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500-mA 3.3-V or 5.0-V Output LDO Regulators

BD4xxM5-C Series

●General Description

The BD4xxM5 series are low quiescent regulators featuring 45 V absolute maximum voltage, and output voltage accuracy of ±2 % (3.3 V or 5 V: Typ.), 500 mA output current and 38 μA (Typ.) current consumption. These regulators are therefore ideal for applications requiring a direct connection to the battery and a low current consumption.
A logical “HIGH” at the CTL enables the device and “LOW” at the CTL disables the device.
(Only W: Includes Enable Input).
Ceramic capacitors can be used for compensation of the output capacitor phase. Furthermore, these ICs also feature overcurrent protection to protect the device from damage caused by short-circuiting and an integrated thermal shutdown to protect the device from overheating at overload conditions.

●Features

- Qualified for Automotive Applications
- Wide Temperature Range (Tj): -40 °C to +150 °C
- Wide Operating Input Range: 3.0 V to 42 V
- Low Quiescent Current: 38 μA (Typ.)
- Output Current: 500 mA
- High Output Voltage Accuracy: ±2 %
- Output Voltage: 3.3 V or 5.0 V (Typ.)
- Enable Input (Only W)
- Overload Current Protection (OCP)
- Thermal Shutdown Protection (TSD)
- AEC-Q100 Qualified (Note1)
  (Note1:Grade1)

●Package W (Typ.) × D (Typ.) × H (Max.)

■ FPJ: TO252-J5(Note2) 6.60 mm × 10.10 mm × 2.38 mm

(Note2: TO252-J5 & TO252-J5F)

■ FP: TO252-3 6.50 mm × 9.50 mm × 2.50 mm

■ FP2: TO263-5(Note3) 10.16 mm × 15.10 mm × 4.70 mm

(Note3: TO263-5 & TO263-5F)

■ FP2: TO263-3(Note4) 10.16 mm × 15.10 mm × 4.70 mm

(Note4: TO263-3 & TO263-3F)

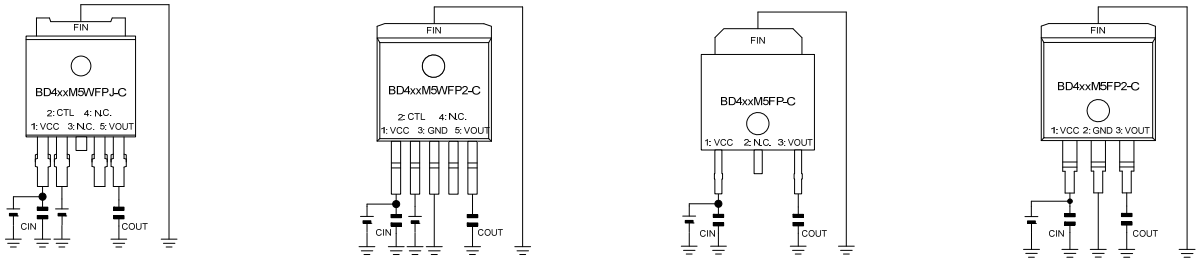
Figure 1. Package Outlook

●Applications

■ Automotive (body, audio system, navigation system, etc.)

●Typical Application Circuits

■ Components Externally Connected: 0.1 μF ≤ CIN, 10 μF ≤ COUT (Typ.)
* Electrolytic, tantalum and ceramic capacitors can be used.

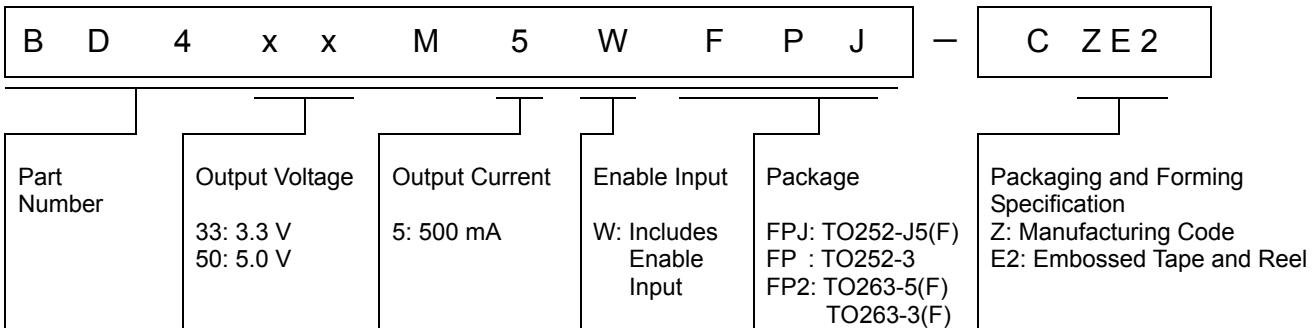


BD433 / 450M5WFPJ-C BD433 / 450M5WFP2-C BD433 / 450M5FP-C BD433 / 450M5FP2-C

Figure 2. Typical Application Circuits

◯Product structure: Silicon Monolithic Integrated Circuit ◯This product is not designed protection against radioactive rays.

●Ordering Information



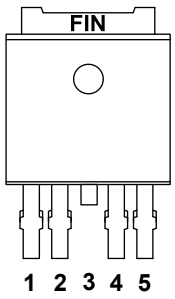
●Lineup

Output Current Ability	Output Voltage (Typ.)	Enable Input (1)	Package Type	Orderable Part Number
500 mA	3.3 V	○	TO252-J5(F)	BD433M5WFPJ-CZE2
			TO263-5(F)	BD433M5WFP2-CZE2
		–	TO252-3	BD433M5FP-CE2
			TO263-3(F)	BD433M5FP2-CZE2
	5.0 V	○	TO252-J5(F)	BD450M5WFPJ-CZE2
			TO263-5(F)	BD450M5WFP2-CZE2
		–	TO252-3	BD450M5FP-CE2
			TO263-3(F)	BD450M5FP2-CZE2

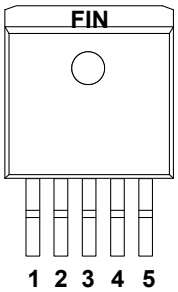
(1) ○: Includes Enable Input
– : Not includes Enable Input

●Pin Configurations

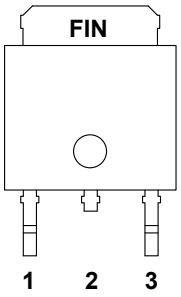
TO252-J5(F)
(Top View)



TO263-5(F)
(Top View)



TO252-3
(Top View)



TO263-3(F)
(Top View)

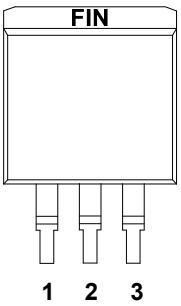


Figure 3. Pin Configuration

●Pin Descriptions

■ BD433 / 450M5WFPJ-C

Pin No.	Pin Name	Function
1	VCC	Supply Voltage Input Pin
2	CTL	Output Control Pin
3	GND	Ground Pin
4	N.C.	Not Connected
5	VOUT	Output Pin
6 (FIN)	GND	Ground Pin

■BD433 / 450M5WFP2-C

Pin No.	Pin Name	Function
1	VCC	Supply Voltage Input Pin
2	CTL	Output Control Pin
3	GND	Ground Pin
4	N.C.	Not Connected
5	VOUT	Output Pin
6 (FIN)	GND	Ground Pin

■ BD433 / 450M5FP-C

Pin No.	Pin Name	Function
1	VCC	Supply Voltage Input Pin
2	N.C.	Not Connected
3	VOUT	Output Pin
4 (FIN)	GND	Ground Pin

■BD433 / 450M5FP2-C

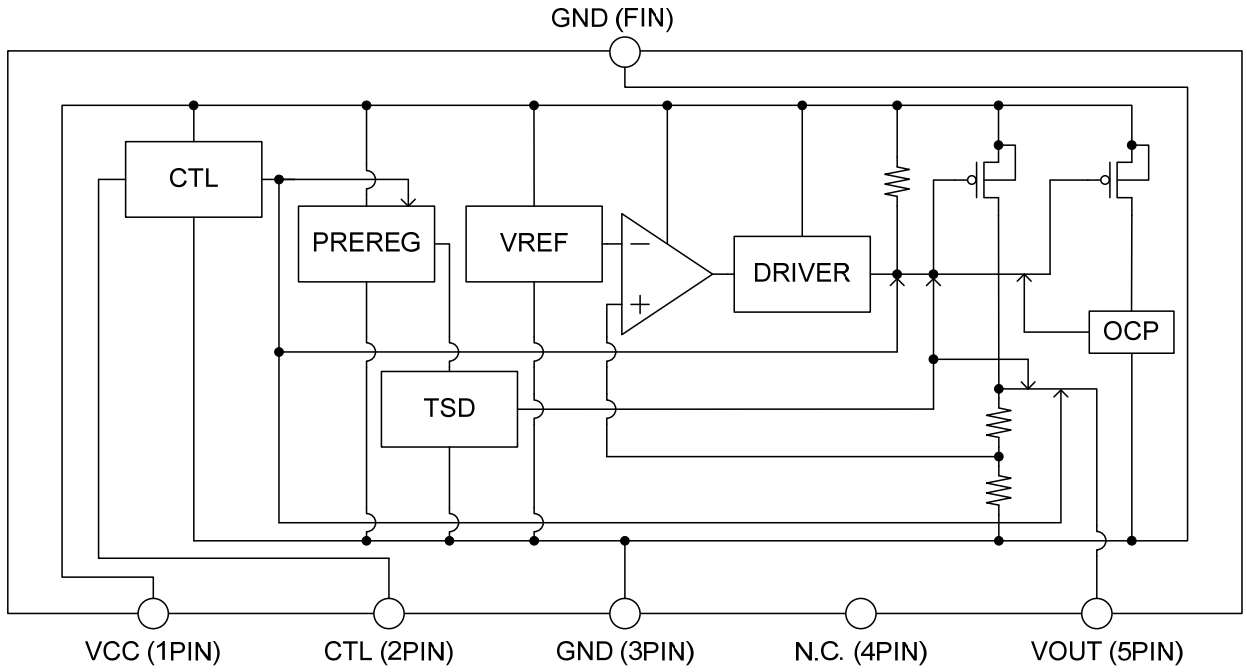
Pin No.	Pin Name	Function
1	VCC	Supply Voltage Input Pin
2	GND	Ground Pin
3	VOUT	Output Pin
4 (FIN)	GND	Ground Pin

* N.C. Pin is recommended to short with GND.

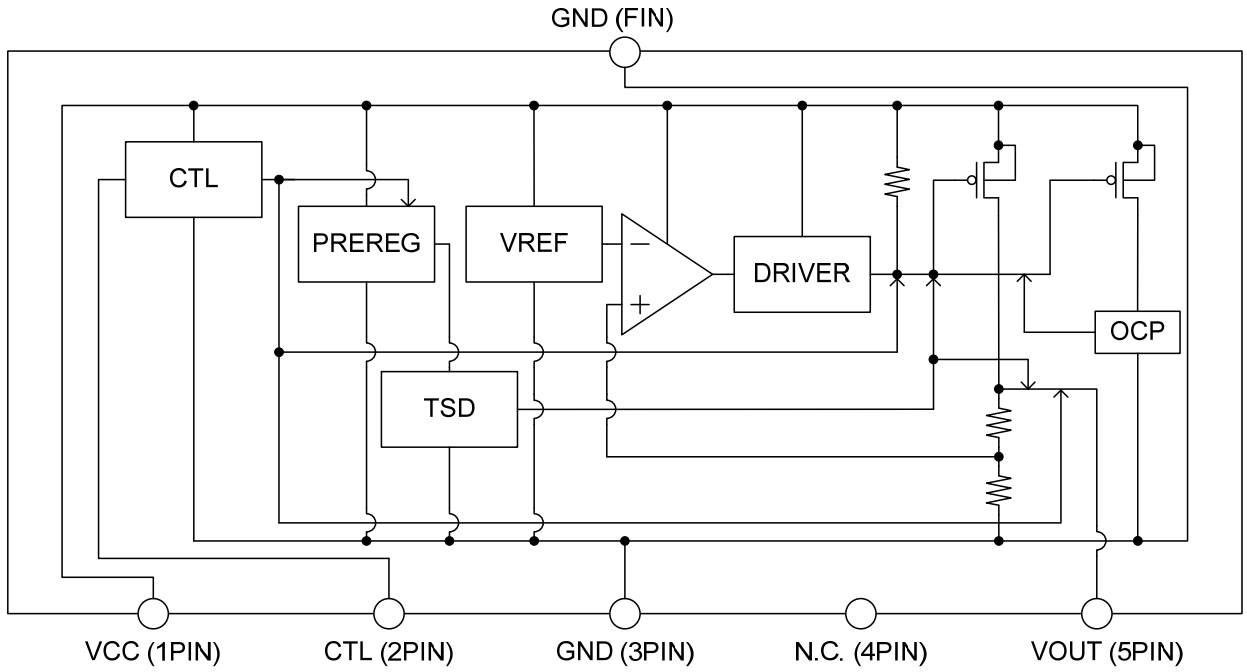
* N.C. Pin can be open because it isn't connected it inside of IC.

●Block Diagrams

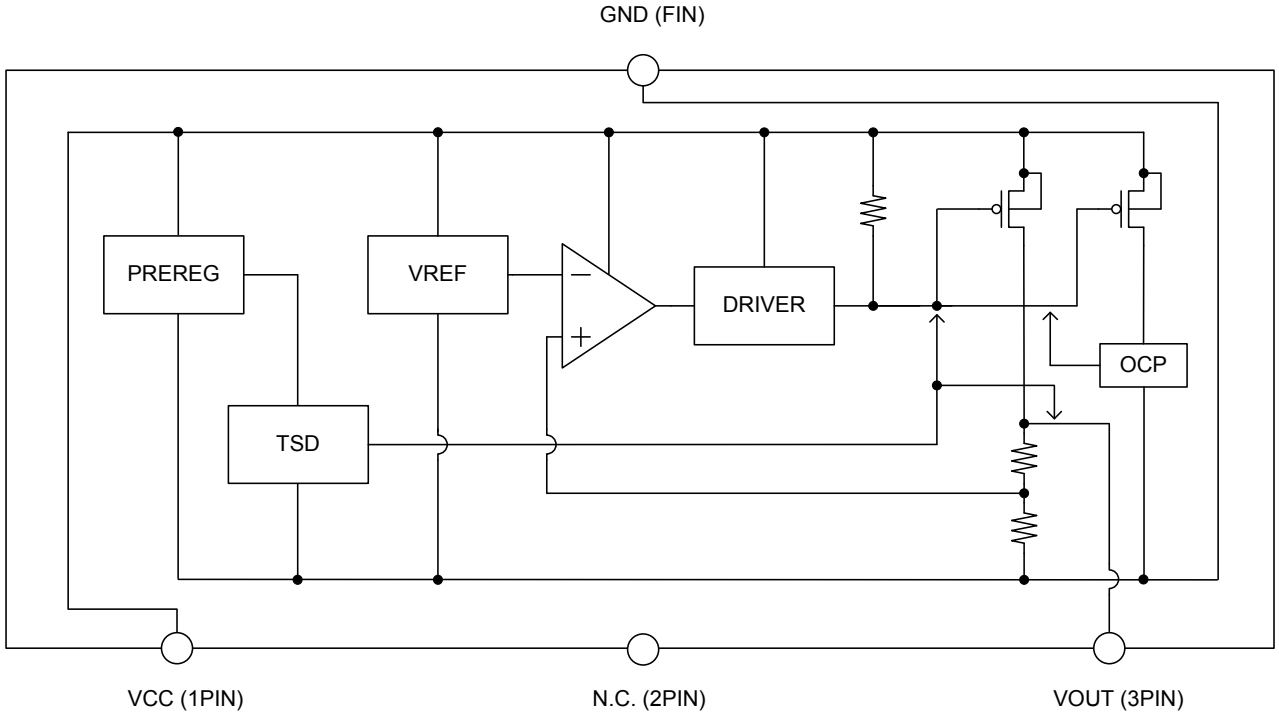
■ BD433 / 450M5WFPJ-C



■ BD433 / 450M5WFP2-C



■ BD433 / 450M5FP-C



■ BD433 / 450M5FP2-C

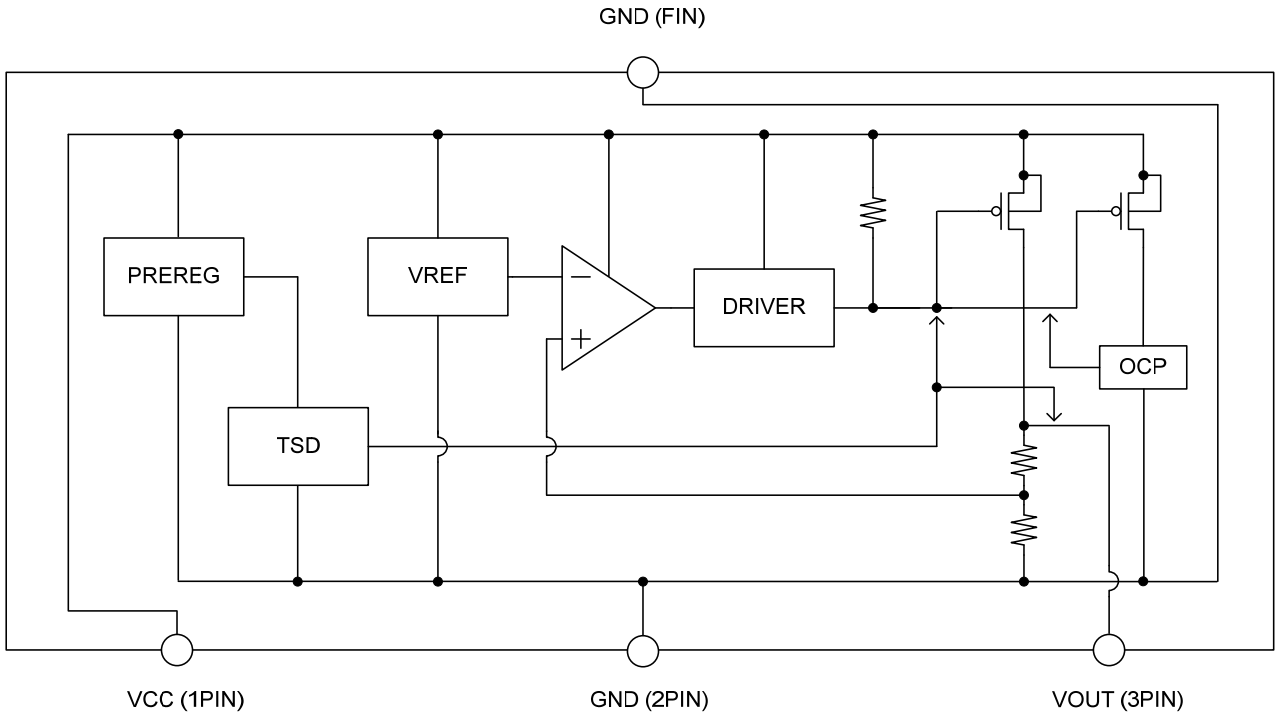


Figure 4. Block Diagrams

●**Description of Blocks**

Block Name	Function	Description of Blocks
CTL (1)	Control Output Voltage ON/OFF	A logical “HIGH” (≥ 2.8 V) at the CTL enables the device and “LOW” (≤ 0.8 V) at the CTL disable the device.
PREREG	Internal Power Supply	Power Supply for Internal Circuit
TSD	Thermal Shutdown Protection	To protect the device from overheating. If the chip temperature (Tj) reaches ca. 175 °C (Typ.), the output is turned off.
VREF	Reference Voltage	Generate the Reference Voltage
DRIVER	Output MOS FET Driver	Drive the Output MOS FET
OCP	Over Current Protection	To protect the device from damage caused by over current. If the output current reaches ca. 900 mA (Typ.), the output is turned off.

(1) Applicable for product with Enable Input.

●Absolute Maximum Ratings

Parameter		Symbol	Ratings	Unit
Supply Voltage	(1)	VCC	-0.3 to +45.0	V
Output Control Voltage	(2)	CTL	-0.3 to +45.0	V
Output Voltage		VOUT	-0.3 to +8.0	V
Junction Temperature Range		Tj	-40 to +150	°C
Storage Temperature Range		Tstg	-55 to +150	°C
Maximum Junction Temperature		Tjmax	150	°C
ESD withstand Voltage (HBM)	(3)	$V_{ESD, HBM}$	±2000	V

(1) Do not exceed Pd.

(2) Applicable for product with Enable Input.
The start-up orders of power supply (VCC) and the CTL do not influence if the voltage is within the operation power supply voltage range.

(3) ESD susceptibility Human Body Model “HBM”.

●Operating Conditions (-40 °C ≤ Tj ≤ +150 °C)

Parameter		Symbol	Min.	Max.	Unit
Supply Voltage (IOUT ≤ 500 mA)	(1)	VCC	5.9	42.0	V
Supply Voltage (IOUT ≤ 250 mA)	(1)	VCC	5.5	42.0	V
Supply Voltage (IOUT ≤ 500 mA)	(2)	VCC	4.6	42.0	V
Supply Voltage (IOUT ≤ 250 mA)	(2)	VCC	4.0	42.0	V
Output Control Voltage	(3)	CTL	0	42.0	V
Start-Up Voltage	(4)	VCC	3.0	–	V
Output Current		IOUT	0	500	mA
Junction Temperature Range		Tj	-40	+150	°C

(1) BD450M5WFPJ-C / BD450M5WFP2-C / BD450M5FP-C / BD450M5FP2-C

(2) BD433M5WFPJ-C / BD433M5WFP2-C / BD433M5FP-C / BD433M5FP2-C

(3) Applicable for Product with Enable Input.

(4) When IOUT = 0 mA

Notice: Please consider that the output voltage would be dropped (Dropout voltage) according to the output current.

●Thermal Impedance (1)

Parameter	Symbol	Typ.	Unit	Conditions
TO252-J5(F) / TO252-3				
Junction to Ambient	θ_{JA}	136	°C / W	1s (2)
		23	°C / W	2s2p (3)
Junction to Top Center of Case (4)	Ψ_{JT}	17	°C / W	1s (2)
		3	°C / W	2s2p (3)
TO263-5(F) / TO263-3(F)				
Junction to Ambient	θ_{JA}	81	°C / W	1s (2)
		21	°C / W	2s2p (3)
Junction to Top Center of Case (4)	Ψ_{JT}	8	°C / W	1s (2)
		2	°C / W	2s2p (3)

(1) The thermal impedance is based on JESD51 - 2A (Still-Air) standard.
(2) JESD51 - 3 standard FR4 114.3 mm × 76.2 mm × 1.57 mm 1-layer (1s)
(Top copper foil: ROHM recommended footprint + wiring to measure, 2 oz. copper.)
(3) JESD51 -5 / -7 standard FR4 114.3 mm × 76.2 mm × 1.60 mm 4-layer（2s2p）
(Top copper foil: ROHM recommended footprint + wiring to measure / 2 inner layers copper foil area of PCB: 74.2 mm × 74.2 mm, copper (top & reverse side / inner layers) 2oz. / 1oz.)
(4) T_T : Top center of case's (mold) temperature

●Electrical Characteristics

Unless otherwise specified, -40 °C ≤ Tj ≤ +150 °C, VCC = 13.5 V, CTL = 5 V (1), IOUT = 0 mA
The typical value is defined at Tj = 25 °C.

Parameter	Symbol	Limit			Unit	Conditions
		Min.	Typ.	Max.		
Shut Down Current	Ishut (1)	–	2.0	5.0	μA	CTL = 0 V Tj ≤ 125 °C
Circuit Current	Icc	–	38	95	μA	IOUT = 0 mA Tj ≤ 125 °C
		–	38	175	μA	IOUT ≤ 500 mA Tj ≤ 150 °C
Output Voltage	VOUT (2)	4.90	5.00	5.10	V	6 V ≤ VCC ≤ 42 V, 0 mA ≤ IOUT ≤ 400 mA
		4.80	5.00	5.10	V	6 V ≤ VCC ≤ 42V 0 mA ≤ IOUT ≤ 500 mA
	VOUT (3)	3.23	3.30	3.37	V	6 V ≤ VCC ≤ 42 V 0 mA ≤ IOUT ≤ 400 mA
		3.20	3.30	3.37	V	6 V ≤ VCC ≤ 42 V 0 mA ≤ IOUT ≤ 500 mA
Dropout Voltage	ΔVd (2)	–	0.20	0.50	V	VCC = VOUT × 0.95 (Typ. 4.75 V) IOUT = 300 mA
	ΔVd (3)	–	0.25	0.75	V	VCC = VOUT × 0.95 (Typ. 3.135 V) IOUT = 300 mA
Ripple Rejection	R.R.	55	60	–	dB	f = 120 Hz, ein = 1 Vrms IOUT = 100 mA
Line Regulation	Reg.I	–	10	30	mV	8 V ≤ VCC ≤ 16 V
Load Regulation	Reg.L	–	10	30	mV	10 mA ≤ IOUT ≤ 400 mA
Thermal Shut Down	TSD	–	175	–	°C	Tj at TSD ON

(1) Applicable for Product with Enable Input.

(2) For BD450M5WFPJ-C / BD450M5WFP2-C / BD450M5FP-C / BD450M5FP2-C

(3) For BD433M5WFPJ-C / BD433M5WFP2-C / BD433M5FP-C / BD433M5FP2-C

●Electrical Characteristics (Enable function * Applicable for product with Enable Input.)

Unless otherwise specified, -40 °C ≤ Tj ≤ +150 °C, VCC = 13.5 V, IOUT = 0 mA. The typical value is defined at Tj = 25 °C.

Parameter	Symbol	Limit			Unit	Conditions
		Min.	Typ.	Max.		
CTL ON Mode Voltage	VthH	2.8	–	–	V	Active Mode
CTL OFF Mode Voltage	VthL	–	–	0.8	V	Off Mode
CTL Bias Current	ICTL	–	15	30	μA	CTL = 5 V

●Typical Performance Curves

■BD433M5WFPJ-C / BD433M5WFP2-C / BD433M5FP-C / BD433M5FP2-C Reference Data

Unless otherwise specified: -40 °C ≤ Tj ≤ +150 °C, VCC = 13.5 V, CTL = 5 V (1), IOUT = 0 mA.

(1) Applicable for Product with Enable Input.

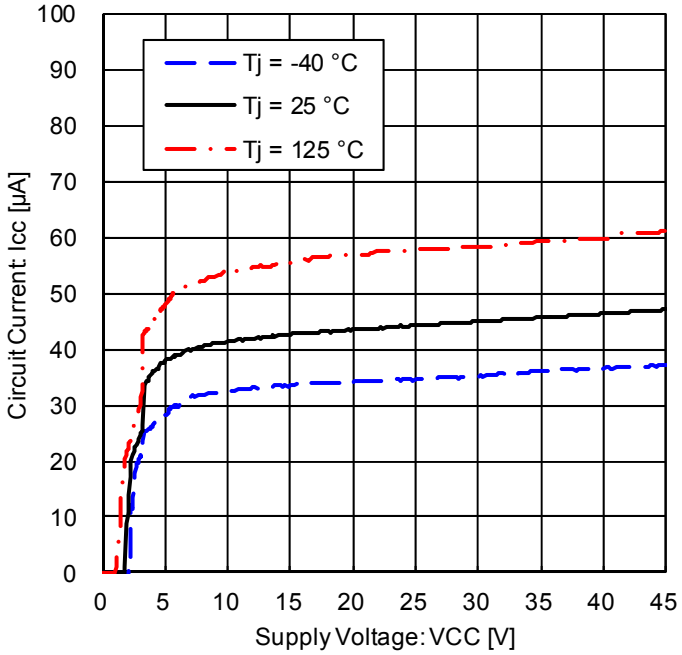


Figure 5. Circuit Current vs. Power Supply Voltage

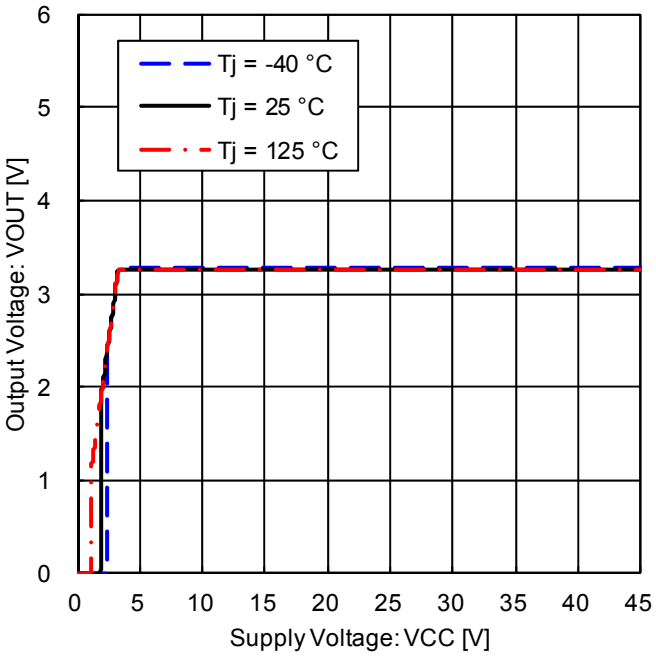


Figure 6. Output Voltage vs. Power Supply Voltage (IOUT = 0 mA)

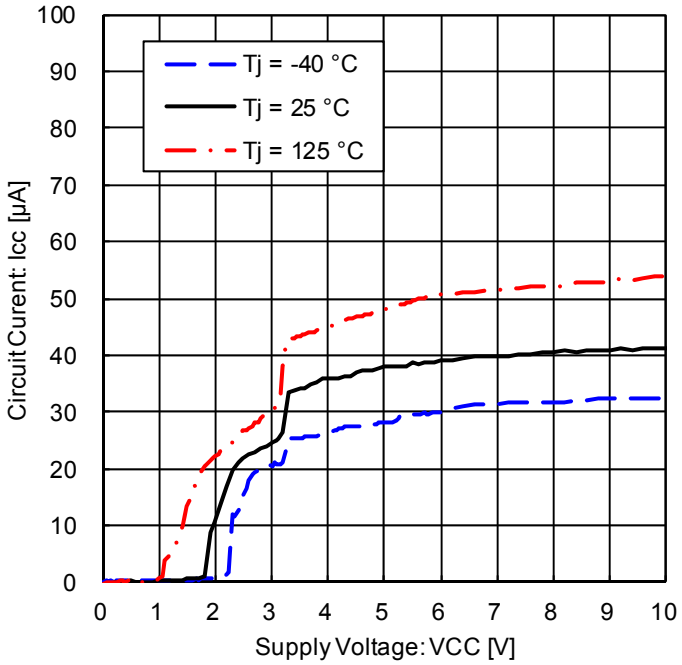


Figure 7. Circuit Current vs. Power Supply Voltage
*Magnified Figure 5. at low supply voltage

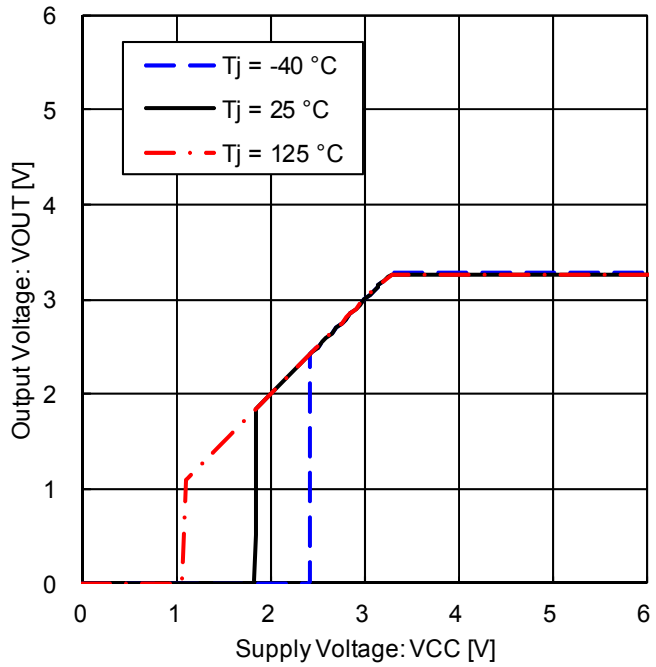


Figure 8. Output voltage vs. Power Supply Voltage (IOUT = 0 mA)
* Magnified Figure 6. at Low Supply Voltage

●Typical Performance Curves

■BD433M5WFPJ-C / BD433M5WFP2-C / BD433M5FP-C / BD433M5FP2-C Reference Data

Unless otherwise specified: -40 °C ≤ Tj ≤ +150 °C, VCC = 13.5 V, CTL = 5 V (1), IOUT = 0 mA.

(1) Applicable for Product with Enable Input.

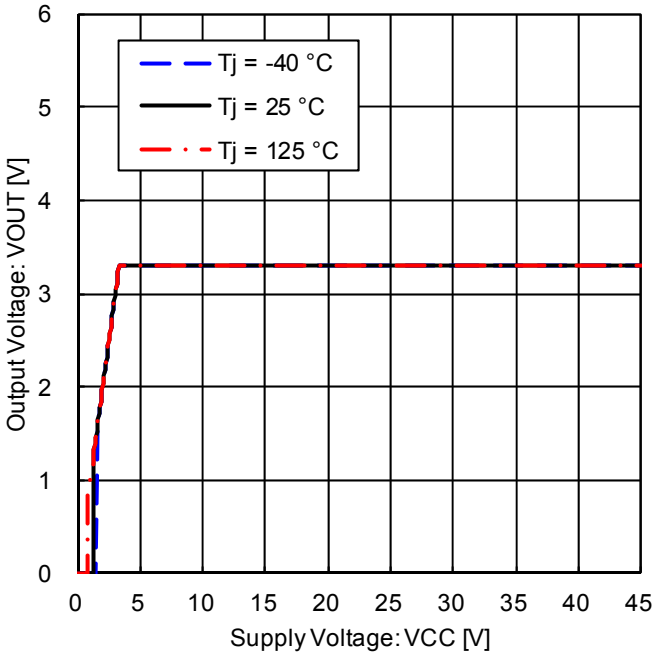


Figure 9. Output Voltage vs. Power Supply Voltage (IOUT = 10 mA)

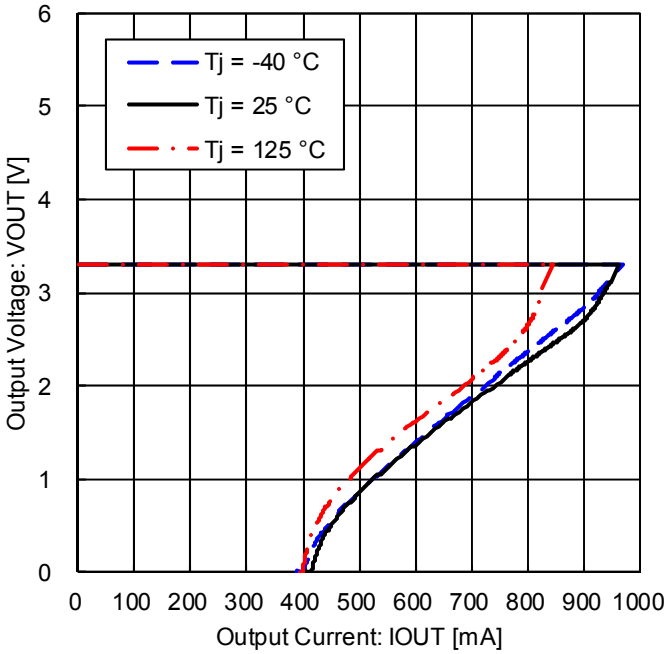


Figure 10. Output Voltage vs. Load (Over Current Protection)

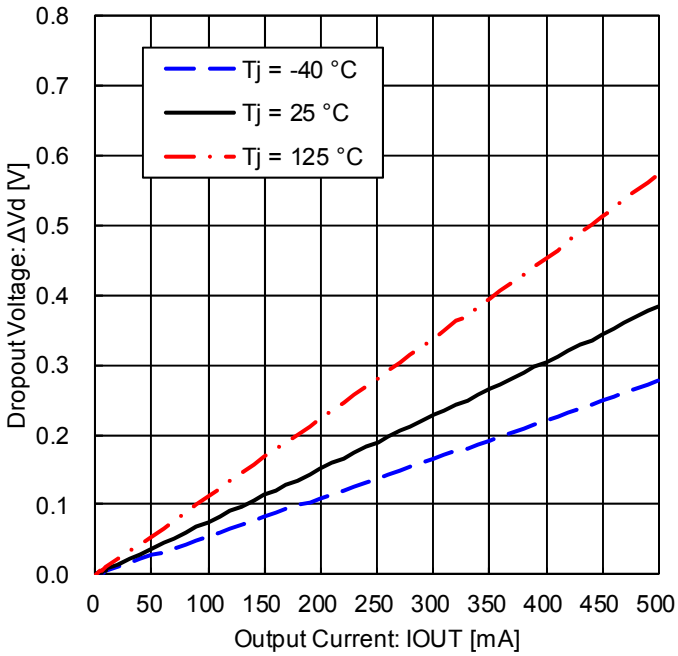


Figure 11. Dropout Voltage (VCC = 3.135 V)

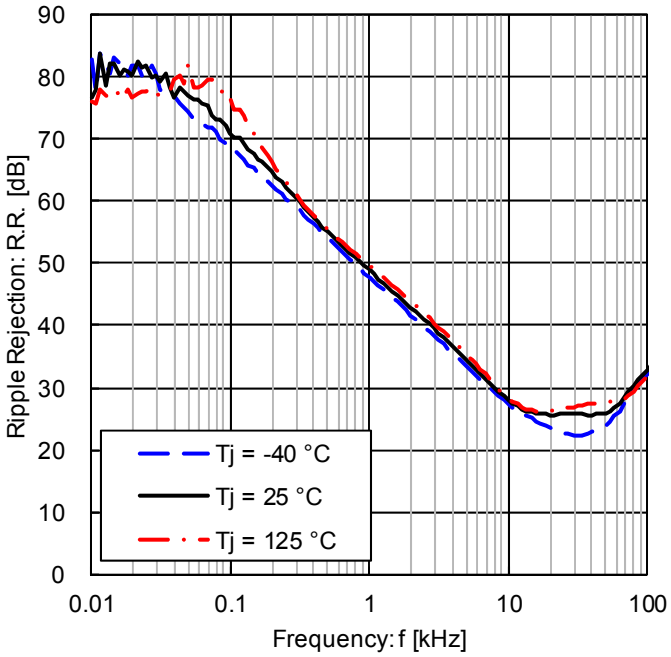


Figure 12. Ripple Rejection (ein = 1 Vrms, IOUT = 100 mA)

●Typical Performance Curves

■BD433M5WFPJ-C / BD433M5WFP2-C / BD433M5FP-C / BD433M5FP2-C Reference Data

Unless otherwise specified: -40 °C ≤ Tj ≤ +150 °C, VCC = 13.5 V, CTL = 5 V (1), IOUT = 0 mA.

(1) Applicable for Product with Enable Input.

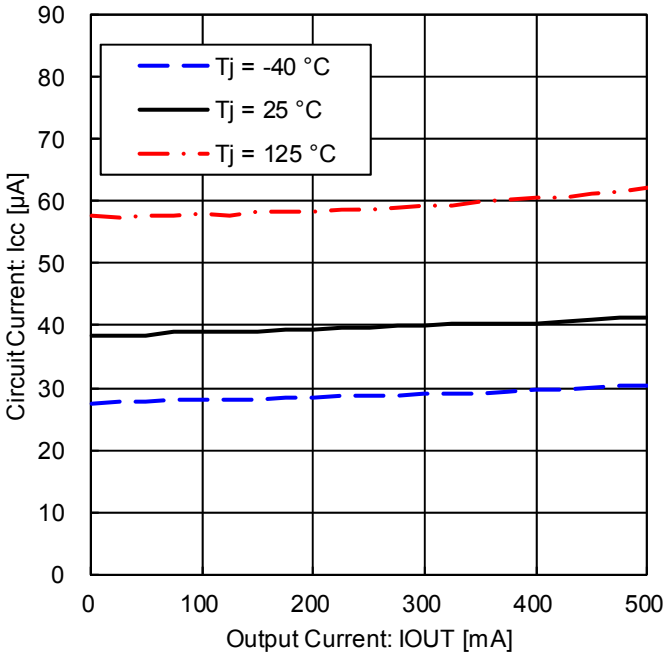


Figure 13. Circuit Current vs. Output Current

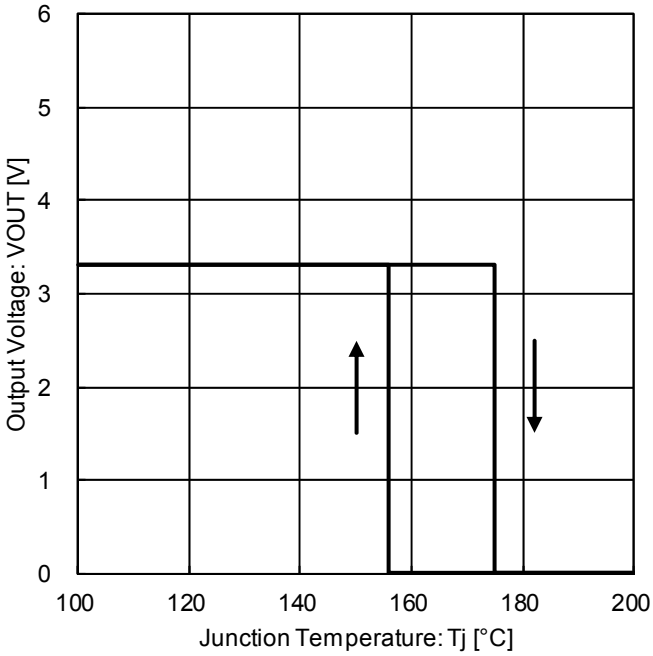


Figure 14. Output Voltage vs. Temperature (Thermal Shut Down)

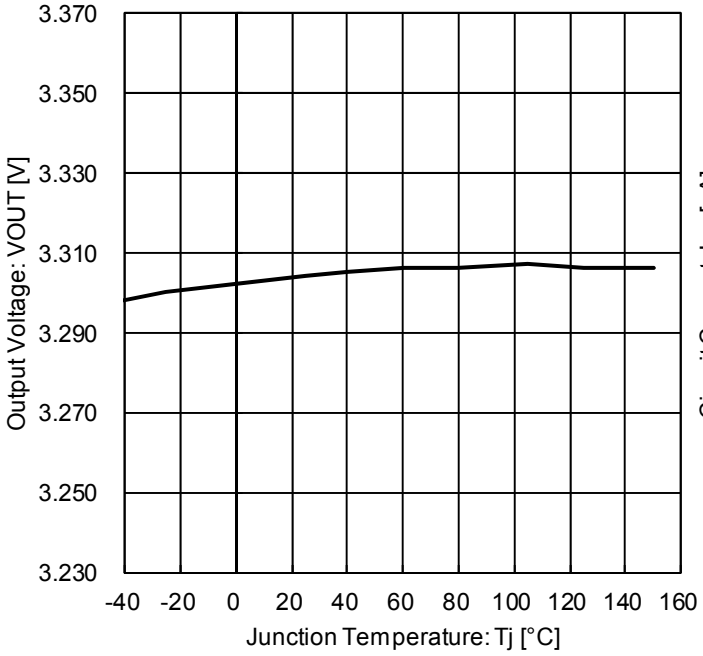


Figure 15. Output Voltage vs. Temperature

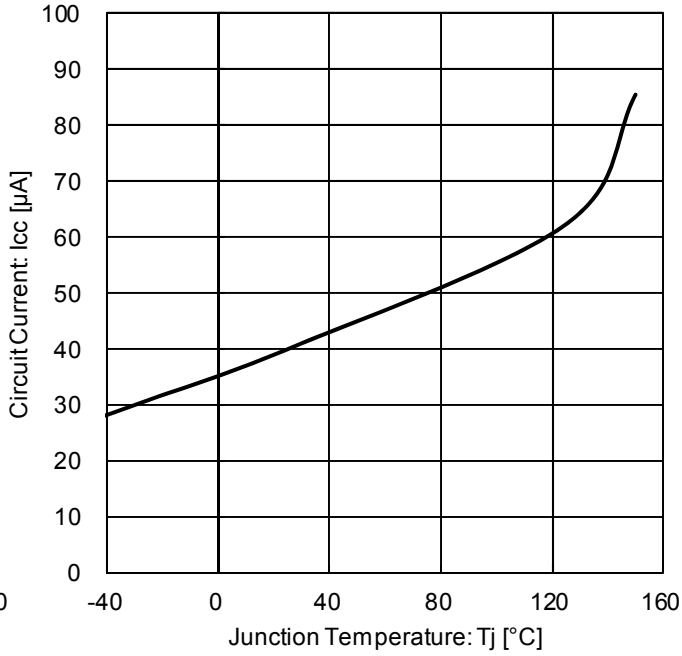


Figure 16. Circuit Current vs. Temperature

●Typical Performance Curves

■BD433M5WFPJ-C / BD433M5WFP2-C Reference Data

Unless otherwise specified: -40 °C ≤ Tj ≤ +150 °C, VCC = 13.5 V, IOUT = 0 mA

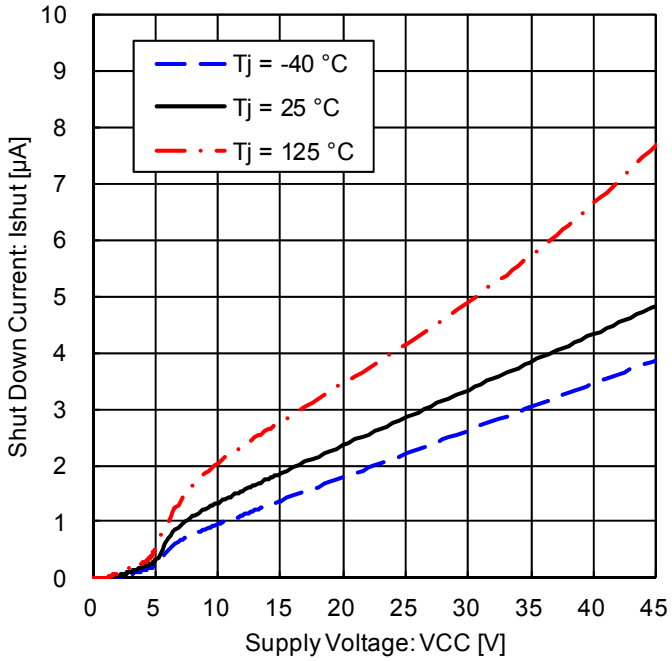


Figure 17. Shut Down Current vs. Power Supply Voltage
(CTL = 0 V)

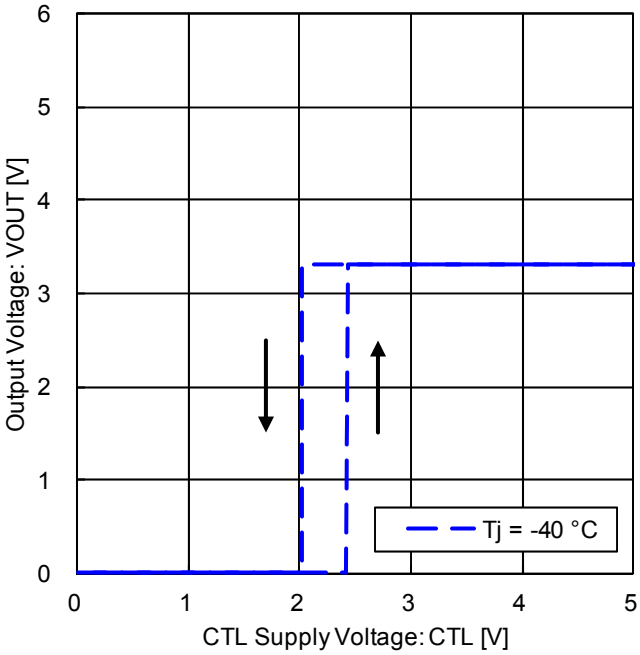


Figure 18. CTL ON / OFF Mode Voltage
(Tj = -40 °C)

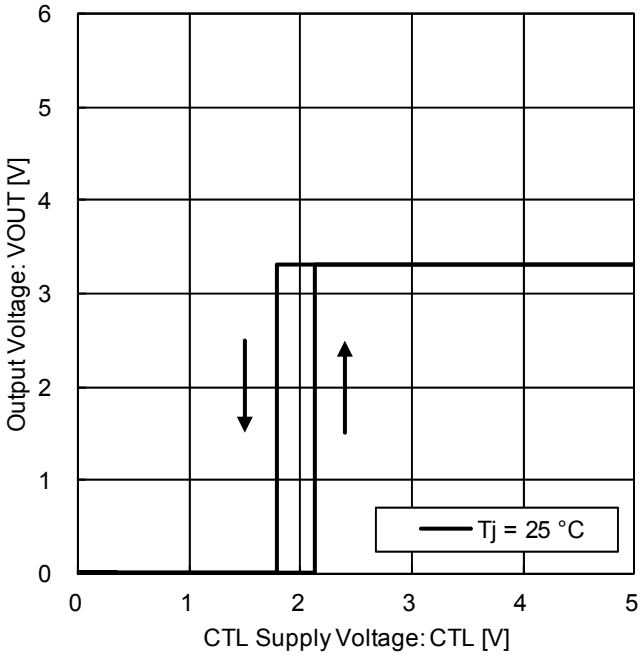


Figure 19. CTL ON / OFF Mode Voltage
(Tj = 25 °C)

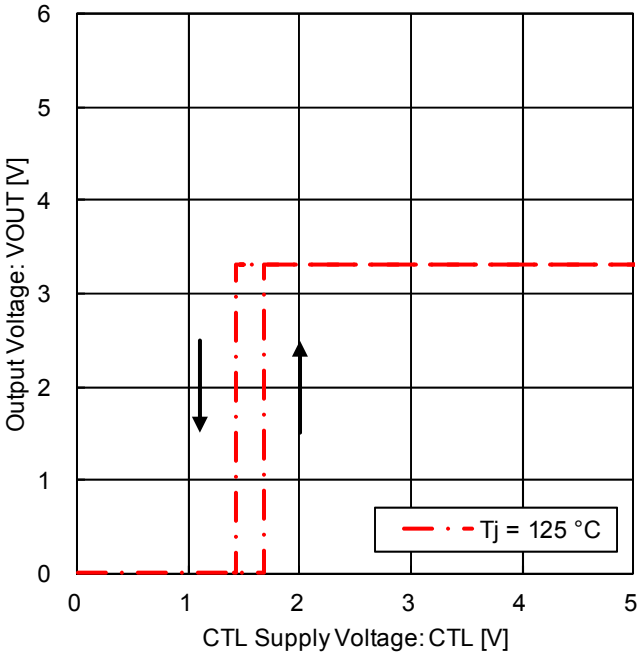


Figure 20. CTL ON / OFF Mode Voltage
(Tj = 125 °C)

●Typical Performance Curves

■BD433M5WFPJ-C / BD433M5WFP2-C Reference Data

Unless otherwise specified: -40 °C ≤ Tj ≤ +150 °C, VCC = 13.5 V, IOUT = 0 mA

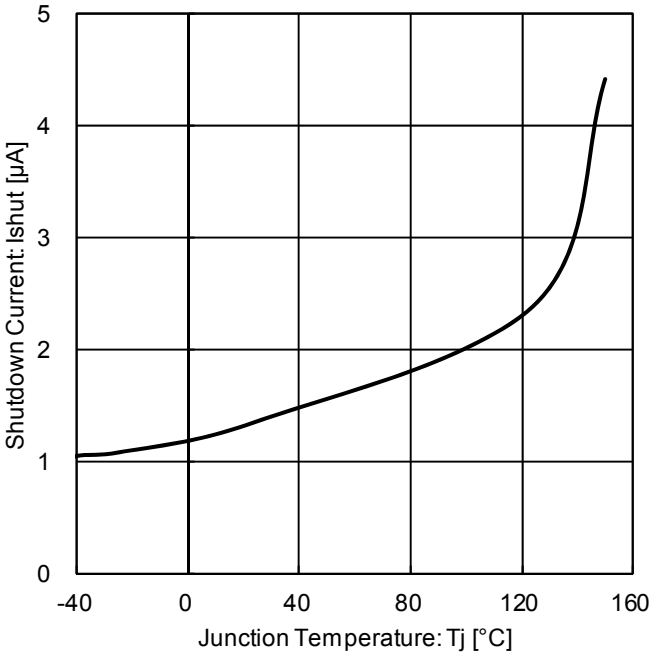


Figure 21. Shut Down Current
(CTL = 0 V)

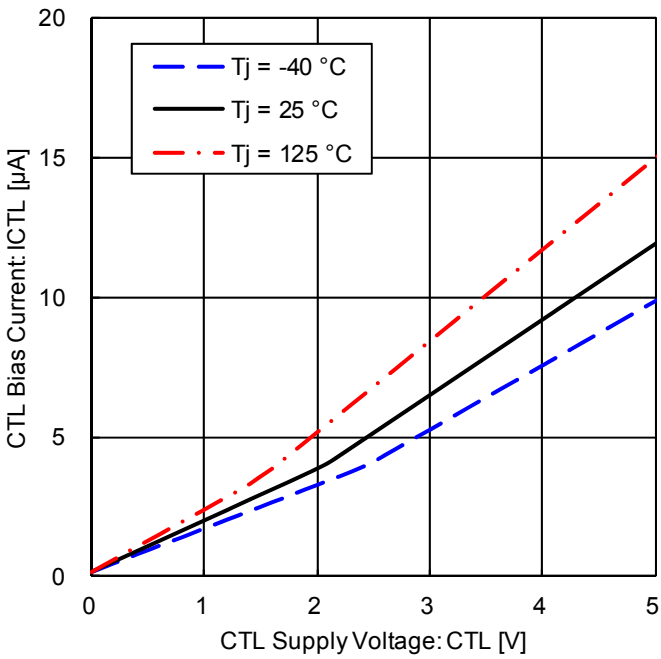


Figure 22. CTL Bias Current vs. CTL Supply Voltage

●Typical Performance Curves

■BD450M5WFPJ-C / BD450M5WFP2-C / BD450M5FP-C/BD450M5FP2-C Reference Data

Unless otherwise specified: -40 °C ≤ Tj ≤ +150 °C, VCC = 13.5 V, CTL = 5V (1), IOUT = 0 mA

(1) Applicable for Product with Enable Input.

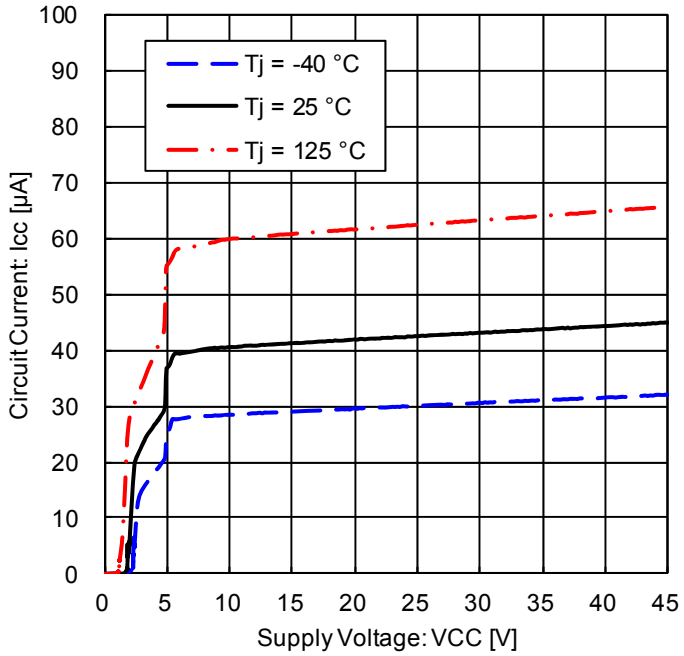


Figure 23. Circuit Current vs. Power Supply Voltage

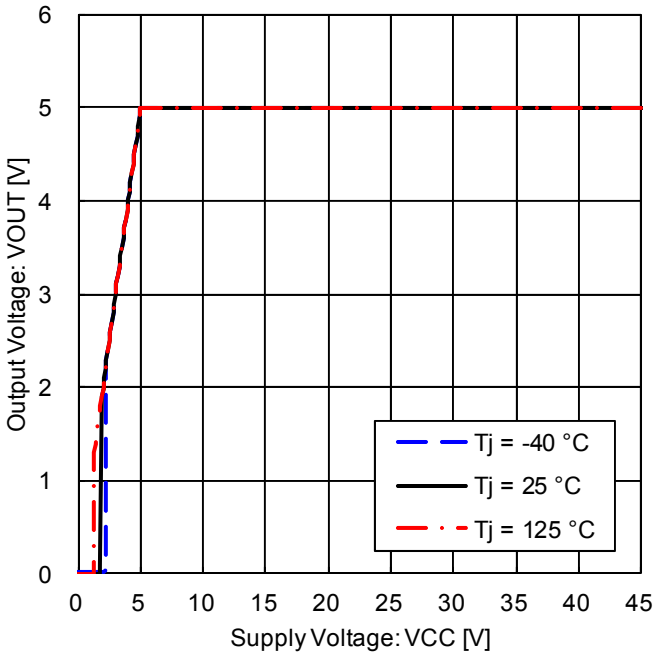


Figure 24. Output Voltage vs. Power Supply Voltage (IOUT = 0 mA)

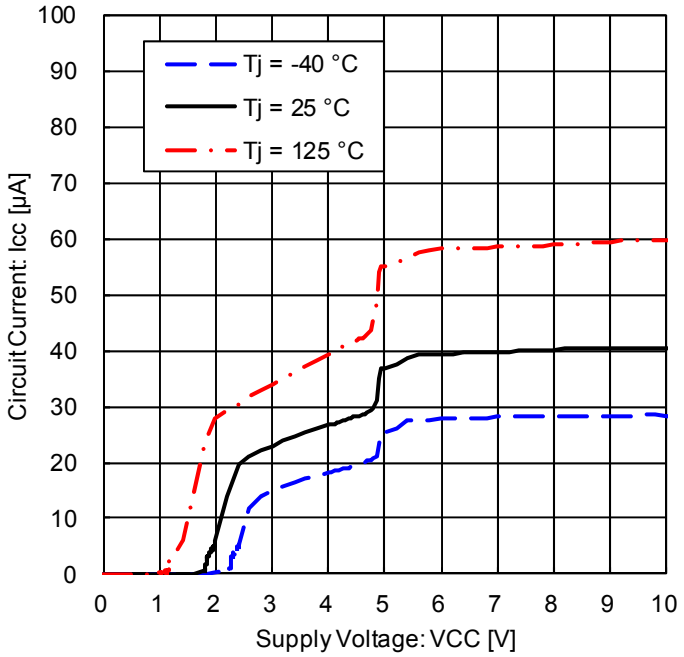


Figure 25. Circuit Current vs. Power Supply Voltage
*Magnified Figure 23. at low supply voltage

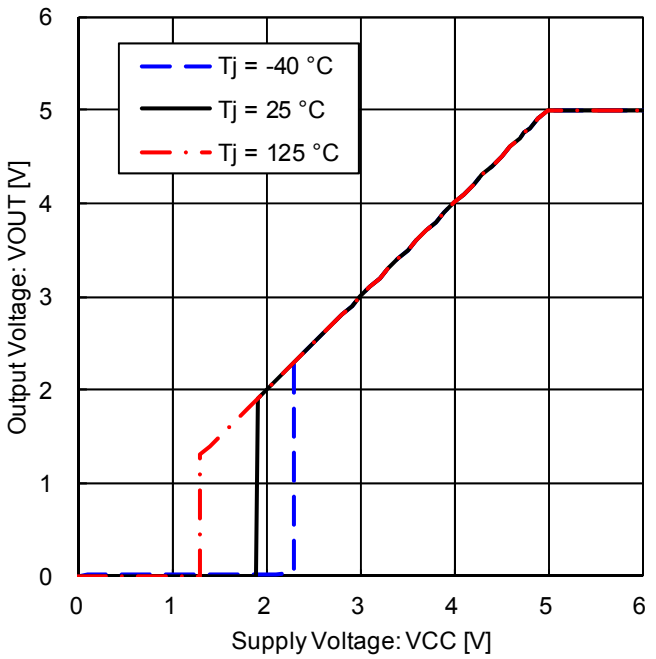


Figure 26. Output Voltage vs. Power Supply Voltage (IOUT = 0 mA)
*Magnified Figure 24. at low supply voltage

●Typical Performance Curves

■BD450M5WFPJ-C / BD450M5WFP2-C / BD450M5FP-C / BD450M5FP2-C Reference Data

Unless otherwise specified: -40 °C ≤ Tj ≤ +150 °C, VCC = 13.5 V, CTL = 5V (1), IOUT = 0 mA

(1) Applicable for Product with Enable Switch.

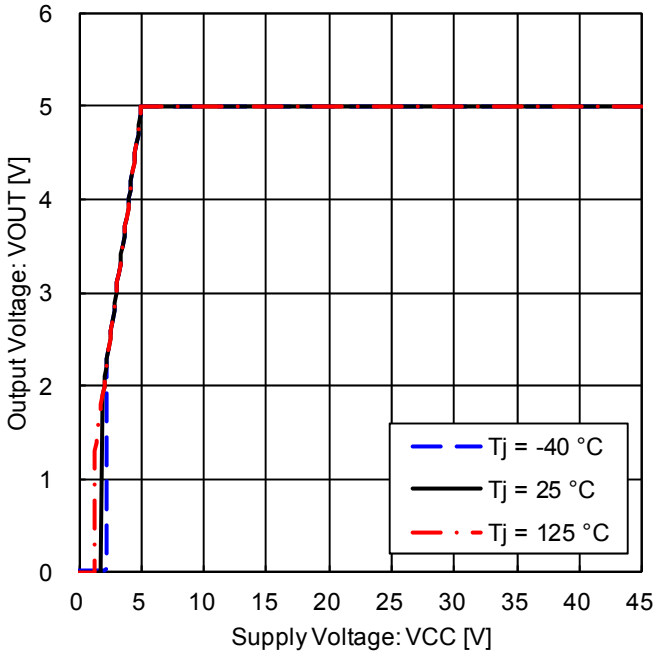


Figure 27. Output Voltage vs. Power Supply Voltage
(IOUT = 10 mA)

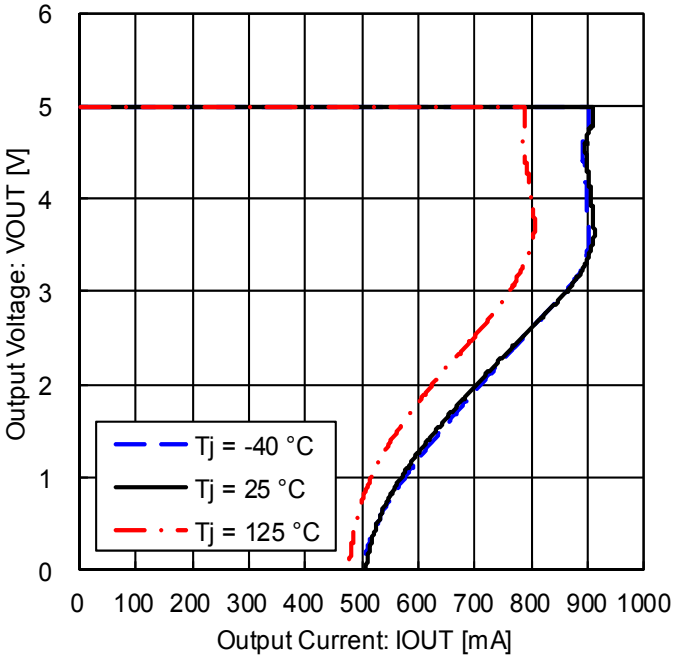


Figure 28. Output Voltage vs. Output Current
(Over Current Protection)

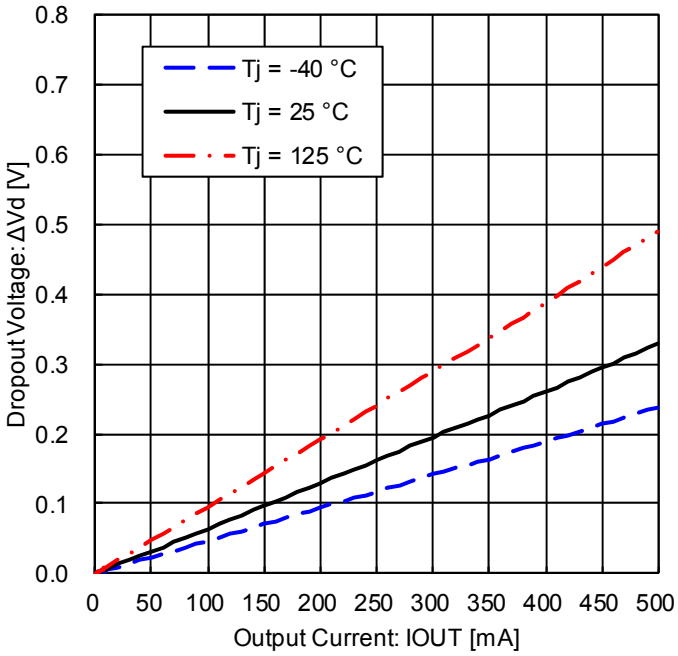


Figure 29. Dropout Voltage
(VCC=4.75V)

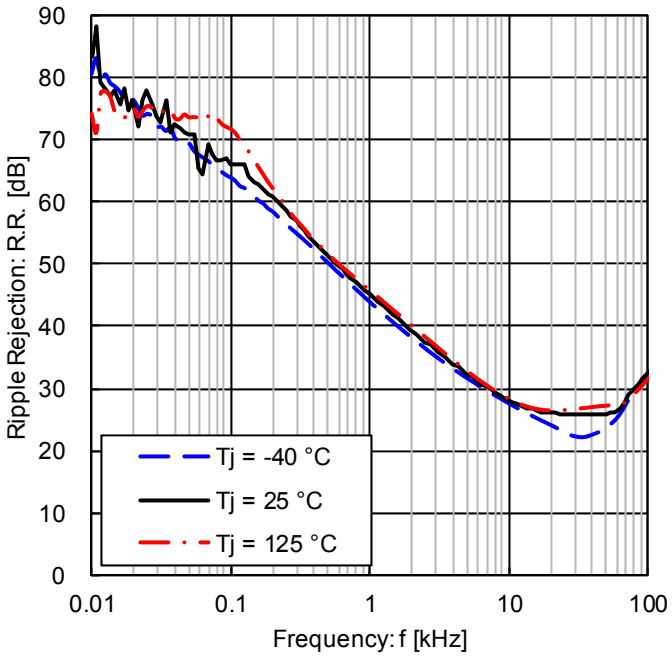


Figure 30. Ripple Rejection
(ein = 1 Vrms, IOUT = 100 mA)

●Typical Performance Curves

■BD450M5WFPJ-C / BD450M5WFP2-C / BD450M5WFP2-C / BD450M5FP-C / BD450M5FP2-C Reference Data

Unless otherwise specified: -40 °C ≤ Tj ≤ +150 °C, VCC = 13.5 V, CTL = 5V (1), IOUT = 0 mA

(1) Applicable for Product with Enable Input.

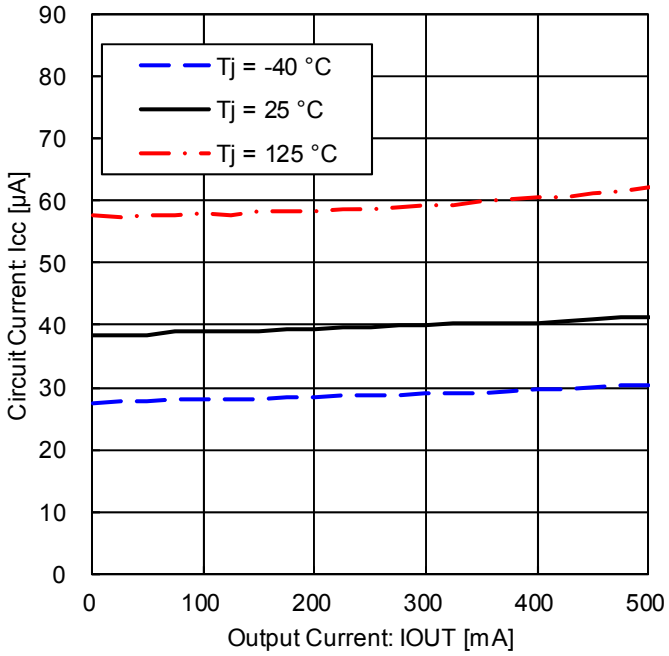


Figure 31. Circuit Current vs. Output Current

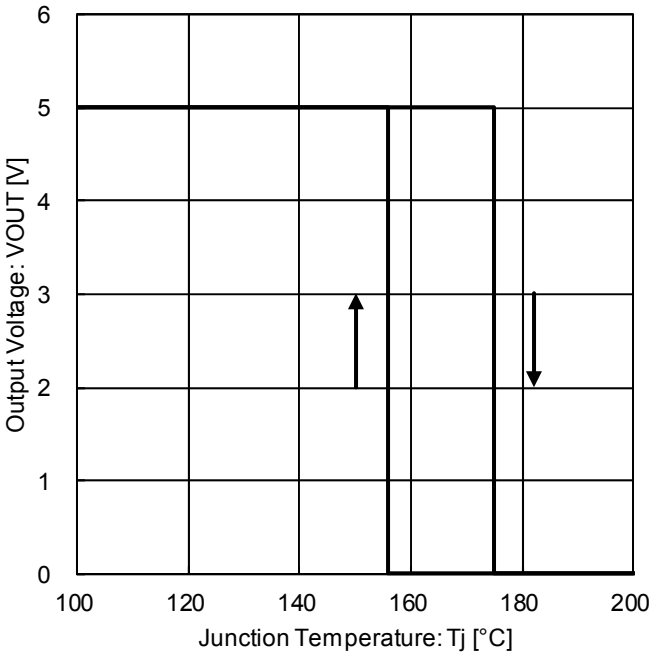


Figure 32. Output Voltage vs. Temperature
(Thermal Shut Down)

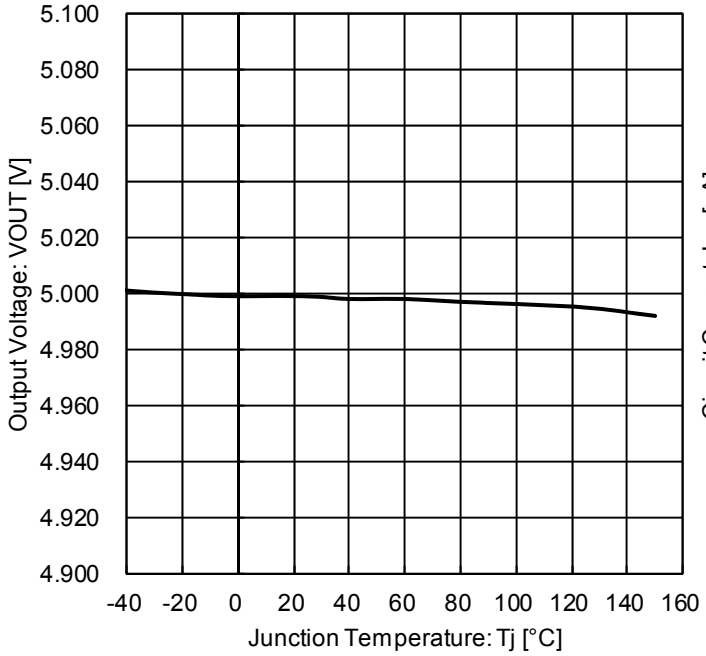


Figure 33. Output Voltage vs. Temperature

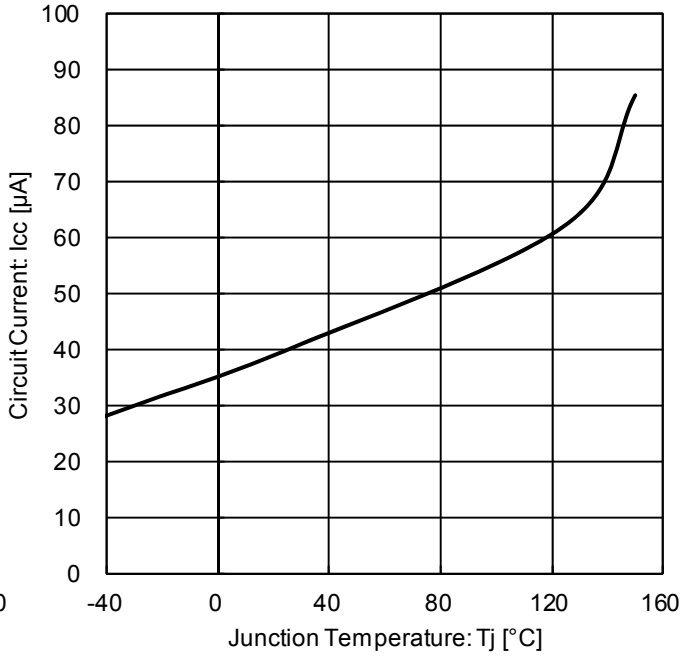


Figure 34. Circuit Current vs. Temperature

●Typical Performance Curves

■BD450M5WFPJ-C / BD450M5WFP2-C Reference Data

Unless otherwise specified: -40 °C ≤ Tj ≤ +150 °C, VCC = 13.5 V, IOUT = 0 mA

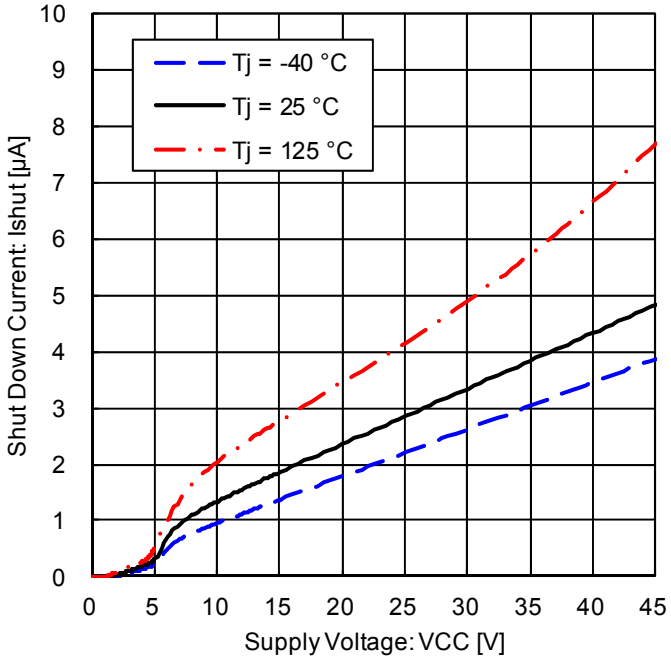


Figure 35. Shut Down Current vs. Power Supply Voltage (CTL = 0 V)

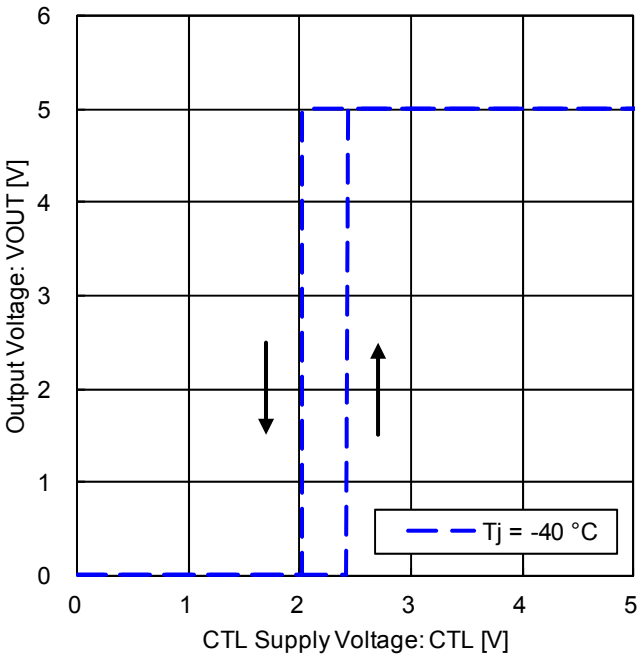


Figure 36. CTL ON / OFF Mode Voltage (Tj = -40 °C)

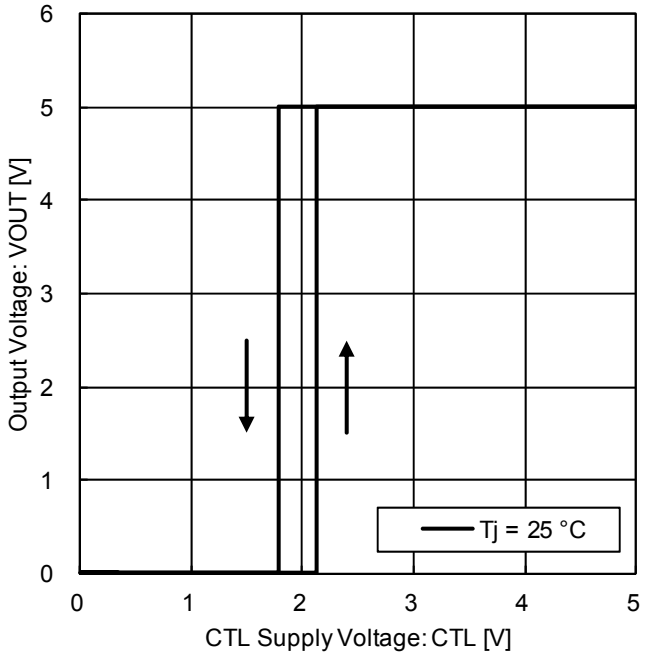


Figure 37. CTL ON / OFF Mode Voltage (Tj = 25 °C)

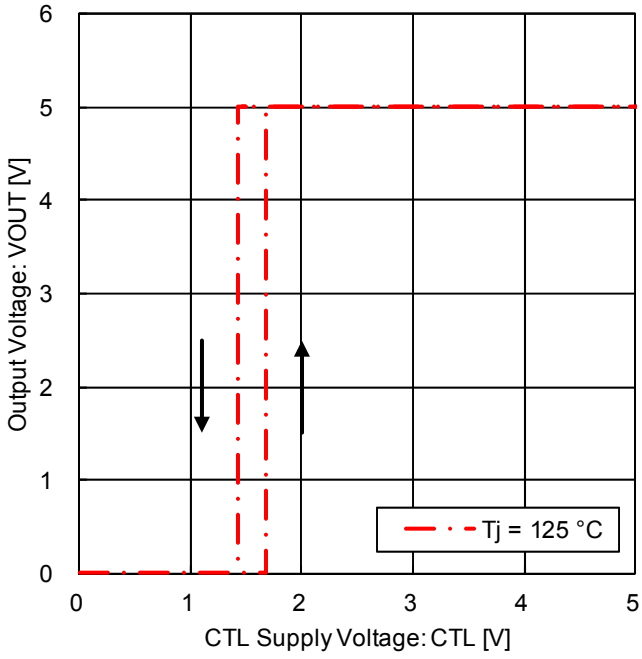


Figure 38. CTL ON / OFF Mode Voltage (Tj = 125 °C)

●Typical Performance Curves

■BD450M5WFPJ-C / BD450M5WFP2-C Reference Data

Unless otherwise specified: -40 °C ≤ Tj ≤ +150 °C, VCC = 13.5 V, IOUT = 0 mA

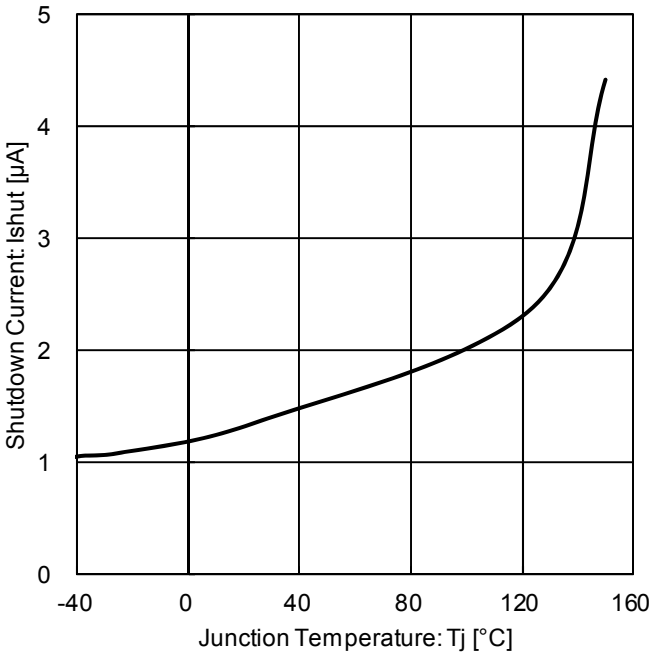


Figure 39. Shut Down Current vs. Temperature (CTL = 0 V)

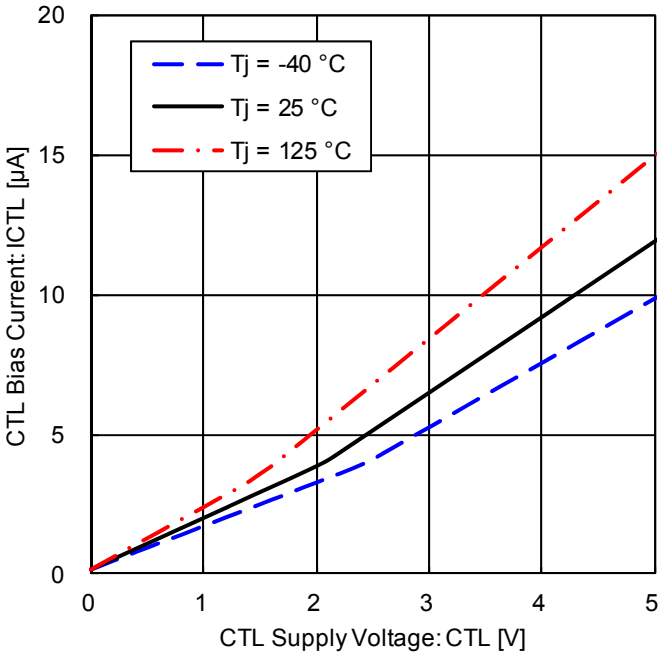
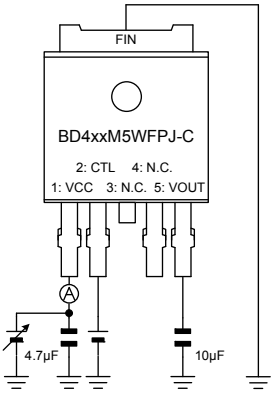
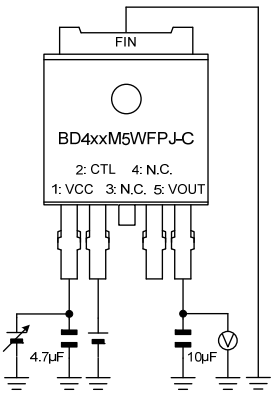


Figure 40. CTL Bias Current vs. CTL Supply Voltage

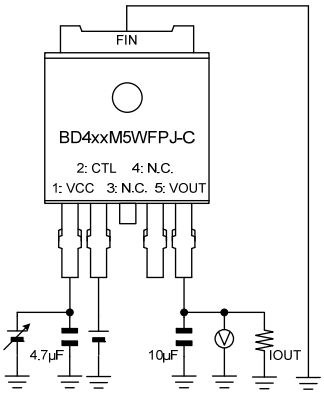
●Measurement Circuit for Typical Performance Curves (BD433 / 450M5WFPJ-C)



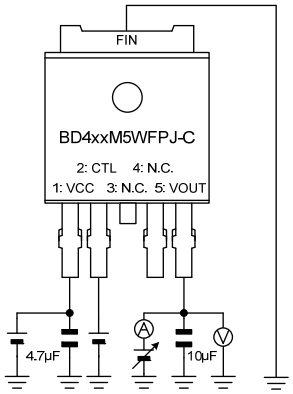
Measurement Setup for
Figure 5, 7, 16, 17, 21,
Figure 23, 25, 34, 35, 39



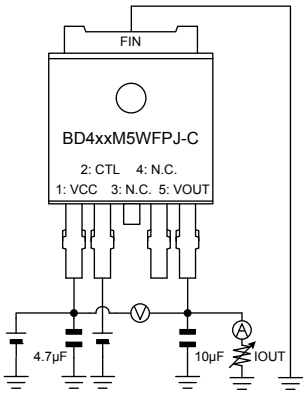
Measurement Setup for
Figure 6, 8, 14, 15,
Figure 24, 26, 32, 33



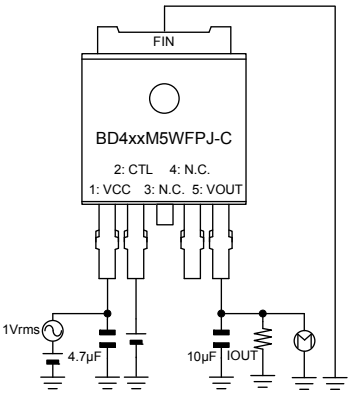
Measurement Setup for
Figure 9, 27



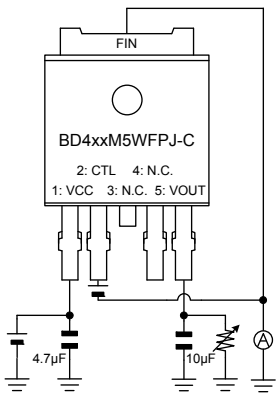
Measurement Setup for
Figure 10, 28



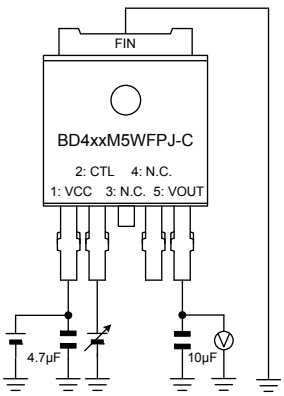
Measurement Setup for
Figure 11, 29



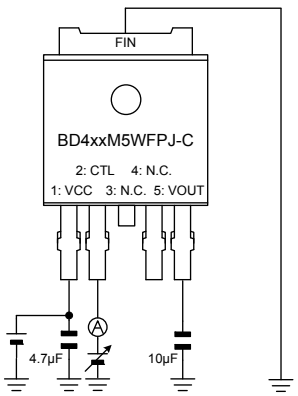
Measurement Setup for
Figure 12, 30



Measurement Setup for
Figure 13, 31

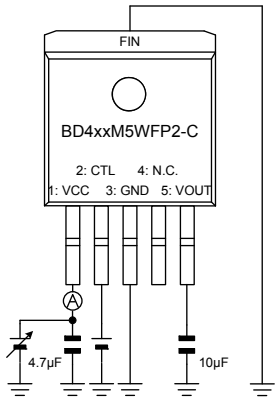


Measurement Setup for
Figure 18, 19, 20,
Figure 36, 37, 38

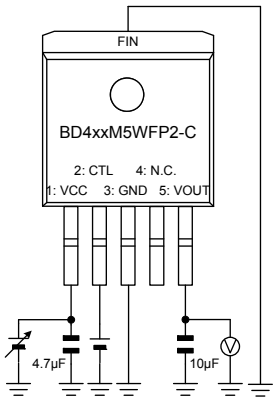


Measurement Setup for
Figure 22, 40

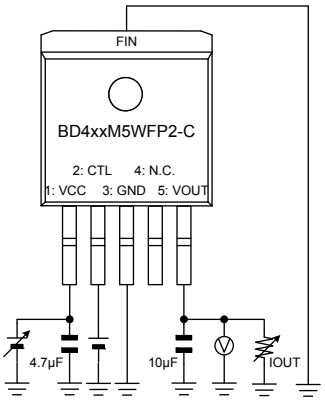
●**Measurement Circuit for Typical Performance Curves (BD433 / 450M5WFP2-C)**



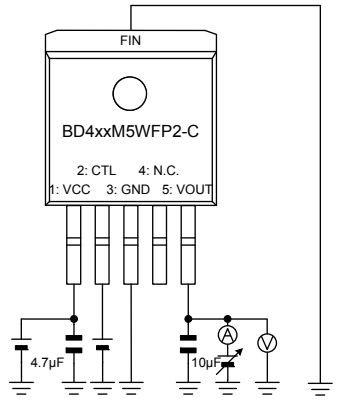
Measurement Setup for
Figure 5, 7, 16, 17, 21,
Figure 23, 25, 34, 35, 39



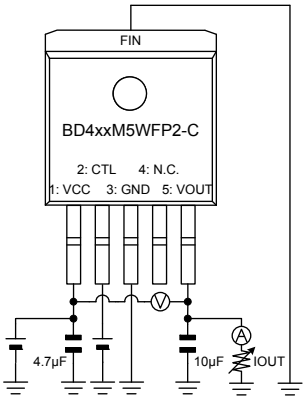
Measurement Setup for
Figure 6, 8, 14, 15,
Figure 24, 26, 32, 33



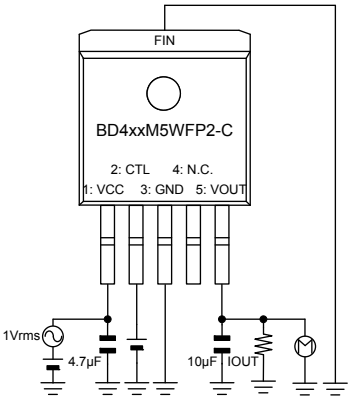
Measurement Setup for
Figure 9, 27



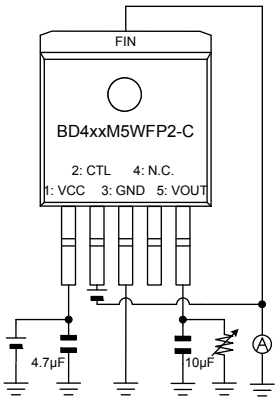
Measurement Setup for
Figure 10, 28



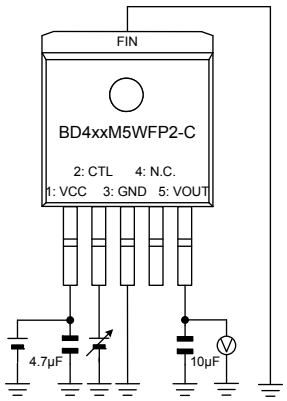
Measurement Setup for
Figure 11, 29



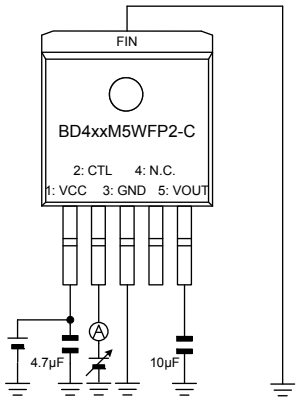
Measurement Setup for
Figure 12, 30



Measurement Setup for
Figure 13, 31

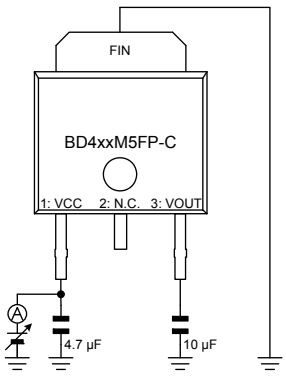


Measurement Setup for
Figure 18, 19, 20,
Figure 36, 37, 38

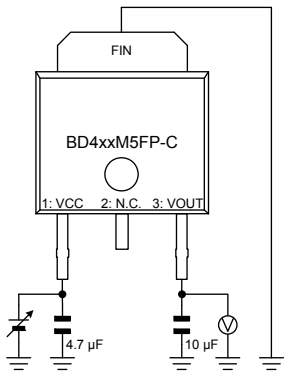


Measurement Setup for
Figure 22, 40

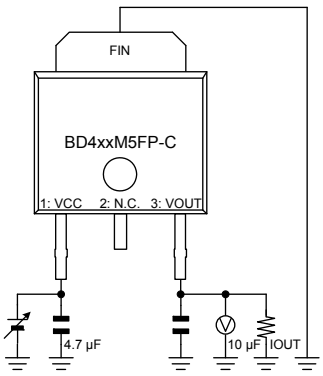
●**Measurement Circuit for Typical Performance Curves (BD433 / 450M5FP-C)**



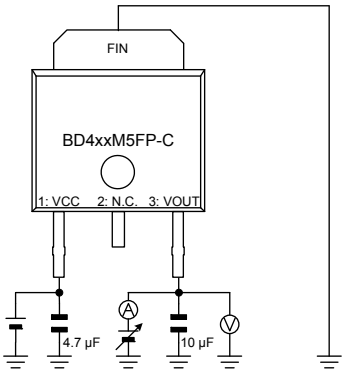
Measurement Setup for
Figure 5, 7, 16,
Figure 23, 25, 34



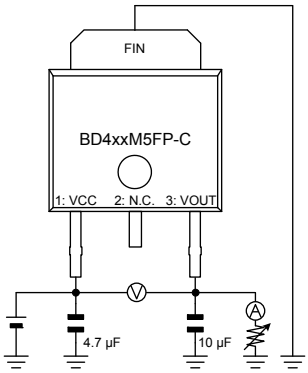
Measurement Setup for
Figure 6, 8, 14, 15,
Figure 24, 26, 32, 33



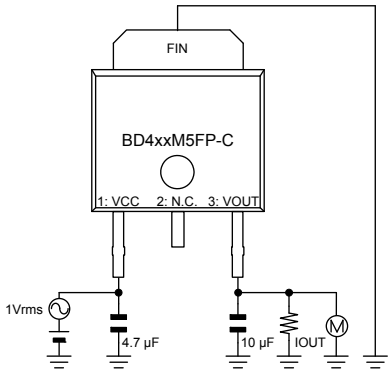
Measurement Setup for
Figure 9, 27



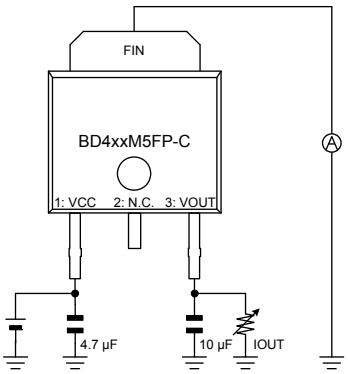
Measurement Setup for
Figure 10, 28



Measurement Setup for
Figure 11, 29

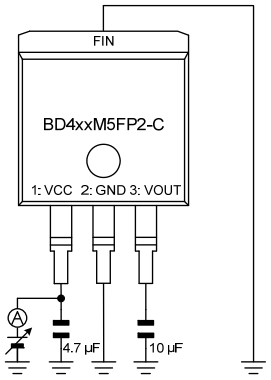


Measurement Setup for
Figure 12, 30

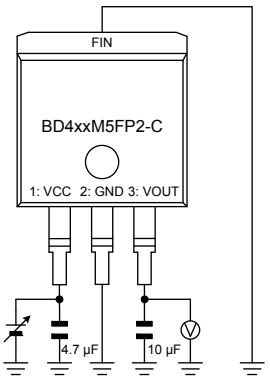


Measurement Setup for
Figure 13, 31

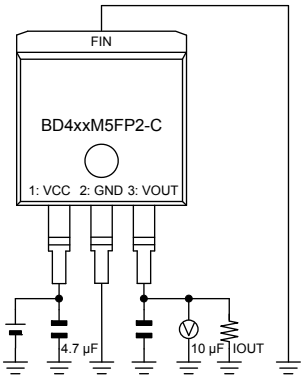
●Measurement Circuit for Typical Performance Curves (BD433 / 450M5FP2-C)



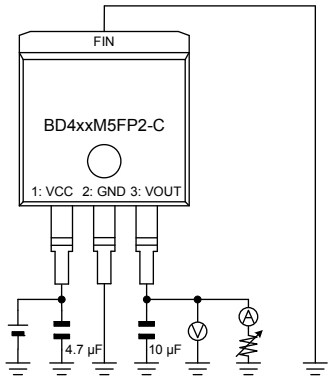
Measurement Setup for
Figure 5, 7, 16,
Figure 23, 25, 34



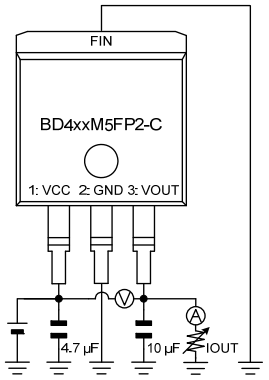
Measurement Setup for
Figure 6, 8, 14, 15,
Figure 24, 26, 32, 33



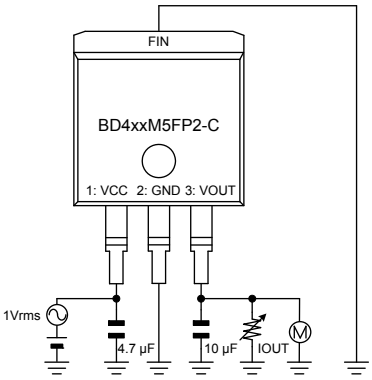
Measurement Setup for
Figure 9, 27



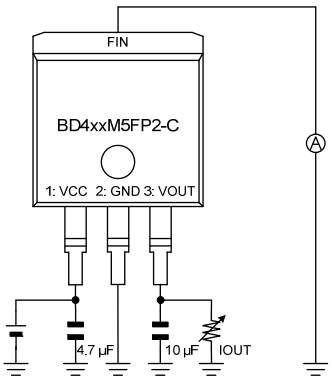
Measurement Setup for
Figure 10, 28



Measurement Setup for
Figure 11, 29



Measurement Setup for
Figure 12, 30



Measurement Setup for
Figure 13, 31

●Selection of Components Externally Connected

・VCC

Insert capacitors with a capacitance of 0.1 µF or higher between the VCC and the GND. Choose the capacitance according to the line between the power smoothing circuit and the VCC. Selection of the capacitance also depends on the application. Verify the application and allow sufficient margins in the design. We recommend using a capacitor with excellent voltage and temperature characteristics.

・Output Pin Capacitor

In order to prevent oscillation, a capacitor needs to be placed between the output pin and GND. We recommend using a capacitor with a capacitance of 10 µF (Typ.) or higher. Electrolytic, tantalum and ceramic capacitors can be used. When selecting the capacitor ensure that the capacitance of 6 µF or higher is maintained at the intended applied voltage and temperature range. Due to changes in temperature the capacitor's capacitance can fluctuate possibly resulting in oscillation. For selection of the capacitor refer to the data of Figure 41.

The stable operation range given in the data of Figure 41 and Figure 42 is based on the standalone IC and resistive load. For actual applications the stable operating range is influenced by the PCB impedance, input supply impedance and load impedance. Therefore verification of the final operating environment is needed.

When selecting a ceramic type capacitor, we recommend using X5R, X7R or better with excellent temperature and DC-biasing characteristics and high voltage tolerance.

Also, in case of rapidly fluctuation of input voltage and load current, select the capacitance in accordance with verifying that the actual application meets with the required specification. Mount the capacitor as much as possible near connected pin.

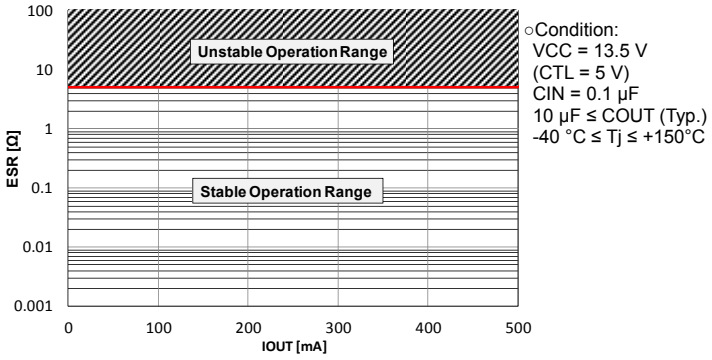


Figure 41. ESR vs. IOUT

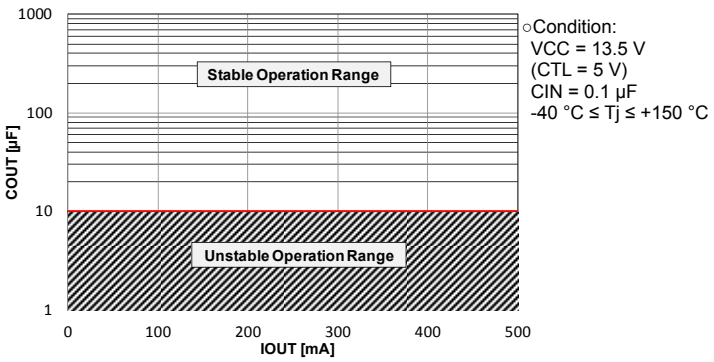


Figure 42. COUT vs. IOUT

●Measurement setup

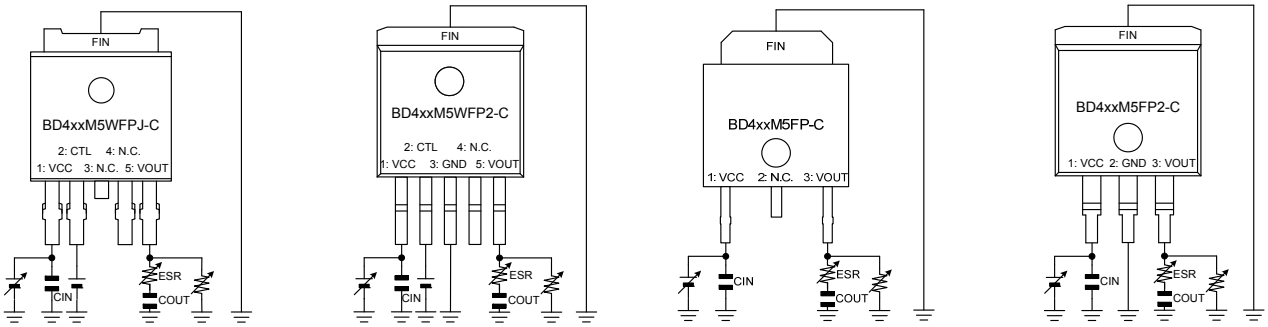
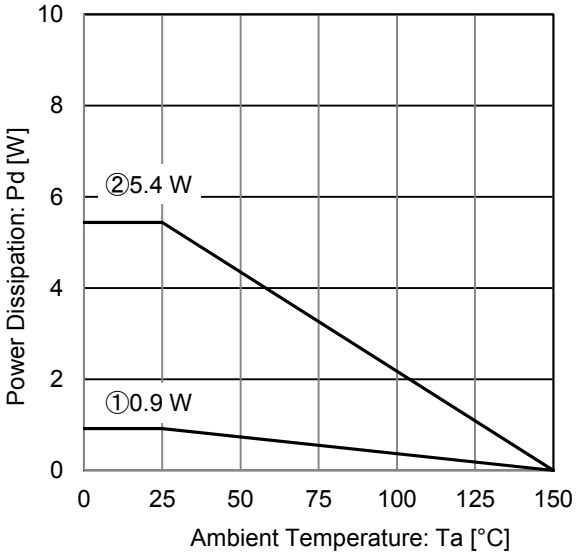


Figure 43. Measurement Setups for ESR Reference Data
(about Output Pin Capacitor)

●**Power Dissipation**

■TO252-J5(F) / TO252-3



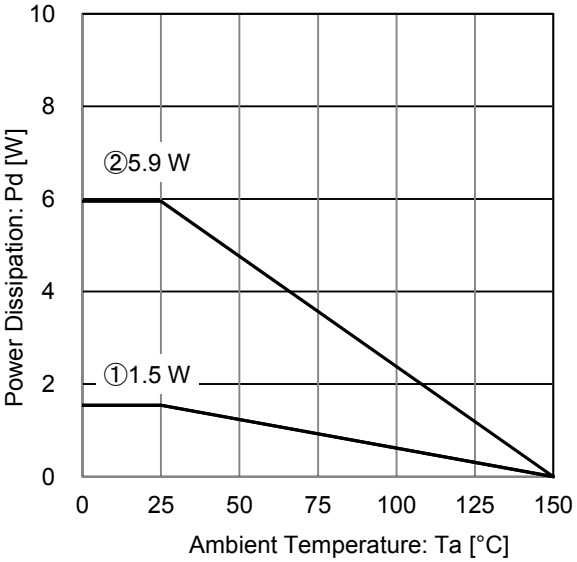
IC mounted on ROHM standard board based on JEDEC.
①: 1-layer PCB (Copper foil area on the reverse side of PCB: 0 mm × 0 mm)
Board material: FR4
Board size: 114.3mm × 76.2mm × 1.57 mmt
Mount condition: PCB and exposed pad are soldered.
Top copper foil: ROHM recommended footprint + wiring to measure, 2 oz. copper.

②: 4-layer PCB (Copper foil area on the reverse side of PCB: 74.2mm × 74.2mm)
Board material: FR4
Board size: 114.3mm × 76.2mm × 1.60 mmt
Mount condition: PCB and exposed pad are soldered.
Top copper foil: ROHM recommended footprint + wiring to measure, 2 oz. copper.
2 inner layers copper foil area of PCB: 74.2 mm × 74.2 mm, 1 oz. copper.
Copper foil area on the reverse side of PCB: 74.2 mm × 74.2 mm, 2 oz. copper.

Condition①: θ_{JA} = 136 °C/W、Ψ_{JT} (top center) = 17 °C/W
Condition②: θ_{JA} = 23 °C/W、Ψ_{JT} (top center) = 3 °C/W

Figure 44. Package Data
(TO252-J5 / TO252-3)

■TO263-5(F) / TO263-3(F)



IC mounted on ROHM standard board based on JEDEC.
①: 1-layer PCB (Copper foil area on the reverse side of PCB: 0 mm × 0 mm)
Board material: FR4
Board size: 114.3mm × 76.2mm × 1.57 mmt
Mount condition: PCB and exposed pad are soldered.
Top copper foil: ROHM recommended footprint + wiring to measure, 2 oz. copper.

②: 4-layer PCB (Copper foil area on the reverse side of PCB: 74.2mm × 74.2mm)
Board material: FR4
Board size: 114.3mm × 76.2mm × 1.60 mmt
Mount condition: PCB and exposed pad are soldered.
Top copper foil: ROHM recommended footprint + wiring to measure, 2 oz. copper.
2 inner layers copper foil area of PCB: 74.2 mm × 74.2 mm, 1 oz. copper.
Copper foil area on the reverse side of PCB: 74.2 mm × 74.2 mm, 2 oz. copper.

Condition①: θ_{JA} = 81 °C/W、Ψ_{JT} (top center) = 8 °C/W
Condition②: θ_{JA} = 21 °C/W、Ψ_{JT} (top center) = 2 °C/W

Figure 45. Package Data
(TO263-5 / TO263-3)