NCV8715

Linear Voltage Regulator - Low Dropout, Ultra-Low Iq, Wide Input Voltage

50 mA

The NCV8715 is 50 mA LDO Linear Voltage Regulator. It is a very stable and accurate device with ultra−low ground current consumption (4.7 μA over the full output load range) and a wide input voltage range (up to 24 V). The regulator incorporates several protection features such as Thermal Shutdown and Current Limiting.

Features

- Operating Input Voltage Range: 2.5 V to 24 V
- Fixed Voltage Options Available: 1.2 V to 5.0 V
- Ultra Low Quiescent Current: Max. 5.8 μA Over Full Load and Temperature
- ±2% Accuracy Over Full Load, Line and Temperature Variations
- PSRR: 52 dB at 100 kHz
- Noise: 190 μV_{RMS} from 200 Hz to 100 kHz
- Thermal Shutdown and Current Limit protection
- Available in XDFN6 1.5 x 1.5 mm and SC−70 (SC−88A) Package
- NCV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q100 Qualified and PPAP Capable; Device Temperature Grade 1: −40°C to +125°C Ambient Operating Temperature Range
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

Typical Applications

- Infotainment, Audio
- Communication Systems
- Safety Systems

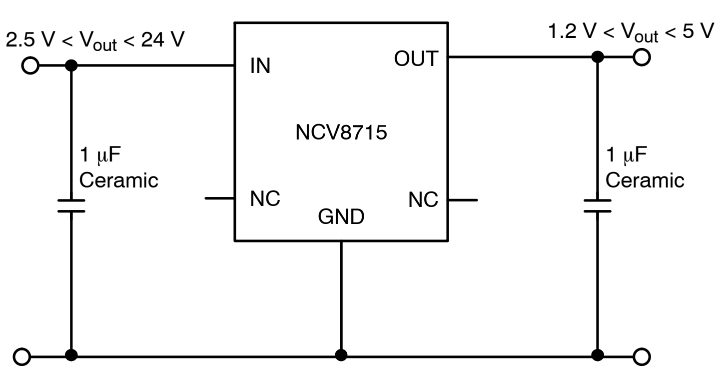

Figure 1. Typical Application Schematic

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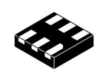
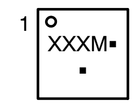
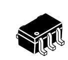
MARKING DIAGRAMS

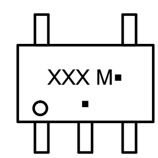


XDFN6
CASE 711AE





SC−70−5
(SC−88A)
CASE 419A



XXX	=	Specific Device Code
M	=	Date Code
▪	=	Pb−Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION

See detailed ordering, marking and shipping information on page 19 of this data sheet.

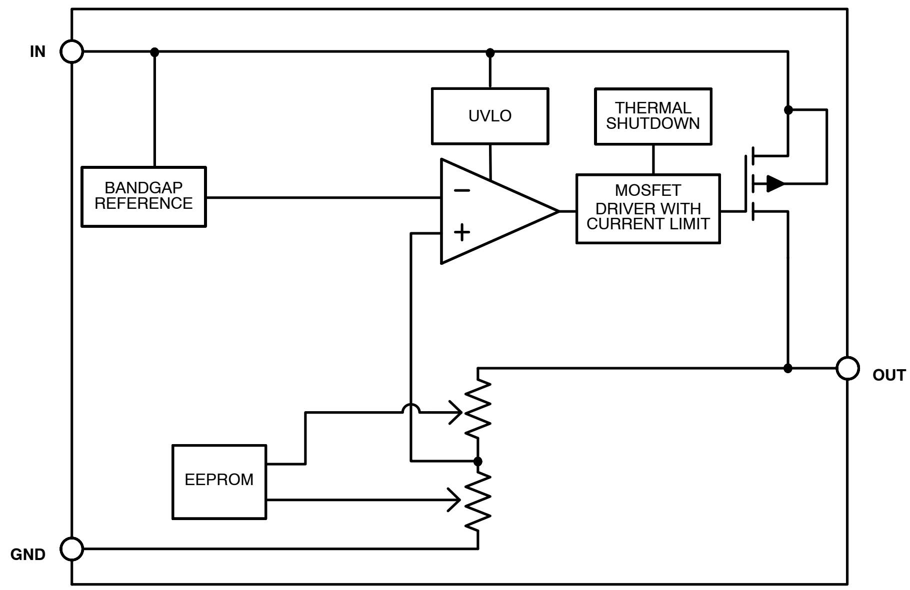


Figure 2. Simplified Block Diagram

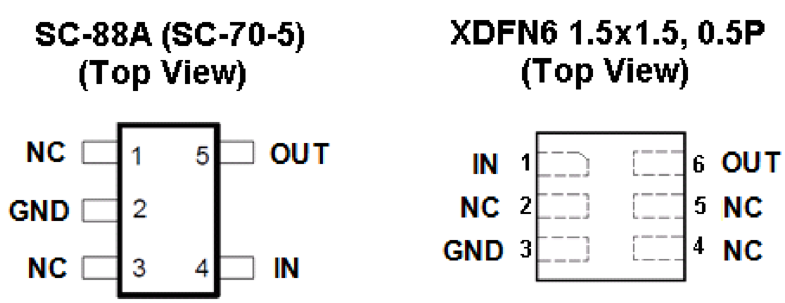


Figure 3. Pin Description

PIN FUNCTION DESCRIPTION

Pin No.		Pin Name	Description
SC–70	XDFN6		
5	6	OUT	Regulated output voltage pin. A small 0.47 μF ceramic capacitor is needed from this pin to ground to assure stability.
1	2	N/C	No connection. This pin can be tied to ground to improve thermal dissipation or left disconnected.
2	3	GND	Power supply ground.
3	4	N/C	No connection. This pin can be tied to ground to improve thermal dissipation or left disconnected.
–	5	N/C	No connection. This pin can be tied to ground to improve thermal dissipation or left disconnected.
4	1	IN	Input pin. A small capacitor is needed from this pin to ground to assure stability.

ABSOLUTE MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Input Voltage (Note 1)	V_{IN}	−0.3 to 24	V
Output Voltage	V_{OUT}	−0.3 to 6	V
Output Short Circuit Duration	t_{SC}	Indefinite	s
Maximum Junction Temperature	$T_{J(MAX)}$	150	°C
Operating Ambient Temperature Range	T_A	−40 to 125	°C
Storage Temperature Range	T_{STG}	−55 to 150	°C
Moisture Sensitivity Level	MSL	MSL1	–
ESD Capability, Human Body Model (Note 2)	ESD_{HBM}	2000	V
ESD Capability, Machine Model (Note 2)	ESD_{MM}	200	V

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Refer to ELECTRICAL CHARACTERISTICS and APPLICATION INFORMATION for Safe Operating Area.
2. This device series incorporates ESD protection and is tested by the following methods:
   ESD Human Body Model tested per EIA/JESD22−A114
   ESD Machine Model tested per EIA/JESD22−A115
   ESD Charged Device Model tested per EIA/JESD22−C101E
   Latch up Current Maximum Rating tested per JEDEC standard: JESD78.

THERMAL CHARACTERISTICS

Rating	Symbol	Value	Unit
Thermal Characteristics, SC−70 (Note 3) Thermal Resistance, Junction−to−Air (Note 4)	$R_{\theta JA}$	390	°C/W
Thermal Characteristics, XDFN6 (Note 3) Thermal Resistance, Junction−to−Air (Note 4)	$R_{\theta JA}$	260	°C/W

3. Refer to ELECTRICAL CHARACTERISTICS and APPLICATION INFORMATION for Safe Operating Area.
4. As measured using a copper heat spreading area of 650 mm^2, 1 oz copper thickness.

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Min	Max	Unit
Input Voltage	V_{IN}	2.5	24	V
Junction Temperature	T_J	−40	125	°C

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

ELECTRICAL CHARACTERISTICS – Voltage Version 1.2 V

$-40°C \le T_J \le 125°C$; V_{IN} = 2.5 V; I_{OUT} = 1 mA, C_{IN} = C_{OUT} = 1.0 μF, unless otherwise noted. Typical values are at T_J = +25°C. (Note 7)

Parameter	Test Conditions		Symbol	Min	Typ	Max	Unit
Operating Input Voltage	$I_{OUT} \le 10$ mA		V_{IN}	2.5		24	V
	10 mA< I_{OUT} < 50 mA			3.0		24	
Output Voltage Accuracy	3.0 V < V_{IN} < 24 V, 0 mA < I_{OUT} < 50 mA		V_{OUT}	1.164	1.2	1.236	V
Line Regulation	2.5 V ≤ V_{IN} ≤ 24 V, I_{OUT} = 1 mA		Reg_{LINE}		2	10	mV
Load Regulation	I_{OUT} = 0 mA to 50 mA		Reg_{LOAD}		5	10	mV
Dropout Voltage (Note 5)			V_{DO}			–	mV
Maximum Output Current	(Note 8)		I_{OUT}	100		200	mA
	0 < I_{OUT} < 50 mA, V_{IN} = 24 V		I_{GND}		3.4	5.8	
Power Supply Rejection Ratio	V_{IN} = 3.0 V, V_{OUT} = 1.2 V V_{PP} = 200 mV modulation I_{OUT} = 1 mA, C_{OUT}= 10 μF	f = 100 kHz	PSRR		60		dB
Output Noise Voltage	V_{OUT} = 1.2 V, I_{OUT} = 50 mA f = 200 Hz to 100 kHz, C_{OUT} = 10 μF		V_N		65		μV_{rms}
Thermal Shutdown Temperature (Note 6)	Temperature increasing from T_J = +25°C		T_{SD}		170		°C
Thermal Shutdown Hysteresis (Note 6)	Temperature falling from T_{SD}		T_{SDH}	–	15	–	°C

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

5. Not Characterized at V_{IN} = 3.0 V, V_{OUT} = 1.2 V, I_{OUT} = 50 mA.
6. Guaranteed by design and characterization.
7. Performance guaranteed over the indicated operating temperature range by design and/or characterization production tested at T_J = T_A = 25°C. Low duty cycle pulse techniques are used during testing to maintain the junction temperature as close to ambient as possible.
8. Respect SOA.

ELECTRICAL CHARACTERISTICS – Voltage Version 1.5 V

$-40°C \le T_J \le 125°C$; V_{IN} = 2.5 V; I_{OUT} = 1 mA, C_{IN} = C_{OUT} = 1.0 µF, unless otherwise noted. Typical values are at T_J = +25°C. (Note 11)

Parameter	Test Conditions		Symbol	Min	Typ	Max	Unit
Operating Input Voltage	$I_{OUT} \le 10$ mA		V_{IN}	2.5		24	V
	10 mA < I_{OUT} < 50 mA			3.0		24	
Output Voltage Accuracy	3.0 V < V_{IN} < 24 V, 0 < I_{OUT} < 50 mA		V_{OUT}	1.455	1.5	1.545	V
Line Regulation	V_{OUT} + 1 V ≤ V_{IN} ≤ 24 V, I_{OUT} = 1 mA		Reg_{LINE}		2	10	mV
Load Regulation	I_{OUT} = 0 mA to 50 mA		Reg_{LOAD}		5	10	mV
Dropout Voltage (Note 9)			V_{DO}			–	mV
Maximum Output Current	(Note 12)		I_{OUT}	100		200	mA
Ground Current	0 < I_{OUT} < 50 mA, V_{IN} = 24 V		I_{GND}		3.4	5.8	µA
Power Supply Rejection Ratio	V_{IN} = 3.0 V, V_{OUT} = 1.5 V V_{PP} = 200 mV modulation I_{OUT} = 1 mA, C_{OUT} = 10 µF	f = 100 kHz	PSRR		56		dB
Output Noise Voltage	V_{OUT} = 1.5 V, I_{OUT} = 50 mA f = 200 Hz to 100 kHz, C_{OUT} = 10 µF		V_N		75		μV_{rms}
Thermal Shutdown Temperature (Note 10)	Temperature increasing from T_J = +25°C		T_{SD}		170		°C
Thermal Shutdown Hysteresis (Note 10)	Temperature falling from T_{SD}		T_{SDH}	–	15	–	°C

9. Not Characterized at V_{IN} = 3.0 V, V_{OUT} = 1.5 V, I_{OUT} = 50 mA.
10. Guaranteed by design and characterization.
11. Performance guaranteed over the indicated operating temperature range by design and/or characterization production tested at $T_J = T_A$ = 25°C. Low duty cycle pulse techniques are used during testing to maintain the junction temperature as close to ambient as possible.
12. Respect SOA.

ELECTRICAL CHARACTERISTICS – Voltage Version 1.8 V

$-40°C \le T_J \le 125°C$; V_{IN} = 2.8V; I_{OUT} = 1 mA, C_{IN} = C_{OUT} = 1.0 μF, unless otherwise noted. Typical values are at T_J = +25°C. (Note 15)

Parameter	Test Conditions		Symbol	Min	Typ	Max	Unit
Operating Input Voltage	I_{OUT} ≤10 mA		V_{IN}	2.8		24	V
	10 mA < I_{OUT} < 50 mA			3.0		24	
Output Voltage Accuracy	3.0 V < V_{IN} < 24 V, 0 < I_{OUT} < 10 mA		V_{OUT}	1.746	1.8	1.854	V
Line Regulation	3 V ≤ V_{IN} ≤ 24 V, I_{OUT} = 1 mA		Reg_{LINE}		2	10	mV
Load Regulation	I_{OUT} = 0 mA to 50 mA		Reg_{LOAD}		5	10	mV
Dropout Voltage (Note 13)			V_{DO}				mV
Maximum Output Current	(Note 16)		I_{OUT}	100		200	mA
Ground Current	0 < I_{OUT} < 50 mA, V_{IN} = 24 V		I_{GND}		3.4	5.8	μA
Power Supply Rejection Ratio	V_{IN} = 3.0 V, V_{OUT} = 1.8 V V_{PP} = 200 mV modulation I_{OUT} = 1 mA, C_{OUT} =10 μF	f = 100 kHz	PSRR		60		dB
Output Noise Voltage	V_{OUT} = 1.8 V, I_{OUT} = 50 mA f = 200 Hz to 100 kHz, C_{OUT} = 10 μF		V_N		95		$μV_{rms}$
Thermal Shutdown Temperature (Note 14)	Temperature increasing from T_J = +25°C		T_{SD}		170		°C
Thermal Shutdown Hysteresis (Note 14)	Temperature falling from T_{SD}		T_{SDH}	–	15	–	°C

13. Not characterized at V_{IN} = 3.0 V, V_{OUT} = 1.8 V, I_{OUT} = 50 mA
14. Guaranteed by design and characterization.
15. Performance guaranteed over the indicated operating temperature range by design and/or characterization production tested at T_J = T_A = 25°C. Low duty cycle pulse techniques are used during testing to maintain the junction temperature as close to ambient as possible.
16. Respect SOA.

ELECTRICAL CHARACTERISTICS – Voltage Version 2.1 V

$-40°C \le T_J \le 125°C$; V_{IN} = 3.1V; I_{OUT} = 1 mA, $C_{IN} = C_{OUT}$ = 1.0 μF, unless otherwise noted. Typical values are at T_J = +25°C. (Note 19)

Parameter	Test Conditions		Symbol	Min	Typ	Max	Unit
Operating Input Voltage	0 < I_{OUT} < 50 mA		V_{IN}	3.1		24	V
Output Voltage Accuracy	3.1 V < V_{IN} < 24 V, 0 < I_{OUT} < 50 mA		V_{OUT}	2.058	2.1	2.142	V
Line Regulation	3.1 V ≤ V_{IN} ≤ 24 V, I_{OUT} = 1 mA		Reg_{LINE}		3	45	mV
	3.3 V ≤ V_{IN} ≤ 24 V, I_{OUT} = 1 mA				3	10	
Load Regulation	I_{OUT} = 0 mA to 50 mA		Reg_{LOAD}		10	15	mV
Dropout Voltage (Note 17)			V_{DO}				mV
Maximum Output Current	(Note 20)		I_{OUT}	100		200	mA
Ground Current	0 < I_{OUT} < 50 mA, V_{IN} = 24 V		I_{GND}		3.4	5.8	μA
Power Supply Rejection Ratio	V_{IN} = 3.1 V, V_{OUT} = 2.1 V V_{PP} = 200 mV modulation I_{OUT} = 1 mA, C_{OUT} =10 μF	f = 100 kHz	PSRR		60		dB
Output Noise Voltage	V_{OUT} = 2.1 V, I_{OUT} = 50 mA f = 200 Hz to 100 kHz, C_{OUT} = 10 μF		V_N		105		μV_{rms}
Thermal Shutdown Temperature (Note 18)	Temperature increasing from T_J = +25°C		T_{SD}		170		°C
Thermal Shutdown Hysteresis (Note 18)	Temperature falling from T_{SD}		T_{SDH}	–	15	–	°C

17. Not characterized at V_{IN} = 3.1 V, V_{OUT} = 2.1 V, I_{OUT} = 50 mA
18. Guaranteed by design and characterization.
19. Performance guaranteed over the indicated operating temperature range by design and/or characterization production tested at $T_J = T_A$ = 25°C. Low duty cycle pulse techniques are used during testing to maintain the junction temperature as close to ambient as possible.
20. Respect SOA.

ELECTRICAL CHARACTERISTICS – Voltage Version 2.5 V

$-40°C \le T_J \le 125°C$; V_{IN} = 3.5 V; I_{OUT} = 1 mA, C_{IN} = C_{OUT} = 1.0 μF, unless otherwise noted. Typical values are at T_J = +25°C. (Note 23)

Parameter	Test Conditions		Symbol	Min	Typ	Max	Unit
Operating Input Voltage	$0 < I_{OUT} < 50$ mA		V_{IN}	3.5		24	V
Output Voltage Accuracy	3.5 V < V_{IN} < 24 V, $0 < I_{OUT} < 50$ mA		V_{OUT}	2.45	2.5	2.55	V
Line Regulation	V_{OUT} + 1 V ≤ V_{IN} ≤ 24 V, I_{OUT} = 1 mA		Reg_{LINE}		3	10	mV
Load Regulation	I_{OUT} = 0 mA to 50 mA		Reg_{LOAD}		10	15	mV
Dropout Voltage (Note 21)	$V_{DO} = V_{IN} - (V_{OUT(NOM)} - 125$ mV) I_{OUT} = 50 mA		V_{DO}		260	450	mV
Maximum Output Current	(Note 24)		I_{OUT}	100		200	mA
Ground Current	$0 < I_{OUT} < 50$ mA, V_{IN} = 24 V		I_{GND}		3.4	5.8	μA
Power Supply Rejection Ratio	V_{IN} = 3.5 V, V_{OUT} = 2.5 V V_{PP} = 200 mV modulation I_{OUT} = 1 mA, C_{OUT} =10 μF	f = 100 kHz	PSRR		60		dB
Output Noise Voltage	V_{OUT} = 2.5 V, I_{OUT} = 50 mA f = 200 Hz to 100 kHz, C_{OUT} = 10 μF		V_N		115		μV_{rms}
Thermal Shutdown Temperature (Note 22)	Temperature increasing from T_J = +25°C		T_{SD}		170		°C
Thermal Shutdown Hysteresis (Note 22)	Temperature falling from T_{SD}		T_{SDH}	–	15	–	°C

21. Characterized when V_{OUT} falls 125 mV below the regulated voltage and only for devices with V_{OUT} = 2.5 V.
22. Guaranteed by design and characterization.
23. Performance guaranteed over the indicated operating temperature range by design and/or characterization production tested at $T_J = T_A$ = 25°C. Low duty cycle pulse techniques are used during testing to maintain the junction temperature as close to ambient as possible.
24. Respect SOA.

ELECTRICAL CHARACTERISTICS – Voltage Version 3.0 V

$-40°C \le T_J \le 125°C$; V_{IN} = 4.0 V; I_{OUT} = 1 mA, $C_{IN} = C_{OUT}$ = 1.0 µF, unless otherwise noted. Typical values are at T_J = +25°C. (Note 27)

Parameter	Test Conditions		Symbol	Min	Typ	Max	Unit
Operating Input Voltage	0 < I_{OUT} < 50 mA		V_{IN}	4.0		24	V
Output Voltage Accuracy	4.0 V < V_{IN} < 24 V, 0< I_{OUT} < 50 mA		V_{OUT}	2.94	3.0	3.06	V
Line Regulation	V_{OUT} + 1 V ≤ V_{IN} ≤ 24 V, I_{OUT} = 1 mA		Reg_{LINE}		3	10	mV
Load Regulation	I_{OUT} = 0 mA to 50 mA		Reg_{LOAD}		10	15	mV
Dropout voltage (Note 25)	$V_{DO} = V_{IN} - (V_{OUT(NOM)}$ – 150 mV) I_{OUT} = 50 mA		V_{DO}		250	400	mV
Maximum Output Current	(Note 28)		I_{OUT}	100		200	mA
Ground current	0 < I_{OUT} < 50 mA, V_{IN} = 24 V		I_{GND}		3.4	5.8	µA
Power Supply Rejection Ratio	V_{IN} = 4.0 V, V_{OUT} = 3.0 V V_{PP} = 100 mV modulation I_{OUT} = 1 mA, C_{OUT} = 10 µF	f = 100 kHz	PSRR		60		dB
Output Noise Voltage	V_{OUT} = 3 V, I_{OUT} = 50 mA, f = 200 Hz to 100 kHz, C_{OUT} = 10 µF		V_N		135		μV_{rms}
Thermal Shutdown Temperature (Note 26)	Temperature increasing from T_J = +25°C		T_{SD}		170		°C
Thermal Shutdown Hysteresis (Note 26)	Temperature falling from T_{SD}		T_{SDH}	-	25	-	°C

25. Characterized when V_{OUT} falls 150 mV below the regulated voltage and only for devices with V_{OUT} = 3.0 V
26. Guaranteed by design and characterization.
27. Performance guaranteed over the indicated operating temperature range by design and/or characterization production tested at $T_J = T_A$ = 25°C. Low duty cycle pulse techniques are used during testing to maintain the junction temperature as close to ambient as possible.
28. Respect SOA

ELECTRICAL CHARACTERISTICS – Voltage Version 3.3 V

$-40°C \le T_J \le 125°C$; V_{IN} = 4.3 V; I_{OUT} = 1 mA, C_{IN} = C_{OUT} = 1.0 μF, unless otherwise noted. Typical values are at T_J = +25°C. (Note 31)

Parameter	Test Conditions		Symbol	Min	Typ	Max	Unit
Operating Input Voltage	0 < I_{OUT} < 50 mA		V_{IN}	4.3		24	V
Output Voltage Accuracy	4.3 V < V_{IN} < 24 V, 0 < I_{OUT} < 50 mA		V_{OUT}	3.234	3.3	3.366	V
Line Regulation	V_{OUT} + 1 V ≤ V_{IN} ≤ 24 V, I_{OUT} = 1 mA		Reg_{LINE}		3	10	mV
Load Regulation	I_{OUT} = 0 mA to 50 mA		Reg_{LOAD}		10	15	mV
Dropout Voltage (Note 29)	V_{DO} = V_{IN} – ($V_{OUT(NOM)}$ – 165 mV) I_{OUT} = 50 mA		V_{DO}		230	350	mV
Maximum Output Current	(Note 32)		I_{OUT}	100		200	mA
Ground Current	0 < I_{OUT} < 50 mA, V_{IN} = 24 V		I_{GND}		3.4	5.8	μA
Power Supply Rejection Ratio	V_{IN} = 4.3 V, V_{OUT} = 3.3 V V_{PP} = 200 mV modulation I_{OUT} = 1 mA, C_{OUT} =10 μF	f = 100 kHz	PSRR		60		dB
Output Noise Voltage	V_{OUT} = 4.3 V, I_{OUT} = 50 mA f = 200 Hz to 100 kHz, C_{OUT} = 10 μF		V_N		140		μV_{rms}
Thermal Shutdown Temperature (Note 30)	Temperature increasing from T_J = +25°C		T_{SD}		170		°C
Thermal Shutdown Hysteresis (Note 30)	Temperature falling from T_{SD}		T_{SDH}	–	15	–	°C

29. Characterized when V_{OUT} falls 165 mV below the regulated voltage and only for devices with V_{OUT} = 3.3 V.
30. Guaranteed by design and characterization.
31. Performance guaranteed over the indicated operating temperature range by design and/or characterization production tested at T_J = T_A = 25°C. Low duty cycle pulse techniques are used during testing to maintain the junction temperature as close to ambient as possible.
32. Respect SOA.

ELECTRICAL CHARACTERISTICS – Voltage Version 5.0 V

$-40°C \le T_J \le 125°C$; V_{IN} = 6.0 V; I_{OUT} = 1 mA, C_{IN} = C_{OUT} = 1 μF, unless otherwise noted. Typical values are at T_J = +25°C. (Note 35)

Parameter	Test Conditions		Symbol	Min	Typ	Max	Unit
Operating Input Voltage	0 < I_{OUT} < 50 mA		V_{IN}	6.0		24	V
Output Voltage Accuracy	6.0V < V_{IN} < 24V, 0< I_{OUT} < 50 mA		V_{OUT}	4.9	5.0	5.1	V
Line Regulation	V_{OUT} + 1 V ≤ V_{IN} ≤ 24 V, Iout = 1mA		Reg_{LINE}		3	10	mV
Load Regulation	I_{OUT} = 0 mA to 50 mA		Reg_{LOAD}		10	20	mV
Dropout Voltage (Note 33)	V_{DO} = V_{IN} – ($V_{OUT(NOM)}$ – 250 mV) I_{OUT} = 50 mA		V_{DO}		230	350	mV
Maximum Output Current	(Note 36)		I_{OUT}	90		200	mA
Ground Current	0 < I_{OUT} < 50 mA, V_{IN} = 24 V		I_{GND}		3.4	5.8	μA
Power Supply Rejection Ratio	V_{IN} = 6.0 V, V_{OUT} = 5.0 V V_{PP} = 200 mV modulation I_{OUT} = 1 mA, C_{OUT} =10 μF	f = 100 kHz	PSRR		56		dB
Output Noise Voltage	V_{OUT} = 5.0 V, I_{OUT} = 50 mA f = 200 Hz to 100 kHz, C_{OUT} = 10 μF		V_N		190		μV_{rms}
Thermal Shutdown Temperature (Note 34)	Temperature increasing from T_J = +25°C		T_{SD}		170		°C
Thermal Shutdown Hysteresis (Note 34)	Temperature falling from T_{SD}		T_{SDH}	–	15	–	°C

33. Characterized when V_{OUT} falls 250 mV below the regulated voltage and only for devices with V_{OUT} = 5.0 V.
34. Guaranteed by design and characterization.
35. Performance guaranteed over the indicated operating temperature range by design and/or characterization production tested at T_J = T_A = 25°C. Low duty cycle pulse techniques are used during testing to maintain the junction temperature as close to ambient as possible.
36. Respect SOA.

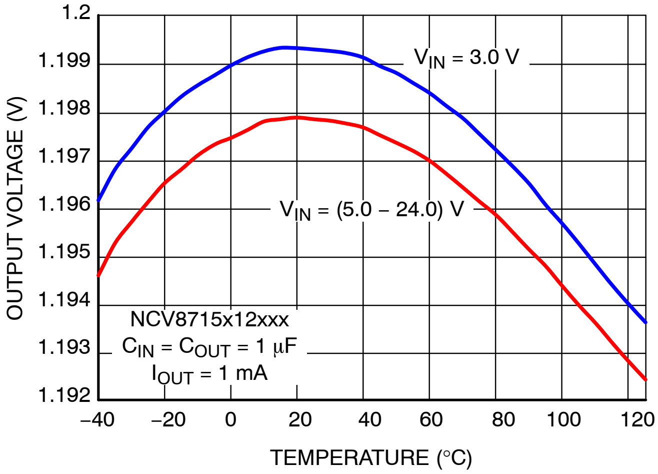


Figure 4. Output Voltage vs. Temperature

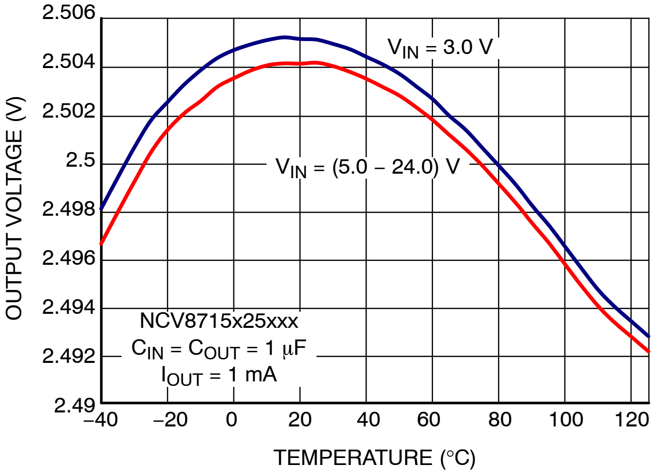


Figure 5. Output Voltage vs. Temperature

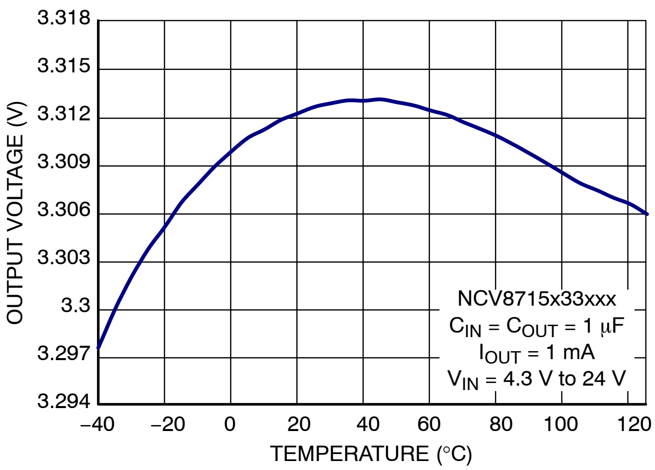


Figure 6. Output Voltage vs. Temperature

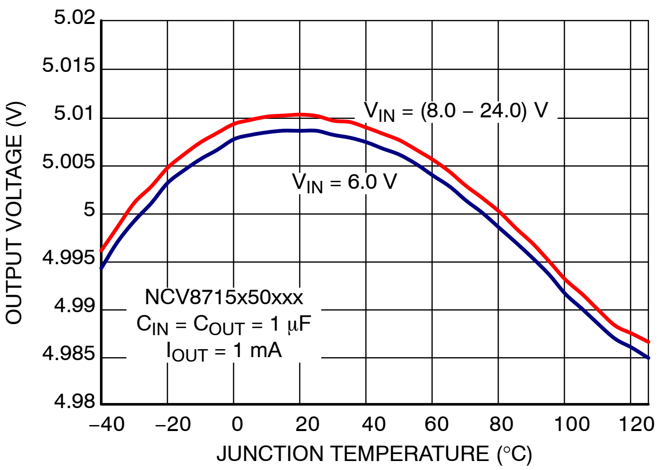


Figure 7. Output Voltage vs. Temperature

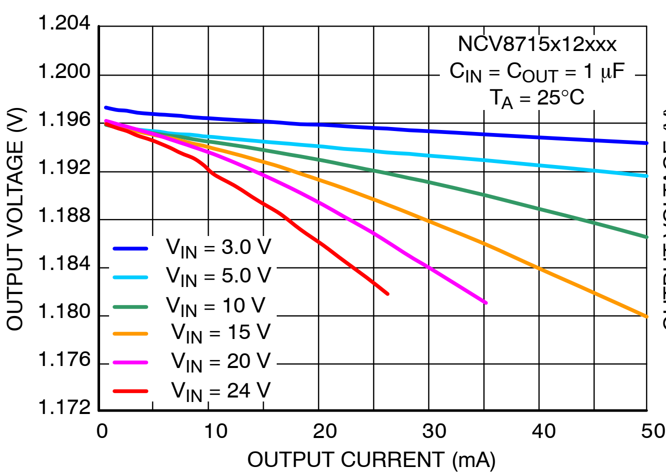


Figure 8. Output Voltage vs. Output Current

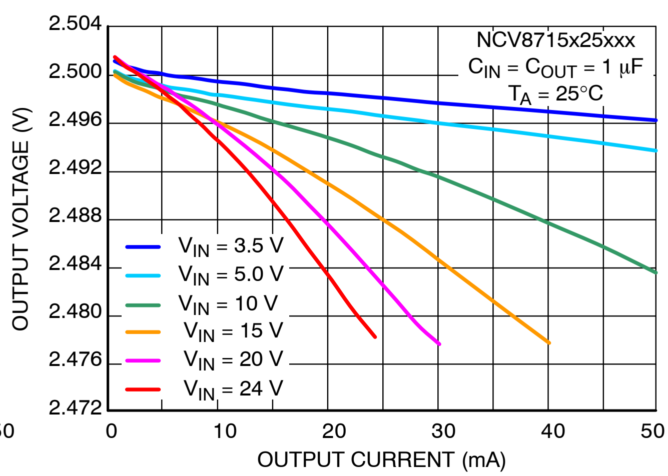


Figure 9. Output Voltage vs. Output Current

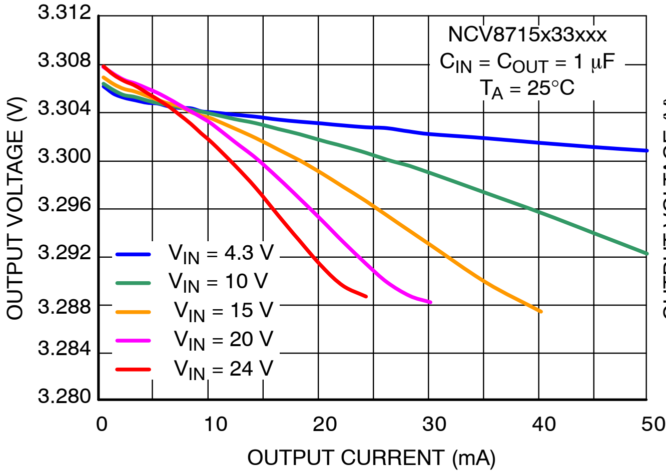


Figure 10. Output Voltage vs. Output Current

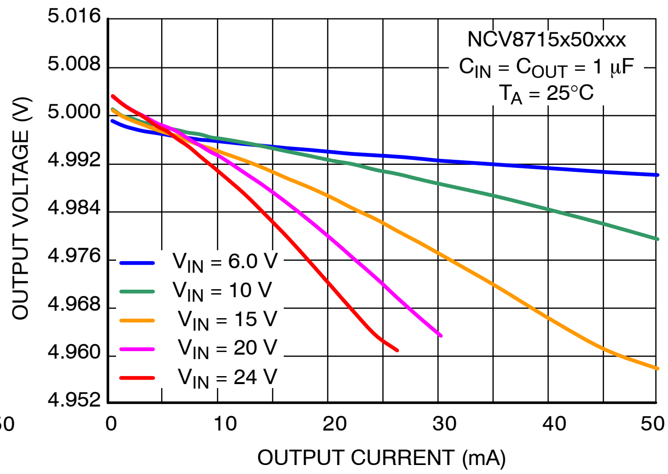


Figure 11. Output Voltage vs. Output Current

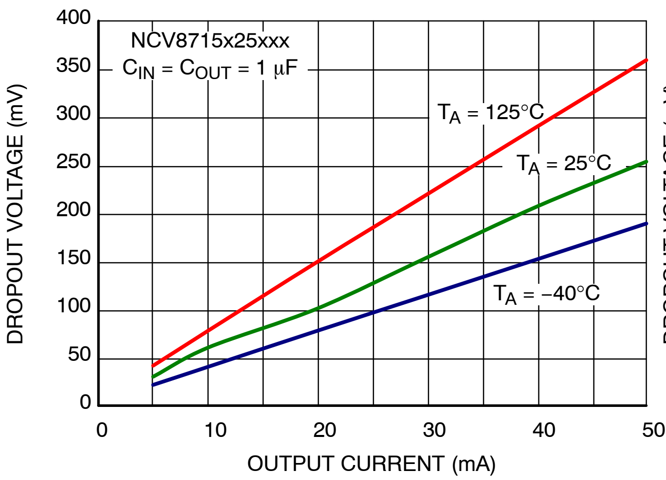


Figure 12. Dropout Voltage vs. Output Current

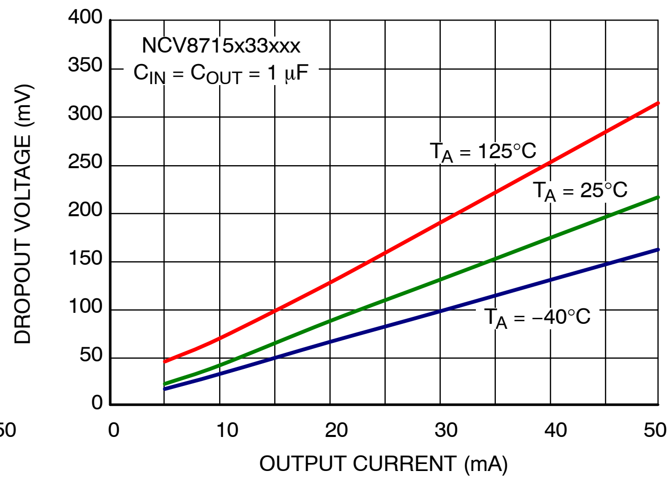


Figure 13. Dropout Voltage vs. Output Current

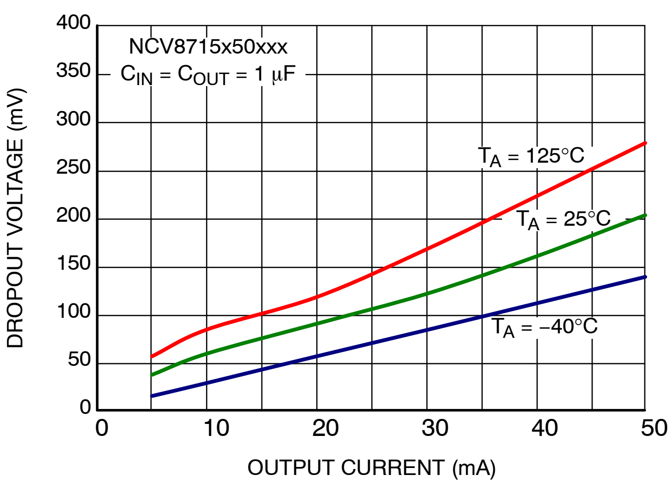


Figure 14. Dropout Voltage vs. Output Current

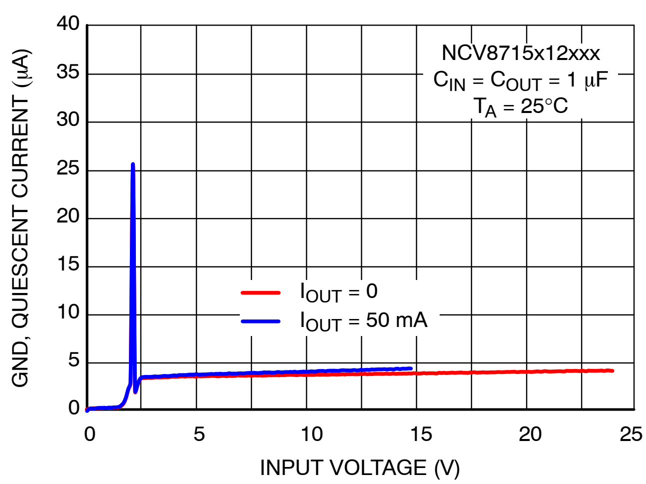


Figure 15. Ground Current vs. Input Voltage

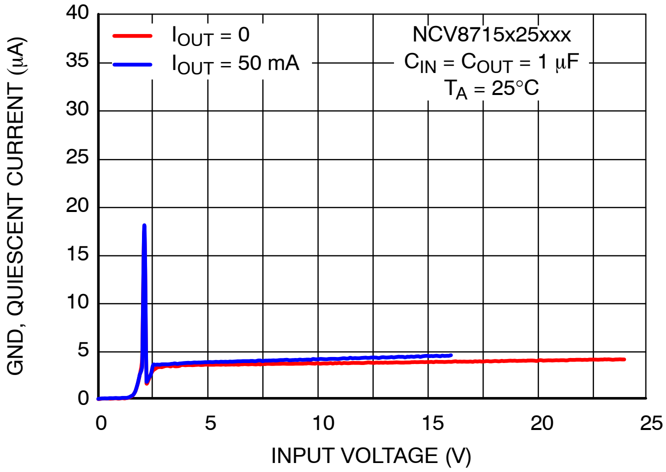


Figure 16. Ground Current vs. Input Voltage

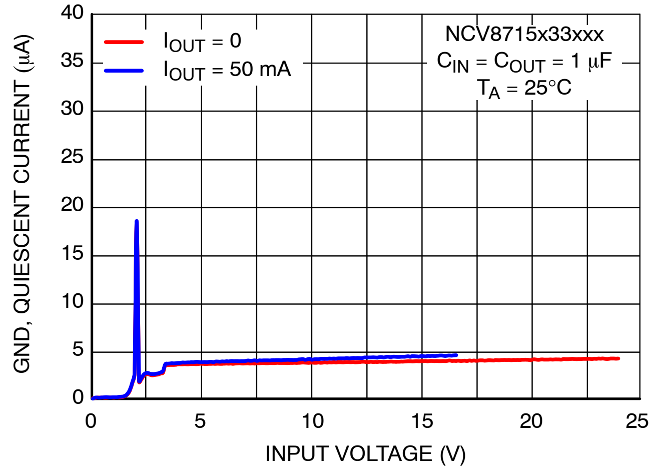


Figure 17. Ground Current vs. Input Voltage

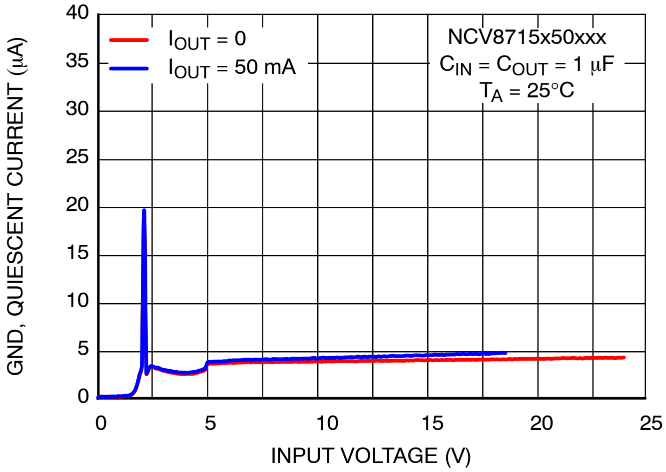


Figure 18. Ground Current vs. Input Voltage

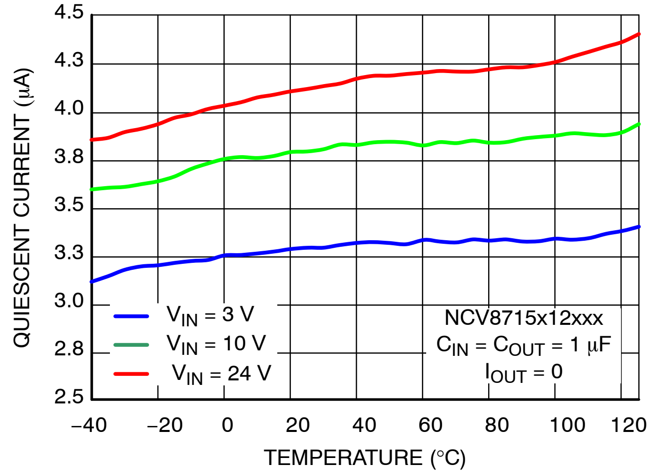


Figure 19. Quiescent Current vs. Temperature

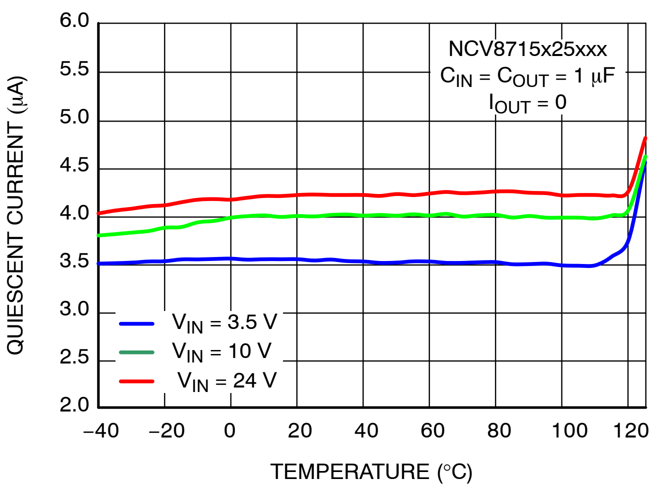


Figure 20. Quiescent Current vs. Temperature

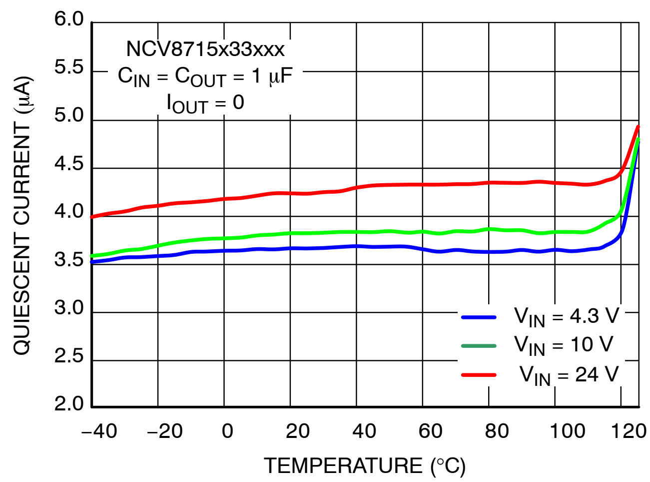


Figure 21. Quiescent Current vs. Temperature

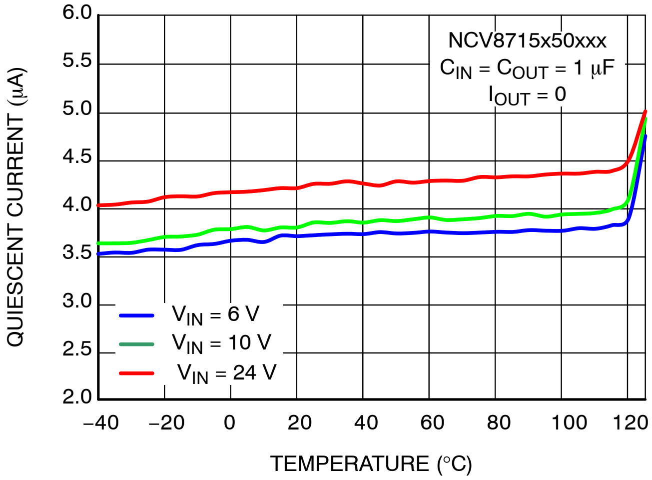


Figure 22. Quiescent Current vs. Temperature

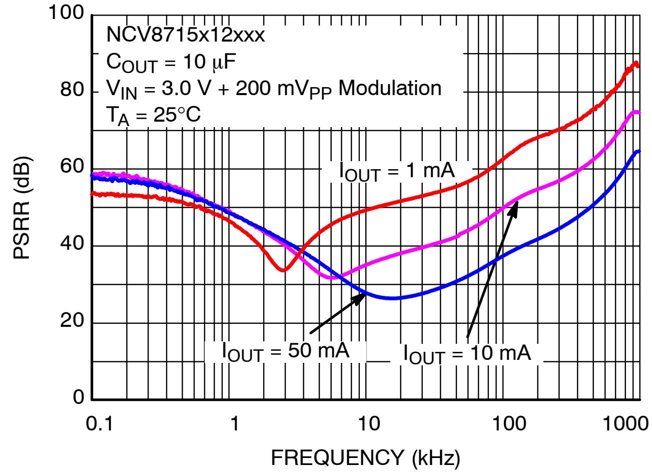


Figure 23. PSRR vs. Frequency

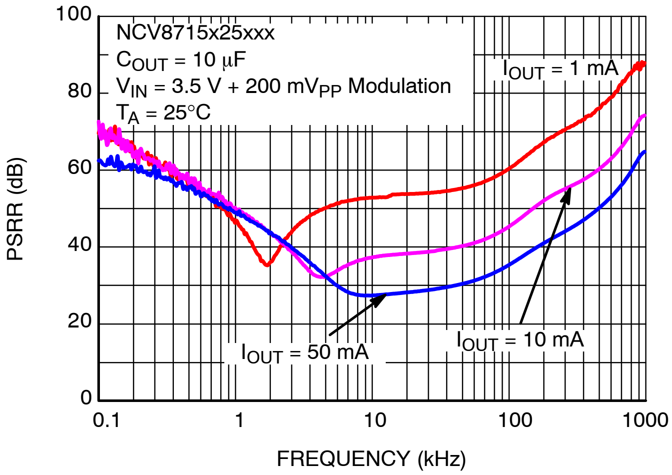


Figure 24. PSRR vs. Frequency

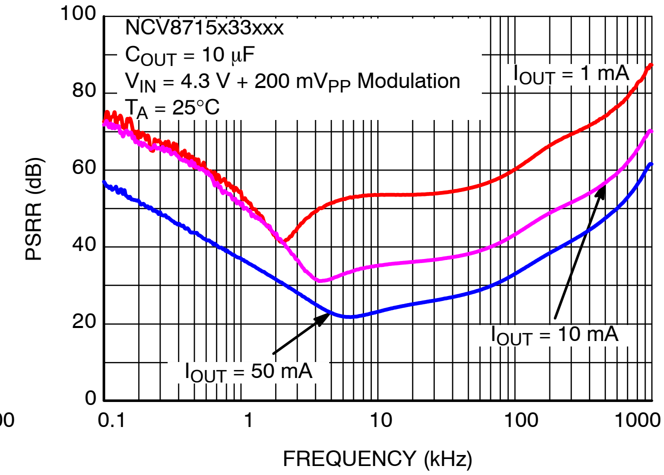


Figure 25. PSRR vs. Frequency

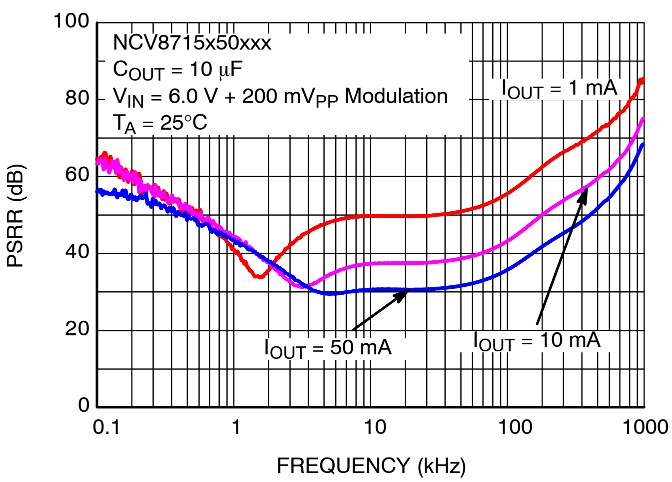


Figure 26. PSRR vs. Frequency

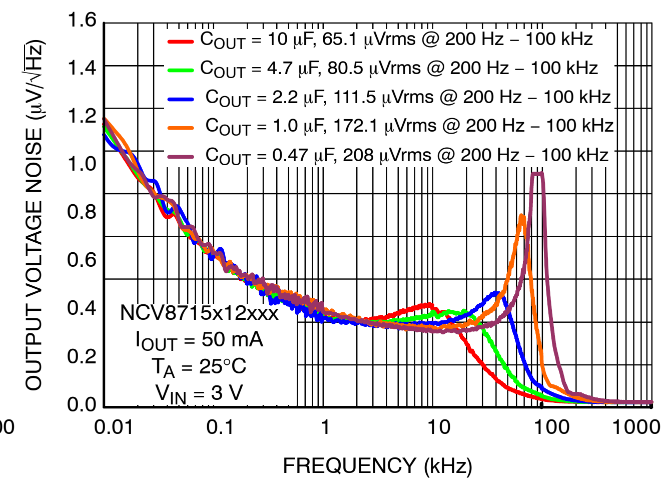


Figure 27. Output Spectral Noise Density vs. Frequency

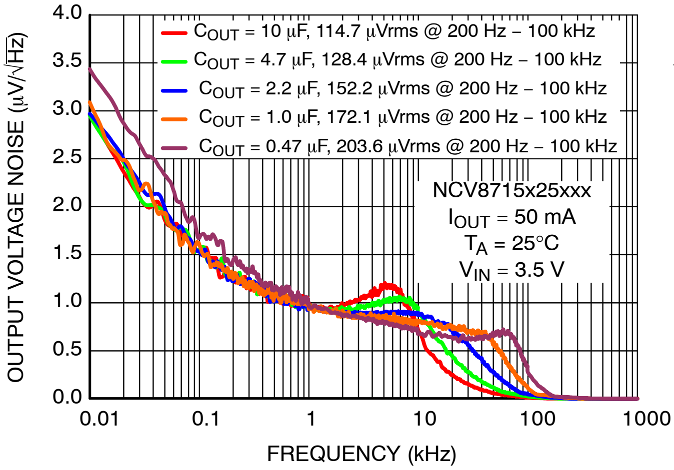


Figure 28. Output Spectral Noise Density vs. Frequency

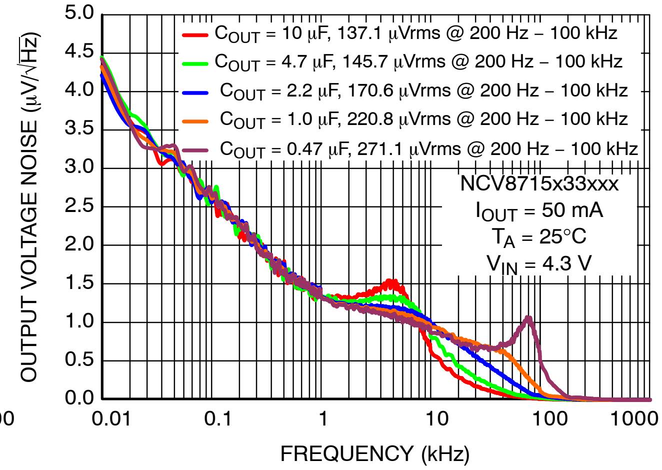


Figure 29. Output Spectral Noise Density vs. Frequency

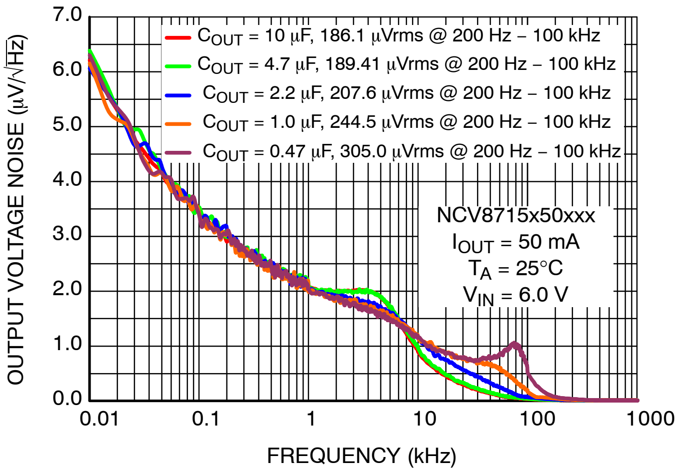


Figure 30. Output Spectral Noise Density vs. Frequency

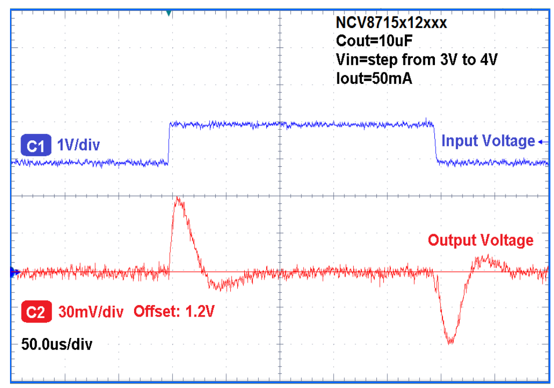


Figure 31. Line Transient Response

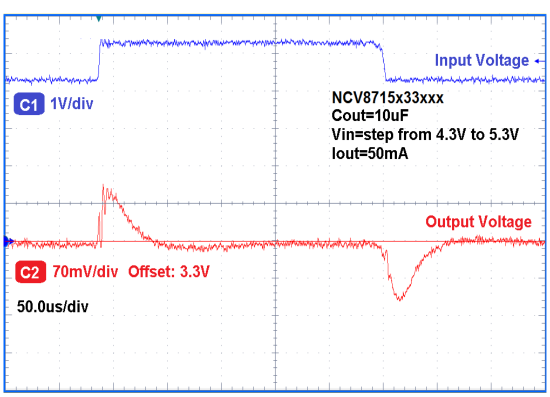


Figure 32. Line Transient Response

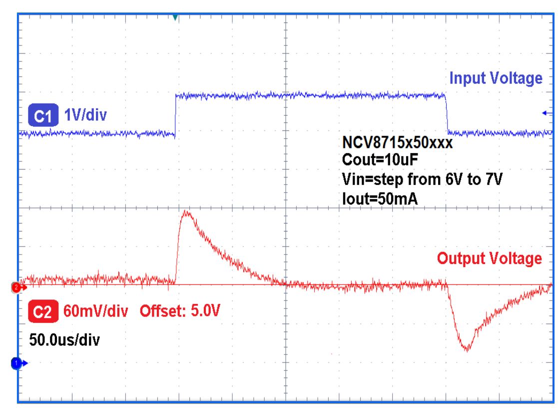


Figure 33. Line Transient Response

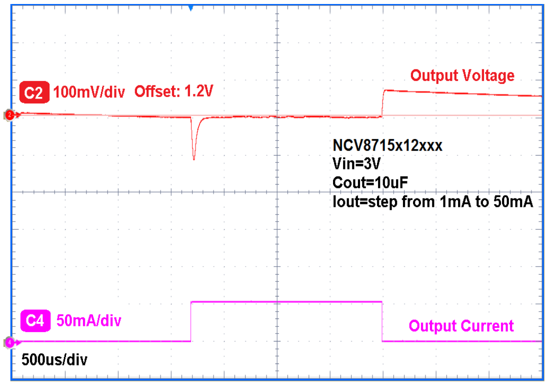


Figure 34. Load Transient Response

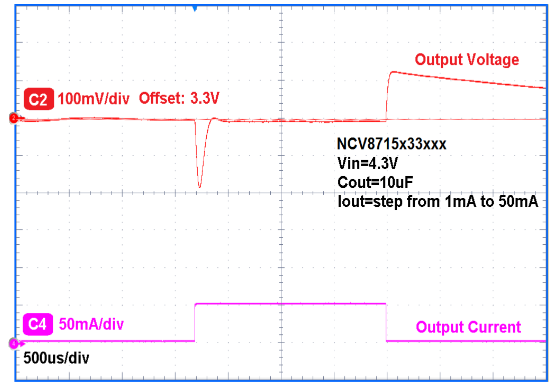


Figure 35. Load Transient Response

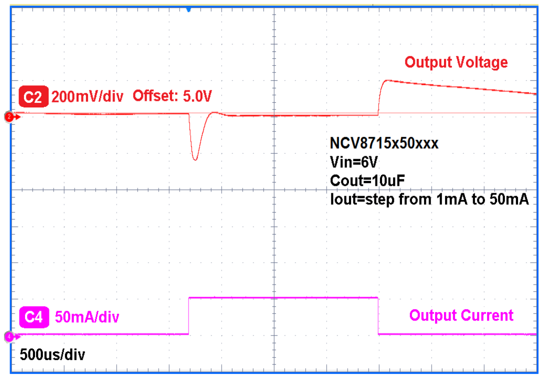


Figure 36. Load Transient Response

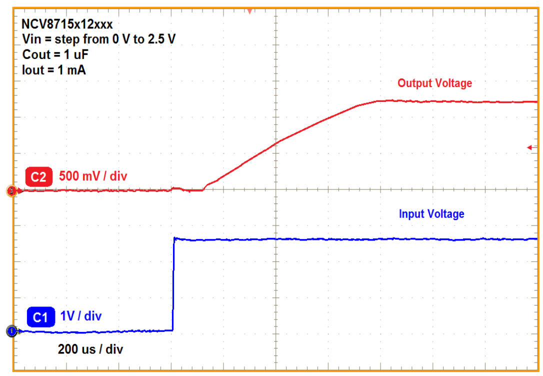


Figure 37. Input Voltage Turn−On Response

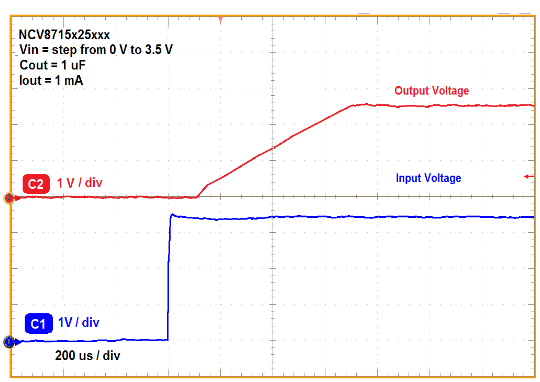


Figure 38. Input Voltage Turn−On Response

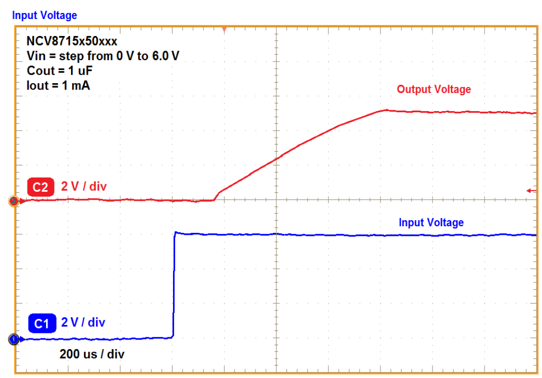


Figure 39. Input Voltage Turn−On Response

APPLICATIONS INFORMATION

The NCV8715 is the member of new family of Wide Input Voltage Range Low Dropout Regulators which delivers Ultra Low Ground Current consumption, Good Noise and Power Supply Rejection Ratio Performance.

Input Decoupling (C_{IN})

It is recommended to connect at least 0.1 μF Ceramic X5R or X7R capacitor between IN and GND pin of the device. This capacitor will provide a low impedance path for any unwanted AC signals or Noise superimposed onto constant Input Voltage. The good input capacitor will limit the influence of input trace inductances and source resistance during sudden load current changes.

Higher capacitance and lower ESR Capacitors will improve the overall line transient response.

Output Decoupling (C_{OUT})

The NCV8715 does not require a minimum Equivalent Series Resistance (ESR) for the output capacitor. The device is designed to be stable with standard ceramics capacitors with values of 0.47 μF or greater up to 10 μF. The X5R and X7R types have the lowest capacitance variations over temperature thus they are recommended.

Power Dissipation and Heat sinking

The maximum power dissipation supported by the device is dependent upon board design and layout. Mounting pad configuration on the PCB, the board material, and the ambient temperature affect the rate of junction temperature rise for the part. The maximum power dissipation the NCV8715 can handle is given by:

$$P_{D(MAX)} = \frac{\left[T_{J(MAX)} - T_A\right]}{R_{\theta JA}} \qquad \text{(eq. 1)}$$

The power dissipated by the NCV8715 for given application conditions can be calculated from the following equations:

$$P_D \approx V_{IN}\left(I_{GND}\left(I_{OUT}\right)\right) + I_{OUT}\left(V_{IN} - V_{OUT}\right) \qquad \text{(eq. 2)}$$

or

$$V_{IN(MAX)} \approx \frac{P_{D(MAX)} + \left(V_{OUT} \times I_{OUT}\right)}{I_{OUT} + I_{GND}} \qquad \text{(eq. 3)}$$

For reliable operation, junction temperature should be limited to +125°C maximum.

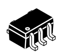
Hints

VIN and GND printed circuit board traces should be as wide as possible. When the impedance of these traces is high, there is a chance to pick up noise or cause the regulator to malfunction. Place external components, especially the output capacitor, as close as possible to the NCV8715, and make traces as short as possible.

ORDERING INFORMATION

Device	Nominal Output Voltage	Marking	Package	Shipping†
NCV8715SQ12T2G	1.2 V	V5A	SC−88A/SC−70 (Pb−Free)*	3000 / Tape & Reel
NCV8715SQ15T2G	1.5 V	V5C		
NCV8715SQ18T2G	1.8 V	V5D		
NCV8715SQ21T2G	2.1 V	V5J		
NCV8715SQ25T2G	2.5 V	V5E		
NCV8715SQ30T2G	3.0 V	V5F		
NCV8715SQ33T2G	3.3 V	V5G		
NCV8715SQ50T2G	5.0 V	V5H		
NCV8715MX12TBG	1.2 V	VA	XDFN6 (Pb−Free)*	
NCV8715MX15TBG	1.5 V	VC		
NCV8715MX18TBG	1.8 V	VE		
NCV8715MX25TBG	2.5 V	VE		
NCV8715MX30TBG	3.0 V	VF		
NCV8715MX33TBG	3.3 V	VG		
NCV8715MX50TBG	5.0 V	VH		

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.
*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

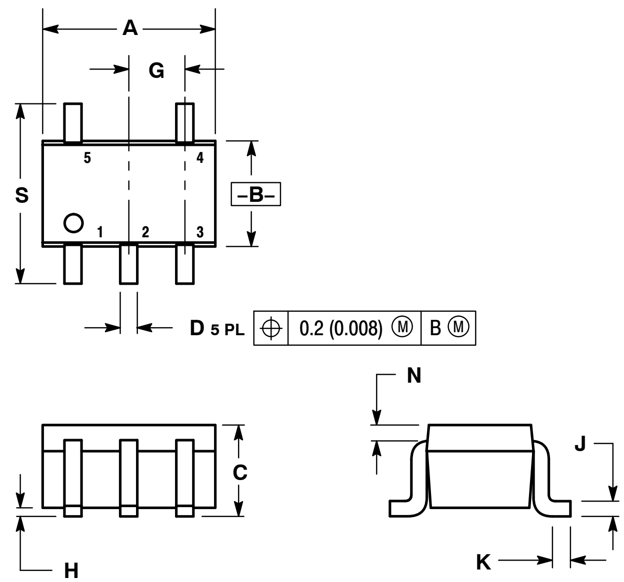


SCALE 2:1

SC−88A (SC−70−5/SOT−353)

CASE 419A−02
ISSUE L

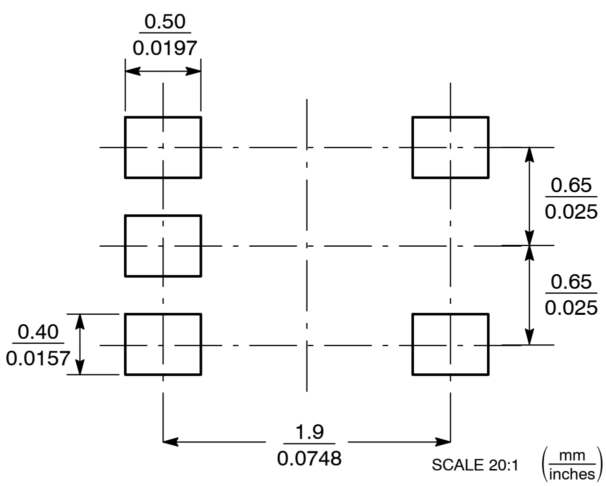
DATE 17 JAN 2013



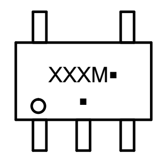
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 419A−01 OBSOLETE. NEW STANDARD 419A−02.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.071	0.087	1.80	2.20
B	0.045	0.053	1.15	1.35
C	0.031	0.043	0.80	1.10
D	0.004	0.012	0.10	0.30
G	0.026 BSC		0.65 BSC	
H	---	0.004	---	0.10
J	0.004	0.010	0.10	0.25
K	0.004	0.012	0.10	0.30
N	0.008 REF		0.20 REF	
S	0.079	0.087	2.00	2.20

SOLDER FOOTPRINT



GENERIC MARKING DIAGRAM*



XXX = Specific Device Code
M = Date Code
▪ = Pb−Free Package

(Note: Microdot may be in either location)

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, “G” or microdot “▪”, may or may not be present. Some products may not follow the Generic Marking.

STYLE 1:
PIN 1. BASE
2. EMITTER
3. BASE
4. COLLECTOR
5. COLLECTOR

STYLE 2:
PIN 1. ANODE
2. EMITTER
3. BASE
4. COLLECTOR
5. CATHODE

STYLE 3:
PIN 1. ANODE 1
2. N/C
3. ANODE 2
4. CATHODE 2
5. CATHODE 1

STYLE 4:
PIN 1. SOURCE 1
2. DRAIN 1/2
3. SOURCE 1
4. GATE 1
5. GATE 2

STYLE 5:
PIN 1. CATHODE
2. COMMON ANODE
3. CATHODE 2
4. CATHODE 3
5. CATHODE 4

STYLE 6:
PIN 1. EMITTER 2
2. BASE 2
3. EMITTER 1
4. COLLECTOR
5. COLLECTOR 2/BASE 1

STYLE 7:
PIN 1. BASE
2. EMITTER
3. BASE
4. COLLECTOR
5. COLLECTOR

STYLE 8:
PIN 1. CATHODE
2. COLLECTOR
3. N/C
4. BASE
5. EMITTER

STYLE 9:
PIN 1. ANODE
2. CATHODE
3. ANODE
4. ANODE
5. ANODE

Note: Please refer to datasheet for style callout. If style type is not called out in the datasheet refer to the device datasheet pinout or pin assignment.

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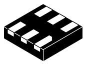
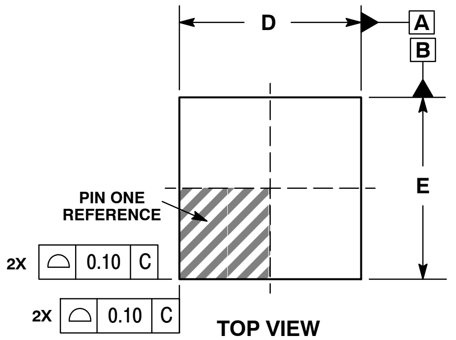
DESCRIPTION:	SC−88A (SC−70−5/SOT−353)	PAGE 1 OF 1



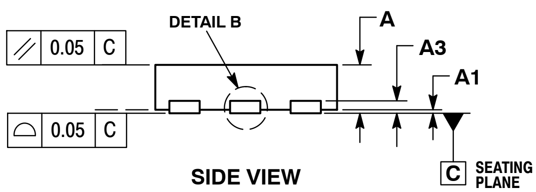
SCALE 4:1

XDFN6 1.5x1.5, 0.5P
CASE 711AE
ISSUE B

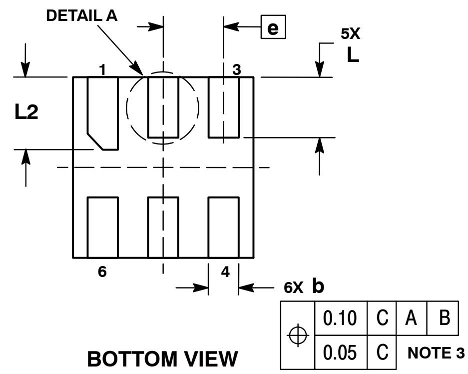
DATE 27 AUG 2015



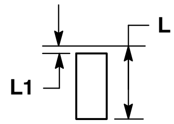
TOP VIEW



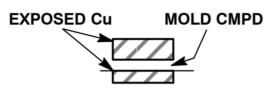
SIDE VIEW



BOTTOM VIEW



DETAIL A
ALTERNATE TERMINAL CONSTRUCTIONS

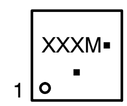


DETAIL B
ALTERNATE CONSTRUCTIONS

NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.10 AND 0.20mm FROM TERMINAL TIP.

	MILLIMETERS	
DIM	MIN	MAX
A	0.35	0.45
A1	0.00	0.05
A3	0.13 REF	
b	0.20	0.30
D	1.50 BSC	
E	1.50 BSC	
e	0.50 BSC	
L	0.40	0.60
L1	---	0.15
L2	0.50	0.70

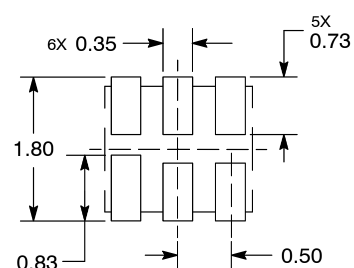
GENERIC MARKING DIAGRAM*



XXX = Specific Device Code
M = Date Code
▪ = Pb−Free Package
(Note: Microdot may be in either location)

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, “G” or microdot “ ▪”, may or may not be present.

RECOMMENDED MOUNTING FOOTPRINT*



DIMENSIONS: MILLIMETERS

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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DESCRIPTION:	XDFN6, 1.5 X 1.5, 0.5 P	PAGE 1 OF 1

PUBLICATION ORDERING INFORMATION

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Phone: 00421 33 790 2910
For additional information, please contact your local Sales Representative

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