	4.7	1000 [*2]	uF
Output Capacitor (Effective Value) [*1]	C_L	5.8	10	220 [*3]	uF

All voltages are described based on the AGND and PGND pin.

[*1] Some ceramic capacitors have an effective capacitance that is significantly lower than the nominal value due to the applied DC bias and ambient temperature. For the input / output capacitance of this IC, use an appropriate ceramic capacitor according to the DC bias usage conditions (ambient temperature, input / output voltage) so that the effective capacitance value is equal to or higher than the recommended component.

[*2] If using a large-capacity capacitor such as an electrolytic capacitor or tantalum capacitor as the input capacitance, place a low ESR ceramic capacitor in parallel. If a ceramic capacitor is not placed, high-frequency voltage fluctuations will increase and the IC may malfunction.

[*3] If using a large-capacity capacitor as the output capacitance, the output voltage may not rise during the soft-start time and the short protection function will operate after the soft-start time, causing the IC to latch and stop.

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MYRGP-W/B 1.0A series   A01 Page 4 of 30

■ ELECTRICAL CHARACTERISTICS

Ta=25℃

PARAMETER	SYMBOL	CONDITIONS		MIN.	TYP.	MAX.	UNITS	CIRCUIT
Output Voltage	V_{OUT}	$V_{IN}=V_{OUT(T)}+2.0V(V_{OUT(T)}≦3.5V)$ or $5.5V(V_{OUT(T)}>3.5V)$, V_{OUT}=<E-3>→<E-1> V_{OUT} Voltage When Lx pin is V_{IN} or oscillations		<E-1>	<E-2>	<E-3>	V	①
Operating Voltage Range	V_{IN}			2.5	-	5.5	V	①
Maximum Output Current	I_{OUTMAX}	When connected to external components, V_{IN}=<C-1>		1000	-	-	mA	①
UVLO Detect Voltage	V_{UVLOD}	V_{IN} = 2.5V to 1.2V, V_{OUT} = 0.6V, V_{IN} Voltage when Lx pin changes "H" to "L" level		1.35	1.95	-	V	③
UVLO Release Voltage	V_{UVLOR}	V_{IN} = 1.2V to 2.5V, V_{OUT} = 0.6V, V_{IN} Voltage when Lx pin changes "L" to "H" level		-	2.00	2.48	V	③
Quiescent Current (MYRGP-B)	I_q	$V_{OUT} =V_{OUT(T)}$ ×1.1		-	25	40	uA	②
Quiescent Current (MYRGP-W)	I_q	$V_{OUT} =V_{OUT(T)}$ ×1.1		-	600	1035	uA	②
Stand-by Current	I_{STB}	V_{EN} =0V		-	0.0	1.0	uA	②
Minimum ON time [2]	t_{ONmin}	When connected to external components, $V_{IN} =V_{EN}$=<C-1>, I_{OUT}=1mA		<E-5>	<E-6>	<E-7>	ns	①
Thermal Shutdown	T_{TSD}			-	150	-	℃	①
Thermal shutdown Hysteresis	T_{HYS}			-	30	-	℃	①
Lx SW "H" ON Resistance	R_{LXH}	V_{OUT}=0.6V, I_{LX}=100mA		-	0.24	0.44	Ω	④
Lx SW "L" ON Resistance [1]	R_{LXL}	V_{IN}=3.6V, $V_{OUT}=V_{OUT(T)}$ × 1.1, I_{LX}=100mA		-	0.16	0.34	Ω	④
Lx SW "H" Leakage Current	I_{LeakH}	V_{IN}=5.5V, V_{EN}=0V, V_{OUT}=0V, V_{LX}=0V		-	0.0	1.0	uA	⑤
Lx SW "L" Leakage Current	I_{LeakL}	V_{IN}=5.5V, V_{EN}=0V, V_{OUT}=0V, V_{LX}=5.5V		-	0.0	1.0	uA	⑤
Current Limit [2]	I_{LIMH}	V_{OUT}=0.6V, I_{Lx} until Lx pin oscillates		1.3 [1]	1.5	2.5 [1]	A	⑥
Output Voltage Temperature Characteristics	$\Delta V_{OUT}/(V_{OUT}\cdot\Delta topr)$	I_{OUT}=30mA -40℃≦Topr≦105℃		-	±100	-	ppm/℃	①
EN "H" Voltage	V_{ENH}	V_{OUT}=0.6V, Applied voltage to V_{EN}, Voltage changes Lx to "H" level	Ta=25℃	1.4	-	5.5	V	③
			Ta=-40~105℃[1]					
EN "L" Voltage	V_{ENL}	V_{OUT}=0.6V, Applied voltage to V_{EN}, Voltage changes Lx to "L" level	Ta=25℃	AGND	-	0.3	V	③
			Ta=-40~105℃[1]					
EN "H" Current	I_{ENH}	V_{IN}=5.5V, V_{EN}=5.5V, V_{OUT}=0V		-	0.0	0.1	uA	⑤
EN "L" Current	I_{ENL}	V_{IN}=5.5V, V_{EN}=0V, V_{OUT}=0V		-	0.0	0.1	uA	⑤
Soft-start Time	t_{SS}	V_{EN}=0V→5.0V, $V_{OUT}=V_{OUT(T)}$ × 0.9 After "H" is fed to EN, the time by when clocks are generated at Lx pin.		0.10	0.30	0.60	ms	③
Short Protection Threshold Voltage	V_{SHORT}	Sweeping V_{OUT}, V_{OUT} voltage which Lx becomes "L" level		0.17	0.27	0.38	V	③
C_L Discharge Resistance	R_{DCHG}	V_{EN}=0V, V_{OUT}=4.0V		100	180	300	Ω	⑦
Inductance	L	Test Freq.=1MHz		-	1.0	-	uH	-

$V_{OUT(T)}$: Nominal Voltage

Unless otherwise stated, V_{IN}=5.0V, V_{EN}=5.0V, "H" level = V_{IN} - 1.2V ~ V_{IN}, "L" level = -0.1V ~ 0.1V

[1] Design value.

[2] Current limit denotes the level of detection at peak of Inductor current.

■ELECTRICAL CHARACTERISTICS (Continued)

● SPEC Table

MYRGP-W; PWM Control

PART NUMBER	NOMINAL OUTPUT VOLTAGE	V_{OUT}			t_{ON}			
		<E-1>	<E-2>	<E-3>	<C-1>	<E-5>	<E-6>	<E-7>
	$V_{OUT(T)}$	MIN.	TYP.	MAX.	V_{IN}	MIN.	TYP.	MAX.
MYRGP080100W21RB	0.80	0.780	0.800	0.820	2.50	55	107	158
MYRGP100100W21RB	1.00	0.980	1.000	1.020	2.50	77	133	190
MYRGP120100W21RB	1.20	1.176	1.200	1.224	2.50	106	160	214
MYRGP150100W21RB	1.50	1.470	1.500	1.530	2.50	140	200	260
MYRGP180100W21RB	1.80	1.764	1.800	1.836	3.00	140	200	260
MYRGP250100W21RB	2.50	2.450	2.500	2.550	4.17	140	200	260
MYRGP330100W21RB	3.30	3.234	3.300	3.366	5.50	140	200	260

● SPEC Table

MYRGP-B; PWM/PFM Control

PART NUMBER	NOMINAL OUTPUT VOLTAGE	V_{OUT}			t_{ON}			
		<E-1>	<E-2>	<E-3>	<C-1>	<E-5>	<E-6>	<E-7>
	$V_{OUT(T)}$	MIN.	TYP.	MAX.	V_{IN}	MIN.	TYP.	MAX.
MYRGP080100B21RB	0.80	0.780	0.800	0.820	2.50	55	107	158
MYRGP100100B21RB	1.00	0.980	1.000	1.020	2.50	77	133	190
MYRGP120100B21RB	1.20	1.176	1.200	1.224	2.50	106	160	214
MYRGP150100B21RB	1.50	1.470	1.500	1.530	2.50	140	200	260
MYRGP180100B21RB	1.80	1.764	1.800	1.836	3.00	140	200	260
MYRGP250100B21RB	2.50	2.450	2.500	2.550	4.17	140	200	260
MYRGP330100B21RB	3.30	3.234	3.300	3.366	5.50	140	200	260

■TEST CIRCUITS

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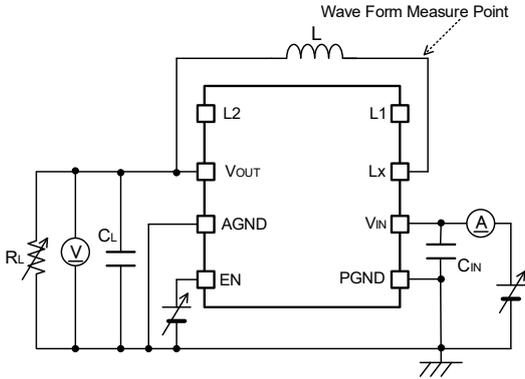
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※External Components
L : 1.0μH(Selected goods)
C_{IN} : 4.7μF(Ceramic)
CL : 10μF(Ceramic)

< Circuit No.③ >

< Circuit No.④ >

$R_{LXH} = (V_{IN} - V_L)/I_{LX}$
$R_{LXL} = V_{LX}/I_{LX}$
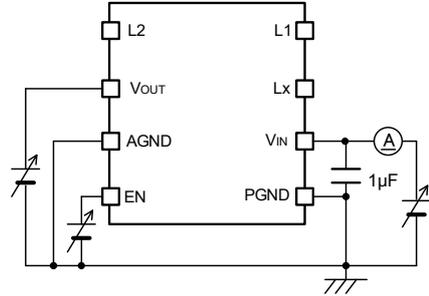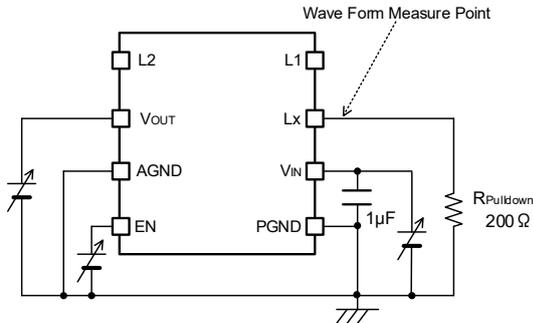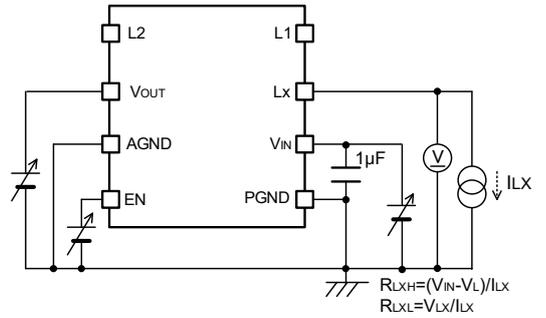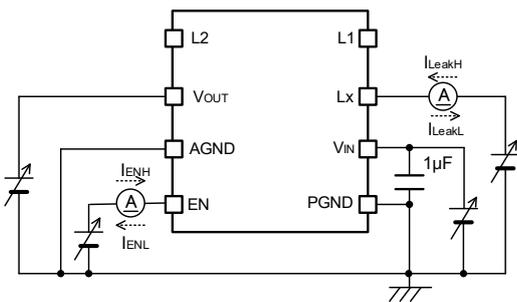
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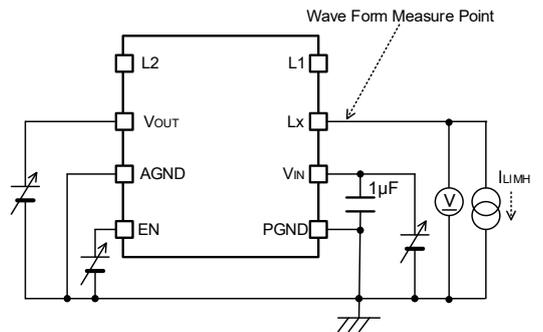
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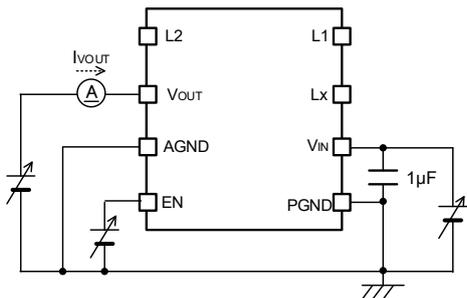
■TYPICAL APPLICATION CIRCUIT
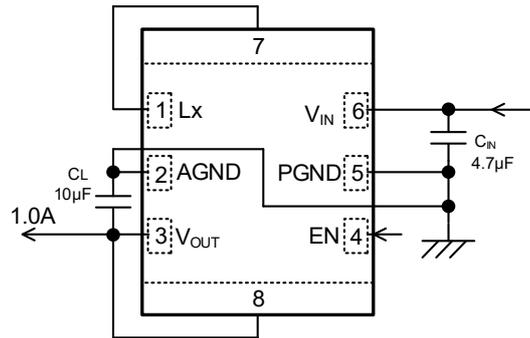
【Typical Examples】

	VALUE	SIZE(L×W×T)
C_{IN} [*1,2]	4.7uF/16V	1.6 x 0.8 x 1.0mm
	10uF/10V	1.6 x 0.8 x 1.0mm
	4.7uF/25V	1.6 x 0.8 x 1.0mm
	4.7uF/25V	2.0 x 1.25 x 1.4mm
	4.7uF/25V	1.6 x 0.8 x 0.9mm
	4.7uF/25V	2.0 x 1.25 x 1.45mm
C_L [*1,3]	10uF/10V	1.6 x 0.8 x 1.0mm
	10uF/25V	1.6 x 0.8 x 1.0mm
	10uF/10V	2.0 x 1.25 x 1.4mm
	10uF/25V	1.6 x 0.8 x 1.0mm
	10uF/10V	2.0 x 1.25 x 1.45mm

[*1] Some ceramic capacitors have an effective capacitance that is significantly lower than the nominal value due to the applied DC bias and ambient temperature. For the input / output capacitance of this IC, use an appropriate ceramic capacitor according to the DC bias usage conditions (ambient temperature, input / output voltage) so that the effective capacitance value is equal to or higher than the recommended component.

[*2] If using a large-capacity capacitor such as an electrolytic capacitor or tantalum capacitor as the input capacitance, place a low ESR ceramic capacitor in parallel. If a ceramic capacitor is not placed, high-frequency voltage fluctuations will increase and the IC may malfunction.

[*3] If using a large-capacity capacitor as the output capacitance with short protection function, the output voltage may not rise during the soft-start time and the short protection function will operate after the soft-start time, causing the IC to latch and stop.

■OPERATIONAL EXPLANATION

This IC consists of a reference voltage source, error amplifier, comparator, phase compensation, on time generation circuit, current limiter circuit, UVLO circuit and so on.
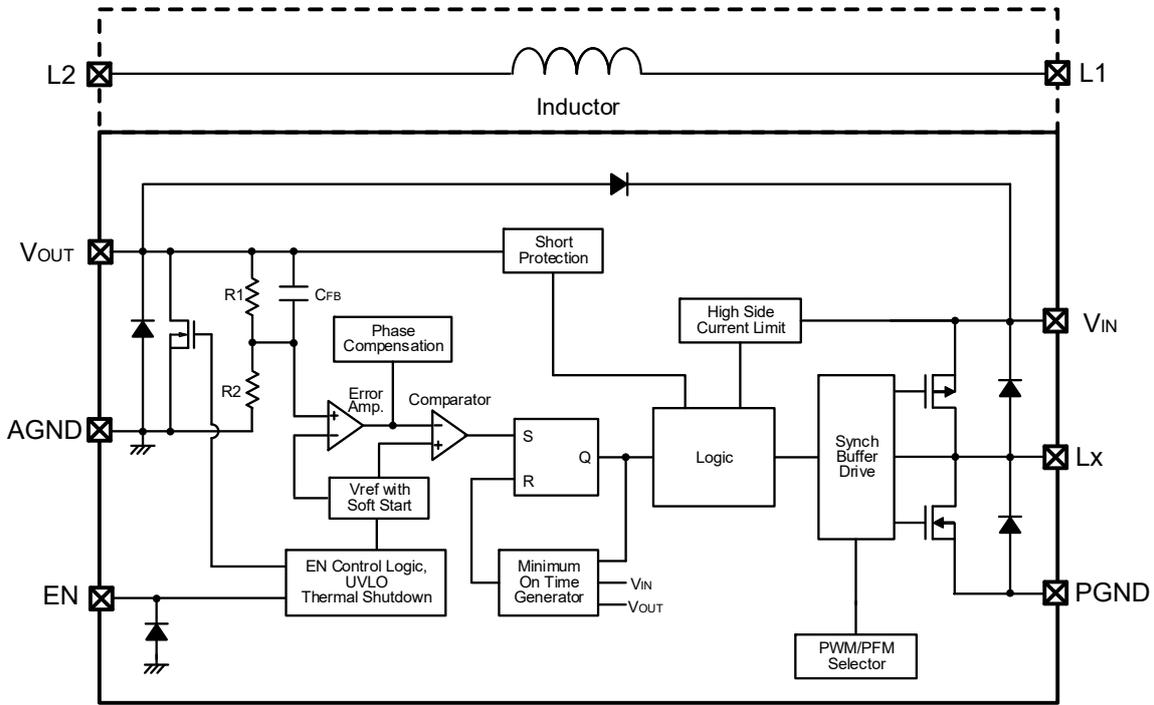
BLOCK DIAGRAM

The control method is High Speed Transient Response-COT (High Speed circuit Architecture for Transient with Constant On Time), which features the On time control method and the fast transient response with low ripple voltage.

■OPERATIONAL EXPLANATION (Continued)

<Nomal operation>

In High Speed Transient Response-COT control, ON time (t_{ON}) dependent on input voltage and output voltage is generated and Pch driver FET is turned on.

The on-time is set as follows during light loads.

$$t_{ON} = (V_{OUT} / V_{IN}) \times 333ns$$

The off time (t_{OFF}) is controlled by comparing the output voltage with the reference voltage using the error amplifier and comparator. Specifically, the reference voltage and a voltage which is obtained by dividing the output voltage with R1 and R2 are compared either use with or using in the sentence, phase compensation is applied to the error amplifier output and sent to the comparator. In the comparator, the output of the error amplifier is compared with the reference voltage, and when it falls below the reference voltage, the SR latch is set and it becomes the ON period again.

PWM control

The MYRGP-W series (PWM control) operates in continuous conduction mode and operates at a stable oscillation frequency regardless of the load. The oscillation frequency can be obtained by the following equation.

$$f_{OSC} = (V_{OUT} / V_{IN}) \times (1 / t_{ON})$$
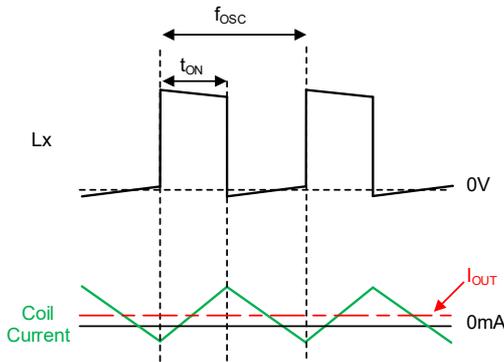
MYRGP-W series: Example of light load operation
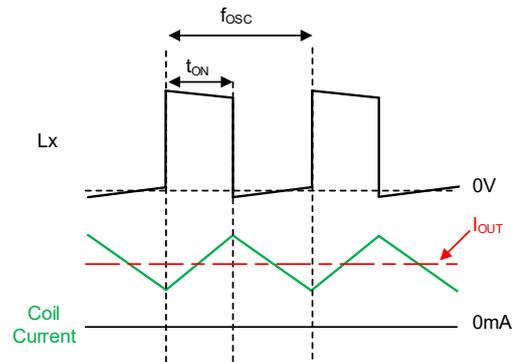
MYRGP-W series: Example of heavy load operation

PWM/PFM automatic switching control

The MYRGP-B series (PWM/PFM automatic switching control) lowers the oscillation frequency at light load by operating in discontinuous conduction mode at light load.

As the output current increases, the switching frequency increases proportionally. By this operation, it is possible to reduce switching loss at light load and achieve high efficiency from light load to heavy load.
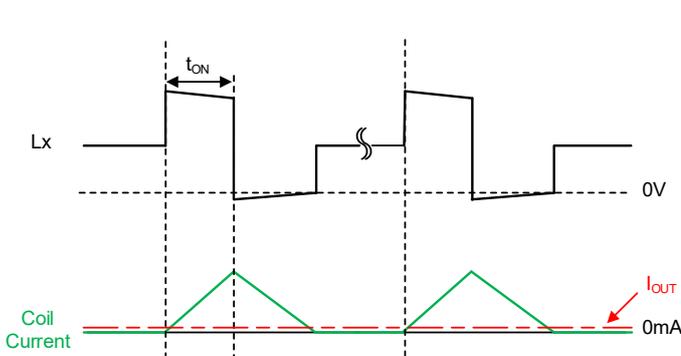
MYRGP-B series: Example of light load operation
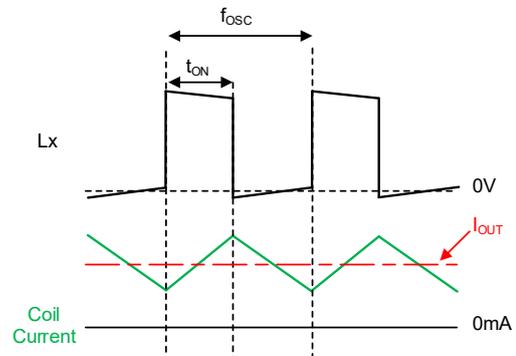
MYRGP-B series: Example of heavy load operation

■OPERATIONAL EXPLANATION (Continued)

＜100% Duty cycle mode＞

In conditions where the input-output voltage difference is small or during transient response, the Pch driver FET may be in 100% duty cycle mode.

The 100% duty cycle mode achieves highspeed response and output voltage stability under the condition where input-output voltage difference is small.

＜EN function＞

When "H" voltage (V_{ENH}) is fed to the EN pin, normal operation starts after raising the output voltage with the soft-start function. When the "L" voltage (V_{ENL}) is fed to the EN pin, it enters the stand-by state and the current consumption is suppressed to I_{STB} (TYP. 0.0uA).

Additionally, Pch driver FET and Nch driver FET are turned off.

＜Start Mode ／ Soft-Start function＞

It is a function to raise the output voltage gradually and suppress inrush current. After the "H" voltage (V_{ENH}) is fed to the EN pin, the reference voltage which is connected to the error amplifier increases linearly during the soft-start period. As a result, the output voltage increases in proportion to the increase of the reference voltage. This operation can prevent a large inrush current and smoothly raise the output voltage.

During the soft-start function, short protection does not work.

Also, even with PWM control, reverse inductor current is prohibited.

■OPERATIONAL EXPLANATION (Continued)

＜Current Limit / Short protection＞
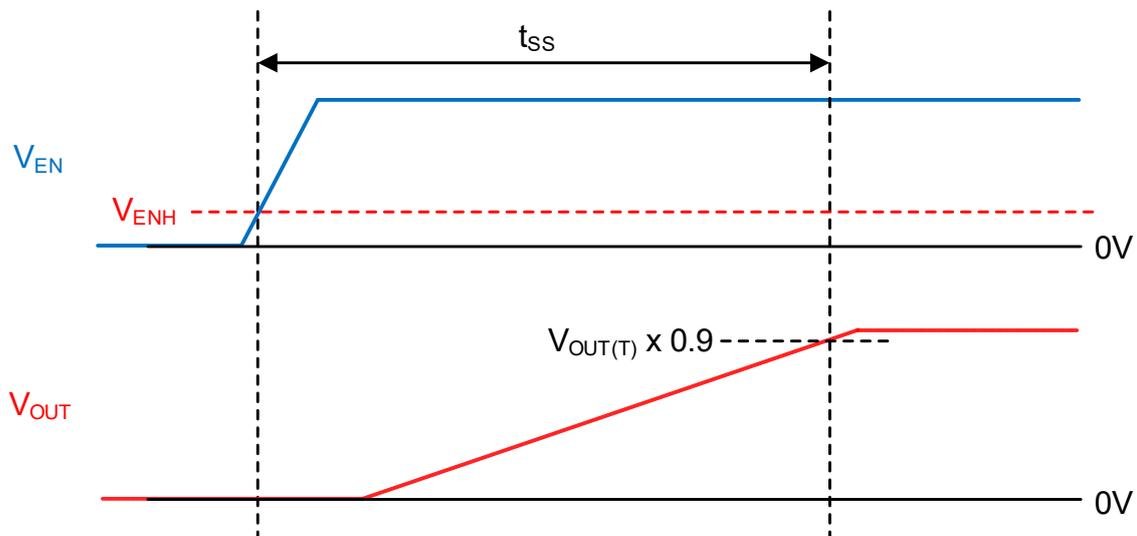
The current limit function monitors the current flowing through Pch driver FET in each switching cycle and when Pch driver current is more than I_{LIMH} (TYP. 1.5A), an overcurrent detection state occurs.

When the overcurrent detection state occurs, the Pch driver FET is turned off. If the current flowing through Pch driver FET is less than I_{LIMH} in the next switching cycle, the overcurrent detection state is released.

If the overcurrent detection state continues or if there is a significant drop in the output voltage, the short protection function will be operated.

The detailed operation at overcurrent is as follows.

1) When the current flowing through the Pch driver FET increases and reaches the current limit value I_{LIMH} (TYP. 1.5A), the current limit state is set and the Pch driver FET is forcibly turned off.

2) After the Pch driver FET is turned off, the Nch driver FET is turned on for a certain period of time, and the inductor current decreases. If there is an overload state, the Pch driver FET will turn on again until inductor current reaches the current limit value.

3) Further reducing the load resistance will drop output voltage.

When the output voltage drops, the inductor current does not decrease during the Nch Driver FET on period, and when the Pch driver turns on again, inductor current will increase more than the current limit value I_{LIMH}. When the inductor current flowing through the Nch driver FET increases, the Pch driver FET is prohibited to turn on until the current flowing through the Nch driver FET drops to I_{LIML} (TYP. 2.0A).

4) When the output voltage drops below short protection voltage V_{SHORT} (TYP. 0.27V) in an overload condition,

The short-circuit protection function is activated, and the P-channel driver FET and N-channel driver FET are latched in the off state.

■OPERATIONAL EXPLANATION (Continued)

＜Current Limit / Short protection (Continued)＞

■Conditions for reversion from latch stop.

　There are two conditions for returning from latch stop due to short protection.

　　・Input "L" voltage to the EN pin to put it into stand-by state and then put IC into active state.

　　・After the input voltage is reduced to the UVLO detection state, a voltage higher than V_{UVLOR} is applied to the input voltage and the input voltage is set to the normal state.

　To recover from latch stop, the output voltage is raised with the soft-start function, and then normal operation is performed. If the overload condition continues, the IC enters the current limit condition again and the current limit function and short protection is activated.

■OPERATIONAL EXPLANATION (Continued)
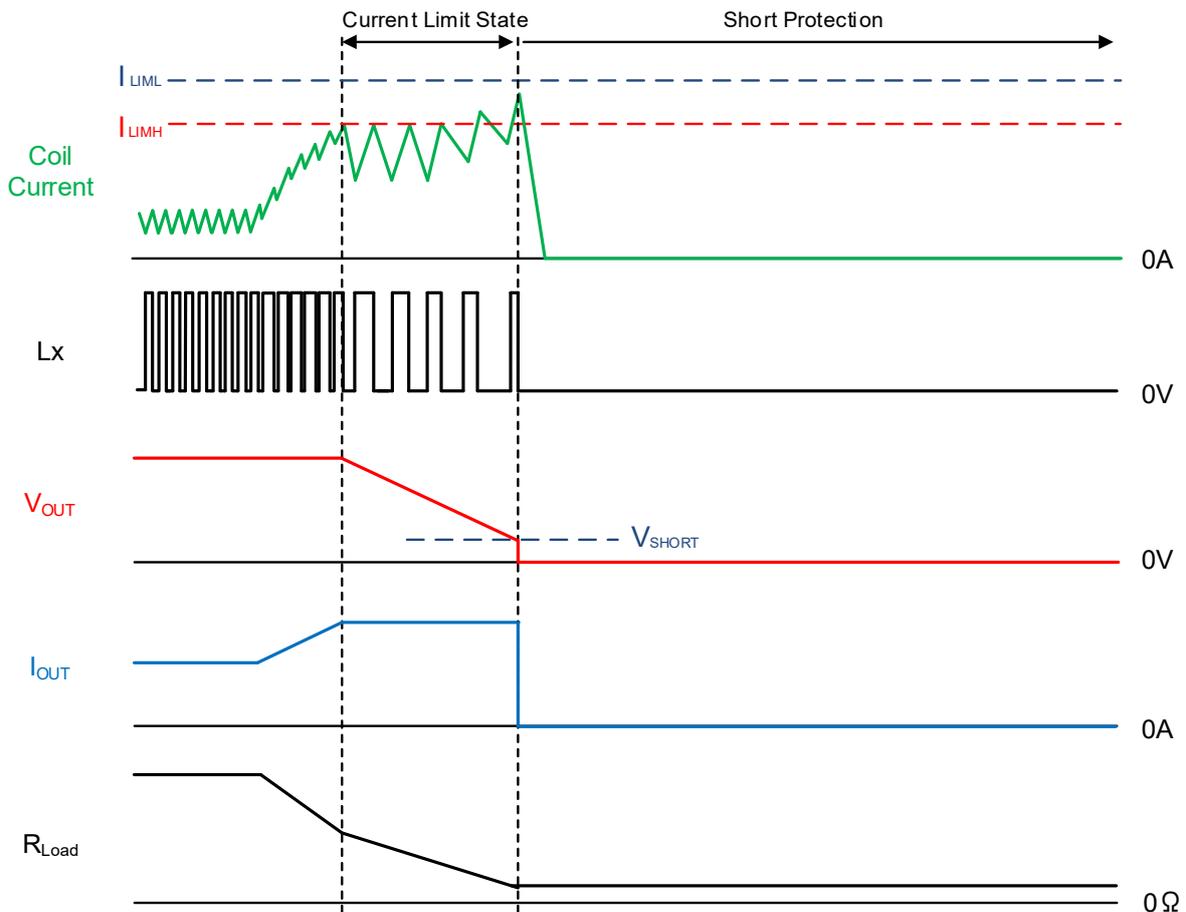
＜Thermal Shutdown function＞

The Junction temperature is monitored to protect the IC from thermal damage.

When the junction temperature reaches T_{TSD} (TYP. 150℃), thermal shutdown operates, the Pch driver FET and Nch driver FET are switched off and the output voltage drops. When the junction temperature drops to the thermal shutdown release temperature T_{TSD}-T_{HYS} (TYP. 120℃) by stopping the current supply, the output voltage is raised with the soft-start function, and then normal operation is performed.

＜UVLO function＞

When the V_{IN} voltage becomes V_{UVLOD} (TYP. 1.95V) or less, the UVLO function operates to forcibly turn off the Pch driver FET to prevent erroneous pulse output due to operation instability of the internal circuit.

When the V_{IN} voltage becomes V_{UVLOR} (TYP. 2.0V) or more, the UVLO function is canceled. After the UVLO function is canceled, the output voltage rises with the soft-start function, and then the normal operation is performed.

Moreover, during the UVLO operation, the internal circuit is operating because stopping by UVLO is not same to a stand-by mode and just switching operation is stopped.

＜C_L Discharge function＞

To prevent application malfunctions caused by charge remaining on the output capacitor (EN = "L") during stand-by, this IC uses an Nch FET and resistor connected to the V_{OUT} pin to rapidly discharge the charge on the output capacitor.

It also operates in the UVLO detection state.

The output voltage during discharging can be calculated by the following equation.

$$V = V_{OUT(T)} \times e^{-t/\tau}$$
$$t = \tau \; Ln \, (V_{OUT(T)} / V)$$

V	: Output voltage during discharge
$V_{OUT(T)}$	: Output voltage
t	: Discharge time
C_L	: Effective capacitance of Output capacitor
R_{DCHG}	: C_L auto-discharge resistance
τ	: $C_L \times R_{DCHG}$

■NOTE ON USE

1) For the phenomenon of temporal and transitional voltage decrease or voltage increase, the IC may be damaged or deteriorated if IC is used beyond the absolute MAX. specifications. Also, if used under out of the recommended operating range, the IC may not operate normally or may cause deterioration.

2) Spike noise and ripple voltage arise in a switching regulator as with a DC/DC converter. These are greatly influenced by external component selection, such as capacitance values, and board layout of external components. Once the design has been completed, verification with actual components should be done.

3) The DC/DC converter characteristics depend greatly on the externally connected components as well as on the characteristics of this IC, so refer to the specifications and standard circuit examples of each component when carefully considering which components to select. Especially for C_L capacitor, it is recommended to use an appropriate ceramic capacitor according to the DC bias usage conditions (ambient temperature, input / output voltage) so that the effective capacitance value is equal to or higher than the recommended component.

4) Due to propagation delay inside the product, the on time generated by the on time generation circuit is not the same as the on time that is the ratio of the input voltage to the output voltage.

5) The actual inductor current may at times exceed the current limit value (I_{LIMH}) due to propagation delays in the current limiting circuit.

6) Regarding PWM/PFM auto switching control method, it works with a discontinuous conduction mode at light loads, and in this case where the voltage difference between input voltage and output voltage is low, the inductor current may reverse when the load is light, and thus pulse skipping will not be possible and light load efficiency will worsen.

7) When the voltage difference between input voltage and output voltage is low, the load stability feature may deteriorate.

8) Murata places an importance on improving our products and their reliability. We request that users incorporate fail safe designs and post aging protection treatment when using Murata products in their systems.

9) This IC is an Inductor Built-in product, do not place it in an environment with a strong magnetic field such as near a magnet. The influence of a strong magnetic field may cause a decrease in inductance value, deterioration of efficiency, and abnormal operation of the IC.

10) The coil is exclusively for this product. Please do not use it for any purpose other than this product.

11) Murata places an importance on improving our products and their reliability. We request that users incorporate fail-safe designs and post-aging protection treatment when using Murata products in their systems.

■NOTE ON USE (Continued)

●Instructions of board layout
The following items require special attention in the board layout.
Please refer to the reference pattern layout on the next page.

(a) Make the wiring of high current lines thicker and shorter.
This makes it possible to reduce the wire impedance, which is expected to reduce noise and improve heat dissipation.
If the wire impedance of the large current line is large, this may cause noise generation or prevent the IC from operating properly.

(b) Place the input capacitance C_{IN}, output capacitance C_L, IC which the large current flows on the same surface. If they are placed on both sides, a large current will flow through Via, which has high impedance, it may cause noise and the IC may not operate normally.

(c) Please mount each external component as close to the IC as possible.
Especially place the input capacitance C_{IN} near the IC and connect it with as low impedance as possible.
If the input capacity C_{IN} and IC are too far apart, it may cause noise or the IC may not operate normally.

＜Reference board layout＞
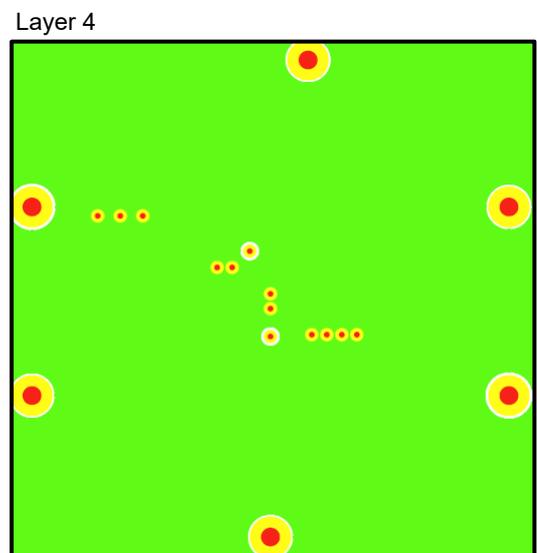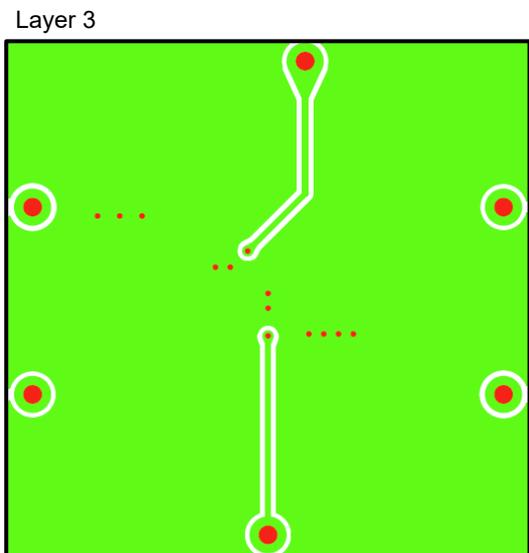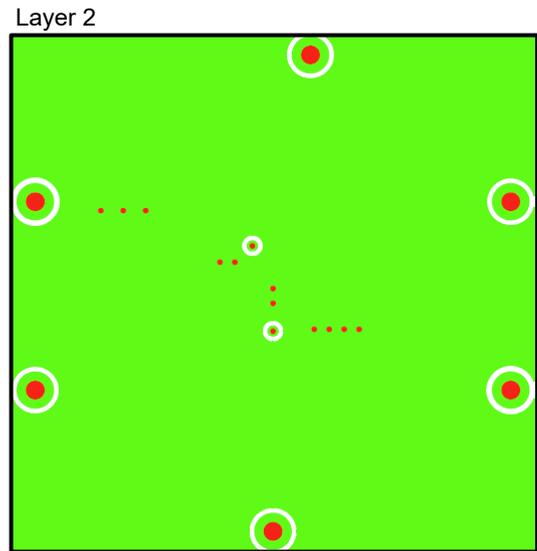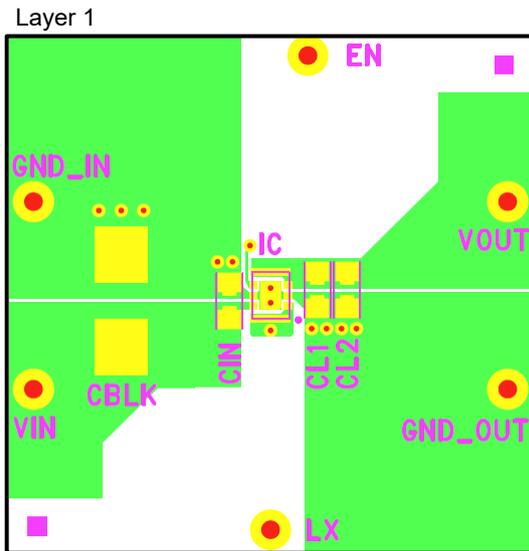
■Notes on handling of product

(1) The coil mounted on this product complies with the general surface mount type chip inductor specifications, and may have scratches, flux stains, etc.

(2) Do not use this product in the following environments. Places exposed to water or salt water, places where condensation occurs, places where toxic gases (hydrogen sulfide, zinc acid, chlorine, ammonia, etc.) are present.

(3) Please do not wash this product with solvent.

■Notes on mounting

(1) Mounting accuracy of 0.05 mm or less is recommended.

(2) The proper position of mounting is based on the coil terminal

■TYPICAL PERFORMANCE CHARACTERISTICS

(1) Efficiency vs. Output Current

MYRGP-W V_OUT(T)=1.2V

MYRGP-B V_OUT(T)=1.2V

MYRGP-W V_OUT(T)=1.8V

MYRGP-B V_OUT(T)=1.8V

MYRGP-W V_OUT(T)=3.3V
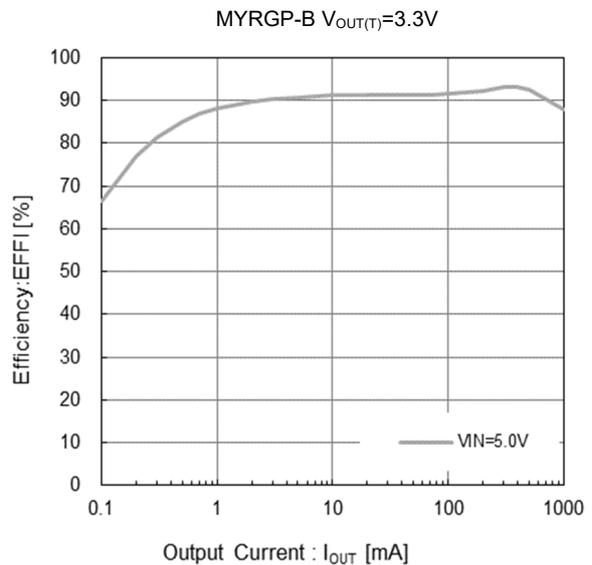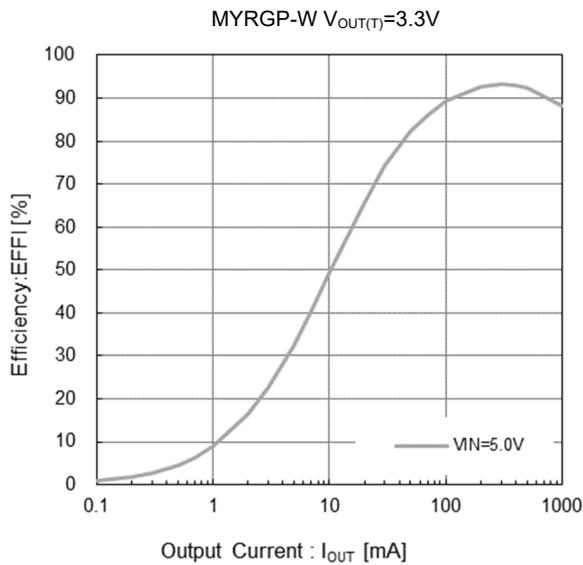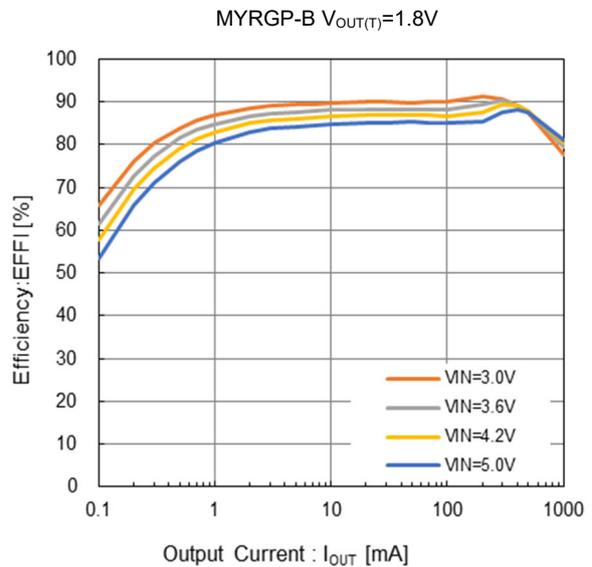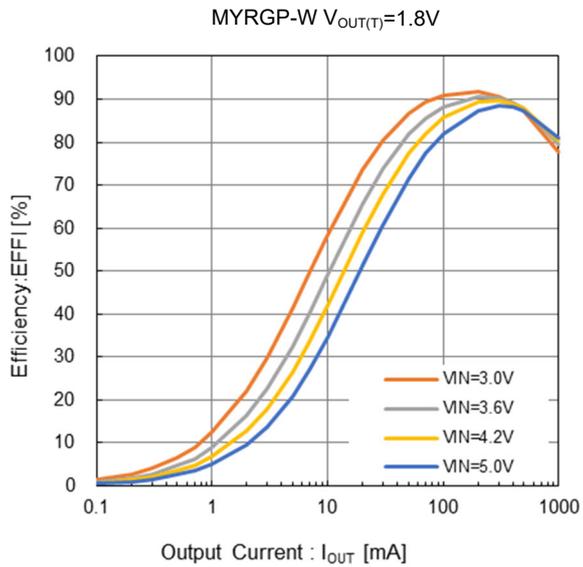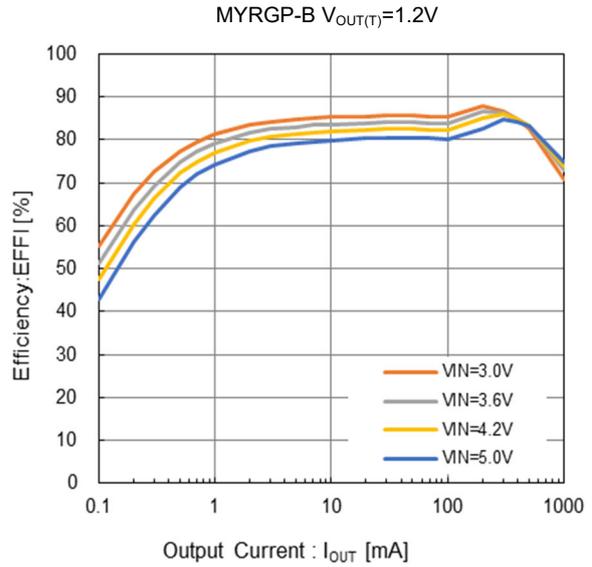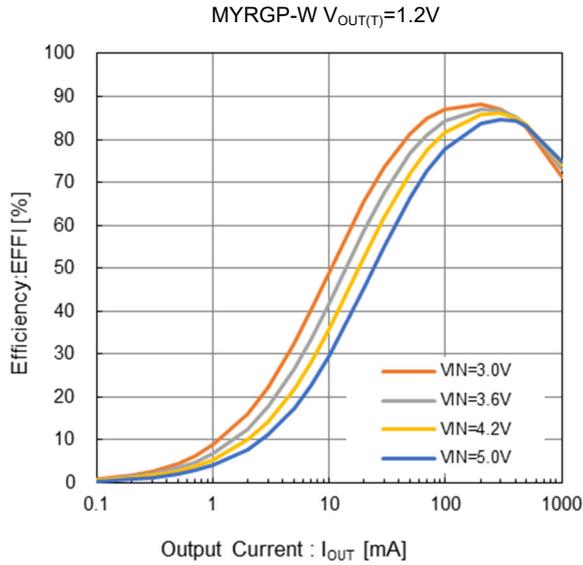
MYRGP-B V_OUT(T)=3.3V

■TYPICAL PERFORMANCE CHARACTERISTICS

(2) Output Voltage vs. Output Current
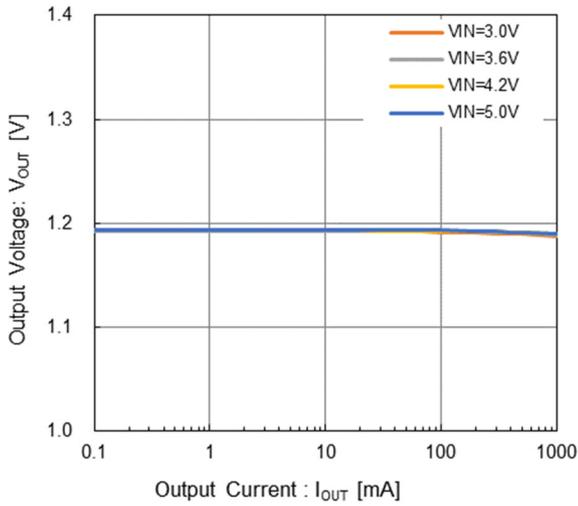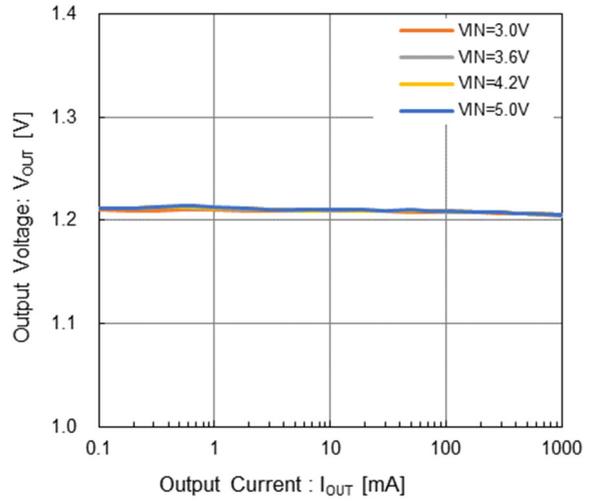
MYRGP-W $V_{OUT(T)}$=1.2V

MYRGP-B $V_{OUT(T)}$=1.2V
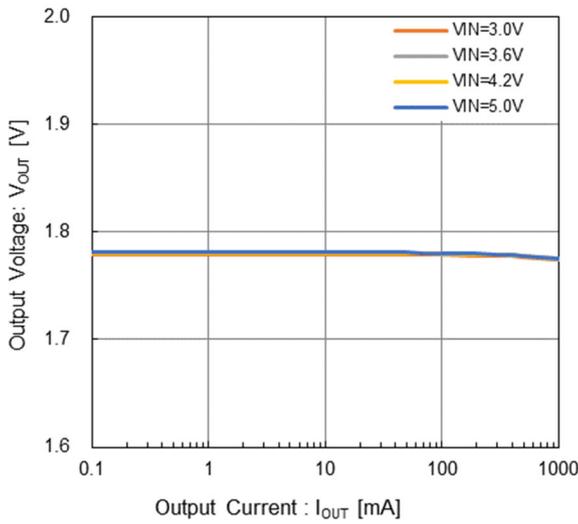
MYRGP-W $V_{OUT(T)}$=1.8V
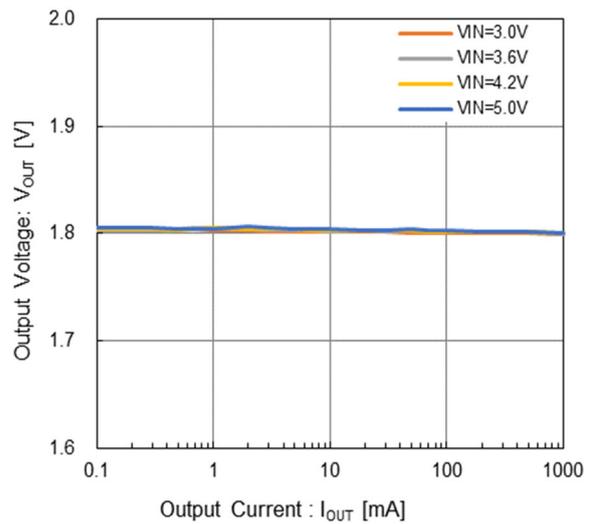
MYRGP-B $V_{OUT(T)}$=1.8V
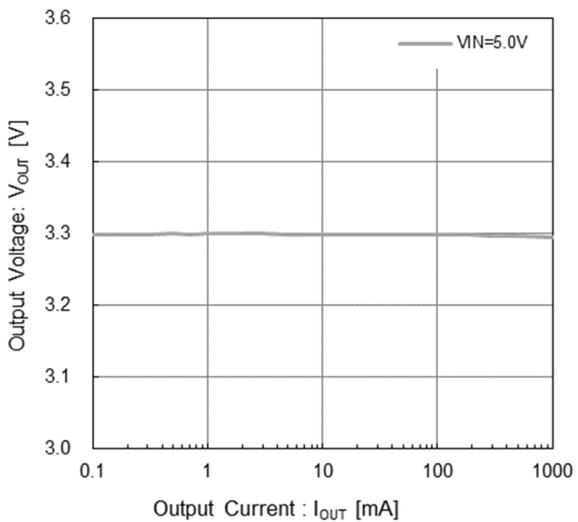
MYRGP-W $V_{OUT(T)}$=3.3V
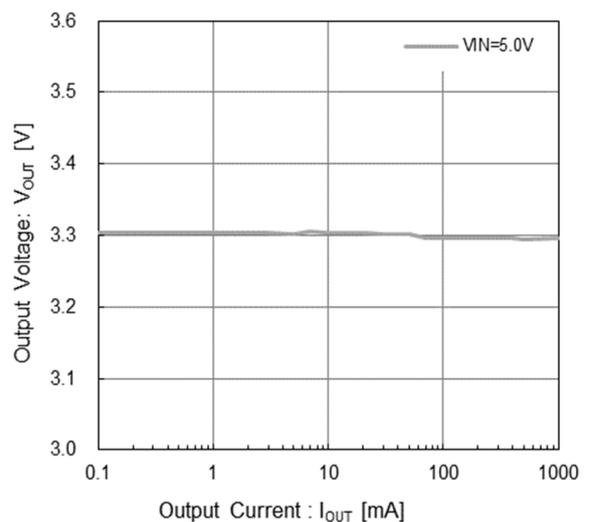
MYRGP-B $V_{OUT(T)}$=3.3V

■TYPICAL PERFORMANCE CHARACTERISTICS

(3) Ripple Voltage vs. Output Current

MYRGP-W $V_{OUT(T)}$=1.2V

MYRGP-B $V_{OUT(T)}$=1.2V

MYRGP-W $V_{OUT(T)}$=1.8V

MYRGP-B $V_{OUT(T)}$=1.8V

MYRGP-W $V_{OUT(T)}$=3.3V
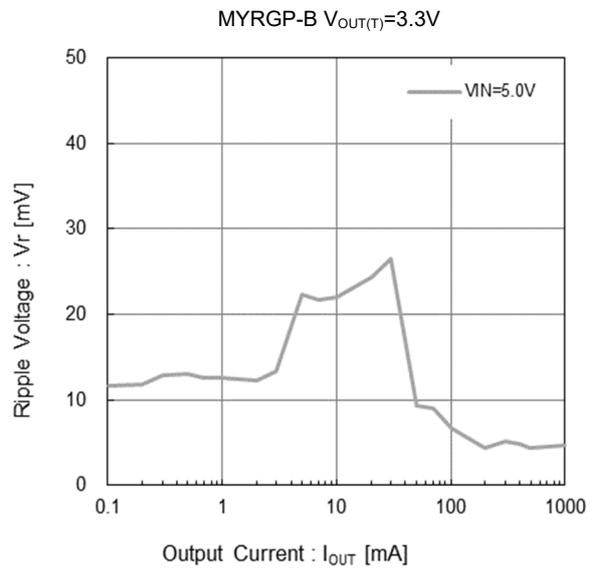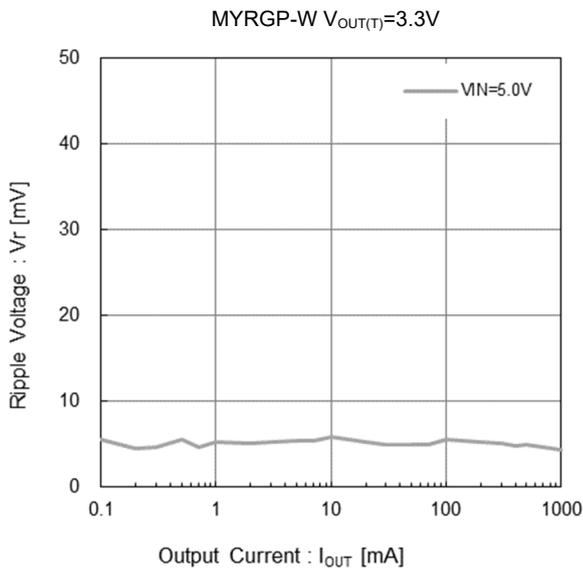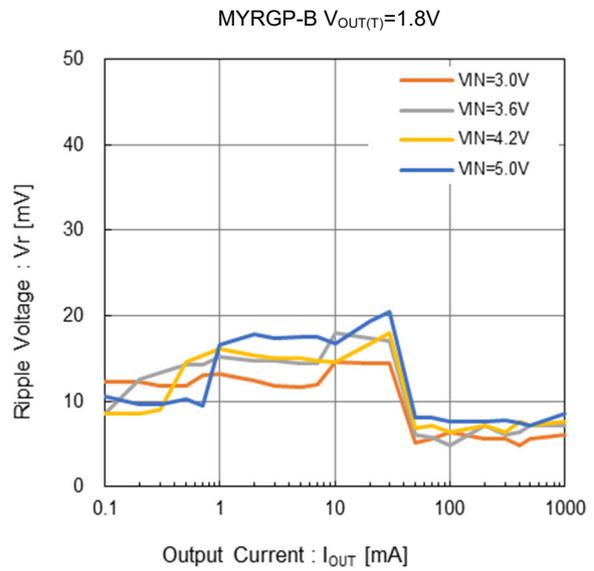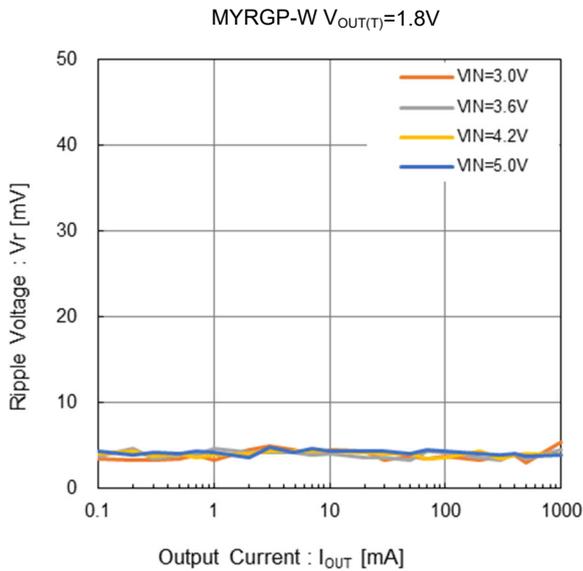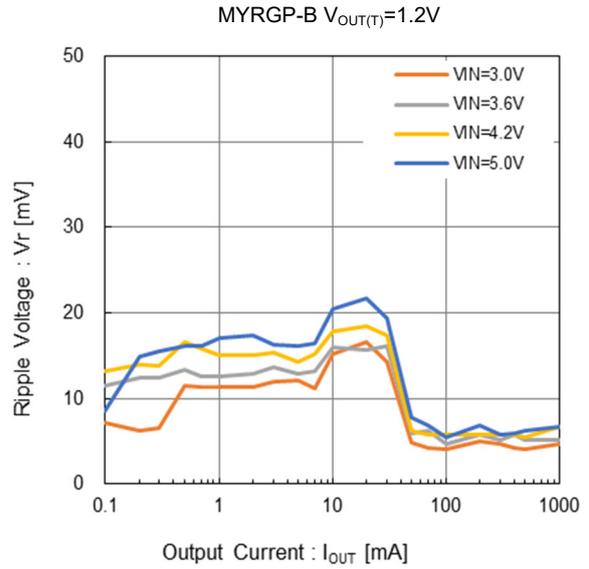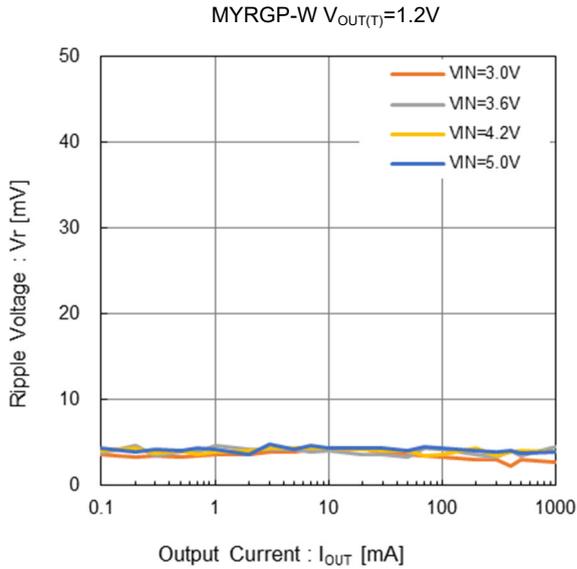
MYRGP-B $V_{OUT(T)}$=3.3V

■TYPICAL PERFORMANCE CHARACTERISTICS

(4) Output Voltage vs. Ambient Temperature

$V_{OUT(T)}$=1.2V
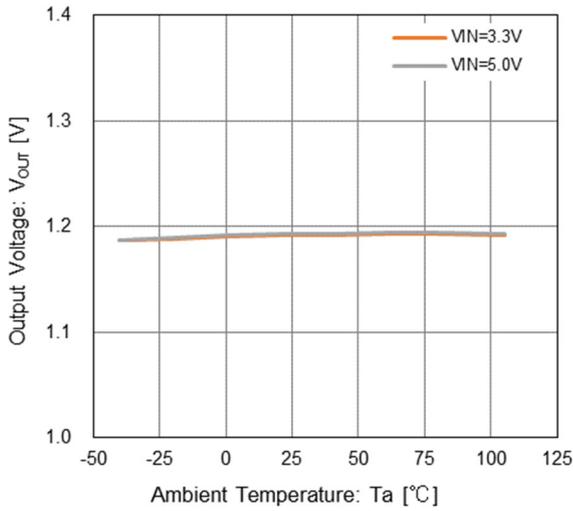
$V_{OUT(T)}$=1.8V
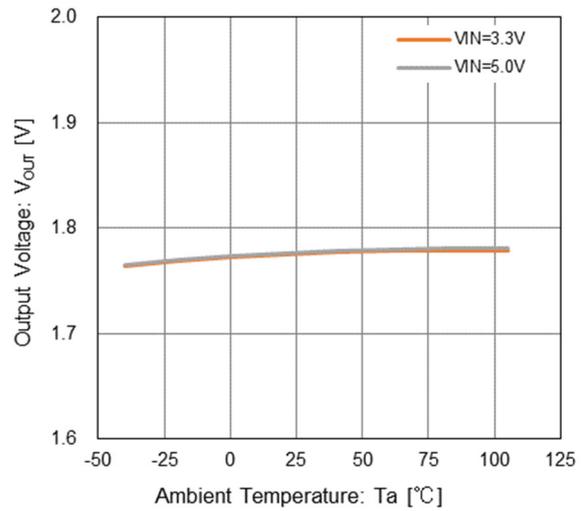
$V_{OUT(T)}$=3.3V
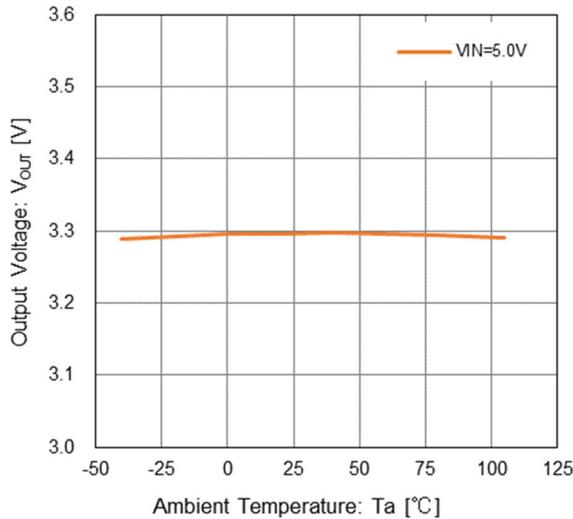
(5) Quiescent Current vs. Ambient Temperature
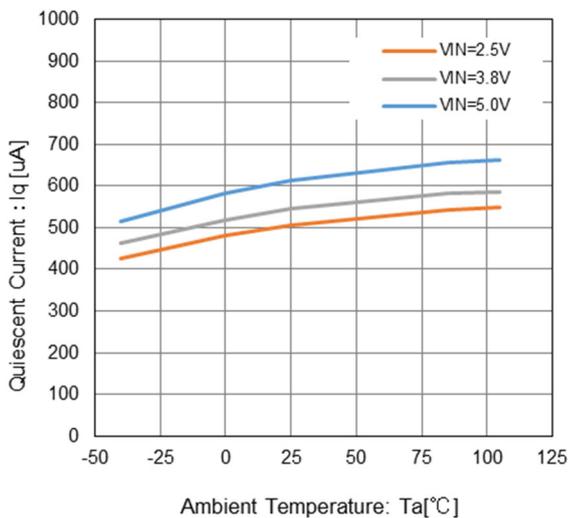
MYRGP-W

MYRGP-B
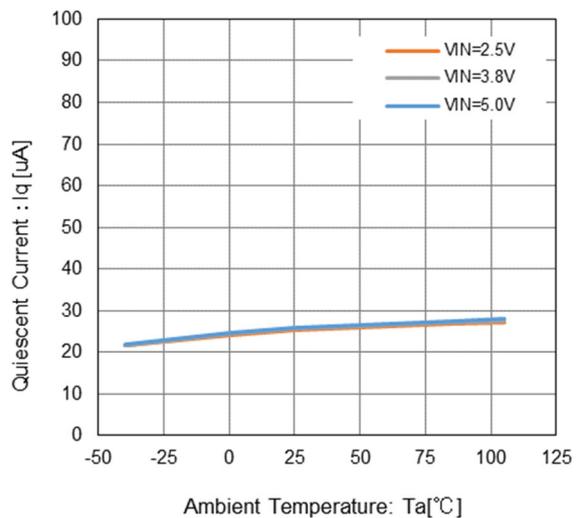
■TYPICAL PERFORMANCE CHARACTERISTICS

(6) Stand-by Current vs. Ambient Temperature
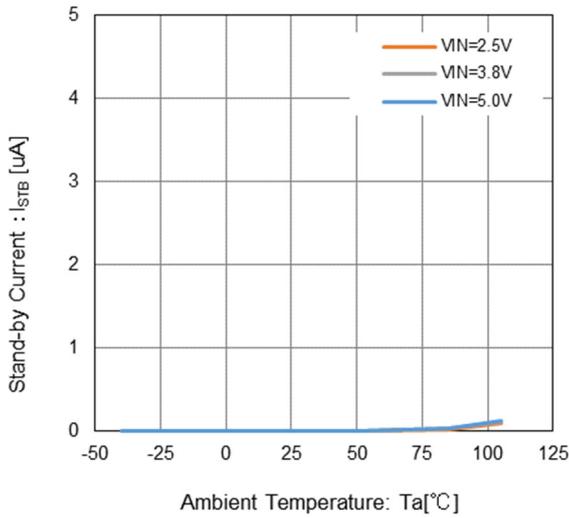
(7) UVLO Voltage vs. Ambient Temperature
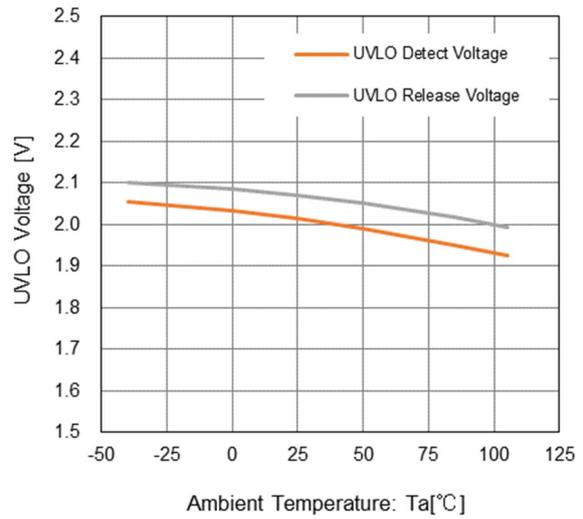
(8) Lx SW "H" ON Resistance vs. Ambient Temperature
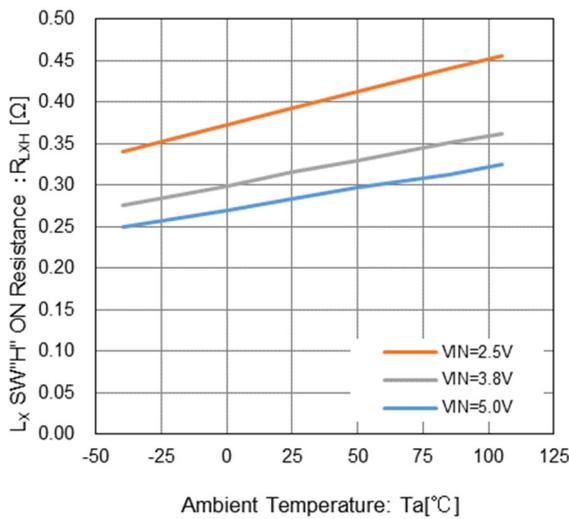
(9) Lx SW "L" ON Resistance vs. Ambient Temperature
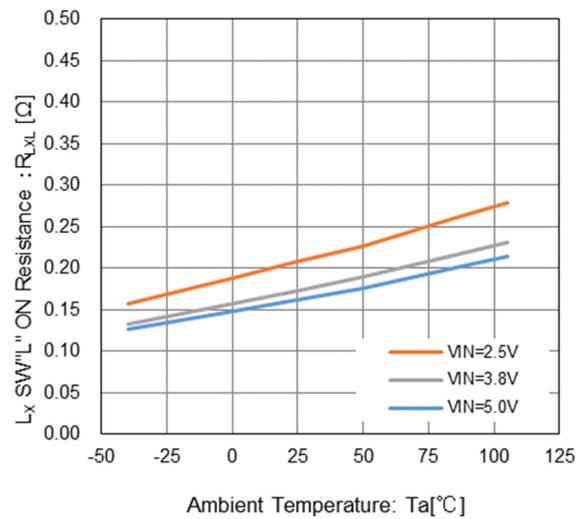
(10) Lx SW "H" Leakage Current vs. Ambient Temperature
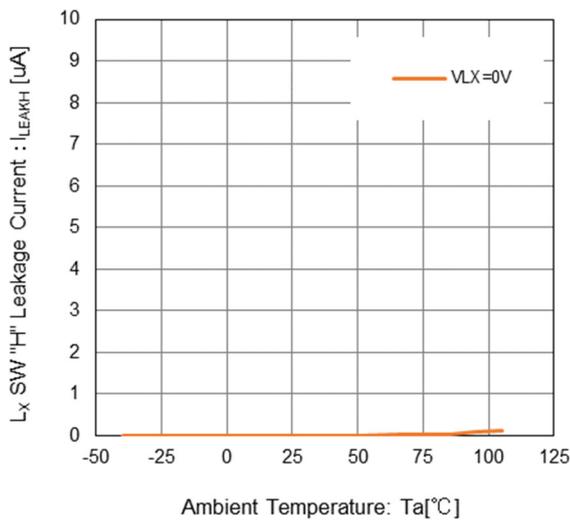
(11) Lx SW "L" Leakage Current vs. Ambient Temperature
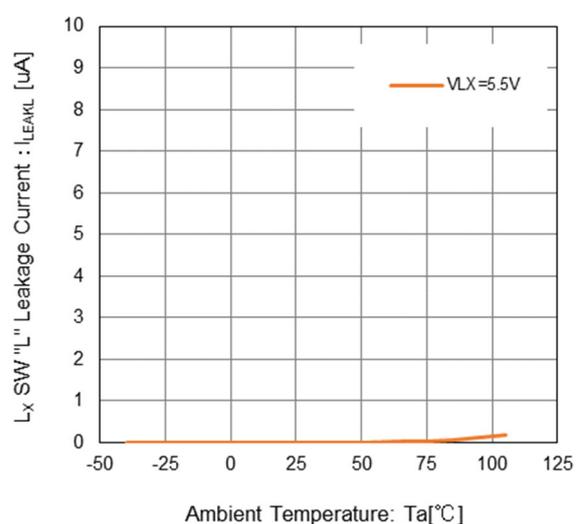
■TYPICAL PERFORMANCE CHARACTERISTICS

(12) Oscillation Frequency vs. Ambient Temperature
MYRGP-W $V_{OUT(T)}$=1.8V, I_{OUT}=300mA
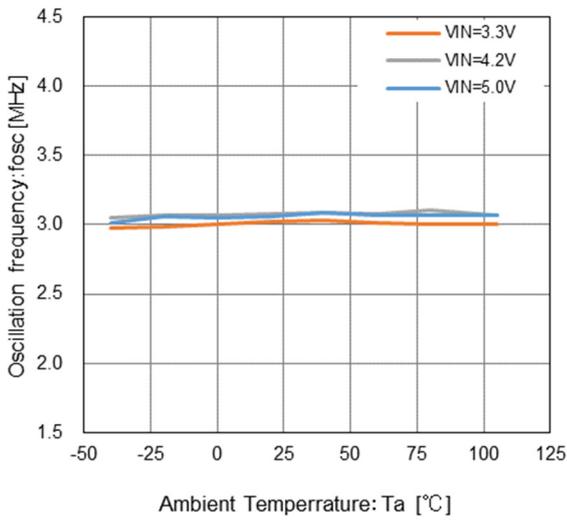
(13) Oscillation Frequency vs. Input Voltage
MYRGP-W $V_{OUT(T)}$=1.8V, I_{OUT}=300mA
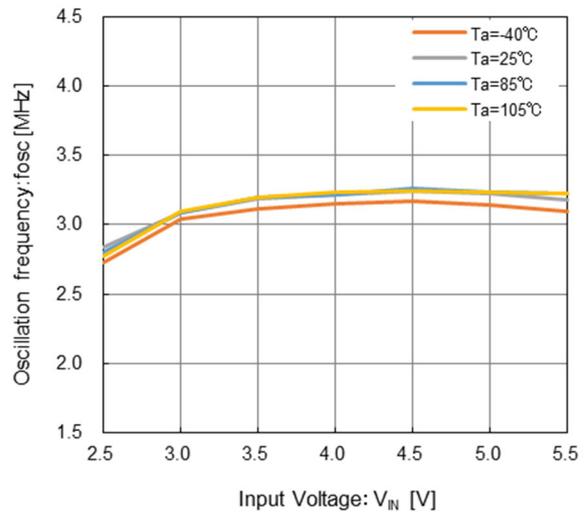
(14) EN "H" Voltage vs. Ambient Temperature
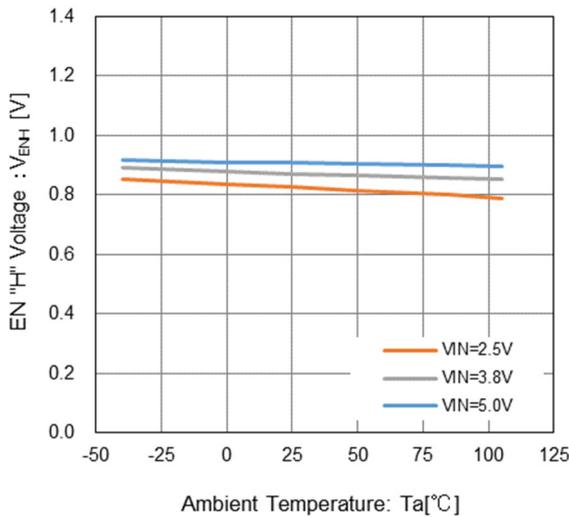
(15) EN "L" Voltage vs. Ambient Temperature
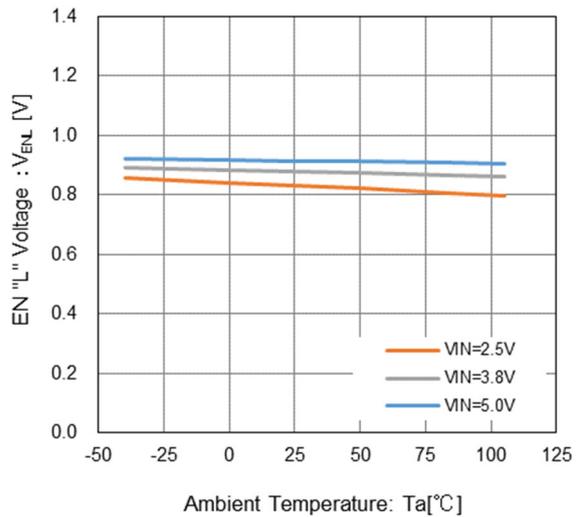
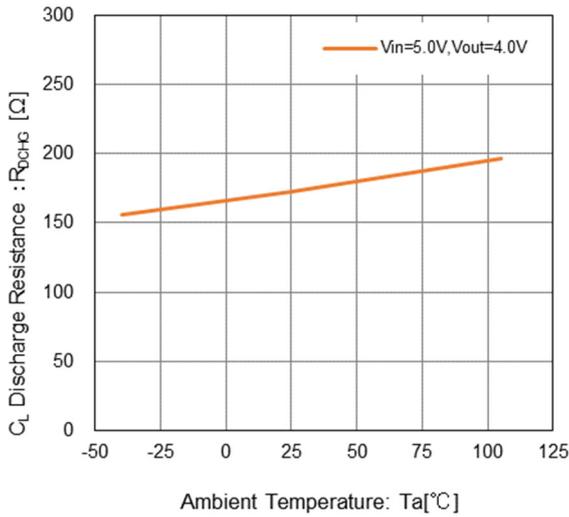(16) Soft Start Time vs. Ambient Temperature
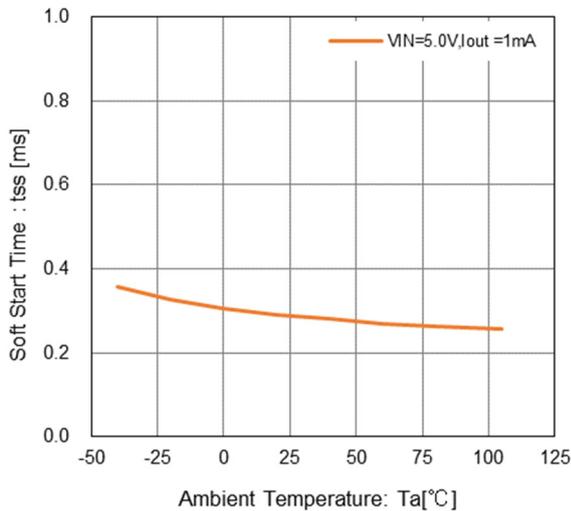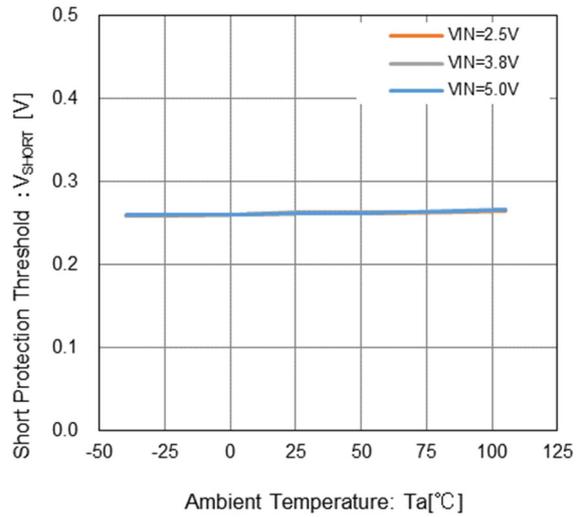

(17) Current Limit vs. Ambient Temperature
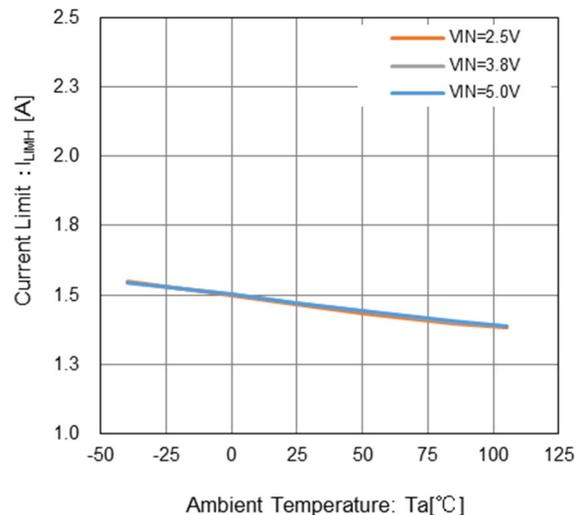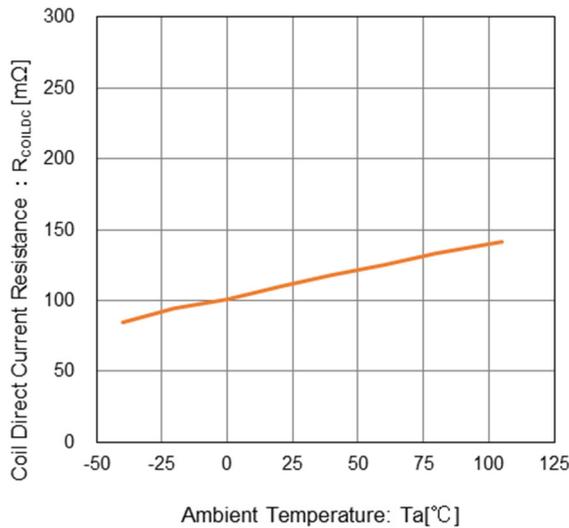
■TYPICAL PERFORMANCE CHARACTERISTICS

(18) C_L Discharge Resistance vs. Ambient Temperature

(19) Short Protection Voltage vs. Ambient Temperature

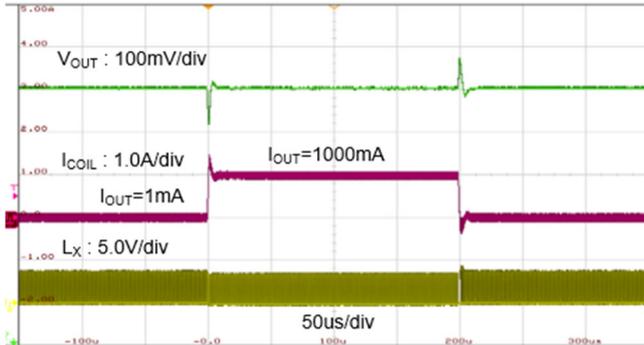(20) Coil Direct Current Resistance vs. Ambient Temperature

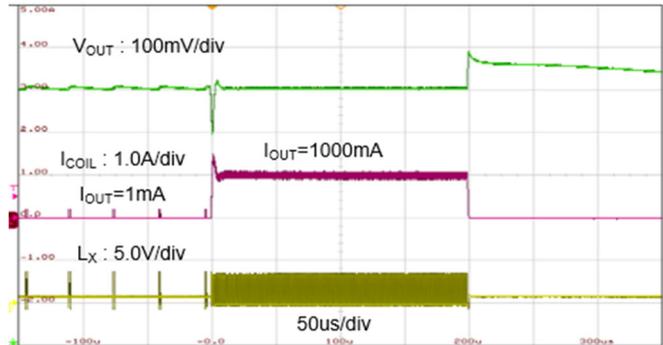# ■TYPICAL PERFORMANCE CHARACTERISTICS

(21) Load Transient Response

MYRGP-W
V_{IN}=3.8V, $V_{OUT(T)}$=0.8V, I_{OUT}=1mA⇔1000mA(tr,tf=1us), Ta=25℃

MYRGP-B
V_{IN}=3.8V, $V_{OUT(T)}$=0.8V, I_{OUT}=1mA⇔1000mA(tr,tf=1us), Ta=25℃

MYRGP-W
V_{IN}=3.8V, $V_{OUT(T)}$=1.8V, I_{OUT}=1mA⇔1000mA(tr,tf=1us), Ta=25℃
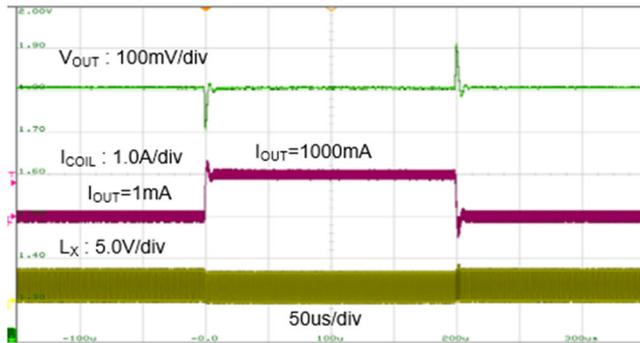
MYRGP-B
V_{IN}=3.8V, $V_{OUT(T)}$=1.8V, I_{OUT}=1mA⇔1000mA(tr,tf=1us), Ta=25℃
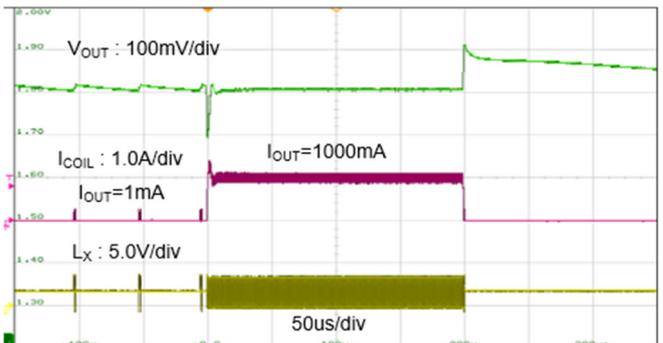
MYRGP-W
V_{IN}=5.5V, $V_{OUT(T)}$=3.6V, I_{OUT}=1mA⇔1000mA(tr,tf=1us), Ta=25℃
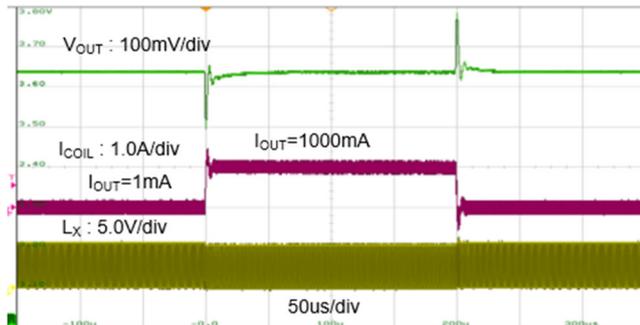
MYRGP-B
V_{IN}=5.5V, $V_{OUT(T)}$=3.6V, I_{OUT}=1mA⇔1000mA(tr,tf=1us), Ta=25℃
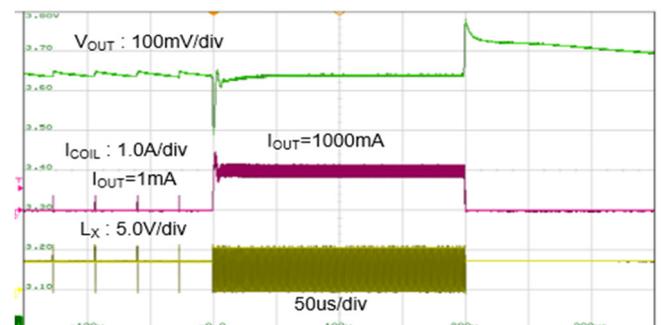
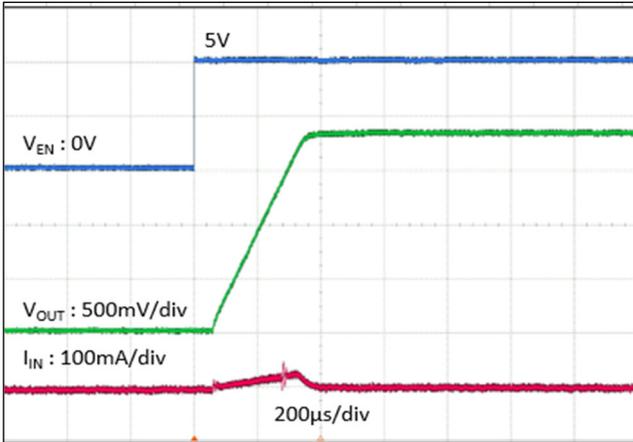■TYPICAL PERFORMANCE CHARACTERISTICS

(22) Start-up

MYRGP-W

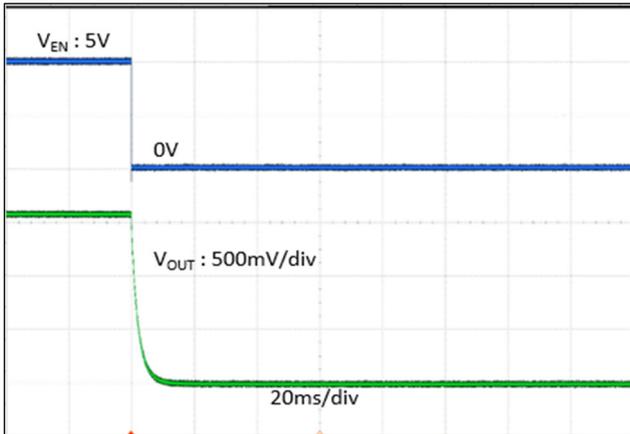V_{IN}=3.6V, $V_{OUT(T)}$=1.8V, V_{EN}=0V⇒5V, R_L=1.8kΩ

MYRGP-B

V_{IN}=3.6V, $V_{OUT(T)}$=1.8V, V_{EN}=0V⇒5V, R_L=1.8kΩ
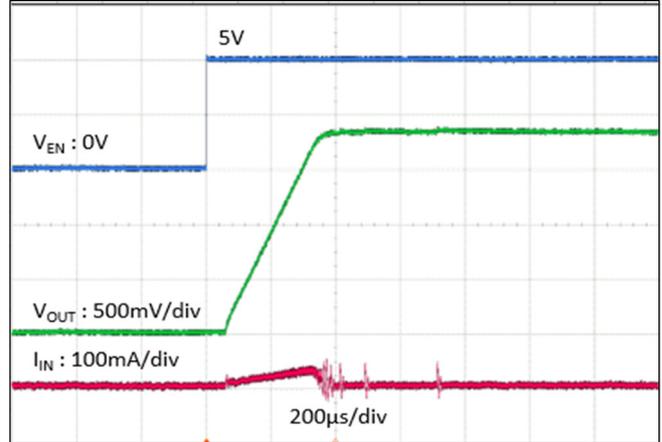
(23) Shutdown

MYRGP-WB

V_{IN}=3.6V, $V_{OUT(T)}$=1.8V, V_{EN}=5V⇒0V, R_L=1.8kΩ

■PACKAGE INFORMATION

Power Dissipation

Power dissipation data for the package is shown in this page.
The value of power dissipation varies with the mount board conditions.
Please use this data as one of reference data taken in the described condition.

1. Measurement Condition (Reference data)

        Condition : Mount on a board

        Ambient   : Natural convection

        Soldering : Lead (Pb) free

        Board Dimensions : 40 x 40 mm (1600mm^2 in one side)

                     Copper (Cu) traces occupy 50% of the board area
                     in top and back faces Package heat-sink
                     is tied to the copper traces.

        Material   : Glass Epoxy (FR-4)

        Thickness   : 1.6 mm

        Through-hole : 4 x 0.8 mm Diameter
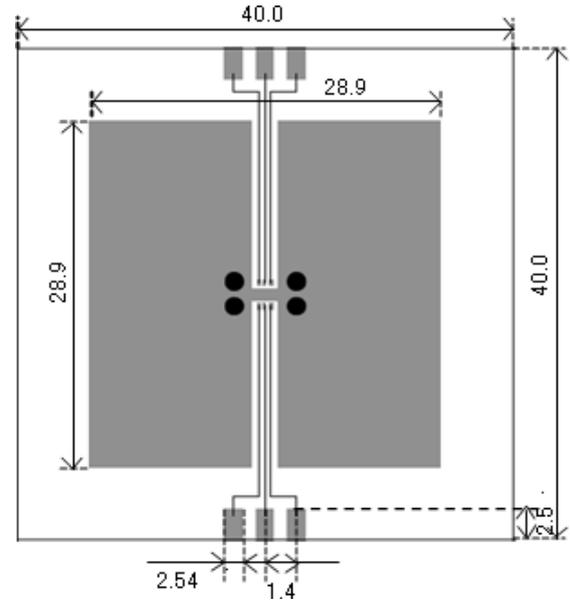
Evaluation Board (Unit:mm)

2. Power Dissipation vs. Ambient Temperature(85℃)
   Board Mount (Tjmax=125℃)

Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	1000	100.00
85	400	
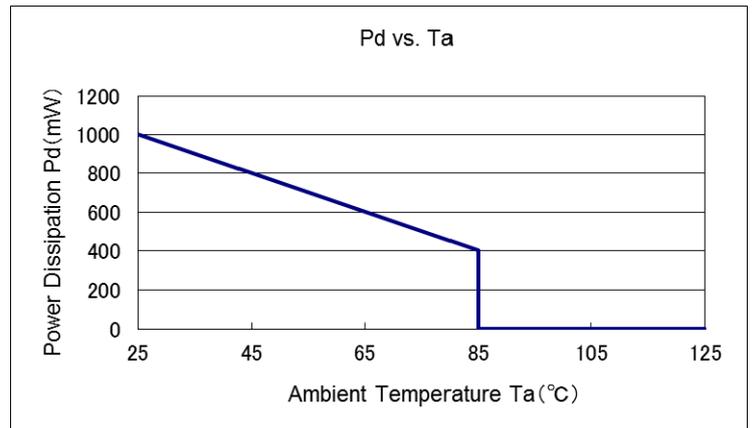
3. Power Dissipation vs. Ambient Temperature(105℃)

Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	1000	100.00
105	200	
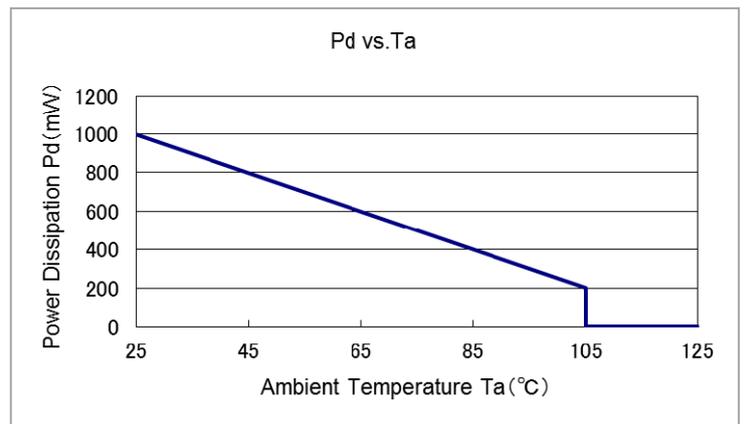
■MARKING RULE

① ：Represents a product series

MARK	PRODUCT SERIES
U	MYRGP-W
V	MYRGP-B
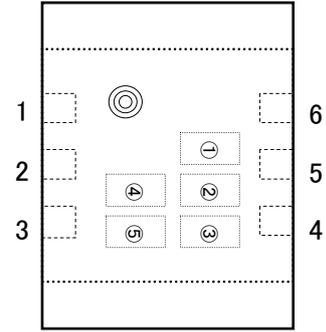
② ：Represents the integer part of the output voltage, and the oscillation frequency.

SYMBOL	V_OUT[V]	Frequency[Hz]	PRODUCT SERIES
N	0.x		MYRGP0**100*21RB
P	1.x	3.0M	MYRGP1**100*21RB
R	2.x		MYRGP2**100*21RB
S	3.x		MYRGP3**100*21RB

③ ：Represents the fractional part of the output voltage.

V_OUT[V]	SYMBOL	PRODUCT SERIES
X.0	0	MYRGP*00100*21RB
X.2	2	MYRGP*20100*21RB
X.3	3	MYRGP*30100*21RB
X.5	5	MYRGP*50100*21RB
X.8	8	MYRGP*80100*21RB

④, ⑤：Represents production lot number 01～09、0A～0Z、11～9Z、A1～A9、AA～AZ、B1～ZZ in order.
(G, I, J, O, Q, W excluded)

■REEL DIMENSION

11.4±1.0

60 +1 -0

180 +0 -3

9.0±0.3

2±0.5

Φ13±0.2

10.5±0.4

(1.5)

3,000pcs/Reel

unit: mm

■TAPING SPECIFICATIONS

2.0±0.05

4.0±0.1

φ1.5 +0.1 -0

1.75±0.1

3.5±0.05

8.0±0.2

4.0±0.1

(φ1.1)

(0.25)

(2.9)

(1.15)

(2.4)

Direction of feed
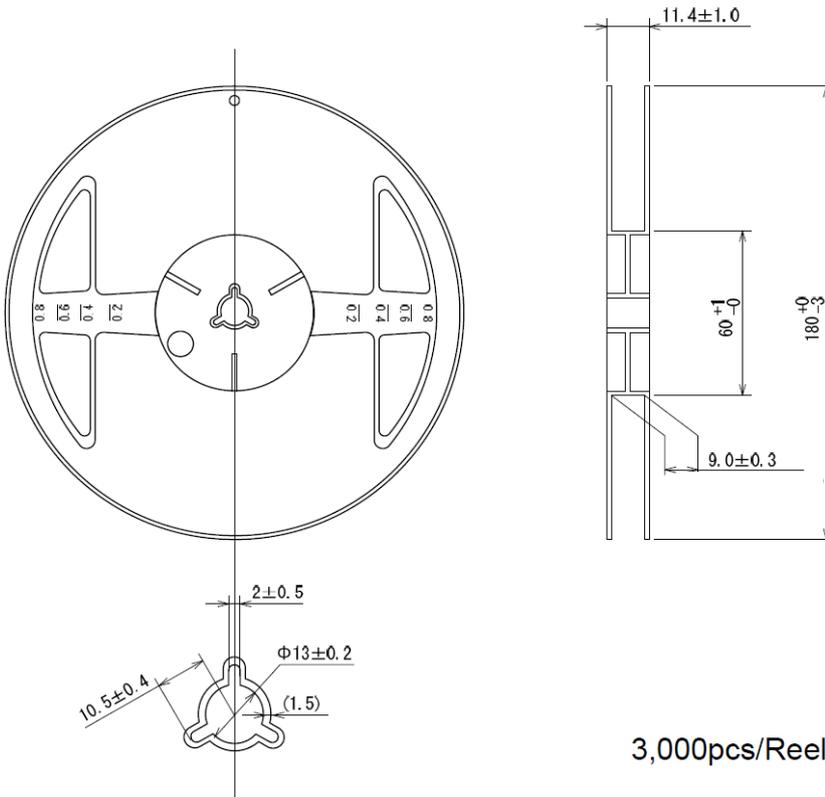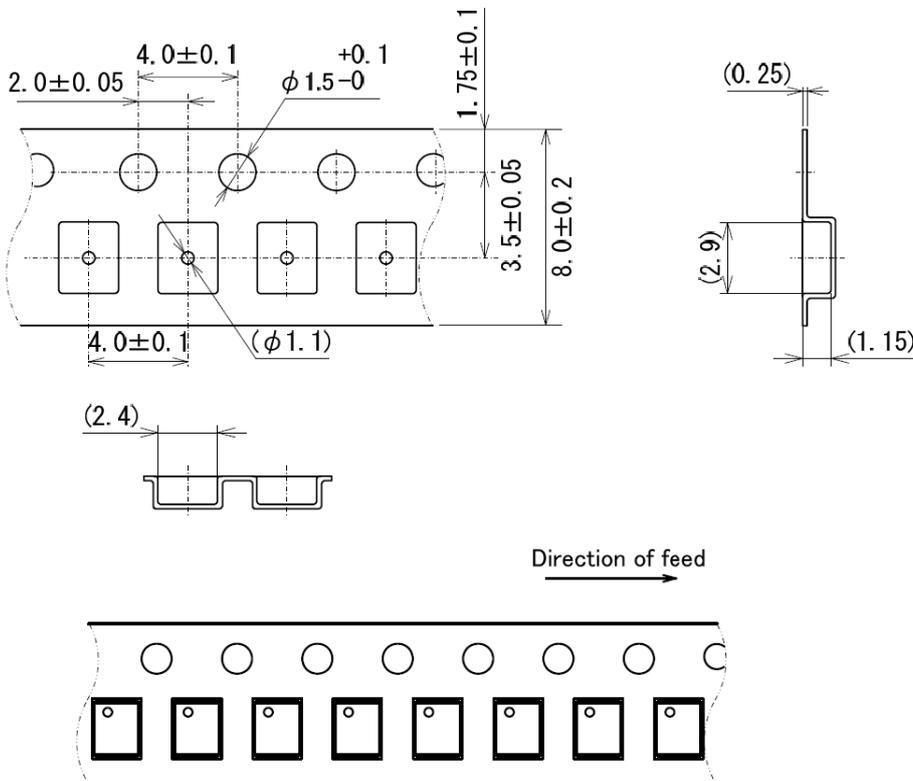
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2. The information in this datasheet is intended to illustrate the operation and characteristics of our products. We neither make warranties or representations with respect to the accuracy or completeness of the information contained in this datasheet nor grant any license to any intellectual property rights of ours or any third party concerning with the information in this datasheet.

3. Applicable export control laws and regulations should be complied, and the procedures required by such laws and regulations should also be followed, when the product or any information contained in this datasheet is exported.

4. The product is neither intended nor warranted for use in equipment of systems which require extremely high levels of quality and/or reliability and/or a malfunction or failure which may cause loss of human life, bodily injury, serious property damage including but not limited to devices or equipment used in 1) nuclear facilities, 2) aerospace industry, 3) medical facilities, 4) automobile industry and other transportation industry and 5) safety devices and safety equipment to control combustions and explosions. Do not use the product for the above use unless agreed by us in writing in advance.

5. Although we make continuous efforts to improve the quality and reliability of our products; nevertheless, Semiconductors are likely to fail with a certain probability. So in order to prevent personal injury and/or property damage resulting from such failure, customers are required to incorporate adequate safety measures in their designs, such as system fail safes, redundancy and fire prevention features.

6. Our products are not designed to be Radiation-resistant.

7. Please use the product listed in this datasheet within the specified ranges.

8. We assume no responsibility for damage or loss due to abnormal use.

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