1 A 24 V LDO for Automotive Applications

NO. EC-238-180730

OUTLINE

The R8152x Series are CMOS-based 24 V input voltage regulators featuring 1 A output current and 24 V input voltage. R8152 provides high input voltage operation and low on-resistance (at V_{OUT} = 10 V, below 0.6 Ω) by using DMOS[*1] transistor. In addition to the basic regulator circuits, R8152x contains an over current protection circuit, an output short-circuit protection circuit, and a thermal shutdown circuit. Besides the low supply current by CMOS, the operating temperature is –40°C to 125°C and the maximum input voltage is 24 V, R8152x is suitable for power source of car accessories. R8152x is available in fixed output voltage options between 3.0 V and 12.0 V in 0.1 V steps, and between 12.5 V and 18.0 V in 0.5 V steps. The output voltage accuracy is as high as ±2%.

R8152x is available in two types of packages: HSOP-6J for high wattage and TO-252-5-P2 for high-density mounting.

[*1] DMOS: Defined as Double Diffused MOS.
DMOS transistor is composed of a low-density n-type (channel) diffused layer and a high-density p-type (sources) diffused layer from the edge of the gate electrode. By scaling down the channel length to submicron dimensions and also decreasing the thickness of the gate oxide film, R8152x has been able to achieve outstanding characteristics of high voltage resistance and low on-resistance.

FEATURES

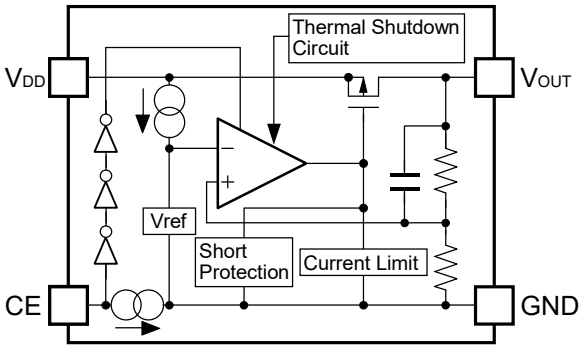
- Input Voltage Range (Maximum Rating) ····· 3.0 V to 24.0 V (36 V)
- Operating Temperature Range ····· –40°C to 125°C
- Supply Current ····· Typ. 70 μA
- Supply Current (Standby Mode) ····· Typ. 0.1 μA
- Output Current····· Min. 1 A
- Line Regulation····· Typ. 0.10%
- Output Voltage Accuracy····· ±2% (25°C)
- Packages ····· HSOP-6J, TO-252-5-P2
- Output Voltage Range ····· 3.0 V to 12.0 V (adjustable by 0.1 V step)
  12.5 V to 18.0 V (adjustable by 0.5 V step)
- Built-in Overcurrent Protection Circuit
- Built-in Output Short-circuit Protection Circuit
- Built-in Thermal Shutdown Circuit

APPLICATIONS

- Power source for ECUs such as EV inverter and battery charge control unit

BLOCK DIAGRAMS

R8152xxxxB



SELECTION GUIDE

Output voltage, version, package type, and taping type are user-selectable options.

Product Name	Package	Quantity per Reel	Pb Free	Halogen Free
R8152SxxxB-E2-FE	HSOP-6J	1,000 pcs	Yes	Yes
R8152JxxxB-T1-FE	TO-252-5-P2	3,000 pcs	Yes	Yes

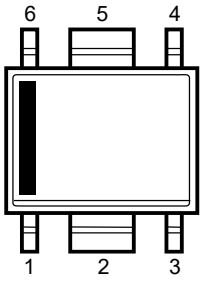
xxx: Specify the set output voltage (V_{SET}) within the range of 3.0 V to 12.0 V in 0.1 V steps, or 12.5 V to 18.0 V in 0.5 V steps.

R8 Automotive Class Code

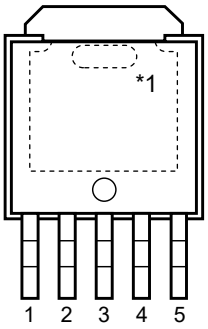
Operating Temperature Range	Guaranteed Specs Temperature Range	Screening	AEC-Q100
−40°C ~ 125°C	−40°C ~ 110°C	High and Low Temperature	Grade 1

PIN DESCRIPTIONS

HSOP-6J



TO-252-5-P2



R8152S: HSOP-6J

Pin No.	Symbol	Description
1	V_{DD}	Input Voltage
2	GND*	Ground Pin
3	GND*	Ground Pin
4	CE	Chip Enable Pin (“H” Active)
5	GND*	Ground Pin
6	V_{OUT}	Output Pin

*) No. 2, No. 3 and No. 5 pins must be wired to the GND plane when they are mounted on board.

R8152J: TO-252-5-P2

Pin No.	Symbol	Description
1	V_{DD}	Input Voltage
2	GND*	Ground Pin
3	GND*	Ground Pin
4	CE	Chip Enable Pin (“H” Active)
5	V_{OUT}	Output Pin

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

*) No. 2 and No. 3 pins must be wired to the GND plane when they are mounted on board.

ABSOLUTE MAXMUM RATINGS

Symbol	Item	Rating		Unit
V_{IN}	Input Voltage	−0.3 to 36		V
V_{CE}	Input Voltage (CE Pin)	−0.3 to 36		V
V_{OUT}	Output Voltage	−0.3 to V_{IN} + 0.3 ≤ 36		V
P_D	Power Dissipation (HSOP-6J)*	Standard Land Pattern	2100	mW
		Ultra High Wattage Land Pattern	3400	
	Power Dissipation (TO-252-5-P2)*	Standard Land Pattern	2350	
		Ultra High Wattage Land Pattern	4800	
Tj	Junction Temperature	−40 to 150		°C
Tstg	Storage Temperature Range	−55 to 150		°C

*) Please refer to *PACKAGE INFORMATION* for detailed information.

ABSOLUTE MAXIMUM RATINGS

Electronic and mechanical stress momentarily exceeded absolute maximum ratings may cause the permanent damages and may degrade the lifetime 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

Symbol	Item	Rating	Unit
V_{IN}	Input Voltage	3.0 to 24.0	V
Ta	Operating Temperature Range	−40 to 125	°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. Design engineering guarantees the reliable operation of the semiconductor devices up to 125°C at preproduction evaluation.

ELECTRICAL CHARACTERISTICS

V_{IN}=V_{SET}[*1] + 1.5 V, unless otherwise noted.

(–40°C ≤ Ta ≤ 110°C)

Symbol	Item	Conditions		Min.	Typ.	Max.	Unit
I_{SS}	Supply Current	V_{IN} = 24 V, I_{OUT} = 0 A	3.0 V ≤ V_{SET} ≤ 14.0 V		70	140	µA
			14.5 V ≤ V_{SET} ≤ 18.0 V		90	150	
Istandby	Standby Current	V_{IN} = 24 V, V_{CE} = 0 V, V_{OUT} = 0 V			0.1	1.5	µA
V_{OUT}	Output Voltage	I_{OUT} = 1 mA	Ta = 25°C	V_{SET} x0.98	V_{SET}	V_{SET} x1.02	V
			–40°C ≤ Ta ≤ 110°C	V_{SET} x0.96		V_{SET} x1.04	
ΔV_{OUT} /ΔI_{OUT}	Load Regulation	0.1 mA ≤ I_{OUT} ≤ 1 A			125	200	mV
ΔV_{OUT} /ΔV_{IN}	Line Regulation	V_{OUT} + 0.2 V ≤ V_{IN} ≤ 24 V, I_{OUT} = 1 mA			0.10	0.25	%
V_{DIF}	Dropout Voltage	I_{OUT} = 1 A		Refer to the *Product-specific Electrical Characteristics*			
I_{LIM}	Output Current Limit	V_{IN} = V_{SET} + 2.0 V		1			A
I_{SC}	Short Current Limit	V_{IN} = 3 V, V_{OUT} = 0 V	Ta = 25°C		100	250	mA
			–40°C ≤ Ta ≤ 110°C			450	
V_{CEH}	CE Input Voltage “H”			2		V_{IN}	V
V_{CEL}	CE Input Voltage “L”			0		0.5	V
T_{TSD}	Thermal Shutdown Temparature	Junction Temperature		150	165		°C
T_{TSR}	Thermal Shutdown Released Temparature	Junction Temperature		125	140		°C
I_{PD}	CE Pull-down Current	V_{IN} = 24 V, V_{CE} = 24 V			0.6	1.2	µA

All test items listed under *Electrical Characteristics* are done under the pulse load condition (–40°C ≤ Ta ≤ 110°C).

[*1] V_{SET} = Set Output Voltage

Product-specific Electrical Characteristics

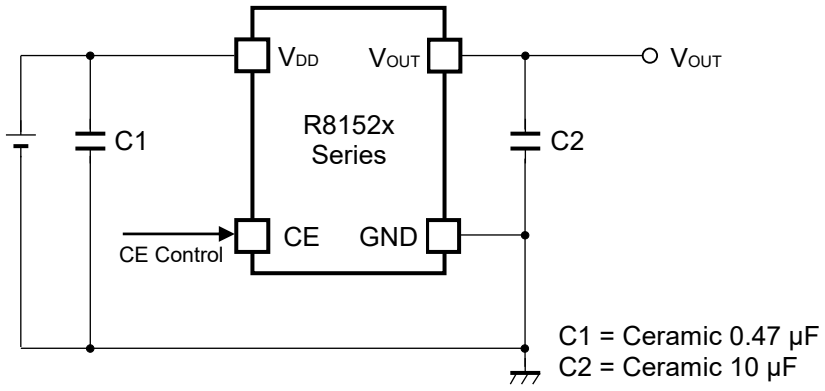
(–40°C ≤ Ta ≤ 110°C)

Product Name	V_{OUT} [V]					V_{DIF} [V]	
	(Ta = 25°C)			(–40°C ≤ Ta ≤ 110°C)			
	MIN.	TYP.	MAX.	MIN.	MAX.	TYP.	MAX.
R8152x030B	2.940	3.000	3.060	2.880	3.120	0.675	1.125
R8152x031B	3.038	3.100	3.162	2.976	3.224		
R8152x032B	3.136	3.200	3.264	3.072	3.328		
R8152x033B	3.234	3.300	3.366	3.168	3.432		
R8152x034B	3.332	3.400	3.468	3.264	3.536		
R8152x035B	3.430	3.500	3.570	3.360	3.640		
R8152x036B	3.528	3.600	3.672	3.456	3.744		
R8152x037B	3.626	3.700	3.774	3.552	3.848		
R8152x038B	3.724	3.800	3.876	3.648	3.952		
R8152x039B	3.822	3.900	3.978	3.744	4.056		
R8152x040B	3.920	4.000	4.080	3.840	4.160		
R8152x041B	4.018	4.100	4.182	3.936	4.264		
R8152x042B	4.116	4.200	4.284	4.032	4.368		
R8152x043B	4.214	4.300	4.386	4.128	4.472		
R8152x044B	4.312	4.400	4.488	4.224	4.576		
R8152x045B	4.410	4.500	4.590	4.320	4.680		
R8152x046B	4.508	4.600	4.692	4.416	4.784		
R8152x047B	4.606	4.700	4.794	4.512	4.888		
R8152x048B	4.704	4.800	4.896	4.608	4.992		
R8152x049B	4.802	4.900	4.998	4.704	5.096		
R8152x050B	4.900	5.000	5.100	4.800	5.200	0.575	1.015
R8152x051B	4.998	5.100	5.202	4.896	5.304		
R8152x052B	5.096	5.200	5.304	4.992	5.408		
R8152x053B	5.194	5.300	5.406	5.088	5.512		
R8152x054B	5.292	5.400	5.508	5.184	5.616		
R8152x055B	5.390	5.500	5.610	5.280	5.720		
R8152x056B	5.488	5.600	5.712	5.376	5.824		
R8152x057B	5.586	5.700	5.814	5.472	5.928		
R8152x058B	5.684	5.800	5.916	5.568	6.032		
R8152x059B	5.782	5.900	6.018	5.664	6.136		
R8152x060B	5.880	6.000	6.120	5.760	6.240		
R8152x061B	5.978	6.100	6.222	5.856	6.344		
R8152x062B	6.076	6.200	6.324	5.952	6.448		
R8152x063B	6.174	6.300	6.426	6.048	6.552		
R8152x064B	6.272	6.400	6.528	6.144	6.656		
R8152x065B	6.370	6.500	6.630	6.240	6.760		
R8152x066B	6.468	6.600	6.732	6.336	6.864		
R8152x067B	6.566	6.700	6.834	6.432	6.968		
R8152x068B	6.664	6.800	6.936	6.528	7.072		
R8152x069B	6.762	6.900	7.038	6.624	7.176		
R8152x070B	6.860	7.000	7.140	6.720	7.280		
R8152x071B	6.958	7.100	7.242	6.816	7.384		
R8152x072B	7.056	7.200	7.344	6.912	7.488		
R8152x073B	7.154	7.300	7.446	7.008	7.592		
R8152x074B	7.252	7.400	7.548	7.104	7.696		
R8152x075B	7.350	7.500	7.650	7.200	7.800		
R8152x076B	7.448	7.600	7.752	7.296	7.904		
R8152x077B	7.546	7.700	7.854	7.392	8.008		
R8152x078B	7.644	7.800	7.956	7.488	8.112		
R8152x079B	7.742	7.900	8.058	7.584	8.216		

(–40°C ≤ Ta ≤ 110°C)

Product Name	V_{OUT} [V] (Ta = 25°C)			V_{OUT} [V] (–40°C ≤ Ta ≤ 110°C)		V_{DIF} [V]	
	MIN.	TYP.	MAX.	MIN.	MAX.	TYP.	MAX.
R8152x080B	7.840	8.000	8.160	7.680	8.320	0.575	1.015
R8152x081B	7.938	8.100	8.262	7.776	8.424		
R8152x082B	8.036	8.200	8.364	7.872	8.528		
R8152x083B	8.134	8.300	8.466	7.968	8.632		
R8152x084B	8.232	8.400	8.568	8.064	8.736		
R8152x085B	8.330	8.500	8.670	8.160	8.840		
R8152x086B	8.428	8.600	8.772	8.256	8.944		
R8152x087B	8.526	8.700	8.874	8.352	9.048		
R8152x088B	8.624	8.800	8.976	8.448	9.152		
R8152x089B	8.722	8.900	9.078	8.544	9.256		
R8152x090B	8.820	9.000	9.180	8.640	9.360	0.475	0.810
R8152x091B	8.918	9.100	9.282	8.736	9.464		
R8152x092B	9.016	9.200	9.384	8.832	9.568		
R8152x093B	9.114	9.300	9.486	8.928	9.672		
R8152x094B	9.212	9.400	9.588	9.024	9.776		
R8152x095B	9.310	9.500	9.690	9.120	9.880		
R8152x096B	9.408	9.600	9.792	9.216	9.984		
R8152x097B	9.506	9.700	9.894	9.312	10.088		
R8152x098B	9.604	9.800	9.996	9.408	10.192		
R8152x099B	9.702	9.900	10.098	9.504	10.296		
R8152x100B	9.800	10.000	10.200	9.600	10.400		
R8152x101B	9.898	10.100	10.302	9.696	10.504		
R8152x102B	9.996	10.200	10.404	9.792	10.608		
R8152x103B	10.094	10.300	10.506	9.888	10.712		
R8152x104B	10.192	10.400	10.608	9.984	10.816		
R8152x105B	10.290	10.500	10.710	10.080	10.920		
R8152x106B	10.388	10.600	10.812	10.176	11.024		
R8152x107B	10.486	10.700	10.914	10.272	11.128		
R8152x108B	10.584	10.800	11.016	10.368	11.232		
R8152x109B	10.682	10.900	11.118	10.464	11.336		
R8152x110B	10.780	11.000	11.220	10.560	11.440		
R8152x111B	10.878	11.100	11.322	10.656	11.544		
R8152x112B	10.976	11.200	11.424	10.752	11.648		
R8152x113B	11.074	11.300	11.526	10.848	11.752		
R8152x114B	11.172	11.400	11.628	10.944	11.856		
R8152x115B	11.270	11.500	11.730	11.040	11.960		
R8152x116B	11.368	11.600	11.832	11.136	12.064		
R8152x117B	11.466	11.700	11.934	11.232	12.168		
R8152x118B	11.564	11.800	12.036	11.328	12.272		
R8152x119B	11.662	11.900	12.138	11.424	12.376		
R8152x120B	11.760	12.000	12.240	11.520	12.480		
R8152x125B	12.250	12.500	12.750	12.000	13.000	0.450	0.730
R8152x130B	12.740	13.000	13.260	12.480	13.520		
R8152x135B	13.230	13.500	13.770	12.960	14.040		
R8152x140B	13.720	14.000	14.280	13.440	14.560		
R8152x145B	14.210	14.500	14.790	13.920	15.080		
R8152x150B	14.700	15.000	15.300	14.400	15.600		
R8152x155B	15.190	15.500	15.810	14.880	16.120		
R8152x160B	15.680	16.000	16.320	15.360	16.640		
R8152x165B	16.170	16.500	16.830	15.840	17.160		
R8152x170B	16.660	17.000	17.340	16.320	17.680		
R8152x175B	17.150	17.500	17.850	16.800	18.200		
R8152x180B	17.640	18.000	18.360	17.280	18.720		

TYPICAL APPLICATION



External Parts Example:

Symbol	Recommended Value	Parts Name	Manufacturer	Model Number
C2 (C_{OUT})	10 µF	Ceramic Capacitor	MURATA	GRM32DB31E106K (Size: 3225)

TECHNICAL NOTES

When using R8152x, please consider the following points.

Phase Compensation

In R8152x, phase compensation is provided to secure stable operation even when the load current is varied. For this purpose, please make sure to use a C2 capacitor.

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.

Depending on the capacitor size, manufacturer, and part number, the bias characteristics and temperature characteristics are different. Evaluate the circuit taking actual characteristics into account.

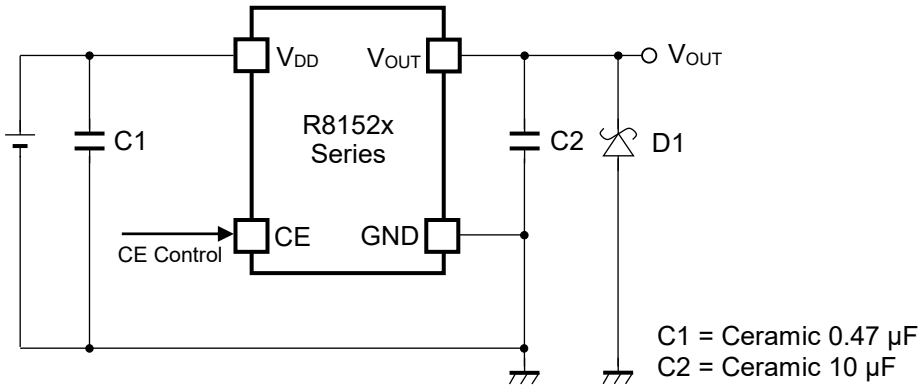
PCB Layout and GND Wiring

Ensure the V_{DD} and GND lines are sufficiently robust. If their impedance is too high, noise pickup or unstable operation may result. Connect a C1 capacitor with 0.47 µF or more value between the V_{DD} and GND pins, and as close as possible to the pins.

Likewise, connect a C2 capacitor with suitable values between the V_{OUT} and GND pins, and as close as possible to the pins (Please refer to the Typical Application above).

In the case of using HSOP-6J package, please make sure to wire No. 2, No. 3, and No. 5 pins to the GND plane. Also, in the case of using TO-252-5-P2 package, please make sure to wire No. 2 and No. 3 pins to the GND plane.

TYPICAL APPLICATION FOR IC CHIP BREAKDOWN PREVENTION



When a sudden surge of electrical current travels along the V_{OUT} pin and GND due to a short-circuit, electrical resonance of a circuit involving an output capacitor (C2) and a short circuit inductor generates a negative voltage and may damage the device or the load devices. Connecting a schottky diode (D1) between the V_{OUT} pin and GND has the effect of preventing damage to them.

PACKAGE INFORMATION

POWER DISSIPATION (HSOP-6J)

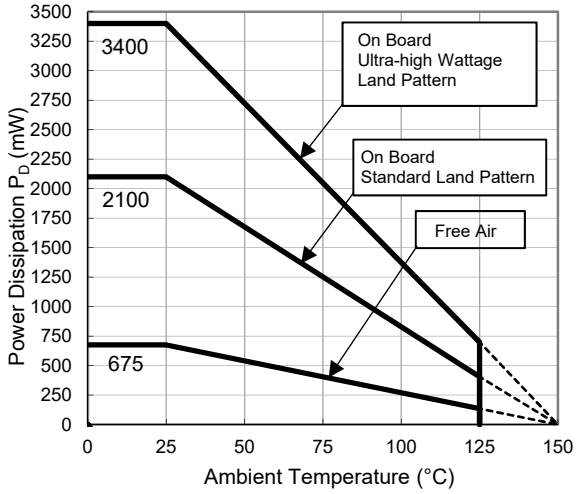
The power dissipation of the package is dependent on PCB material, layout, and environmental conditions. The following conditions are used in this measurement.

Measurement Conditions

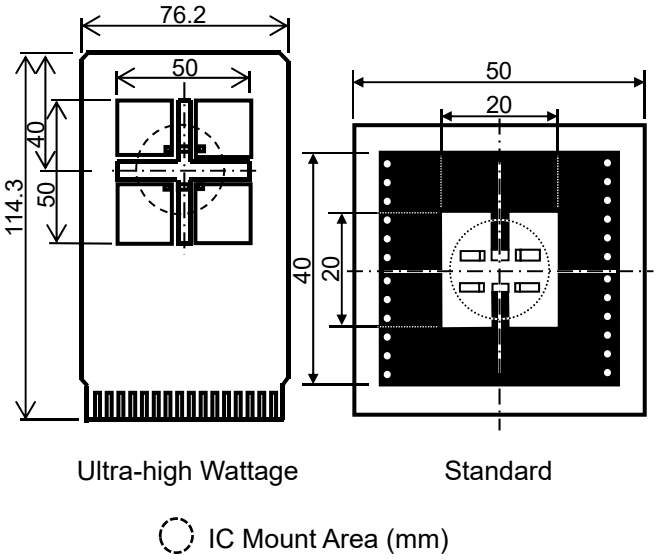
	Ultra-high Wattage Land Pattern	Standard Land Pattern
Environment	Mounting on Board (Wind Velocity = 0 m/s)	Mounting on Board (Wind Velocity = 0 m/s)
Board Material	Glass Cloth Epoxy Plastic (Four-layer Board)	Glass Cloth Epoxy Plastic (Double-sided Board)
Board Dimensions	76.2 mm × 114.3 mm × 0.8 mm	50 mm × 50 mm × 1.6 mm
Copper Ratio	96%	50%
Through-holes	ϕ 0.3 mm × 28 pcs	ϕ 0.5 mm × 24 pcs

Measurement Result (Ta = 25°C, Tjmax = 150°C)

	Ultra-high Wattage Land Pattern	Standard Land Pattern	Free Air
Power Dissipation	3400 mW	2100 mW	675 mW
Thermal Resistance	37°C/W	59°C/W	185°C/W

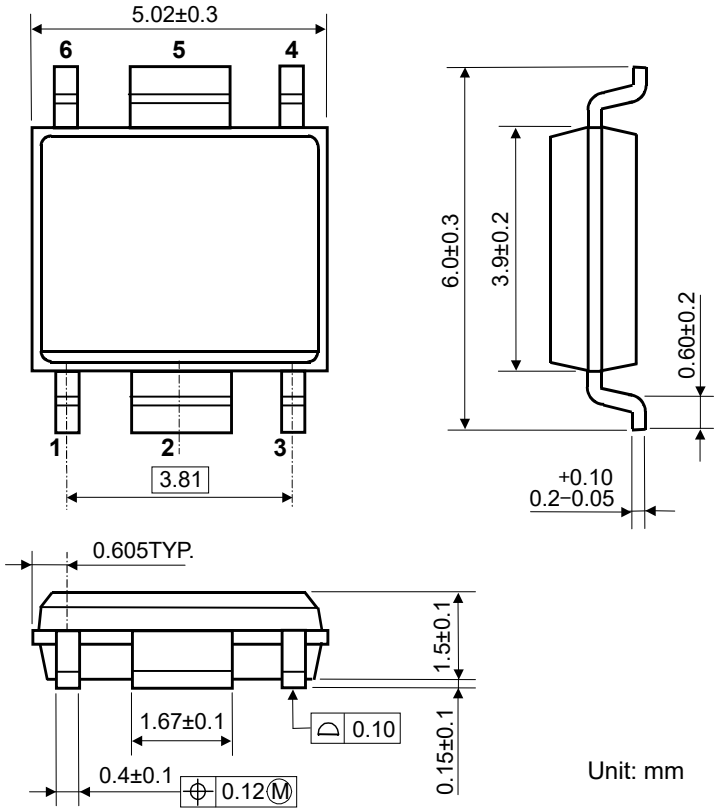


Power Dissipation vs. Ambient Temperature



Measurement Board Pattern

PACKAGE DIMENSIONS (HSOP-6J)



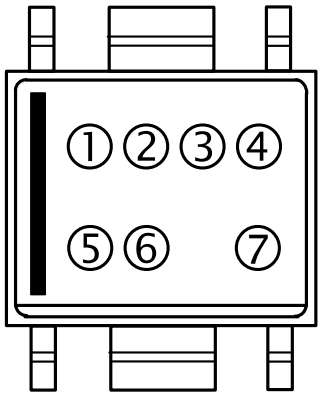
HSOP-6J Package Dimensions

MARK SPECIFICATION (HSOP-6J)

①②③④: Product Code … **Refer to *R8152S MARK SPECIFICATION TABLE***

⑤⑥: Lot Number … Alphanumeric Serial Number

⑦: Lot Sub Number …Alphanumeric Serial Number



HSOP-6J Mark Specification

R8152S MARK SPECIFICATION TABLE (HSOP-6J)

Product Name	①	②	③	④	V_{SET}
R8152S030B	N	0	3	0	3.0 V
R8152S031B	N	0	3	1	3.1 V
R8152S032B	N	0	3	2	3.2 V
R8152S033B	N	0	3	3	3.3 V
R8152S034B	N	0	3	4	3.4 V
R8152S035B	N	0	3	5	3.5 V
R8152S036B	N	0	3	6	3.6 V
R8152S037B	N	0	3	7	3.7 V
R8152S038B	N	0	3	8	3.8 V
R8152S039B	N	0	3	9	3.9 V
R8152S040B	N	0	4	0	4.0 V
R8152S041B	N	0	4	1	4.1 V
R8152S042B	N	0	4	2	4.2 V
R8152S043B	N	0	4	3	4.3 V
R8152S044B	N	0	4	4	4.4 V
R8152S045B	N	0	4	5	4.5 V
R8152S046B	N	0	4	6	4.6 V
R8152S047B	N	0	4	7	4.7 V
R8152S048B	N	0	4	8	4.8 V
R8152S049B	N	0	4	9	4.9 V
R8152S050B	N	0	5	0	5.0 V
R8152S051B	N	0	5	1	5.1 V
R8152S052B	N	0	5	2	5.2 V
R8152S053B	N	0	5	3	5.3 V
R8152S054B	N	0	5	4	5.4 V
R8152S055B	N	0	5	5	5.5 V
R8152S056B	N	0	5	6	5.6 V
R8152S057B	N	0	5	7	5.7 V
R8152S058B	N	0	5	8	5.8 V
R8152S059B	N	0	5	9	5.9 V
R8152S060B	N	0	6	0	6.0 V
R8152S061B	N	0	6	1	6.1 V
R8152S062B	N	0	6	2	6.2 V
R8152S063B	N	0	6	3	6.3 V
R8152S064B	N	0	6	4	6.4 V
R8152S065B	N	0	6	5	6.5 V
R8152S066B	N	0	6	6	6.6 V
R8152S067B	N	0	6	7	6.7 V
R8152S068B	N	0	6	8	6.8 V
R8152S069B	N	0	6	9	6.9 V
R8152S070B	N	0	7	0	7.0 V
R8152S071B	N	0	7	1	7.1 V
R8152S072B	N	0	7	2	7.2 V
R8152S073B	N	0	7	3	7.3 V
R8152S074B	N	0	7	4	7.4 V
R8152S075B	N	0	7	5	7.5 V
R8152S076B	N	0	7	6	7.6 V
R8152S077B	N	0	7	7	7.7 V
R8152S078B	N	0	7	8	7.8 V
R8152S079B	N	0	7	9	7.9 V

Product Name	①	②	③	④	V_{SET}
R8152S080B	N	0	8	0	8.0 V
R8152S081B	N	0	8	1	8.1 V
R8152S082B	N	0	8	2	8.2 V
R8152S083B	N	0	8	3	8.3 V
R8152S084B	N	0	8	4	8.4 V
R8152S085B	N	0	8	5	8.5 V
R8152S086B	N	0	8	6	8.6 V
R8152S087B	N	0	8	7	8.7 V
R8152S088B	N	0	8	8	8.8 V
R8152S089B	N	0	8	9	8.9 V
R8152S090B	N	0	9	0	9.0 V
R8152S091B	N	0	9	1	9.1 V
R8152S092B	N	0	9	2	9.2 V
R8152S093B	N	0	9	3	9.3 V
R8152S094B	N	0	9	4	9.4 V
R8152S095B	N	0	9	5	9.5 V
R8152S096B	N	0	9	6	9.6 V
R8152S097B	N	0	9	7	9.7 V
R8152S098B	N	0	9	8	9.8 V
R8152S099B	N	0	9	9	9.9 V
R8152S100B	N	1	0	0	10.0 V
R8152S101B	N	1	0	1	10.1 V
R8152S102B	N	1	0	2	10.2 V
R8152S103B	N	1	0	3	10.3 V
R8152S104B	N	1	0	4	10.4 V
R8152S105B	N	1	0	5	10.5 V
R8152S106B	N	1	0	6	10.6 V
R8152S107B	N	1	0	7	10.7 V
R8152S108B	N	1	0	8	10.8 V
R8152S109B	N	1	0	9	10.9 V
R8152S110B	N	1	1	0	11.0 V
R8152S111B	N	1	1	1	11.1 V
R8152S112B	N	1	1	2	11.2 V
R8152S113B	N	1	1	3	11.3 V
R8152S114B	N	1	1	4	11.4 V
R8152S115B	N	1	1	5	11.5 V
R8152S116B	N	1	1	6	11.6 V
R8152S117B	N	1	1	7	11.7 V
R8152S118B	N	1	1	8	11.8 V
R8152S119B	N	1	1	9	11.9 V
R8152S120B	N	1	2	0	12.0 V
R8152S125B	N	1	2	5	12.5 V
R8152S130B	N	1	3	0	13.0 V
R8152S135B	N	1	3	5	13.5 V
R8152S140B	N	1	4	0	14.0 V
R8152S145B	N	1	4	5	14.5 V
R8152S150B	N	1	5	0	15.0 V
R8152S155B	N	1	5	5	15.5 V
R8152S160B	N	1	6	0	16.0 V
R8152S165B	N	1	6	5	16.5 V
R8152S170B	N	1	7	0	17.0 V
R8152S175B	N	1	7	5	17.5 V
R8152S180B	N	1	8	0	18.0 V

POWER DISSIPATION (TO-252-5-P2)

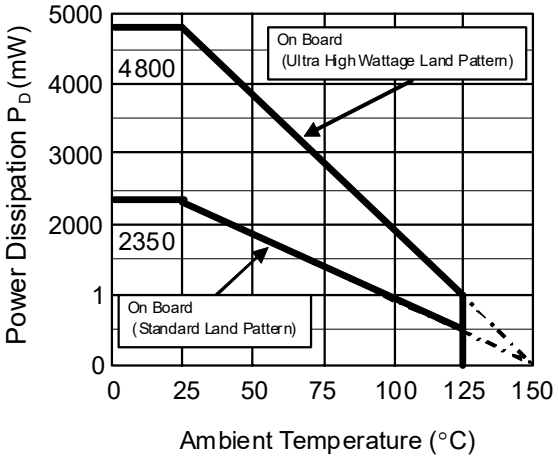
Power Dissipation (P_D) depends on conditions of mounting on board.
This specification is based on the measurement at the condition below:

* Measurement conditions

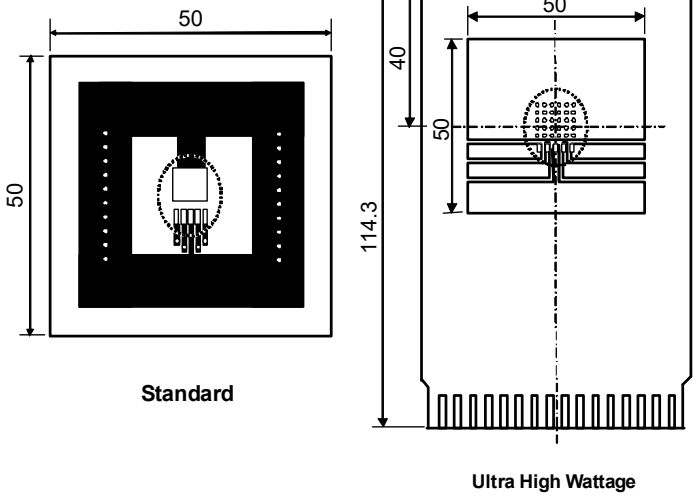
	Standard Land Pattern	Ultra High Wattage Land Pattern
Environment	Mounting on board (Wind velocity 0 m/s)	
Board Material	Glass cloth epoxy plastic (Double layers)	Glass cloth epoxy plastic (Four-layers)
Board Dimensions	50 mm x 50 mm x 1.6 mm	76.2 mm x 114.3 mm x 0.8 mm
Copper Ratio	Top side: Approx.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

* Measurement Results (Ta = 25°C, Tjmax = 150°C)

	Standard Land Pattern	Ultra High Wattage Land Pattern
Power Dissipation	2350 mW	4800 mW
Thermal Resistance	θja = (150 - 25°C)/2.35 W = 53°C/W	θja = (150 - 25°C)/4.8 W = 26°C/W
	θjc = 17°C/W	θjc = 7°C/W



Power Dissipation



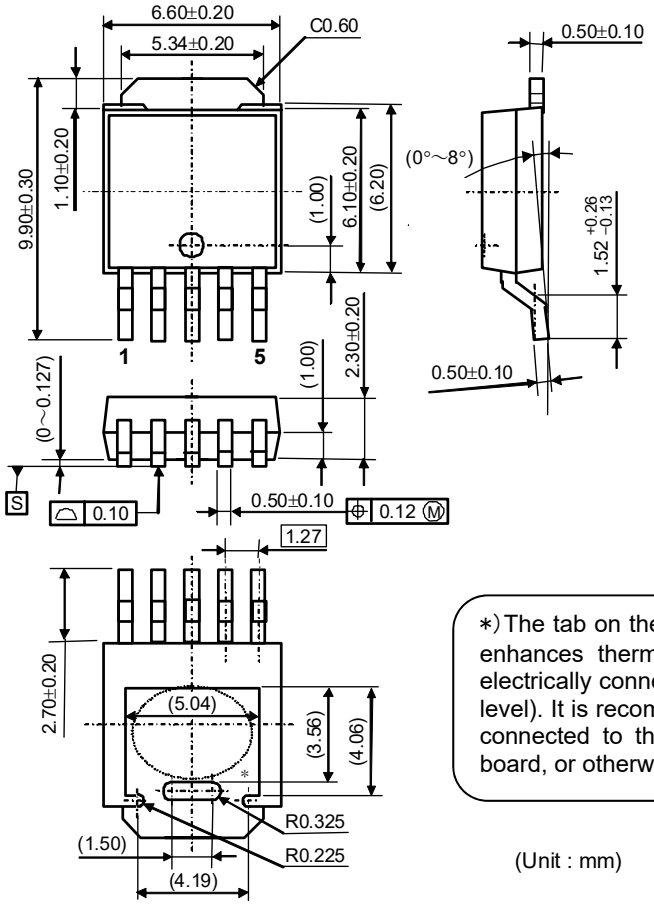
Standard

Ultra High Wattage

Measurement Board Pattern

IC Mount Area (Unit: mm)

PACKAGE DIMENSIONS (TO-252-5-P2)



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

(Unit : mm)

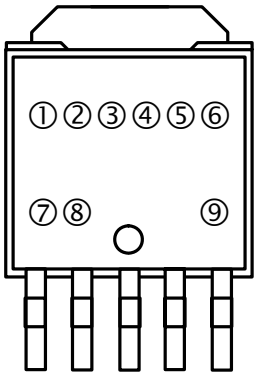
TO-252-5-P2 Package Dimensions

MARK SPECIFICATION (TO-252-5-P2)

①②③④⑤⑥: Product Code … **Refer to *R8152J MARK SPECIFICATION TABLE***

⑦⑧: Lot Number … Alphanumeric Serial Number

⑨: Lot Sub Number …Alphanumeric Serial Number



TO-252-5-P2 Mark Specification

R8152J MARK SPECIFICATION TABLE (TO-252-5-P2)

Product Name	① ② ③ ④ ⑤ ⑥	V_{SET}
R8152J030B	F 1 J 0 3 0	3.0 V
R8152J031B	F 1 J 0 3 1	3.1 V
R8152J032B	F 1 J 0 3 2	3.2 V
R8152J033B	F 1 J 0 3 3	3.3 V
R8152J034B	F 1 J 0 3 4	3.4 V
R8152J035B	F 1 J 0 3 5	3.5 V
R8152J036B	F 1 J 0 3 6	3.6 V
R8152J037B	F 1 J 0 3 7	3.7 V
R8152J038B	F 1 J 0 3 8	3.8 V
R8152J039B	F 1 J 0 3 9	3.9 V
R8152J040B	F 1 J 0 4 0	4.0 V
R8152J041B	F 1 J 0 4 1	4.1 V
R8152J042B	F 1 J 0 4 2	4.2 V
R8152J043B	F 1 J 0 4 3	4.3 V
R8152J044B	F 1 J 0 4 4	4.4 V
R8152J045B	F 1 J 0 4 5	4.5 V
R8152J046B	F 1 J 0 4 6	4.6 V
R8152J047B	F 1 J 0 4 7	4.7 V
R8152J048B	F 1 J 0 4 8	4.8 V
R8152J049B	F 1 J 0 4 9	4.9 V
R8152J050B	F 1 J 0 5 0	5.0 V
R8152J051B	F 1 J 0 5 1	5.1 V
R8152J052B	F 1 J 0 5 2	5.2 V
R8152J053B	F 1 J 0 5 3	5.3 V
R8152J054B	F 1 J 0 5 4	5.4 V
R8152J055B	F 1 J 0 5 5	5.5 V
R8152J056B	F 1 J 0 5 6	5.6 V
R8152J057B	F 1 J 0 5 7	5.7 V
R8152J058B	F 1 J 0 5 8	5.8 V
R8152J059B	F 1 J 0 5 9	5.9 V
R8152J060B	F 1 J 0 6 0	6.0 V
R8152J061B	F 1 J 0 6 1	6.1 V
R8152J062B	F 1 J 0 6 2	6.2 V
R8152J063B	F 1 J 0 6 3	6.3 V
R8152J064B	F 1 J 0 6 4	6.4 V
R8152J065B	F 1 J 0 6 5	6.5 V
R8152J066B	F 1 J 0 6 6	6.6 V
R8152J067B	F 1 J 0 6 7	6.7 V
R8152J068B	F 1 J 0 6 8	6.8 V
R8152J069B	F 1 J 0 6 9	6.9 V
R8152J070B	F 1 J 0 7 0	7.0 V
R8152J071B	F 1 J 0 7 1	7.1 V
R8152J072B	F 1 J 0 7 2	7.2 V
R8152J073B	F 1 J 0 7 3	7.3 V
R8152J074B	F 1 J 0 7 4	7.4 V
R8152J075B	F 1 J 0 7 5	7.5 V
R8152J076B	F 1 J 0 7 6	7.6 V
R8152J077B	F 1 J 0 7 7	7.7 V
R8152J078B	F 1 J 0 7 8	7.8 V
R8152J079B	F 1 J 0 7 9	7.9 V

Product Name	① ② ③ ④ ⑤ ⑥	V_{SET}
R8152J080B	F 1 J 0 8 0	8.0 V
R8152J081B	F 1 J 0 8 1	8.1 V
R8152J082B	F 1 J 0 8 2	8.2 V
R8152J083B	F 1 J 0 8 3	8.3 V
R8152J084B	F 1 J 0 8 4	8.4 V
R8152J085B	F 1 J 0 8 5	8.5 V
R8152J086B	F 1 J 0 8 6	8.6 V
R8152J087B	F 1 J 0 8 7	8.7 V
R8152J088B	F 1 J 0 8 8	8.8 V
R8152J089B	F 1 J 0 8 9	8.9 V
R8152J090B	F 1 J 0 9 0	9.0 V
R8152J091B	F 1 J 0 9 1	9.1 V
R8152J092B	F 1 J 0 9 2	9.2 V
R8152J093B	F 1 J 0 9 3	9.3 V
R8152J094B	F 1 J 0 9 4	9.4 V
R8152J095B	F 1 J 0 9 5	9.5 V
R8152J096B	F 1 J 0 9 6	9.6 V
R8152J097B	F 1 J 0 9 7	9.7 V
R8152J098B	F 1 J 0 9 8	9.8 V
R8152J099B	F 1 J 0 9 9	9.9 V
R8152J100B	F 1 J 1 0 0	10.0 V
R8152J101B	F 1 J 1 0 1	10.1 V
R8152J102B	F 1 J 1 0 2	10.2 V
R8152J103B	F 1 J 1 0 3	10.3 V
R8152J104B	F 1 J 1 0 4	10.4 V
R8152J105B	F 1 J 1 0 5	10.5 V
R8152J106B	F 1 J 1 0 6	10.6 V
R8152J107B	F 1 J 1 0 7	10.7 V
R8152J108B	F 1 J 1 0 8	10.8 V
R8152J109B	F 1 J 1 0 9	10.9 V
R8152J110B	F 1 J 1 1 0	11.0 V
R8152J111B	F 1 J 1 1 1	11.1 V
R8152J112B	F 1 J 1 1 2	11.2 V
R8152J113B	F 1 J 1 1 3	11.3 V
R8152J114B	F 1 J 1 1 4	11.4 V
R8152J115B	F 1 J 1 1 5	11.5 V
R8152J116B	F 1 J 1 1 6	11.6 V
R8152J117B	F 1 J 1 1 7	11.7 V
R8152J118B	F 1 J 1 1 8	11.8 V
R8152J119B	F 1 J 1 1 9	11.9 V
R8152J120B	F 1 J 1 2 0	12.0 V
R8152J125B	F 1 J 1 2 5	12.5 V
R8152J130B	F 1 J 1 3 0	13.0 V
R8152J135B	F 1 J 1 3 5	13.5 V
R8152J140B	F 1 J 1 4 0	14.0 V
R8152J145B	F 1 J 1 4 5	14.5 V
R8152J150B	F 1 J 1 5 0	15.0 V
R8152J155B	F 1 J 1 5 5	15.5 V
R8152J160B	F 1 J 1 6 0	16.0 V
R8152J165B	F 1 J 1 6 5	16.5 V
R8152J170B	F 1 J 1 7 0	17.0 V
R8152J175B	F 1 J 1 7 5	17.5 V
R8152J180B	F 1 J 1 8 0	18.0 V

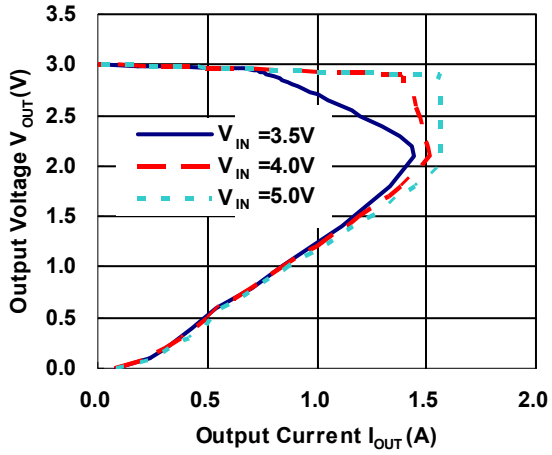
TYPICAL CHARACTERISTICS

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

Ta = 25°C, unless otherwise noted.

1) Output Voltage vs. Output Current (C1 = Ceramic 0.47 µF, C2 = Ceramic 10 µF)

R8152x030B



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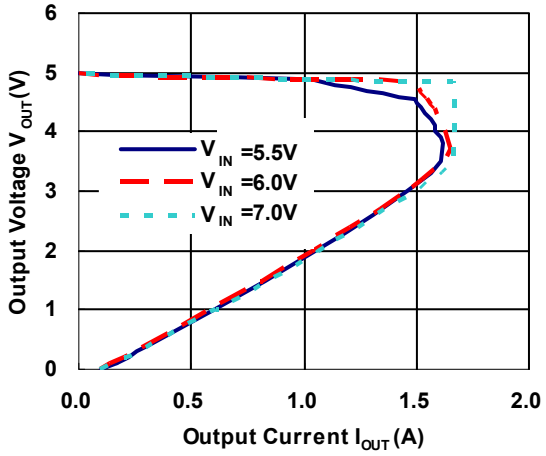

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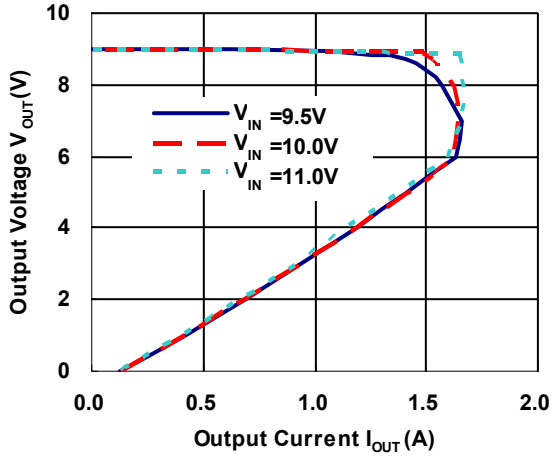

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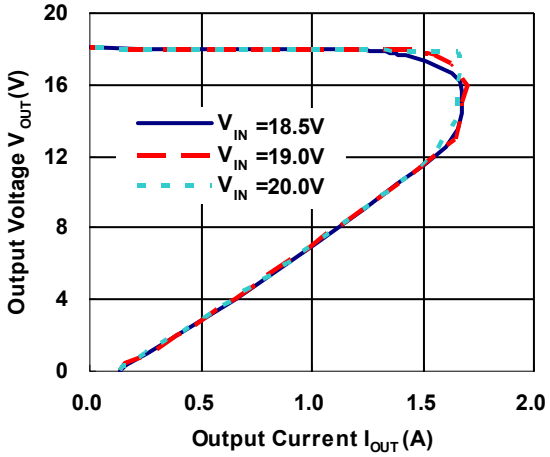
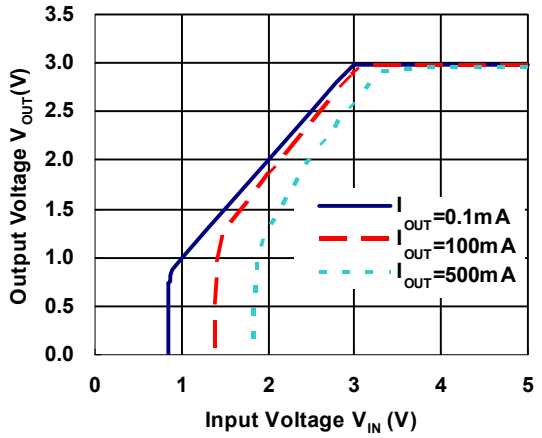


2) Output Voltage vs. Input Voltage (C1 = Ceramic 0.47 µF, C2 = Ceramic 10 µF)

R8152x030B



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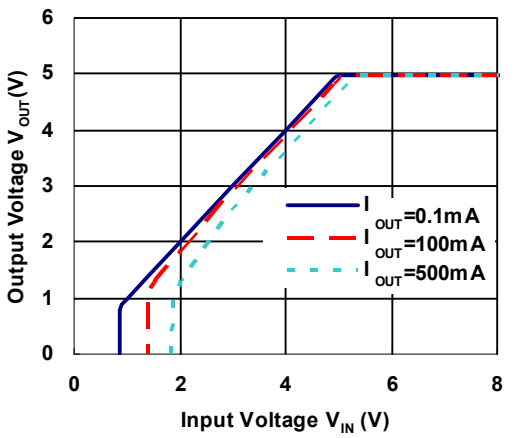

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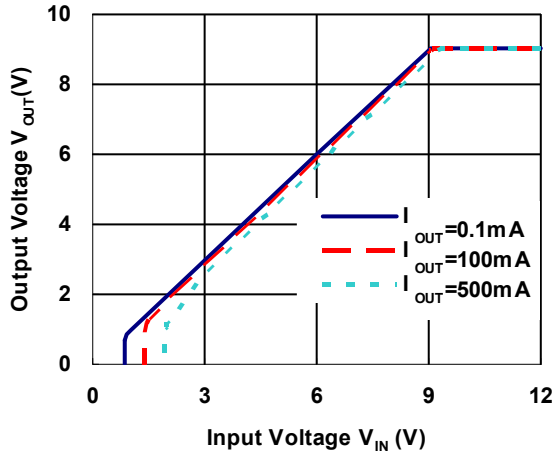

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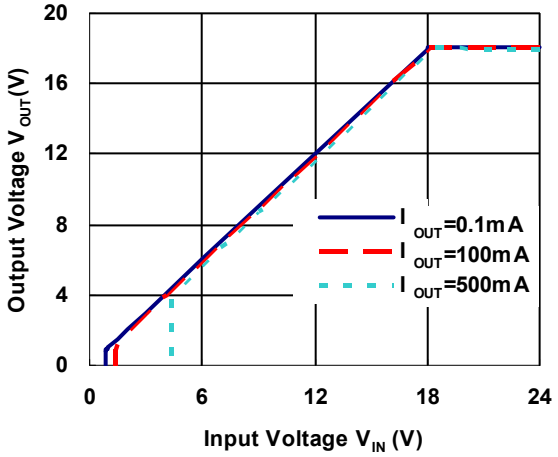
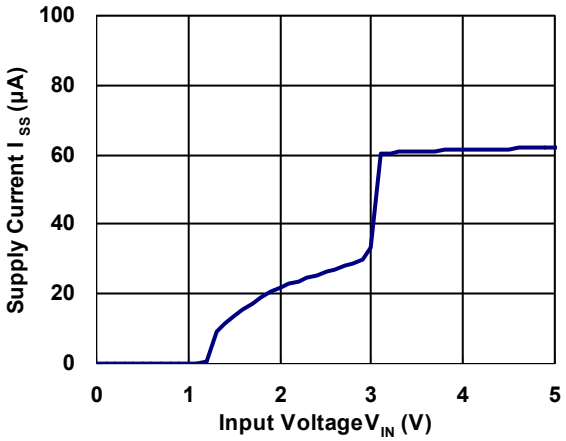


3) Supply Current vs. Input Voltage (C1 = Ceramic 0.47 µF, C2 = Ceramic 10 µF)

R8152x030B



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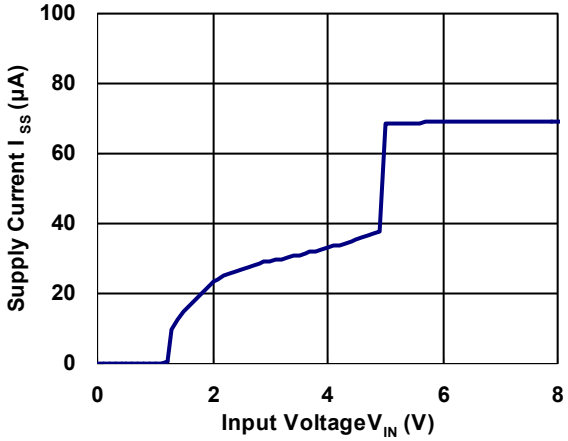

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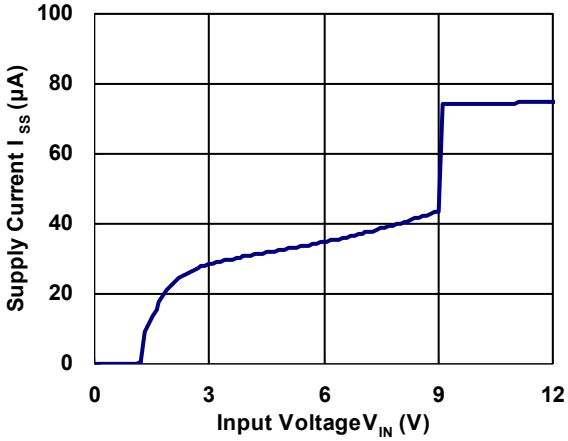

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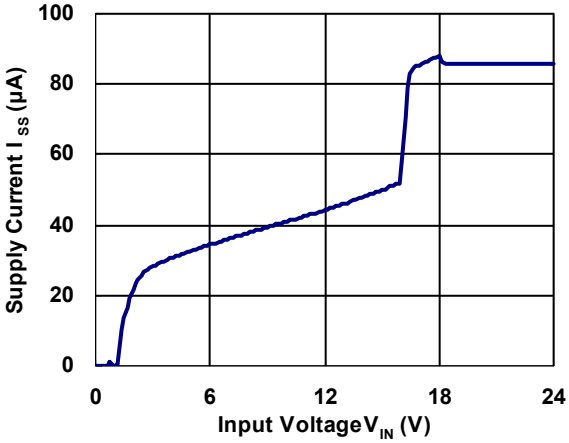
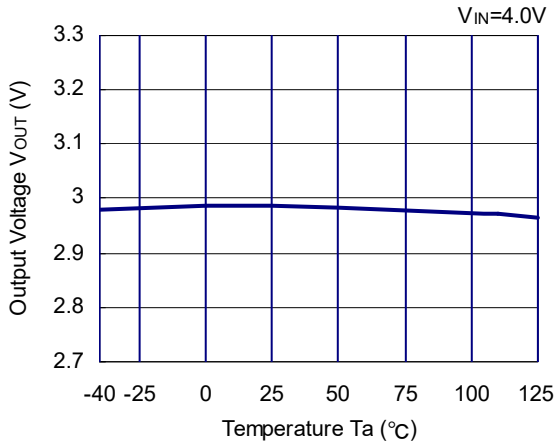


4) Output Voltage vs. Ambient Temperature (C1 = Ceramic 0.47 µF, C2 = Ceramic 10 µF, I_{OUT} = 1 mA)

R8152x030B



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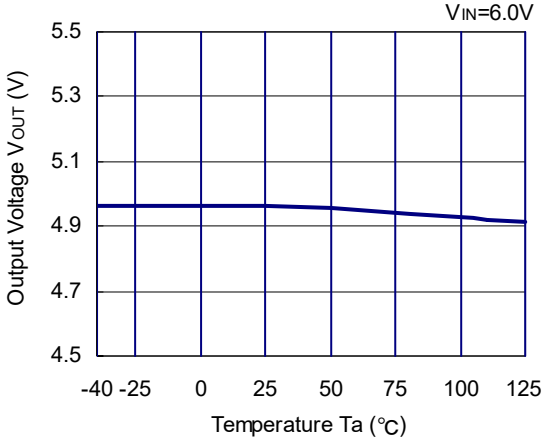

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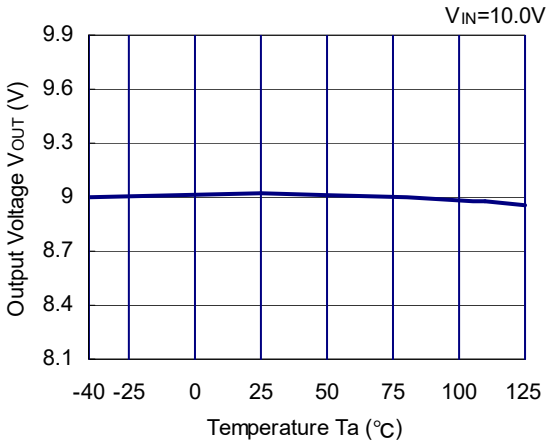

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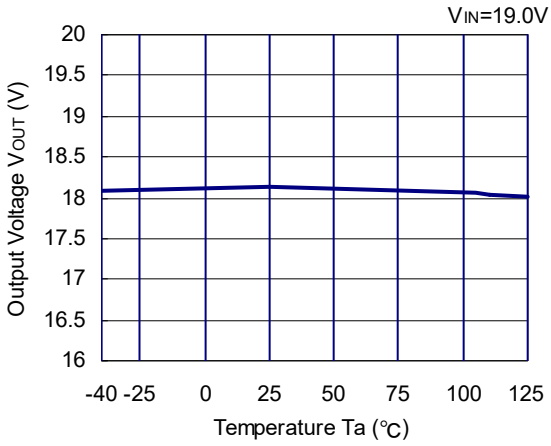
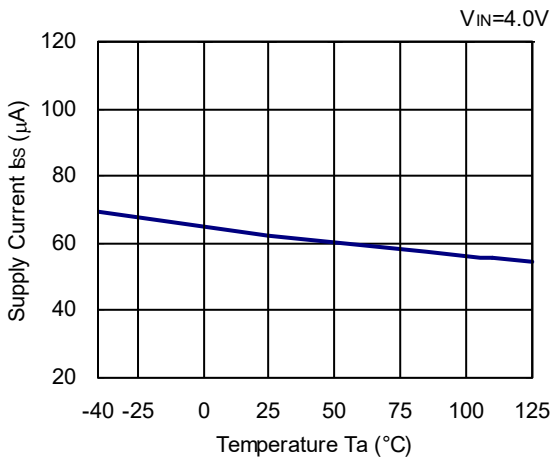


5) Supply Current vs. Ambient Temperature (C1 = Ceramic 0.47 µF, C2 = Ceramic 10 µF, I_{OUT} = 0 mA)

R8152x030B



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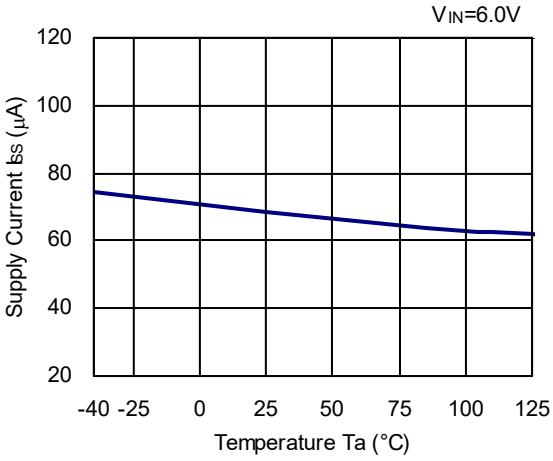

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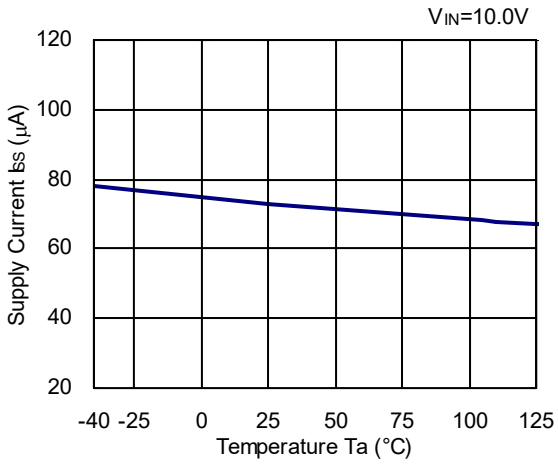

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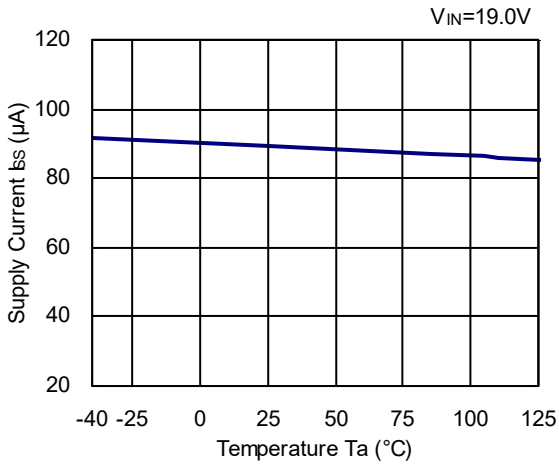
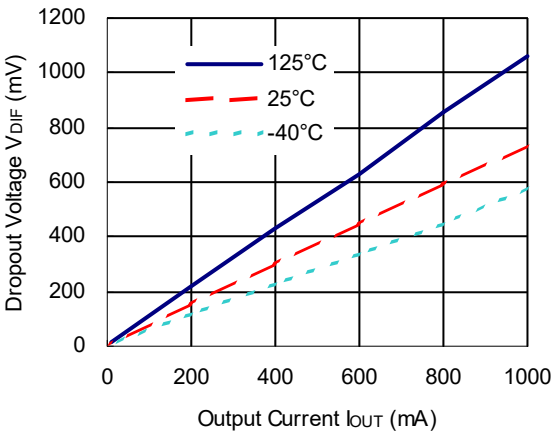
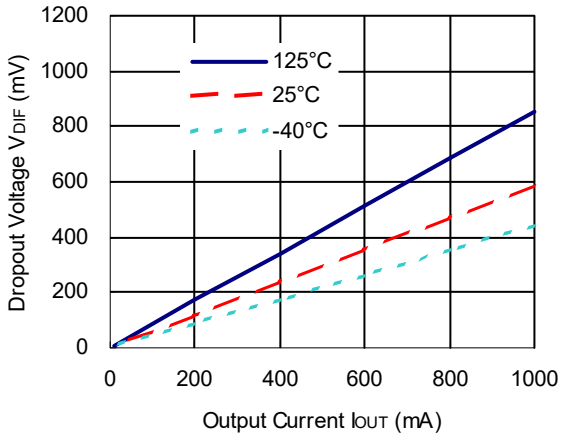


6) Dropout Voltage vs. Output Current (C1 = Ceramic 0.47 µF, C2 = Ceramic 10 µF)

R8152x030B



R8152x050B



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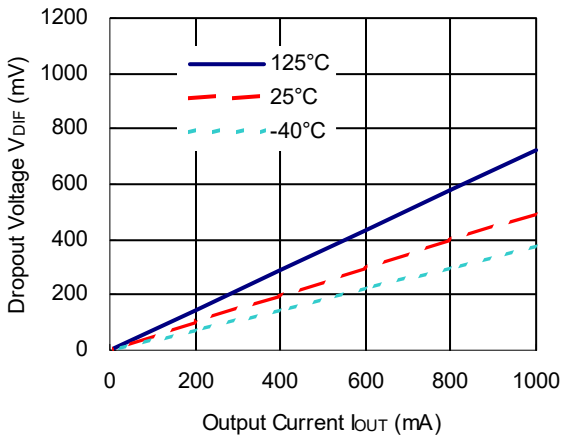

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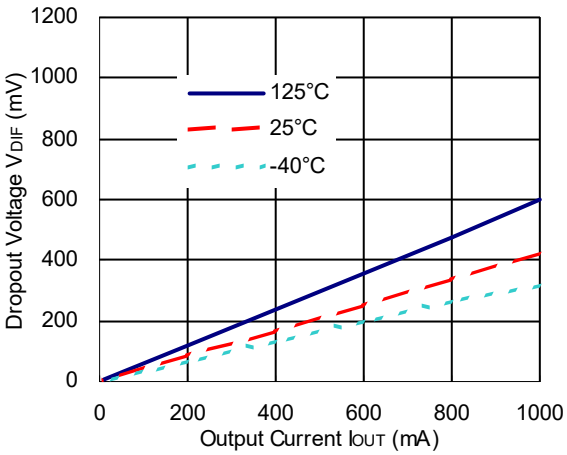
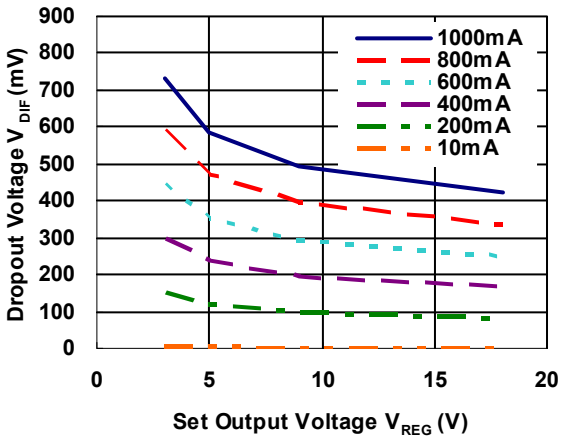
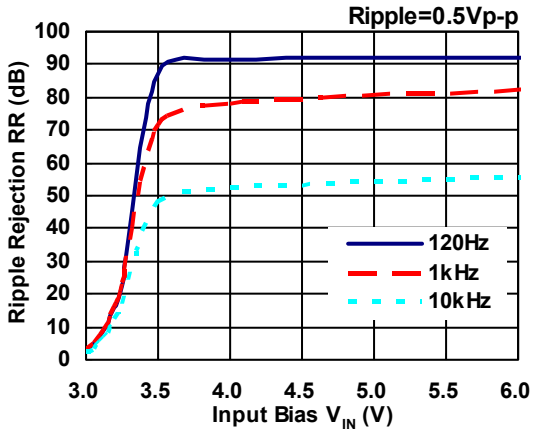


7) Dropout Voltage vs. Setting Voltage (C1 = Ceramic 0.47 µF, C2 = Ceramic 10 µF)



8) Ripple Rejection vs. Input Bias Voltage (C1 = none, C2 = Ceramic 10 µF, I_{OUT} = 100 mA)

R8152x030B



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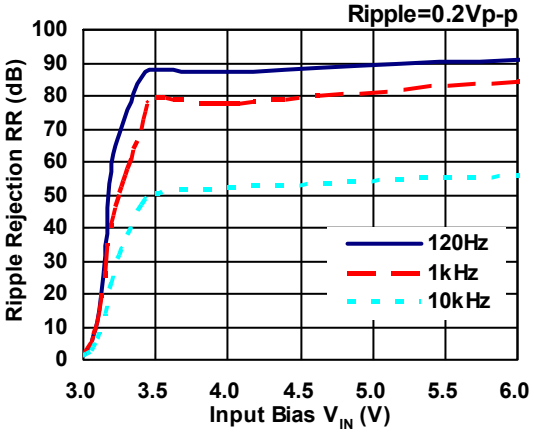

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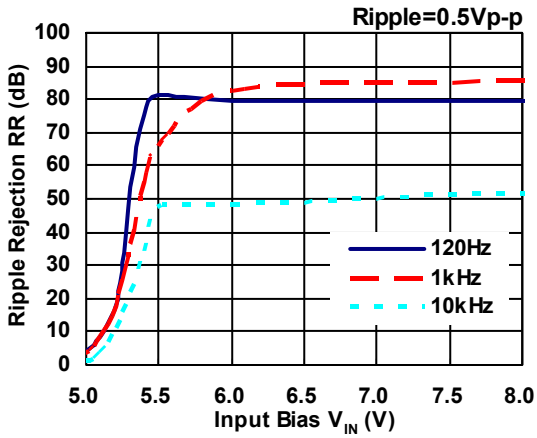

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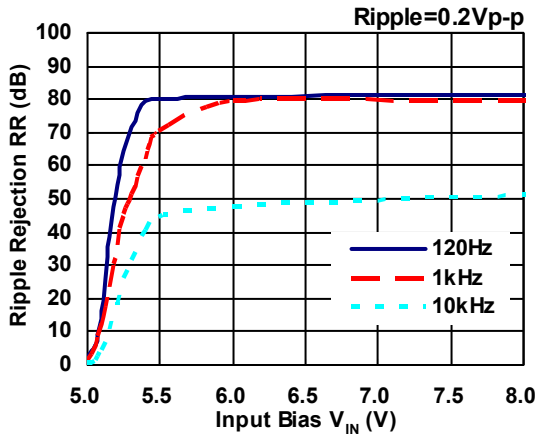

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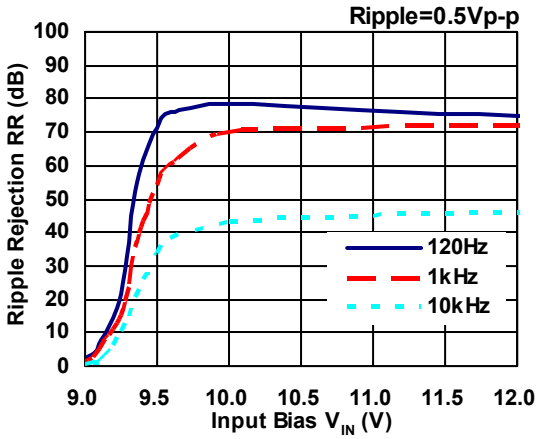

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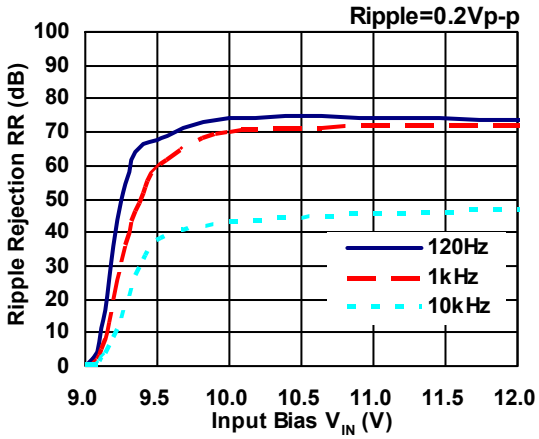

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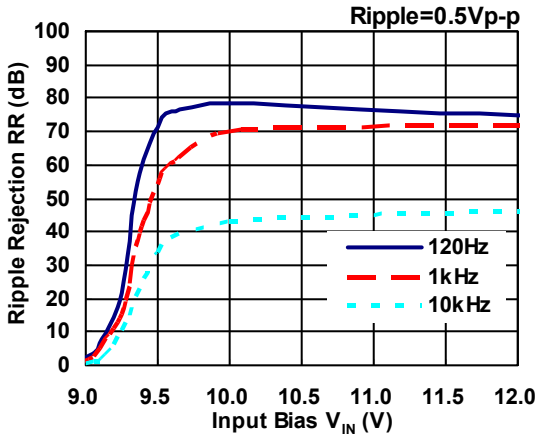

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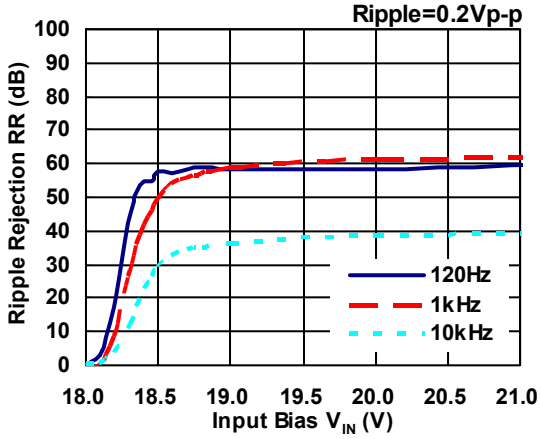
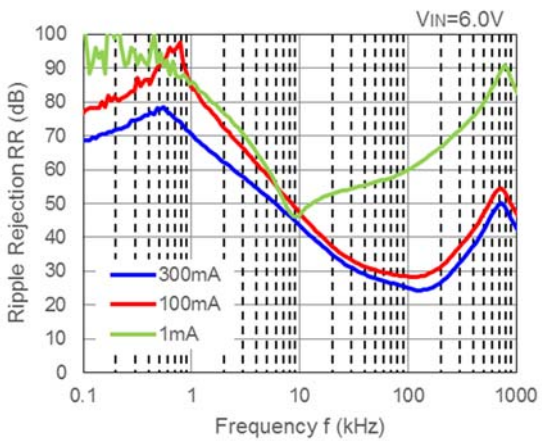


9) Ripple Rejection vs. Frequency (C1 = none, C2 = Ceramic 10 µF, Ripple = 0.5 Vp-p)

R8152x050B



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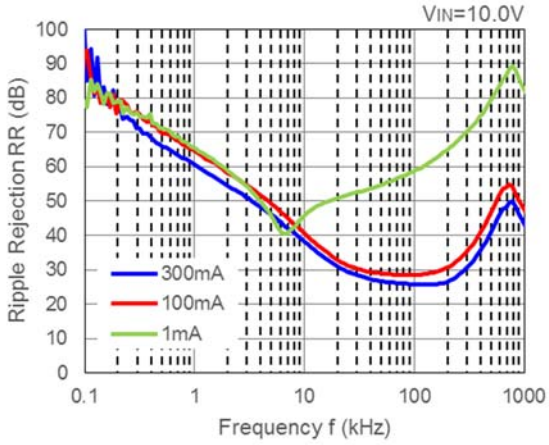
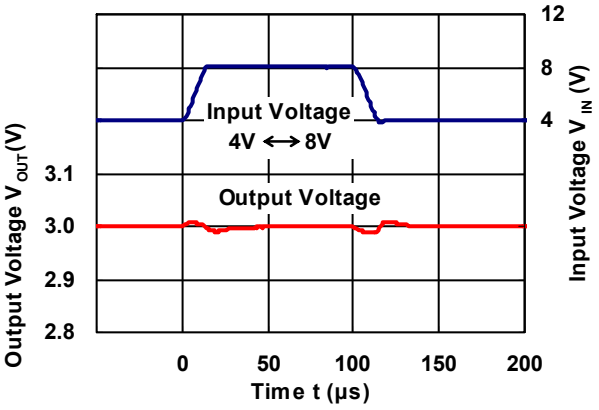


10) Input Transient Response (C1 = none, C2 = Ceramic 10 µF, I_{OUT} = 100 mA, tr = tf = 10 µs)

R8152x030B



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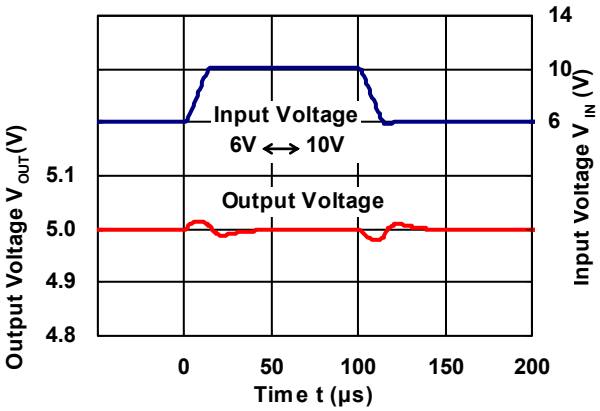

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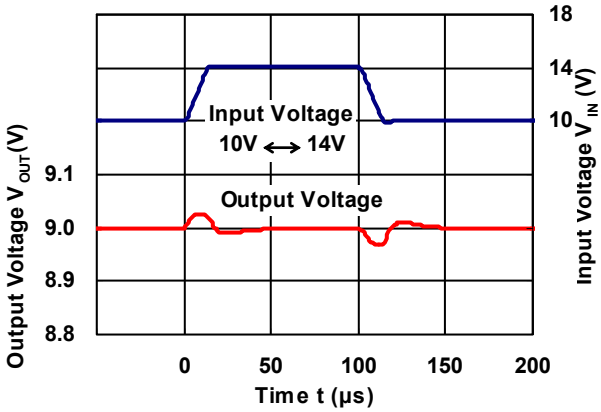

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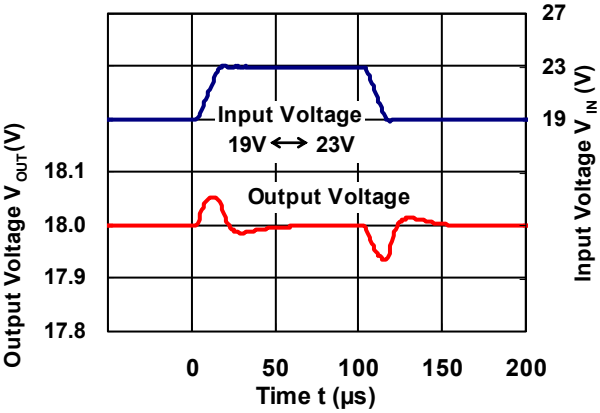
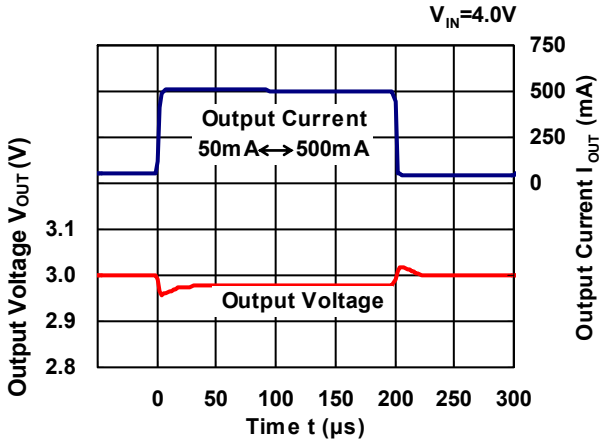


11) Load Transient Response (C1 = Ceramic 0.47 µF, C2 = Ceramic 10 µF, tr = tf = 0.5 µs)

R8152x030B



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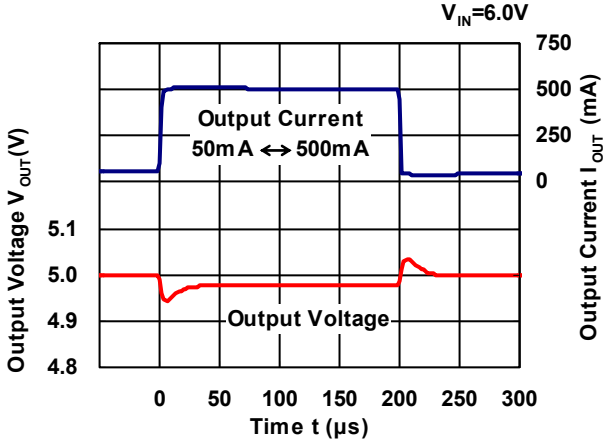

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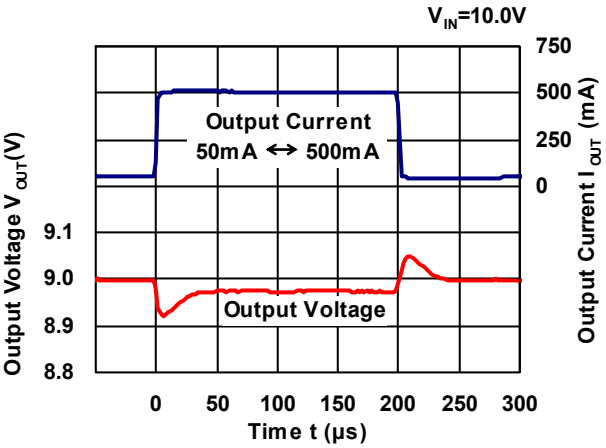

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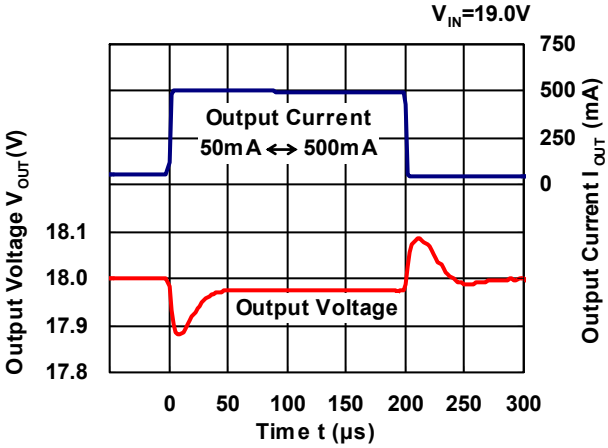
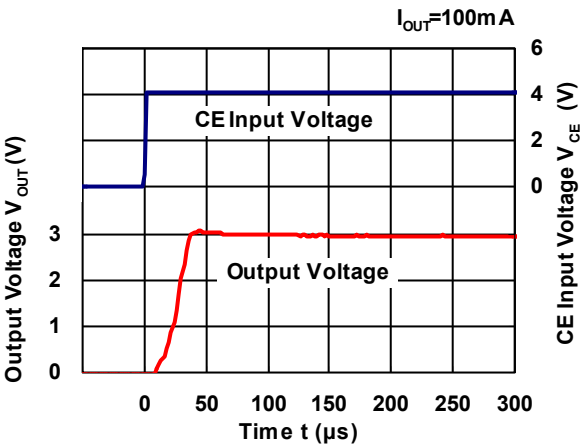


12) CE Turn On Speed (C1 = Ceramic 0.47 µF, C2 = Ceramic 10 µF, tr = tf = 0.5 µs)

R8152x030B



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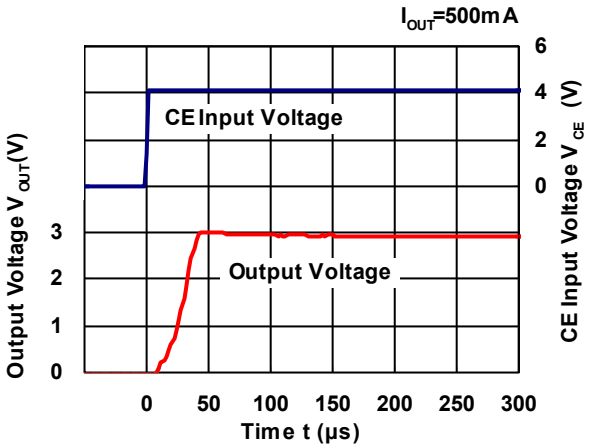

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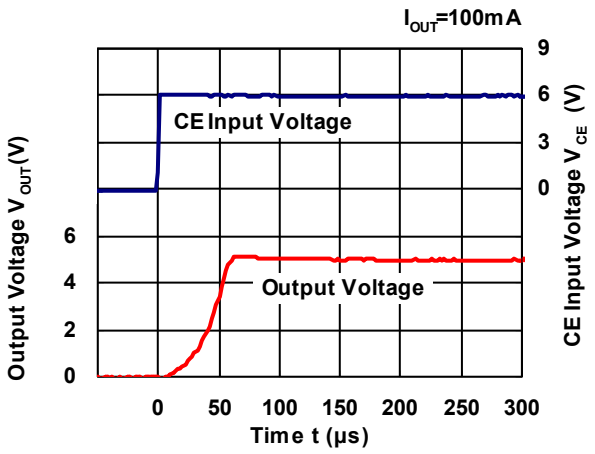

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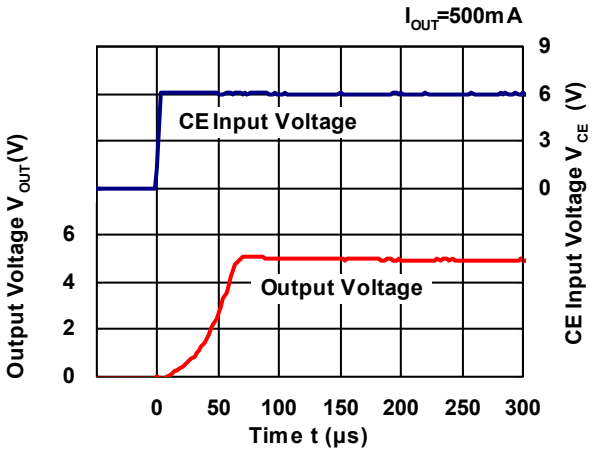

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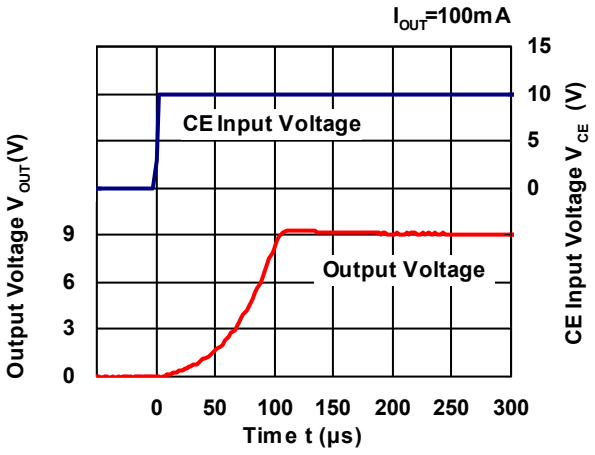

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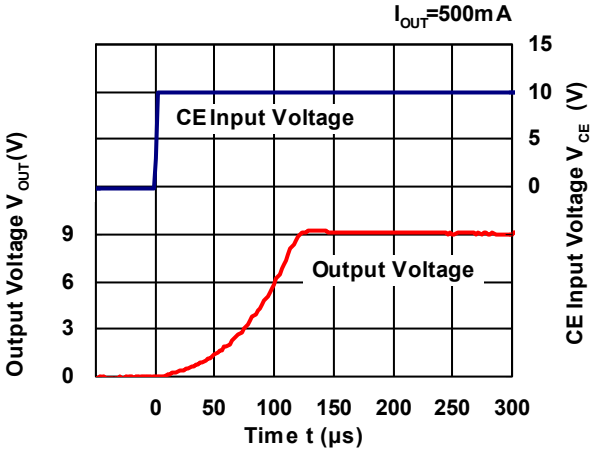

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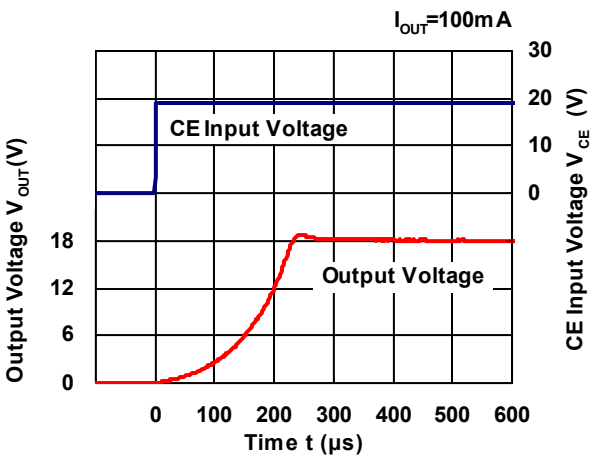

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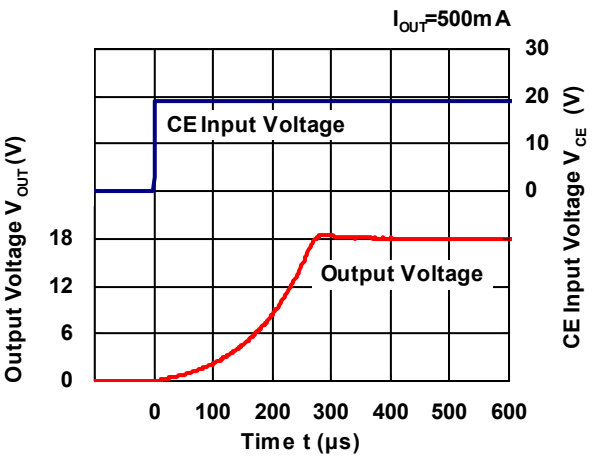
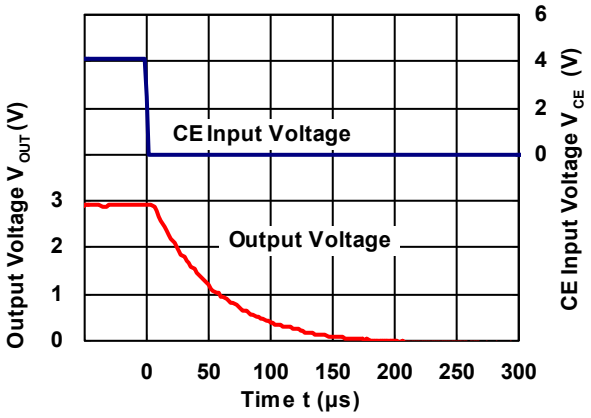


13) CE Turn Off Speed (C1 = Ceramic 0.47 µF, C2 = Ceramic 10 µF, I_{OUT} = 500 mA, tr = tf = 0.5 µs)

R8152x030B



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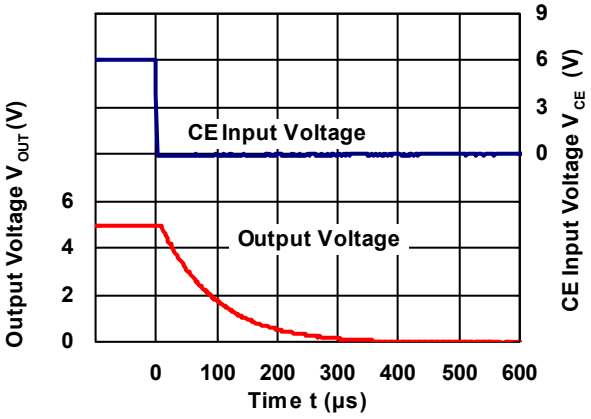

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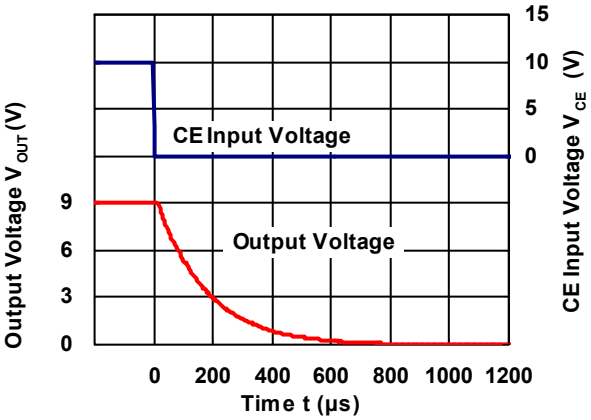

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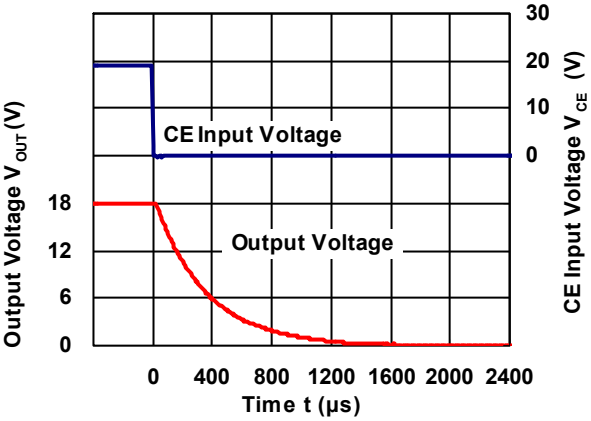


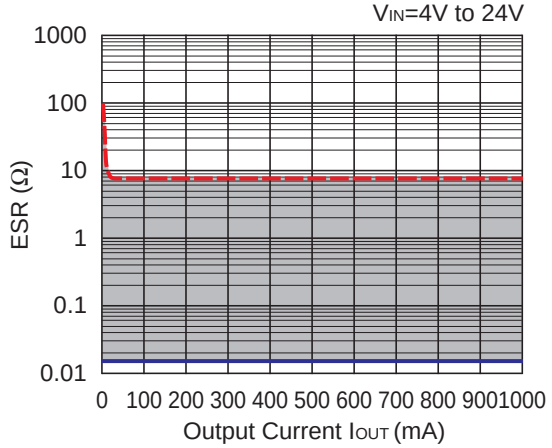
EQUIVALENT SERIES RESISTANCE (ESR) VS. OUTPUT CURRENT

Ceramic type output capacitor is recommended for this series; however, the other output capacitors with low ESR also can be used. As for reference, the below graphs show the relationship between output current (I_{OUT}) and equivalent series resistance (ESR). The noise level of the output current (I_{OUT}) was measured by the test circuit and is lower than the specified value.

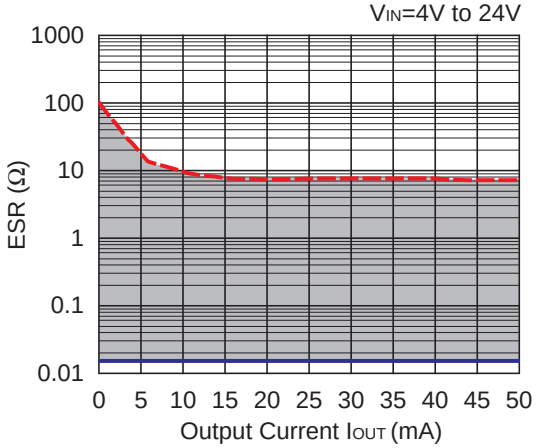
Measurement Conditions

- Input Voltage: V_{OUT} + 1 V to 24 V
- Noise Frequency Range: 10 Hz to 1 MHz
- Ambient Temperature: −40°C to 125°C
- Shaded Area: Noise level is lower than the specified value
- Capacitor: C1 = Ceramic 0.47 µF, C2 = Ceramic 10 µF

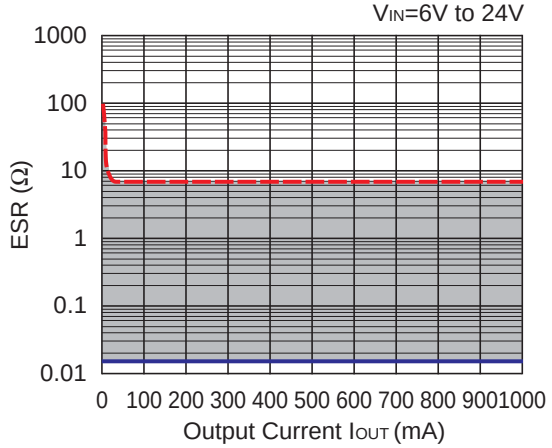
R8152x030B
Specified Value = 40 µVrms
V_{IN}=4V to 24V



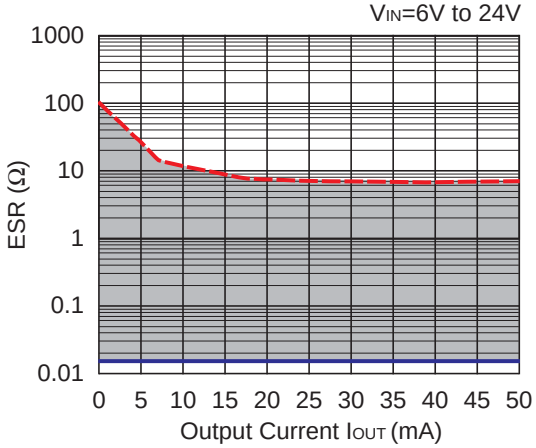
R8152x030B
Specified Value = 40 µVrms
V_{IN}=4V to 24V



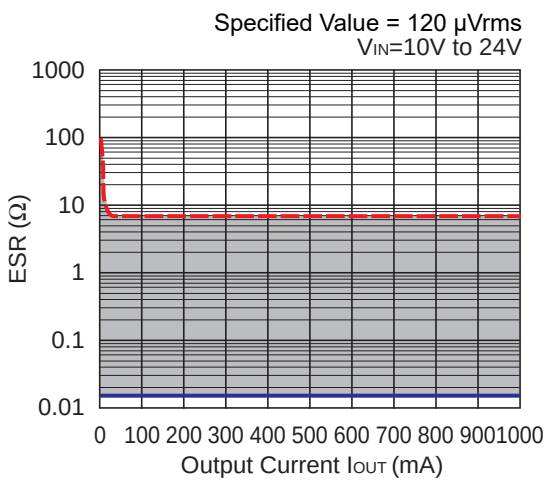
R8152x050B
Specified Value = 50 µVrms
V_{IN}=6V to 24V



R8152x050B
Specified Value = 50 µVrms
V_{IN}=6V to 24V



R8152x090B



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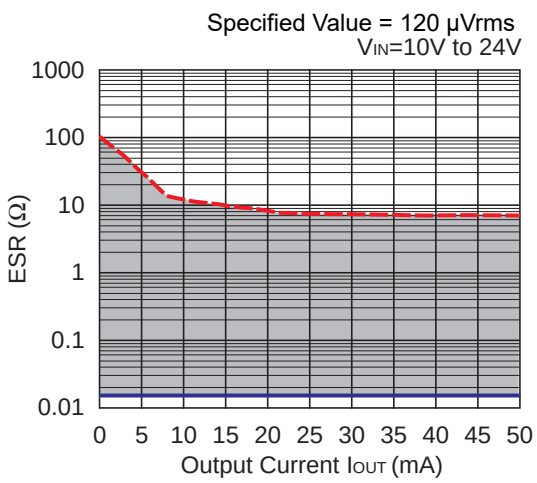

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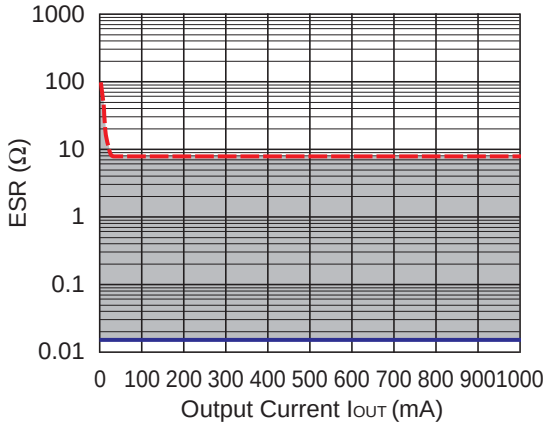
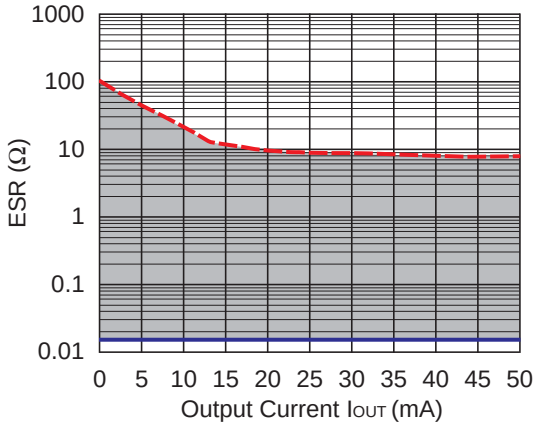


R8152x180B



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