

500mA, Low Quiescent Current, Low-Noise, High PSRR, Low-Dropout Linear Regulator

1 FEATURES

- Qualified for Automotive Applications
- AEC-Q100 Qualified with the Grade 1
- Input voltage range: 2.7V to 6.5V
- Output voltage range:
 - Fixed option: 1.2V to 3.3V
 - Adjustable option: 1.2V to 6V
- Up to 500mA load current
- Very low dropout: 250mV at 500mA ($V_{OUT}=3.3V$)
- Low IQ: 45 μ A
- High PSRR: 75dB at 100Hz
- Excellent Load and Line Transient Response
- Stable with a Ceramic, 2.2 μ F, Low-ESR Output Capacitor
- Fast Start-Up Time: 45 μ s
- High Output Accuracy: $\pm 0.75\%$
- Micro SIZE PACKAGES: SOT23-5, DFN2X2-6, DFN3X3-8

2 APPLICATIONS

- Post DC-DC Converter Ripple Filtering
- IP Network Cameras
- Macro Base Stations
- Thermostats

3 DESCRIPTIONS

The RS3215-Q1 family of low-dropout (LDO), low power linear regulators offers excellent ac performance with very low ground current. High power-supply rejection ratio (PSRR), low noise, fast start-up, and excellent line and load transient responses are provided while consuming a very low 45 μ A (typical) ground current.

The RS3215-Q1 family of devices is stable with ceramic capacitors and uses an advanced BiCMOS fabrication process to yield a typical dropout voltage of 250mV at 500mA output. The RS3215-Q1 family of devices uses a precision voltage reference and feedback loop to achieve high accuracy of $\pm 0.75\%$.

The RS3215-Q1 series is available in Green SOT23-5, DFN2X2-6 and DFN3X3-8 packages. It operates over an ambient temperature range of -40°C to 125°C.

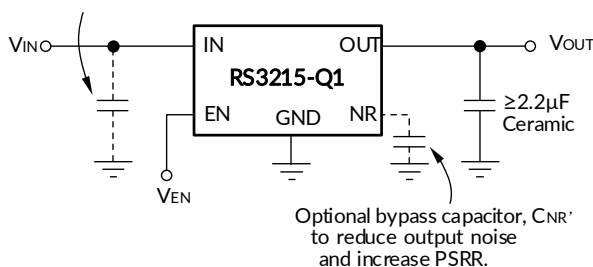
Device Information ⁽¹⁾

PART NUMBER	PACKAGE	BODY SIZE (NOM)
RS3215-Q1	SOT23-5	1.60mm $\times$ 2.92mm
	DFN2X2-6	2.00mm $\times$ 2.00mm
	DFN3X3-8	3.00mm $\times$ 3.00mm

(1) For all available packages, see the orderable addendum at the end of the data sheet.

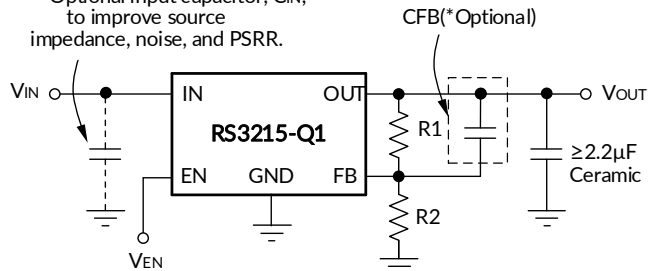
Typical Application

Optional input capacitor, C_{IN} , to improve source impedance, noise, and PSRR.



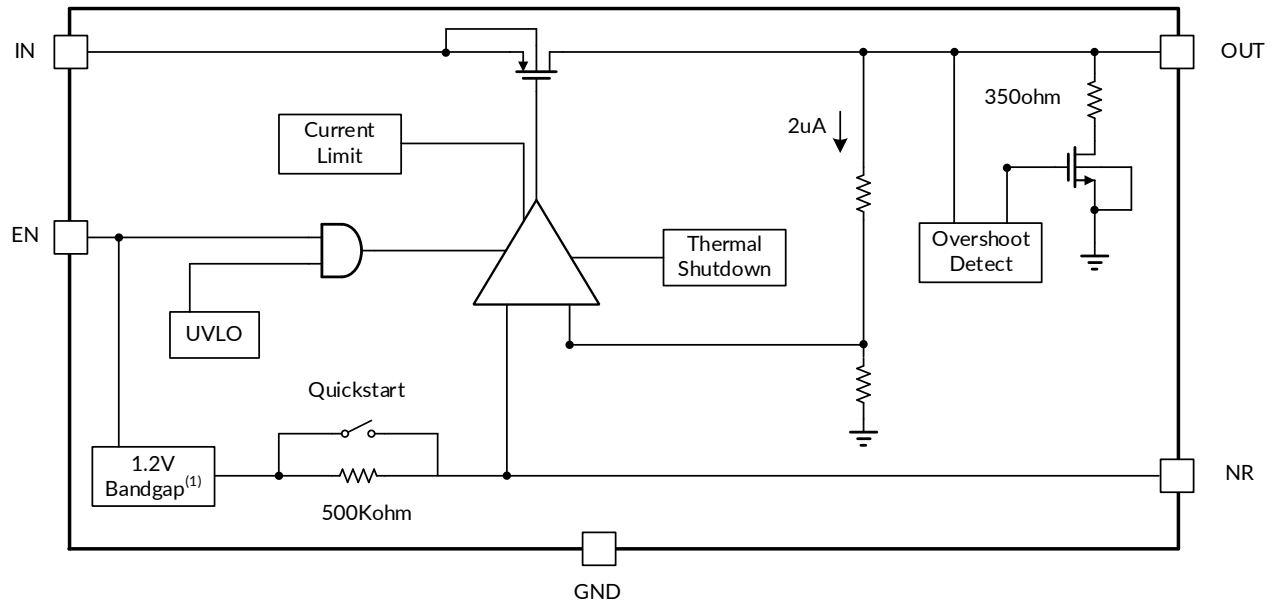
Typical Application: Fixed Voltage Version

Optional input capacitor, C_{IN} , to improve source impedance, noise, and PSRR.



Typical Application: Adjustable Voltage Version

4 FUNCTIONAL BLOCK DIAGRAM



(1) The 1.2V fixed voltage version has a 1V bandgap instead of a 1.2V circuit.
BG Output Voltage = 1.2V & 1V

Figure 1. Fixed Voltage Versions

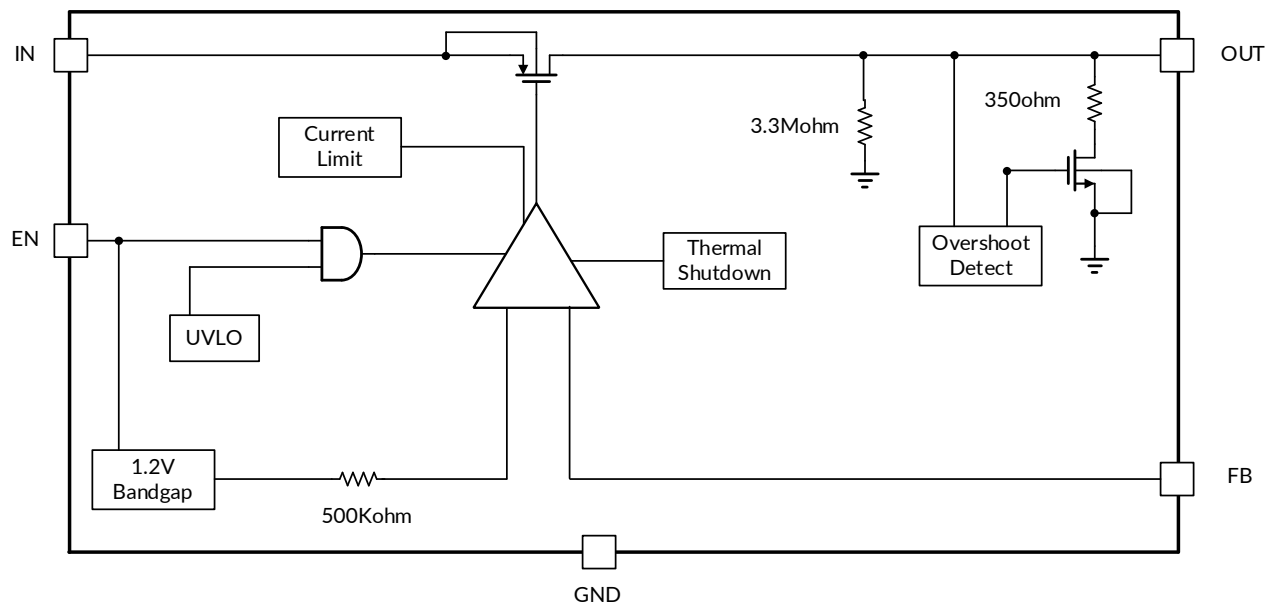


Figure 2. Adjustable Voltage Versions

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5 REVISION HISTORY

Note: Page numbers for previous revisions may differ from page numbers in the current version.

VERSION	Change Date	Change Item
A.0	2024/06/06	Preliminary version completed
A.1	2024/11/21	Initial version completed
A.2	2026/06/17	Modify DFN2X2-6 PACKAGE OUTLINE DIMENSIONS

6 PACKAGE/ORDERING INFORMATION ⁽¹⁾

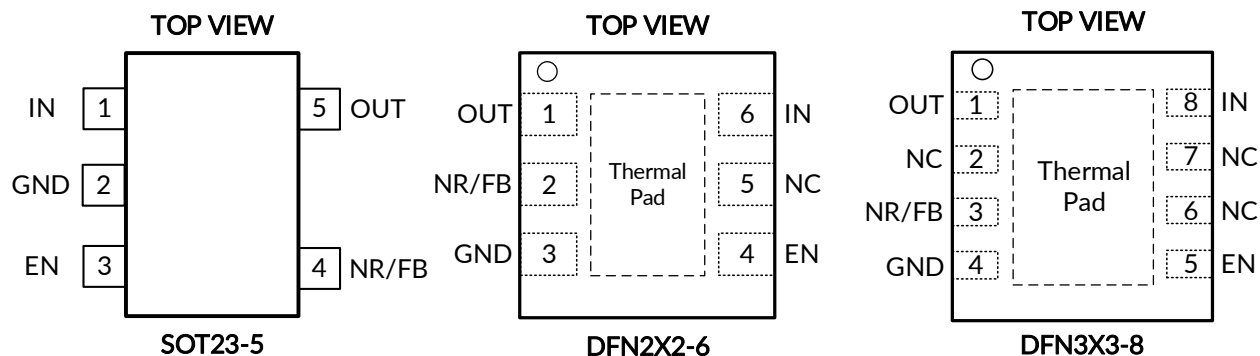
Orderable Device	V _{OUT} (V)	TEMPERATURE RANGE	PACKAGE LEAD	Lead finish/Ball material ⁽²⁾	MSL Peak Temp ⁽³⁾	PACKAGE MARKING ⁽⁴⁾	PACKAGE OPTION
RS3215-1.2XF5-Q1	1.2	-40°C ~125°C	SOT23-5	SN	MSL1-260°-Unlimited	LF12	Tape and Reel,3000
RS3215-1.5XF5-Q1	1.5	-40°C ~125°C	SOT23-5	SN	MSL1-260°-Unlimited	LF15	Tape and Reel,3000
RS3215-1.8XF5-Q1	1.8	-40°C ~125°C	SOT23-5	SN	MSL1-260°-Unlimited	LF18	Tape and Reel,3000
RS3215-2.5XF5-Q1	2.5	-40°C ~125°C	SOT23-5	SN	MSL1-260°-Unlimited	LF25	Tape and Reel,3000
RS3215-2.7XF5-Q1	2.7	-40°C ~125°C	SOT23-5	SN	MSL1-260°-Unlimited	LF27	Tape and Reel,3000
RS3215-2.8XF5-Q1	2.8	-40°C ~125°C	SOT23-5	SN	MSL1-260°-Unlimited	LF28	Tape and Reel,3000
RS3215-3.0XF5-Q1	3.0	-40°C ~125°C	SOT23-5	SN	MSL1-260°-Unlimited	LF30	Tape and Reel,3000
RS3215-3.3XF5-Q1	3.3	-40°C ~125°C	SOT23-5	SN	MSL1-260°-Unlimited	LF33	Tape and Reel,3000
RS3215-ADJ8XF5-Q1	ADJ	-40°C ~125°C	SOT23-5	SN	MSL1-260°-Unlimited	LFAD8	Tape and Reel,3000
RS3215-1.2XTDC8-Q1	1.2	-40°C ~125°C	DFN3X3-8	NIPDAUAG /Plating Sn	MSL1-260°-Unlimited	RS3215A	Tape and Reel,5000
RS3215-1.5XTDC8-Q1	1.5	-40°C ~125°C	DFN3X3-8	NIPDAUAG /Plating Sn	MSL1-260°-Unlimited	RS3215B	Tape and Reel,5000
RS3215-1.8XTDC8-Q1	1.8	-40°C ~125°C	DFN3X3-8	NIPDAUAG /Plating Sn	MSL1-260°-Unlimited	RS3215C	Tape and Reel,5000
RS3215-2.5XTDC8-Q1	2.5	-40°C ~125°C	DFN3X3-8	NIPDAUAG /Plating Sn	MSL1-260°-Unlimited	RS3215D	Tape and Reel,5000
RS3215-2.7XTDC8-Q1	2.7	-40°C ~125°C	DFN3X3-8	NIPDAUAG /Plating Sn	MSL1-260°-Unlimited	RS3215E	Tape and Reel,5000
RS3215-2.8XTDC8-Q1	2.8	-40°C ~125°C	DFN3X3-8	NIPDAUAG /Plating Sn	MSL1-260°-Unlimited	RS3215F	Tape and Reel,5000
RS3215-3.0XTDC8-Q1	3.0	-40°C ~125°C	DFN3X3-8	NIPDAUAG /Plating Sn	MSL1-260°-Unlimited	RS3215G	Tape and Reel,5000
RS3215-3.3XTDC8-Q1	3.3	-40°C ~125°C	DFN3X3-8	NIPDAUAG /Plating Sn	MSL1-260°-Unlimited	RS3215H	Tape and Reel,5000
RS3215-ADJ8XTDC8-Q1	ADJ	-40°C ~125°C	DFN3X3-8	NIPDAUAG /Plating Sn	MSL1-260°-Unlimited	RS3215K	Tape and Reel,5000
RS3215-1.2XTDE6-Q1	1.2	-40°C ~125°C	DFN2X2-6	NIPDAUAG /Plating Sn	MSL1-260°-Unlimited	LF12	Tape and Reel,3000
RS3215-1.5XTDE6-Q1	1.5	-40°C ~125°C	DFN2X2-6	NIPDAUAG /Plating Sn	MSL1-260°-Unlimited	LF15	Tape and Reel,3000
RS3215-1.8XTDE6-Q1	1.8	-40°C ~125°C	DFN2X2-6	NIPDAUAG /Plating Sn	MSL1-260°-Unlimited	LF18	Tape and Reel,3000
RS3215-2.5XTDE6-Q1	2.5	-40°C ~125°C	DFN2X2-6	NIPDAUAG /Plating Sn	MSL1-260°-Unlimited	LF25	Tape and Reel,3000
RS3215-2.7XTDE6-Q1	2.7	-40°C ~125°C	DFN2X2-6	NIPDAUAG /Plating Sn	MSL1-260°-Unlimited	LF27	Tape and Reel,3000
RS3215-2.8XTDE6-Q1	2.8	-40°C ~125°C	DFN2X2-6	NIPDAUAG /Plating Sn	MSL1-260°-Unlimited	LF28	Tape and Reel,3000

RS3215-3.0XTDE6-Q1	3.0	-40°C ~125°C	DFN2X2-6	NIPDAUAG /Plating Sn	MSL1-260°-Unlimited	LF30	Tape and Reel,3000
RS3215-3.3XTDE6-Q1	3.3	-40°C ~125°C	DFN2X2-6	NIPDAUAG /Plating Sn	MSL1-260°-Unlimited	LF33	Tape and Reel,3000
RS3215-ADJ8XTDE6-Q1	ADJ	-40°C ~125°C	DFN2X2-6	NIPDAUAG /Plating Sn	MSL1-260°-Unlimited	LFAD8	Tape and Reel,3000

NOTE:

- (1) This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the right-hand navigation.
- (2) Lead finish/Ball material. Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.
- (3) RUNIC classify the MSL level with using the common preconditioning setting in our assembly factory conforming to the JEDEC industrial standard J-STD-20F, Please align with RUNIC if your end application is quite critical to the preconditioning setting or if you have special requirement.
- (4) There may be additional marking, which relates to the lot trace code information (data code and vendor code), the logo or the environmental category on the device.

7 PIN CONFIGURATION AND FUNCTIONS (TOP VIEW)



Pin Description

NAME	PIN			I/O ⁽¹⁾	DESCRIPTION
	SOT23-5	DFN2X2-6	DFN3X3-8		
IN	1	6	8	I	Input supply.
GND	2	3	4	G	Ground.
EN	3	4	5	I	Driving the enable pin (EN) high turns on the regulator. Driving this pin low puts the regulator into shutdown mode. The EN pin can be connected to the IN pin if not used.
NR/FB	4	2	3	-	The NR pin is only available for the fixed voltage versions. Connecting an external capacitor to this pin bypasses noise generated by the internal band gap and allows the output noise to be reduced to very low levels. The maximum recommended capacitor is 0.01μF. The FB pin is only available for the adjustable voltage versions. This pin is the input to the control-loop error amplifier, and is used to set the output voltage of the device.
OUT	5	1	1	O	This pin is the output of the regulator. A small 2.2μF ceramic capacitor is required from this pin to ground to assure stability.
NC	-	5	2,6,7	-	Not internally connected.
-	-	Thermal Pad	Thermal Pad	-	The pad must be tied to the GND pin.

(1) I=input, O=output, G= Ground.

8 SPECIFICATIONS

8.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted) ⁽¹⁾ ⁽²⁾

		MIN	MAX	UNIT
V _{IN}	Input voltage	-0.3	7	V
V _{EN}	Enable input voltage	-0.3	V _{IN} + 0.3	V
V _{FB}	Input voltage	-0.3	1.6	V
V _{OUT}	Output voltage	-0.3	V _{IN} + 0.3	V
I _{OUT}	Current	Internally limited		A
θ _{JA}	Package thermal impedance ⁽³⁾	SOT23-5	200	°C/W
		DFN3X3-8	60	
		DFN2X2-6	82	
T _J	Junction temperature ⁽⁴⁾	-40	150	°C
T _{stg}	Storage temperature	-55	150	°C

- (1) Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under Recommended Operating Conditions is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- (2) All voltages are with respect to the GND pin.
- (3) The package thermal impedance is calculated in accordance with JEDEC-51.
- (4) The maximum power dissipation is a function of T_{J(MAX)}, R_{θJA}, and T_A. The maximum allowable power dissipation at any ambient temperature is P_D = (T_{J(MAX)} - T_A) / R_{θJA}. All numbers apply for packages soldered directly onto a PCB.

8.2 ESD Ratings

The following ESD information is provided for handling of ESD-sensitive devices in an ESD protected area only.

		VALUE	UNIT
V _(ESD)	Electrostatic discharge	Human-Body Model (HBM), per AEC Q100-002 ⁽¹⁾	±2000
		Charged-Device Model (CDM), per AEC Q100-011	±1000
		Latch-Up (LU), per AEC Q100-004	±200

- (1) AEC Q100-002 indicates that HBM stressing shall be in accordance with the ANSI/ESDA/JEDEC JS-001 specification.



ESD SENSITIVITY CAUTION

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

8.3 Recommended Operating Conditions

over operating free-air temperature range (unless otherwise noted) ⁽¹⁾

		MIN	MAX	UNIT
V _{IN}	Input supply voltage	2.7	6.5	V
V _{OUT}	Output voltage	V _{FB}	6	V
I _{OUT}	Output current	0	500	mA
T _A	Operating free-air temperature	-40	125	°C

- (1) When operating at T_J near 125°C, I_{OUT(min)} is 500μA.

8.4 Electrical Characteristics

Over operating temperature range ($-40^{\circ}\text{C} \leq T_J \leq 125^{\circ}\text{C}$), $V_{IN} = V_{OUTnom} + 0.5\text{ V}$ or 2.7 V (whichever is greater), $I_{OUT}=1\text{mA}$, $V_{EN} = V_{IN}$, $C_{OUT} = 2.2\mu\text{F}$, and $C_{NR} = 0.01\mu\text{F}$, unless otherwise noted. For the adjustable version, $V_{OUT} = 3.3\text{V}$. Typical values are at $T_A = 25^{\circ}\text{C}$.

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNIT
POWER SUPPLY AND CURRENTS							
Input Voltage ⁽¹⁾	V _{IN}			2.7		6.5	V
Under Voltage Lockout	UVLO	V _{IN} rising, T _J = -40°C ~125°C		2.25	2.45	2.65	V
Hysteresis	V _{HYS}	V _{IN} falling			60		mV
Quiescent Current	I _Q	I _{OUT} = 0mA, T _J = 25°C			45	70	μA
		I _{OUT} = 0mA, T _J = -40°C ~125°C				80	
Ground Pin Current	I _{GND}	10mA ≤ I _{OUT} ≤ 500mA, T _J = 25°C			70	120	μA
		10mA ≤ I _{OUT} ≤ 500mA, T _J = -40°C ~125°C				350	
Shutdown Current	I _{SD}	V _{EN} = 0V, T _J = 25°C			0.1	1	μA
		V _{EN} = 0V, T _J = -40°C ~125°C				15	
OUTPUT VOLTAGE							
Output Voltage Range	V _{OUT}	Adjustable Only		V _{FB}		6	V
Feedback Voltage	V _{FB}	Adjustable Only		1.191	1.200	1.209	V
Feedback Pin Current	I _{FB}	Adjustable Only			0.01	0.1	uA
DC Output Accuracy ⁽¹⁾	ΔV _{OUT}	T _J = 25°C		-0.75		0.75	%
		T _J = -40°C ~125°C		-1.5		1.5	%
Line Regulation ⁽¹⁾	ΔV _{OUT} (ΔV _{IN})	V _{OUTnom} + 0.5V ≤ V _{IN} ≤ 6.5V			0.02	0.06	%/V
Load Regulation	ΔV _{OUT} (ΔI _{OUT})	500μA ≤ I _{OUT} ≤ 500mA			0.002	0.006	%/mA
DROPOUT VOLTAGE							
Dropout Voltage ⁽²⁾	V _{DO}	I _{OUT} = 500mA	V _{OUT} =3.3V, T _J = 25°C		250	300	mV
			V _{OUT} =3.3V, T _J = -40°C ~125°C			400	
			V _{OUT} =5.0V (Adjustable only)		195		
			V _{OUT} =6.0V (Adjustable only)		180		
POWER SUPPLY REJECTION RATIO AND NOISE							
Power Supply Rejection Ratio ⁽³⁾	PSRR	V _{IN} = 3.8V, V _{OUT} = 3.3V, C _{NR} = 0.01μF, I _{OUT} = 100mA	f = 100Hz		75		dB
			f = 1kHz		64		dB
			f = 10kHz		43		dB
			f = 100kHz		23		dB
Output Noise Voltage ⁽³⁾	V _N	BW = 10 Hz to 100 kHz, V _{OUT} = 3.3 V	C _{NR} =0.01μF		11×V _{OUT}		μV _{RMS}
			C _{NR} =none		45×V _{OUT}		μV _{RMS}
ENABLE AND STARTUP TIME							
Enable High(enabled)	V _{IH}	EN rising, T _J = -40°C ~125°C		1.2			V
Enable Low(shutdown)	V _{IL}	EN falling, T _J = -40°C ~125°C				0.4	V
Enable Pin Current, Enabled	I _{EN}	V _{EN} = V _{IN} = 6.5V, T _J = 25°C			0.1	1.5	μA
		V _{EN} = V _{IN} = 6.5V, T _J = -40°C ~125°C				2	

Startup Time ⁽³⁾	t _{STR}	C _{NR} = none		45		μs
		C _{NR} = 0.001μF		45		μs
		C _{NR} = 0.01μF		50		μs
		C _{NR} = 0.047μF		50		μs
PROTECTIONS						
Output Current Limit	I _{LIM}	V _{OUT} = 0.9 × V _{OUTnom} , V _{IN} = V _{OUTnom} + 0.5V, V _{IN} ≥ 2.7V	500	1150	1600	mA
Thermal Shutdown Temperature ⁽³⁾	T _{SD}	Shutdown, temperature increasing		150		°C
		Reset, temperature decreasing		135		°C

NOTES:

1. Minimum $V_{IN} = V_{OUT} + V_{DO}$ or 2.7V, whichever is greater.
2. V_{DO} FT test method: test the V_{OUT} voltage at $V_{OUTnom} + V_{DOMAX}$ with output current.
3. Guaranteed by design and characterization, not a FT item.

8.5 Typical Performance Characteristics

NOTE: The graphs and tables provided following this note are a statistical summary based on a limited number of samples and are provided for informational purposes only.

Over operating temperature range ($-40^{\circ}\text{C} \leq T_J \leq 125^{\circ}\text{C}$), $V_{IN} = V_{OUTnom} + 0.5\text{V}$ or 2.7V (whichever is greater), $I_{OUT} = 1\text{mA}$, $V_{EN} = V_{IN}$, $C_{OUT} = 2.2\mu\text{F}$, and $C_{NR} = 0.01\mu\text{F}$, unless otherwise noted.

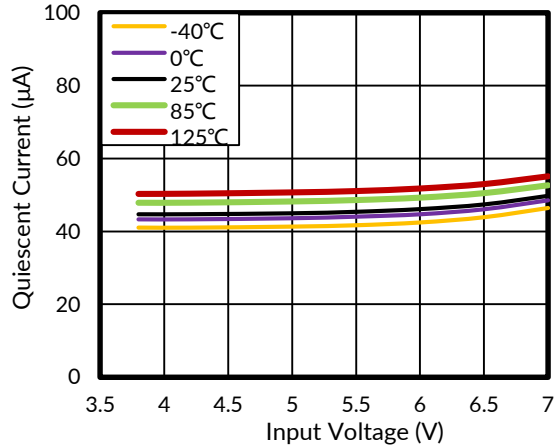


Figure 3. Quiescent Current vs Input Voltage

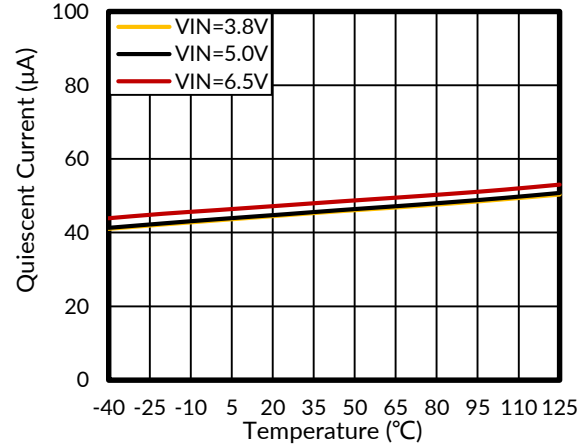


Figure 4. Quiescent Current vs Temperature

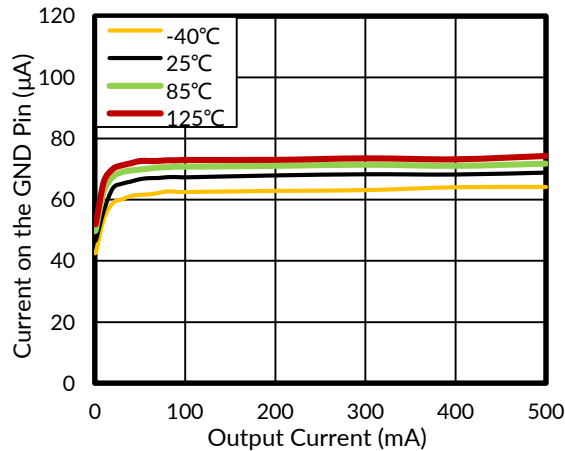


Figure 5. Ground Pin Current vs Output Current

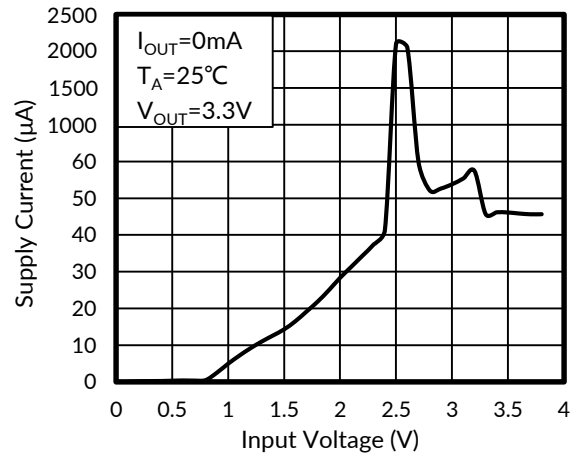


Figure 6. Supply Current vs Input Voltage

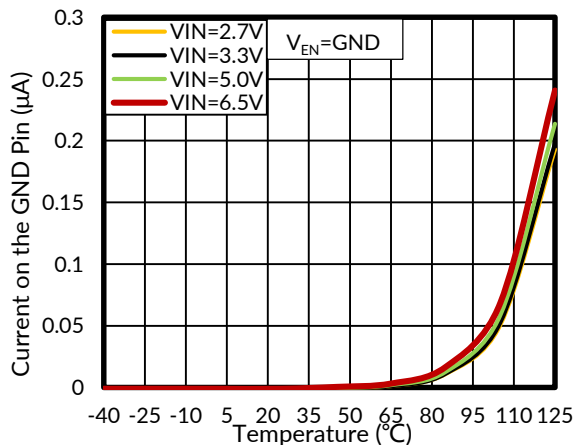


Figure 7. Shutdown Current vs Temperature

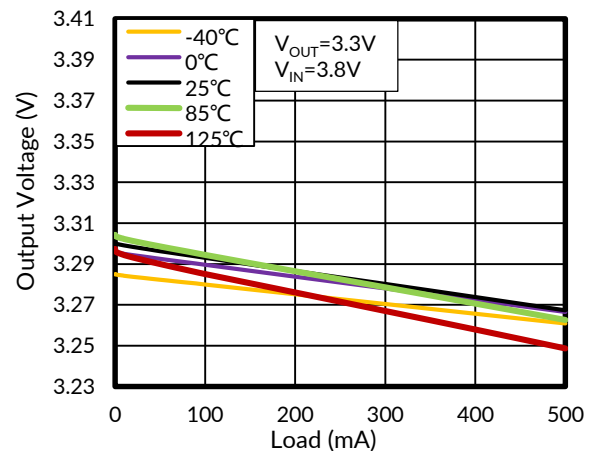


Figure 8. Load Regulation

Typical Performance Characteristics

NOTE: The graphs and tables provided following this note are a statistical summary based on a limited number of samples and are provided for informational purposes only.

Over operating temperature range ($-40^{\circ}\text{C} \leq T_J \leq 125^{\circ}\text{C}$), $V_{IN} = V_{OUTnom} + 0.5\text{V}$ or 2.7V (whichever is greater), $I_{OUT} = 1\text{mA}$, $V_{EN} = V_{IN}$, $C_{OUT} = 2.2\mu\text{F}$, and $C_{NR} = 0.01\mu\text{F}$, unless otherwise noted.

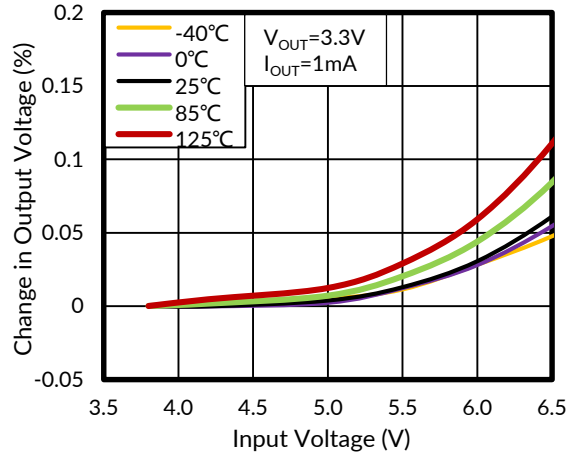


Figure 9. Line Regulation

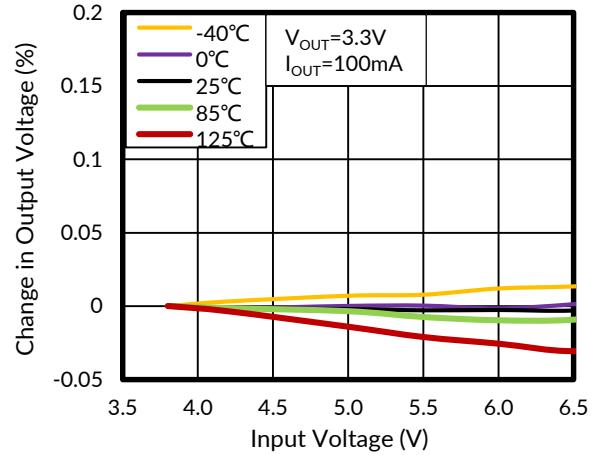


Figure 10. Line Regulation

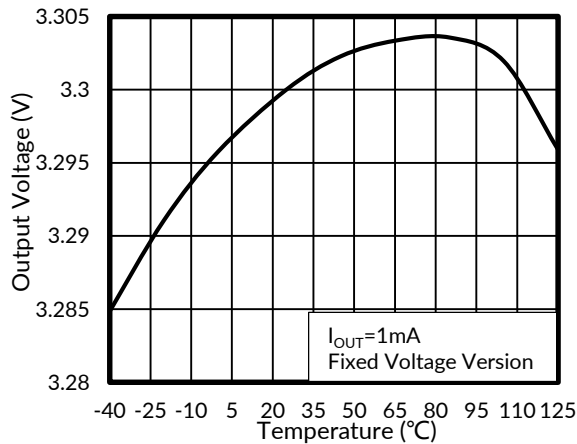


Figure 11. Output Voltage vs Junction Temperature

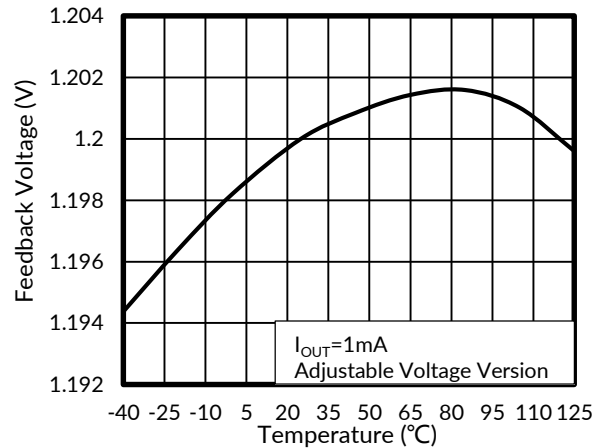


Figure 12. Feedback Voltage vs Junction Temperature

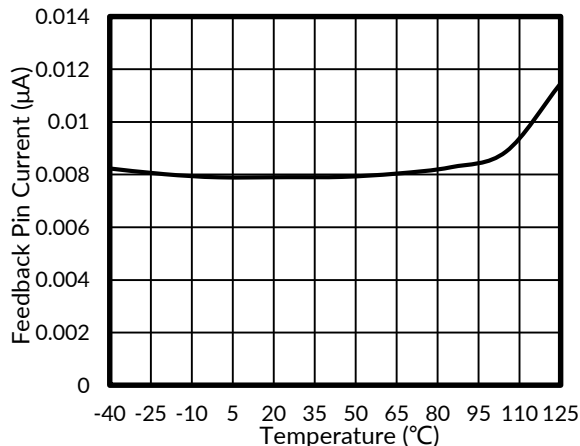


Figure 13. Feedback Pin Current vs Junction Temperature

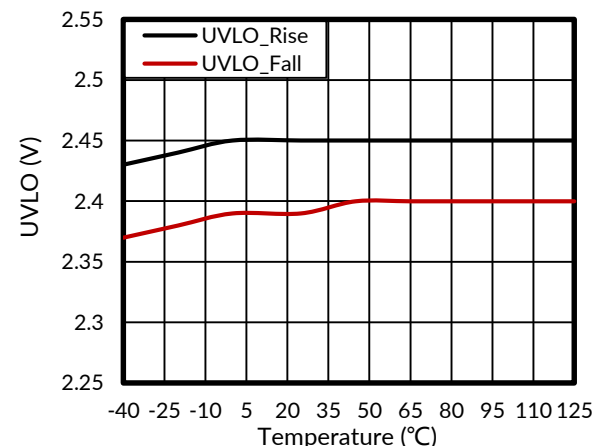


Figure 14. UVLO vs Junction Temperature

Typical Performance Characteristics

NOTE: The graphs and tables provided following this note are a statistical summary based on a limited number of samples and are provided for informational purposes only.

Over operating temperature range ($-40^{\circ}\text{C} \leq T_J \leq 125^{\circ}\text{C}$), $V_{IN} = V_{OUTnom} + 0.5\text{V}$ or 2.7V (whichever is greater), $I_{OUT} = 1\text{mA}$, $V_{EN} = V_{IN}$, $C_{OUT} = 2.2\mu\text{F}$, and $C_{NR} = 0.01\mu\text{F}$, unless otherwise noted.

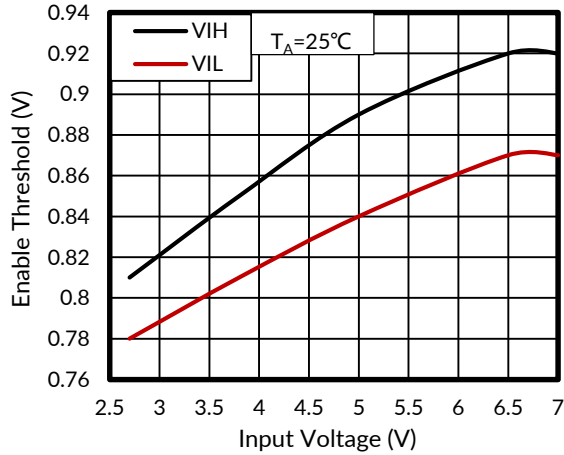


Figure 15. Enable Threshold vs Input Voltage

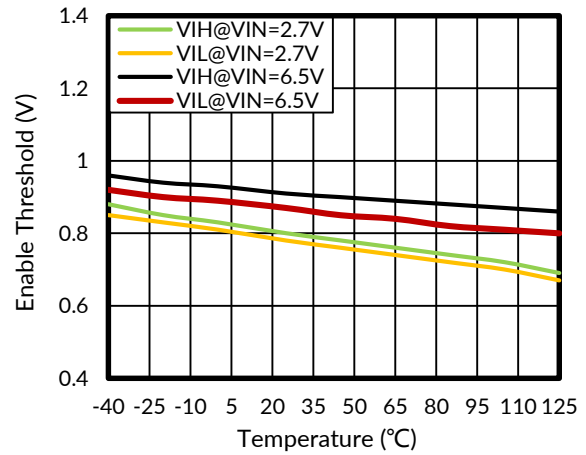


Figure 16. Enable Threshold vs Junction Temperature

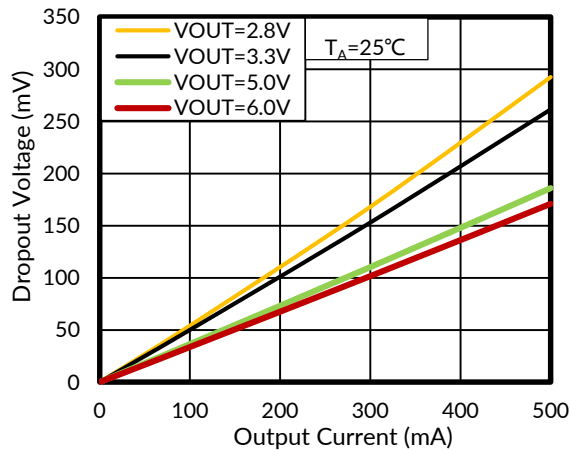


Figure 17. Dropout Voltage vs Output Current

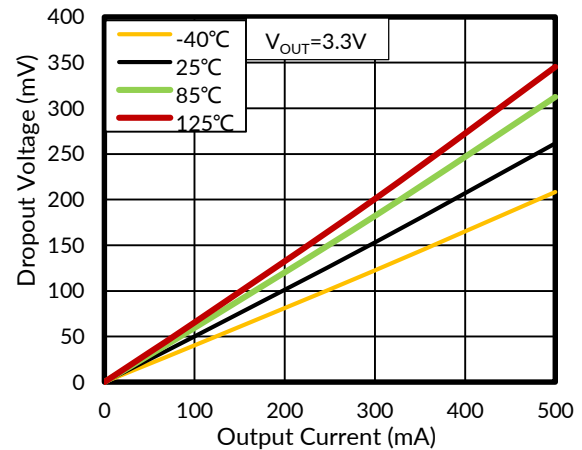


Figure 18. Dropout Voltage vs Output Current

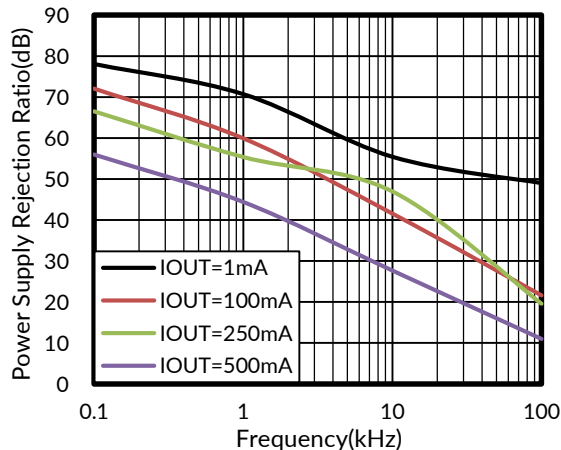


Figure 19. Power Supply Rejection Ratio vs Frequency

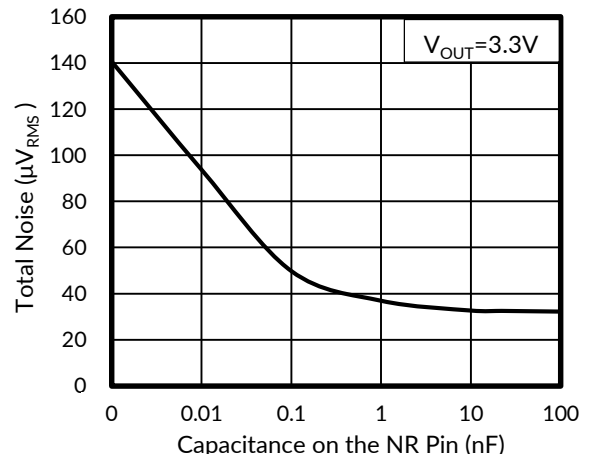


Figure 20. RMS Noise vs C_{NR}

Typical Performance Characteristics

NOTE: The graphs and tables provided following this note are a statistical summary based on a limited number of samples and are provided for informational purposes only.

Over operating temperature range ($-40^{\circ}\text{C} \leq T_J \leq 125^{\circ}\text{C}$), $V_{IN} = V_{OUT_{nom}} + 0.5\text{V}$ or 2.7V (whichever is greater), $I_{OUT} = 1\text{mA}$, $V_{EN} = V_{IN}$, $C_{OUT} = 2.2\mu\text{F}$, and $C_{NR} = 0.01\mu\text{F}$, unless otherwise noted.

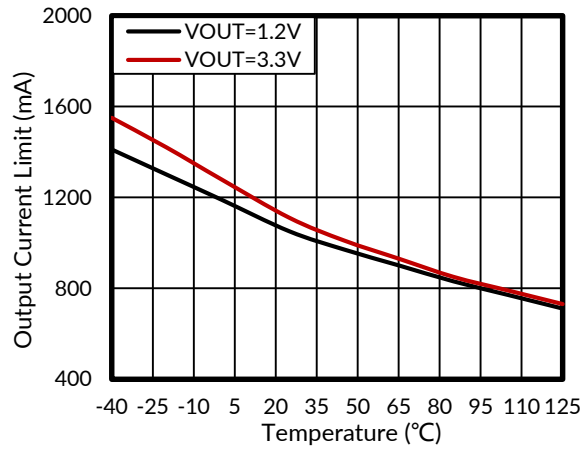


Figure 21. Output Current Limit vs Temperature

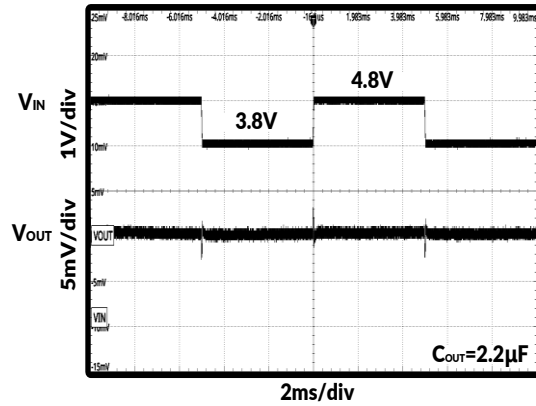


Figure 22. Line Transient Response

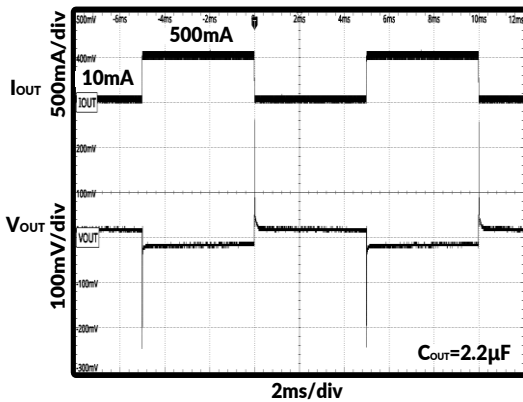


Figure 23. Load Transient Response

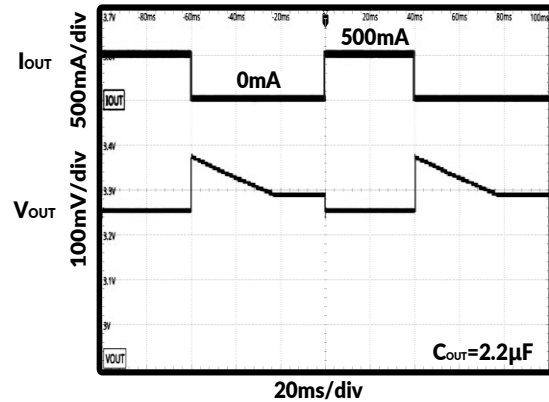


Figure 24. Load Transient Response

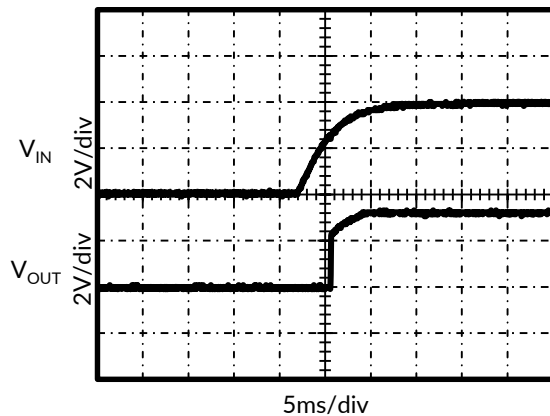


Figure 25. Power On

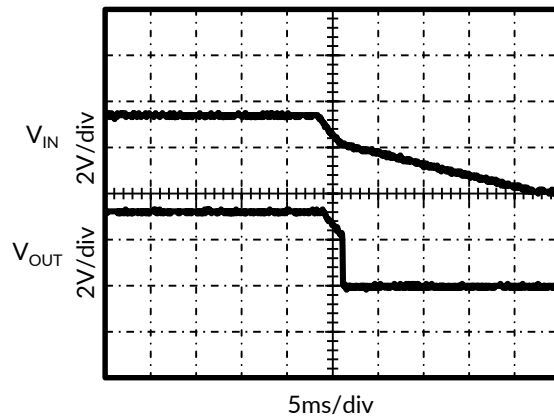


Figure 26. Power Off

Typical Performance Characteristics

NOTE: The graphs and tables provided following this note are a statistical summary based on a limited number of samples and are provided for informational purposes only.

Over operating temperature range ($-40^{\circ}\text{C} \leq T_J \leq 125^{\circ}\text{C}$), $V_{IN} = V_{OUTnom} + 0.5\text{V}$ or 2.7V (whichever is greater), $I_{OUT} = 1\text{mA}$, $V_{EN} = V_{IN}$, $C_{OUT} = 2.2\mu\text{F}$, and $C_{NR} = 0.01\mu\text{F}$, unless otherwise noted.

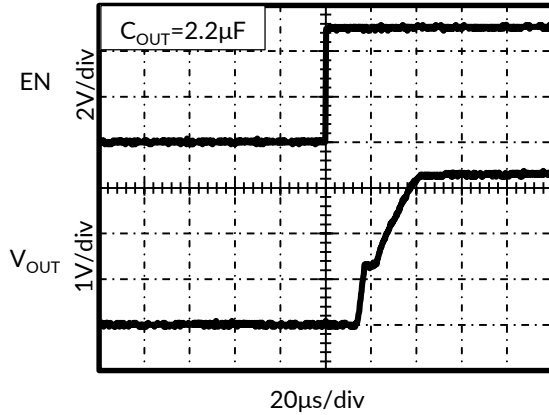


Figure 27. Turn-On Response Using EN

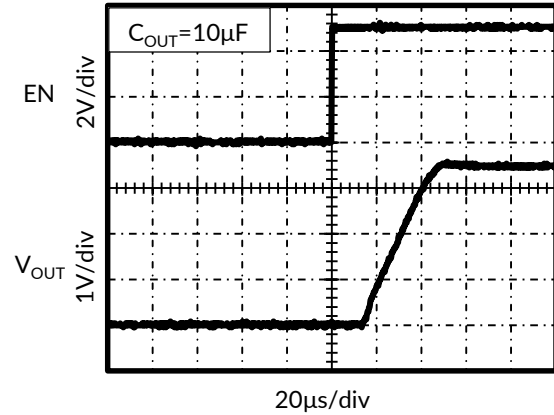


Figure 28. Turn-On Response Using EN

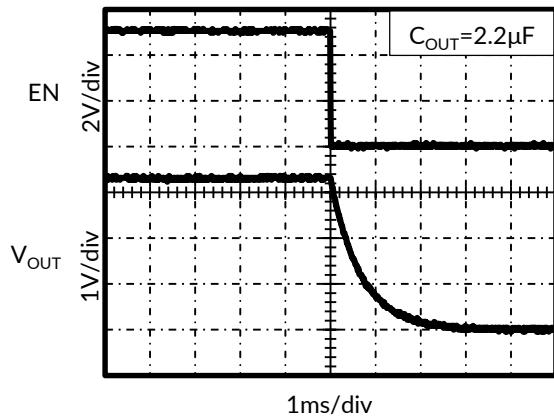


Figure 29. Turn-Off Response Using EN

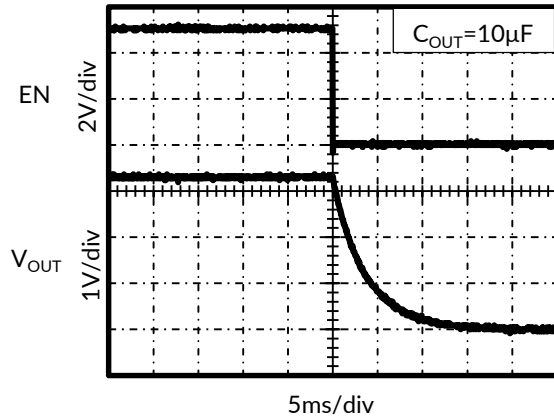


Figure 30. Turn-Off Response Using EN

9 FEATURE DESCRIPTION

9.1 Internal Current-Limit

The RS3215-Q1 internal current-limit helps protect the regulator during fault conditions. During current-limit, the output sources a fixed amount of current that is largely independent of the output voltage. For reliable operation, do not operate the device in current-limit for extended periods of time.

The RS3215-Q1 family of devices has a built-in body diode that conducts current when the voltage at the OUT pin exceeds the voltage at the IN pin. This current is not limited, so if extended reverse voltage operation is anticipated, external limiting can be appropriate.

9.2 Shutdown

The enable pin (EN) is active high and is compatible with standard and low-voltage TTL-CMOS levels. When shutdown capability is not required, the EN pin can be connected to the IN pin.

9.3 Startup and Noise Reduction Capacitor

Fixed voltage versions of the RS3215-Q1 family of devices use a quick-start circuit to fast-charge the noise reduction capacitor, C_{NR} , if present. This architecture allows the combination of very-low output noise and fast startup times. The NR pin is high impedance so a low-leakage C_{NR} capacitor must be used. Most ceramic capacitors are appropriate in this configuration. A high-quality, COG-type (NP0) dielectric ceramic capacitor is recommended for C_{NR} when used in environments where abrupt changes in temperature can occur.

9.4 Transient Response

As with any regulator, increasing the size of the output capacitor reduces overshoot and undershoot magnitude but increases the transient response duration. In the adjustable version, adding C_{FB} between the OUT and FB pins improves stability and transient response performance. The transient response of the RS3215-Q1 family of devices is enhanced by an active pulldown that engages when the output overshoots by approximately 4.5% or more when the device is enabled. When enabled, the pull-down device behaves like a 350 Ω resistor to ground.

9.5 Undervoltage Lockout (UVLO)

The RS3215-Q1 family of devices uses an undervoltage lockout circuit to keep the output shut off until the internal circuitry is operating properly.

9.6 Disabled

The device is disabled under the following conditions:

- The input voltage is less than the UVLO threshold minus V_{HYS} , or has not yet exceeded the UVLO threshold.
- The enable voltage is less than the enable falling threshold voltage or has not yet exceeded the enable rising threshold. When disabled, the pull-down device behaves like a 350 Ω resistor to ground.
- The device junction temperature is greater than the thermal shutdown temperature.

10 TYPICAL APPLICATION

10.1 Input and Output Capacitor Requirements

Although an input capacitor is not required for stability, connecting a 0.1μF to 1μF low-equivalent series resistance (ESR) capacitor across the input supply near the regulator is good analog design practice. This capacitor counteracts reactive input sources and improves transient response and ripple rejection. A higher value capacitor can be necessary if large, fast, rise-time load transients are anticipated or if the device is located several inches from the power source. If source impedance is not sufficiently low, a 0.1μF input capacitor can be necessary to ensure stability.

The RS3215-Q1 family of devices is designed to be stable with standard ceramic output capacitors of values 2.2μF or larger. X5R- and X7R-type capacitors are best because they have minimal variation in value and ESR over temperature.

10.2 Adjustable Device Feedback Resistors

The adjustable-version device requires external feedback divider resistors to set the output voltage. V_{OUT} is set using the feedback divider resistors, R_1 and R_2 , according to the following equation:

$$V_{OUT} = V_{FB} \times (1 + R_1 / R_2) \quad (1)$$

To ignore the FB pin current error term in the V_{OUT} equation, set the feedback divider current to 100x the FB pin current listed in the Electrical Characteristics table. This setting provides the maximum feedback divider series resistance, as shown in the following equation:

$$R_1 + R_2 \leq V_{OUT} / (I_{FB} \times 100) \quad (2)$$

10.3 Feed-Forward Capacitor(*Optional)

For the adjustable-voltage version device, a feed-forward capacitor (CFB) can be connected from the OUT pin to the FB pin. CFB improves transient, noise, and PSRR performance, but is not required for regulator stability. Recommended CFB values are listed in the table1.

Table1

VOUT (V)	COUT (μF)	R2 (kΩ)	CFB (pF)
1.8	2.2 or 4.7 or 10 or 22	220	22
		100	47
		47	100
3.3	2.2 or 4.7 or 10 or 22	220	22
		100	47
		47	100
5.0	2.2 or 4.7 or 10 or 22	220	22
		100	47
		47	100

11 POWER SUPPLY RECOMMENDATIONS

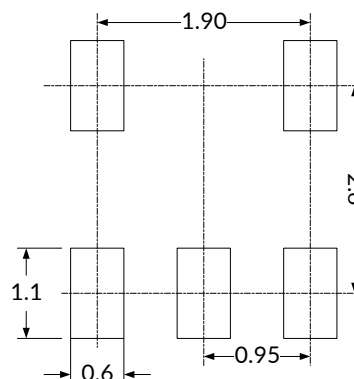
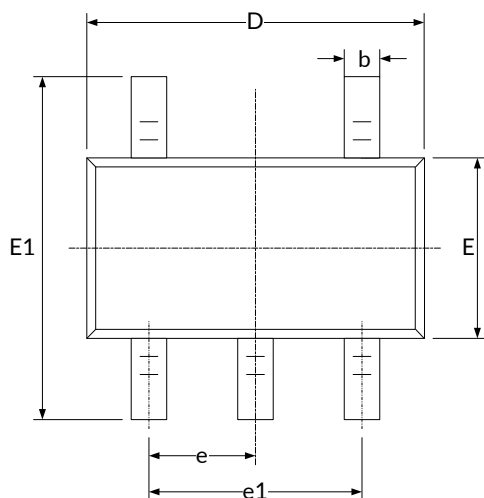
The device is designed to operate from an input voltage supply range between 2.7V and 6.5V. The input voltage range must provide adequate headroom in order for the device to have a regulated output. This input supply must be well regulated. If the input supply is noisy, additional input capacitors with low ESR can help improve output noise.

12 LAYOUT

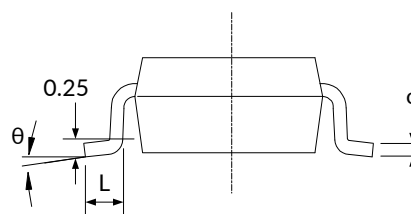
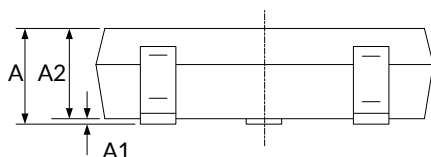
For best overall performance, place all circuit components on the same side of the circuit board and as near as practical to the respective LDO pin connections. Place ground return connections to the input and output capacitor, and to the LDO ground pin as close to each other as possible, connected by a wide, component-side, copper surface. The use of vias and long traces to create LDO component connections is strongly discouraged and negatively affects system performance. This grounding and layout scheme minimizes inductive parasitics, and thereby reduces load-current transients, minimizes noise, and increases circuit stability. A ground reference plane is also recommended and is either embedded in the printed circuit board (PCB) itself or located on the bottom side of the PCB opposite the components. This reference plane serves to assure accuracy of the output voltage, shields the LDO from noise, and behaves similar to a thermal plane to spread (or sink) heat from the LDO device when connected to the exposed thermal pad. In most applications, this ground plane is necessary to meet thermal requirements.

To improve ac performance (such as PSRR, output noise, and transient response), designing the board with separate ground planes for V_{IN} and V_{OUT} is recommended, with each ground plane connected only at the GND pin of the device. In addition, the ground connection for the bypass capacitor must connect directly to the GND pin of the device.

13 PACKAGE OUTLINE DIMENSIONS SOT23-5 ⁽³⁾



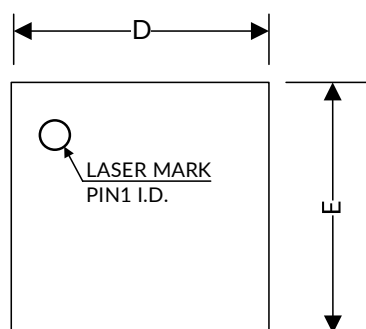
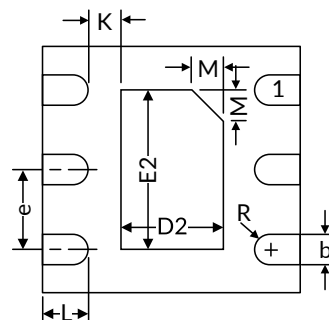
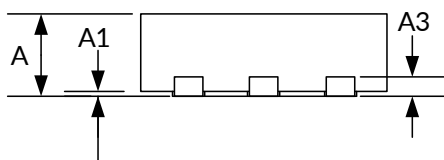
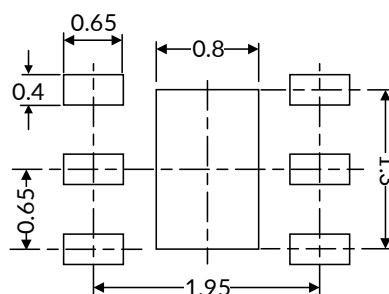
RECOMMENDED LAND PATTERN (Unit: mm)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A ⁽¹⁾		1.250		0.049
A1	0.000	0.150	0.000	0.006
A2	1.000	1.200	0.039	0.047
b	0.360	0.500	0.014	0.020
c	0.100	0.200	0.004	0.008
D ⁽¹⁾	2.826	3.026	0.111	0.119
E ⁽¹⁾	1.526	1.726	0.060	0.068
E1	2.600	3.000	0.102	0.118
e	0.950(BSC) ⁽²⁾		0.037(BSC) ⁽²⁾	
e1	1.800	2.000	0.071	0.079
L	0.350	0.600	0.014	0.024
θ	0°	8°	0°	8°

NOTE:

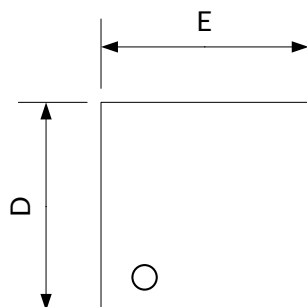
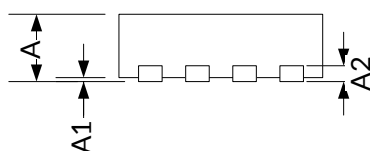
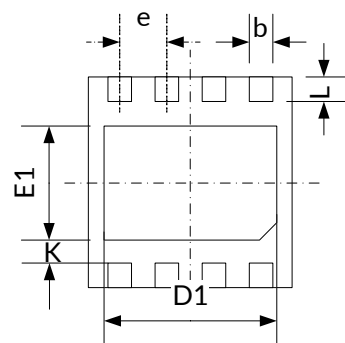
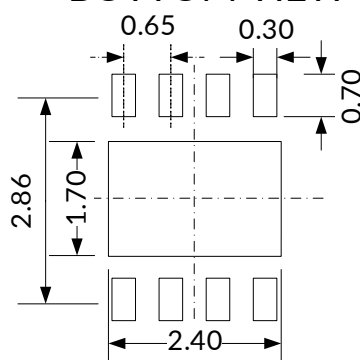
1. Plastic or metal protrusions of 0.15mm maximum per side are not included.
2. BSC (Basic Spacing between Centers), "Basic" spacing is nominal.
3. This drawing is subject to change without notice.

DFN2X2-6⁽³⁾

TOP VIEW

BOTTOM VIEW

SIDE VIEW

**RECOMMENDED LAND
PATTERN (Unit: mm)**

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A ⁽¹⁾	0.700	0.800	0.028	0.032
A1	0.000	0.050	0.000	0.002
A3	0.200 REF ⁽²⁾		0.008 REF ⁽²⁾	
b	0.200	0.300	0.008	0.012
D ⁽¹⁾	1.900	2.100	0.075	0.083
E ⁽¹⁾	1.900	2.100	0.075	0.083
D2	0.700	0.900	0.028	0.035
E2	1.200	1.400	0.047	0.055
e	0.550	0.750	0.022	0.030
K	0.150	0.350	0.006	0.014
L	0.300	0.400	0.012	0.016
M	0.250 REF ⁽²⁾		0.010 REF ⁽²⁾	
R	0.130 REF ⁽²⁾		0.005 REF ⁽²⁾	

NOTE:

1. Plastic or metal protrusions of 0.075mm maximum per side are not included.
2. REF is the abbreviation for Reference.
3. This drawing is subject to change without notice.

DFN3X3-8 ⁽³⁾

TOP VIEW

SIDE VIEW

BOTTOM VIEW

RECOMMENDED LAND PATTERN (Unit: mm)

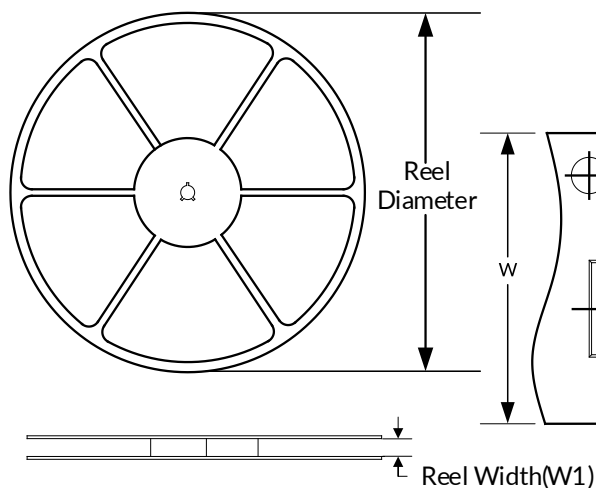
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A ⁽¹⁾	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A2	0.203 REF ⁽²⁾		0.008 REF ⁽²⁾	
b	0.200	0.300	0.008	0.012
D ⁽¹⁾	2.900	3.100	0.114	0.122
D1	2.250	2.350	0.089	0.093
E ⁽¹⁾	2.900	3.100	0.114	0.122
E1	1.450	1.550	0.057	0.061
e	0.650 TYP		0.026 TYP	
L	0.425	0.525	0.017	0.021
K	0.200 REF ⁽²⁾		0.008 REF ⁽²⁾	

NOTE:

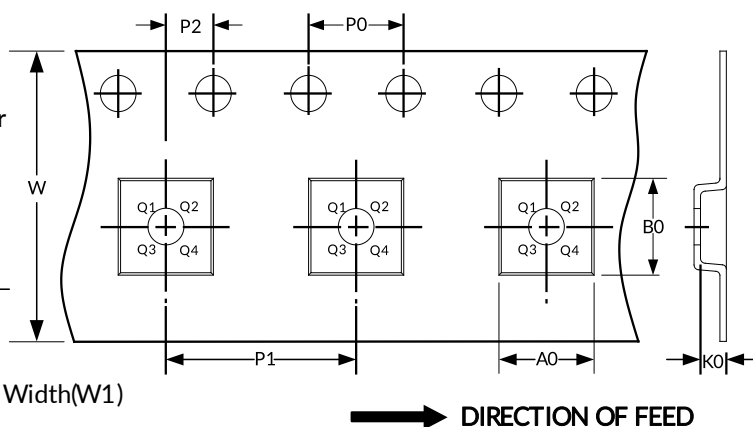
1. Plastic or metal protrusions of 0.075mm maximum per side are not included.
2. REF is the abbreviation for Reference.
3. This drawing is subject to change without notice.

14 TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSION



NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width(mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
SOT23-5	7"	9.5	3.20	3.20	1.40	4.0	4.0	2.0	8.0	Q3
DFN2X2-6	7"	9.5	2.30	2.30	1.10	4.0	4.0	2.0	8.0	Q1
DFN3X3-8	13"	12.4	3.35	3.35	1.13	4.0	8.0	2.0	12.0	Q1

NOTE:

1. All dimensions are nominal.
2. Plastic or metal protrusions of 0.15mm maximum per side are not included.

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