

300 mA Ultra-small Dual LDO Regulator

No. EA-202-230523

OUTLINE

The RP154x is a CMOS-based voltage regulator that provides high ripple rejection, low dropout voltage, high output voltage accuracy, and low supply current. Internally, the RP154x consists of a voltage reference unit, an error amplifier, resistors for setting output voltage, a short current limit circuit and a chip enable circuit.

The RP154x is available in fixed output voltage options. Besides the low supply current by CMOS, the RP154x offers a low dropout voltage by built-in low ON resistance r_{ON} as well as an extended battery life by a chip enable function. Compared with the existing CMOS-based regulators, the RP154x is further improved in ripple rejection, line transient response, and load transient response. All these features allow the RP154x to become ideal power sources for hand-held communication equipment.

The RP154x is offered in a 6-pin SOT-23-6 package for a single input type and an 8-pin DFN1216-8 package for a dual input type. Both packages are equipped with two LDOs which can achieve high-density mounting.

FEATURES

- Supply Current Typ. 50 μ A x 2 (VR1 & VR2)
- Standby Current Typ. 0.1 μ A x 2 (VR1 & VR2)
- Input Voltage Range 1.4 V to 5.25 V
- Output Voltage Range 0.8 V to 3.7 V (0.1 V steps)
- Output Voltage Accuracy $\pm 1.0\%$ ($V_{SET} > 2.0$ V, $T_a = 25^\circ$ C)
- Temperature-Drift Coefficient of Output Voltage Typ. ± 80 ppm/ $^\circ$ C
- Dropout Voltage Typ. 0.25 V ($I_{OUT} = 300$ mA, $V_{SET} = 2.5$ V)
- Ripple Rejection Typ. 75 dB ($f = 1$ kHz)
- Line Regulation Typ. 0.02%/V
- Packages DFN1216-8, SOT-23-6
- Short-current Limit Circuit Typ. 60 mA
- Overcurrent Protection Circuit
- Ceramic Capacitor Compatible 1.0 μ A or more

APPLICATIONS

- Power source for portable communication equipment.
- Power source for electrical appliances such as cameras, VCRs and camcorders.
- Power source for battery-powered equipment.

SELECTION GUIDE

The set output voltage, the package type and the auto discharge function⁽¹⁾ are user-selectable options.

Selection Guide

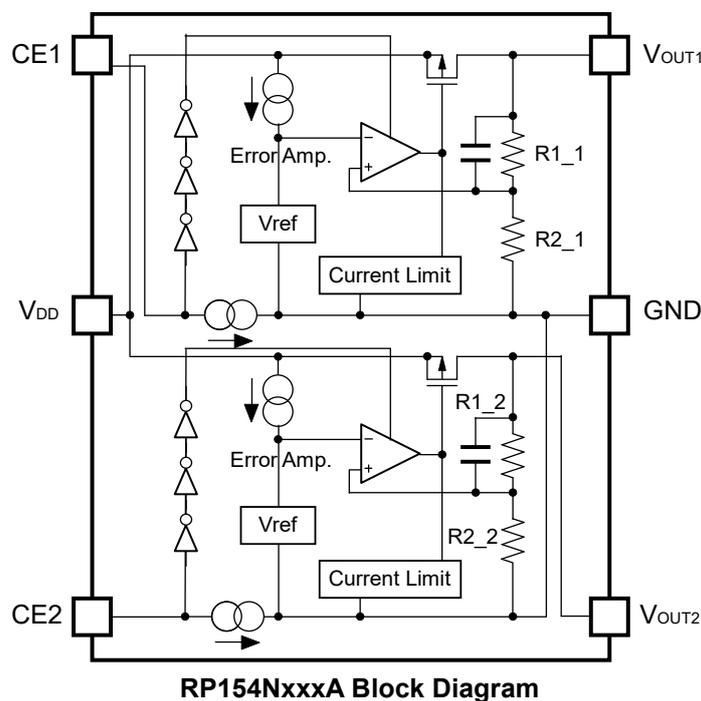
Product Name	Package	Quantity per Reel	Pb Free	Halogen Free
RP154L0xx*-E2	DFN1216-8	5,000 pcs	Yes	Yes
RP154N0xx*-TR-FE	SOT-23-6	3,000 pcs	Yes	Yes

xx: Specify the combination of set output voltage (V_{SET}) within the range of 0.8 V to 3.7 V in 0.1 V step.

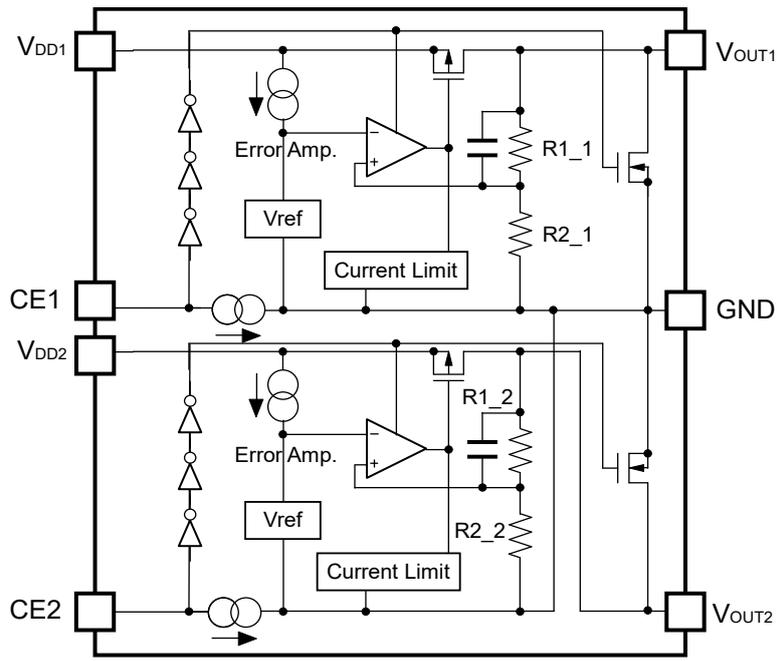
*: The auto discharge function at off state are options as follows.

- (A) Auto-discharge function not included, Active-high
- (B) Auto-discharge function included, Active-high

BLOCK DIAGRAMS

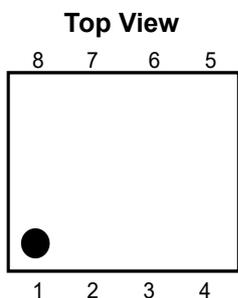


⁽¹⁾ Auto-discharge function quickly lowers the output voltage to 0 V by releasing the electrical charge accumulated in the external capacitor when the chip enable signal is switched from the active mode to the standby mode.

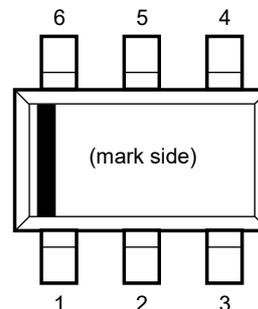
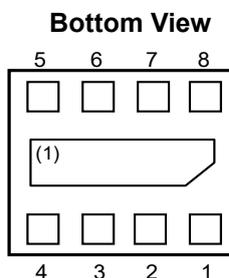


RP154LxxxB Block Diagram

PIN DESCRIPTIONS



DFN1216-8 Pin Configuration



SOT-23-6 Pin Configuration

DFN1216-8 Pin Description

Pin No.	Symbol	Description
1	GND	Ground Pin ⁽²⁾
2	VOUT1	Output Pin 1
3	VOUT2	Output Pin 2
4	GND	Ground Pin ⁽²⁾
5	CE2	Chip Enable Pin 2, Active-high
6	VDD2	Input Pin
7	VDD1	Input Pin
8	CE1	Chip Enable Pin 1, Active-high

SOT-23-6 Pin Description

Pin No.	Symbol	Description
1	CE1	Chip Enable Pin 1 ("H" Active)
2	VDD	Input Pin
3	CE2	Chip Enable Pin 2 ("H" Active)
4	VOUT2	Output Pin 2
5	GND	Ground Pin
6	VOUT1	Output Pin 1

⁽¹⁾ Tab is GND level. (They are connected to the reverse side of this IC). The tab is better to be connected to the GND, but leaving it open is also acceptable.

⁽²⁾ The GND pin must be wired together when it is mounted on board.

ABSOLUTE MAXIMUM RATINGS

Absolute Maximum Ratings

Symbol	Item	Rating	Unit	
V_{IN}	Input Voltage	6.0	V	
V_{CE}	Input Voltage (CE Pin)	-0.3 to 6.0	V	
V_{OUT1}, V_{OUT2}	Output Voltage	-0.3 to $V_{IN} + 0.3$	V	
I_{OUT1}, I_{OUT2}	Output Current	400	mA	
P_D	Power Dissipation ⁽¹⁾ (JEDEC STD. 51-7 Test Land Pattern)	DFN1216-8	1700	mW
		SOT-23-6	660	
P_D	Power Dissipation (DFN1216-8) ⁽²⁾	625	mW	
	Power Dissipation (SOT-23-6) ⁽¹⁾	420		
T_j	Junction Temperature Range	-40 to 125	° C	
T_{stg}	Storage Temperature Range	-55 to 125	° C	

ABSOLUTE MAXIMUM RATINGS

Electronic and mechanical stress momentarily exceeded absolute maximum ratings may cause permanent damage 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 CONDITIONS

Recommended Operating Conditions

Symbol	Item	Rating	Unit
V_{IN}	Operating Input Voltage	1.4 to 5.25	V
T_a	Operating Temperature Range	-40 to 85	°C

RECOMMENDED OPERATING CONDITIONS

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

⁽¹⁾ Refer to *POWER DISSIPATION* for detailed information.

⁽²⁾ Refer to *POWER DISSIPATION* for detailed information.

ELECTRICAL CHARACTERISTICS

$V_{IN} = V_{SET} > +1.0\text{ V}$ ($V_{SET} > 1.5\text{ V}$), $V_{IN} = 2.5\text{ V}$ ($V_{SET} \leq 1.5\text{ V}$), $I_{OUT} = 1\text{ mA}$, $C_{IN} = C_{OUT} = 1.0\text{ }\mu\text{F}$, unless otherwise noted,

V_{SET} = Set Output Voltage

The specification in is checked and guaranteed by design engineering at $-40^{\circ}\text{C} \leq T_a \leq 85^{\circ}\text{C}$.

VR1/VR2 Electrical Characteristics

($T_a = 25^{\circ}\text{C}$)

Symbol	Item	Conditions	Min.	Typ.	Max.	Unit		
V_{OUT}	Output Voltage	$T_a = 25^{\circ}\text{C}$	$V_{SET} > 2.0\text{ V}$	$\times 0.99$		$\times 1.01$	V	
			$V_{SET} \leq 2.0\text{ V}$	-20		20	mV	
		$-40^{\circ}\text{C} \leq T_a \leq 85^{\circ}\text{C}$	$V_{SET} > 2.0\text{ V}$	×0.97			×1.03	V
			$V_{SET} \leq 2.0\text{ V}$	-60			60	mV
I_{OUT}	Output Current		300			mA		
$\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$	Load Regulation	$1\text{ mA} \leq I_{OUT} \leq 300\text{ mA}$		15	40	mV		
V_{DIF}	Dropout Voltage	Refer to Dropout Voltage by Set Output Voltage.						
I_{SS}	Supply Current	$I_{OUT} = 0\text{ mA}$		50	75	μA		
$I_{standby}$	Standby Current	$V_{CE} = 0\text{ V}$		0.1	1.0	μA		
$\frac{\Delta V_{OUT}}{\Delta V_{IN}}$	Line Regulation	$V_{SET} + 0.5\text{ V} \leq V_{IN} \leq 5.25\text{ V}$ ($V_{IN} \geq 1.4\text{ V}$)		0.02	0.10	%/V		
RR	Ripple Rejection	$f = 1\text{ kHz}$, Ripple 0.2 Vp-p $V_{IN} = V_{SET} + 1.0\text{ V}$, $I_{OUT} = 30\text{ mA}$ (When $V_{SET} \leq 2.0\text{ V}$, $V_{IN} = 3.0\text{ V}$)		75		dB		
V_{IN}	Input Voltage ⁽¹⁾		1.4		5.25	V		
$\frac{\Delta V_{OUT}}{\Delta T_a}$	Output Voltage Temperature Coefficient	$-40^{\circ}\text{C} \leq T_a \leq 85^{\circ}\text{C}$		± 80		ppm/ $^{\circ}\text{C}$		
I_{SC}	Short Current Limit	$V_{OUT} = 0\text{ V}$		60		mA		
I_{PD}	CE Pull-down Current			0.3	0.6	μA		
V_{CEH}	CE Input Voltage "H"		1.0			V		
V_{CEL}	CE Input Voltage "L"				0.4	V		
en	Output Noise	$BW = 10\text{ Hz} \sim 100\text{ kHz}$		75		μVrms		
R_{LOW}	Low Output Nch Tr. ON Resistance (of B version)	$V_{IN} = 4.0\text{ V}$, $V_{CE} = 0\text{ V}$		50		Ω		

All of unit are tested and specified under load conditions such that $T_j \approx T_a = 25^{\circ}\text{C}$ except for Output Noise, Ripple Rejection, Output Voltage Temperature Coefficient and Thermal Shutdown.

⁽¹⁾ The maximum Input Voltage of *ELECTRICAL CHARACTERISTICS* is 5.25 V. In case of exceeding this specification, the IC must be operated on condition that the Input Voltage is up to 5.5 V and the total operating time is within 500 hrs.

ELECTRICAL CHARACTERISTICS (continued)

The specification in is checked and guaranteed by design engineering at $-40^{\circ}\text{C} \leq T_a \leq 85^{\circ}\text{C}$.

Dropout Voltage by Set Output Voltage

(Ta = 25° C)

Set Output Voltage V_{SET} (V)	Dropout Voltage V_{DIF} (V)		
	Condition	Typ.	Max.
$V_{\text{SET}} = 0.8$	$I_{\text{OUT}} = 300 \text{ mA}$	0.56	<input type="checkbox"/> 0.72
$V_{\text{SET}} = 0.9$		0.51	<input type="checkbox"/> 0.65
$1.0 \leq V_{\text{SET}} < 1.2$		0.46	<input type="checkbox"/> 0.59
$1.2 \leq V_{\text{SET}} < 1.4$		0.39	<input type="checkbox"/> 0.50
$1.4 \leq V_{\text{SET}} < 1.7$		0.35	<input type="checkbox"/> 0.44
$1.7 \leq V_{\text{SET}} < 2.1$		0.30	<input type="checkbox"/> 0.39
$2.1 \leq V_{\text{SET}} < 2.5$		0.26	<input type="checkbox"/> 0.34
$2.5 \leq V_{\text{SET}} < 3.0$		0.25	<input type="checkbox"/> 0.30
$3.0 \leq V_{\text{SET}} \leq 3.7$		0.22	<input type="checkbox"/> 0.29

RP154xxxxx Product-specific Electrical Characteristics

Product Name	VR1								VR2							
	V _{OUT} [V] (Ta = 25°C)			V _{OUT} [V] (-40°C ≤ Ta ≤ 85°C)			ΔV _{DIF} [V]		V _{OUT} [V] (Ta = 25°C)			V _{OUT} [V] (-40°C ≤ Ta ≤ 85°C)			ΔV _{DIF} [V]	
	Min.	Typ.	Max.	Min.	Typ.	Max.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Typ.	Max.
RP154x001x	2.772	2.800	2.828	2.716	2.800	2.884	0.25	0.30	2.772	2.800	2.828	2.716	2.800	2.884	0.25	0.30
RP154x002x	1.780	1.800	1.820	1.740	1.800	1.860	0.30	0.39	2.772	2.800	2.828	2.716	2.800	2.884	0.25	0.30
RP154x003x	1.480	1.500	1.520	1.440	1.500	1.560	0.35	0.44	2.772	2.800	2.828	2.716	2.800	2.884	0.25	0.30
RP154x004x	1.180	1.200	1.220	1.140	1.200	1.260	0.39	0.50	1.780	1.800	1.820	1.740	1.800	1.860	0.30	0.39
RP154x005x	3.267	3.300	3.333	3.201	3.300	3.399	0.22	0.29	1.180	1.200	1.220	1.140	1.200	1.260	0.39	0.50
RP154x006x	3.267	3.300	3.333	3.201	3.300	3.399	0.22	0.29	1.780	1.800	1.820	1.740	1.800	1.860	0.30	0.39
RP154x007x	2.822	2.850	2.878	2.765	2.850	2.935	0.25	0.30	2.822	2.850	2.878	2.765	2.850	2.935	0.25	0.30
RP154x008x	2.822	2.850	2.878	2.765	2.850	2.935	0.25	0.30	2.574	2.600	2.626	2.522	2.600	2.678	0.25	0.30
RP154x009x	2.970	3.000	3.030	2.910	3.000	3.090	0.22	0.29	2.772	2.800	2.828	2.716	2.800	2.884	0.25	0.30
RP154x010x	2.970	3.000	3.030	2.910	3.000	3.090	0.22	0.29	1.780	1.800	1.820	1.740	1.800	1.860	0.30	0.39
RP154x011x	1.780	1.800	1.820	1.740	1.800	1.860	0.30	0.39	1.480	1.500	1.520	1.440	1.500	1.560	0.35	0.44
RP154x012x	2.772	2.800	2.828	2.716	2.800	2.884	0.25	0.30	2.574	2.600	2.626	2.522	2.600	2.678	0.25	0.30
RP154x013x	3.267	3.300	3.333	3.201	3.300	3.399	0.22	0.29	2.772	2.800	2.828	2.716	2.800	2.884	0.25	0.30
RP154x014x	3.267	3.300	3.333	3.201	3.300	3.399	0.22	0.29	3.267	3.300	3.333	3.201	3.300	3.399	0.22	0.29
RP154x015x	1.480	1.500	1.520	1.440	1.500	1.560	0.35	0.44	2.475	2.500	2.525	2.425	2.500	2.575	0.25	0.30
RP154x016x	1.480	1.500	1.520	1.440	1.500	1.560	0.35	0.44	2.970	3.000	3.030	2.910	3.000	3.090	0.22	0.29
RP154x017x	2.475	2.500	2.525	2.425	2.500	2.575	0.25	0.30	2.970	3.000	3.030	2.910	3.000	3.090	0.22	0.29
RP154x018x	1.780	1.800	1.820	1.740	1.800	1.860	0.30	0.39	1.780	1.800	1.820	1.740	1.800	1.860	0.30	0.39
RP154x019x	1.480	1.500	1.520	1.440	1.500	1.560	0.35	0.44	2.574	2.600	2.626	2.522	2.600	2.678	0.25	0.30
RP154x020x	2.772	2.800	2.828	2.716	2.800	2.884	0.25	0.30	1.780	1.800	1.820	1.740	1.800	1.860	0.30	0.39
RP154x021x	1.180	1.200	1.220	1.140	1.200	1.260	0.39	0.50	2.772	2.800	2.828	2.716	2.800	2.884	0.25	0.30
RP154x022x	2.772	2.800	2.828	2.716	2.800	2.884	0.25	0.30	1.180	1.200	1.220	1.140	1.200	1.260	0.39	0.50
RP154x023x	2.475	2.500	2.525	2.425	2.500	2.575	0.25	0.30	2.475	2.500	2.525	2.425	2.500	2.575	0.25	0.30
RP154x024x	3.267	3.300	3.333	3.201	3.300	3.399	0.22	0.29	2.970	3.000	3.030	2.910	3.000	3.090	0.22	0.29
RP154x025x	2.970	3.000	3.030	2.910	3.000	3.090	0.22	0.29	2.970	3.000	3.030	2.910	3.000	3.090	0.22	0.29

RP154xxxx Product-specific Electrical Characteristics

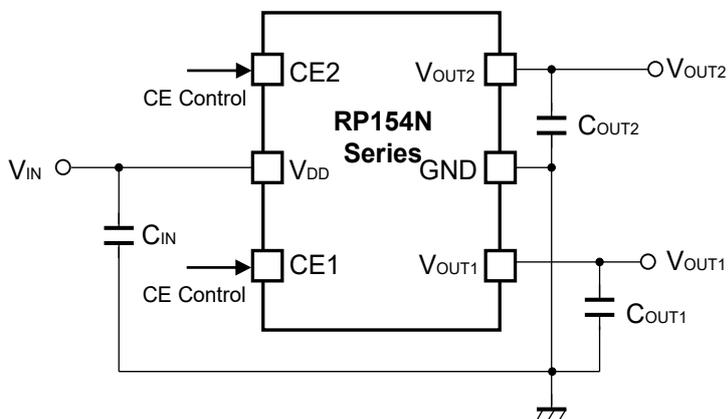
Product Name	VR1								VR2							
	V _{OUT} [V] (Ta = 25°C)			V _{OUT} [V] (-40°C ≤ Ta ≤ 85°C)			ΔV _{DIF} [V]		V _{OUT} [V] (Ta = 25°C)			V _{OUT} [V] (-40°C ≤ Ta ≤ 85°C)			ΔV _{DIF} [V]	
	Min.	Typ.	Max.	Min.	Typ.	Max.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Typ.	Max.
RP154x026x	2.772	2.800	2.828	2.716	2.800	2.884	0.25	0.30	3.069	3.100	3.131	3.007	3.100	3.193	0.22	0.29
RP154x027x	2.277	2.300	2.323	2.231	2.300	2.369	0.26	0.34	2.772	2.800	2.828	2.716	2.800	2.884	0.25	0.30
RP154x028x	2.772	2.800	2.828	2.716	2.800	2.884	0.25	0.30	0.980	1.000	1.020	0.940	1.000	1.060	0.46	0.59
RP154x029x	1.480	1.500	1.520	1.440	1.500	1.560	0.35	0.44	1.480	1.500	1.520	1.440	1.500	1.560	0.35	0.44
RP154x030x	1.180	1.200	1.220	1.140	1.200	1.260	0.39	0.50	2.871	2.900	2.929	2.813	2.900	2.987	0.25	0.30
RP154x031x	2.624	2.650	2.676	2.571	2.650	2.729	0.25	0.30	2.822	2.850	2.878	2.765	2.850	2.935	0.25	0.30
RP154x032x	3.267	3.300	3.333	3.201	3.300	3.399	0.22	0.29	2.822	2.850	2.878	2.765	2.850	2.935	0.25	0.30
RP154x033x	1.780	1.800	1.820	1.740	1.800	1.860	0.30	0.39	2.871	2.900	2.929	2.813	2.900	2.987	0.25	0.30
RP154x034x	3.069	3.100	3.131	3.007	3.100	3.193	0.22	0.29	3.069	3.100	3.131	3.007	3.100	3.193	0.22	0.29
RP154x035x	2.772	2.800	2.828	2.716	2.800	2.884	0.25	0.30	2.673	2.700	2.727	2.619	2.700	2.781	0.25	0.30
RP154x036x	0.980	1.000	1.020	0.940	1.000	1.060	0.46	0.59	1.780	1.800	1.820	1.740	1.800	1.860	0.30	0.39
RP154x037x	1.180	1.200	1.220	1.140	1.200	1.260	0.39	0.50	2.475	2.500	2.525	2.425	2.500	2.575	0.25	0.30
RP154x038x	1.680	1.700	1.720	1.640	1.700	1.760	0.30	0.39	3.069	3.100	3.131	3.007	3.100	3.193	0.22	0.29
RP154x039x	1.780	1.800	1.820	1.740	1.800	1.860	0.30	0.39	2.475	2.500	2.525	2.425	2.500	2.575	0.25	0.30
RP154x040x	1.480	1.500	1.520	1.440	1.500	1.560	0.35	0.44	1.780	1.800	1.820	1.740	1.800	1.860	0.30	0.39
RP154x041x	1.780	1.800	1.820	1.740	1.800	1.860	0.30	0.39	2.673	2.700	2.727	2.619	2.700	2.781	0.25	0.30
RP154x042x	2.673	2.700	2.727	2.619	2.700	2.781	0.25	0.30	2.673	2.700	2.727	2.619	2.700	2.781	0.25	0.30
RP154x043x	2.871	2.900	2.929	2.813	2.900	2.987	0.25	0.30	2.871	2.900	2.929	2.813	2.900	2.987	0.25	0.30
RP154x044x	1.680	1.700	1.720	1.640	1.700	1.760	0.30	0.39	2.970	3.000	3.030	2.910	3.000	3.090	0.22	0.29
RP154x045x	1.730	1.750	1.770	1.690	1.750	1.810	0.30	0.39	2.970	3.000	3.030	2.910	3.000	3.090	0.22	0.29
RP154x046x	2.970	3.000	3.030	2.910	3.000	3.090	0.22	0.29	3.069	3.100	3.131	3.007	3.100	3.193	0.22	0.29
RP154x047x	1.730	1.750	1.770	1.690	1.750	1.810	0.30	0.39	3.069	3.100	3.131	3.007	3.100	3.193	0.22	0.29
RP154x048x	1.780	1.800	1.820	1.740	1.800	1.860	0.30	0.39	3.069	3.100	3.131	3.007	3.100	3.193	0.22	0.29
RP154x049x	2.475	2.500	2.525	2.425	2.500	2.575	0.25	0.30	3.069	3.100	3.131	3.007	3.100	3.193	0.22	0.29
RP154x050x	3.069	3.100	3.131	3.007	3.100	3.193	0.22	0.29	3.267	3.300	3.333	3.201	3.300	3.399	0.22	0.29

RP154xxxxx Product-specific Electrical Characteristics

Product Name	VR1								VR2							
	V _{OUT} [V] (Ta = 25°C)			V _{OUT} [V] (-40°C ≤ Ta ≤ 85°C)			ΔV _{DIF} [V]		V _{OUT} [V] (Ta = 25°C)			V _{OUT} [V] (-40°C ≤ Ta ≤ 85°C)			ΔV _{DIF} [V]	
	Min.	Typ.	Max.	Min.	Typ.	Max.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Typ.	Max.
RP154x051x	3.564	3.600	3.636	3.492	3.600	3.708	0.22	0.29	3.564	3.600	3.636	3.492	3.600	3.708	0.22	0.29
RP154x052x	1.780	1.800	1.820	1.740	1.800	1.860	0.30	0.39	2.970	3.000	3.030	2.910	3.000	3.090	0.22	0.29
RP154x053x	2.822	2.850	2.878	2.765	2.850	2.935	0.25	0.30	3.069	3.100	3.131	3.007	3.100	3.193	0.22	0.29
RP154x054x	1.180	1.200	1.220	1.140	1.200	1.260	0.39	0.50	1.180	1.200	1.220	1.140	1.200	1.260	0.39	0.50
RP154x055x	3.663	3.700	3.737	3.589	3.700	3.811	0.22	0.29	3.663	3.700	3.737	3.589	3.700	3.811	0.22	0.29
RP154x056x	1.080	1.100	1.120	1.040	1.100	1.160	0.46	0.59	1.780	1.800	1.820	1.740	1.800	1.860	0.30	0.39
RP154x057x	1.080	1.100	1.120	1.040	1.100	1.160	0.46	0.59	1.180	1.200	1.220	1.140	1.200	1.260	0.39	0.50
RP154x058x	0.980	1.000	1.020	0.940	1.000	1.060	0.46	0.59	3.267	3.300	3.333	3.201	3.300	3.399	0.22	0.29
RP154x059x	0.880	0.900	0.920	0.840	0.900	0.960	0.51	0.65	1.780	1.800	1.820	1.740	1.800	1.860	0.30	0.39
RP154x060x	0.880	0.900	0.920	0.840	0.900	0.960	0.51	0.65	0.880	0.900	0.920	0.840	0.900	0.960	0.51	0.65
RP154x061x	1.180	1.200	1.220	1.140	1.200	1.260	0.39	0.50	2.970	3.000	3.030	2.910	3.000	3.090	0.22	0.29
RP154x062x	2.772	2.800	2.828	2.716	2.800	2.884	0.25	0.30	2.871	2.900	2.929	2.813	2.900	2.987	0.25	0.30
RP154x063x	3.267	3.300	3.333	3.201	3.300	3.399	0.22	0.29	1.480	1.500	1.520	1.440	1.500	1.560	0.35	0.44
RP154x064x	1.080	1.100	1.120	1.040	1.100	1.160	0.46	0.59	2.871	2.900	2.929	2.813	2.900	2.987	0.25	0.30
RP154x065x	2.772	2.800	2.828	2.716	2.800	2.884	0.25	0.30	2.475	2.500	2.525	2.425	2.500	2.575	0.25	0.30
RP154x066x	0.780	0.800	0.820	0.740	0.800	0.860	0.56	0.72	1.780	1.800	1.820	1.740	1.800	1.860	0.30	0.39
RP154x067x	3.267	3.300	3.333	3.201	3.300	3.399	0.22	0.29	2.475	2.500	2.525	2.425	2.500	2.575	0.25	0.30
RP154x068x	1.280	1.300	1.320	1.240	1.300	1.360	0.39	0.50	1.780	1.800	1.820	1.740	1.800	1.860	0.30	0.39
RP154x069x	1.680	1.700	1.720	1.640	1.700	1.760	0.30	0.39	1.480	1.500	1.520	1.440	1.500	1.560	0.35	0.44
RP154x070x	1.180	1.200	1.220	1.140	1.200	1.260	0.39	0.50	1.280	1.300	1.320	1.240	1.300	1.360	0.39	0.50
RP154x071x	1.080	1.100	1.120	1.040	1.100	1.160	0.46	0.59	3.267	3.300	3.333	3.201	3.300	3.399	0.22	0.29

APPLICATION INFORMATION

TYPICAL APPLICATION CIRCUIT

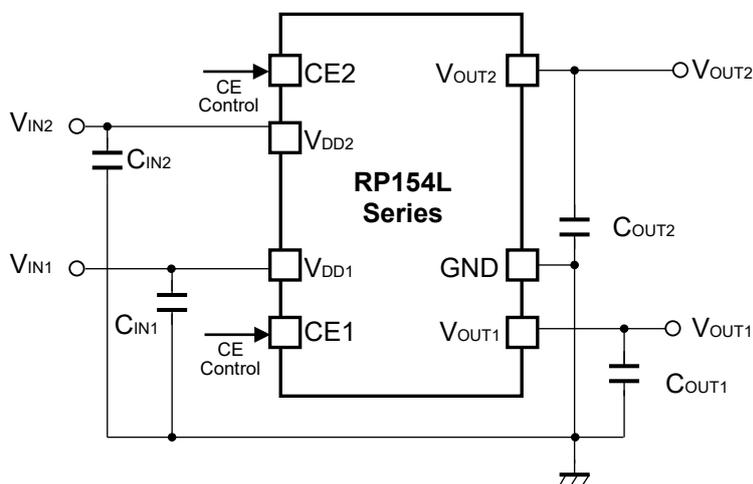


$C_{IN} = C_{OUT1} = C_{OUT2} = \text{Ceramic } 1.0 \mu\text{F}$

RP154NxxxA/B Typical Application Circuit

External Components

Symbol	Description
C_{OUT1}, C_{OUT2}	Ceramic Capacitor, 1.0 μF , Murata: GRM155B31A105KE15



$C_{IN1} = C_{IN2} = C_{OUT1} = C_{OUT2} = \text{Ceramic } 1.0 \mu\text{F}$

RP154LxxxA/B Typical Application Circuit

External Components

Symbol	Description
C_{OUT1}, C_{OUT2}	Ceramic Capacitor, 1.0 μF , Murata: GRM155B31A105KE15

TECHNICAL NOTES

Phase Compensation

In these ICs, phase compensation is made for securing stable operation even if the load current is varied. For this purpose, use capacitors (1.0 μ F or more) for C_{OUT1} and C_{OUT2} 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. If the tantalum capacitor is used and its ESR (Equivalent Series Resistance) is too large, the output may be unstable, therefore, fully evaluation is necessary.

PCB Layout

Make VDD and GND lines sufficient. If their impedance is high, noise pickup or unstable operation may result. Connect capacitors with a capacitance value as much as 1.0 μ F or more between VDD and GND pin, and as close as possible to the pins (C_{IN1} / C_{IN2}).

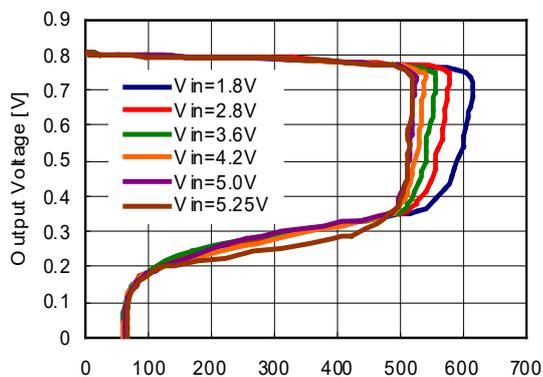
Set external components, especially the output capacitors, as close as possible to the ICs, and make wiring as short as possible (C_{OUT1} / C_{OUT2}).

TYPICAL CHARACTERISTICS

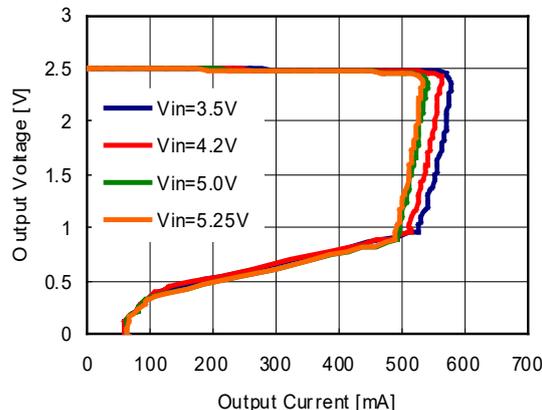
Note: Typical Characteristics are intended to be used as reference data; they are not guaranteed.

1) Output Voltage vs. Output Current ($C_{IN} = 1.0 \mu F$, $C_{OUT1} = C_{OUT2} = 1.0 \mu F$, $T_a = 25^\circ C$)

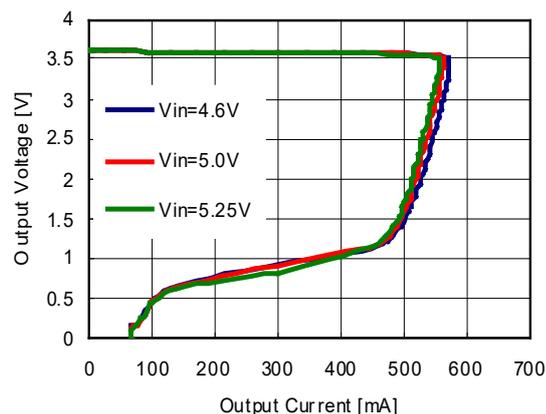
0.8V (VR1/VR2)



2.5V (VR1/VR2)

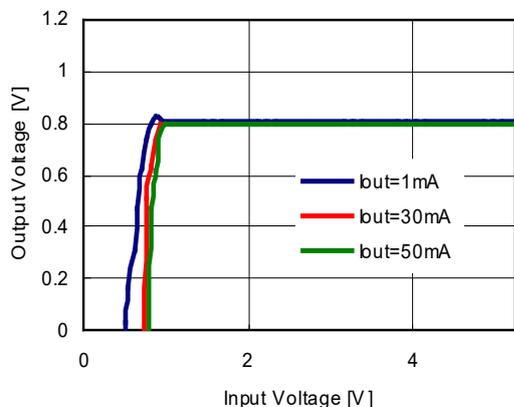


3.6V (VR1/VR2)

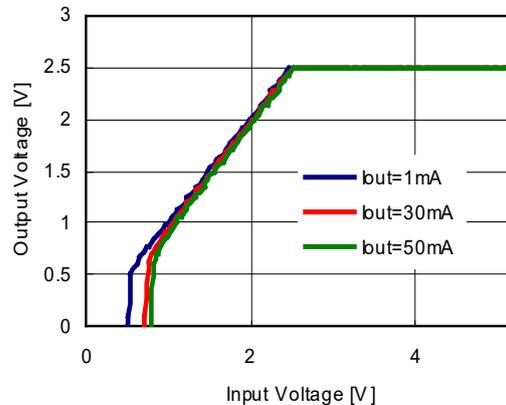


2) Output Voltage vs. Input Voltage ($C_{IN} = 1.0 \mu F$, $C_{OUT1} = C_{OUT2} = 1.0 \mu F$, $T_a = 25^\circ C$)

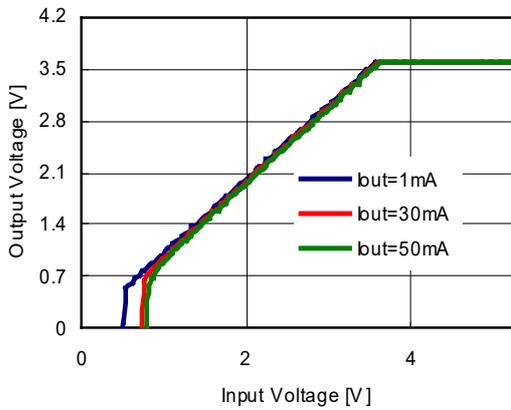
0.8V (VR1/VR2)



2.5V (VR1/VR2)

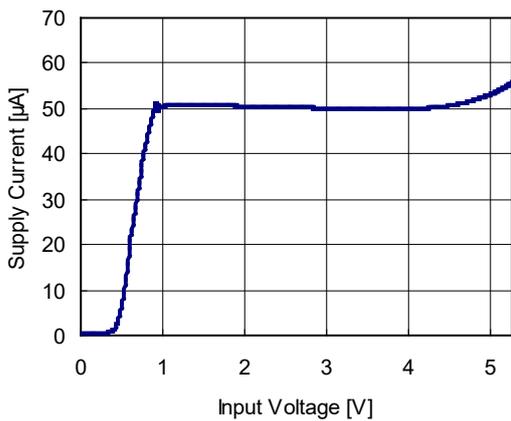


3.6V(VR1/VR2)

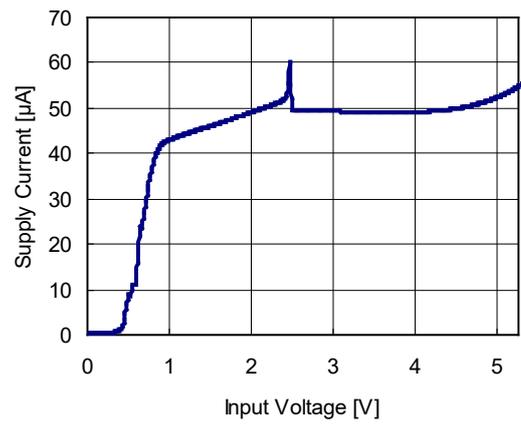


3) Supply Current vs. Input Voltage ($C_{IN} = 1.0 \mu F$, $C_{OUT1} = C_{OUT2} = 1.0 \mu F$, $T_a = 25^\circ C$)

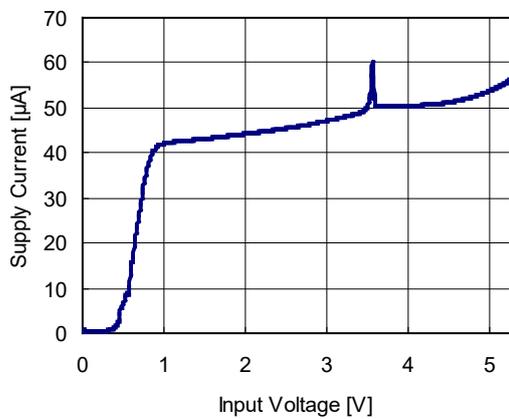
0.8V(VR1/VR2)



2.5V(VR1/VR2)

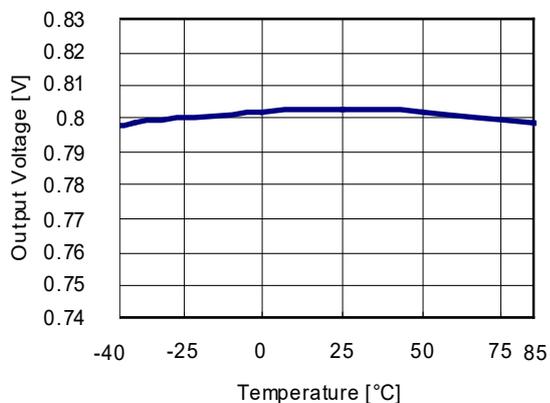


3.6V(VR1/VR2)

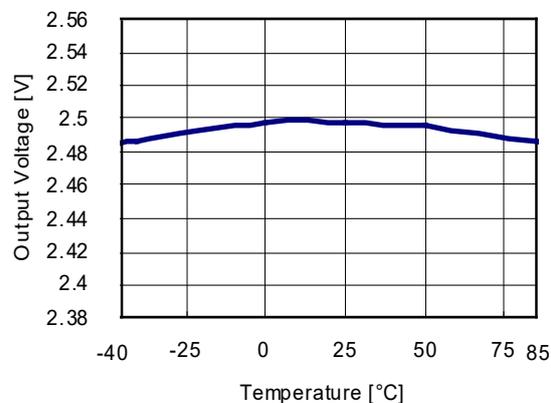


4) Output Voltage vs. Temperature ($C_{IN} = 1.0 \mu F$, $C_{OUT1} = C_{OUT2} = 1.0 \mu F$, $I_{OUT} = 5 \text{ mA}$)

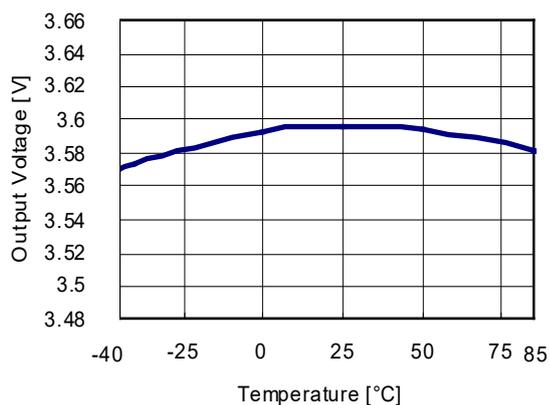
0.8V(VR1/VR2)



2.5V(VR1/VR2)

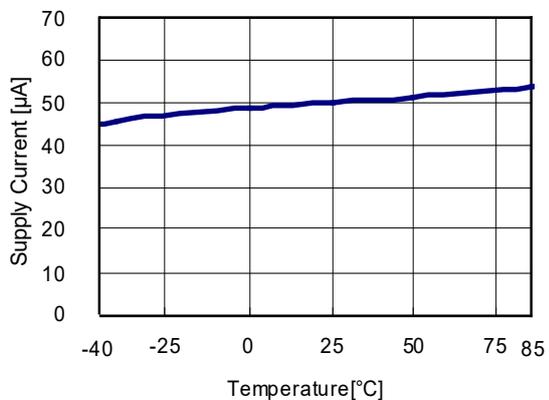


3.6V(VR1/VR2)

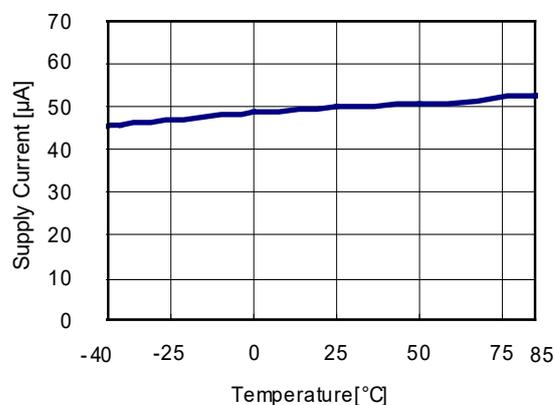


5) Supply Current vs. Temperature ($C_{IN} = 1.0 \mu F$, $C_{OUT1} = C_{OUT2} = 1.0 \mu F$)

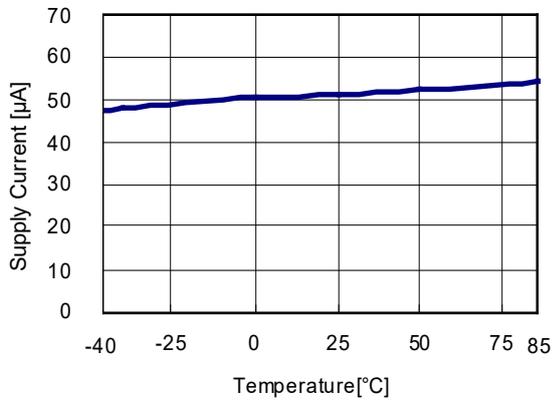
0.8V(VR1/VR2)



2.5V(VR1/VR2)

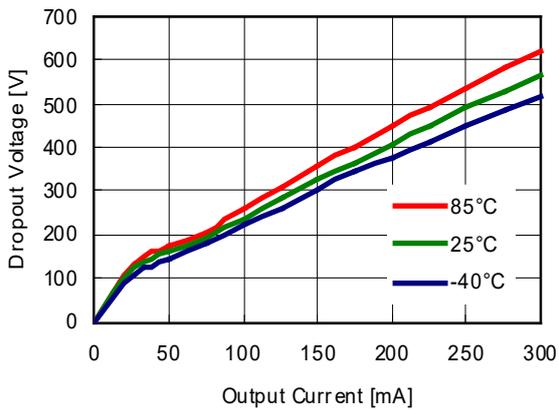


3.6V(VR1/VR2)

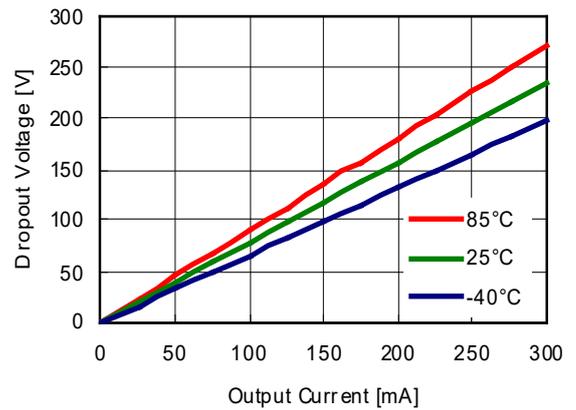


6) Dropout Voltage vs. Output Current ($C_{IN} = 1.0 \mu F$, $C_{OUT1} = C_{OUT2} = 1.0 \mu F$)

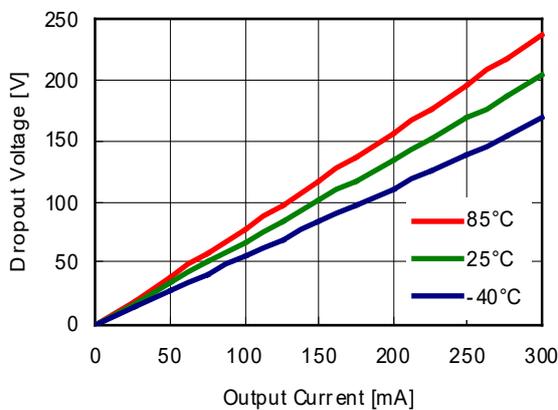
0.8V(VR1/VR2)



2.5V(VR1/VR2)

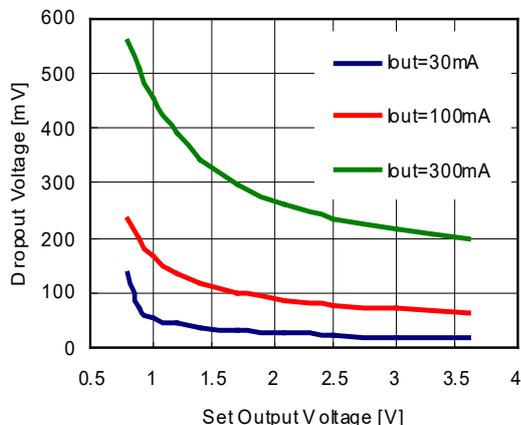


3.6V(VR1/VR2)



7) Dropout Voltage vs. Set Output Voltage

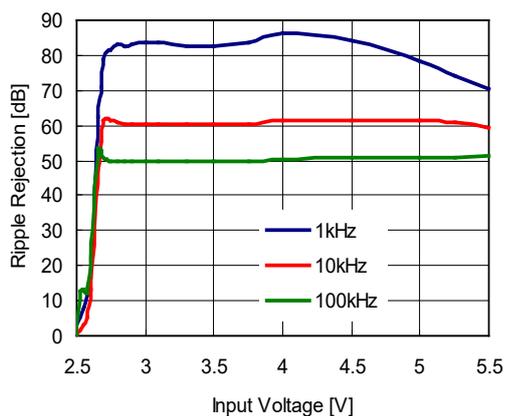
(VR1/VR2)



8) Ripple Rejection vs. Input Voltage (C_{IN} = none, C_{OUT1} = C_{OUT2} = 1.0 μF, Ripple = 0.2 Vp-p, Ta = 25°C)

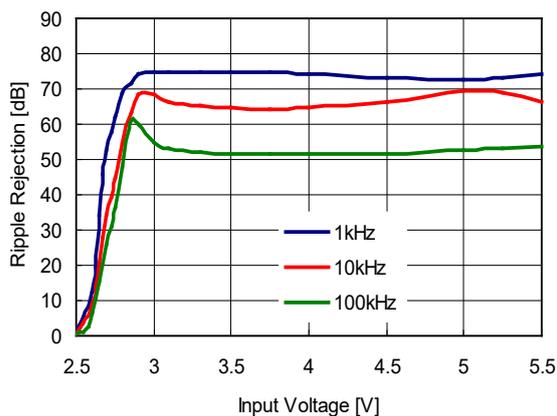
2.5V(VR1/VR2)

I_{out}=1mA



2.5V(VR1/VR2)

I_{out}=30mA

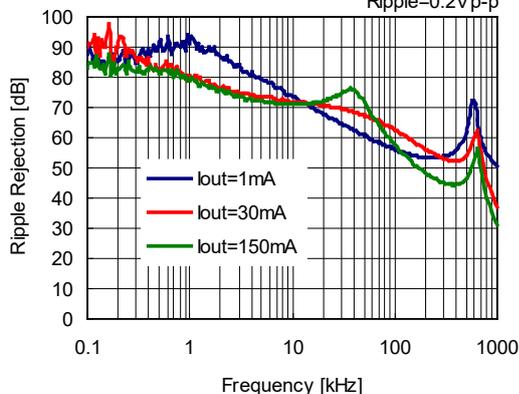


9) Ripple Rejection vs. Frequency (C_{IN} = none, C_{OUT1} = C_{OUT2} = 1.0 μF, Ta = 25°C)

0.8V(VR1/VR2)

V_{in}=3V

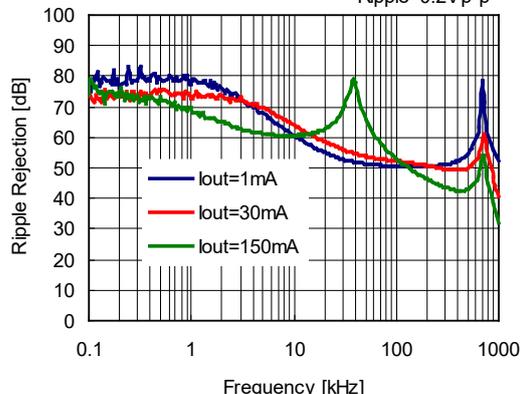
Ripple=0.2Vp-p

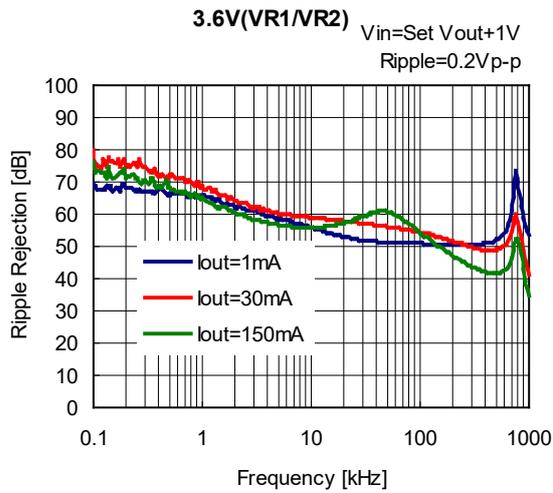


2.5V(VR1/VR2)

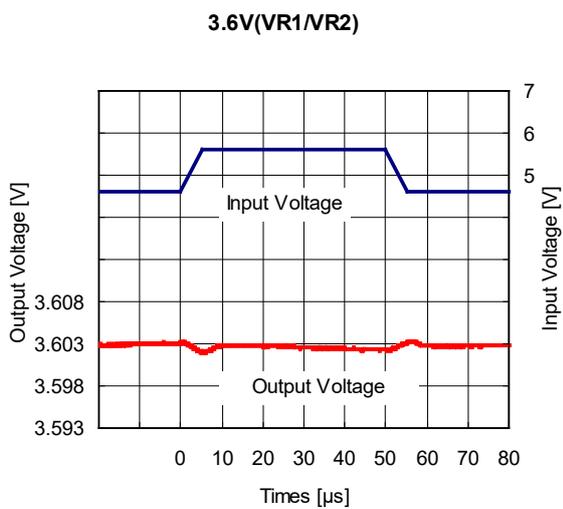
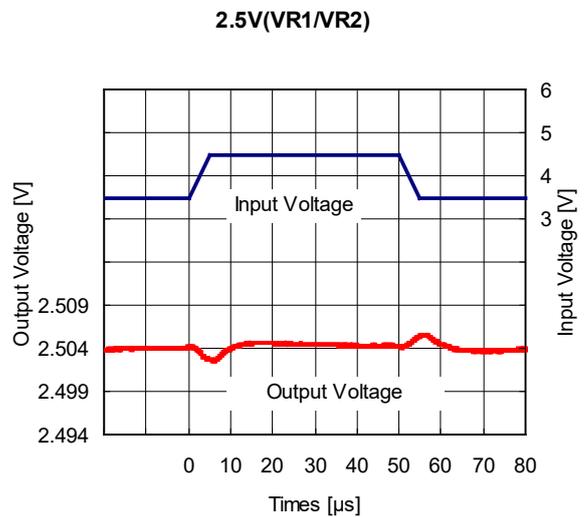
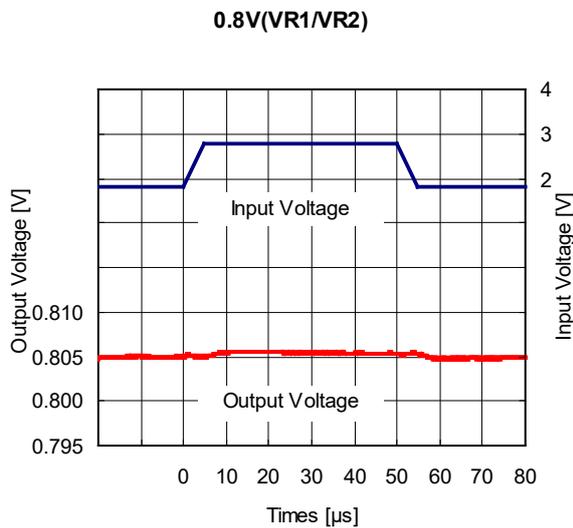
V_{in}=Set Vout+1V

Ripple=0.2Vp-p

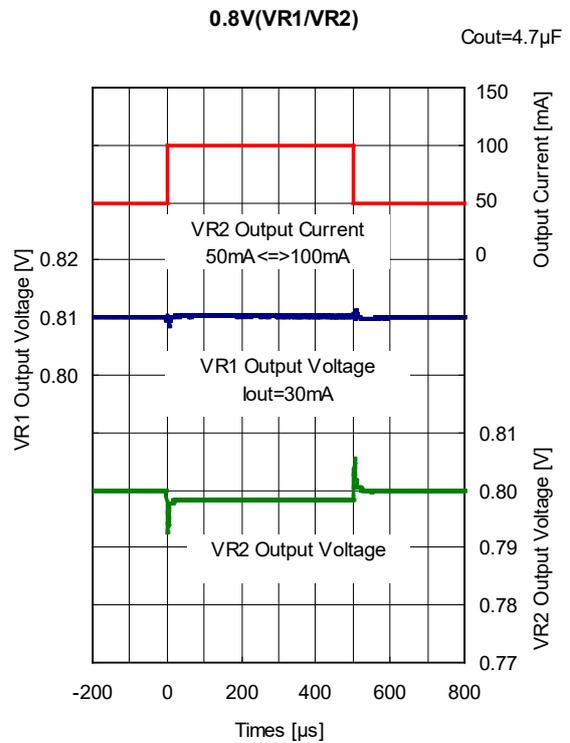
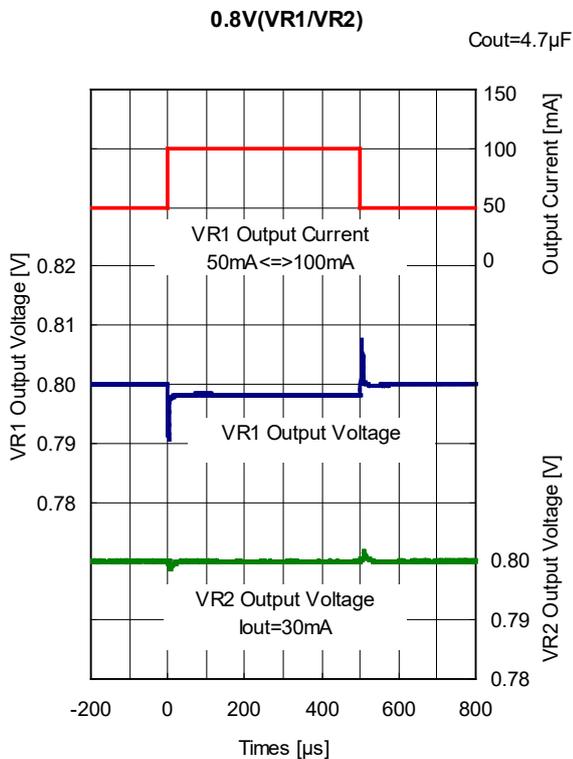
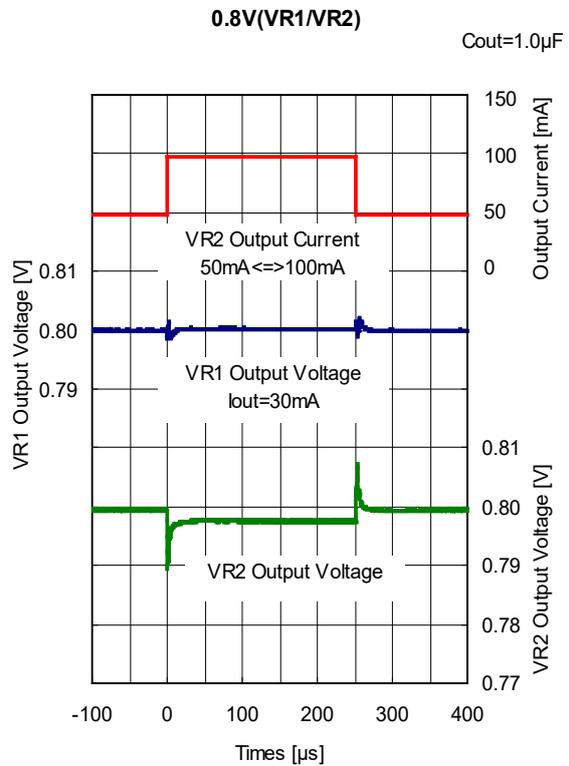
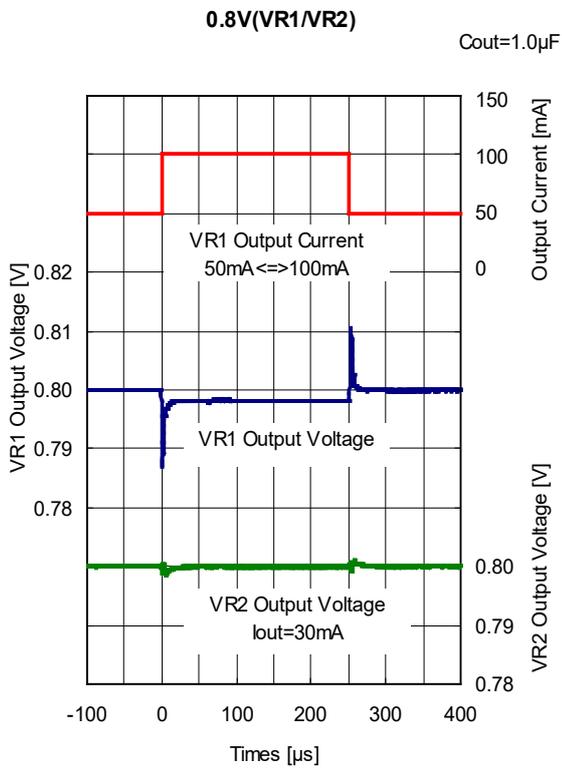


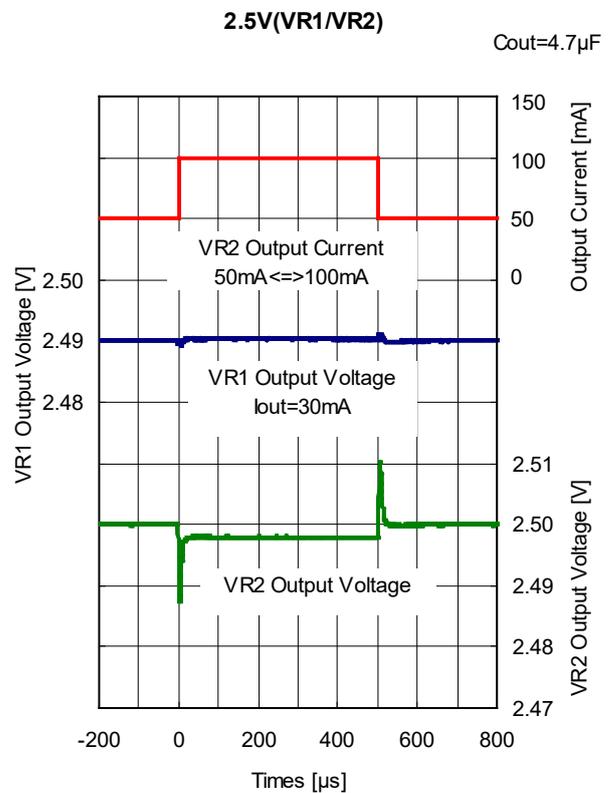
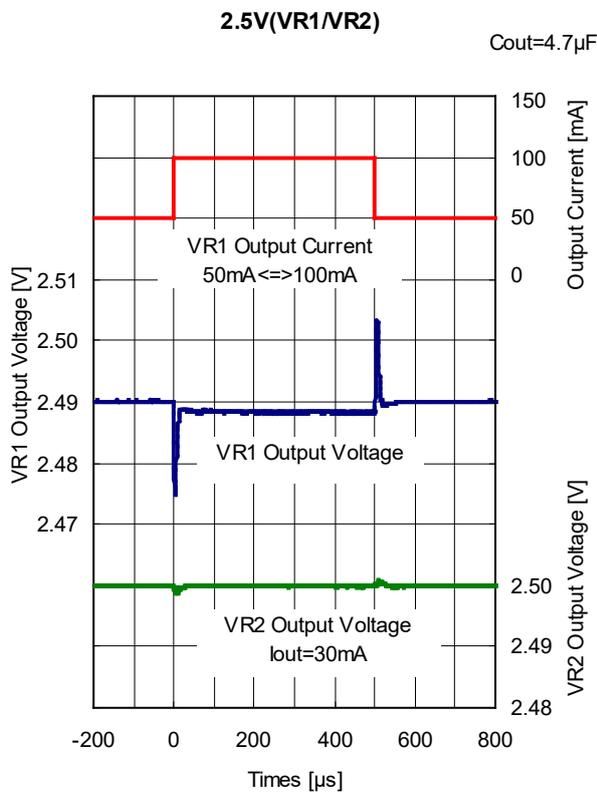
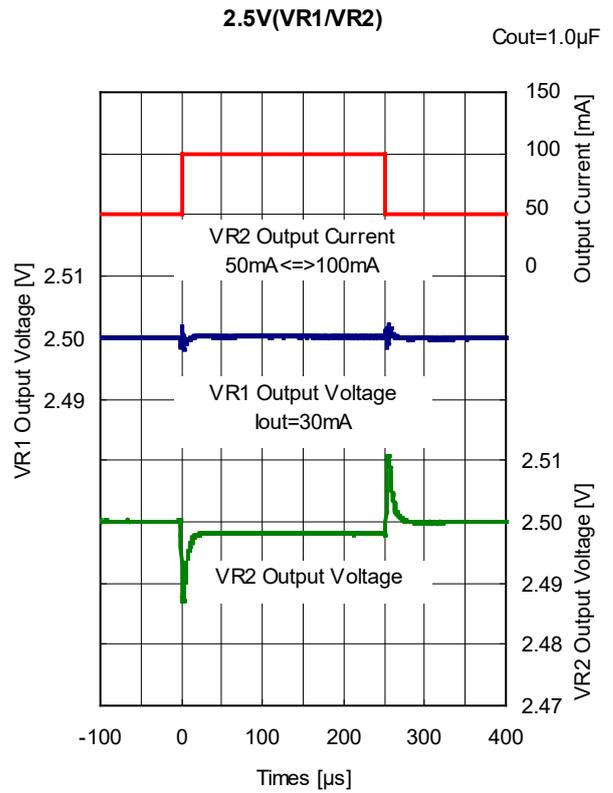
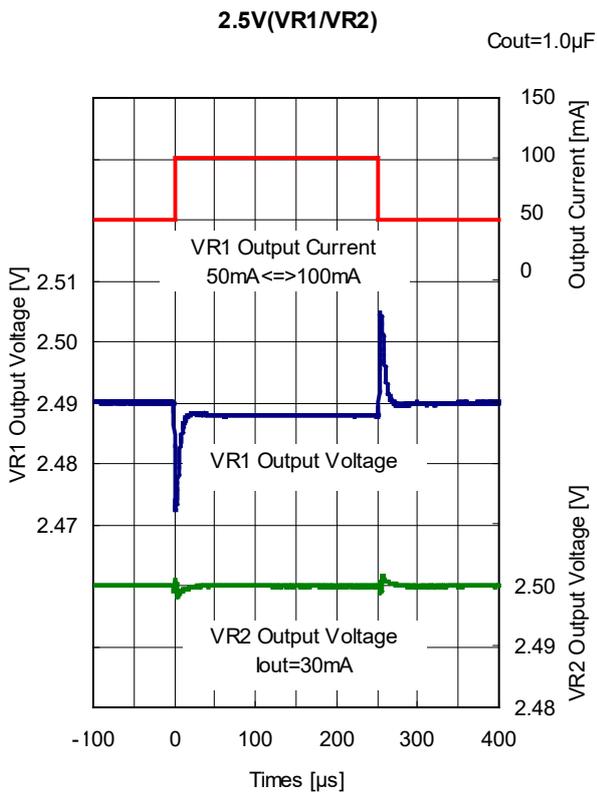


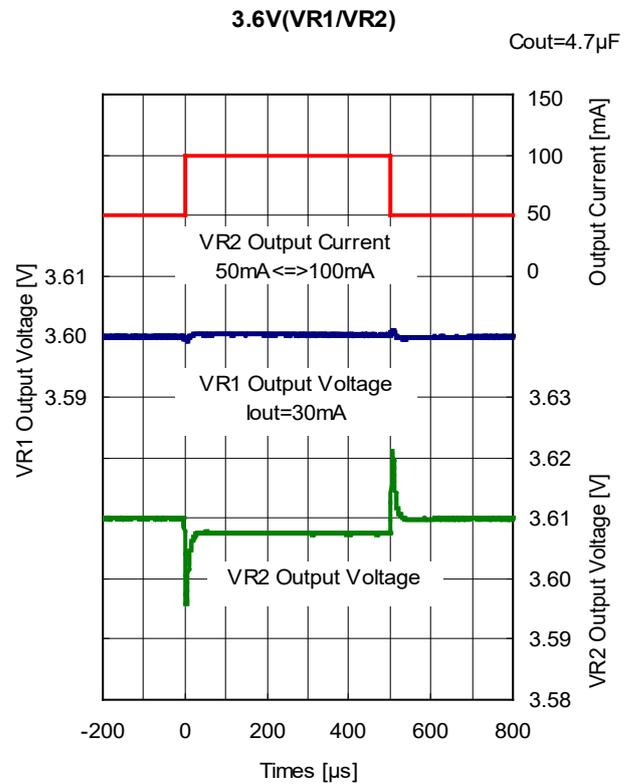
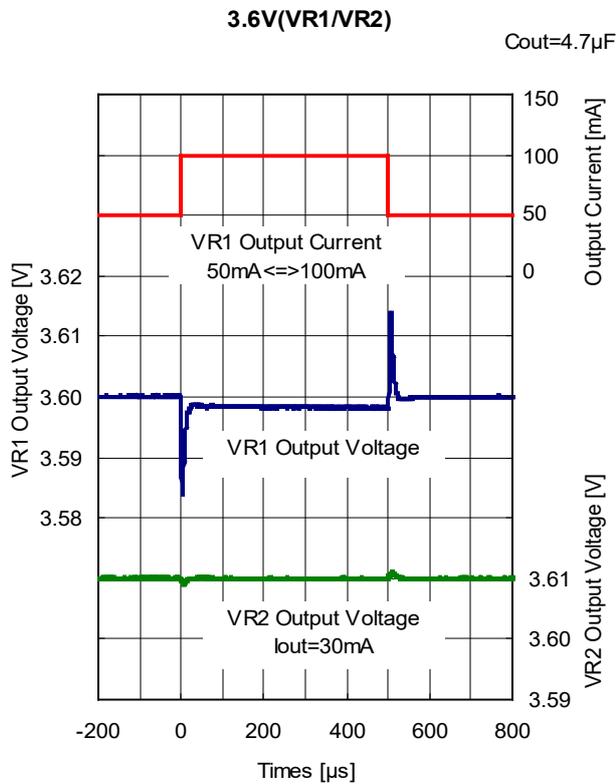
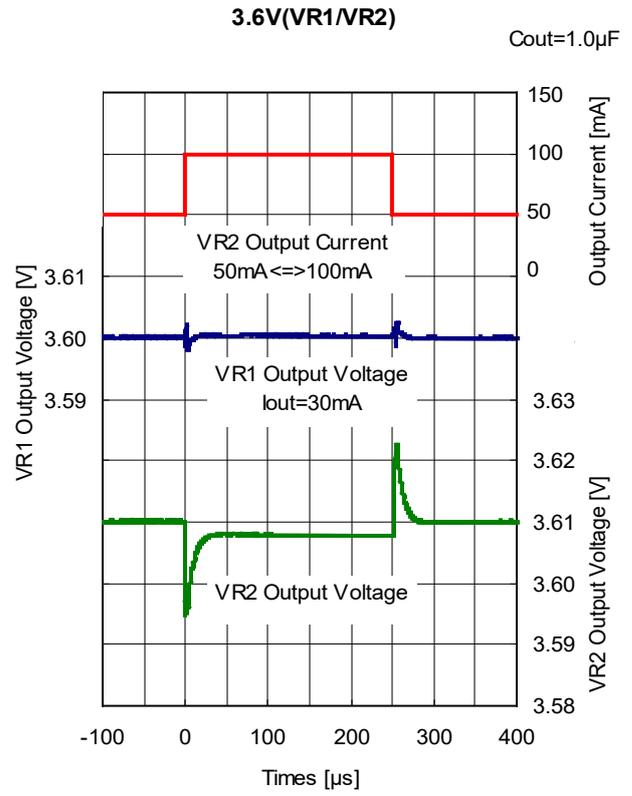
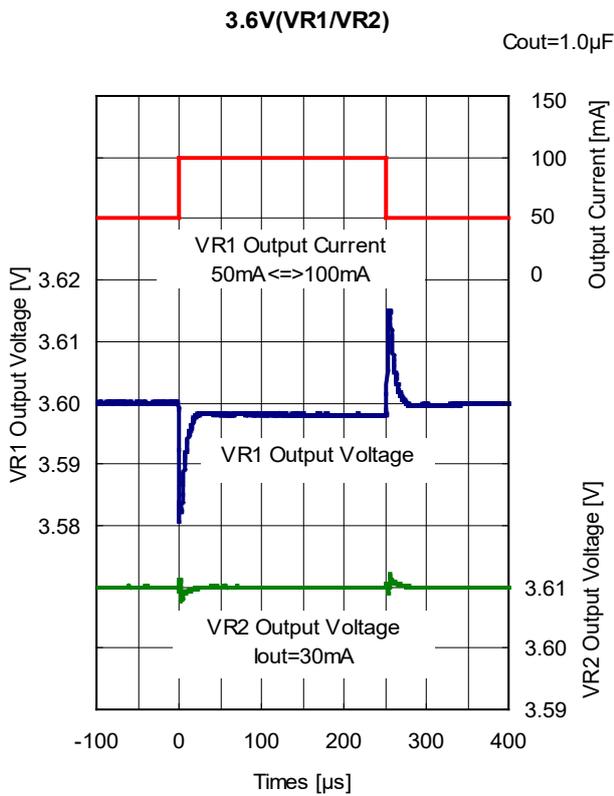
10) Input Transient Response ($C_{IN} = \text{none}$, $C_{OUT1} = C_{OUT2} = 1.0 \mu F$, $t_r = t_f = 5 \mu s$, $T_a = 25^\circ C$)

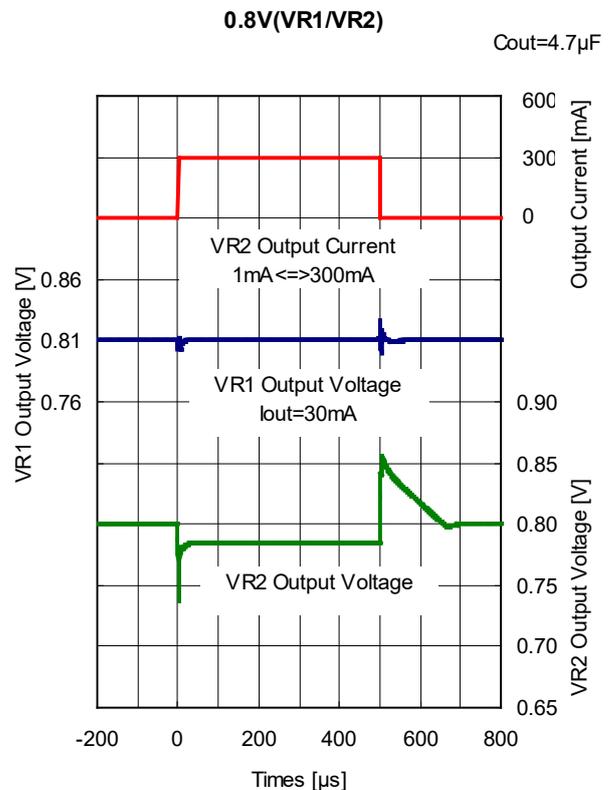
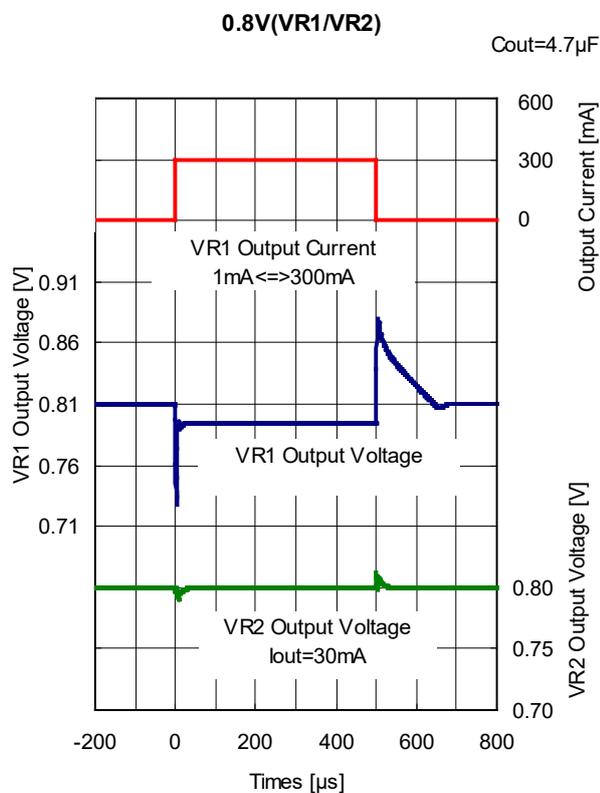
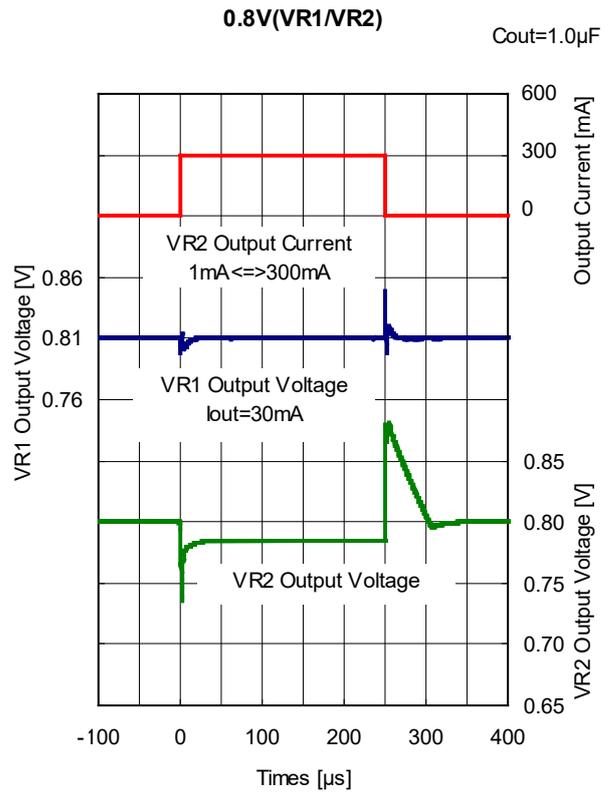
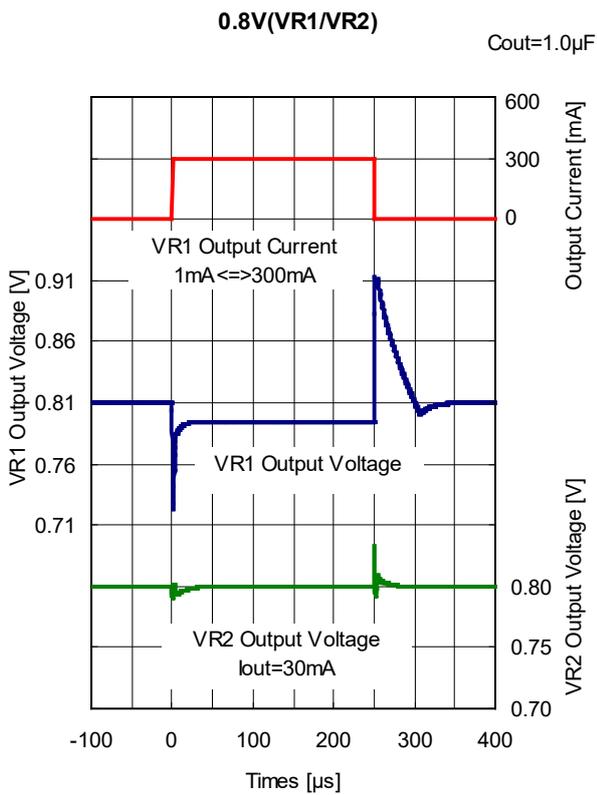


11) Load Transient Response ($C_{IN} = 1.0 \mu F$, $C_{OUT1} = C_{OUT2} = 1.0 \mu F$, $t_r = t_f = 0.5 \mu s$, $T_a = 25^\circ C$)



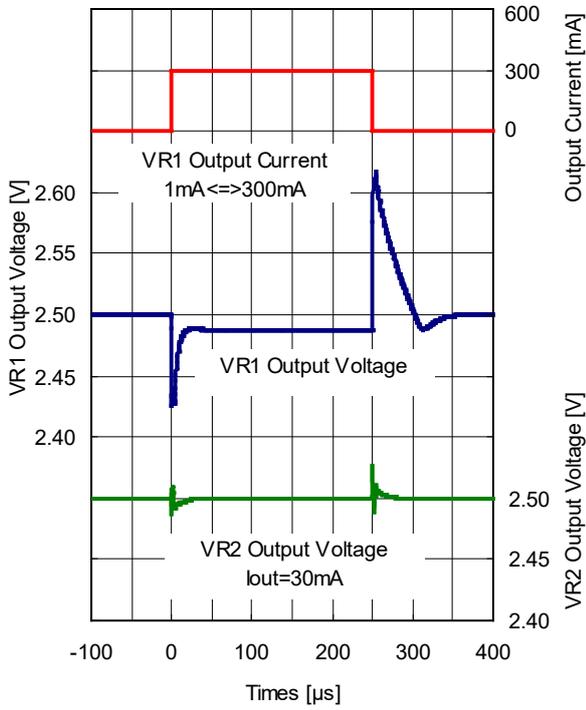






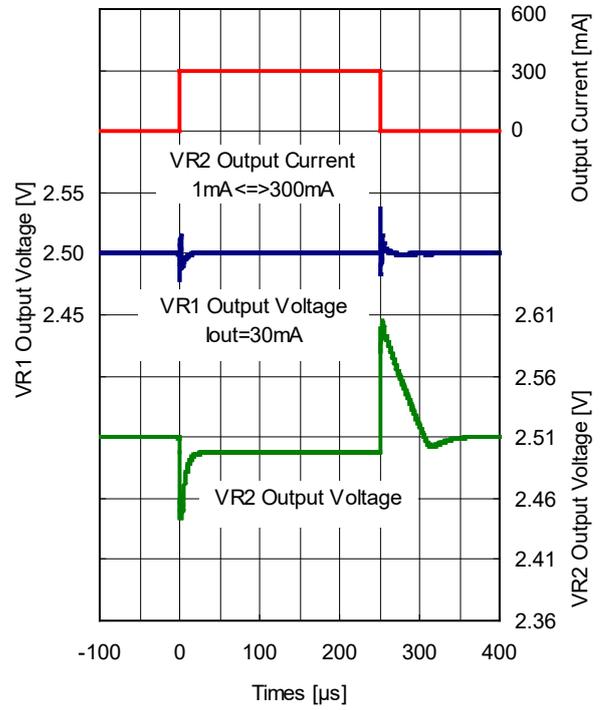
2.5V(VR1/VR2)

Cout=1.0μF



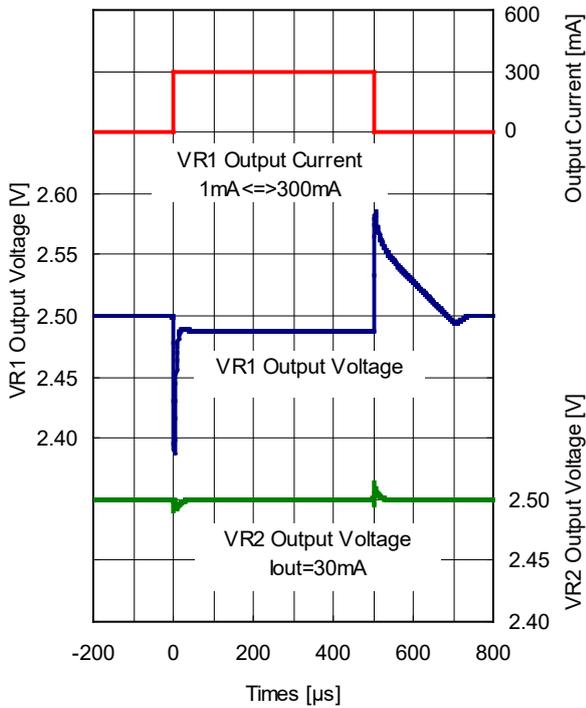
2.5V(VR1/VR2)

Cout=1.0μF



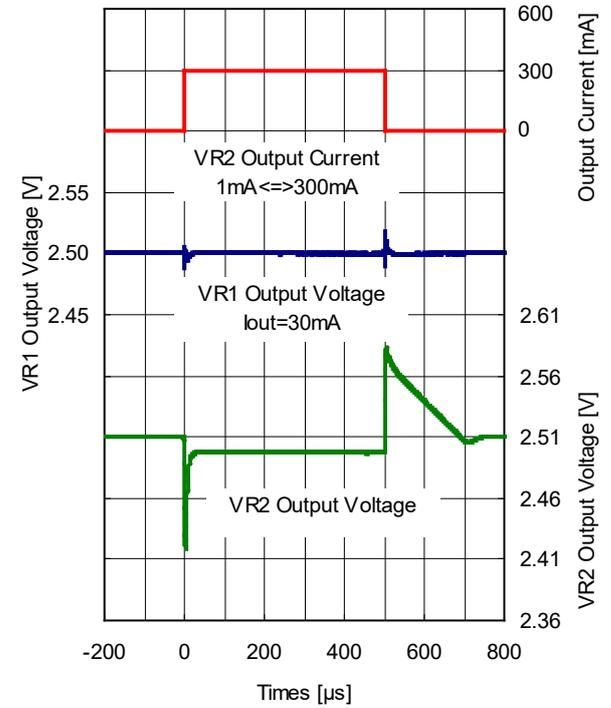
2.5V(VR1/VR2)

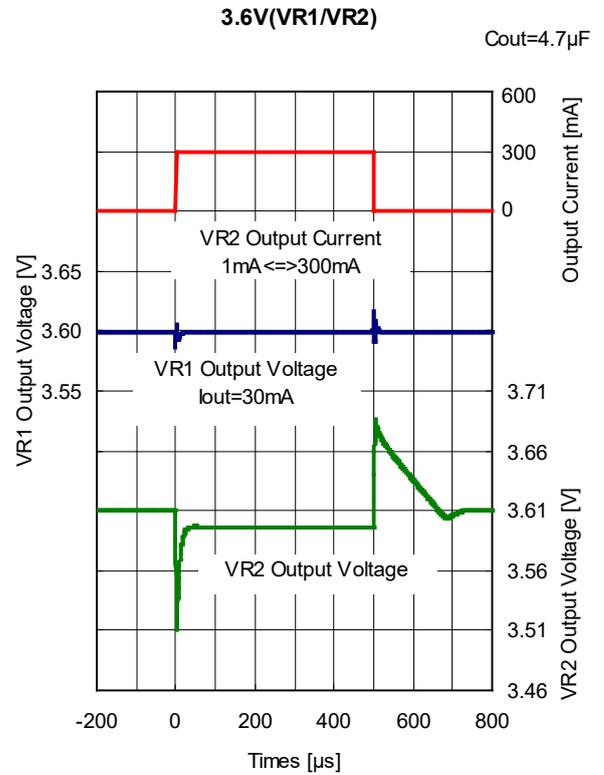
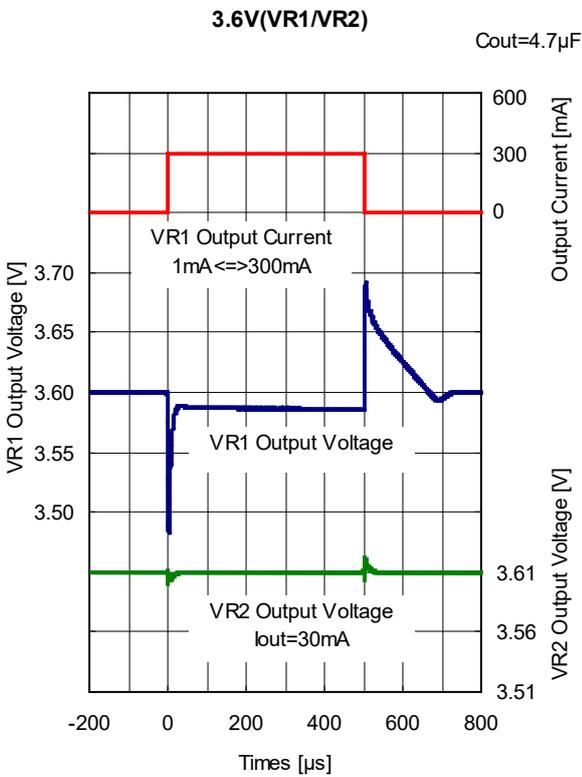
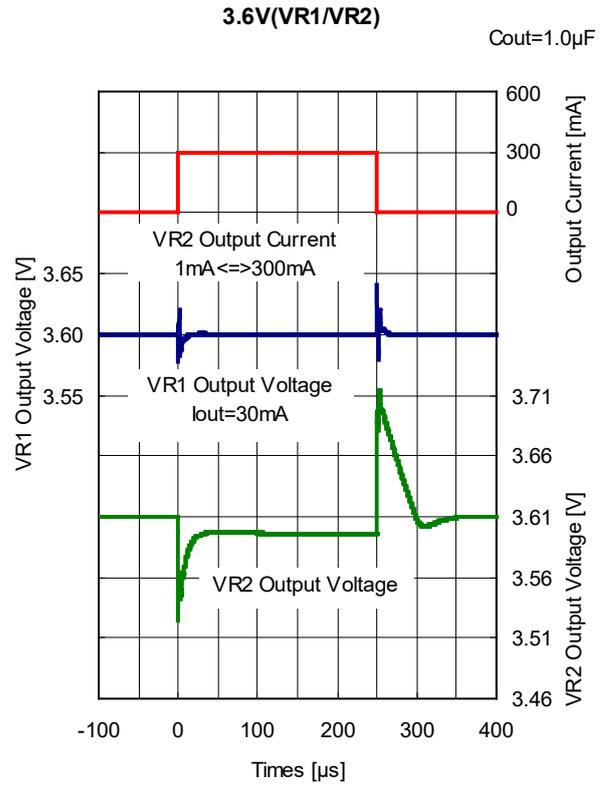
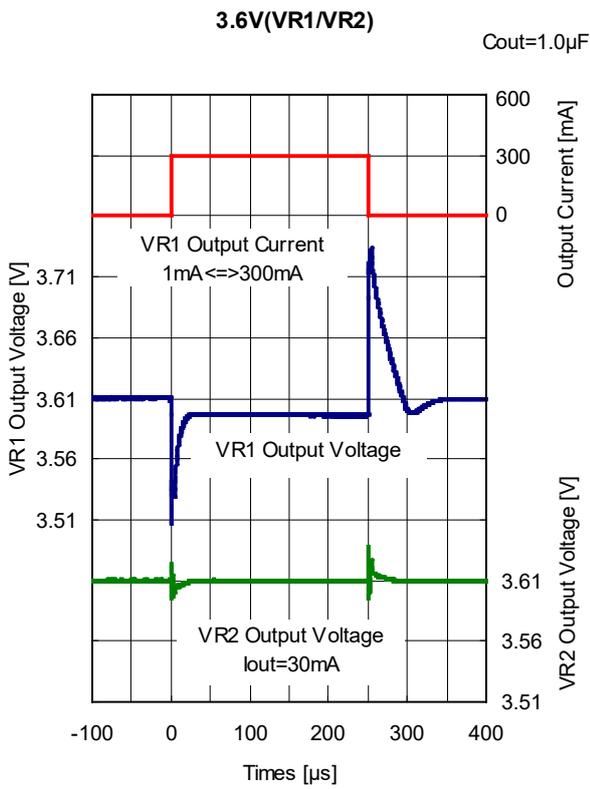
Cout=4.7μF



2.5V(VR1/VR2)

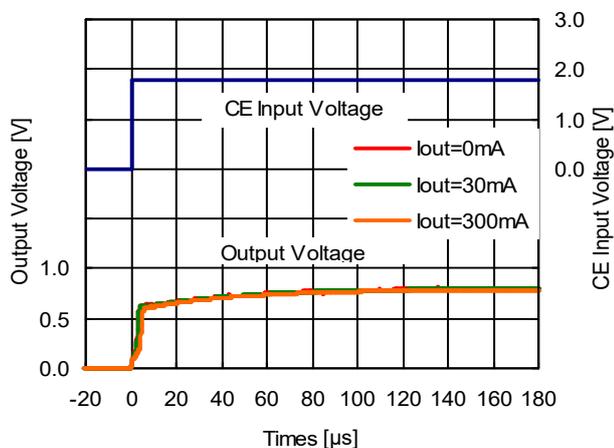
Cout=4.7μF



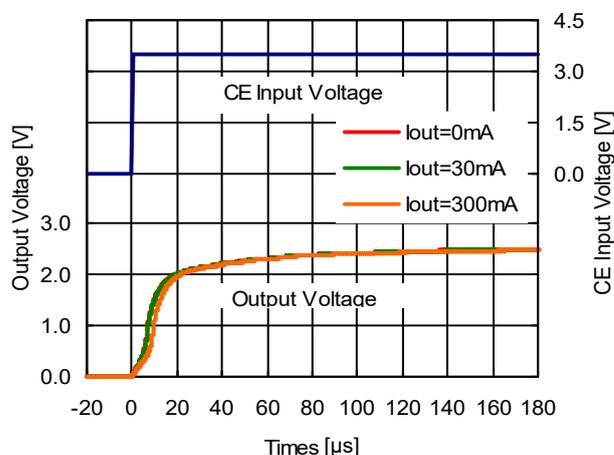


12) Turn On Speed with CE pin ($C_{IN} = 1.0 \mu F$, $C_{OUT1} = C_{OUT2} = 1.0 \mu F$, $T_a = 25^\circ C$)

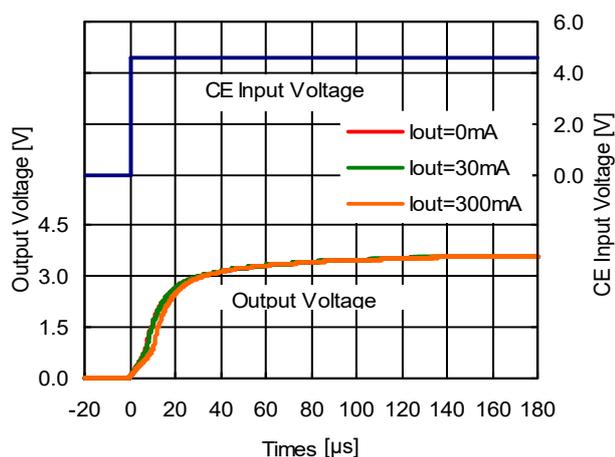
0.8V(VR1/VR2)



2.5V(VR1/VR2)

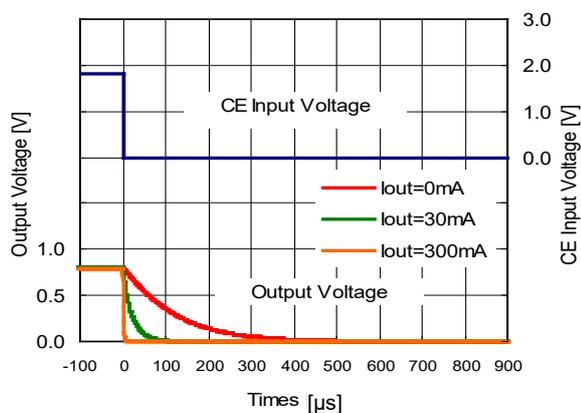


3.6V(VR1/VR2)

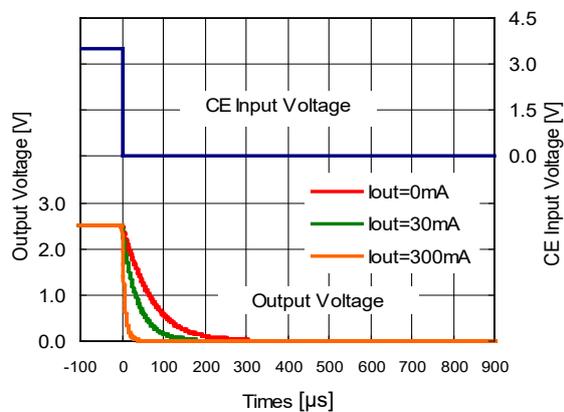


13) Turn Off Speed with CE pin (RP154xxxxB) ($C_{IN} = 1.0 \mu F$, $C_{OUT1} = C_{OUT2} = 1.0 \mu F$, $T_a = 25^\circ C$)

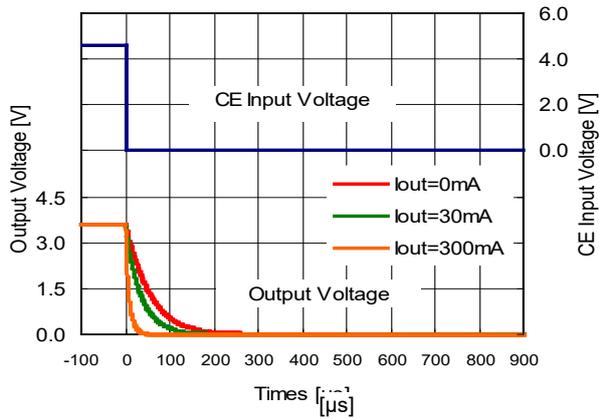
0.8V(VR1/VR2)



2.5V(VR1/VR2)

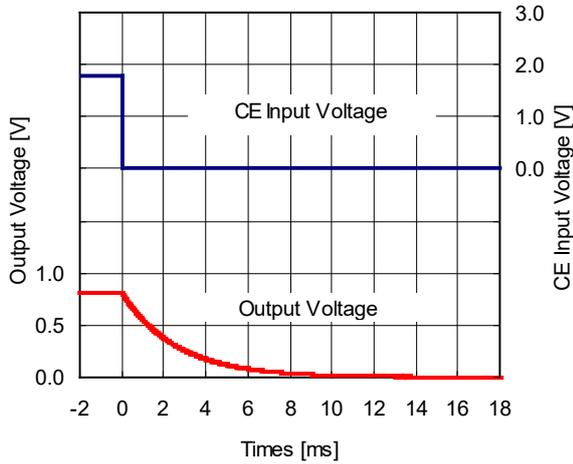


3.6V(VR1/VR2)

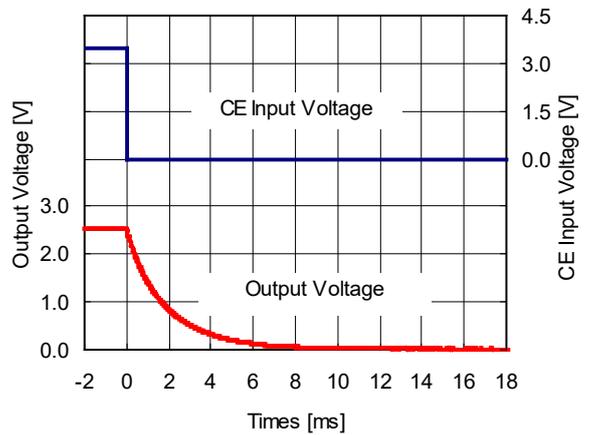


14) Turn Off Speed with CE pin (RP154xxxxA) ($C_{IN} = 1.0 \mu$ F, $C_{OUT1} = C_{OUT2} = 1.0 \mu$ F, $I_{OUT} = 0$ mA, $T_a = 25^\circ$ C)

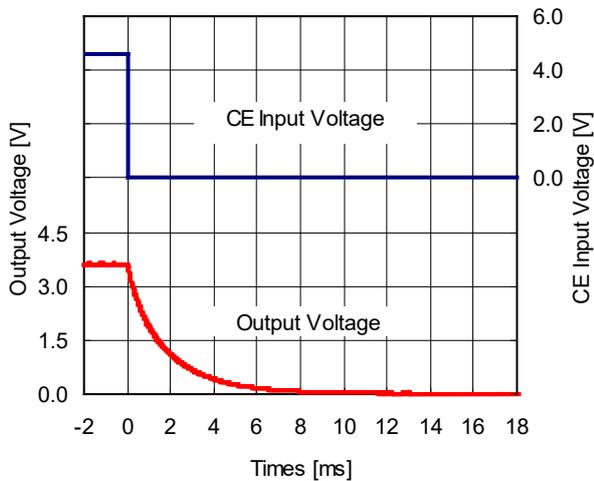
0.8V(VR1/VR2)



2.5V(VR1/VR2)



3.6V(VR1/VR2)



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 $40 \mu\text{V}$ (Avg.) are marked as the hatched area in the graph.

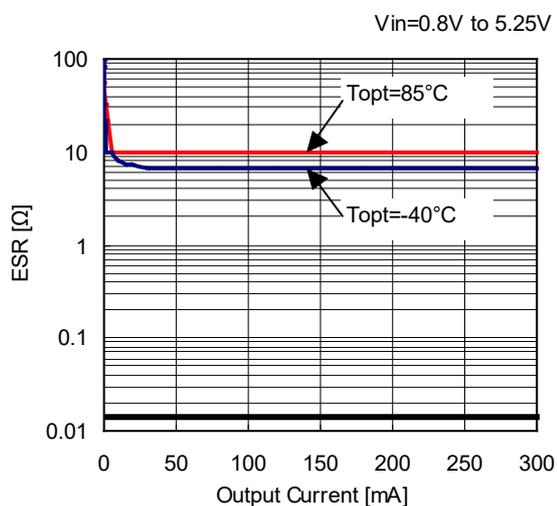
Measurement conditions

Frequency Band: 10 Hz to 2 MHz

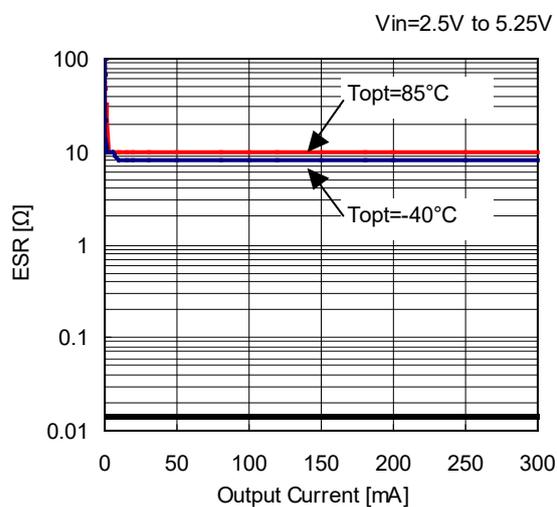
Temperature: -40°C to 85°C

C_{IN} , C_{OUT1} , C_{OUT2} : $1.0 \mu\text{F}$

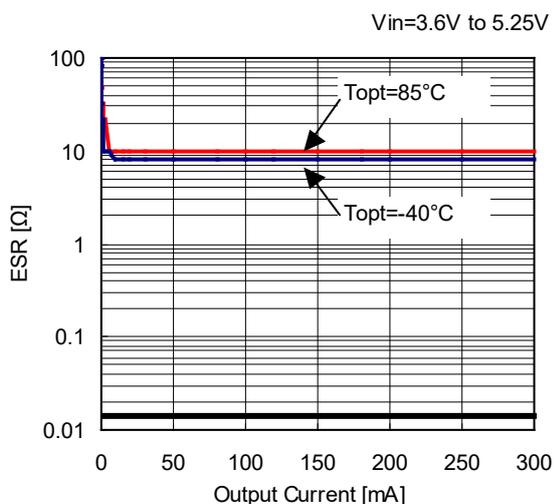
0.8V(VR1/VR2)



2.5V(VR1/VR2)



3.6V(VR1/VR2)



The power dissipation of the package is dependent on PCB material, layout, and environmental conditions. The following measurement conditions are based on JEDEC STD. 51-7.

Measurement Conditions

Item	Measurement Conditions
Environment	Mounting on Board (Wind Velocity = 0 m/s)
Board Material	Glass Cloth Epoxy Plastic (Four-Layer Board)
Board Dimensions	76.2 mm × 114.3 mm × 0.8 mm
Copper Ratio	Outer Layer (First Layer): Less than 95% of 50 mm Square Inner Layers (Second and Third Layers): Approx. 100% of 50 mm Square Outer Layer (Fourth Layer): Approx. 100% of 50 mm Square
Through-holes	φ 0.2 mm × 25 pcs

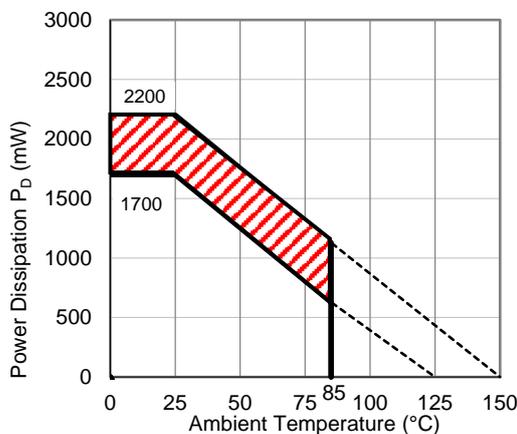
Measurement Result

(Ta = 25°C, Tjmax = 125°C)

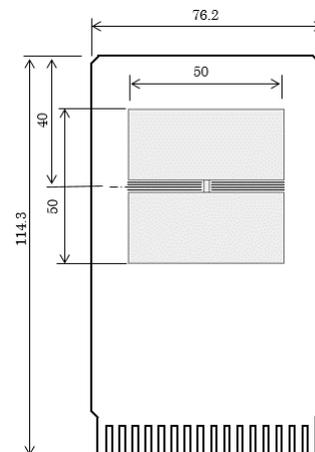
Item	Measurement Result
Power Dissipation	1700 mW
Thermal Resistance (θja)	θja = 56°C/W
Thermal Characterization Parameter (ψjt)	ψjt = 18°C/W

θja: Junction-to-Ambient Thermal Resistance

ψjt: Junction-to-Top Thermal Characterization Parameter



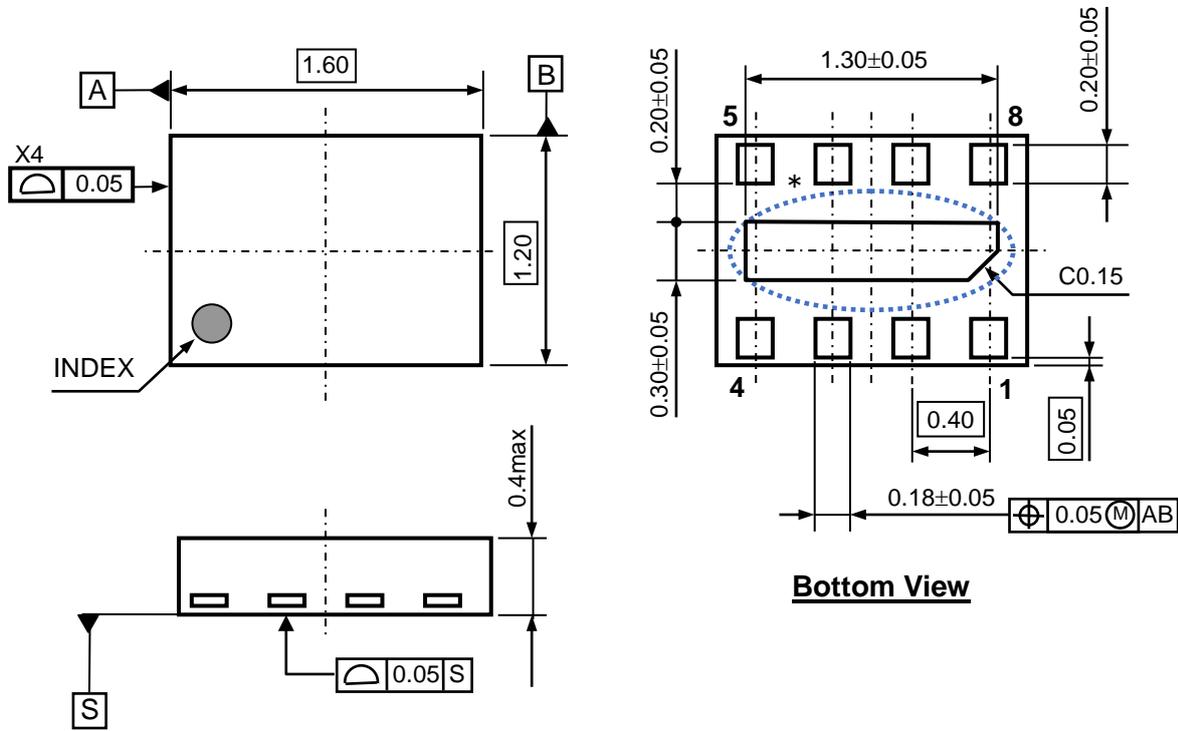
Power Dissipation vs. Ambient Temperature



Measurement Board Pattern

The above graph shows the power dissipation of the package at Tjmax = 125°C and Tjmax = 150°C. Operating the device in the hatched range might have a negative influence on its lifetime. The total hours of use and the total years of use must be limited as follows:

Total Hours of Use	Total Years of Use (4 hours/day)
13,000 hours	9 years



UNIT: mm

DFN1216-8 Package Dimensions

* The tab on the bottom of the package shown by blue circle is a substrate potential (GND). It is recommended that this tab be connected to the ground plane on the board but it is possible to leave the tab floating.

The power dissipation of the package is dependent on PCB material, layout, and environmental conditions. The following measurement conditions are based on JEDEC STD. 51-7.

Measurement Conditions

Item	Measurement Conditions
Environment	Mounting on Board (Wind Velocity = 0 m/s)
Board Material	Glass Cloth Epoxy Plastic (Four-Layer Board)
Board Dimensions	76.2 mm × 114.3 mm × 0.8 mm
Copper Ratio	Outer Layer (First Layer): Less than 95% of 50 mm Square Inner Layers (Second and Third Layers): Approx. 100% of 50 mm Square Outer Layer (Fourth Layer): Approx. 100% of 50 mm Square
Through-holes	φ 0.3 mm × 7 pcs

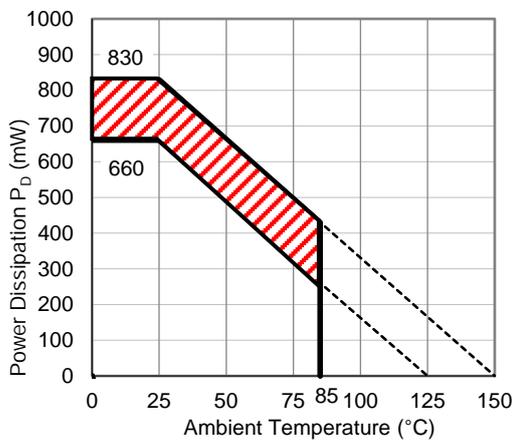
Measurement Result

(Ta = 25°C, Tjmax = 125°C)

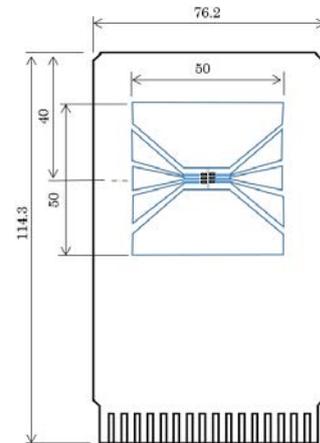
Item	Measurement Result
Power Dissipation	660 mW
Thermal Resistance (θja)	θja = 150°C/W
Thermal Characterization Parameter (ψjt)	ψjt = 51°C/W

θja: Junction-to-Ambient Thermal Resistance

ψjt: Junction-to-Top Thermal Characterization Parameter



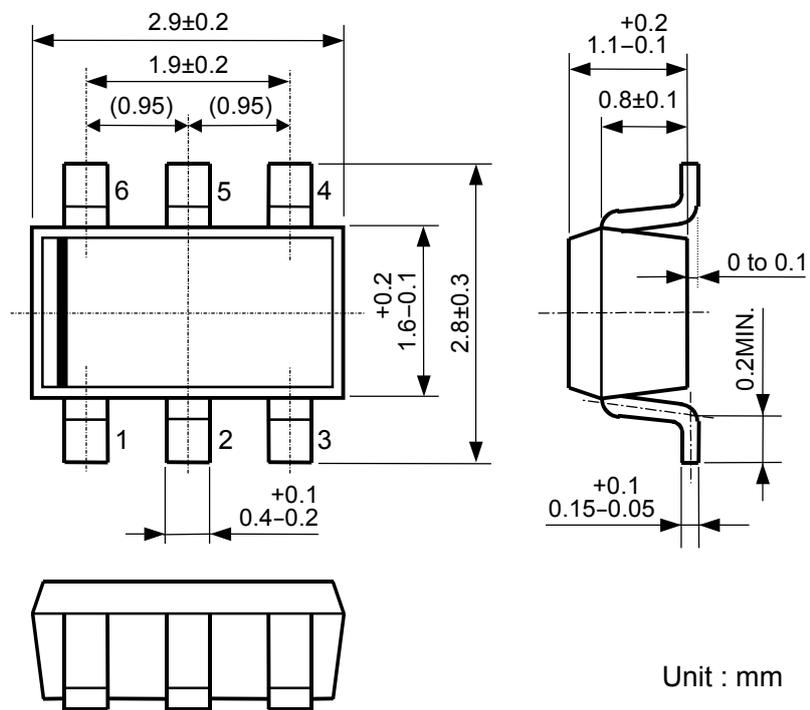
Power Dissipation vs. Ambient Temperature



Measurement Board Pattern

The above graph shows the power dissipation of the package at Tjmax = 125°C and Tjmax = 150°C. Operating the device in the hatched range might have a negative influence on its lifetime. The total hours of use and the total years of use must be limited as follows:

Total Hours of Use	Total Years of Use (4 hours/day)
13,000 hours	9 years



Unit : mm

SOT-23-6 Package Dimensions

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 - 8-1. **Quality Warranty Period**

In the case of a product purchased through an authorized distributor or directly from us, the warranty period for this product shall be one (1) year after delivery to your company. For defective products that occurred during this period, we will take the quality warranty measures described in section 8-2. However, if there is an agreement on the warranty period in the basic transaction agreement, quality assurance agreement, delivery specifications, etc., it shall be followed.
 - 8-2. **Quality Warranty Remedies**

When it has been proved defective due to manufacturing factors as a result of defect analysis by us, we will either deliver a substitute for the defective product or refund the purchase price of the defective product.

Note that such delivery or refund is sole and exclusive remedies to your company for the defective product.
 - 8-3. **Remedies after Quality Warranty Period**

With respect to any defect of this product found after the quality warranty period, the defect will be analyzed by us. On the basis of the defect analysis results, the scope and amounts of damage shall be determined by mutual agreement of both parties. Then we will deal with upper limit in Section 8-2. This provision is not intended to limit any legal rights of your company.
9. Anti-radiation design is not implemented in the products described in this document.
10. The X-ray exposure can influence functions and characteristics of the products. Confirm the product functions and characteristics in the evaluation stage.
11. WLCSP products should be used in light shielded environments. The light exposure can influence functions and characteristics of the products under operation or storage.
12. Warning for handling Gallium and Arsenic (GaAs) products (Applying to GaAs MMIC, Photo Reflector). These products use Gallium (Ga) and Arsenic (As) which are specified as poisonous chemicals by law. For the prevention of a hazard, do not burn, destroy, or process chemically to make them as gas or power. When the product is disposed of, please follow the related regulation and do not mix this with general industrial waste or household waste.
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