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 Tr. 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 µA x 2 (VR1 & VR2)
- Standby Current ..... Typ. 0.1µA 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 ..... ±1.0% (V_{SET} > 2.0 V, Ta = 25°C)
- Temperature-Drift Coefficient of Output Voltage ..... Typ. ±80 ppm/° 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 µA 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.

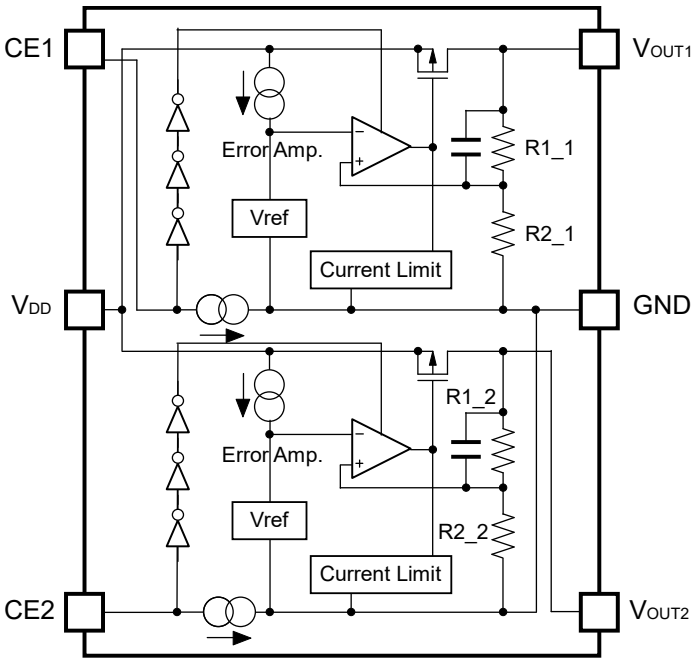
Selection Guide

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.

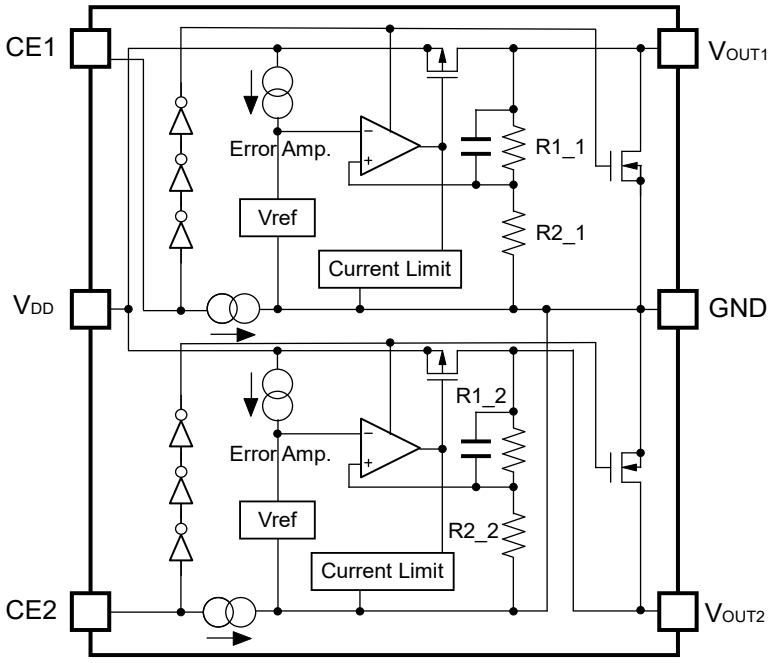
∗: The auto discharge function at off state are options as follows.
(A) Auto-discharge function not included, Active-high
(B) Auto-discharge function included, Active-high

BLOCK DIAGRAMS

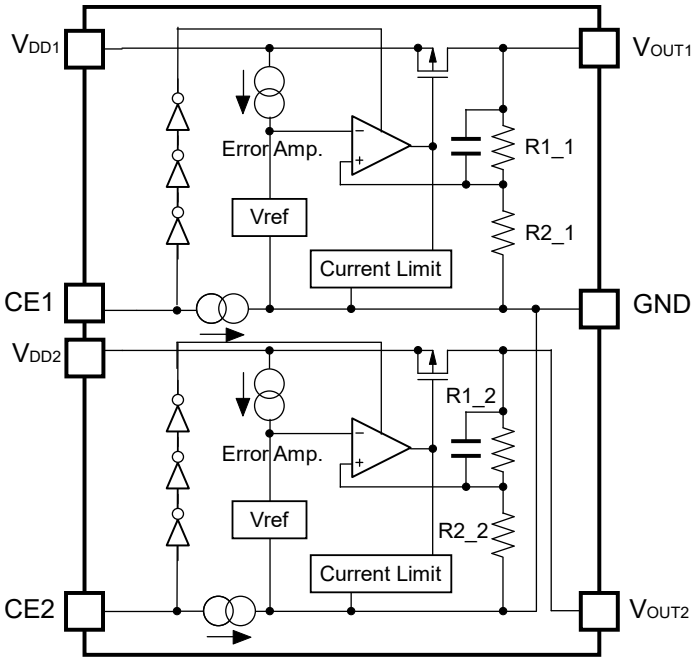


RP154NxxxA Block Diagram

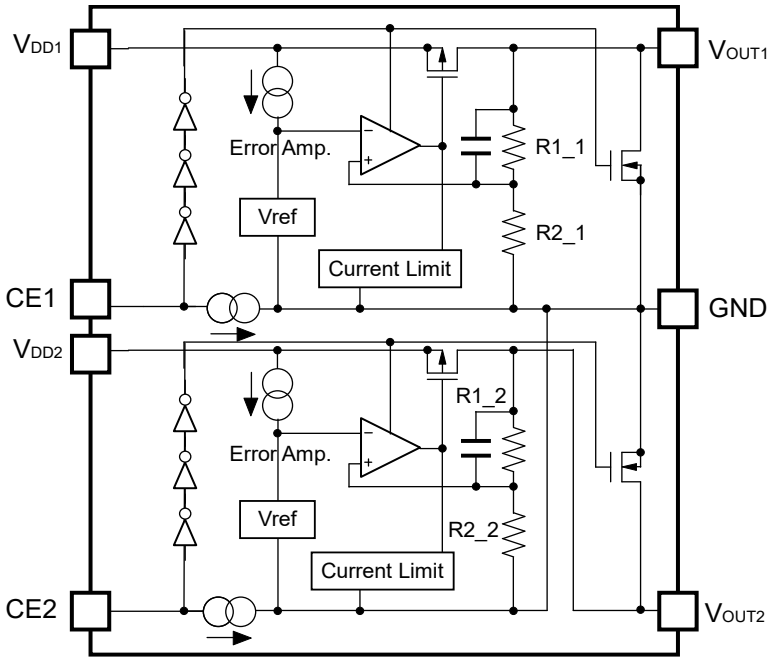
(1) Auto-discharge function quickly lowers the output voltage to 0 V by releasing the electrical charge accumulated in the external capacitor when the chip enable signal is switched from the active mode to the standby mode.



RP154NxxxB Block Diagram

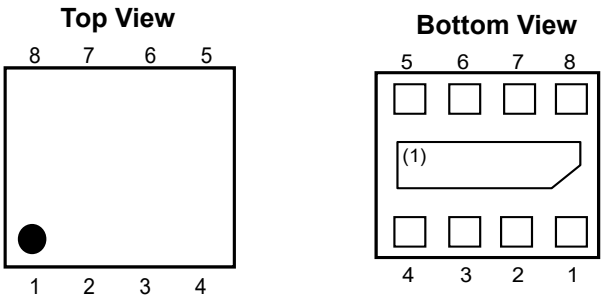


RP154LxxxA Block Diagram

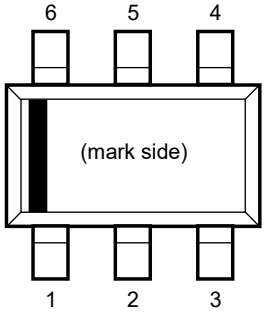


RP154LxxxB Block Diagram

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	
Tj	Junction Temperature Range		−40 to 125	° C
Tstg	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
Ta	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 V (V_{SET} > 1.5 V), V_{IN} = 2.5 V (V_{SET} ≤ 1.5 V), I_{OUT} = 1 mA, C_{IN} = C_{OUT} = 1.0 µF, unless otherwise noted,

V_{SET} = Set Output Voltage

The specification in [ ] is checked and guranteed by design engineering at −40°C ≤ Ta ≤ 85°C.

VR1/VR2 Electrical Characteristics (Ta = 25° C)

Symbol	Item	Conditions		Min.	Typ.	Max.	Unit
V_{OUT}	Output Voltage	Ta = 25°C	V_{SET} > 2.0 V	×0.99		×1.01	V
			V_{SET} ≤ 2.0 V	−20		20	mV
		−40°C ≤ Ta ≤ 85°C	V_{SET} > 2.0 V	[×0.97]		[×1.03]	V
			V_{SET} ≤ 2.0 V	[−60]		[60]	mV
I_{OUT}	Output Current			[300]			mA
ΔV_{OUT} /ΔI_{OUT}	Load Regulation	1 mA ≤ I_{OUT} ≤ 300 mA			15	[40]	mV
V_{DIF}	Dropout Voltage	**Refer to *Dropout Voltage by Set Output Voltage*.**					
I_{SS}	Supply Current	I_{OUT} = 0 mA			50	[75]	µA
Istandby	Standby Current	V_{CE} = 0 V			0.1	1.0	µA
ΔV_{OUT} /ΔV_{IN}	Line Regulation	V_{SET} + 0.5 V ≤ V_{IN} ≤ 5.25 V (V_{IN} ≥ 1.4 V)			0.02	[0.10]	%/V
RR	Ripple Rejection	f = 1 kHz, Ripple 0.2 Vp-p V_{IN} = V_{SET}+1.0 V, I_{OUT} = 30 mA (When V_{SET} ≤ 2.0 V, V_{IN} = 3.0 V)			75		dB
V_{IN}	Input Voltage(1)			[1.4]		[5.25]	V
ΔV_{OUT} /ΔTa	Output Voltage Temperature Coefficient	−40°C ≤ Ta ≤ 85°C			±80		ppm /°C
I_{SC}	Short Current Limit	V_{OUT} = 0 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 Hz ~ 100 kHz			75		µVrms
R_{LOW}	Low Output Nch Tr. ON Resistance (of B version)	V_{IN} = 4.0 V, V_{CE} = 0 V			50		Ω

All of unit are tested and specified under load conditions such that Tj ≈ Ta = 25°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 guranteed by design engineering at −40°C ≤ Ta ≤ 85°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_{SET} = 0.8	I_{OUT} = 300 mA	0.56	0.72
V_{SET} = 0.9		0.51	0.65
1.0 ≤ V_{SET} < 1.2		0.46	0.59
1.2 ≤ V_{SET} <1.4		0.39	0.50
1.4≤ V_{SET} <1.7		0.35	0.44
1.7≤ V_{SET} <2.1		0.30	0.39
2.1≤ V_{SET} <2.5		0.26	0.34
2.5≤ V_{SET} <3.0		0.25	0.30
3.0 ≤ V_{SET} ≤ 3.7		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.
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

RP154xxxxx Product-specific Electrical Characteristics

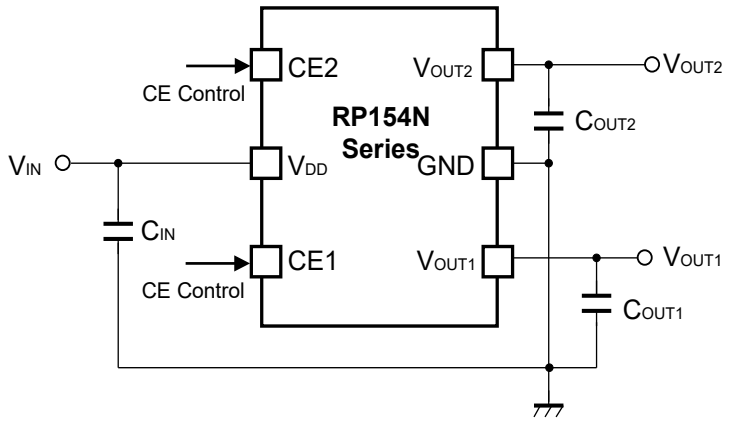
Product Name	VR1								VR2							
	V_{OUT} [V] (Ta = 25°C)			V_{OUT} [V] (−40°C ≤ Ta ≤ 85°C)			ΔV_{DIF} [V]		V_{OUT} [V] (Ta = 25°C)			V_{OUT} [V] (−40°C ≤ Ta ≤ 85°C)			ΔV_{DIF} [V]	
	Min.	Typ.	Max.	Min.	Typ.	Max.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Typ.	Max.
RP154x026x	2.772	2.800	2.828	2.716	2.800	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	1240	1.300	1360	0.39	0.50	1780	1.800	1820	1740	1.800	1860	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

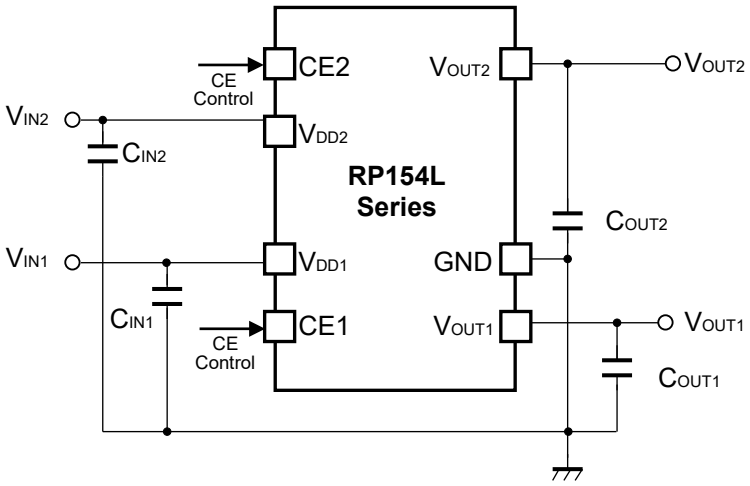


C_{IN} = C_{OUT1} = C_{OUT2} = Ceramic 1.0 µF

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} = Ceramic 1.0 µF

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 µF 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 µF or more between VDD and GND pin, and as close as possible to the pins (C_{IN1}/ C_{IN2}).

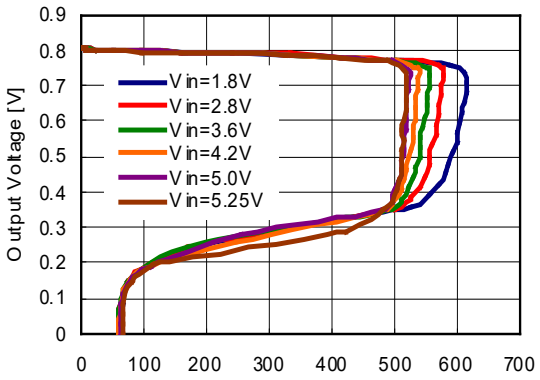
Set external components, especially the output capacitors, as close as possible to the ICs, and make wiring as short as possible (C_{OUT1}/ C_{OUT2}).

TYPICAL CHARACTERISTICS

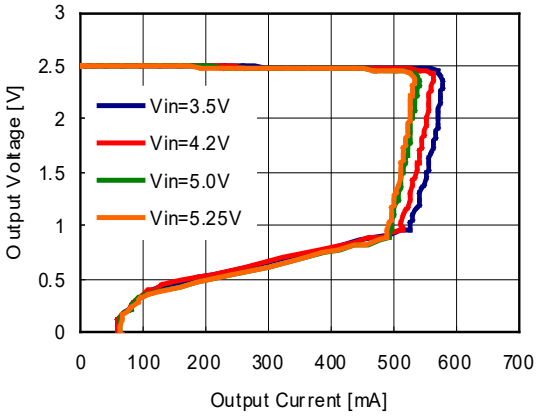
Note: Typical Characteristics are intended to be used as reference data; they are not guaranteed.

1) Output Voltage vs. Output Current (C_{IN} = 1.0 µF, C_{OUT1} = C_{OUT2} = 1.0 µF, Ta = 25°C)

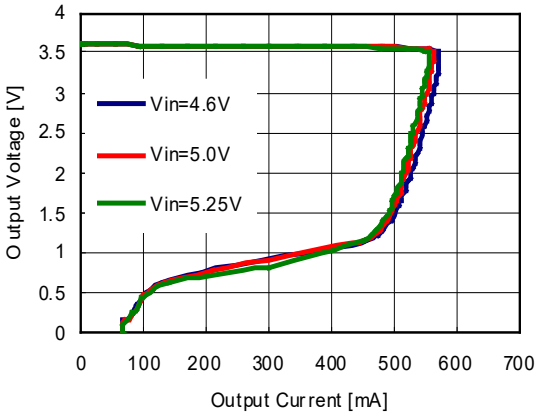
0.8V (VR1/VR2)



2.5V (VR1/VR2)

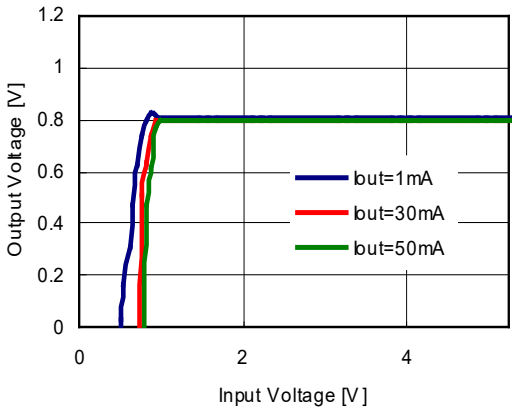


3.6V (VR1/VR2)

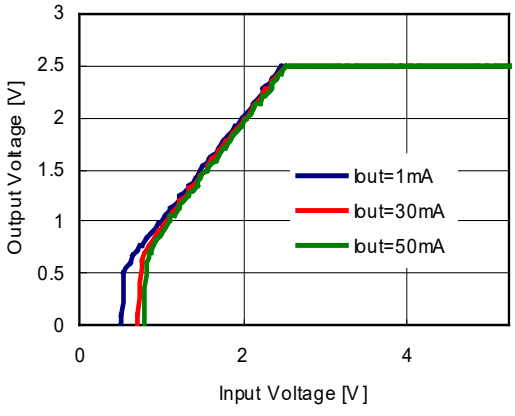


2) Output Voltage vs. Input Voltage (C_{IN} = 1.0 µF, C_{OUT1} = C_{OUT2} = 1.0 µF, Ta = 25°C)

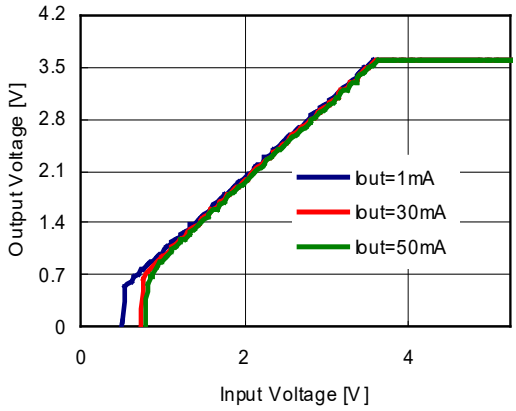
0.8V (VR1/VR2)



2.5V (VR1/VR2)

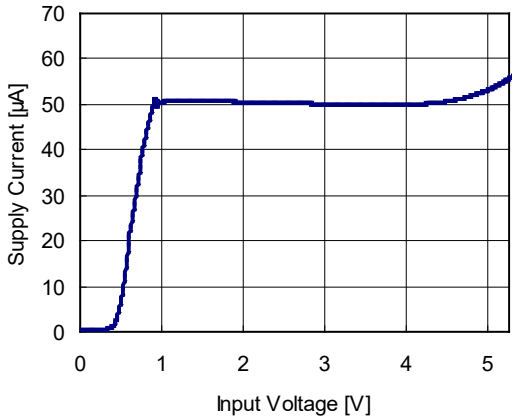


3.6V(VR1/VR2)

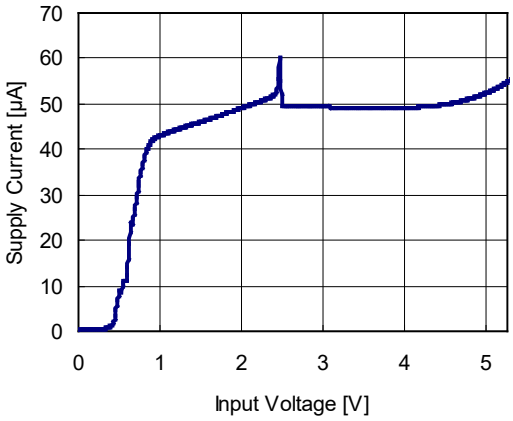


3) Supply Current vs. Input Voltage (C_{IN} = 1.0 µF, C_{OUT1} = C_{OUT2} = 1.0 µF, Ta = 25°C)

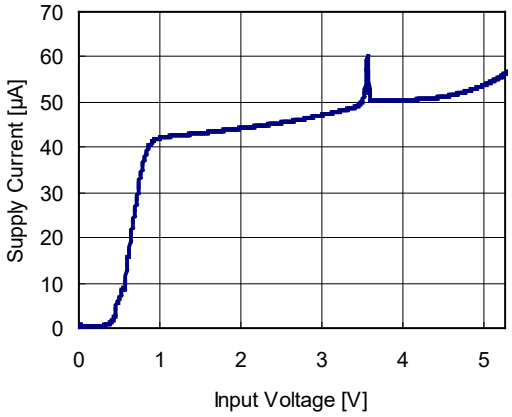
0.8V(VR1/VR2)



2.5V(VR1/VR2)

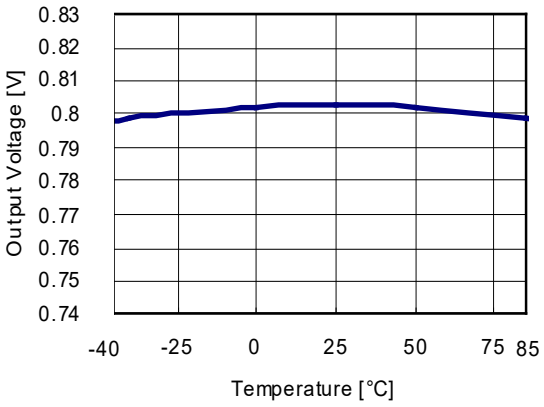


3.6V(VR1/VR2)

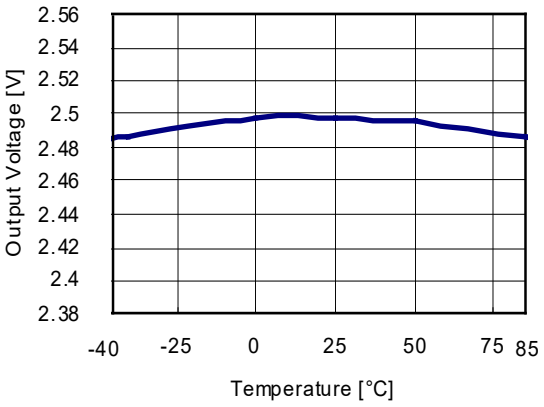


4) Output Voltage vs. Temperature (C_{IN} = 1.0 µF, C_{OUT1} = C_{OUT2} = 1.0 µF, I_{OUT} = 5 mA)

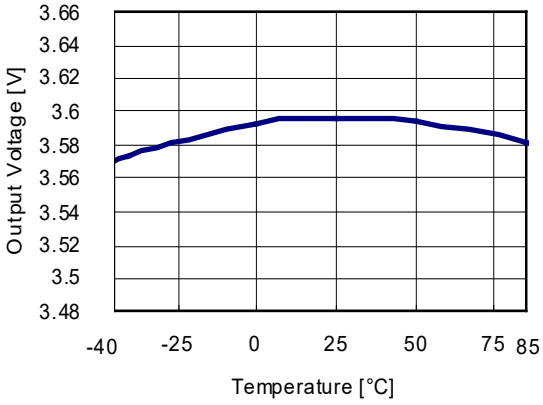
0.8V(VR1/VR2)



2.5V(VR1/VR2)

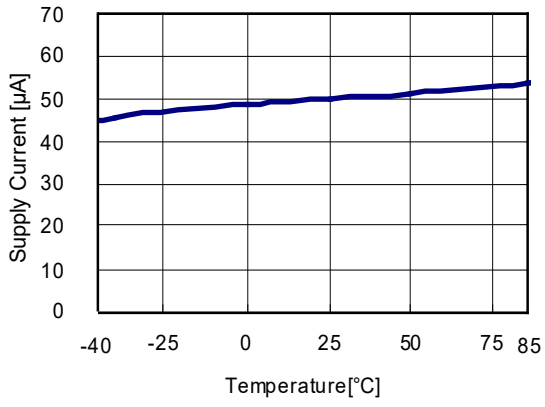


3.6V(VR1/VR2)

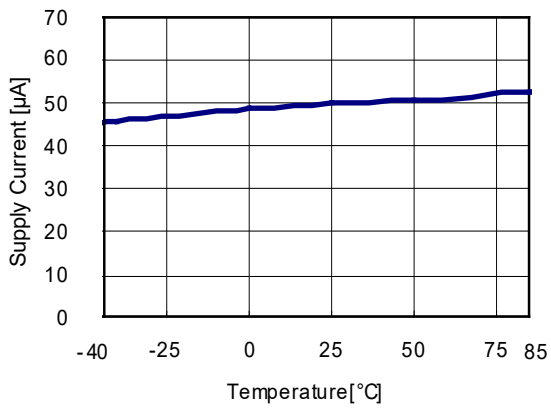


5) Supply Current vs. Temperature (C_{IN} = 1.0 µF, C_{OUT1} = C_{OUT2} = 1.0 µF)

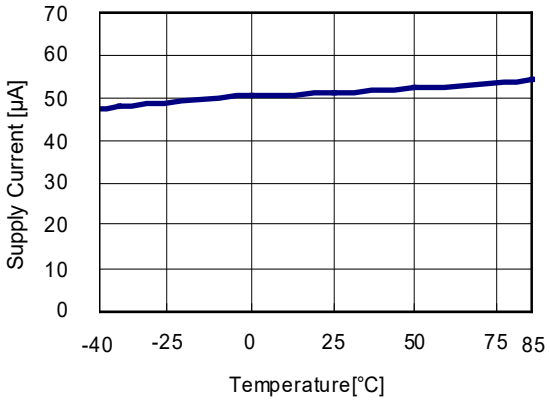
0.8V(VR1/VR2)



2.5V(VR1/VR2)

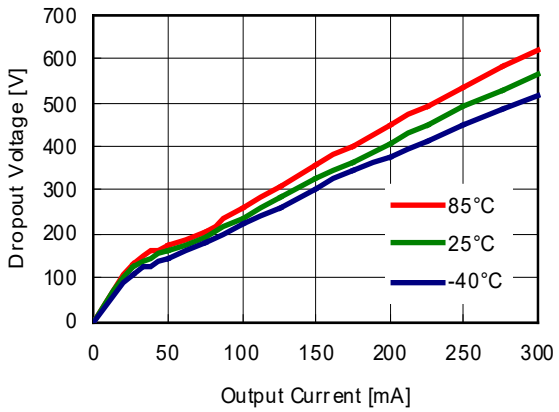


3.6V(VR1/VR2)

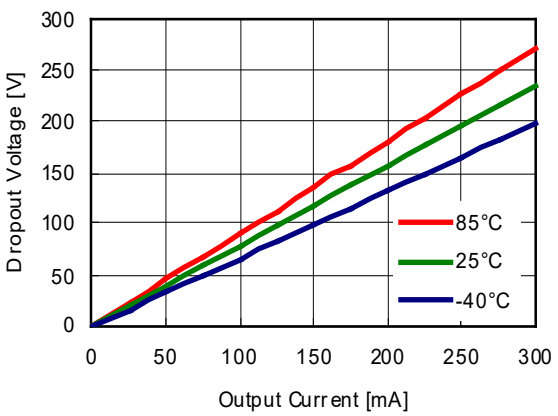


6) Dropout Voltage vs. Output Current (C_{IN} = 1.0 µF, C_{OUT1} = C_{OUT2} = 1.0 µF)

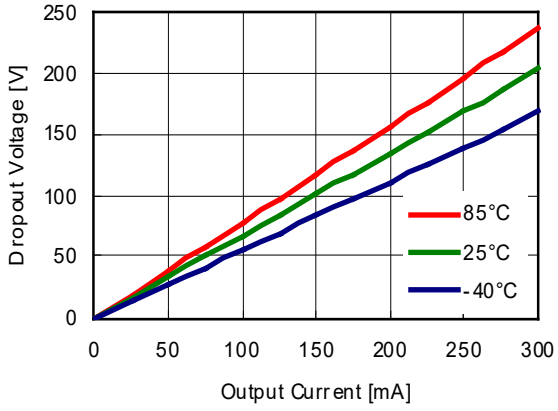
0.8V(VR1/VR2)



2.5V(VR1/VR2)

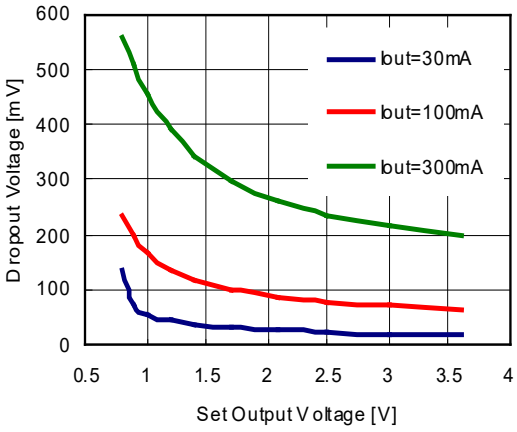


3.6V(VR1/VR2)



7) Dropout Voltage vs. Set Output Voltage

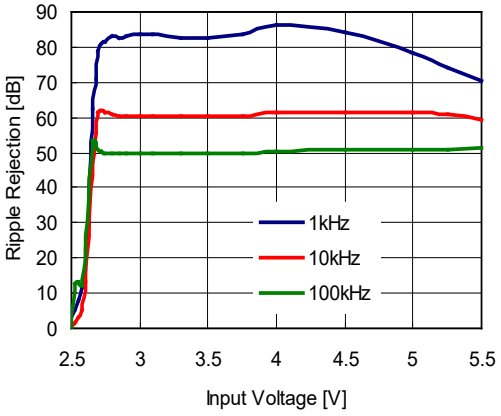
(VR1/VR2)



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

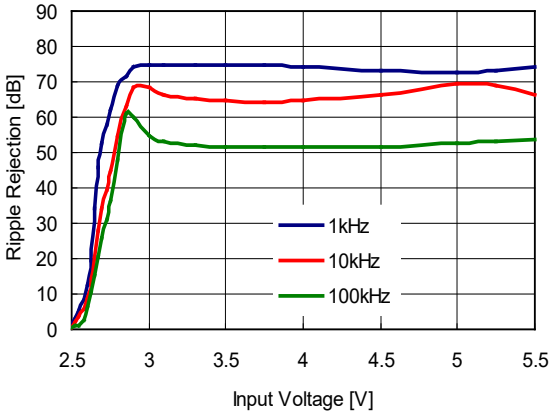
2.5V(VR1/VR2)

Iout=1mA



2.5V(VR1/VR2)

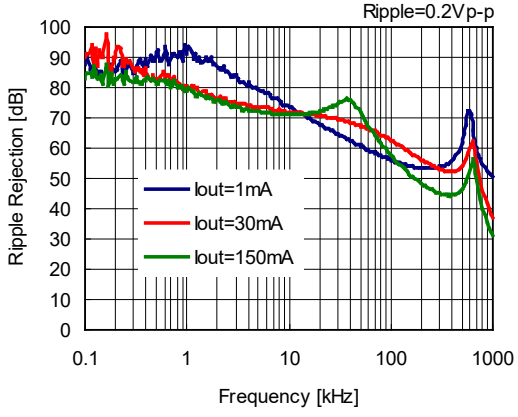
Iout=30mA



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

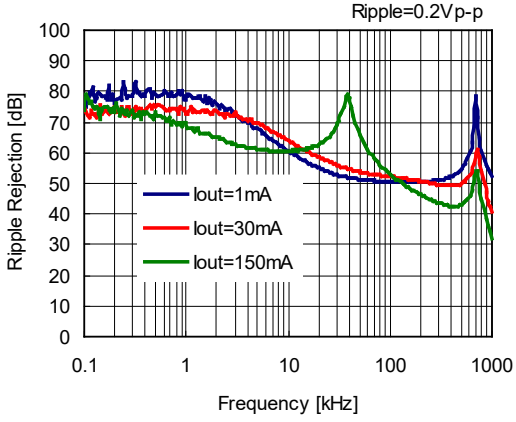
0.8V(VR1/VR2)

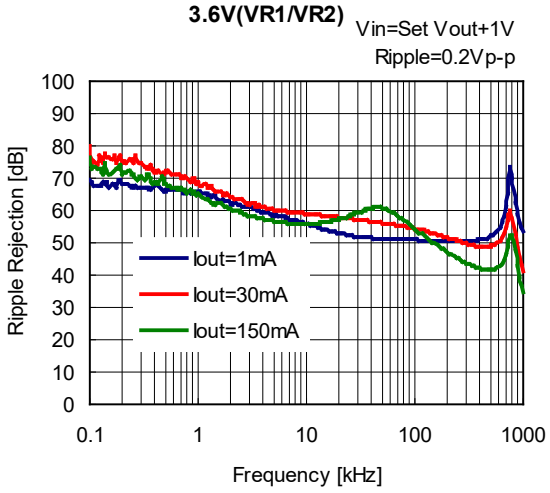
Vin=3V
Ripple=0.2Vp-p



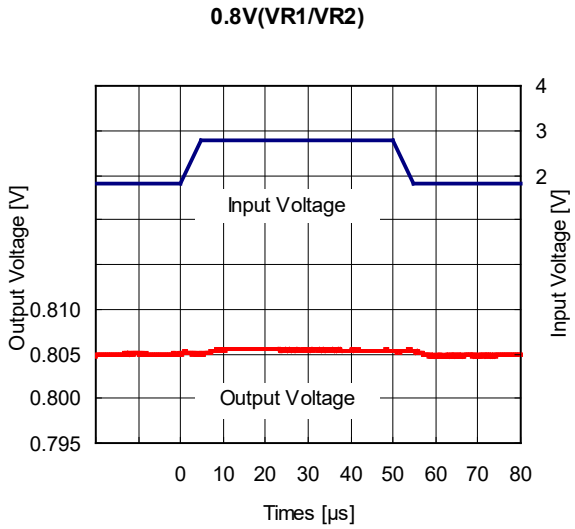
2.5V(VR1/VR2)

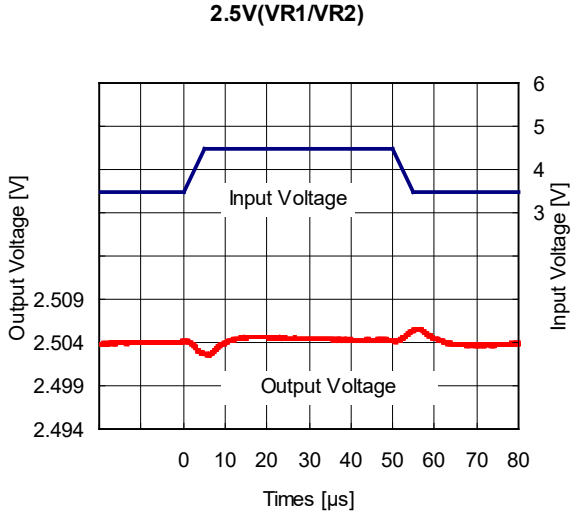
Vin=Set Vout+1V
Ripple=0.2Vp-p

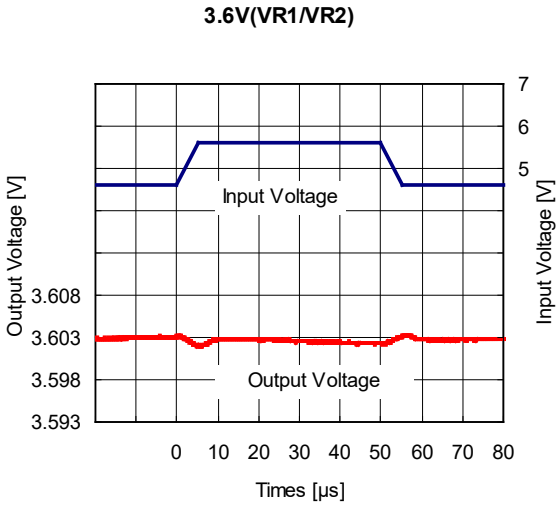




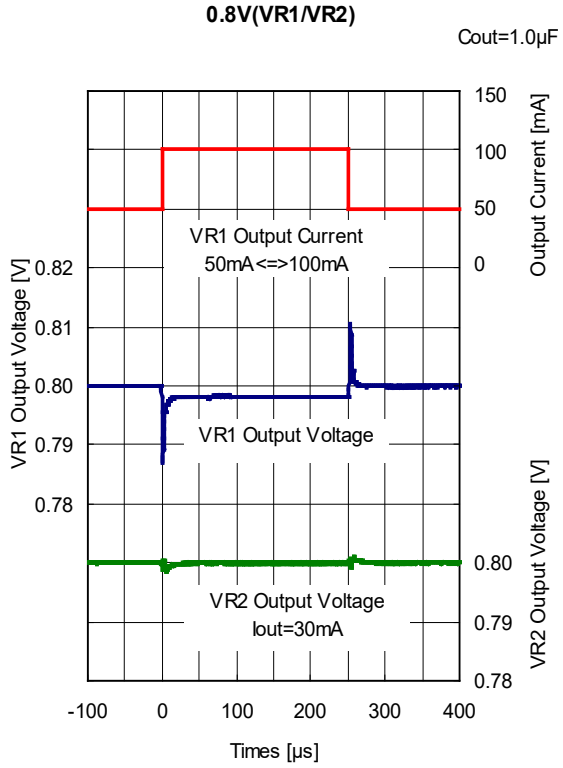
10) Input Transient Response (C_{IN} = none, C_{OUT1} = C_{OUT2} = 1.0 µF, tr = tf = 5 µs, Ta = 25°C)

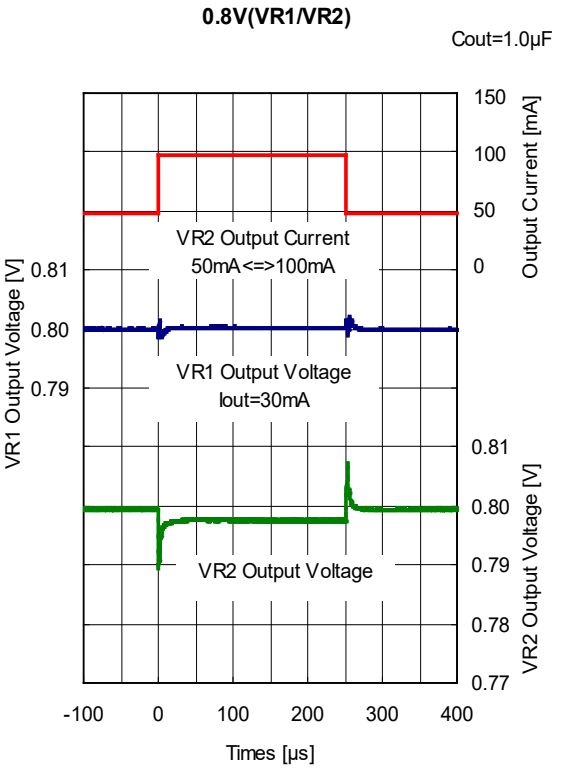


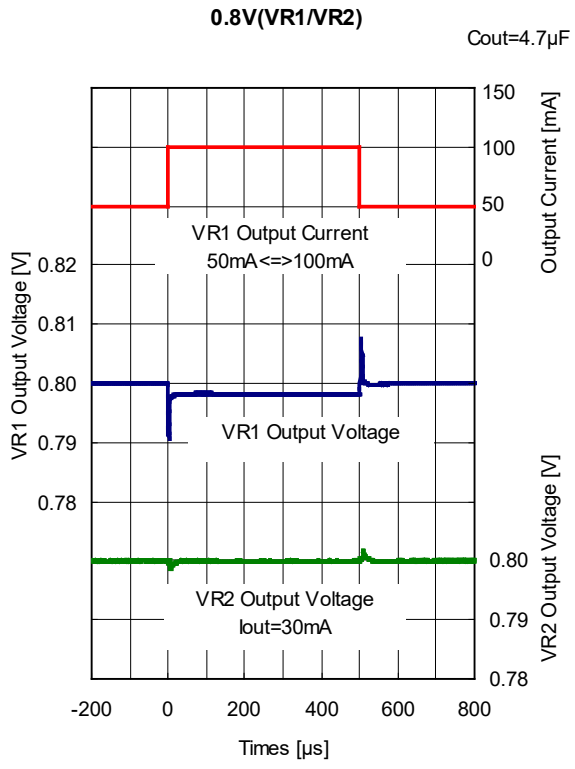


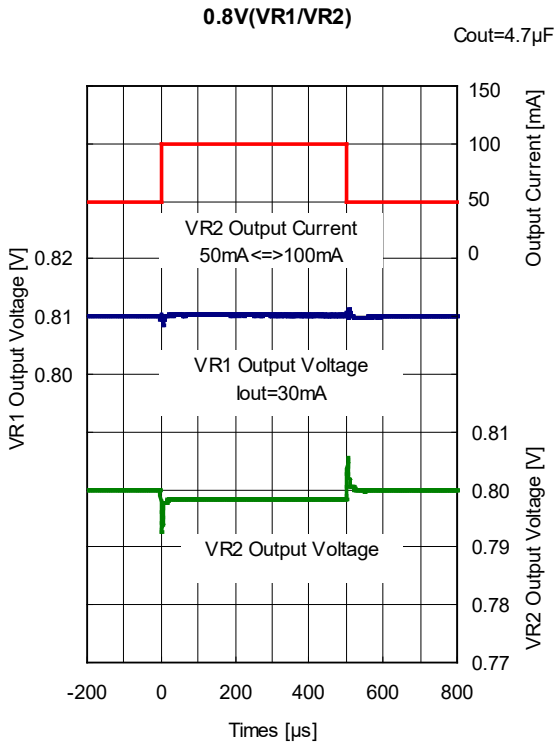


11) Load Transient Response (C_{IN} = 1.0 µF, C_{OUT1} = C_{OUT2} = 1.0 µF, tr = tf = 0.5 µs, Ta = 25°C)

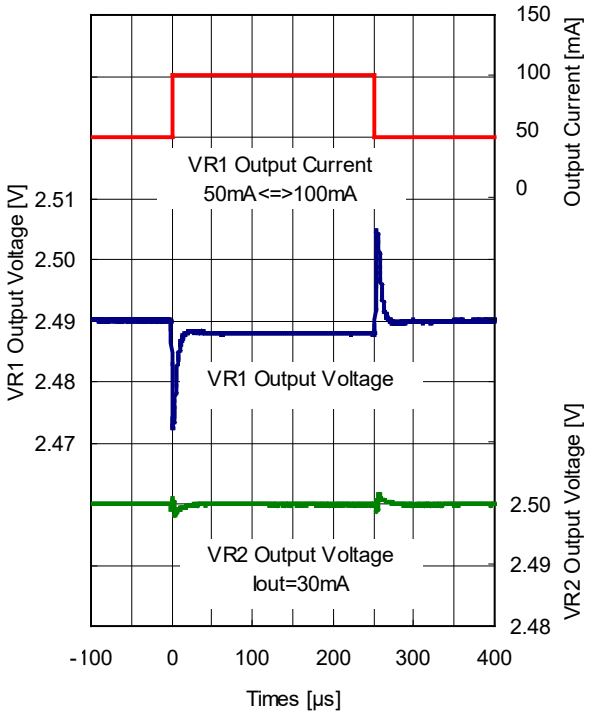




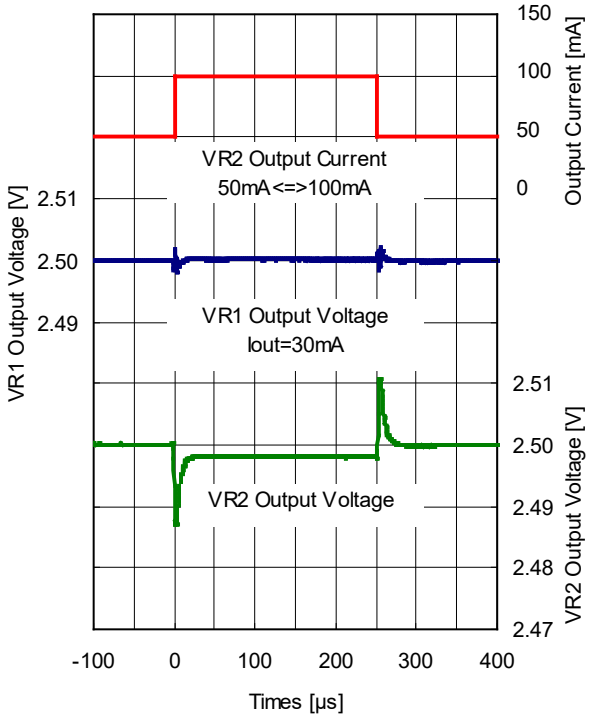




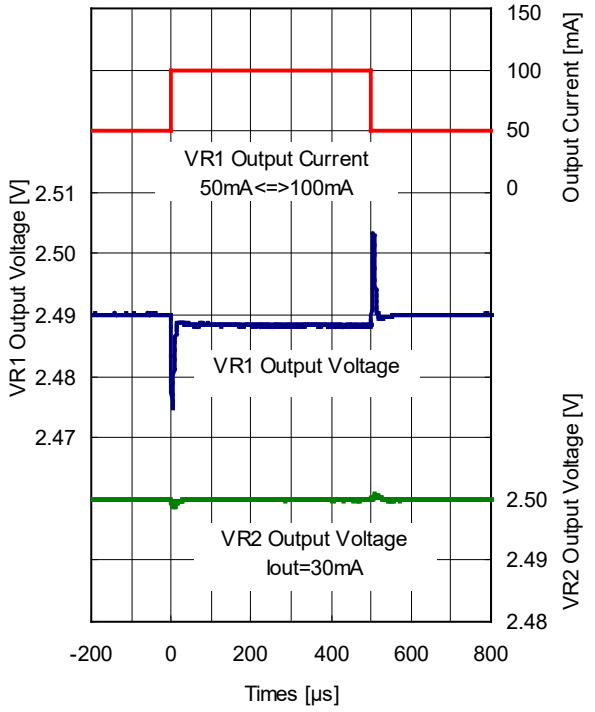
2.5V(VR1/VR2) Cout=1.0μF



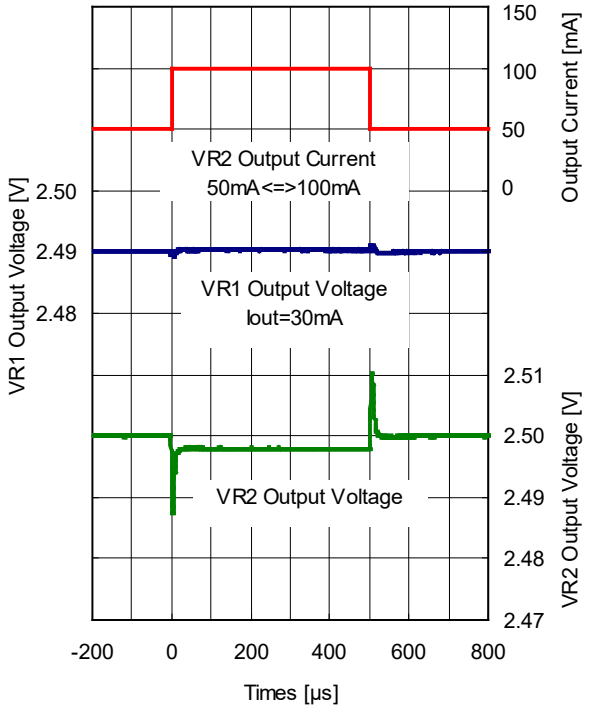
2.5V(VR1/VR2) Cout=1.0μF



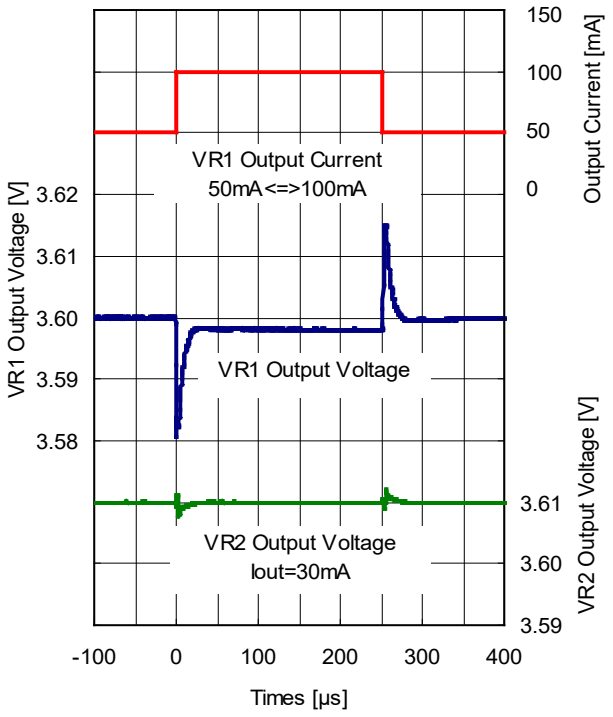
2.5V(VR1/VR2) Cout=4.7μF



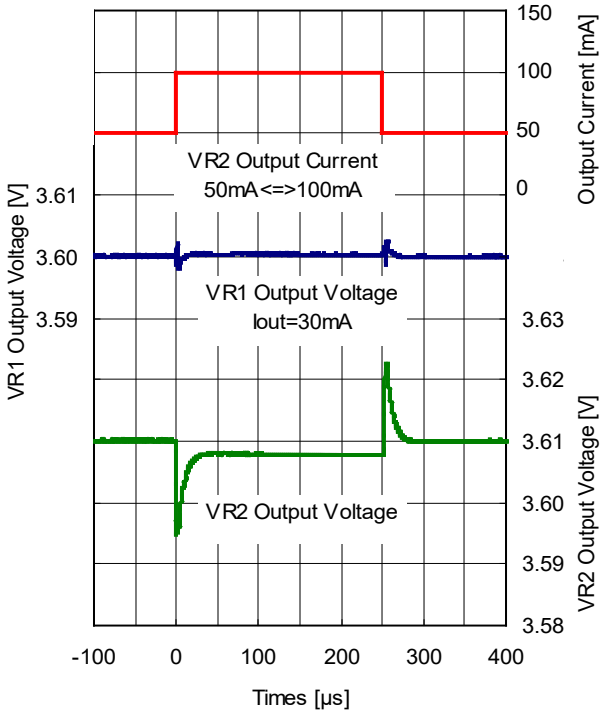
2.5V(VR1/VR2) Cout=4.7μF



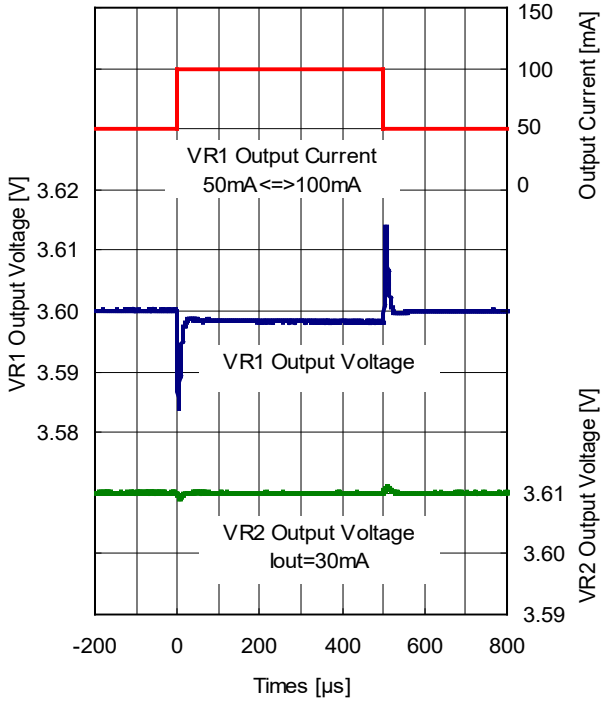
3.6V(VR1/VR2) Cout=1.0µF



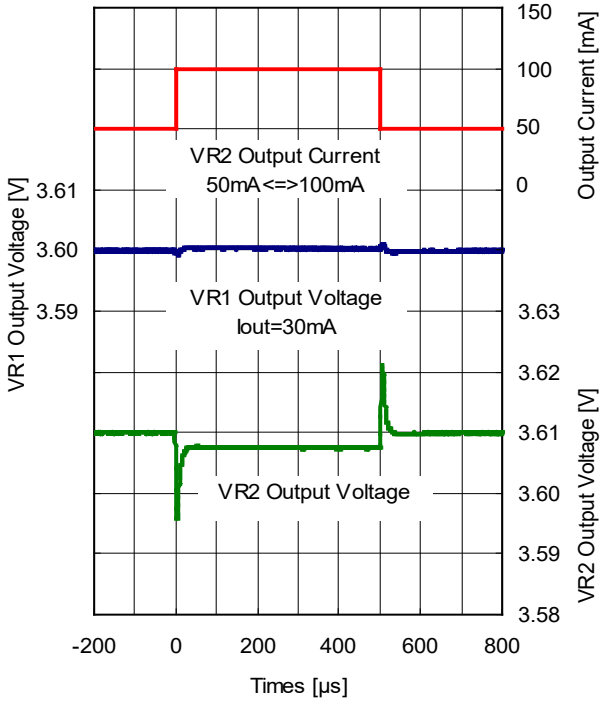
3.6V(VR1/VR2) Cout=1.0µF



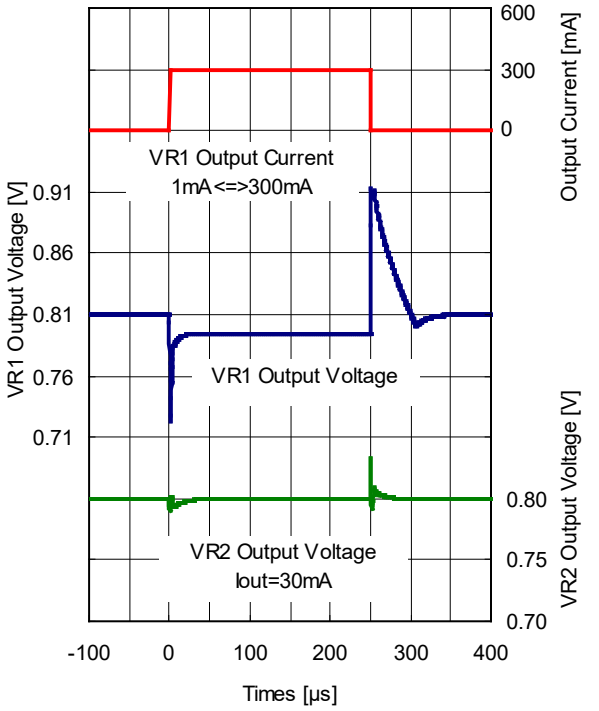
3.6V(VR1/VR2) Cout=4.7µF



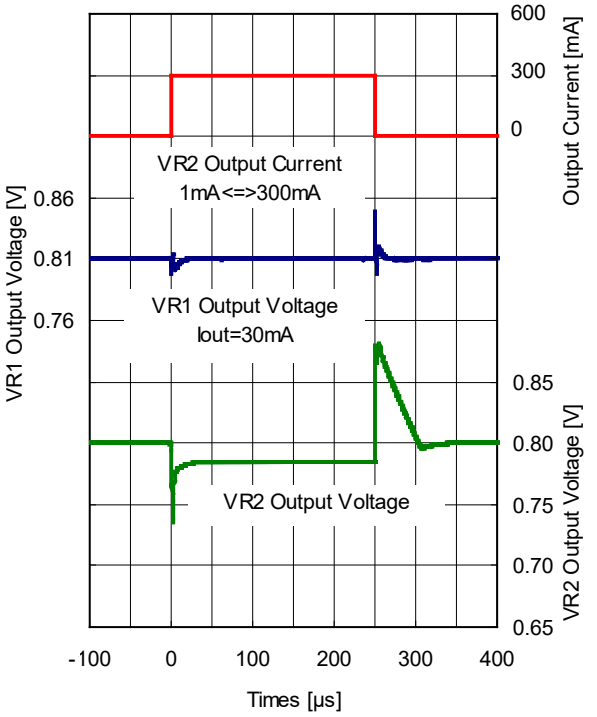
3.6V(VR1/VR2) Cout=4.7µF



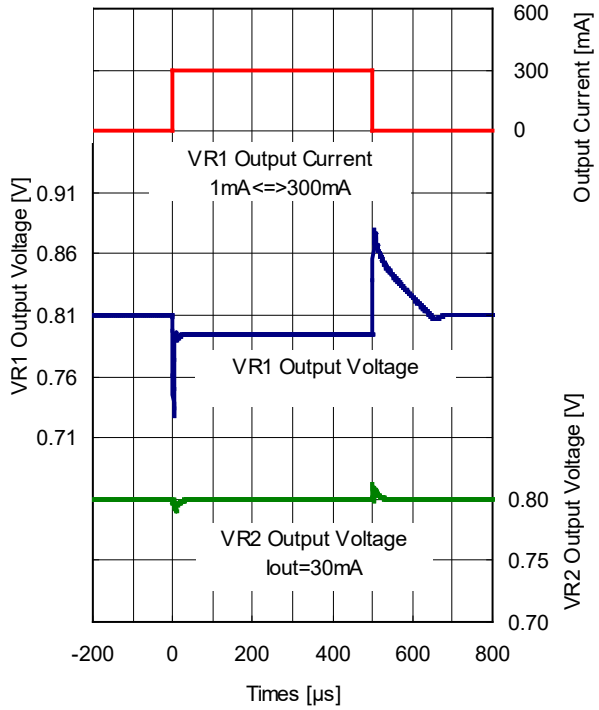
0.8V(VR1/VR2) Cout=1.0μF



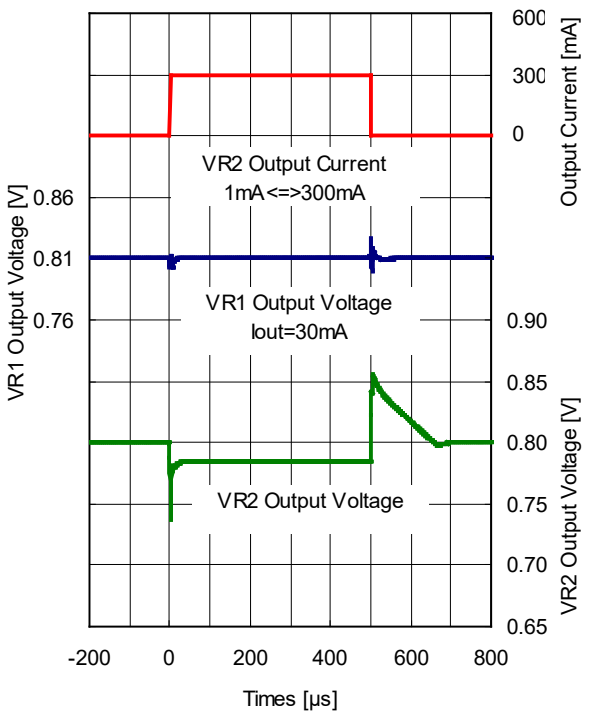
0.8V(VR1/VR2) Cout=1.0μF



0.8V(VR1/VR2) Cout=4.7μF

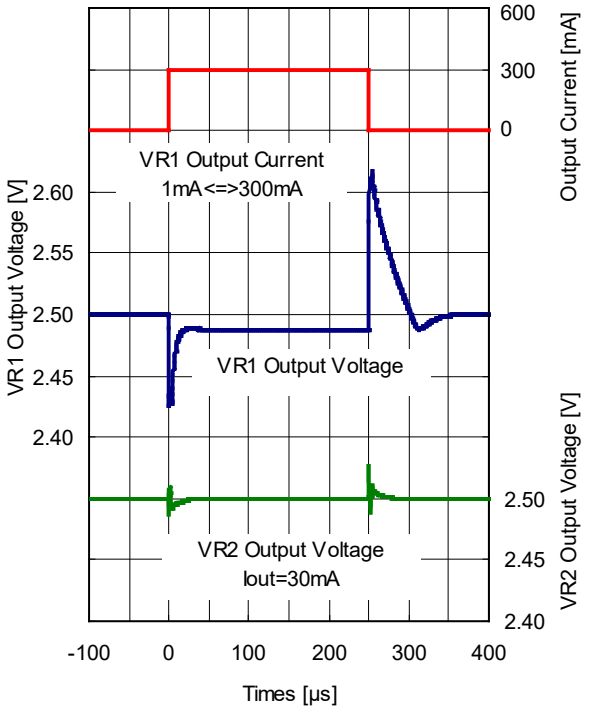


0.8V(VR1/VR2) Cout=4.7μF



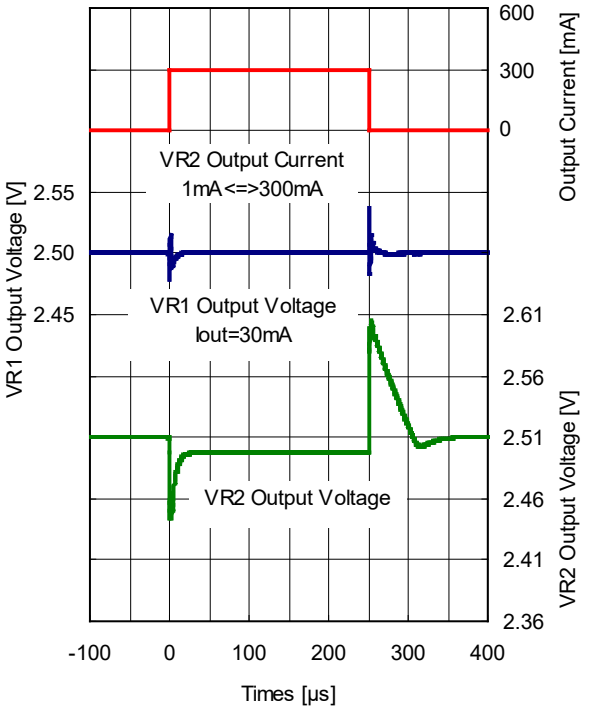
2.5V(VR1/VR2)

Cout=1.0μF



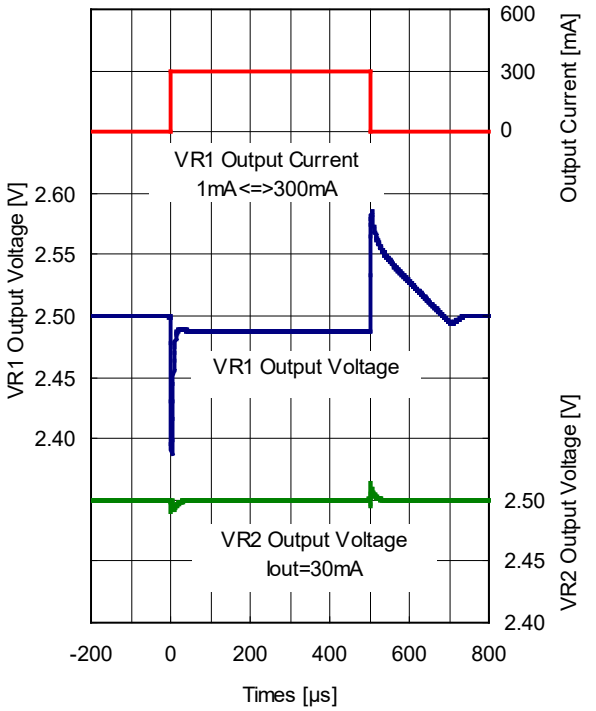
2.5V(VR1/VR2)

Cout=1.0μF



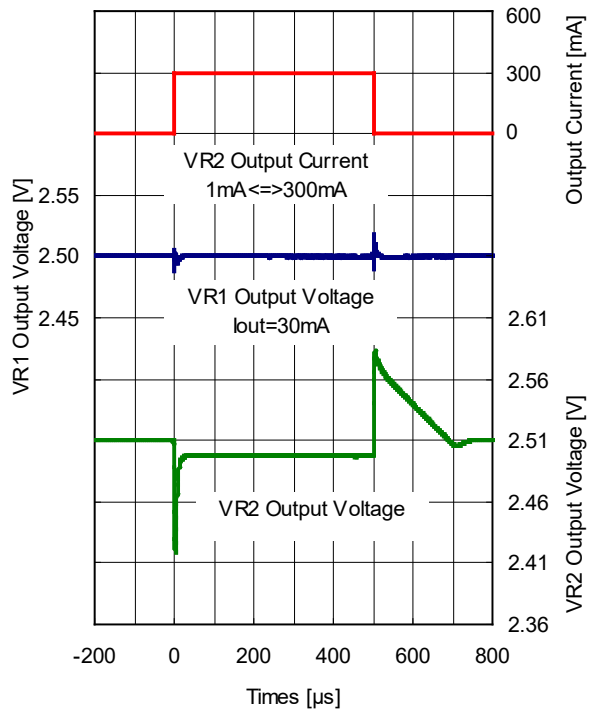
2.5V(VR1/VR2)

Cout=4.7μF

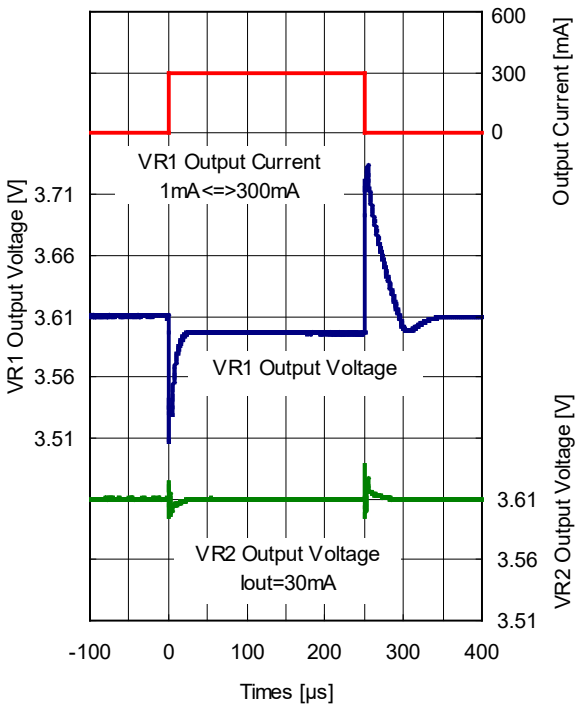


2.5V(VR1/VR2)

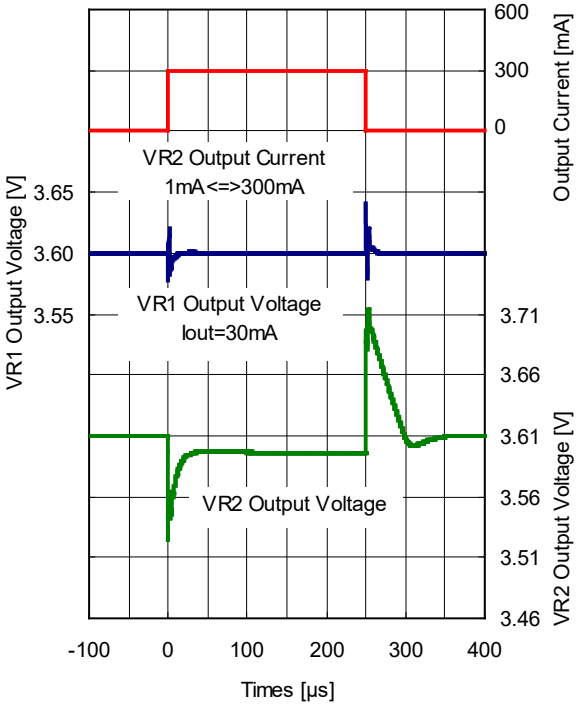
Cout=4.7μF



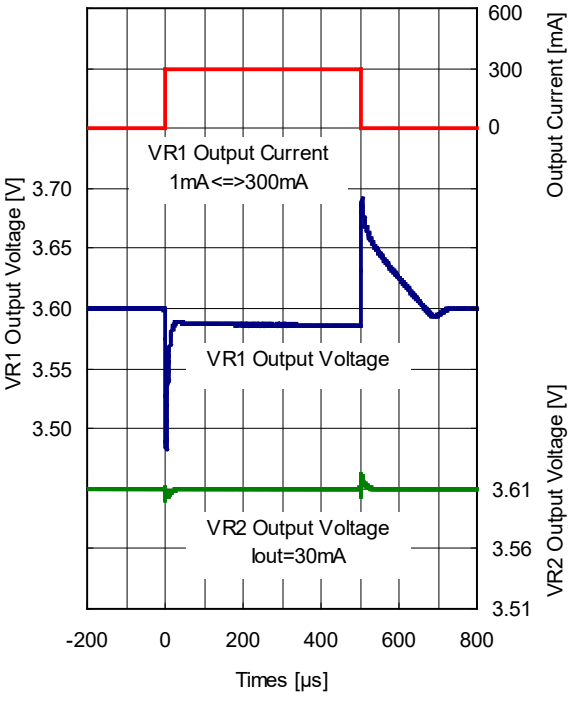
3.6V(VR1/VR2) Cout=1.0μF



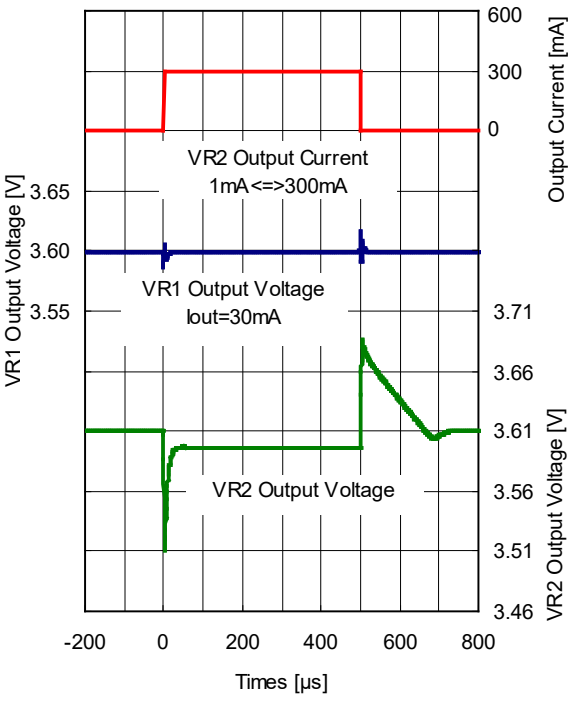
3.6V(VR1/VR2) Cout=1.0μF



3.6V(VR1/VR2) Cout=4.7μF

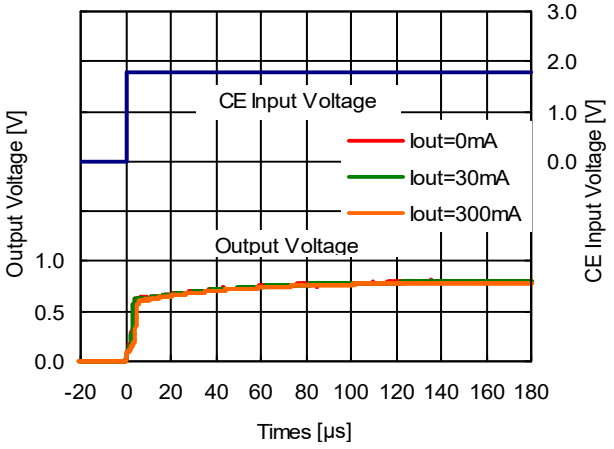


3.6V(VR1/VR2) Cout=4.7μF

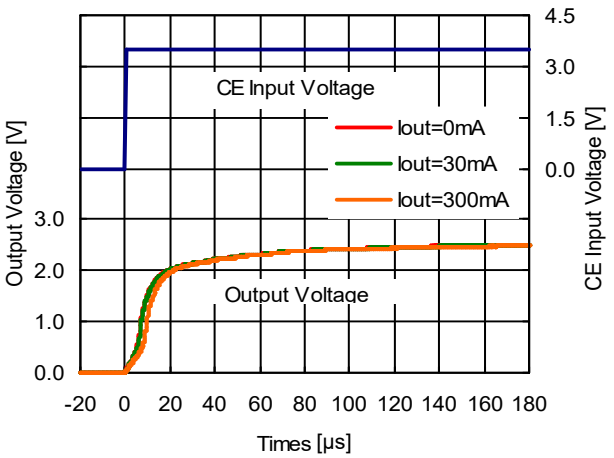


12) Turn On Speed with CE pin (C_{IN} = 1.0 µF, C_{OUT1} = C_{OUT2} = 1.0 µF, Ta = 25°C)

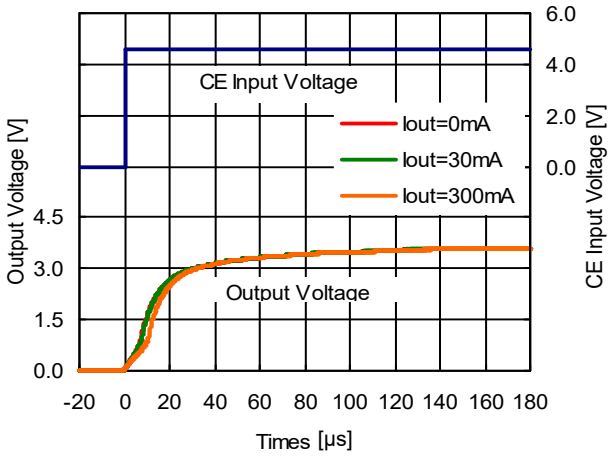
0.8V(VR1/VR2)



2.5V(VR1/VR2)

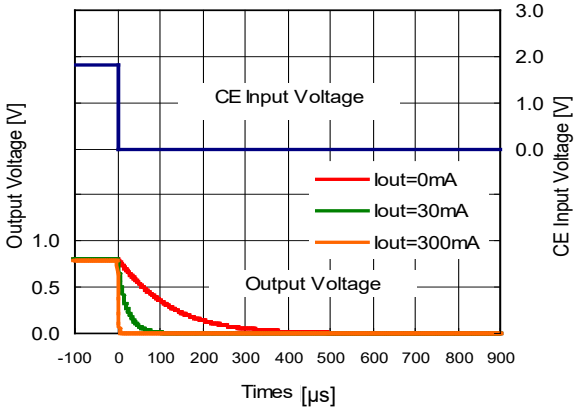


3.6V(VR1/VR2)

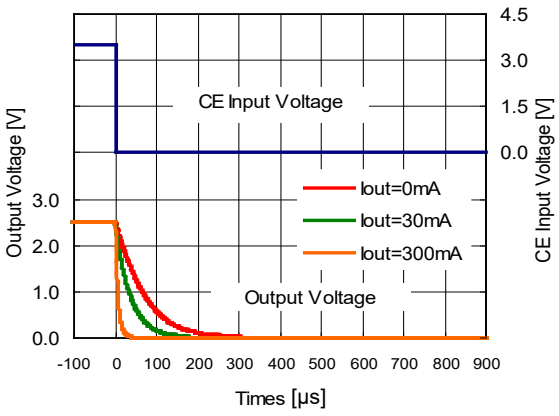


13) Turn Off Speed with CE pin (RP154xxxxB) (C_{IN} = 1.0 µF, C_{OUT1} = C_{OUT2} = 1.0 µF, Ta = 25°C)

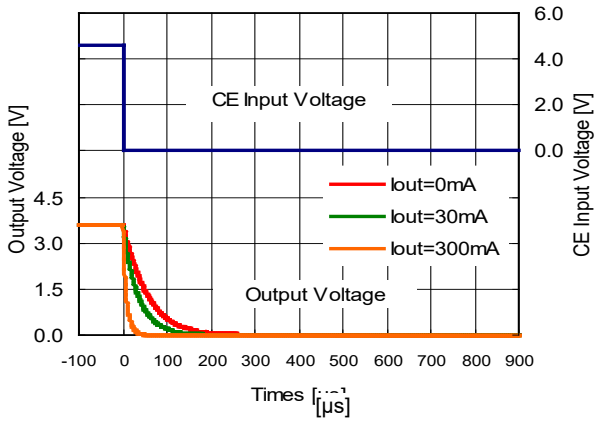
0.8V(VR1/VR2)



2.5V(VR1/VR2)

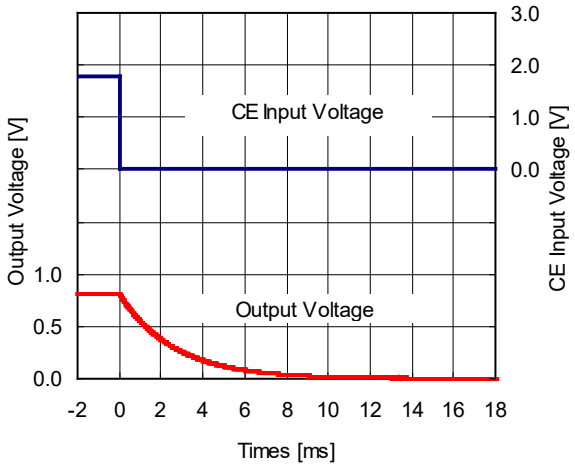


3.6V(VR1/VR2)

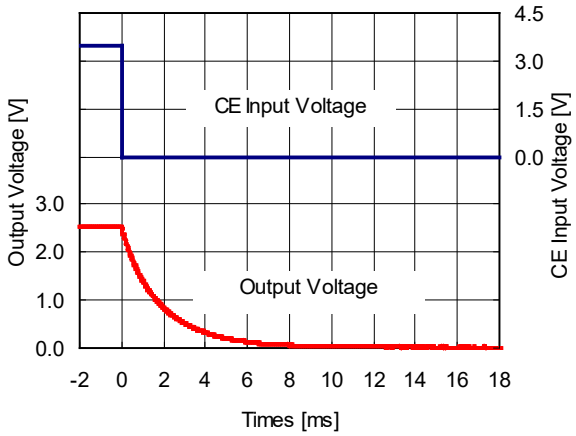


14) Turn Off Speed with CE pin (RP154xxxxA) (C_{IN} = 1.0 µF, C_{OUT1} = C_{OUT2} = 1.0 µF, I_{OUT} = 0 mA, Ta = 25°C)

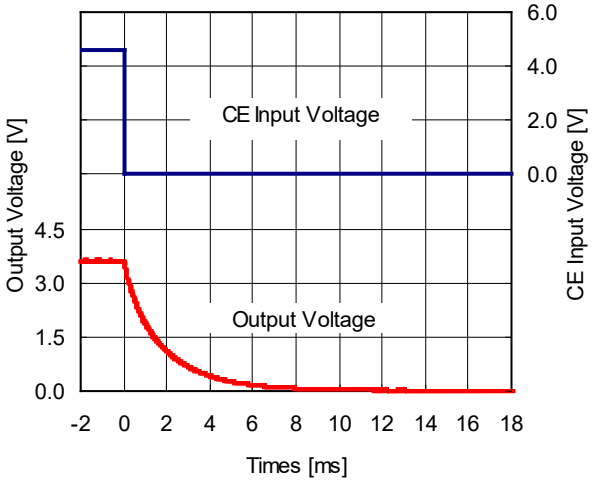
0.8V(VR1/VR2)



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 μV (Avg.) are marked as the hatched area in the graph.

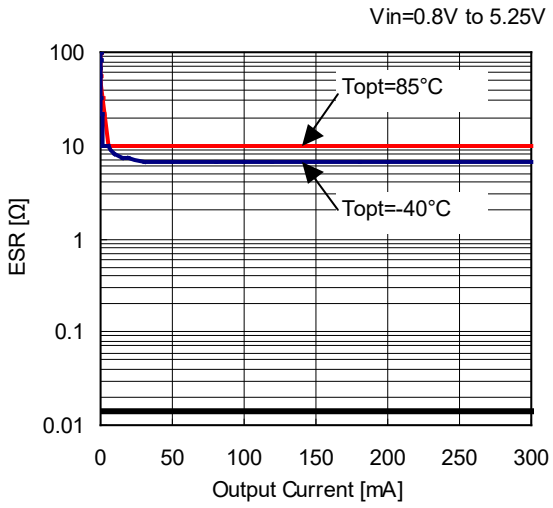
Measurement conditions

Frequency Band: 10 Hz to 2 MHz

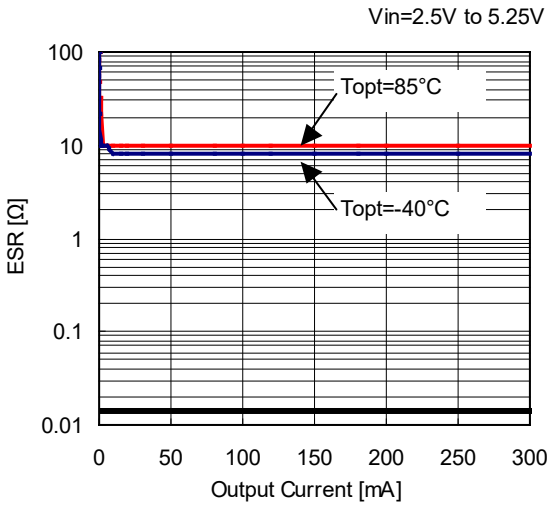
Temperature: −40°C to 85°C

C_{IN}, C_{OUT1}, C_{OUT2}: 1.0 μF

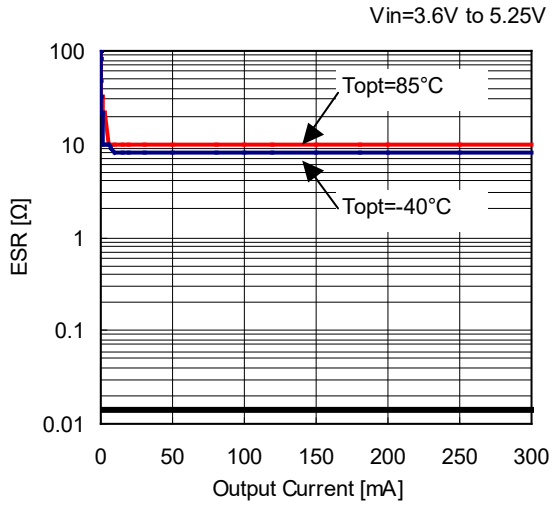
0.8V(VR1/VR2)



2.5V(VR1/VR2)



3.6V(VR1/VR2)



PD-DFN1216-8-(85125150)-JE-B

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

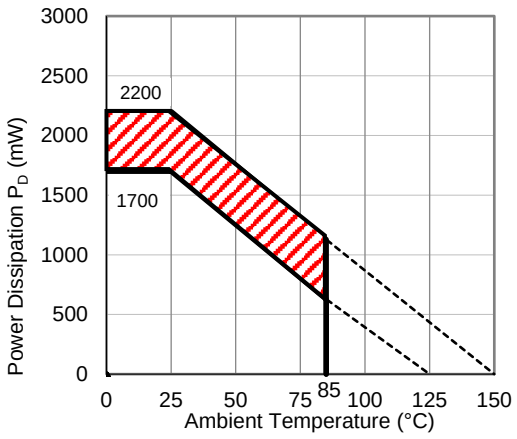
Item	Measurement Conditions
Environment	Mounting on Board (Wind Velocity = 0 m/s)
Board Material	Glass Cloth Epoxy Plastic (Four-Layer Board)
Board Dimensions	76.2 mm × 114.3 mm × 0.8 mm
Copper Ratio	Outer Layer (First Layer): Less than 95% of 50 mm Square Inner Layers (Second and Third Layers): Approx.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

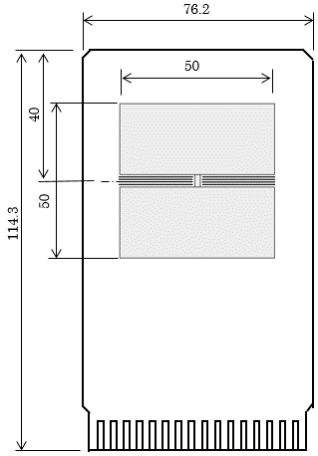
Item	Measurement Result
Power Dissipation	1700 mW
Thermal Resistance (θja)	θja = 56°C/W
Thermal Characterization Parameter (ψjt)	ψjt = 18°C/W

θja: Junction-to-Ambient Thermal Resistance

ψjt: Junction-to-Top Thermal Characterization Parameter



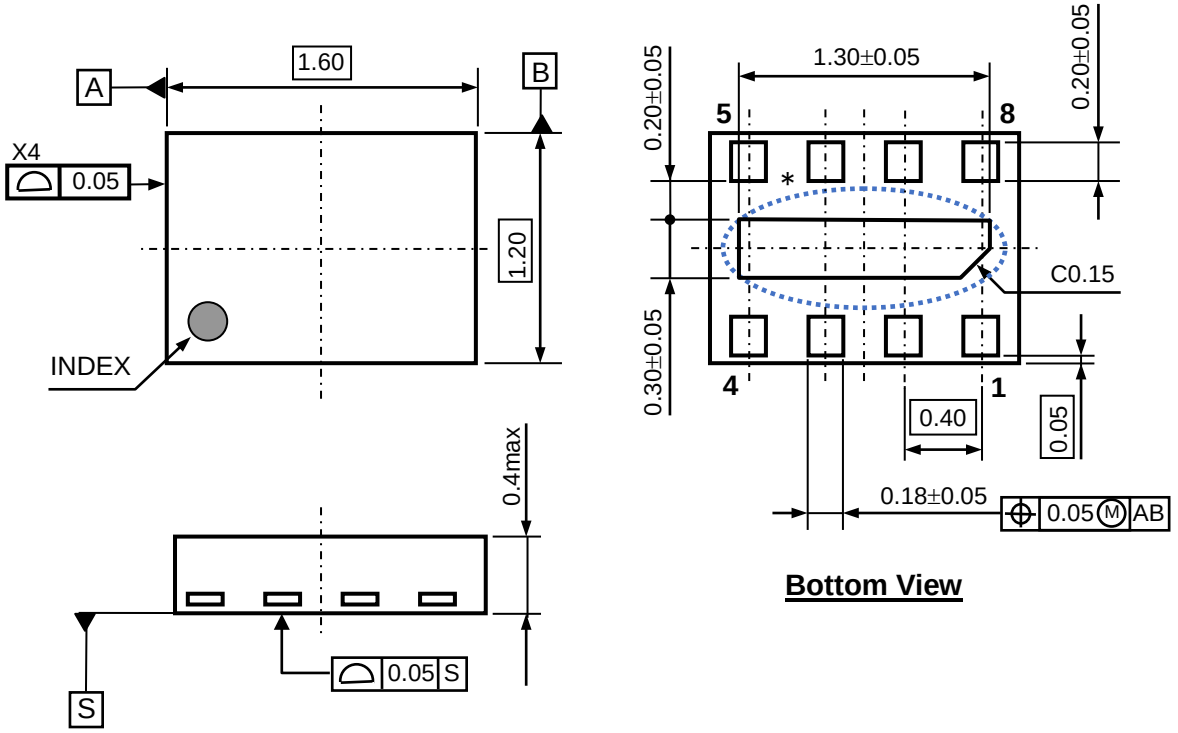
Power Dissipation vs. Ambient Temperature



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



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.

Ver. A

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

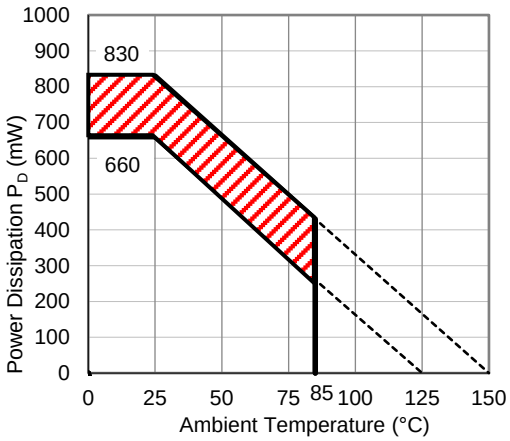
Item	Measurement Conditions
Environment	Mounting on Board (Wind Velocity = 0 m/s)
Board Material	Glass Cloth Epoxy Plastic (Four-Layer Board)
Board Dimensions	76.2 mm × 114.3 mm × 0.8 mm
Copper Ratio	Outer Layer (First Layer): Less than 95% of 50 mm Square Inner Layers (Second and Third Layers): Approx.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

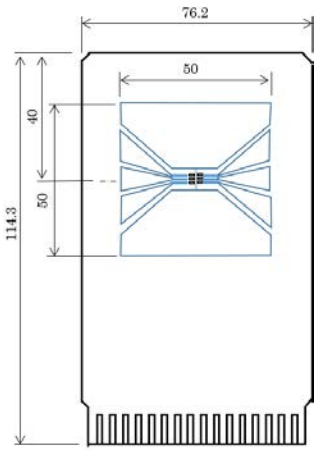
Item	Measurement Result
Power Dissipation	660 mW
Thermal Resistance (θja)	θja = 150°C/W
Thermal Characterization Parameter (ψjt)	ψjt = 51°C/W

θja: Junction-to-Ambient Thermal Resistance

ψjt: Junction-to-Top Thermal Characterization Parameter



Power Dissipation vs. Ambient Temperature

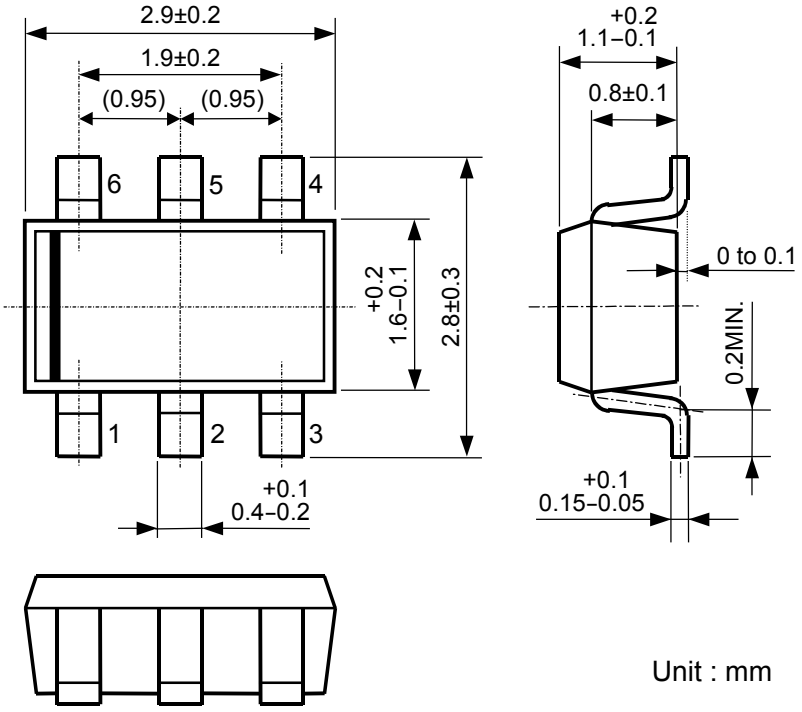


Measurement Board Pattern

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

Ver. A



Unit : mm

SOT-23-6 Package Dimensions

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    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.
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