1 A Voltage Regulator (Operating Voltage up to 16 V) for Automotive Applications

NO.EC-183-131101

OUTLINE

The R1190x series are a low supply current voltage regulator with high output voltage accuracy. The maximum operating voltage is 16V and the output current is 1A. Each of these ICs consists of a voltage reference unit, an error amplifier, a resistor-net for voltage setting, as a short current protection, a peak current protection, a thermal shutdown, an inrush current limit and a chip enable circuit. The wide input voltage range (Max. 16V). Additionally, the output voltage is fixed internally, in the range from 2.0V to 12.0V by the 0.1V steps. The supply current of R1190x series is excellent (Typ. 150μA) moreover R1190x series has the standby mode (Typ. 0.1μA) by the chip enable function.

Since the package for these ICs are TO-252-5-P2 and HSOP-6J with high power dissipation, high density mounting of the ICs on boards is possible.

FEATURES

- Input Voltage Range (Maximum Rating) ....3.5V to 16V (18 V)
- Supply Current....................................... Typ. 150μA
- Standby Current..................................... Typ. 0.1μA
- Output Voltage Range ....2.0V to 12.0V (0.1V steps)
- Output Voltage Accuracy .... ±1.5%
- Temperature-Drift Coefficient of Output Voltage... Typ. ±100ppm/°C
- Dropout Voltage... Typ. 1.1V (I_{OUT}=1A, V_{OUT}=5V)
- Output Current... Min. 1A (3.3V ≤ V_{OUT} ≤ 12.0V)
- Line Regulation.. Typ. 0.02%/V
- Ripple Rejection .... Typ. 60 dB
- Packages.. HSOP-6J, TO-252-5-P2
- Built-in Fold Back Protection Circuit......................Typ.300mA (Current at short mode)
- Built-in Thermal Shutdown Circuit
- Built-in Inrush Current Limit Circuit........................The Delay Pin for setting Inrush Current Limit Time

APPLICATIONS

- Power source for accessories such as car audios, car navigation systems, and ETC systems

BLOCK DIAGRAMS

R1190xxxxB   **R1190xxxxD**
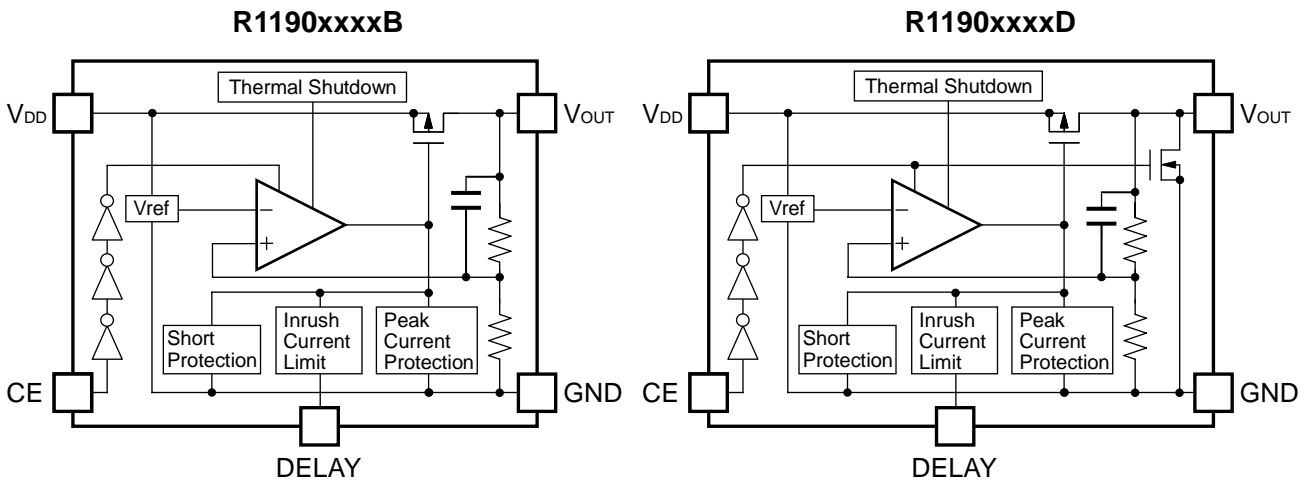
SELECTION GUIDE

The output voltage, auto discharge function, package for the ICs can be selected at the user's request.

Product Name	Package	Quantity per Reel	Pb Free	Halogen Free
R1190Sxxx∗-E2-#E	HSOP-6J	1,000 pcs	Yes	Yes
R1190Jxxx∗-T1-#E	TO-252-5-P2	3,000 pcs	Yes	Yes

xxx : The output voltage can be designated in the range of 2.0V(020) to 12.0V(120) in 0.1V steps.

∗ : The auto discharge function at off state are options as follows.
   (B) without auto discharge function at off state
   (D) with auto discharge function at off state

#: Specify Automotive Class Code

	Operating Temperature Range	Guaranteed Specs Temperature Range	Screening
A	−40°C ~ 85°C	25°C	High Temperature

Auto-discharge function quickly lowers the output voltage to 0V by releasing the electrical charge accumulated in the external capacitor when the chip enable signal is switched from the active mode to the standby mode.

Nisshinbo Micro Devices Inc.

PIN DESCRIPTIONS
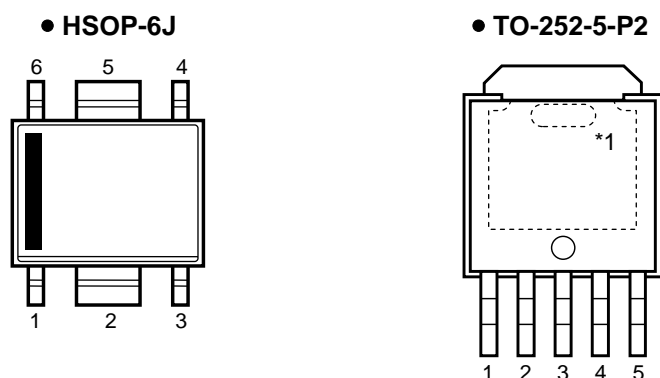
● **HSOP-6J**   ● **TO-252-5-P2**

● **HSOP-6J**

Pin No.	Symbol	Description
1	V_{OUT}	Output Pin
2	GND	Ground Pin
3	CE	Chip Enable Pin ("H" Active)
4	DELAY	Delay Pin (for setting Inrush Current Limit Time)
5	GND	Ground Pin
6	V_{DD}	Input Pin

● **TO-252-5-P2**

Pin No.	Symbol	Description
1	DELAY	Delay Pin (for setting Inrush Current Limit Time)
2	V_{DD}	Input Pin
3	GND	Ground Pin
4	V_{OUT}	Output Pin
5	CE	Chip Enable Pin ("H" Active)

[1] The tab on the bottom of the package enhances thermal performance and is electrically connected to GND (substrate level). It is recommended that the tab be connected to the ground plane on the board, or otherwise be left open.

Nisshinbo Micro Devices Inc.

R1190x
NO.EC-183-131101

ABSOLUTE MAXIMUM RATINGS

Symbol	Item			Rating	Unit
V_{IN}	Input Voltage			-0.3 to 18	V
V_{CE}	Input Voltage (CE Pin)			-0.3 to $V_{IN}+0.3 \leq 18$	V
V_{OUT}	Output Voltage			-0.3 to $V_{IN}+0.3 \leq 18$	V
P_D	Power Dissipation	HSOP-6J[*]	Standard Land Pattern	1700	mW
			Ultra High Wattage Land Pattern	2700	
		TO-252-5-P2[*]	Standard Land Pattern	1900	
			Ultra High Wattage Land Pattern	3800	
Tj	Junction Temperature			-40 to 125	°C
T_{stg}	Storage Temperature Range			-55 to 125	°C

∗) Refer to *PACKAGE INFORMATION* for detailed information.

ABSOLUTE MAXIMUM RATINGS

Electronic and mechanical stress momentarily exceeded absolute maximum ratings may cause the permanent damages and may degrade the life time and safety for both device and system using the device in the field.
The functional operation at or over these absolute maximum ratings is not assured.

RECOMMENDED OPERATING RATINGS

Symbol	Item	Rating	Unit
V_{IN}	Input Voltage	3.5 to 16	V
Ta	Operating Temperature Range	-40 to 85	°C

RECOMMENDED OPERATING RATINGS

All of electronic equipment should be designed that the mounted semiconductor devices operate within the recommended operating ratings. The semiconductor devices cannot operate normally over the recommended operating ratings, even if when they are used over such ratings by momentary electronic noise or surge. And the semiconductor devices may receive serious damage when they continue to operate over the recommended operating ratings.

4

ELECTRICAL CHARACTERISTICS

V_{IN}=CE=Set V_{OUT} + 2.0V, C_{IN}=4.7μF, C_{OUT}=4.7μF, I_{OUT}=1mA, unless otherwise noted.
The specifications surrounded by ☐ are guaranteed by Design Engineering at −40°C ≦ Ta ≦ 85°C.

R1190xxxxB/D

(Ta=25°C)

Symbol	Item	Conditions		MIN.	TYP.	MAX.	Unit
V_{OUT}	Output Voltage	I_{OUT}=1mA	Ta=25°C	x 0.985		x 1.015	V
			-40°C ≦ Ta ≦ 85°C	x 0.973		x 1.027	
I_{LIM}	Output Current Limit	V_{IN}=V_{OUT}+2.3V	2.0 ≦ V_{OUT}<2.5	600			mA
			2.5 ≦ V_{OUT}<3.3	700			
			3.3 ≦ V_{OUT} ≦ 12.0	1000			
ΔV_{OUT} /ΔI_{OUT}	Load Regulation	Please see the following table *(1)					
V_{DIF}	Dropout Voltage	Please see the following table *(2)					
I_{SS}	Supply Current	I_{OUT}=0mA			150	220	μA
Istandby	Supply Current (CE Off State)	V_{IN}=16V V_{CE}=0V			0.1	1.0	μA
ΔV_{OUT} /ΔV_{IN}	Line Regulation	V_{OUT}+0.5V(Min. 3.5V) ≦ V_{IN} ≦ 16V I_{OUT}=1mA			0.02	0.10	%/V
I_{SC}	Short Current Limit	V_{OUT}=0V			300		mA
V_{CEH}	CE Input Voltage "H"			1.6		V_{IN}	V
V_{CEL}	CE Input Voltage "L"			0.0		0.6	V
T_{TSD}	Thermal Shutdown Temperature	Junction Temperature			150		°C
T_{TSR}	Thermal Shutdown Released Temperature	Junction Temperature			130		°C
R_{LOW}	Nch On Resistance for Auto Discharge (D Version Only)	V_{IN}=5.0V V_{CE}=0V V_{OUT}=0.3V			100		Ω

All of units are tested and specified under pulse load conditions such that Tj≈Ta=25°C except for Thermal Shutdown, Load Regulation at 0.1mA ≦ V_{OUT} ≦ 600mA(2.0 ≦ V_{OUT}<2.5V) and at 0.1mA ≦ V_{OUT} ≦ 700mA(2.5 ≦ V_{OUT}<3.3V) and at 0.1mA ≦ V_{OUT} ≦ 1000mA(3.3 ≦ V_{OUT} ≦ 12.0V), Dropout Voltage at I_{OUT}=600mA(2.0 ≦ V_{OUT}<2.5V) and at I_{OUT}=700mA(2.5 ≦ V_{OUT}<3.3V) and at I_{OUT}=1000mA(3.3 ≦ V_{OUT} ≦ 12.0V)

Nisshinbo Micro Devices Inc.

V_{IN}=CE=Set V_{OUT} + 2.0V, C_{IN}=4.7μF, C_{OUT}=4.7μF, I_{OUT}=1mA, unless otherwise noted.
The specifications surrounded by ☐ are guaranteed by Design Engineering at −40°C $\leqq$ Ta $\leqq$ 85°C.

*(1) Load Regulation
(Ta=25°C)

Output Voltage V_{OUT} (V)	Load Regulation $\Delta V_{out}/\Delta I_{OUT}$ (mV)			
	Condition		Typ.	Max.
2.0 $\leqq$ V_{OUT}<2.5	V_{IN}=V_{OUT}+2.3V	1mA $\leqq$ I_{OUT} $\leqq$ 200mA	20	60
		1mA $\leqq$ I_{OUT} $\leqq$ 600mA	80	180
2.5 $\leqq$ V_{OUT}<3.3	V_{IN}=V_{OUT}+2.3V	1mA $\leqq$ I_{OUT} $\leqq$ 200mA	20	60
		1mA $\leqq$ I_{OUT} $\leqq$ 700mA	90	200
3.3 $\leqq$ V_{OUT}<5.0	V_{IN}=V_{OUT}+2.3V	1mA $\leqq$ I_{OUT} $\leqq$ 200mA	20	60
		1mA $\leqq$ I_{OUT} $\leqq$ 1000mA	120	230
5.0 $\leqq$ V_{OUT} $\leqq$ 12.0	V_{IN}=V_{OUT}+2.3V	1mA $\leqq$ I_{OUT} $\leqq$ 200mA	40	100
		1mA $\leqq$ I_{OUT} $\leqq$ 1000mA	130	250

*(2) Dropout Voltage
(Ta=25°C)

Output Voltage V_{OUT} (V)	Dropout Voltage V_{DIF} (V)			Output Voltage V_{OUT} (V)	Dropout Voltage V_{DIF} (V)		
	Condition	Typ.	Max.		Condition	Typ.	Max.
2.0	I_{OUT}=200mA		1.5	2.0 $\leqq$ V_{OUT}<2.5	I_{OUT}=600mA	1.6	2.2
2.1			1.4				
2.2			1.3				
2.3			1.2				
2.4			1.1				
2.5			1.0	2.5 $\leqq$ V_{OUT}<3.3	I_{OUT}=700mA	1.5	2.15
2.6			0.9				
2.7			0.8				
2.8 $\leqq$ V_{OUT}<3.1			0.7				
3.1 $\leqq$ V_{OUT}<3.3		0.4	0.7	3.3 $\leqq$ V_{OUT} $\leqq$ 12.0	I_{OUT}=1000mA	1.6	2.3
3.3 $\leqq$ V_{OUT}<4.0		0.3	0.53			1.4	2.1
4.0 $\leqq$ V_{OUT}<5.0		0.25	0.42			1.1	1.85
5.0 $\leqq$ V_{OUT}<9.0		0.19	0.31			0.8	1.30
9.0 $\leqq$ V_{OUT} $\leqq$ 12.0		0.1	0.18				

All of units are tested and specified under pulse load conditions such that Tj≈Ta=25°C except for Thermal Shutdown, Load Regulation at 0.1mA $\leqq$ V_{OUT} $\leqq$ 600mA(2.0 $\leqq$ V_{OUT}<2.5V) and at 0.1mA $\leqq$ V_{OUT} $\leqq$ 700mA(2.5 $\leqq$ V_{OUT}<3.3V) and at 0.1mA $\leqq$ V_{OUT} $\leqq$ 1000mA(3.3 $\leqq$ V_{OUT} $\leqq$ 12.0V), Dropout Voltage at I_{OUT}=600mA(2.0 $\leqq$ V_{OUT}<2.5V) and at I_{OUT}=700mA(2.5 $\leqq$ V_{OUT}<3.3V) and at I_{OUT}=1000mA(3.3 $\leqq$ V_{OUT} $\leqq$ 12.0V)

Nisshinbo Micro Devices Inc.

TYPICAL APPLICATION

(External Components)
C1, C2: Ceramic Capacitor 4.7μF   Nippon Chemi-con Corporation   KTD500B475M43A0T00

TECHNICAL NOTES

When using these ICs, consider the following points:

Phase Compensation

In these ICs, phase compensation is made for securing stable operation even if the load current is varied. For this purpose, use a capacitor C_{OUT} with good frequency characteristics and ESR (Equivalent Series Resistance). (Note: If additional ceramic capacitors are connected with parallel to the output pin with an output capacitor for phase compensation, the operation might be unstable. Because of this, test these ICs with as same external components as ones to be used on the PCB.)

PCB Layout

Make V_{DD} and GND lines sufficient. If their impedance is high, noise pickup or unstable operation may result. Connect a capacitor with a capacitance value as much as 4.7μF or more between V_{DD} and GND pin, and as close as possible to the pins.

Set external components, especially the output capacitor, as close as possible to the ICs, and make wiring as short as possible. (Refer to the TYPICAL APPLICATION diagram above.)

Thermal Shutdown

There is the built-in thermal-shutdown function in R1190x series. It discontinues operation of the IC when the junction temperature becomes over 150°C (Typ.) and IC re-operates when the junction temperature under 130°C. If the temperature increasing keeps the IC repeats ON and OFF operating. The output becomes the pulse condition.

Chip Enable Circuit

For the output voltage stability, please do not use the intermediate electric potential (the voltage value between V_{CEH} and V_{CEL}) that causes the supply current increasing and the unstable of output voltage.

Inrush-Current Limit Function

R1190x Series has the function to limit the inrush-current, it limited approximately 0.3A when the voltage regulator is turn ON. It is also possible to set time of the rush-current limitation by connecting capacitor with DELAY pin. The rush-current time (t_D) and the value of capacitor ($C_D(F)$) is calculatable by the following formula;

$$t_D=(0.000198+(3.79\times10^7\times C_D))\times V_{IN}$$

The inrush-current is limited even if the capacitor is not connected with the DELAY pin. In this case, the time is calculated as $C_D=0$ by the formula above.

Though, if the value of time is insufficient for controlling the inrush-current, please connect the capacitor with DELAY pin. The DELAY pin is used as OPEN when the capacitor is not used. Please use the DELAY pin as OPEN when the capacitor is not used.

Auto-Discharge Function

R1190xxxxD series has the auto-discharge function. When "L" signal is put into the Chip-enable pin (CE), the switch between V_{OUT} and GND is turned ON and the charge at capacitor is discharge rapidly by the auto-discharge function.

TYPICAL APPLICATION FOR IC CHIP BREAKDOWN PREVENTION
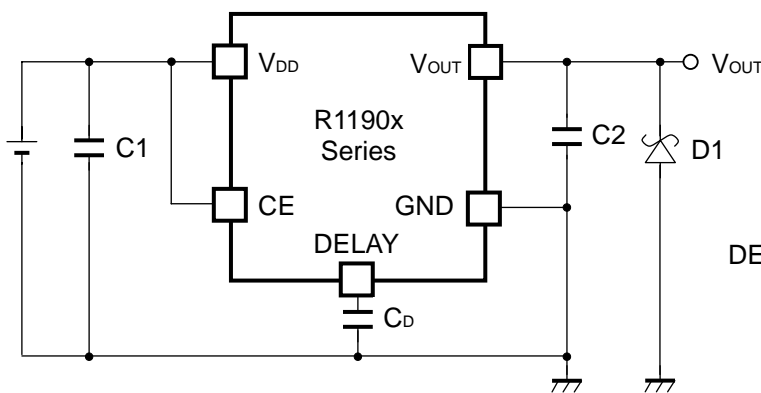
DELAY pin is OPEN when C_D pin is not used.

(External Components)
C1, C2: Ceramic Capacitor 4.7μF   Nippon Chemi-con Corporation   KTD500B475M43A0T00

When a sudden surge of electrical current travels along the V_{OUT} pin and GND due to a short-circuit, electrical resonance of a circuit involving an output capacitor (C2) and a short circuit inductor generates a negative voltage and may damage the device or the load devices. To prevent damage to the device or the load devices, it is recommended that a schottky diode (D1) be connected between the V_{OUT} pin and GND.

PACKAGE INFORMATION

POWER DISSIPATION (HSOP-6J)

Power Dissipation (P_D) depends on conditions of mounting on board. This specification is based on the measurement at the condition below:

Measurement Conditions

	Ultra High Wattage Land Pattern	Standard Land Pattern
Environment	Mounting on Board (Wind velocity=0m/s)	Mounting on Board (Wind velocity=0m/s)
Board Material	Glass cloth epoxy plastic (4 Layers)	Glass cloth epoxy plastic (2 Layers)
Board Dimensions	76.2mm × 114.3mm × 0.8mm	50mm × 50mm × 1.6mm
Copper Ratio	96%	50%
Through-hole	ϕ0.3mm × 28pcs	ϕ0.5mm × 24pcs

Measurement Result (Ta=25°C, Tjmax=125°C)

	Ultra High Wattage Land Pattern	Standard Land Pattern	Free Air
Power Dissipation	2700mW	1700mW	540mW
Thermal Resistance	37°C/W	59°C/W	185°C/W
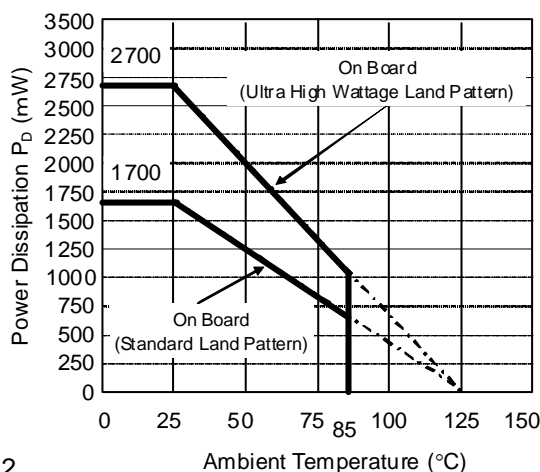
Power Dissipation
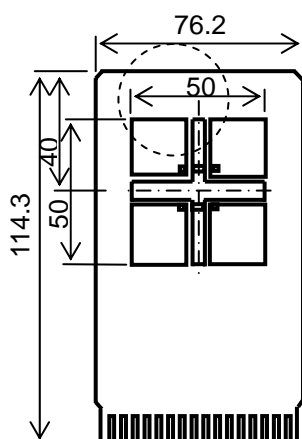
Ultra High Wattage Land Pattern
IC mount area(Unit: mm)
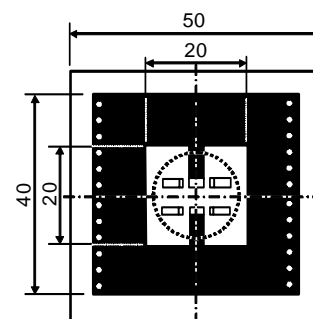
Standard

Measurement Board Pattern
IC Mount Area (Unit : mm)

Nisshinbo Micro Devices Inc.

PACKAGE DIMENSIONS (HSOP-6J)

5.02±0.3

6 5 4

3.81

6.0±0.3

3.9±0.2

0.60±0.2

1 2 3

$$0.2^{+0.10}_{-0.05}$$

0.605TYP.

1.5±0.1

0.15±0.1

1.67±0.1

△ 0.10

0.4±0.1   ⊕ 0.12Ⓜ

Unit: mm
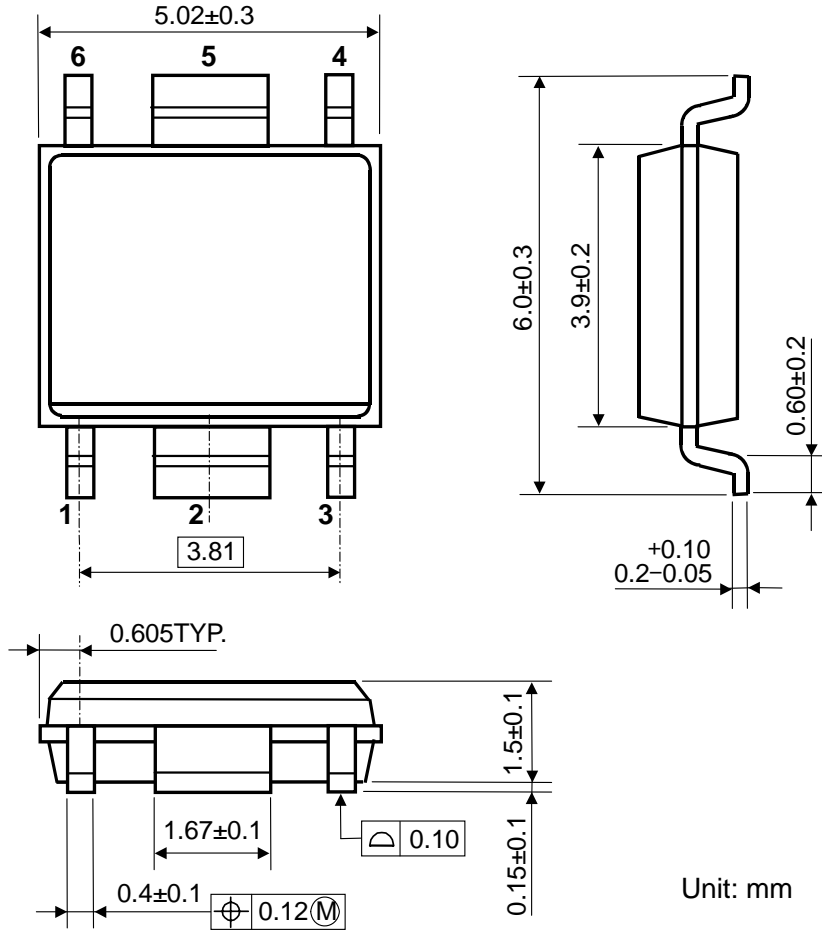
MARK SPECIFICATION (HSOP-6J)

①②③④: Product Code … **Refer to *MARK SPECIFICATION TABLE (HSOP-6J)***
⑤⑥: Lot Number … Alphanumeric Serial Number

① ② ③
④ ⑤ ⑥

Nisshinbo Micro Devices Inc.
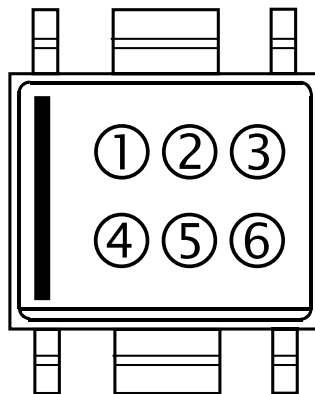
MARK SPECIFICATION TABLE (HSOP-6J)

R1190SxxxB

Product Name	① ② ③ ④	V_{SET}	Product Name	① ② ③ ④	V_{SET}	Product Name	① ② ③ ④	V_{SET}
R1190S020B	L 0 2 0	2.0 V	R1190S060B	L 0 6 0	6.0 V	R1190S100B	L 1 0 0	10.0 V
R1190S021B	L 0 2 1	2.1 V	R1190S061B	L 0 6 1	6.1 V	R1190S101B	L 1 0 1	10.1 V
R1190S022B	L 0 2 2	2.2 V	R1190S062B	L 0 6 2	6.2 V	R1190S102B	L 1 0 2	10.2 V
R1190S023B	L 0 2 3	2.3 V	R1190S063B	L 0 6 3	6.3 V	R1190S103B	L 1 0 3	10.3 V
R1190S024B	L 0 2 4	2.4 V	R1190S064B	L 0 6 4	6.4 V	R1190S104B	L 1 0 4	10.4 V
R1190S025B	L 0 2 5	2.5 V	R1190S065B	L 0 6 5	6.5 V	R1190S105B	L 1 0 5	10.5 V
R1190S026B	L 0 2 6	2.6 V	R1190S066B	L 0 6 6	6.6 V	R1190S106B	L 1 0 6	10.6 V
R1190S027B	L 0 2 7	2.7 V	R1190S067B	L 0 6 7	6.7 V	R1190S107B	L 1 0 7	10.7 V
R1190S028B	L 0 2 8	2.8 V	R1190S068B	L 0 6 8	6.8 V	R1190S108B	L 1 0 8	10.8 V
R1190S029B	L 0 2 9	2.9 V	R1190S069B	L 0 6 9	6.9 V	R1190S109B	L 1 0 9	10.9 V
R1190S030B	L 0 3 0	3.0 V	R1190S070B	L 0 7 0	7.0 V	R1190S110B	L 1 1 0	11.0 V
R1190S031B	L 0 3 1	3.1 V	R1190S071B	L 0 7 1	7.1 V	R1190S111B	L 1 1 1	11.1 V
R1190S032B	L 0 3 2	3.2 V	R1190S072B	L 0 7 2	7.2 V	R1190S112B	L 1 1 2	11.2 V
R1190S033B	L 0 3 3	3.3 V	R1190S073B	L 0 7 3	7.3 V	R1190S113B	L 1 1 3	11.3 V
R1190S034B	L 0 3 4	3.4 V	R1190S074B	L 0 7 4	7.4 V	R1190S114B	L 1 1 4	11.4 V
R1190S035B	L 0 3 5	3.5 V	R1190S075B	L 0 7 5	7.5 V	R1190S115B	L 1 1 5	11.5 V
R1190S036B	L 0 3 6	3.6 V	R1190S076B	L 0 7 6	7.6 V	R1190S116B	L 1 1 6	11.6 V
R1190S037B	L 0 3 7	3.7 V	R1190S077B	L 0 7 7	7.7 V	R1190S117B	L 1 1 7	11.7 V
R1190S038B	L 0 3 8	3.8 V	R1190S078B	L 0 7 8	7.8 V	R1190S118B	L 1 1 8	11.8 V
R1190S039B	L 0 3 9	3.9 V	R1190S079B	L 0 7 9	7.9 V	R1190S119B	L 1 1 9	11.9 V
R1190S040B	L 0 4 0	4.0 V	R1190S080B	L 0 8 0	8.0 V	R1190S120B	L 1 2 0	12.0 V
R1190S041B	L 0 4 1	4.1 V	R1190S081B	L 0 8 1	8.1 V			
R1190S042B	L 0 4 2	4.2 V	R1190S082B	L 0 8 2	8.2 V			
R1190S043B	L 0 4 3	4.3 V	R1190S083B	L 0 8 3	8.3 V			
R1190S044B	L 0 4 4	4.4 V	R1190S084B	L 0 8 4	8.4 V			
R1190S045B	L 0 4 5	4.5 V	R1190S085B	L 0 8 5	8.5 V			
R1190S046B	L 0 4 6	4.6 V	R1190S086B	L 0 8 6	8.6 V			
R1190S047B	L 0 4 7	4.7 V	R1190S087B	L 0 8 7	8.7 V			
R1190S048B	L 0 4 8	4.8 V	R1190S088B	L 0 8 8	8.8 V			
R1190S049B	L 0 4 9	4.9 V	R1190S089B	L 0 8 9	8.9 V			
R1190S050B	L 0 5 0	5.0 V	R1190S090B	L 0 9 0	9.0 V			
R1190S051B	L 0 5 1	5.1 V	R1190S091B	L 0 9 1	9.1 V			
R1190S052B	L 0 5 2	5.2 V	R1190S092B	L 0 9 2	9.2 V			
R1190S053B	L 0 5 3	5.3 V	R1190S093B	L 0 9 3	9.3 V			
R1190S054B	L 0 5 4	5.4 V	R1190S094B	L 0 9 4	9.4 V			
R1190S055B	L 0 5 5	5.5 V	R1190S095B	L 0 9 5	9.5 V			
R1190S056B	L 0 5 6	5.6 V	R1190S096B	L 0 9 6	9.6 V			
R1190S057B	L 0 5 7	5.7 V	R1190S097B	L 0 9 7	9.7 V			
R1190S058B	L 0 5 8	5.8 V	R1190S098B	L 0 9 8	9.8 V			
R1190S059B	L 0 5 9	5.9 V	R1190S099B	L 0 9 9	9.9 V			

Nisshinbo Micro Devices Inc.

R1190SxxxD

Product Name	① ② ③ ④	V$_{SET}$	Product Name	① ② ③ ④	V$_{SET}$	Product Name	① ② ③ ④	V$_{SET}$
R1190S020D	M 0 2 0	2.0 V	R1190S060D	M 0 6 0	6.0 V	R1190S100D	M 1 0 0	10.0 V
R1190S021D	M 0 2 1	2.1 V	R1190S061D	M 0 6 1	6.1 V	R1190S101D	M 1 0 1	10.1 V
R1190S022D	M 0 2 2	2.2 V	R1190S062D	M 0 6 2	6.2 V	R1190S102D	M 1 0 2	10.2 V
R1190S023D	M 0 2 3	2.3 V	R1190S063D	M 0 6 3	6.3 V	R1190S103D	M 1 0 3	10.3 V
R1190S024D	M 0 2 4	2.4 V	R1190S064D	M 0 6 4	6.4 V	R1190S104D	M 1 0 4	10.4 V
R1190S025D	M 0 2 5	2.5 V	R1190S065D	M 0 6 5	6.5 V	R1190S105D	M 1 0 5	10.5 V
R1190S026D	M 0 2 6	2.6 V	R1190S066D	M 0 6 6	6.6 V	R1190S106D	M 1 0 6	10.6 V
R1190S027D	M 0 2 7	2.7 V	R1190S067D	M 0 6 7	6.7 V	R1190S107D	M 1 0 7	10.7 V
R1190S028D	M 0 2 8	2.8 V	R1190S068D	M 0 6 8	6.8 V	R1190S108D	M 1 0 8	10.8 V
R1190S029D	M 0 2 9	2.9 V	R1190S069D	M 0 6 9	6.9 V	R1190S109D	M 1 0 9	10.9 V
R1190S030D	M 0 3 0	3.0 V	R1190S070D	M 0 7 0	7.0 V	R1190S110D	M 1 1 0	11.0 V
R1190S031D	M 0 3 1	3.1 V	R1190S071D	M 0 7 1	7.1 V	R1190S111D	M 1 1 1	11.1 V
R1190S032D	M 0 3 2	3.2 V	R1190S072D	M 0 7 2	7.2 V	R1190S112D	M 1 1 2	11.2 V
R1190S033D	M 0 3 3	3.3 V	R1190S073D	M 0 7 3	7.3 V	R1190S113D	M 1 1 3	11.3 V
R1190S034D	M 0 3 4	3.4 V	R1190S074D	M 0 7 4	7.4 V	R1190S114D	M 1 1 4	11.4 V
R1190S035D	M 0 3 5	3.5 V	R1190S075D	M 0 7 5	7.5 V	R1190S115D	M 1 1 5	11.5 V
R1190S036D	M 0 3 6	3.6 V	R1190S076D	M 0 7 6	7.6 V	R1190S116D	M 1 1 6	11.6 V
R1190S037D	M 0 3 7	3.7 V	R1190S077D	M 0 7 7	7.7 V	R1190S117D	M 1 1 7	11.7 V
R1190S038D	M 0 3 8	3.8 V	R1190S078D	M 0 7 8	7.8 V	R1190S118D	M 1 1 8	11.8 V
R1190S039D	M 0 3 9	3.9 V	R1190S079D	M 0 7 9	7.9 V	R1190S119D	M 1 1 9	11.9 V
R1190S040D	M 0 4 0	4.0 V	R1190S080D	M 0 8 0	8.0 V	R1190S120D	M 1 2 0	12.0 V
R1190S041D	M 0 4 1	4.1 V	R1190S081D	M 0 8 1	8.1 V			
R1190S042D	M 0 4 2	4.2 V	R1190S082D	M 0 8 2	8.2 V			
R1190S043D	M 0 4 3	4.3 V	R1190S083D	M 0 8 3	8.3 V			
R1190S044D	M 0 4 4	4.4 V	R1190S084D	M 0 8 4	8.4 V			
R1190S045D	M 0 4 5	4.5 V	R1190S085D	M 0 8 5	8.5 V			
R1190S046D	M 0 4 6	4.6 V	R1190S086D	M 0 8 6	8.6 V			
R1190S047D	M 0 4 7	4.7 V	R1190S087D	M 0 8 7	8.7 V			
R1190S048D	M 0 4 8	4.8 V	R1190S088D	M 0 8 8	8.8 V			
R1190S049D	M 0 4 9	4.9 V	R1190S089D	M 0 8 9	8.9 V			
R1190S050D	M 0 5 0	5.0 V	R1190S090D	M 0 9 0	9.0 V			
R1190S051D	M 0 5 1	5.1 V	R1190S091D	M 0 9 1	9.1 V			
R1190S052D	M 0 5 2	5.2 V	R1190S092D	M 0 9 2	9.2 V			
R1190S053D	M 0 5 3	5.3 V	R1190S093D	M 0 9 3	9.3 V			
R1190S054D	M 0 5 4	5.4 V	R1190S094D	M 0 9 4	9.4 V			
R1190S055D	M 0 5 5	5.5 V	R1190S095D	M 0 9 5	9.5 V			
R1190S056D	M 0 5 6	5.6 V	R1190S096D	M 0 9 6	9.6 V			
R1190S057D	M 0 5 7	5.7 V	R1190S097D	M 0 9 7	9.7 V			
R1190S058D	M 0 5 8	5.8 V	R1190S098D	M 0 9 8	9.8 V			
R1190S059D	M 0 5 9	5.9 V	R1190S099D	M 0 9 9	9.9 V			

POWER DISSIPATION (TO-252-5-P2)

Power Dissipation (P_D) depends on conditions of mounting on board.
This specification is based on the measurement at the condition below:

* Measurement conditions

	Standard Land Pattern	Ultra High Wattage Land Pattern
Environment	Mounting on board (Wind velocity 0m/s)	
Board Material	Glass cloth epoxy plastic (Double layers)	Glass cloth epoxy plastic (Four-layers)
Board Dimensions	50mm x 50mm x 1.6mm	76.2mm x 114.3mm x 0.8mm
Copper Ratio	Top side: Approx. 50%, Back side: Approx. 50%	Top, Back side: Approx. 96%, 2nd, 3rd: 100%
Through - hole	ϕ 0.5mm x 24pcs	ϕ 0.4mm x 30pcs

* Measurement Results   (Ta=25°C, Tjmax=125°C)

	Standard Land Pattern	Ultra High Wattage Land Pattern
Power Dissipation	1900mW	3800mW
Thermal Resistance	θja=(125-25°C)/1.9W= 53°C/W	θja= (125-25°C)/3.8W = 26°C/W
	θjc= 17°C/W	θjc= 7°C/W

Power Dissipation

Standard

Ultra High Wattage

Measurement Board Pattern
IC Mount Area (Unit : mm)

Nisshinbo Micro Devices Inc.
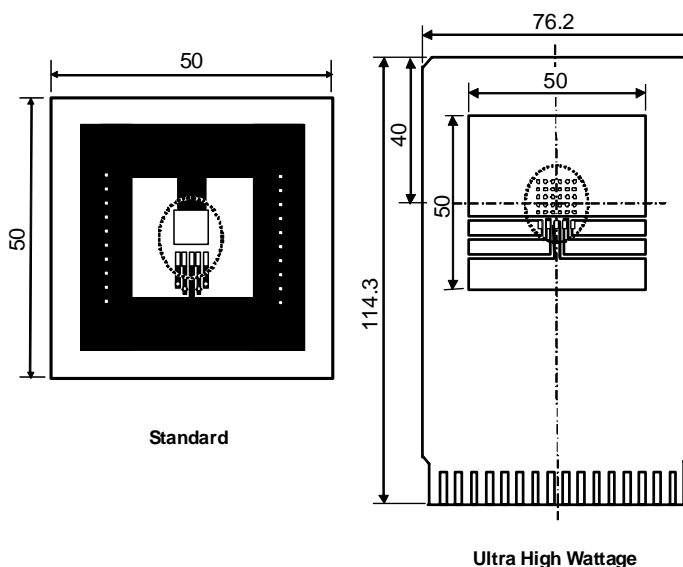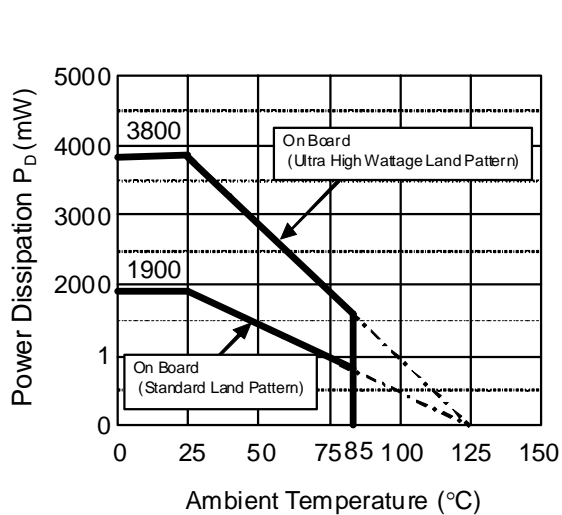
PACKAGE DIMENSIONS (TO-252-5-P2)
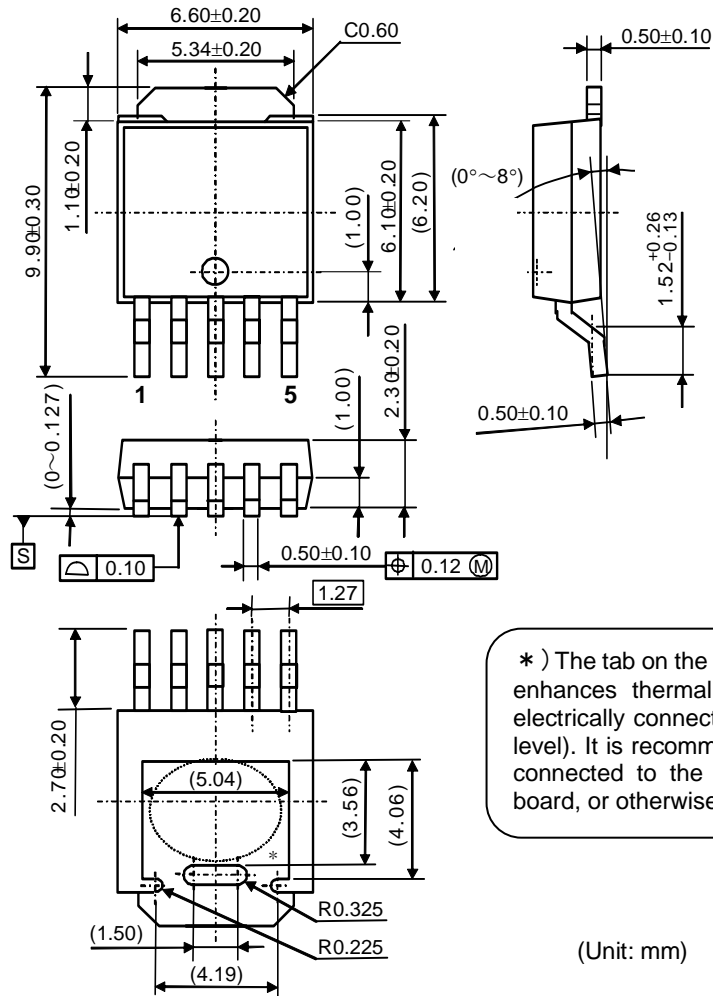
6.60±0.20
5.34±0.20
C0.60
0.50±0.10
9.90±0.30
1.10±0.20
(1.00)
6.10±0.20
(6.20)
(0°～8°)
1.52$^{+0.26}_{-0.13}$
1
5
(0～0.127)
(1.00)
2.30±0.20
0.50±0.10
S
0.10
0.50±0.10
0.12 (M)
1.27
2.70±0.20
(5.04)
3.56
(4.06)
R0.325
(1.50)
R0.225
(4.19)

＊）The tab on the bottom of the package enhances thermal performance and is electrically connected to GND (substrate level). It is recommended that the tab be connected to the ground plane on the board, or otherwise be left floating.

(Unit: mm)

MARK SPECIFICATION (TO-252-5-P2)

①②③④⑤⑥⑦⑧: Product Code … **Refer to *MARK SPECIFICATION TABLE (TO-252-5-P2)***
⑨⑩: Lot Number … Alphanumeric Serial Number

①②③④⑤⑥
⑦⑧   ⑨⑩

Nisshinbo Micro Devices Inc.
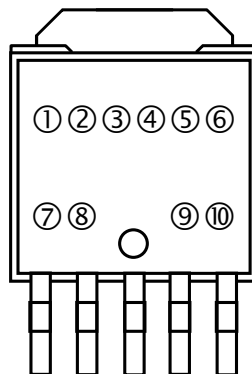
MARK SPECIFICATION TABLE (TO-252-5-P2)

R1190JxxxB

Product Name	①②③④⑤⑥⑦⑧	V_{SET}	Product Name	①②③④⑤⑥⑦⑧	V_{SET}	Product Name	①②③④⑤⑥⑦⑧	V_{SET}
R1190J020B	B 1 J 0 2 0 B	2.0 V	R1190J060B	B 1 J 0 6 0 B	6.0 V	R1190J100B	B 1 J 1 0 0 B	10.0 V
R1190J021B	B 1 J 0 2 1 B	2.1 V	R1190J061B	B 1 J 0 6 1 B	6.1 V	R1190J101B	B 1 J 1 0 1 B	10.1 V
R1190J022B	B 1 J 0 2 2 B	2.2 V	R1190J062B	B 1 J 0 6 2 B	6.2 V	R1190J102B	B 1 J 1 0 2 B	10.2 V
R1190J023B	B 1 J 0 2 3 B	2.3 V	R1190J063B	B 1 J 0 6 3 B	6.3 V	R1190J103B	B 1 J 1 0 3 B	10.3 V
R1190J024B	B 1 J 0 2 4 B	2.4 V	R1190J064B	B 1 J 0 6 4 B	6.4 V	R1190J104B	B 1 J 1 0 4 B	10.4 V
R1190J025B	B 1 J 0 2 5 B	2.5 V	R1190J065B	B 1 J 0 6 5 B	6.5 V	R1190J105B	B 1 J 1 0 5 B	10.5 V
R1190J026B	B 1 J 0 2 6 B	2.6 V	R1190J066B	B 1 J 0 6 6 B	6.6 V	R1190J106B	B 1 J 1 0 6 B	10.6 V
R1190J027B	B 1 J 0 2 7 B	2.7 V	R1190J067B	B 1 J 0 6 7 B	6.7 V	R1190J107B	B 1 J 1 0 7 B	10.7 V
R1190J028B	B 1 J 0 2 8 B	2.8 V	R1190J068B	B 1 J 0 6 8 B	6.8 V	R1190J108B	B 1 J 1 0 8 B	10.8 V
R1190J029B	B 1 J 0 2 9 B	2.9 V	R1190J069B	B 1 J 0 6 9 B	6.9 V	R1190J109B	B 1 J 1 0 9 B	10.9 V
R1190J030B	B 1 J 0 3 0 B	3.0 V	R1190J070B	B 1 J 0 7 0 B	7.0 V	R1190J110B	B 1 J 1 1 0 B	11.0 V
R1190J031B	B 1 J 0 3 1 B	3.1 V	R1190J071B	B 1 J 0 7 1 B	7.1 V	R1190J111B	B 1 J 1 1 1 B	11.1 V
R1190J032B	B 1 J 0 3 2 B	3.2 V	R1190J072B	B 1 J 0 7 2 B	7.2 V	R1190J112B	B 1 J 1 1 2 B	11.2 V
R1190J033B	B 1 J 0 3 3 B	3.3 V	R1190J073B	B 1 J 0 7 3 B	7.3 V	R1190J113B	B 1 J 1 1 3 B	11.3 V
R1190J034B	B 1 J 0 3 4 B	3.4 V	R1190J074B	B 1 J 0 7 4 B	7.4 V	R1190J114B	B 1 J 1 1 4 B	11.4 V
R1190J035B	B 1 J 0 3 5 B	3.5 V	R1190J075B	B 1 J 0 7 5 B	7.5 V	R1190J115B	B 1 J 1 1 5 B	11.5 V
R1190J036B	B 1 J 0 3 6 B	3.6 V	R1190J076B	B 1 J 0 7 6 B	7.6 V	R1190J116B	B 1 J 1 1 6 B	11.6 V
R1190J037B	B 1 J 0 3 7 B	3.7 V	R1190J077B	B 1 J 0 7 7 B	7.7 V	R1190J117B	B 1 J 1 1 7 B	11.7 V
R1190J038B	B 1 J 0 3 8 B	3.8 V	R1190J078B	B 1 J 0 7 8 B	7.8 V	R1190J118B	B 1 J 1 1 8 B	11.8 V
R1190J039B	B 1 J 0 3 9 B	3.9 V	R1190J079B	B 1 J 0 7 9 B	7.9 V	R1190J119B	B 1 J 1 1 9 B	11.9 V
R1190J040B	B 1 J 0 4 0 B	4.0 V	R1190J080B	B 1 J 0 8 0 B	8.0 V	R1190J120B	B 1 J 1 2 0 B	12.0 V
R1190J041B	B 1 J 0 4 1 B	4.1 V	R1190J081B	B 1 J 0 8 1 B	8.1 V			
R1190J042B	B 1 J 0 4 2 B	4.2 V	R1190J082B	B 1 J 0 8 2 B	8.2 V			
R1190J043B	B 1 J 0 4 3 B	4.3 V	R1190J083B	B 1 J 0 8 3 B	8.3 V			
R1190J044B	B 1 J 0 4 4 B	4.4 V	R1190J084B	B 1 J 0 8 4 B	8.4 V			
R1190J045B	B 1 J 0 4 5 B	4.5 V	R1190J085B	B 1 J 0 8 5 B	8.5 V			
R1190J046B	B 1 J 0 4 6 B	4.6 V	R1190J086B	B 1 J 0 8 6 B	8.6 V			
R1190J047B	B 1 J 0 4 7 B	4.7 V	R1190J087B	B 1 J 0 8 7 B	8.7 V			
R1190J048B	B 1 J 0 4 8 B	4.8 V	R1190J088B	B 1 J 0 8 8 B	8.8 V			
R1190J049B	B 1 J 0 4 9 B	4.9 V	R1190J089B	B 1 J 0 8 9 B	8.9 V			
R1190J050B	B 1 J 0 5 0 B	5.0 V	R1190J090B	B 1 J 0 9 0 B	9.0 V			
R1190J051B	B 1 J 0 5 1 B	5.1 V	R1190J091B	B 1 J 0 9 1 B	9.1 V			
R1190J052B	B 1 J 0 5 2 B	5.2 V	R1190J092B	B 1 J 0 9 2 B	9.2 V			
R1190J053B	B 1 J 0 5 3 B	5.3 V	R1190J093B	B 1 J 0 9 3 B	9.3 V			
R1190J054B	B 1 J 0 5 4 B	5.4 V	R1190J094B	B 1 J 0 9 4 B	9.4 V			
R1190J055B	B 1 J 0 5 5 B	5.5 V	R1190J095B	B 1 J 0 9 5 B	9.5 V			
R1190J056B	B 1 J 0 5 6 B	5.6 V	R1190J096B	B 1 J 0 9 6 B	9.6 V			
R1190J057B	B 1 J 0 5 7 B	5.7 V	R1190J097B	B 1 J 0 9 7 B	9.7 V			
R1190J058B	B 1 J 0 5 8 B	5.8 V	R1190J098B	B 1 J 0 9 8 B	9.8 V			
R1190J059B	B 1 J 0 5 9 B	5.9 V	R1190J099B	B 1 J 0 9 9 B	9.9 V			

Nisshinbo Micro Devices Inc.

R1190JxxxD

Product Name	①②③④⑤⑥⑦⑧	V$_{SET}$	Product Name	①②③④⑤⑥⑦⑧	V$_{SET}$	Product Name	①②③④⑤⑥⑦⑧	V$_{SET}$
R1190J020D	B 1 J 0 2 0 D	2.0 V	R1190J060D	B 1 J 0 6 0 D	6.0 V	R1190J100D	B 1 J 1 0 0 D	10.0 V
R1190J021D	B 1 J 0 2 1 D	2.1 V	R1190J061D	B 1 J 0 6 1 D	6.1 V	R1190J101D	B 1 J 1 0 1 D	10.1 V
R1190J022D	B 1 J 0 2 2 D	2.2 V	R1190J062D	B 1 J 0 6 2 D	6.2 V	R1190J102D	B 1 J 1 0 2 D	10.2 V
R1190J023D	B 1 J 0 2 3 D	2.3 V	R1190J063D	B 1 J 0 6 3 D	6.3 V	R1190J103D	B 1 J 1 0 3 D	10.3 V
R1190J024D	B 1 J 0 2 4 D	2.4 V	R1190J064D	B 1 J 0 6 4 D	6.4 V	R1190J104D	B 1 J 1 0 4 D	10.4 V
R1190J025D	B 1 J 0 2 5 D	2.5 V	R1190J065D	B 1 J 0 6 5 D	6.5 V	R1190J105D	B 1 J 1 0 5 D	10.5 V
R1190J026D	B 1 J 0 2 6 D	2.6 V	R1190J066D	B 1 J 0 6 6 D	6.6 V	R1190J106D	B 1 J 1 0 6 D	10.6 V
R1190J027D	B 1 J 0 2 7 D	2.7 V	R1190J067D	B 1 J 0 6 7 D	6.7 V	R1190J107D	B 1 J 1 0 7 D	10.7 V
R1190J028D	B 1 J 0 2 8 D	2.8 V	R1190J068D	B 1 J 0 6 8 D	6.8 V	R1190J108D	B 1 J 1 0 8 D	10.8 V
R1190J029D	B 1 J 0 2 9 D	2.9 V	R1190J069D	B 1 J 0 6 9 D	6.9 V	R1190J109D	B 1 J 1 0 9 D	10.9 V
R1190J030D	B 1 J 0 3 0 D	3.0 V	R1190J070D	B 1 J 0 7 0 D	7.0 V	R1190J110D	B 1 J 1 1 0 D	11.0 V
R1190J031D	B 1 J 0 3 1 D	3.1 V	R1190J071D	B 1 J 0 7 1 D	7.1 V	R1190J111D	B 1 J 1 1 1 D	11.1 V
R1190J032D	B 1 J 0 3 2 D	3.2 V	R1190J072D	B 1 J 0 7 2 D	7.2 V	R1190J112D	B 1 J 1 1 2 D	11.2 V
R1190J033D	B 1 J 0 3 3 D	3.3 V	R1190J073D	B 1 J 0 7 3 D	7.3 V	R1190J113D	B 1 J 1 1 3 D	11.3 V
R1190J034D	B 1 J 0 3 4 D	3.4 V	R1190J074D	B 1 J 0 7 4 D	7.4 V	R1190J114D	B 1 J 1 1 4 D	11.4 V
R1190J035D	B 1 J 0 3 5 D	3.5 V	R1190J075D	B 1 J 0 7 5 D	7.5 V	R1190J115D	B 1 J 1 1 5 D	11.5 V
R1190J036D	B 1 J 0 3 6 D	3.6 V	R1190J076D	B 1 J 0 7 6 D	7.6 V	R1190J116D	B 1 J 1 1 6 D	11.6 V
R1190J037D	B 1 J 0 3 7 D	3.7 V	R1190J077D	B 1 J 0 7 7 D	7.7 V	R1190J117D	B 1 J 1 1 7 D	11.7 V
R1190J038D	B 1 J 0 3 8 D	3.8 V	R1190J078D	B 1 J 0 7 8 D	7.8 V	R1190J118D	B 1 J 1 1 8 D	11.8 V
R1190J039D	B 1 J 0 3 9 D	3.9 V	R1190J079D	B 1 J 0 7 9 D	7.9 V	R1190J119D	B 1 J 1 1 9 D	11.9 V
R1190J040D	B 1 J 0 4 0 D	4.0 V	R1190J080D	B 1 J 0 8 0 D	8.0 V	R1190J120D	B 1 J 1 2 0 D	12.0 V
R1190J041D	B 1 J 0 4 1 D	4.1 V	R1190J081D	B 1 J 0 8 1 D	8.1 V			
R1190J042D	B 1 J 0 4 2 D	4.2 V	R1190J082D	B 1 J 0 8 2 D	8.2 V			
R1190J043D	B 1 J 0 4 3 D	4.3 V	R1190J083D	B 1 J 0 8 3 D	8.3 V			
R1190J044D	B 1 J 0 4 4 D	4.4 V	R1190J084D	B 1 J 0 8 4 D	8.4 V			
R1190J045D	B 1 J 0 4 5 D	4.5 V	R1190J085D	B 1 J 0 8 5 D	8.5 V			
R1190J046D	B 1 J 0 4 6 D	4.6 V	R1190J086D	B 1 J 0 8 6 D	8.6 V			
R1190J047D	B 1 J 0 4 7 D	4.7 V	R1190J087D	B 1 J 0 8 7 D	8.7 V			
R1190J048D	B 1 J 0 4 8 D	4.8 V	R1190J088D	B 1 J 0 8 8 D	8.8 V			
R1190J049D	B 1 J 0 4 9 D	4.9 V	R1190J089D	B 1 J 0 8 9 D	8.9 V			
R1190J050D	B 1 J 0 5 0 D	5.0 V	R1190J090D	B 1 J 0 9 0 D	9.0 V			
R1190J051D	B 1 J 0 5 1 D	5.1 V	R1190J091D	B 1 J 0 9 1 D	9.1 V			
R1190J052D	B 1 J 0 5 2 D	5.2 V	R1190J092D	B 1 J 0 9 2 D	9.2 V			
R1190J053D	B 1 J 0 5 3 D	5.3 V	R1190J093D	B 1 J 0 9 3 D	9.3 V			
R1190J054D	B 1 J 0 5 4 D	5.4 V	R1190J094D	B 1 J 0 9 4 D	9.4 V			
R1190J055D	B 1 J 0 5 5 D	5.5 V	R1190J095D	B 1 J 0 9 5 D	9.5 V			
R1190J056D	B 1 J 0 5 6 D	5.6 V	R1190J096D	B 1 J 0 9 6 D	9.6 V			
R1190J057D	B 1 J 0 5 7 D	5.7 V	R1190J097D	B 1 J 0 9 7 D	9.7 V			
R1190J058D	B 1 J 0 5 8 D	5.8 V	R1190J098D	B 1 J 0 9 8 D	9.8 V			
R1190J059D	B 1 J 0 5 9 D	5.9 V	R1190J099D	B 1 J 0 9 9 D	9.9 V			

TEST CIRCUITS
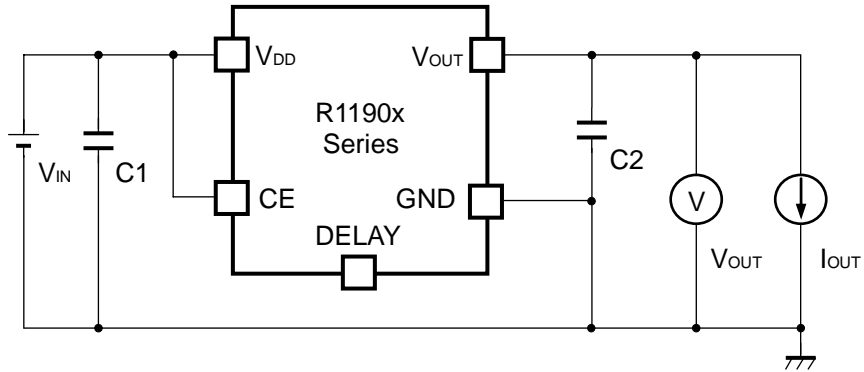
Basic Test Circuit
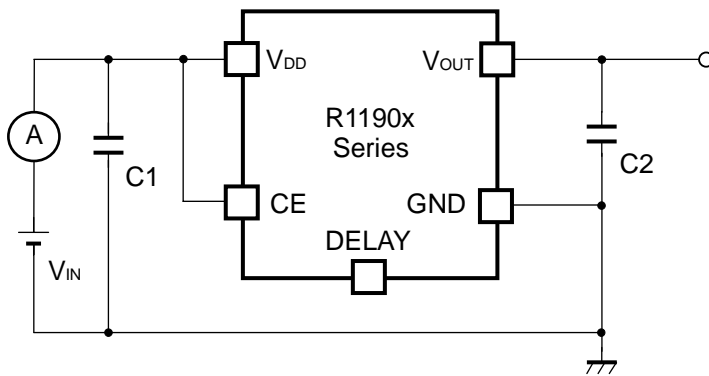
Test Circuit for Supply Current
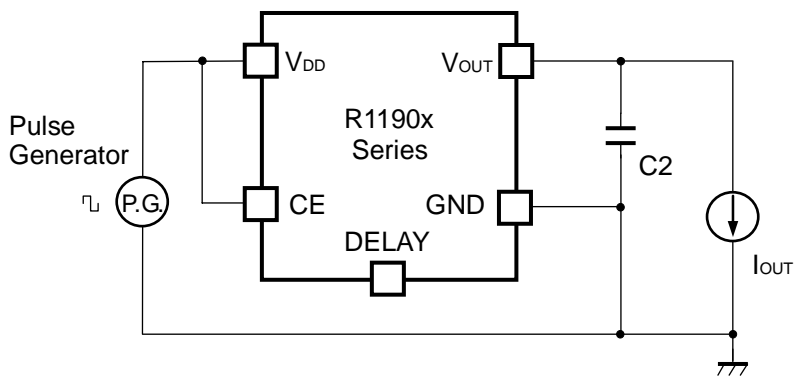
Test Circuit for Ripple Rejection

Nisshinbo Micro Devices Inc.
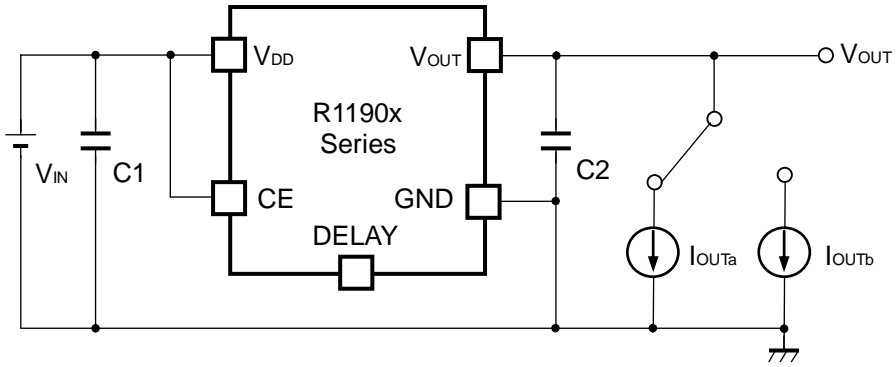
Test Circuit for Load Transient Response

Nisshinbo Micro Devices Inc.

TYPICAL CHARACTERISTIC

Note: Typical Characteristics are intended to be used as reference data; they are not guaranteed.

1) Output Voltage vs. Output Current (C1=C2=4.7μF, Ta=25°C)

R1190x020x

R1190x033x

R1190x050x

R1190x090x

R1190x120x

Nisshinbo Micro Devices Inc.
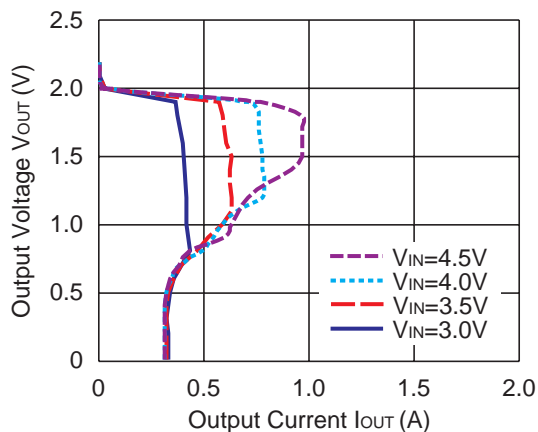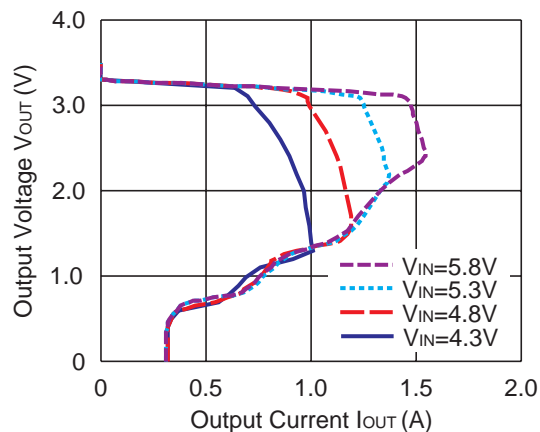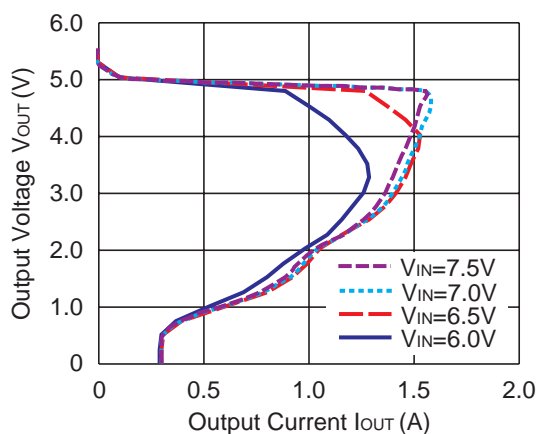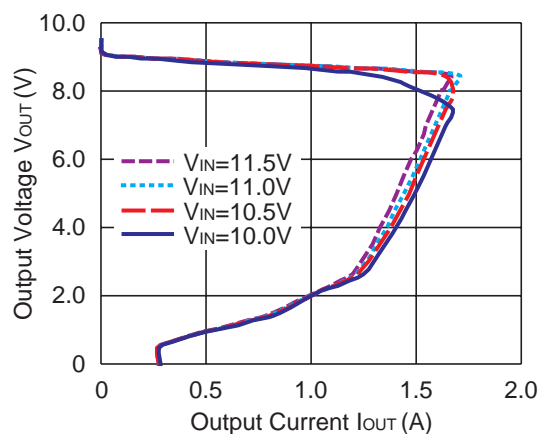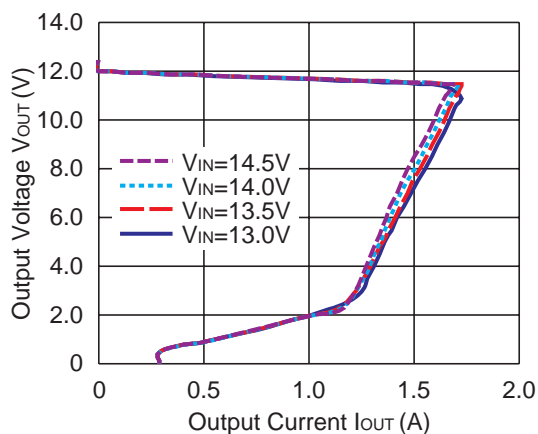
2) Output Voltage vs. Input Voltage (C1=C2=4.7μF, Ta=25°C)

R1190x020x

R1190x033x

R1190x050x

R1190x090x

R1190x120x

Nisshinbo Micro Devices Inc.
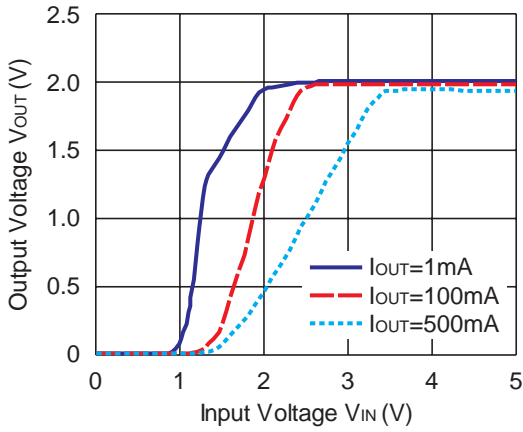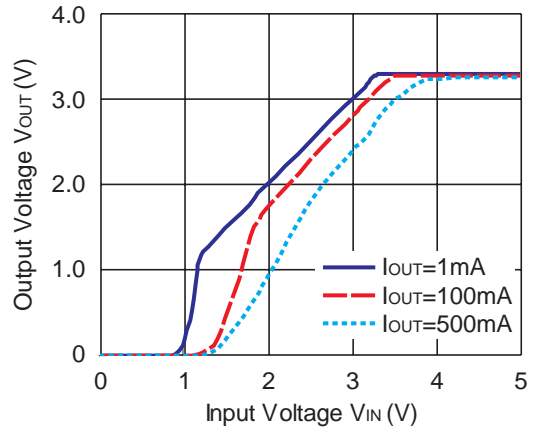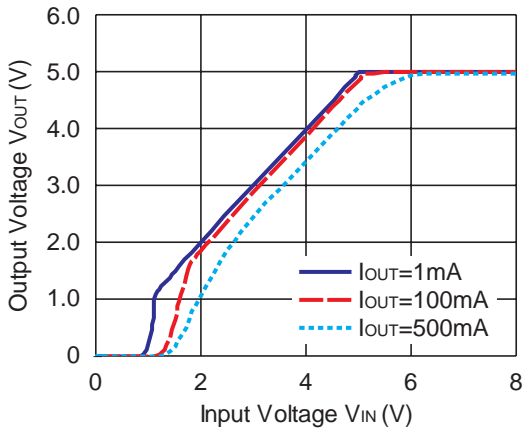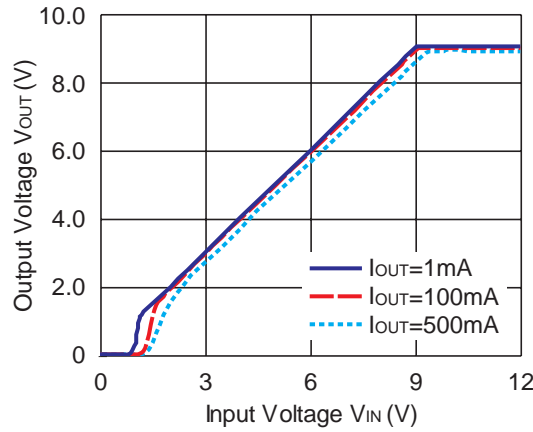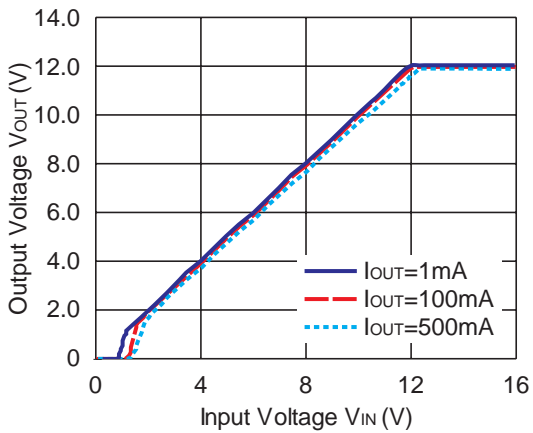
3) Supply Current vs. Input Voltage (C1=C2=4.7μF, Ta=25°C)

R1190x020x

R1190x033x

R1190x050x

R1190x090x

R1190x120x

Nisshinbo Micro Devices Inc.
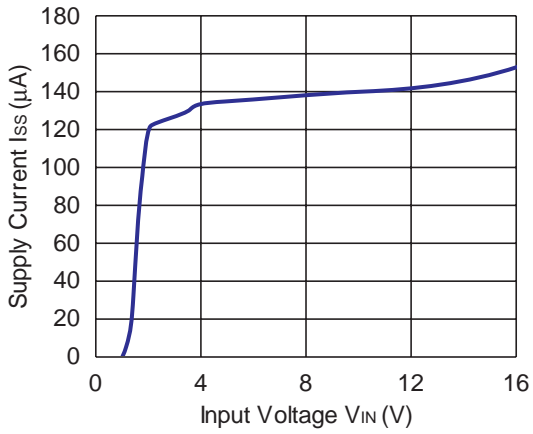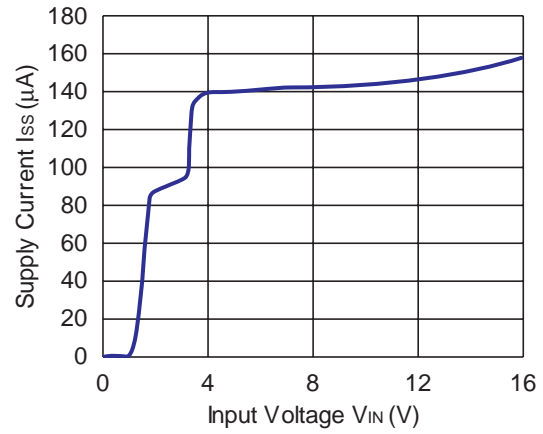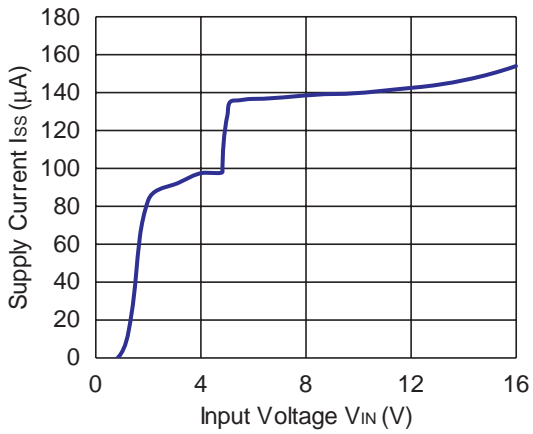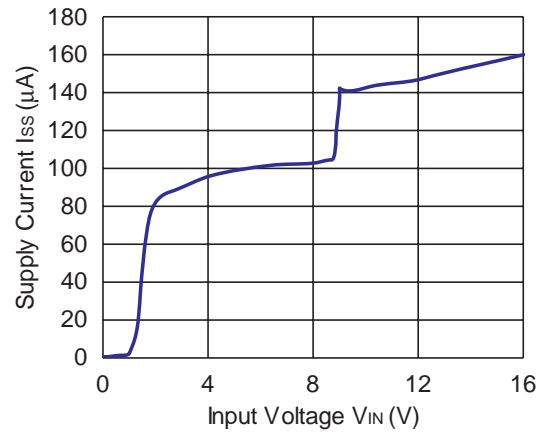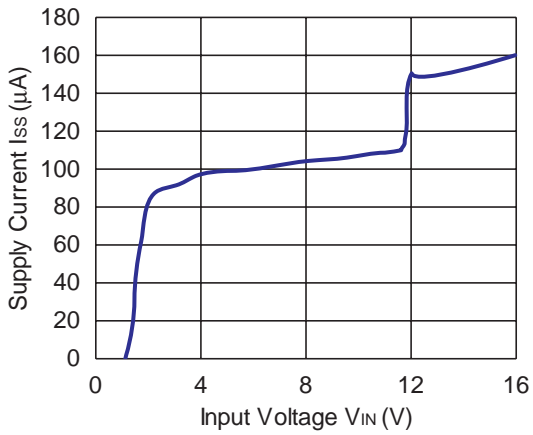
4) Output Voltage vs. Temperature (C1=C2=4.7μF, I_{OUT}=1mA)

R1190x020x

VIN=4.0V

R1190x033x

VIN=5.3V

R1190x050x

VIN=7.0V

R1190x090x

VIN=11.0V

R1190x120x

VIN=14.0V

Nisshinbo Micro Devices Inc.
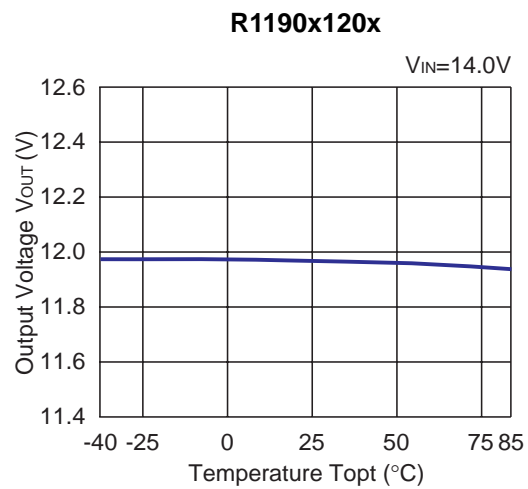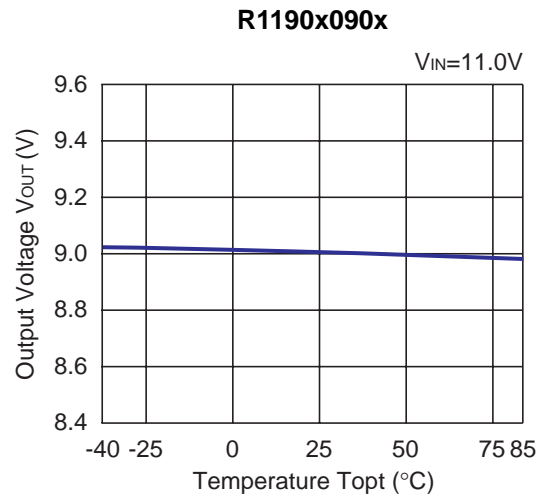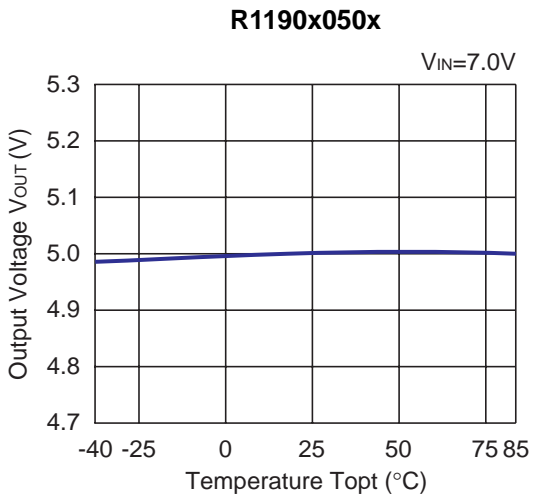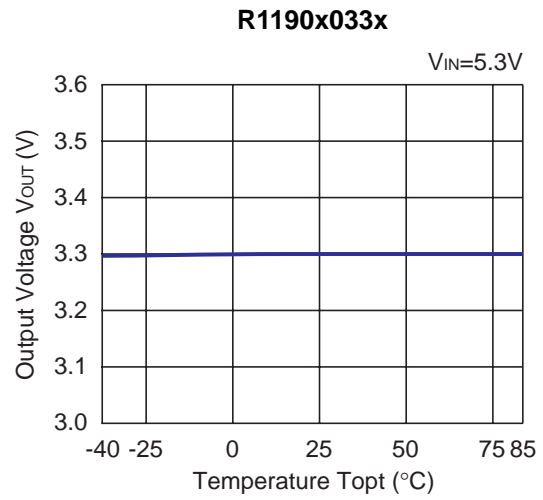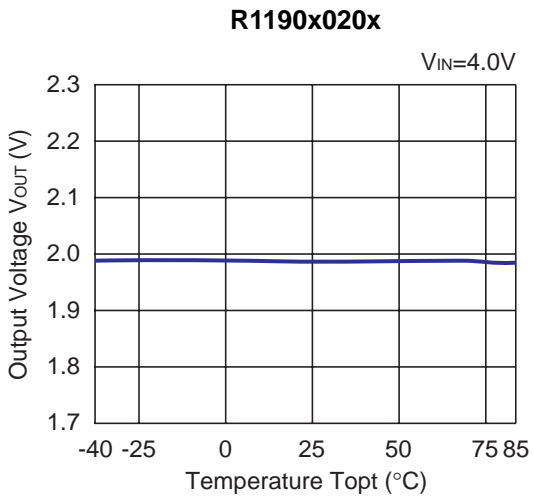
5) Supply Current vs. Temperature (C1=C2=4.7μF)

R1190x020x

V_{IN}=4.0V
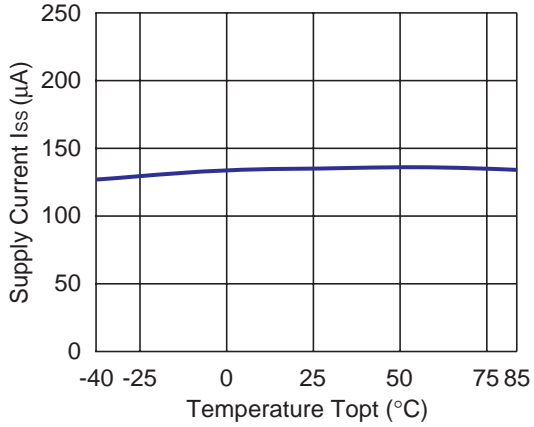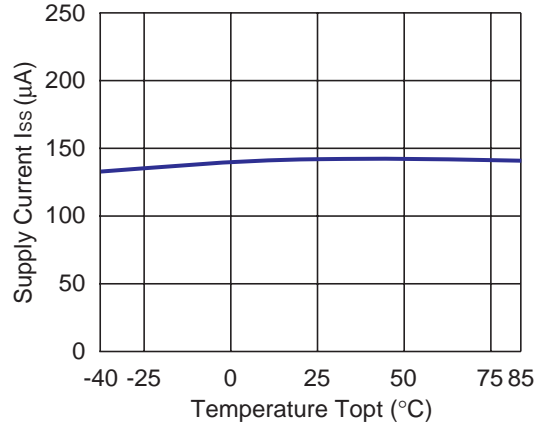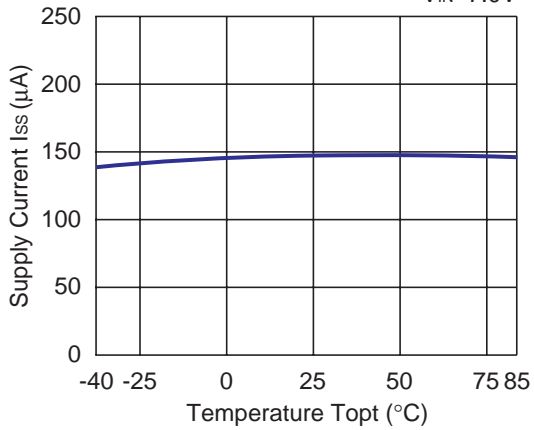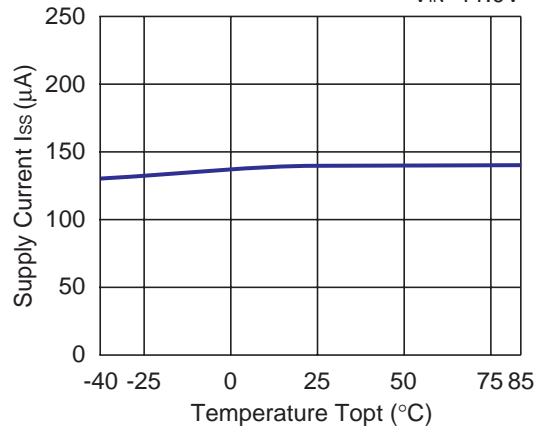
R1190x033x

V_{IN}=5.3V

R1190x050x

V_{IN}=7.0V

R1190x090x

V_{IN}=11.0V

R1190x120x

V_{IN}=14.0V

Nisshinbo Micro Devices Inc.

6) Dropout Voltage vs. Output Current (C1=C2=4.7μF)

R1190x020x

R1190x033x

R1190x050x

R1190x090x

R1190x120x

Nisshinbo Micro Devices Inc.
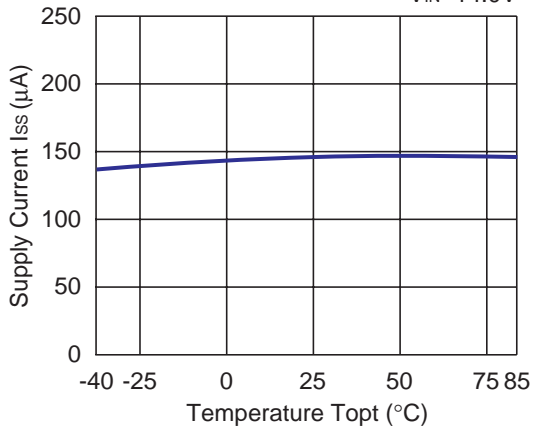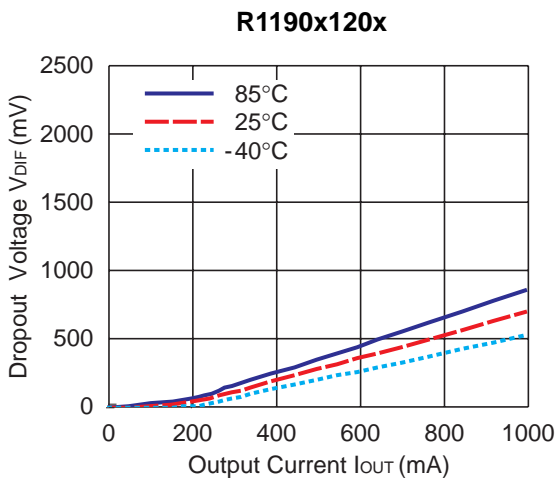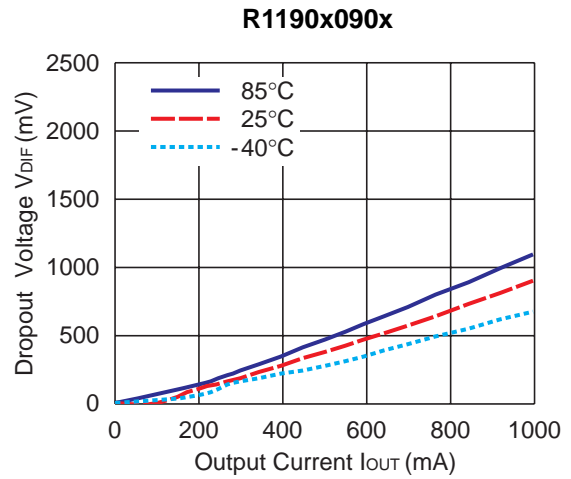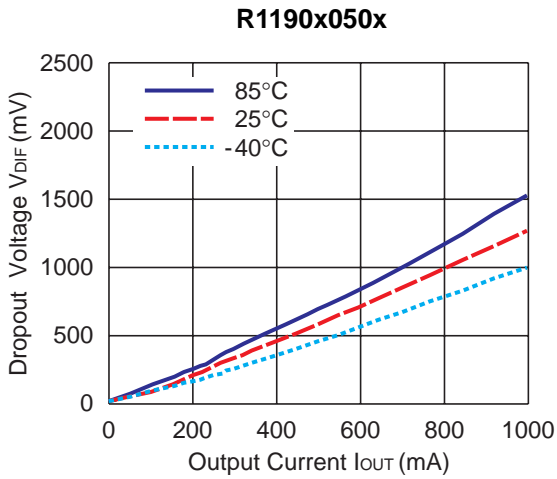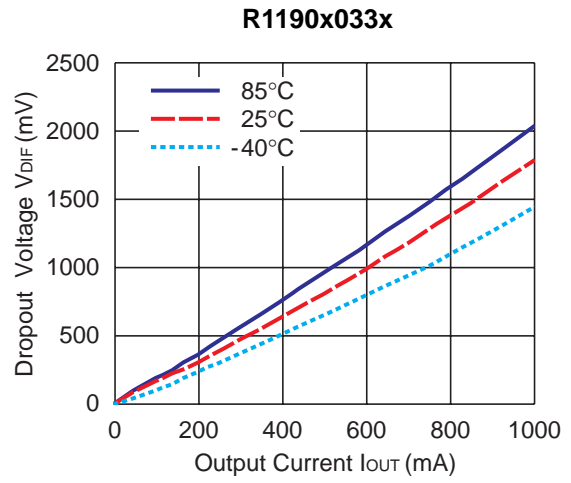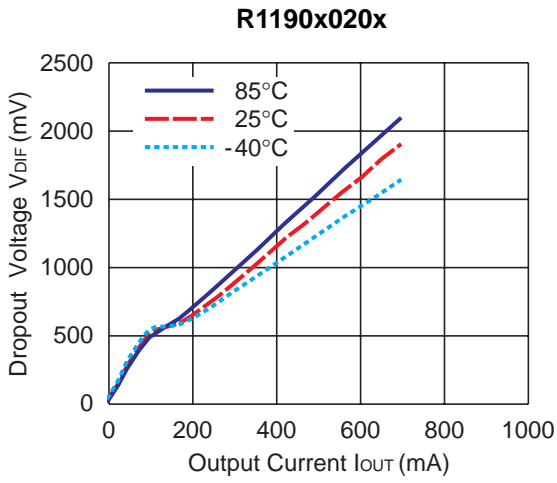
7) Dropout Voltage vs. Set Output Voltage (C1=C2=4.7μF, Ta=25°C)
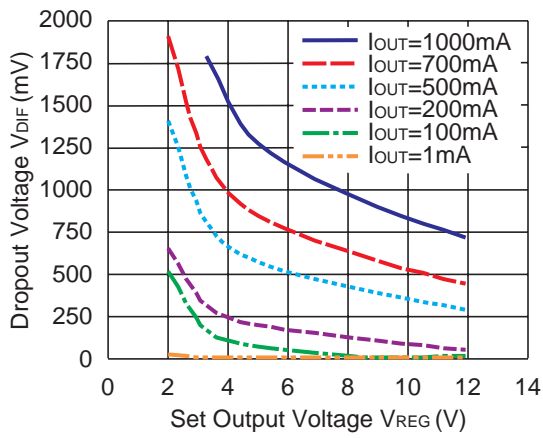
8) Ripple Rejection vs. Input Voltage (C1=none, C2=4.7μF, I_{OUT}=100mA, Ripple=0.2Vp-p, Ta=25°C)

R1190x020x

R1190x033x

R1190x050x

R1190x090x

Nisshinbo Micro Devices Inc.
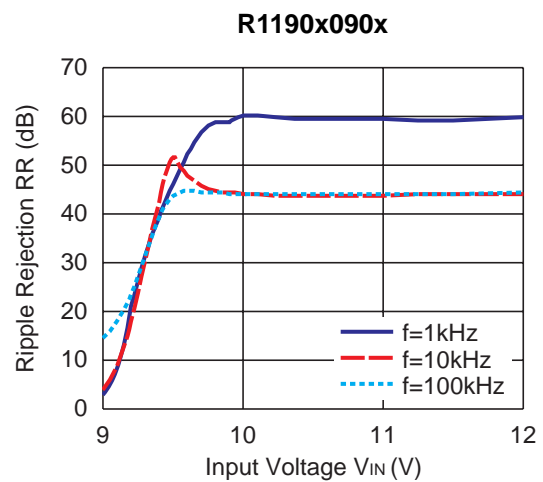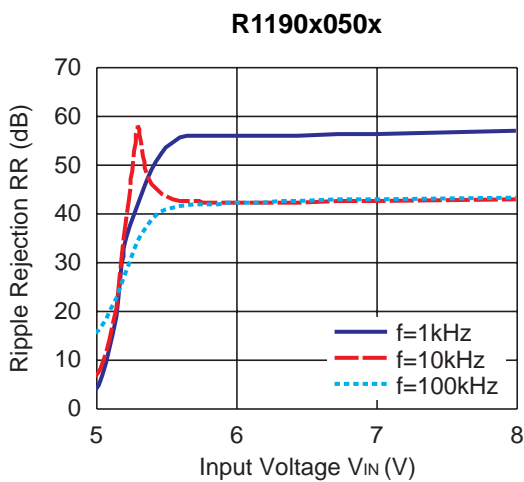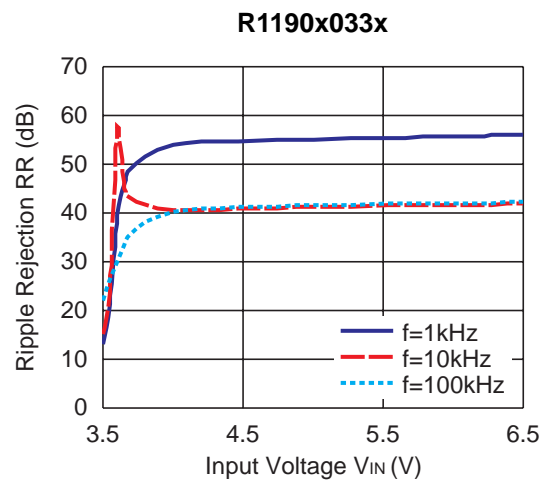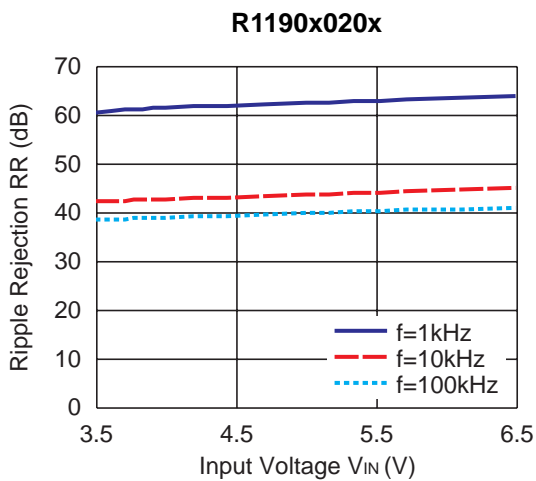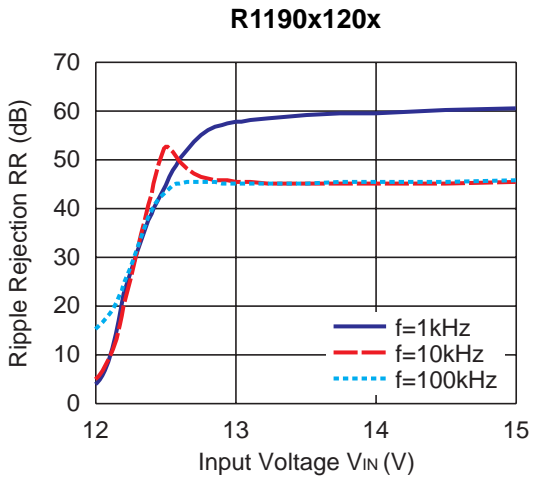
R1190x120x

9) **Ripple Rejection vs. Frequency (C1=none, C2=4.7μF, Ripple=0.2Vp-p, Ta=25°C)**

R1190x020x

R1190x033x

R1190x050x

R1190x090x

Nisshinbo Micro Devices Inc.

R1190x120x

V_{IN}=14.0V
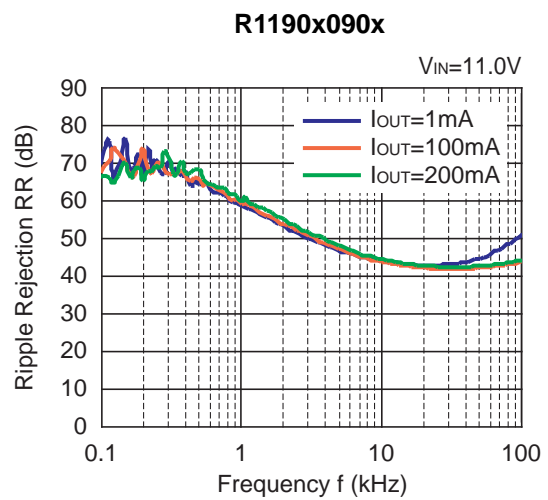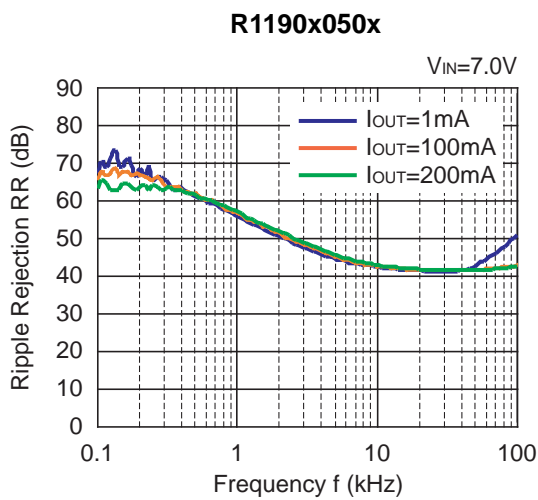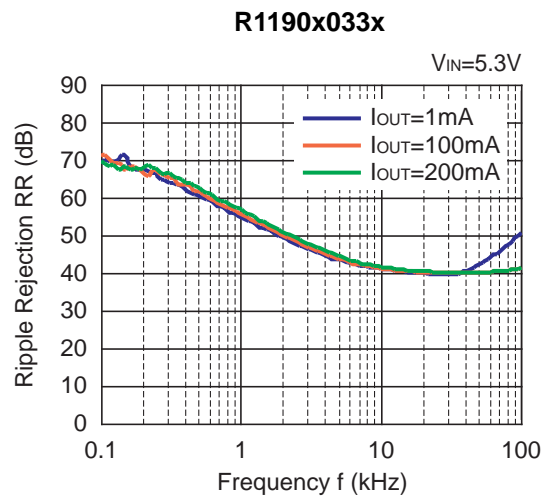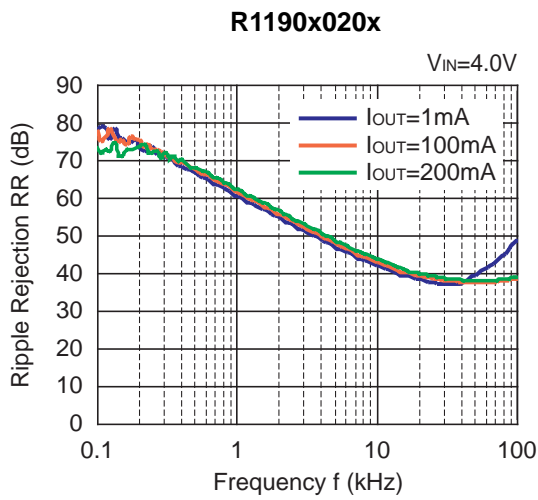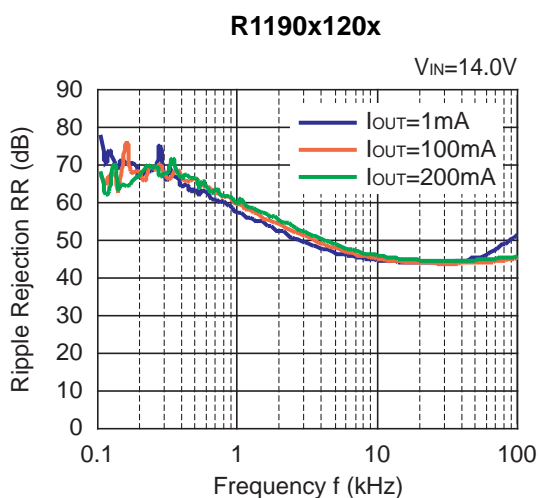
10) Input Transient Response (C1=none, C2=4.7μF, I$_{OUT}$=1mA, tr=tf=0.5μs)

R1190x020x

R1190x033x

R1190x050x

R1190x090x

Nisshinbo Micro Devices Inc.
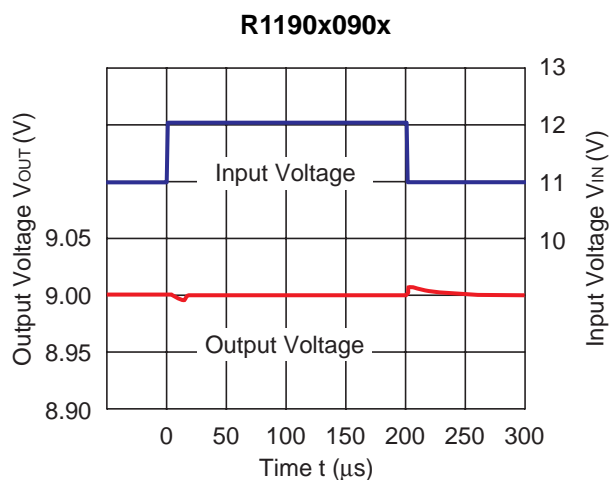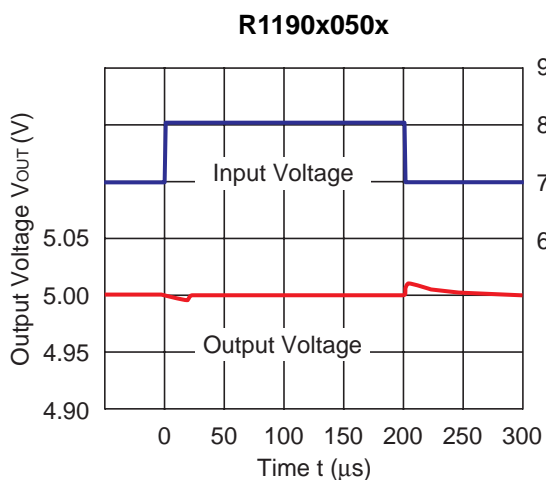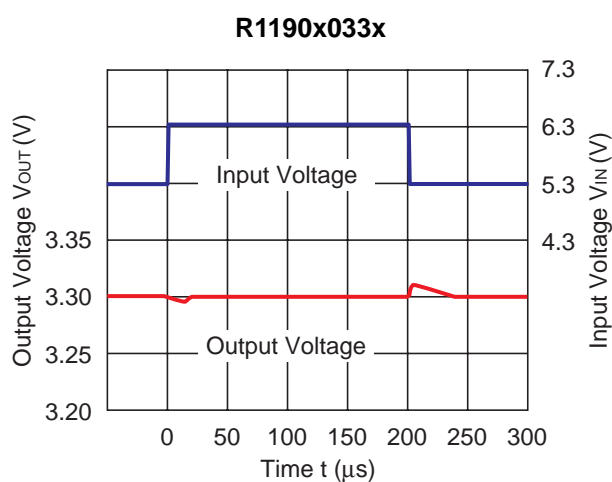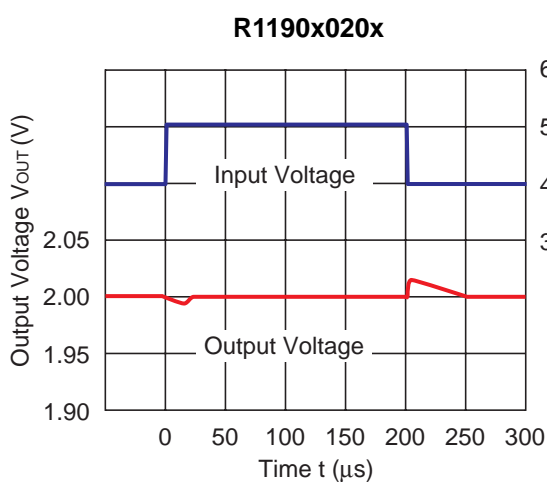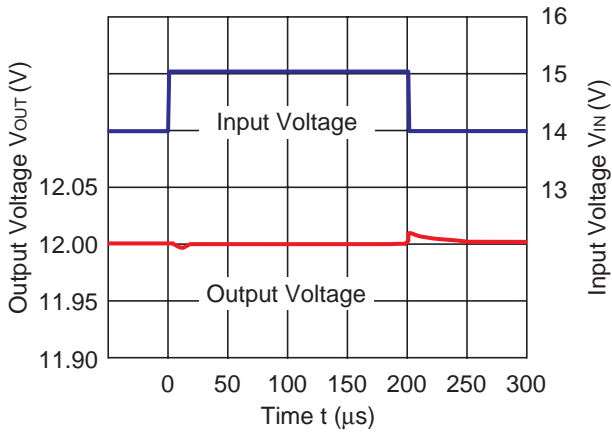
R1190x120x

11) Load Transient Response (C1=C2=4.7μF, tr=tf=0.5μs)

R1190x020x

R1190x033x

R1190x050x

R1190x090x

Nisshinbo Micro Devices Inc.

R1190x120x

V_{IN}=14.3V
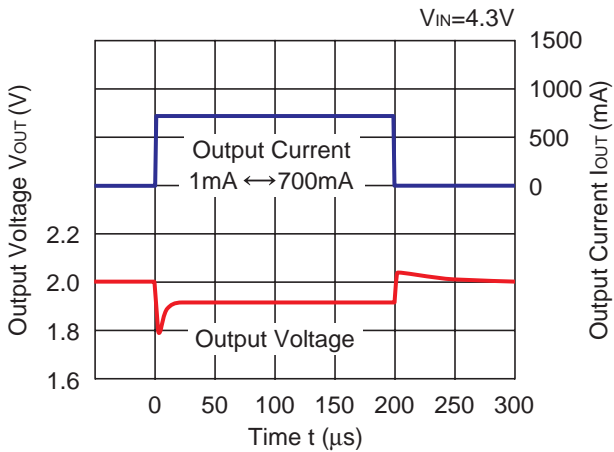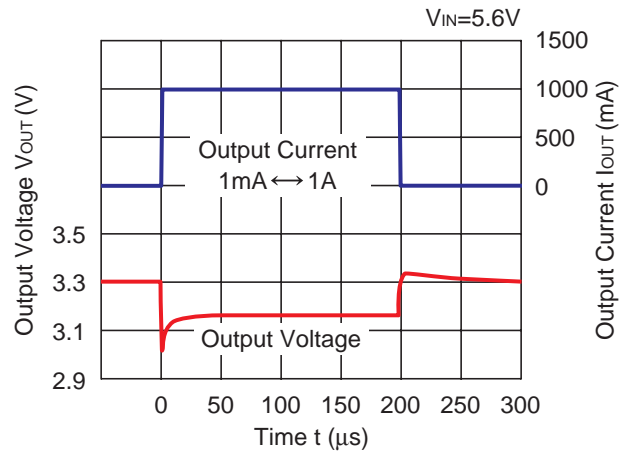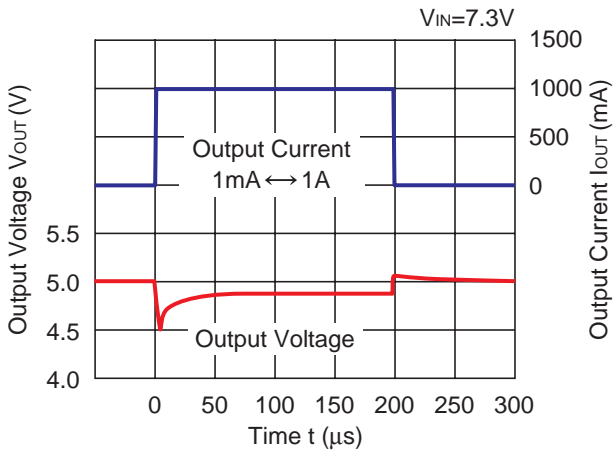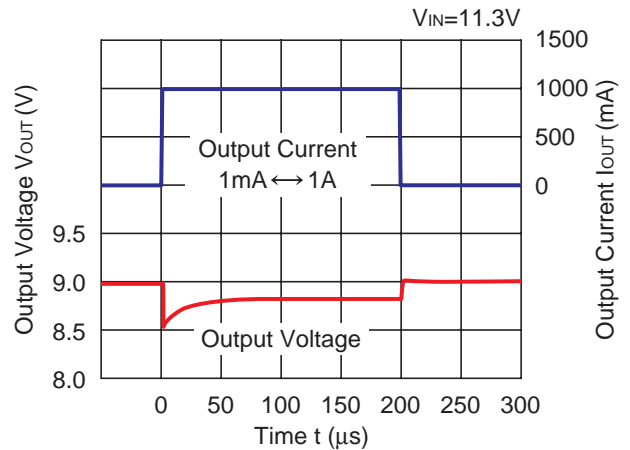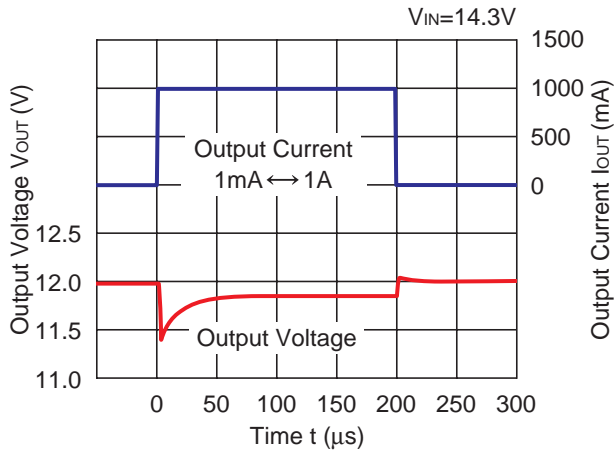
12) Turn On Speed with CE Pin (I_{OUT}=1mA, C1=C2=4.7μF, tr=tf=0.5μs)

R1190x020x

V_{IN}=4V

R1190x050x

V_{IN}=7V

R1190x090x

V_{IN}=11V

R1190x120x

V_{IN}=14V

Nisshinbo Micro Devices Inc.
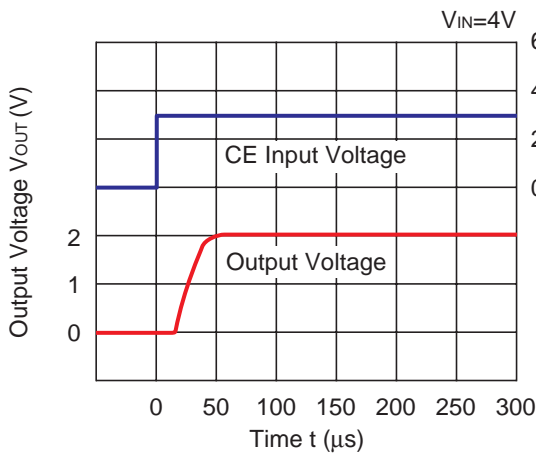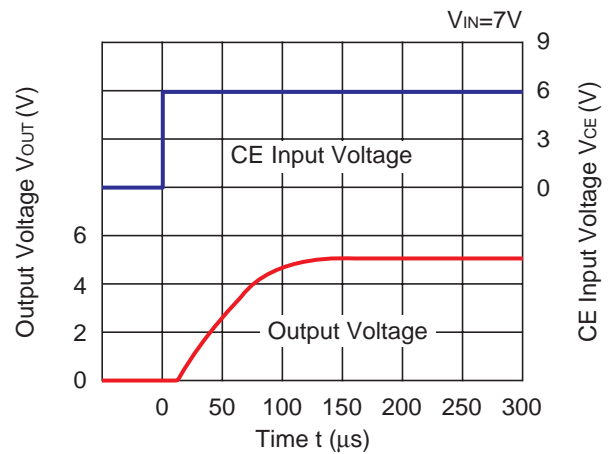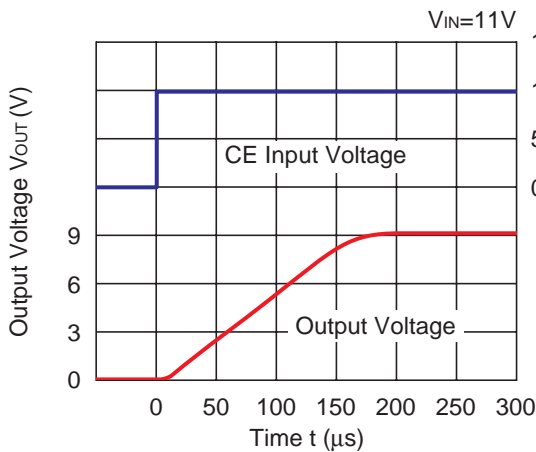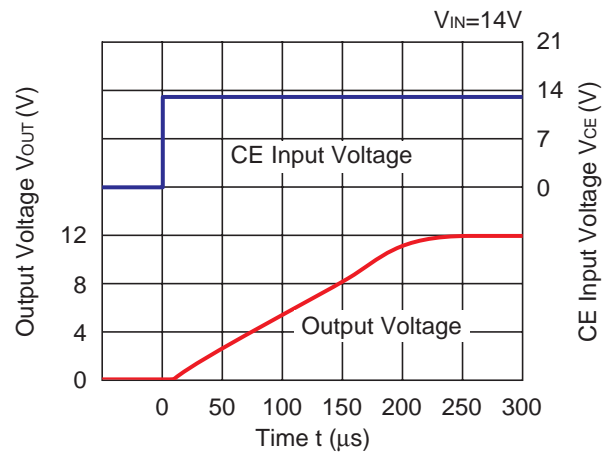
13) Turn Off Speed with CE Pin (D Version) (I$_{OUT}$=1mA, C1=C2=4.7μF, tr=tf=0.5μs)

R1190x020x

V$_{IN}$=4V

R1190x050x

V$_{IN}$=7V

R1190x090x

V$_{IN}$=11V

R1190x120x

V$_{IN}$=14V
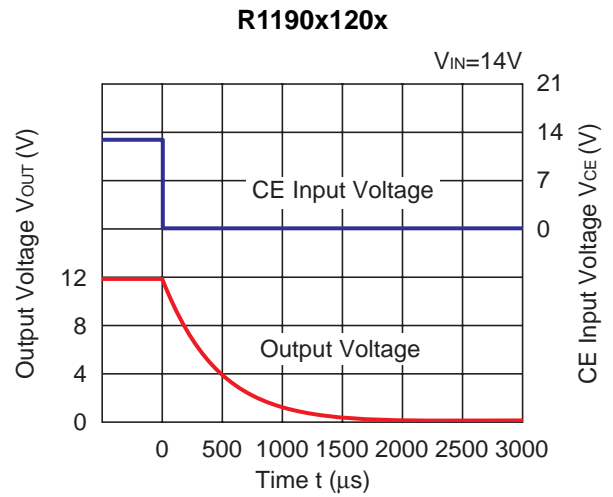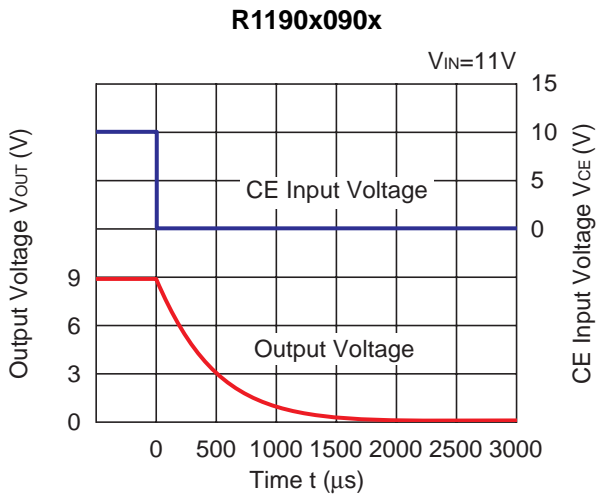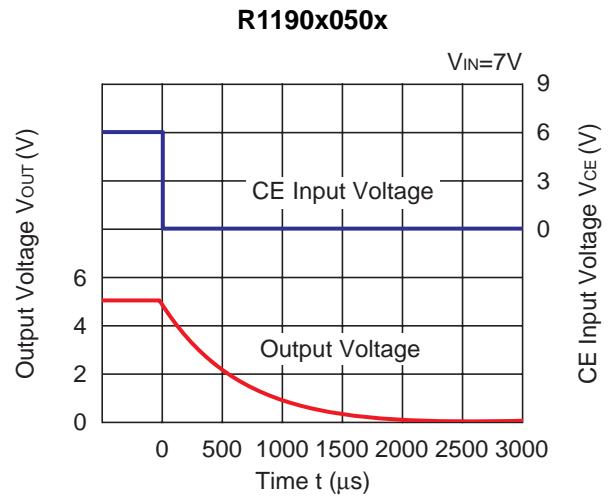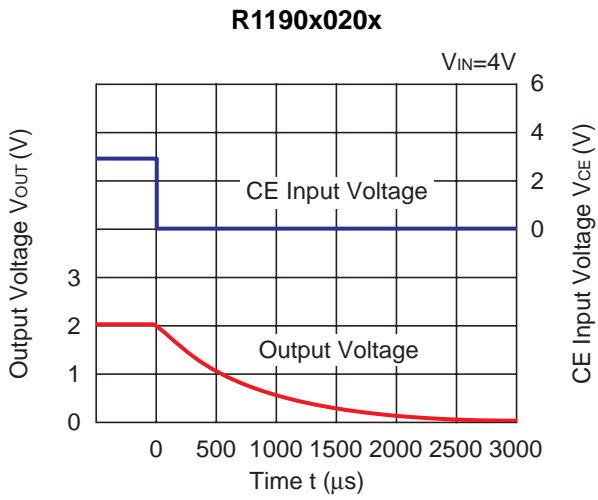
14) Inrush Current at Turn On (V$_{IN}$=7.0V, C1=C2=4.7μF, C$_D$=none, tr=tf=0.5μs)

Nisshinbo Micro Devices Inc.
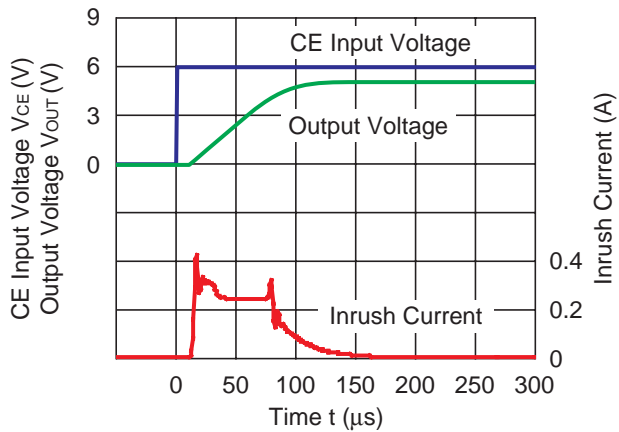
15) Inrush Current Limit vs. C_D Capacitance (C1=C2=4.7μF)

R1190x050x

V_{IN}=7.0V
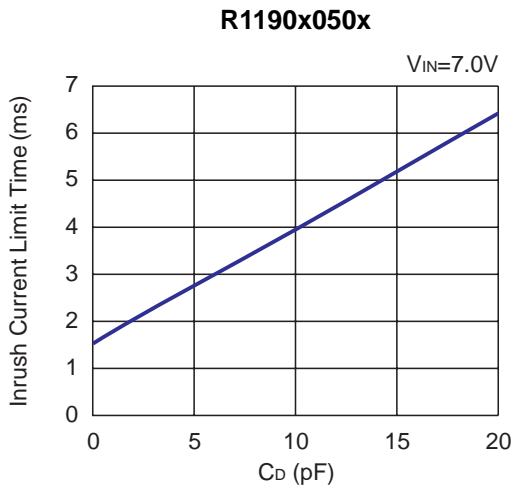
16) Inrush Current Limit Delay Time vs. Input Voltage (C1=C2=4.7μF)

R1190x050x

V_{IN}=7.0V
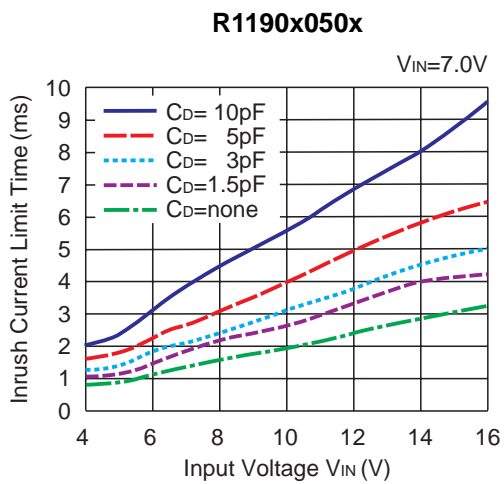
17) Thermal Shutdown vs. Temperature (C1=C2=4.7μF)

R1190x050x

V_{IN}=16V
Rload=1kΩ

Nisshinbo Micro Devices Inc.
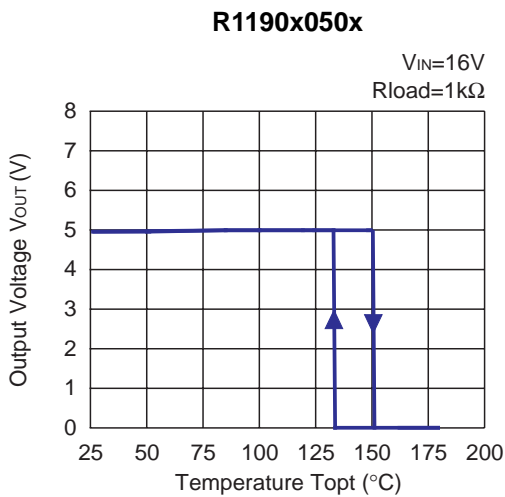
ESR vs. Output Current

When using these ICs, consider the following points:

The relations between I_{OUT} (Output Current) and ESR of an output capacitor are shown below.

The conditions when the white noise level is under $40\mu Vrms$ (Avg.) are marked as the hatched area in the graph.

Measurement conditions

- Frequency Band : 10Hz to 1MHz
- Temperature : $-40°C$ to $85°C$
- Hatched Area : Noise level is under $40\mu Vrms$ (Avg.)
- C_{IN} : $4.7\mu F$ (KTD500B475M43A0T00)
- C_{OUT} : $4.7\mu F$ (KTD500B475M43A0T00)
  : $10.0\mu F$ (FK22Y5V1H106Z)

R1190x020x

V_{IN}=4.3V to 16V
C_{IN}=C_{OUT}=Ceramic $4.7\mu F$

R1190x020x

V_{IN}=4.3V to 16V
C_{IN}=Ceramic $4.7\mu F$
C_{OUT}=Ceramic $10.0\mu F$

R1190x033x

V_{IN}=5.6V to 16V
C_{IN}=C_{OUT}=Ceramic $4.7\mu F$

R1190x033x

V_{IN}=5.6V to 16V
C_{IN}=Ceramic $4.7\mu F$
C_{OUT}=Ceramic $10.0\mu F$

Nisshinbo Micro Devices Inc.

R1190x050x

V_{IN}=7.3V to 16V
C_{IN}=C_{OUT}=Ceramic 4.7µF

R1190x050x

V_{IN}=7.3V to 16V
C_{IN}=Ceramic 4.7µF
C_{OUT}=Ceramic 10.0µF

R1190x090x

V_{IN}=11.3V to 16.0V
C_{IN}=C_{OUT}=Ceramic 4.7µF

R1190x090x

V_{IN}=11.3V to 16.0V
C_{IN}=Ceramic 4.7µF
C_{OUT}=Ceramic 10.0µF

R1190x120x

V_{IN}=14.3V to 16.0V
C_{IN}=C_{OUT}=Ceramic 4.7µF

R1190x120x

V_{IN}=14.3V to 16.0V
C_{IN}=Ceramic 4.7µF
C_{OUT}=Ceramic 10.0µF

Nisshinbo Micro Devices Inc.

NiSSHiNBO

Nisshinbo Micro Devices Inc.

Official website
https://www.nisshinbo-microdevices.co.jp/en/

Purchase information
https://www.nisshinbo-microdevices.co.jp/en/buy/