150 mA Low Voltage Dual-Channel LDO Regulator with Sequence Control

NO.EA-200-160707

OUTLINE

The RP152x is a 150 mA dual-channel LDO regulator that provides high ripple rejection, low dropout voltage, high output voltage accuracy, and low supply current. Internally, the RP152x consists of a voltage reference unit, an error amplifier, resistors for setting output voltage, a short current limit circuit, and a chip enable circuit. Moreover, the RP152xxxxC consists of a start-up sequence circuit.

The RP152x is available in fixed output voltage options. Besides the low supply current by CMOS, the RP152x 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 RP152x is further improved in ripple rejection, line transient response, and load transient response. All these features allow the RP152x to become ideal power sources for hand-held communication equipment.

The RP152x is offered in a 6-pin SOT-23-6 package and a 6-pin DFN1212-6 package. Both packages are equipped with two LDOs which can achieve high-density mounting.

FEATURES

- Supply Current ····· Typ. 40 µA x 2
- Standby Current ····· Typ. 0.1µA x 2
- Ripple Rejection ····· Typ. 70 dB, f = 1 kHz
- Input Voltage Range ····· 1.4 V to 5.25 V
- Output Voltage Range ····· 0.8 V to 3.6 V, 0.1 V step
- 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. 0.20 V, I_{OUT} = 150 mA, V_{SET} = 2.8 V
- Line Regulation ····· Typ. 0.02%/ V
- Packages ····· DFN1212-6, SOT-23-6
- Short-current Limit ····· Typ. 40 mA
- Ceramic Capacitor Compatible ····· 0.22 µF or more

APPLICATIONS

- Battery-powered Equipment
- Portable Communication Equipment, Cameras
- Home Electrical Appliances

SELECTION GUIDE

The set output voltage, the package type, the auto-discharge function[1] and the start-up sequence control are user-selectable options.

Selection Guide

Product Name	Package	Quantity per Reel	Pb Free	Halogen Free
RP152Lxxx∗-TR	DFN1212-6	5,000 pcs	Yes	Yes
RP152Nxxx∗-TR-FE	SOT-23-6	3,000 pcs	Yes	Yes

xxx: Specify the combination of set output voltage (V_{SET}) within the range of 0.8 V to 3.6 V in 0.1 V step.

∗: Specify the auto-discharge function and the start-up sequence control.

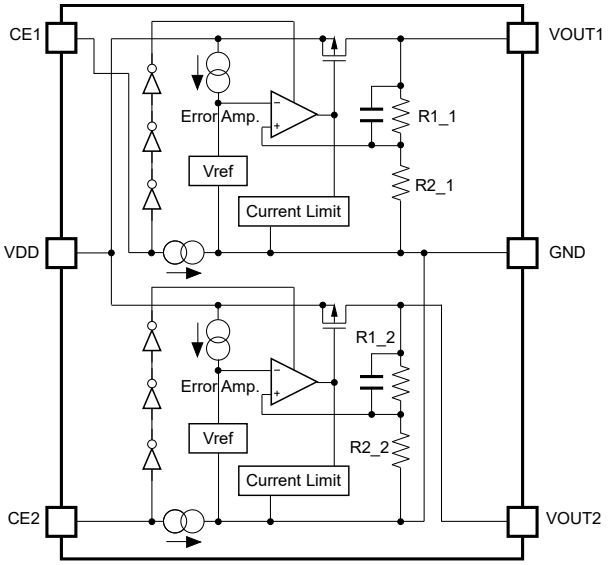
(A) Auto-discharge function not included

(B) Auto-discharge function included

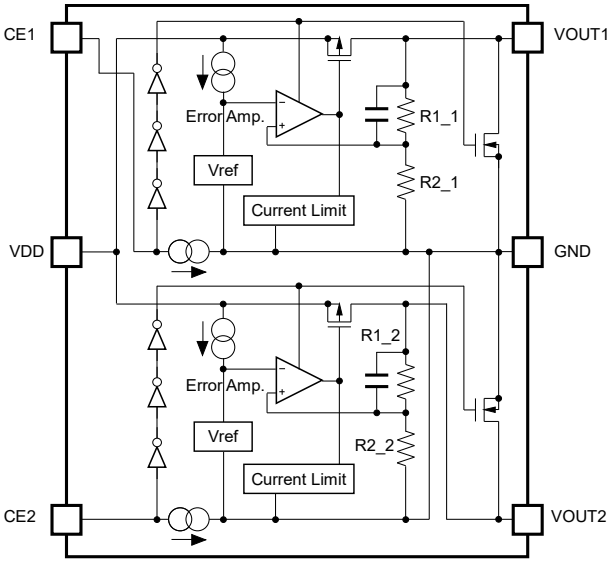
(C) Start-up sequence control and Auto-discharge function included

[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.

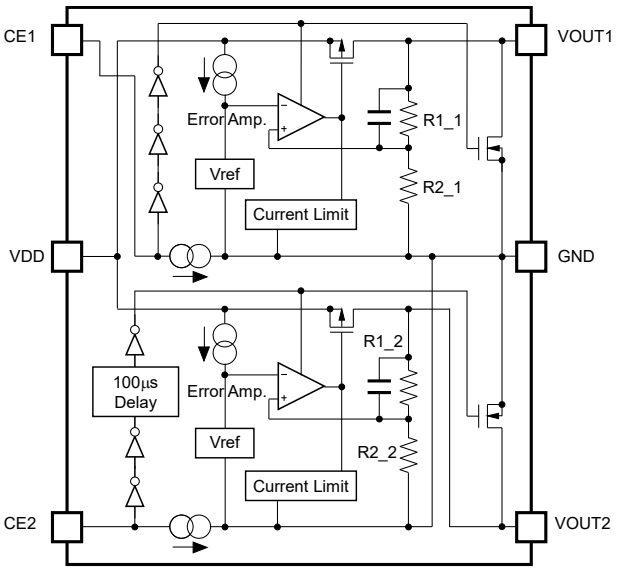
BLOCK DIAGRAMS



RP152xxxxA Block Diagram

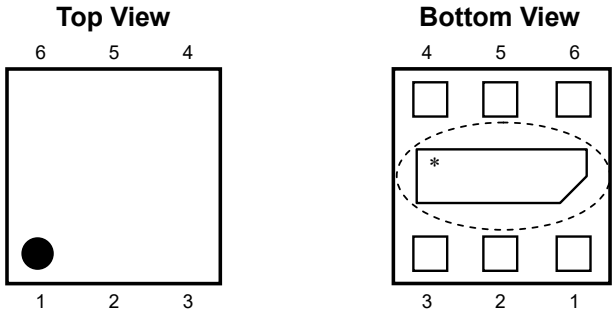


RP152xxxxB Block Diagram

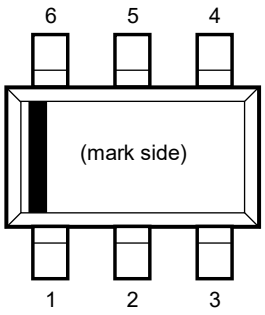


RP152xxxxC Block Diagram

PIN DESCRIPTIONS



DFN1212-6 Pin Configuration



SOT-23-6 Pin Configuration

DFN1212-6 Pin Description

Pin No.	Symbol	Description
1	VOUT1	Output Pin 1
2	VOUT2	Output Pin2
3	GND	Ground Pin
4	CE2	Chip Enable Pin 2, Active-high
5	VDD	Input Pin
6	CE1	Chip Enable Pin 1, Active-high

∗ 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.

SOT-23-6 Pin Description

Pin No.	Symbol	Description
1	CE1	Chip Enable Pin 1, Active-high
2	VDD	Input Pin
3	CE2	Chip Enable Pin 2, Active-high
4	VOUT2	Output Pin2
5	GND	Ground Pin
6	VOUT1	Output Pin 1

ABSOLUTE MAXIMUM RATINGS

Absolute Maximum Ratings

Symbol	Item	Rating		Unit
V_{IN}	Input Voltage	−0.3 to 6.0		V
V_{CE}	CE Pin Input Voltage	−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	180		mA
P_D	Power Dissipation (Standard Land Pattern)[1]	DFN1212-6	600	mW
		SOT-23-6	420	
Tj	Junction Temperature	−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 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 CONDITIONS

Recommended Operating Conditions

Symbol	Item	Rating	Unit
V_{IN}	Input Voltage[2]	1.40 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 when 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* in *SUPPLEMENTARY ITEMS* for detailed information.
[2] In case of operating the device beyond 5.25 V, do not exceed 5.5 V with 500 total operating hours.

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} = 0.22 µF, unless otherwise noted.

The specifications surrounded by ▭ are guaranteed by Design Engineering at −40°C ≤ Ta ≤ 85°C.

RP152x 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			150			mA
ΔV_{OUT} /ΔI_{OUT}	Load Regulation	1 mA ≤ I_{OUT} ≤ 150 mA		**Refer to *Product-specific Electrical Characteristics***			
V_{DIF}	Dropout Voltage	I_{OUT} = 150 mA					
I_{SS}	Supply Current	I_{OUT} = 0 mA			40	60	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} ≤ 5.0 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 Notes: V_{IN} = 3.0 V when V_{SET} ≤ 2.0 V			70		dB
ΔV_{OUT} /ΔTa	Output Voltage Temperature Coefficient	−40°C ≤ Ta ≤ 85°C			±80		ppm /°C
I_{SC}	Short Current Limit	V_{SET} = 0 V			40		mA
I_{PD}	CE Pull-down Current				0.3		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 to 100 kHz			60		µVrms
R_{LOW}	Low Output Nch Tr. ON Resistance (RP152xxxxB/C)	V_{IN} = 4.0 V, V_{CE} = 0 V	RP152xxxxC (VR2)		10		Ω
			Others		50		

All test items listed under *ELECTRICAL CHARACTERISTICS* are done under the pulse load condition (Tj ≈Ta = 25°C) except for Output Noise, Ripple Rejection and Output Voltage Temperature Coefficient.

Product-specific Electrical Characteristics VOUT1

Product Name	V_{OUT1} (Ta = 25°C)			V_{OUT1} (−40°C ≤ Ta ≤ 85°C)			$\Delta V_{OUT1}/\Delta I_{OUT}$		V_{DIF1}	
	Min.	Typ.	Max.	Min.	Typ.	Max.	Typ.	Max.	Typ.	Max.
RP152x001x	2.772	2.800	2.828	2.716	2.800	2.884	15	60	0.200	0.350
RP152x002x	1.780	1.800	1.820	1.740	1.800	1.860	15	55	0.270	0.460
RP152x003x	1.480	1.500	1.520	1.440	1.500	1.560	15	50	0.310	0.550
RP152x004x	1.180	1.200	1.220	1.140	1.200	1.260	15	50	0.390	0.620
RP152x005x	3.267	3.300	3.333	3.201	3.300	3.399	15	60	0.190	0.320
RP152x006x	3.267	3.300	3.333	3.201	3.300	3.399	15	60	0.190	0.320
RP152x007x	2.822	2.850	2.879	2.765	2.850	2.936	15	60	0.200	0.350
RP152x008x	2.822	2.850	2.879	2.765	2.850	2.936	15	60	0.200	0.350
RP152x009x	2.970	3.000	3.030	2.910	3.000	3.090	15	60	0.190	0.320
RP152x010x	2.970	3.000	3.030	2.910	3.000	3.090	15	60	0.190	0.320
RP152x011x	1.780	1.800	1.820	1.740	1.800	1.860	15	55	0.270	0.460
RP152x012x	2.772	2.800	2.828	2.716	2.800	2.884	15	60	0.200	0.350
RP152x013x	3.267	3.300	3.333	3.201	3.300	3.399	15	60	0.190	0.320
RP152x014x	3.267	3.300	3.333	3.201	3.300	3.399	15	60	0.190	0.320
RP152x015x	1.480	1.500	1.520	1.440	1.500	1.560	15	50	0.310	0.550
RP152x016x	1.480	1.500	1.520	1.440	1.500	1.560	15	50	0.310	0.550
RP152x017x	2.475	2.500	2.525	2.425	2.500	2.575	15	60	0.200	0.350
RP152x018x	1.780	1.800	1.820	1.740	1.800	1.860	15	55	0.270	0.460
RP152x019x	1.480	1.500	1.520	1.440	1.500	1.560	15	50	0.310	0.550
RP152x020x	2.772	2.800	2.828	2.716	2.800	2.884	15	60	0.200	0.350
RP152x021x	1.180	1.200	1.220	1.140	1.200	1.260	15	50	0.390	0.620
RP152x022x	2.772	2.800	2.828	2.716	2.800	2.884	15	60	0.200	0.350
RP152x023x	2.475	2.500	2.525	2.425	2.500	2.575	15	60	0.200	0.350
RP152x024x	3.267	3.300	3.333	3.201	3.300	3.399	15	60	0.190	0.320
RP152x025x	2.970	3.000	3.030	2.910	3.000	3.090	15	60	0.190	0.320
RP152x026x	2.772	2.800	2.828	2.716	2.800	2.884	15	60	0.200	0.350
RP152x027x	2.277	2.300	2.323	2.231	2.300	2.369	15	60	0.230	0.390
RP152x028x	2.772	2.800	2.828	2.716	2.800	2.884	15	60	0.200	0.350
RP152x029x	1.480	1.500	1.520	1.440	1.500	1.560	15	50	0.310	0.550
RP152x030x	1.480	1.500	1.520	1.440	1.500	1.560	15	50	0.310	0.550
RP152x031x	1.780	1.800	1.820	1.740	1.800	1.860	15	55	0.270	0.460
RP152x032x	1.180	1.200	1.220	1.140	1.200	1.260	15	50	0.390	0.620
RP152x033x	3.069	3.100	3.131	3.007	3.100	3.193	15	60	0.190	0.320
RP152x034x	1.780	1.800	1.820	1.740	1.800	1.860	15	55	0.270	0.460
RP152x035x	2.475	2.500	2.525	2.425	2.500	2.575	15	60	0.200	0.350
RP152x036x	1.180	1.200	1.220	1.140	1.200	1.260	15	50	0.390	0.620
RP152x037x	3.267	3.300	3.333	3.201	3.300	3.399	15	60	0.190	0.320
RP152x038x	1.180	1.200	1.220	1.140	1.200	1.260	15	50	0.390	0.620
RP152x039x	2.079	2.100	2.121	2.037	2.100	2.163	15	60	0.230	0.390
RP152x040x	2.772	2.800	2.828	2.716	2.800	2.884	15	60	0.200	0.350

Product-specific Electrical Characteristics VOUT1 (continued)

Product Name	V_{OUT1} (Ta = 25°C)			V_{OUT1} (−40°C ≤ Ta ≤ 85°C)			$\Delta V_{OUT1}/\Delta I_{OUT}$		V_{DIF1}	
	Min.	Typ.	Max.	Min.	Typ.	Max.	Typ.	Max.	Typ.	Max.
RP152x041x	1.780	1.800	1.820	1.740	1.800	1.860	15	55	0.270	0.460
RP152x042x	1.180	1.200	1.220	1.140	1.200	1.260	15	50	0.390	0.620
RP152x043x	1.280	1.300	1.320	1.240	1.300	1.360	15	50	0.390	0.620
RP152x044x	1.080	1.100	1.120	1.040	1.100	1.160	15	50	0.440	0.720
RP152x045x	2.772	2.800	2.828	2.716	2.800	2.884	15	60	0.200	0.350
RP152x046x	2.772	2.800	2.828	2.716	2.800	2.884	15	60	0.200	0.350
RP152x047x	2.475	2.500	2.525	2.425	2.500	2.575	15	60	0.200	0.350
RP152x048x	2.475	2.500	2.525	2.425	2.500	2.575	15	60	0.200	0.350
RP152x049x	1.480	1.500	1.520	1.440	1.500	1.560	15	50	0.310	0.550
RP152x050x	2.376	2.400	2.424	2.328	2.400	2.472	15	60	0.230	0.390
RP152x051x	0.980	1.000	1.020	0.940	1.000	1.060	10	40	0.440	0.720
RP152x052x	1.780	1.800	1.820	1.740	1.800	1.860	15	55	0.270	0.460
RP152x053x	2.574	2.600	2.626	2.522	2.600	2.678	15	60	0.200	0.350
RP152x054x	2.475	2.500	2.525	2.425	2.500	2.575	15	60	0.200	0.350
RP152x055x	2.970	3.000	3.030	2.910	3.000	3.090	15	60	0.190	0.320
RP152x056x	2.574	2.600	2.626	2.522	2.600	2.678	15	60	0.200	0.350
RP152x057x	3.069	3.100	3.131	3.007	3.100	3.193	15	60	0.190	0.320
RP152x058x	0.880	0.900	0.920	0.840	0.900	0.960	10	40	0.500	0.800
RP152x059x	2.871	2.900	2.929	2.813	2.900	2.987	15	60	0.200	0.350
RP152x060x	1.180	1.200	1.212	1.140	1.200	1.260	15	50	0.390	0.620
RP152x061x	1.780	1.800	1.820	1.740	1.800	1.860	15	55	0.270	0.460
RP152x062x	2.475	2.500	2.525	2.425	2.500	2.575	15	60	0.200	0.350

Product-specific Electrical Characteristics VOUT2

Product Name	V_{OUT2} (Ta = 25°C)			V_{OUT2} (−40°C ≤ Ta ≤ 85°C)			$\Delta V_{OUT2}/\Delta I_{OUT}$		V_{DIF2}	
	Min.	Typ.	Max.	Min.	Typ.	Max.	Typ.	Max.	Typ.	Max.
RP152x001x	2.772	2.800	2.828	2.716	2.800	2.884	15	60	0.200	0.350
RP152x002x	2.772	2.800	2.828	2.716	2.800	2.884	15	60	0.200	0.350
RP152x003x	2.772	2.800	2.828	2.716	2.800	2.884	15	60	0.200	0.350
RP152x004x	1.780	1.800	1.820	1.740	1.800	1.860	15	55	0.270	0.460
RP152x005x	1.180	1.200	1.220	1.140	1.200	1.260	15	50	0.390	0.620
RP152x006x	1.780	1.800	1.820	1.740	1.800	1.860	15	55	0.270	0.460
RP152x007x	2.822	2.850	2.879	2.765	2.850	2.936	15	60	0.200	0.350
RP152x008x	2.574	2.600	2.626	2.522	2.600	2.678	15	60	0.200	0.350
RP152x009x	2.772	2.800	2.828	2.716	2.800	2.884	15	60	0.200	0.350
RP152x010x	1.780	1.800	1.820	1.740	1.800	1.860	15	55	0.270	0.460
RP152x011x	1.480	1.500	1.520	1.440	1.500	1.560	15	50	0.310	0.550
RP152x012x	2.574	2.600	2.626	2.522	2.600	2.678	15	60	0.200	0.350
RP152x013x	2.772	2.800	2.828	2.716	2.800	2.884	15	60	0.200	0.350
RP152x014x	3.267	3.300	3.333	3.201	3.300	3.399	15	60	0.190	0.320
RP152x015x	2.475	2.500	2.525	2.425	2.500	2.575	15	60	0.200	0.350
RP152x016x	2.970	3.000	3.030	2.910	3.000	3.090	15	60	0.190	0.320
RP152x017x	2.970	3.000	3.030	2.910	3.000	3.090	15	60	0.190	0.320
RP152x018x	1.780	1.800	1.820	1.740	1.800	1.860	15	55	0.270	0.460
RP152x019x	2.574	2.600	2.626	2.522	2.600	2.678	15	60	0.200	0.350
RP152x020x	1.780	1.800	1.820	1.740	1.800	1.860	15	55	0.270	0.460
RP152x021x	2.772	2.800	2.828	2.716	2.800	2.884	15	60	0.200	0.350
RP152x022x	1.180	1.200	1.220	1.140	1.200	1.260	15	50	0.390	0.620
RP152x023x	2.475	2.500	2.525	2.425	2.500	2.575	15	60	0.200	0.350
RP152x024x	2.970	3.000	3.030	2.910	3.000	3.090	15	60	0.190	0.320
RP152x025x	2.970	3.000	3.030	2.910	3.000	3.090	15	60	0.190	0.320
RP152x026x	3.069	3.100	3.131	3.007	3.100	3.193	15	60	0.190	0.320
RP152x027x	2.772	2.800	2.828	2.716	2.800	2.884	15	60	0.200	0.350
RP152x028x	0.980	1.000	1.020	0.940	1.000	1.060	10	40	0.440	0.720
RP152x029x	1.480	1.500	1.520	1.440	1.500	1.560	15	50	0.310	0.550
RP152x030x	3.267	3.300	3.333	3.201	3.300	3.399	15	60	0.190	0.320
RP152x031x	2.673	2.700	2.727	2.619	2.700	2.781	15	60	0.200	0.350
RP152x032x	2.970	3.000	3.030	2.910	3.000	3.090	15	60	0.190	0.320
RP152x033x	3.069	3.100	3.131	3.007	3.100	3.193	15	60	0.190	0.320
RP152x034x	2.574	2.600	2.626	2.522	2.600	2.678	15	60	0.200	0.350
RP152x035x	1.180	1.200	1.220	1.140	1.200	1.260	15	50	0.390	0.620
RP152x036x	2.871	2.900	2.929	2.813	2.900	2.987	15	60	0.200	0.350
RP152x037x	1.980	2.000	2.020	1.940	2.000	2.060	15	60	0.270	0.460
RP152x038x	2.822	2.850	2.879	2.765	2.850	2.936	15	60	0.200	0.350
RP152x039x	3.267	3.300	3.333	3.201	3.300	3.399	15	60	0.190	0.320
RP152x040x	2.822	2.850	2.879	2.765	2.850	2.936	15	60	0.200	0.350

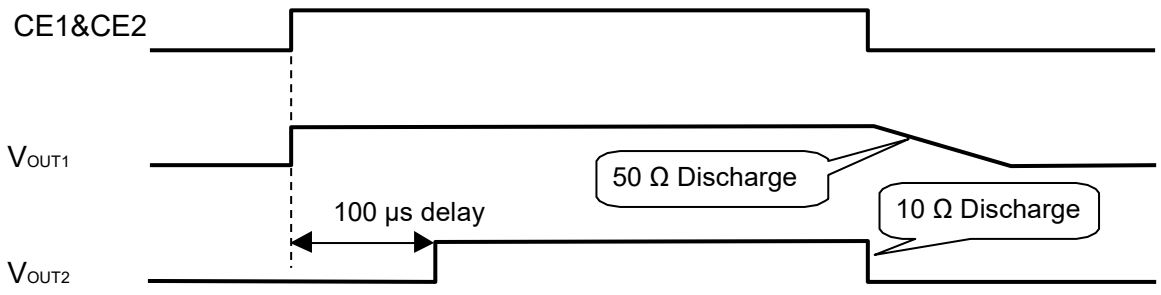
Product-specific Electrical Characteristics VOUT2 (continued)

Product Name	V_{OUT2} (Ta = 25°C)			V_{OUT2} (−40°C ≤ Ta ≤ 85°C)			$\Delta V_{OUT2}/\Delta I_{OUT}$		V_{DIF2}	
	Min.	Typ.	Max.	Min.	Typ.	Max.	Typ.	Max.	Typ.	Max.
RP152x041x	2.970	3.000	3.030	2.910	3.000	3.090	15	60	0.190	0.320
RP152x042x	2.574	2.600	2.626	2.522	2.600	2.678	15	60	0.200	0.350
RP152x043x	2.772	2.800	2.828	2.716	2.800	2.884	15	60	0.200	0.350
RP152x044x	1.480	1.500	1.520	1.440	1.500	1.560	15	50	0.310	0.550
RP152x045x	3.267	3.300	3.333	3.201	3.300	3.399	15	60	0.190	0.320
RP152x046x	2.970	3.000	3.030	2.910	3.000	3.090	15	60	0.190	0.320
RP152x047x	2.772	2.800	2.828	2.716	2.800	2.884	15	60	0.200	0.350
RP152x048x	3.168	3.200	3.232	3.104	3.200	3.296	15	60	0.190	0.320
RP152x049x	2.822	2.850	2.879	2.765	2.850	2.936	15	60	0.200	0.350
RP152x050x	2.871	2.900	2.929	2.813	2.900	2.987	15	60	0.200	0.350
RP152x051x	1.780	1.800	1.820	1.740	1.800	1.860	15	55	0.270	0.460
RP152x052x	2.822	2.850	2.879	2.765	2.850	2.936	15	60	0.200	0.350
RP152x053x	2.673	2.700	2.727	2.619	2.700	2.781	15	60	0.200	0.350
RP152x054x	1.780	1.800	1.820	1.740	1.800	1.860	15	55	0.270	0.460
RP152x055x	2.822	2.850	2.879	2.765	2.850	2.936	15	60	0.200	0.350
RP152x056x	2.970	3.000	3.030	2.910	3.000	3.090	15	60	0.190	0.320
RP152x057x	1.780	1.800	1.820	1.740	1.800	1.860	15	55	0.270	0.460
RP152x058x	0.880	0.900	0.920	0.840	0.900	0.960	10	40	0.500	0.800
RP152x059x	2.871	2.900	2.929	2.813	2.900	2.987	15	60	0.200	0.350
RP152x060x	1.180	1.200	1.212	1.140	1.200	1.260	15	50	0.390	0.620
RP152x061x	2.871	2.900	2.929	2.813	2.900	2.987	15	60	0.200	0.350
RP152x062x	3.069	3.100	3.131	3.007	3.100	3.193	15	60	0.190	0.320

THEORY OF OPERATION

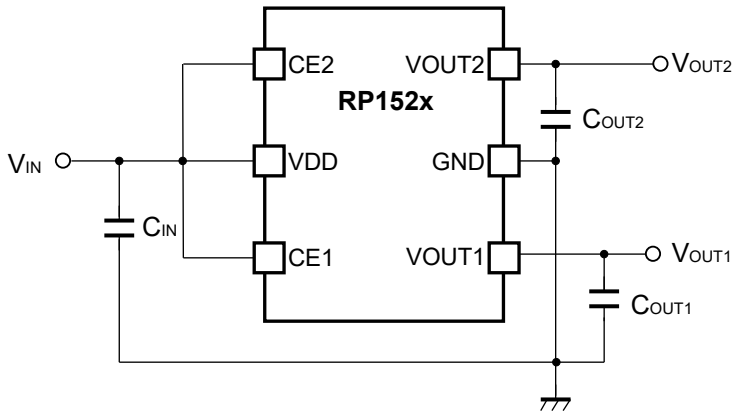
Start-up Sequence Circuit

The RP152xxxxC is equipped with a start-up sequence circuit. VR2 stands-up in 100 µs delay after VR1 stands up simultaneously with CE. Moreover, to disabling is depending upon the setting output voltage and the external capacitors. VR1 reduces the output voltage by the Nch driver of about 50 Ω, and VR2 reduces the output voltage by the Nch driver of about 10 Ω.



RP152xxxxC Start-up Sequence Circuit

APPLICATION INFORMATION



RP152x Typical Application Circuit

External Components

Symbol	Description
C_{IN}	Ceramic, 0.22 µF, Murata: GRM155B31A224KE18B
C_{OUT1}	
C_{OUT2}	

Technical Notes on the Components Selection

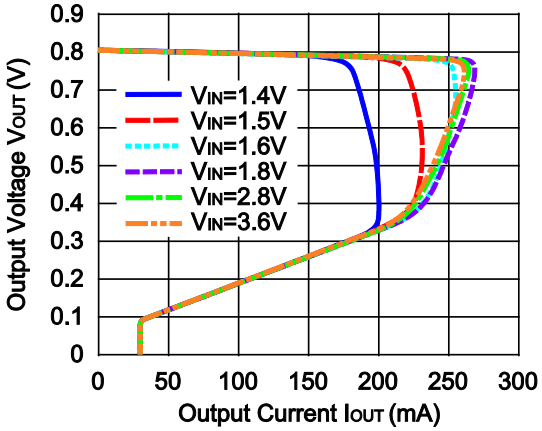
- In this device, phase compensation is provided to secure stable operation even when the load current varied. For this purpose, connect 0.22 µF or more output capacitors (C_{OUT1}, C_{OUT2}) between the VOUT and GND pin with shortest-distance wiring. In case of using a tantalum type capacitor and the ESR (Equivalent Series Resistance) value of the capacitor is large, the output might be unstable. Evaluate the circuit including consideration of frequency characteristics.
- Ensure the VDD and GND lines are sufficiently robust. If their impedance is too high, noise pickup or unstable operation may result. Connect a 0.22 µF input capacitor (C_{IN}) between the VDD and GND pins with shortest-distance wiring. Refer to *Typical Application Circuit*.

TYPICAL CHARACTERISTICS

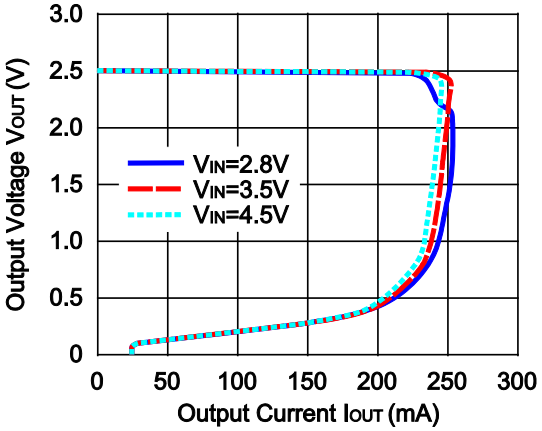
Notes: Typical Characteristics are intended to be used as reference data; they are not guaranteed.

1) Output Voltage vs. Output Current (Ta = 25°C)

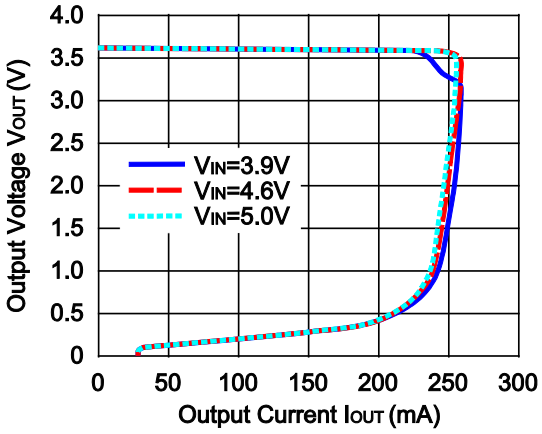
0.8 V (VR1/ VR2)



2.5 V (VR1/ VR2)

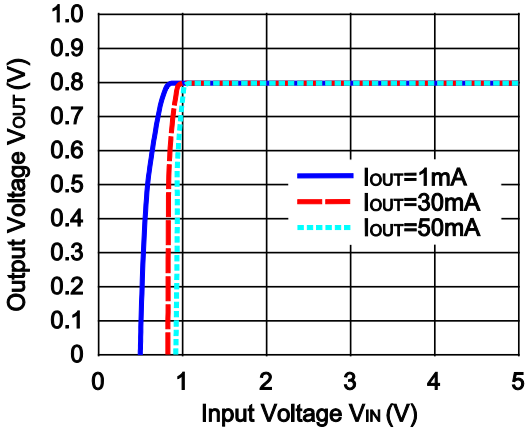


3.6 V (VR1/ VR2)

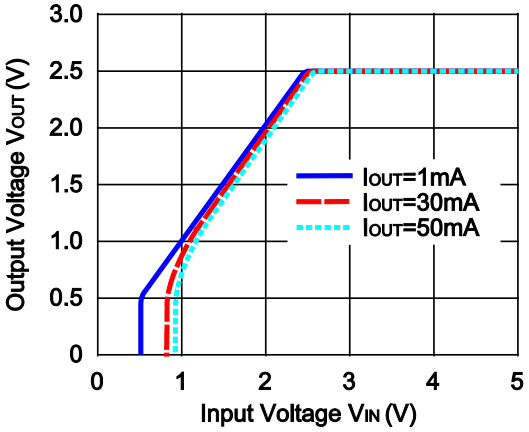


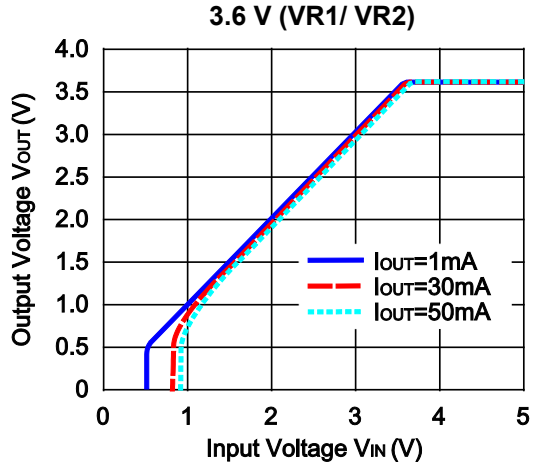
2) Output Voltage vs. Input Voltage (Ta = 25°C)

0.8 V (VR1/ VR2)

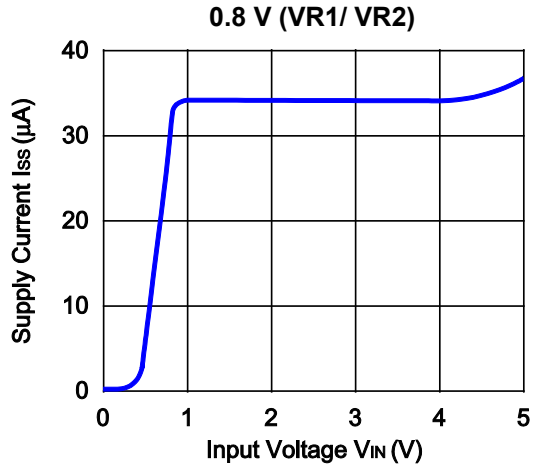


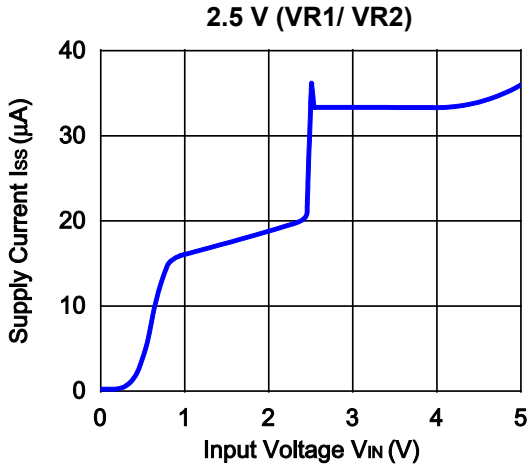
2.5 V (VR1/ VR2)

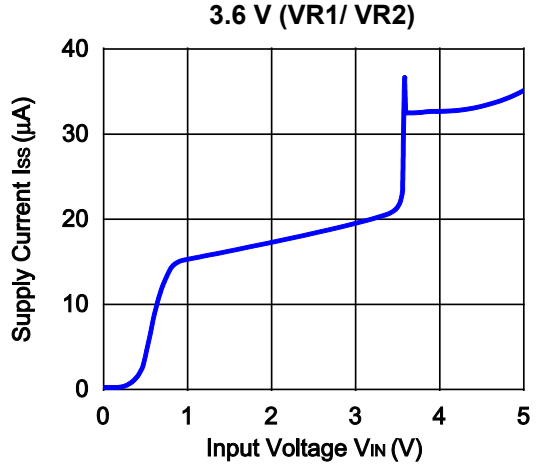




3) Supply Current vs. Input Voltage

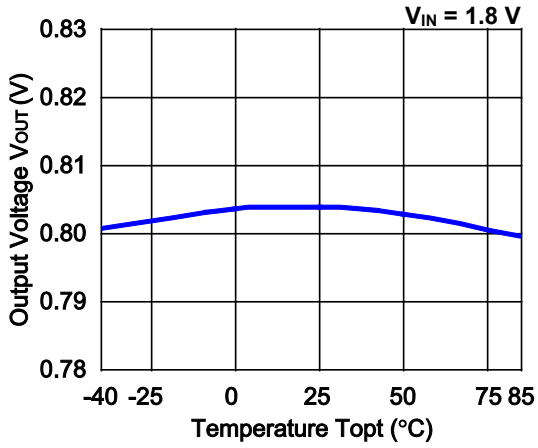




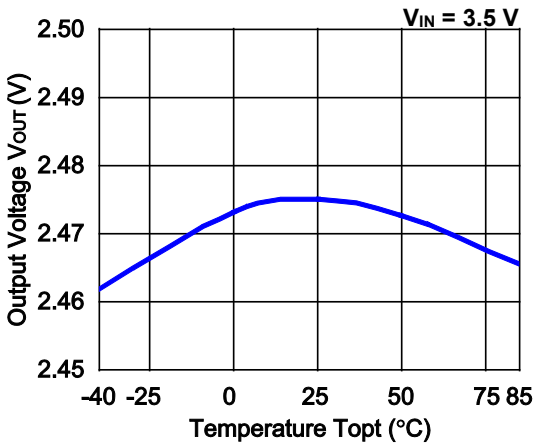


4) Output Voltage vs. Temperature

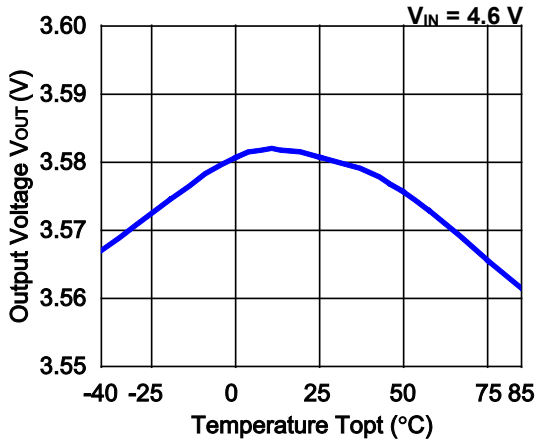
0.8 V (VR1/ VR2)



2.5 V (VR1/ VR2)

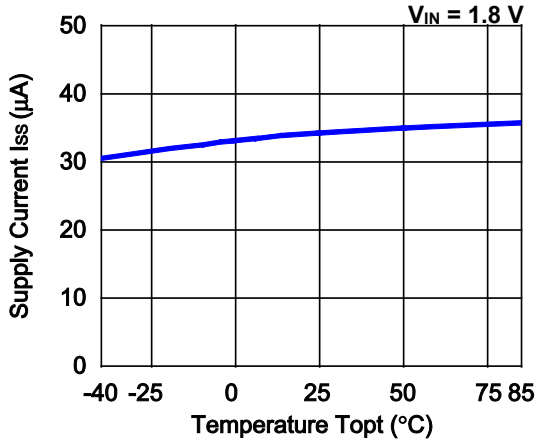


3.6 V (VR1/ VR2)

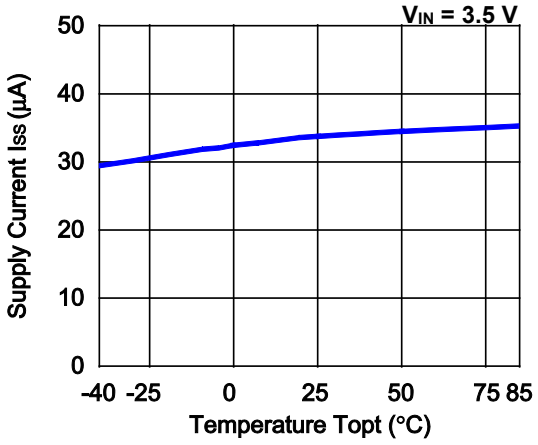


5) Supply Current vs. Temperature

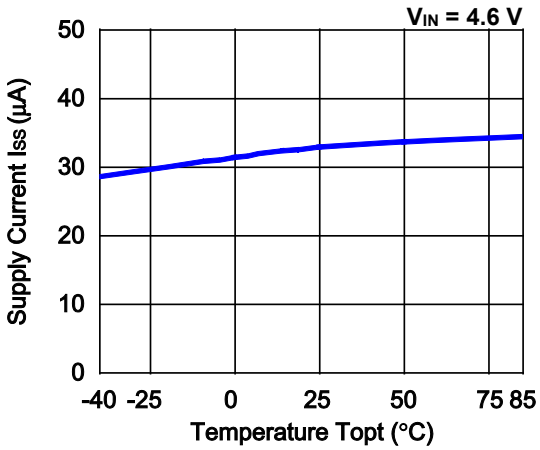
0.8 V (VR1/ VR2)



2.5 V (VR1/ VR2)

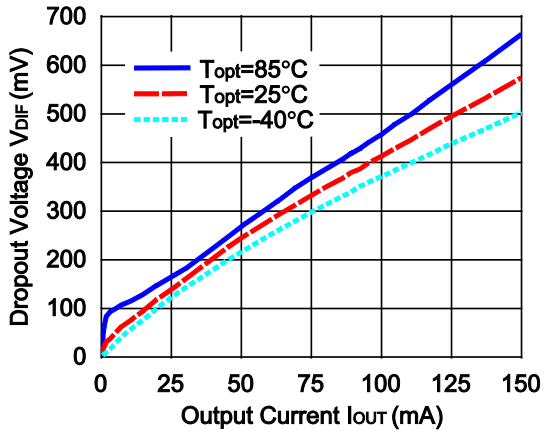


3.6V（VR1/VR2）

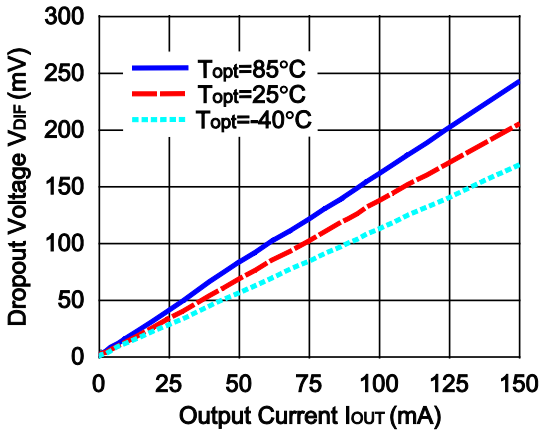


6) Dropout Voltage vs. Output Current

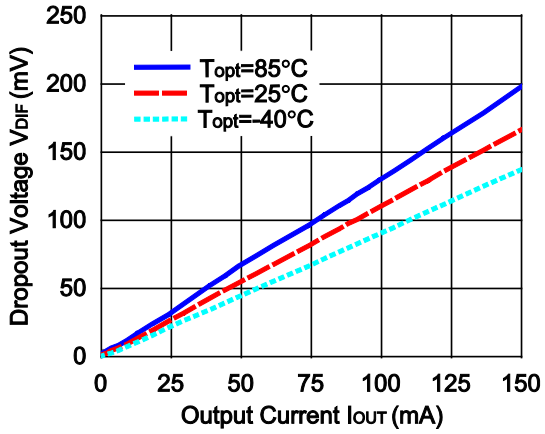
0.8 V (VR1/ VR2)



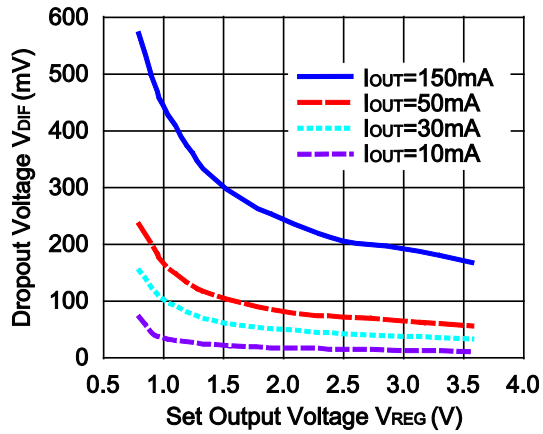
2.5 V (VR1/ VR2)



3.6 V (VR1/ VR2)

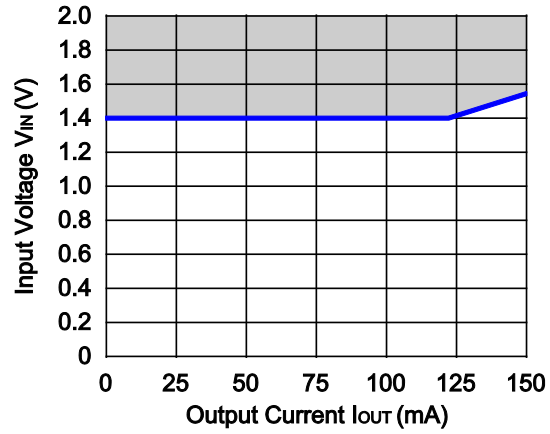


7) Dropout Voltage vs. Set Output Voltage



8) Minimum Operating Voltage

0.8 V (VR1/ VR2)

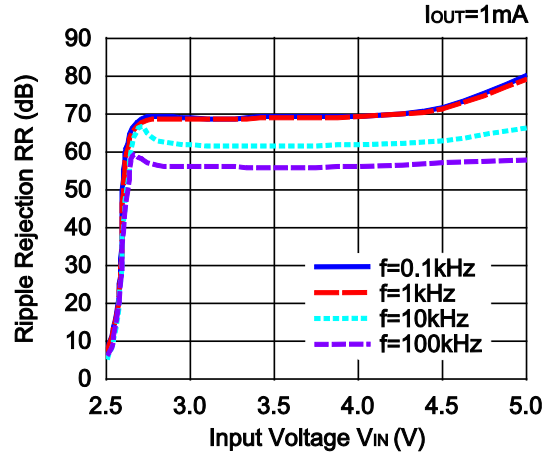


The hatched area is available for a 0.8-V output device.

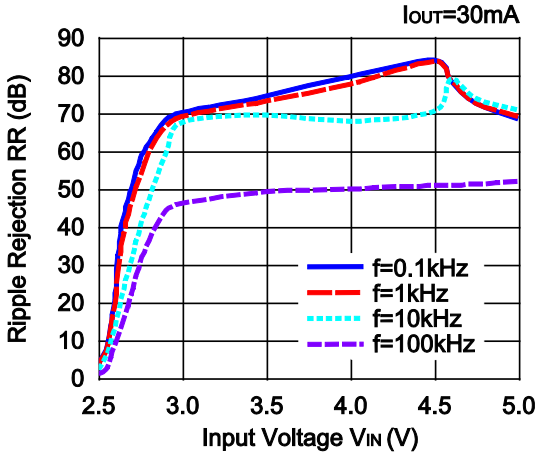
9) Ripple Rejection vs. Input Voltage

(C_{IN} = none, C_{OUT1} = C_{OUT2} = Ceramic 0.22 µF, Ripple = 0.2 Vp-p, Ta = 25°C)

2.5 V (VR1/ VR2)



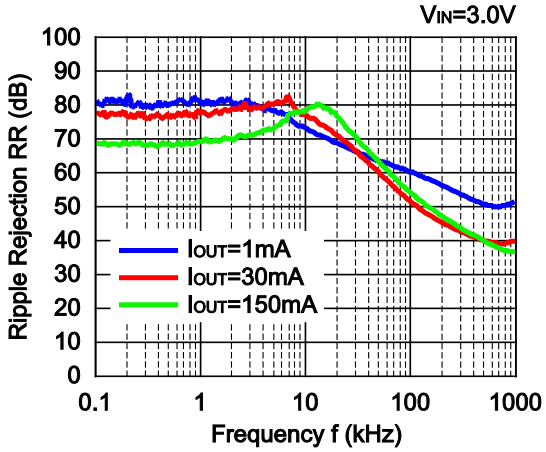
2.5 V (VR1/ VR2)



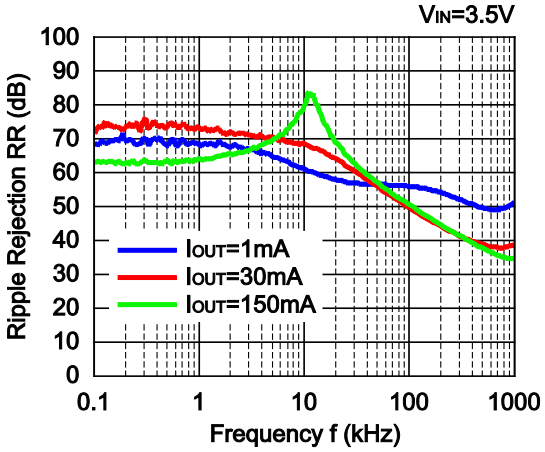
10) Ripple Rejection vs. Frequency

(C_{IN} = none, C_{OUT1} = C_{OUT2} = Ceramic 0.22 µF, Ripple = 0.2 Vp-p, Ta = 25°C)

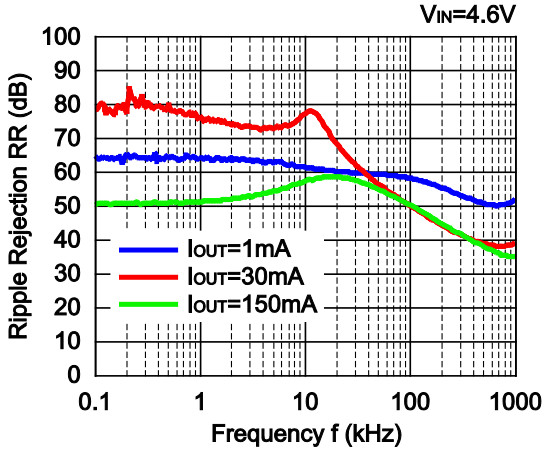
0.8 V (VR1/ VR2)



2.5 V (VR1/ VR2)



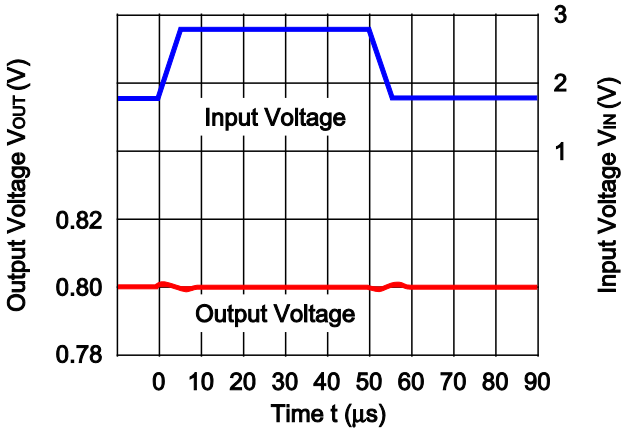
3.6 V (VR1/ VR2)



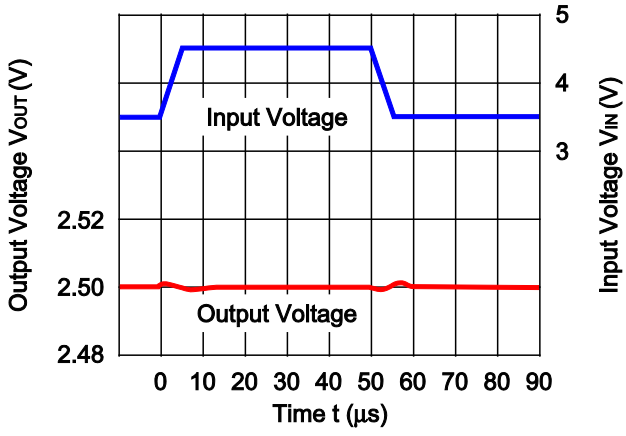
11) Input Transient Response

(I_{OUT} = 30 mA, tr = tf = 5 µs, C_{IN} = none, C_{OUT1} = C_{OUT2} = 0.22 µF, Ta = 25°C)

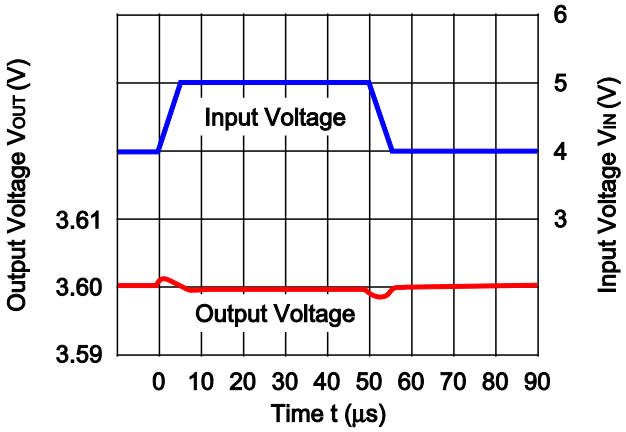
0.8 V (VR1/ VR2)



2.5 V (VR1/ VR2)

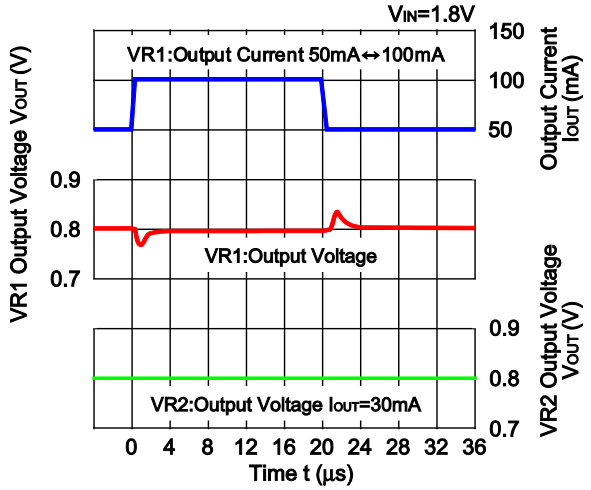


3.6 V (VR1/ VR2)

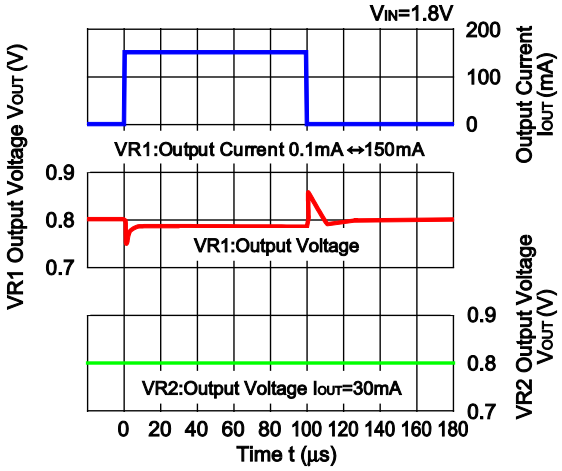


12) Load Transient Response (tr = tf = 0.5 µs, C_{IN} = C_{OUT1} = C_{OUT2} = 0.22 µF, Ta = 25°C)

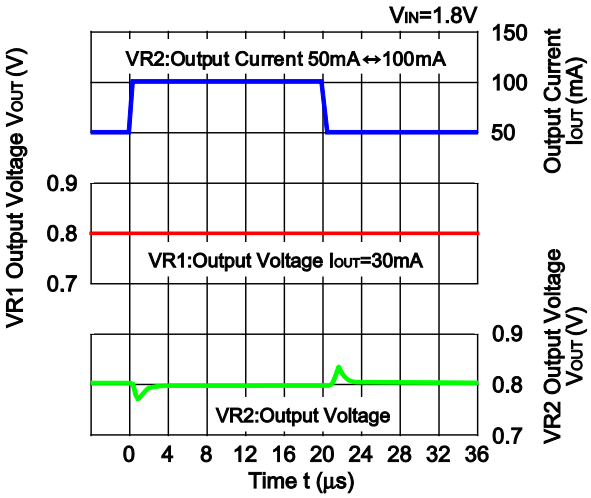
0.8 V (VR1/ VR2)



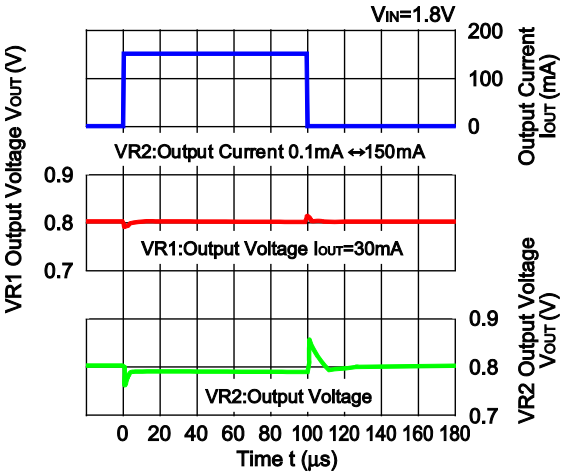
0.8 V (VR1/ VR2)



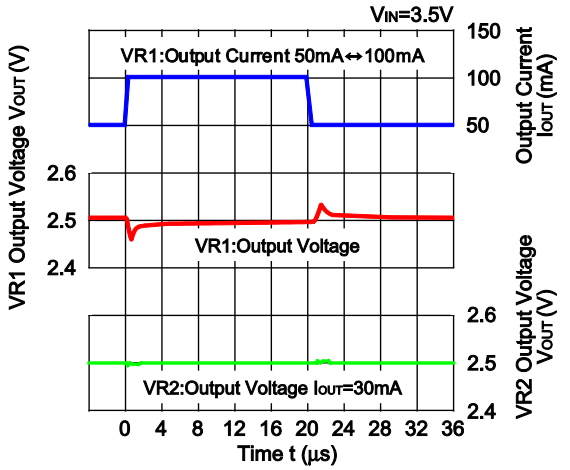
0.8 V (VR1/ VR2)



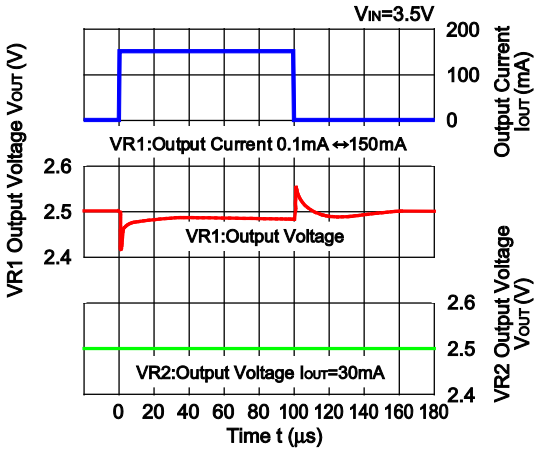
0.8 V (VR1/ VR2)



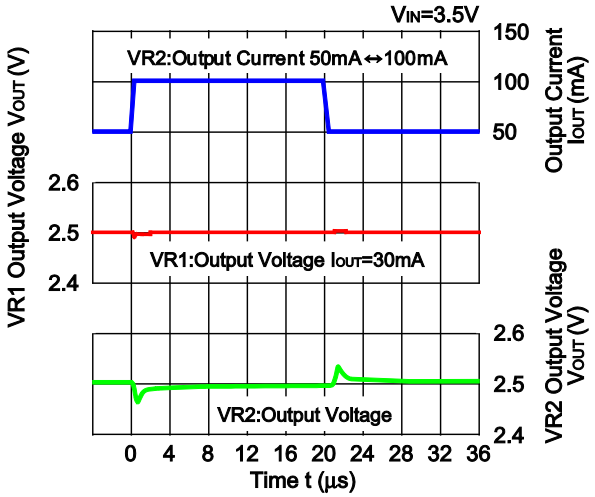
2.5 V (VR1/ VR2)



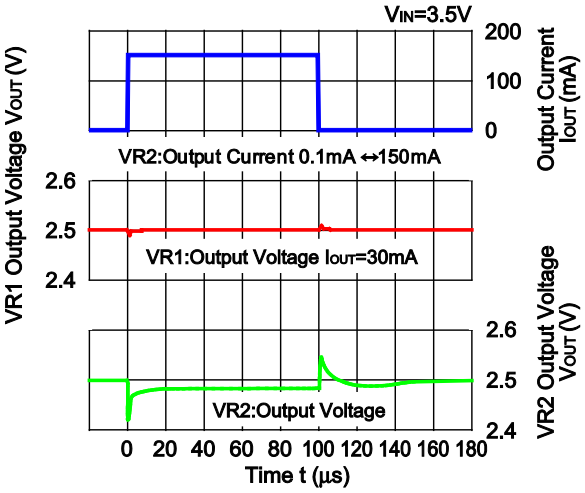
2.5 V (VR1/ VR2)



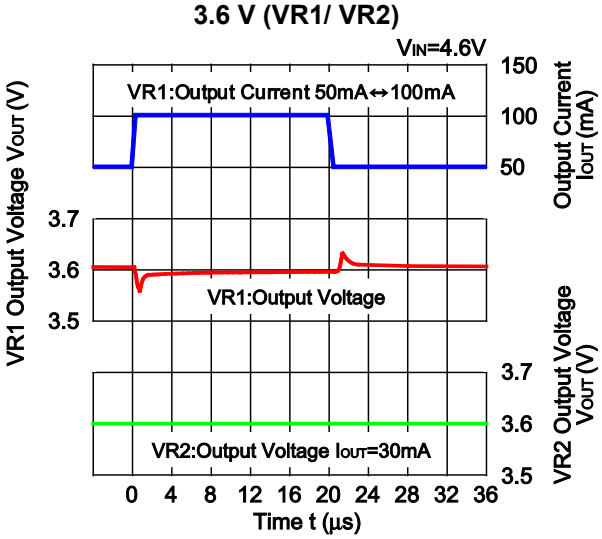
2.5 V (VR1/ VR2)



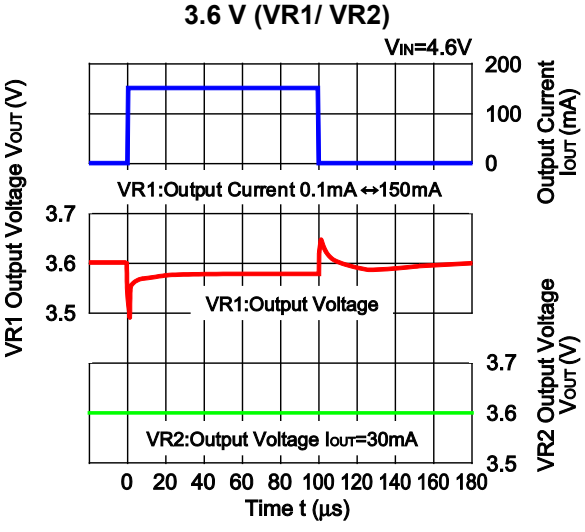
2.5 V (VR1/ VR2)



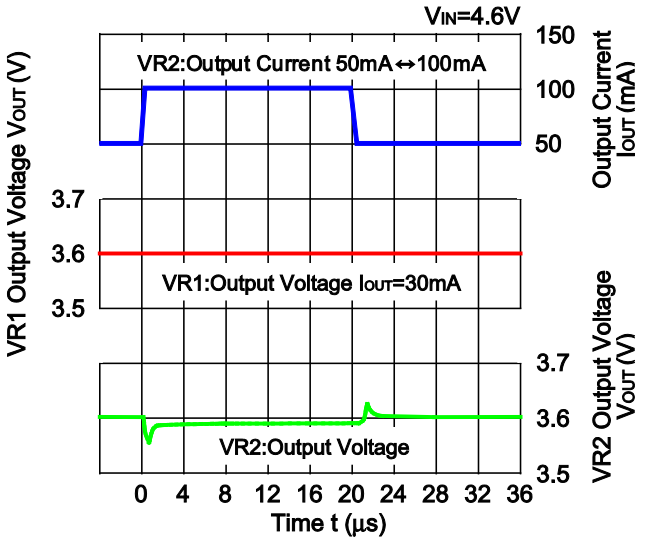
3.6 V (VR1/ VR2)



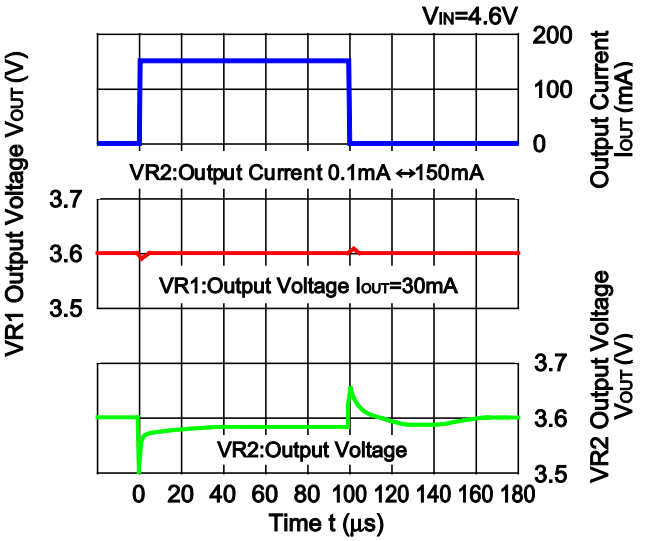
3.6 V (VR1/ VR2)



3.6 V (VR1/ VR2)

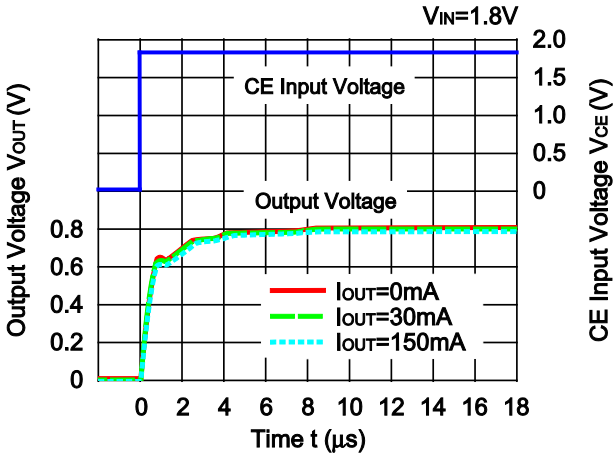


3.6 V (VR1/ VR2)

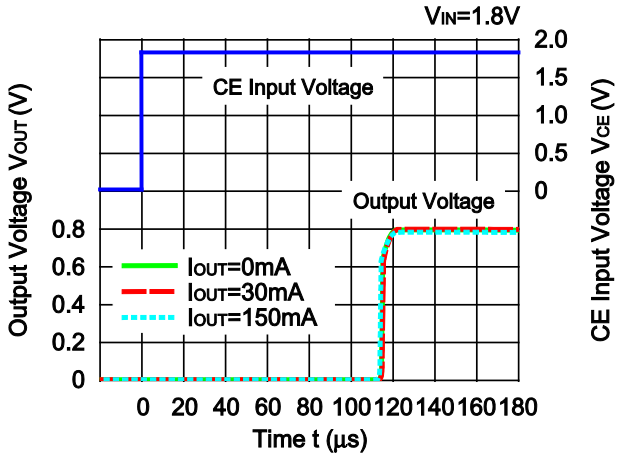


13) Turn On Speed with CE Pin (C_{IN} = C_{OUT1} = C_{OUT2} = 0.22 µF, Ta = 25°C)

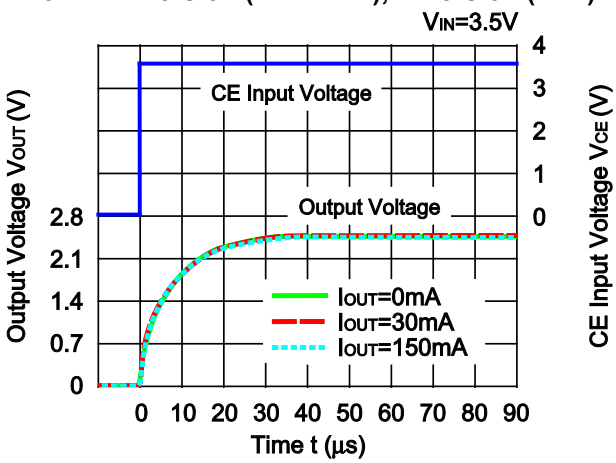
0.8 V A/B Version (VR1/ VR2), C Version (VR1)



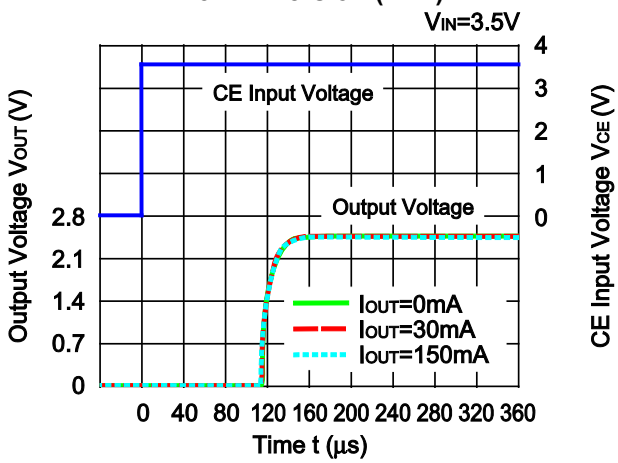
0.8 V C Version (VR2)



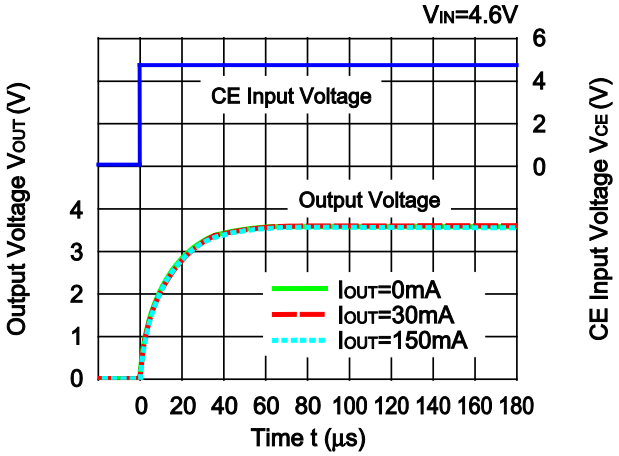
2.5 V A/B Version (VR1/ VR2), C Version (VR1)



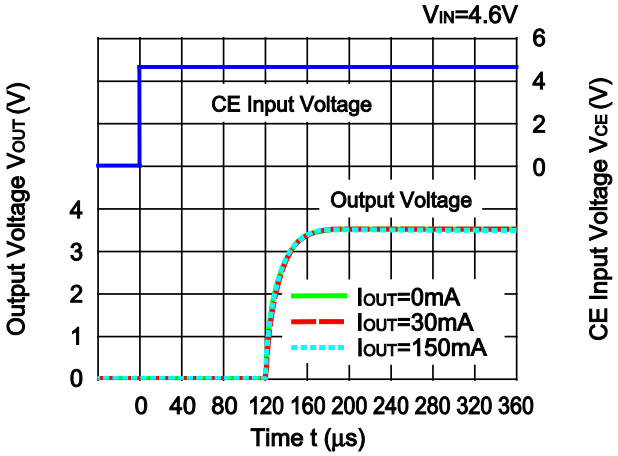
2.5 V C Version (VR2)



3.6 V A/B Version (VR1/ VR2), C Version (VR1)

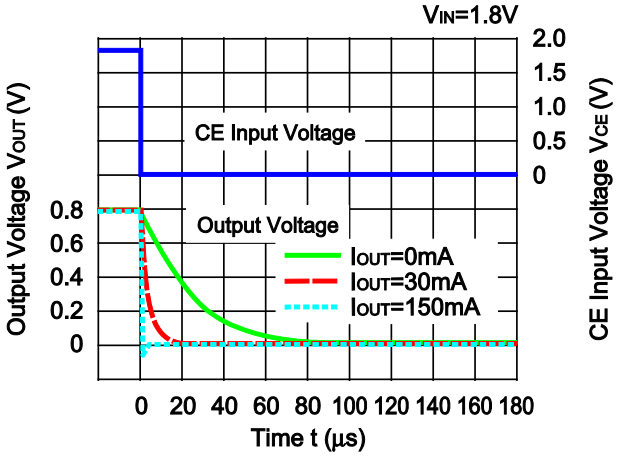


3.6 V C Version (VR2)

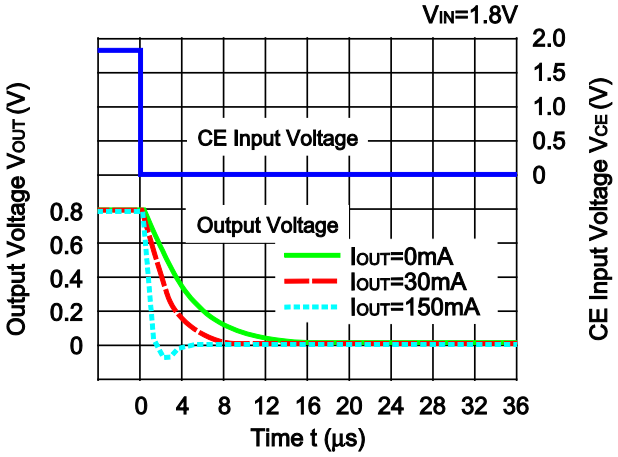


14) Tum Off Speed with CE Pin (C_{IN} = C_{OUT1} = C_{OUT2} = 0.22 µF, Ta = 25°C)

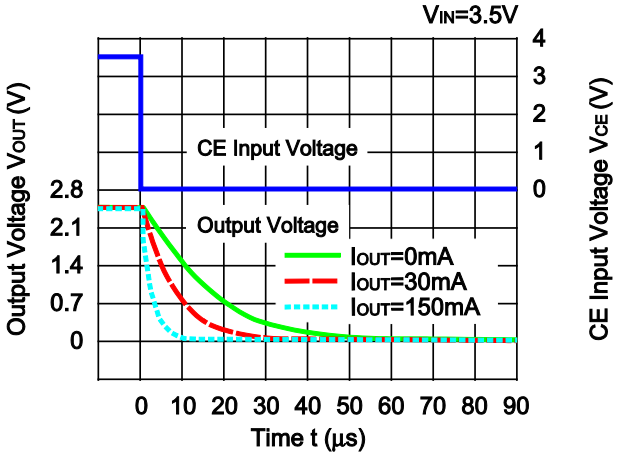
0.8 V B Version (VR1/ VR2), C Version (VR1)



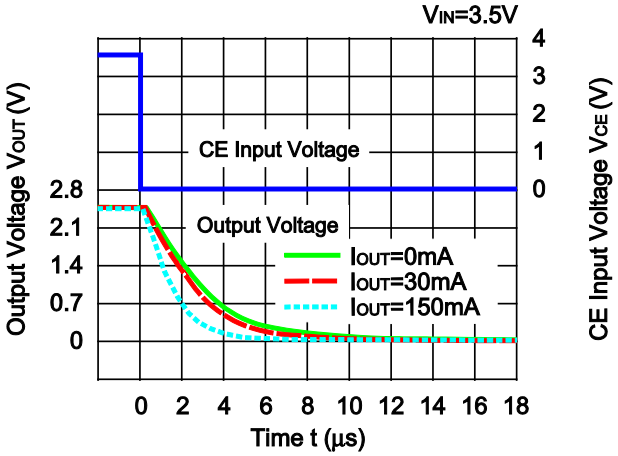
0.8 V C Version (VR2)



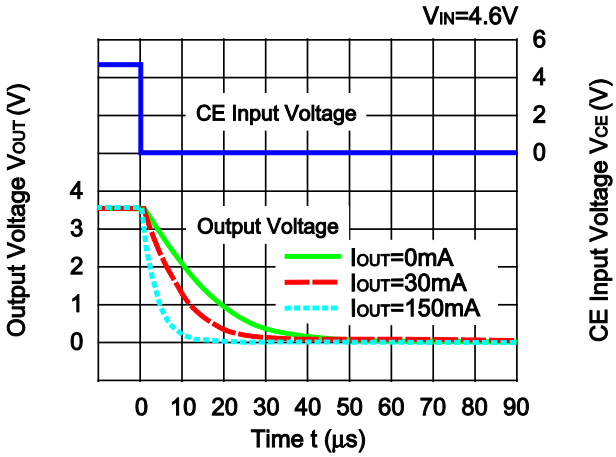
2.5 V B Version (VR1/ VR2), C Version (VR1)



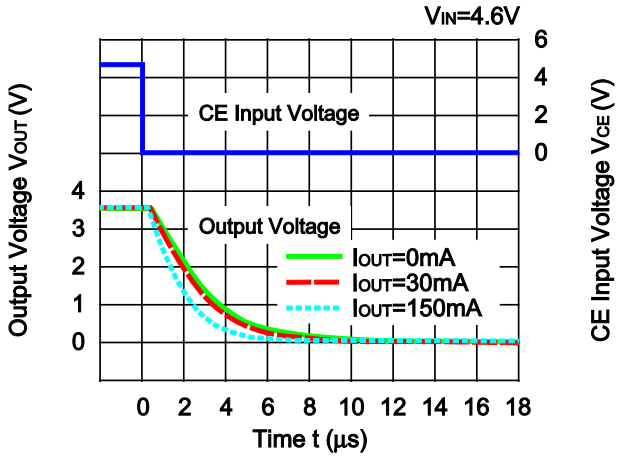
2.5 V C Version (VR2)



3.6 V B Version (VR1/ VR2), C Version (VR1)



3.6 V C Version (VR2)



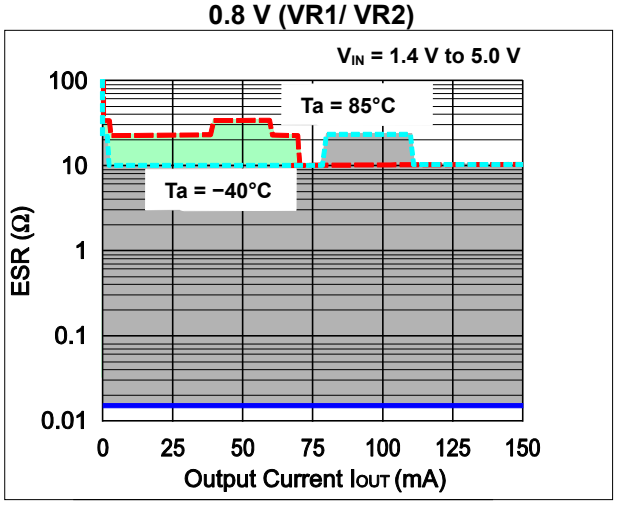
Equivalent Series Resistance (ESR) vs. Output Current

It is recommended that a ceramic type capacitor be used for the RP152x. However, other types of capacitors having lower ESR can also be used. The relation between the output current (I_{OUT}) and the ESR of output capacitor is shown below.

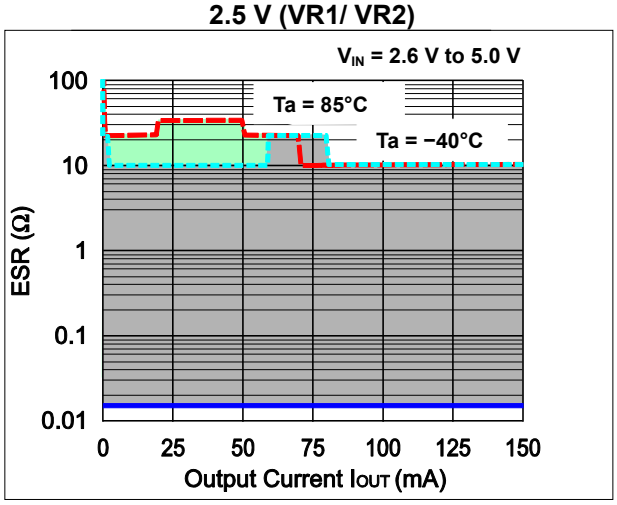
Measurement Conditions:

- Noise Frequency Band: 10 Hz to 2 MHz
- Measurement Temperature: −40°C to +85°C
- Hatched Area: Noise level is 40 µV (avg.) or below.
- C_{IN}, C_{OUT1}, C_{OUT2}: 0.22 µF (Murata: GRM155B10J224KE01)

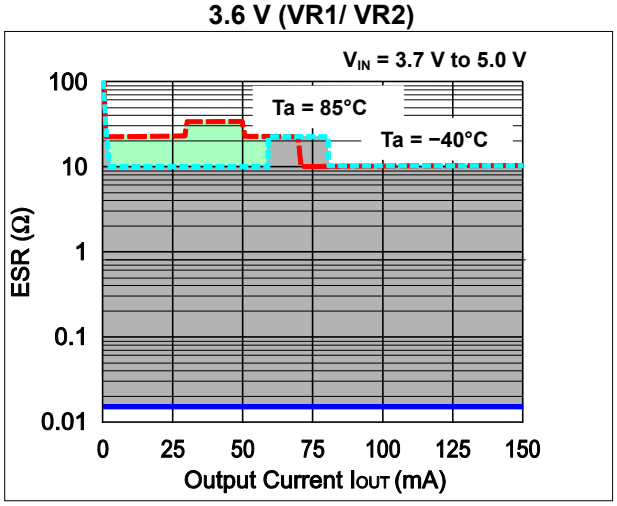
0.8 V (VR1/ VR2)



2.5 V (VR1/ VR2)



3.6 V (VR1/ VR2)



Ver. A

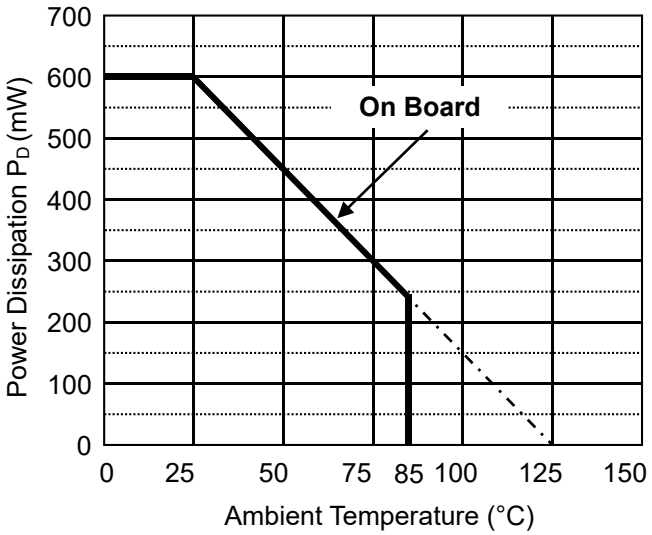
Power Dissipation (P_D) of the package is dependent on PCB material, layout, and environmental conditions. The following conditions are used in this measurement.

Measurement Conditions

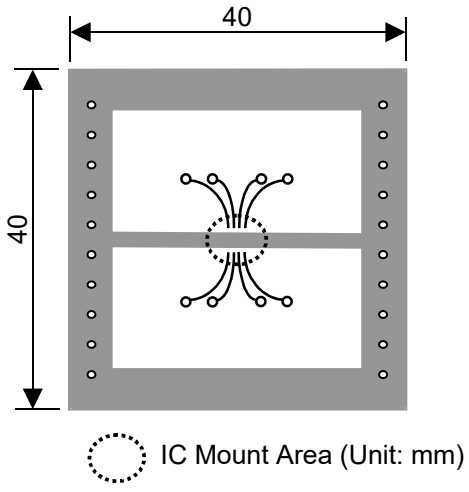
	Standard Land Pattern
Environment	Mounting on Board (Wind Velocity = 0 m/s)
Board Material	Glass Cloth Epoxy Plastic (Double-sided)
Board Dimensions	40 mm x 40 mm x 1.6 mm
Copper Ratio	Top-side: Approx. 50%, Back-side: Approx. 50%
Through-holes	ϕ: 0.5 mm x 28 pcs

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

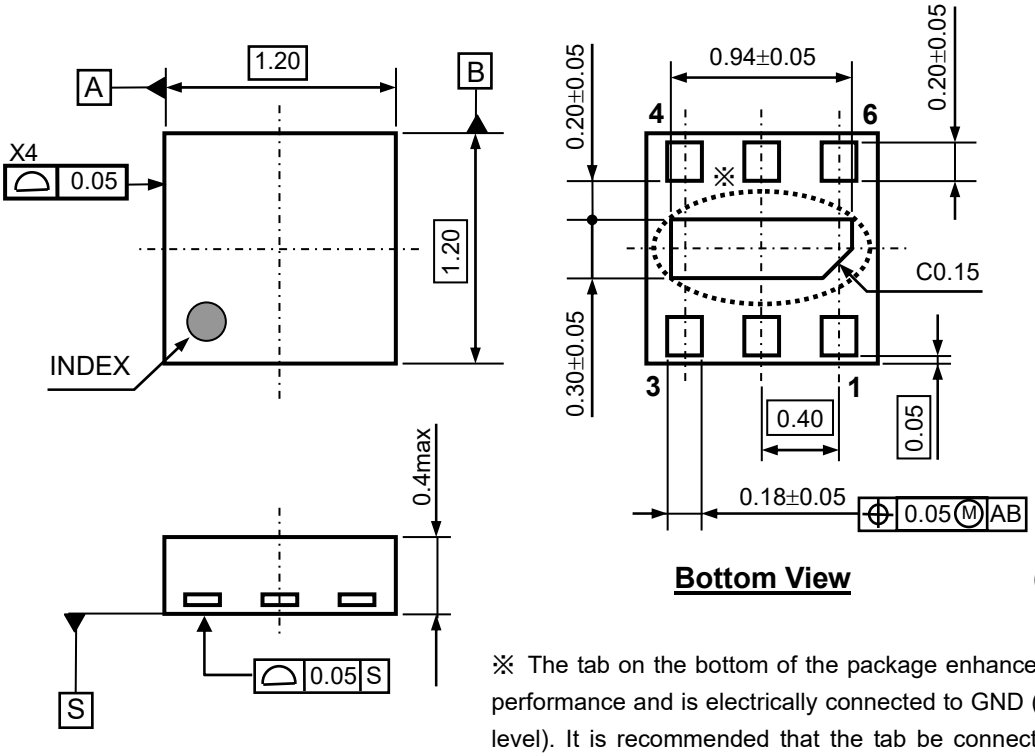
	Standard Land Pattern
Power Dissipation	600 mW
Thermal Resistance	θja = (125 − 25°C) / 0.6 W = 167°C/W
	θjc = 30°C/W



Power Dissipation vs. Ambient Temperature



Measurement Board Pattern



Bottom View (Unit: mm)

※ 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.

DFN1212-6 Package Dimensions

Ver. A

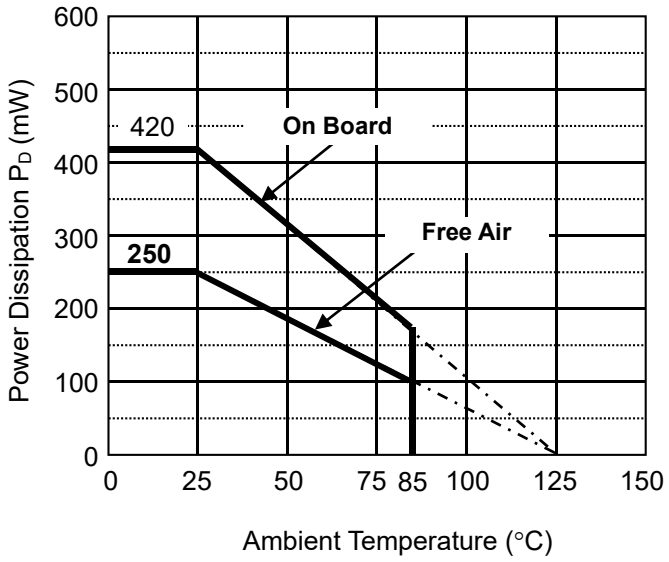
Power Dissipation (P_D) of the package is dependent on PCB material, layout, and environmental conditions. The following conditions are used in this measurement.

Measurement Conditions

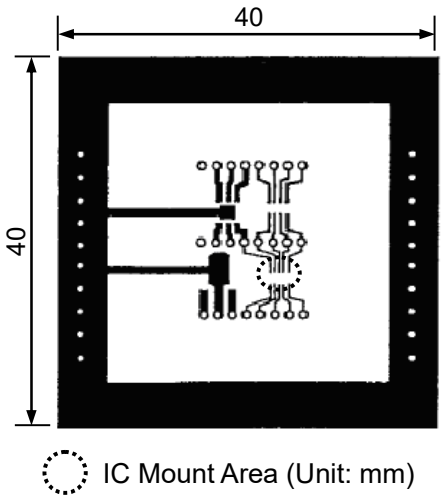
	Standard Land Pattern
Environment	Mounting on Board (Wind Velocity = 0 m/s)
Board Material	Glass Cloth Epoxy Plastic (Double-sided)
Board Dimensions	40 mm x 40 mm x 1.6 mm
Copper Ratio	Top-side: Approx. 50%, Back-side: Approx. 50%
Through-holes	ϕ 0.5 mm x 44 pcs

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

	Standard Land Pattern	Free Air
Power Dissipation	420 mW	250 mW
Thermal Resistance	θja = (125 - 25°C) / 0.42 W = 238°C/W	400°C/W

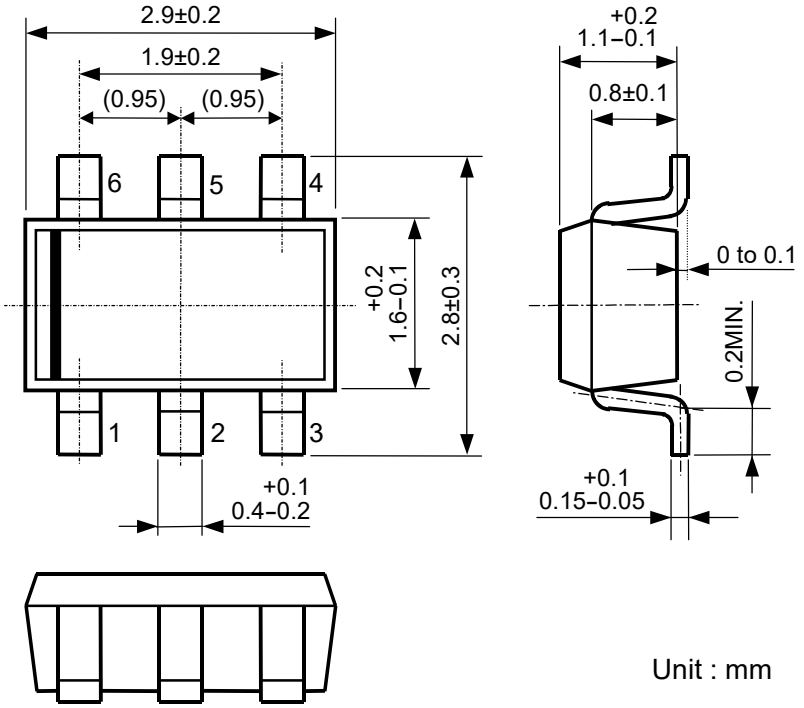


Power Dissipation (mW) vs. Temperature (°C)



Measurement Board Pattern

Ver. A



Unit : mm

SOT-23-6 Package Dimensions

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7. Anti-radiation design is not implemented in the products described in this document.
8. The X-ray exposure can influence functions and characteristics of the products. Confirm the product functions and characteristics in the evaluation stage.
9. WLCSP products should be used in light shielded environments. The light exposure can influence functions and characteristics of the products under operation or storage.
10. There can be variation in the marking when different AOI (Automated Optical Inspection) equipment is used. In the case of recognizing the marking characteristic with AOI, please contact our sales or our distributor before attempting to use AOI.
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