

Features

- Very Low Dropout Voltage
- Low Current Consumption: Typ. 50µA
- Output Voltage: 3.3V
- Guaranteed 600mA Output
- Input Range up to 5.5V
- Current Limit Protection
- Stable with either electrolytic capacitor or low-ESR MLCC (multi-layer ceramic capacitor) Low Temperature Coefficient
- SOP-8L and SOT89-3L: Available in "Green" Molding Compound (No Br, Sb)
- Lead Free Finish / RoHS Compliant (Note 1)

General Description

The AP7215 low-dropout linear regulator operates from a 3.3V to 5.5V supply and delivers a guaranteed 600mA continuous load current.

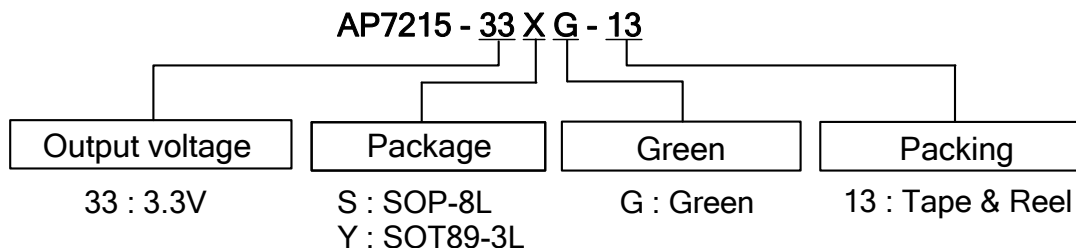
The high-accuracy output voltage is preset to an internally trimmed voltage. An active-low open-drain reset output remains asserted for at least 20ms (TYP) after input voltage rises above the reset threshold.



The space-saving SOP-8L and SOT89-3L package are suitable for "pocket" and hand-held applications.

Applications

- HD/Blue-Ray DVD & MP3/4 Players
- Mobile Handsets and Smart Phones
- Digital Still Camera
- Hand-Held Computers

Ordering Information

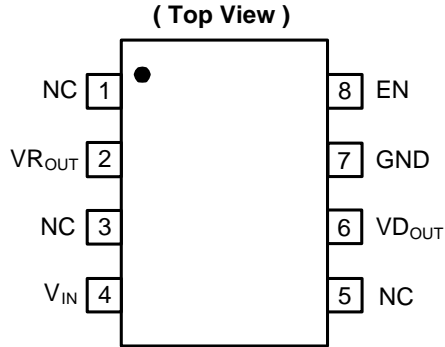


| Device | Package Code | Packaging (Note 2) | 13" Tape and Reel | |
|--|--------------|--------------------|-------------------|--------------------|
| | | | Quantity | Part Number Suffix |
|  AP7215-33SG-13 | S | SOP-8L | 2500/Tape & Reel | -13 |
|  AP7215-33YG-13 | Y | SOT89-3L | 2500/Tape & Reel | -13 |

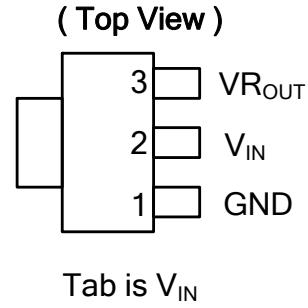
Notes: 1. EU Directive 2002/95/EC (RoHS). All applicable RoHS exemptions applied, see *EU Directive 2002/95/EC Annex Notes*.
 2. Pad layout as shown on Diodes Inc. suggested pad layout document AP02001, which can be on our website at <http://www.diodes.com/datasheets/ap02001.pdf>.

Pin Assignments

(1) SOP-8L



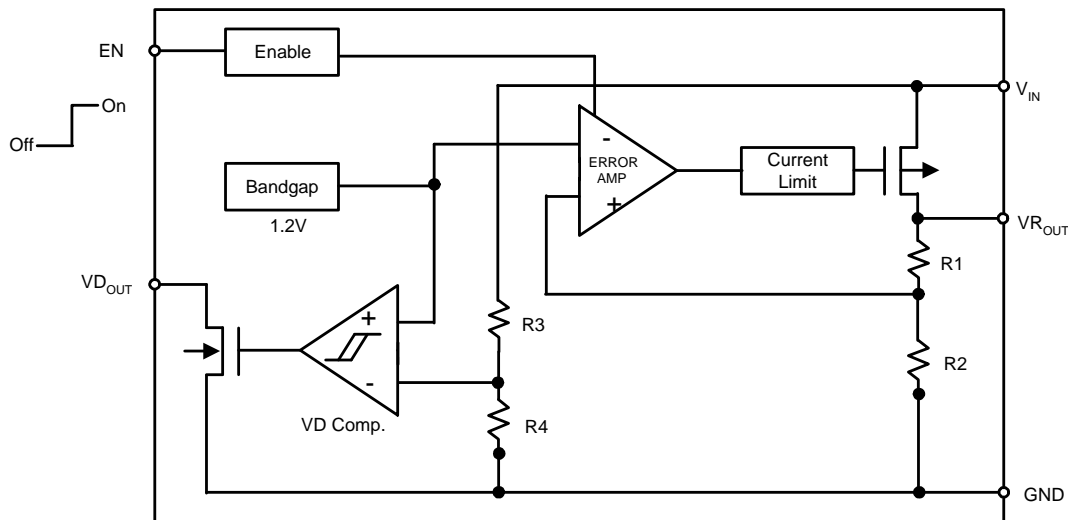
(2) SOT89-3L



Pin Descriptions

| Pin Name | Pin No. | | Description |
|-------------------|---------|----------|-----------------------------------|
| | SOP-8L | SOT89-3L | |
| NC | 1, 3, 5 | - | No Connection |
| VR _{OUT} | 2 | 3 | Voltage Output |
| V _{IN} | 4 | 2 | Supply Voltage |
| VD _{OUT} | 6 | - | VD Output Voltage (Reset Output) |
| GND | 7 | 1 | Ground |
| EN | 8 | - | Enable (VR _{OUT} ON/OFF) |

Block Diagram



Absolute Maximum Ratings

| Symbol | Parameter | Rating | Unit | |
|---------------|---------------------------------|----------------------------|------|---|
| ESD HBM | Human Body Model ESD Protection | 2 | KV | |
| ESD MM | Machine Model ESD Protection | 350 | V | |
| V_{IN} | Input Voltage | +6 | V | |
| $V_{R_{OUT}}$ | Output Voltage | GND - 0.3 ~ $V_{IN} + 0.3$ | V | |
| $T_{J(MAX)}$ | Maximum Junction Temperature | 150 | °C | |
| P_D | Power Dissipation | SOP-8L | 1.2 | W |
| | | SOT89-3L | 0.79 | W |

Recommended Operating Conditions

| Symbol | Parameter | Min | Max | Unit |
|-----------|--------------------------------------|-----|-----|------|
| V_{IN} | Input Voltage | 3.3 | 5.5 | V |
| I_{OUT} | Output Current | 0 | 600 | mA |
| T_J | Operating Junction Temperature Range | -40 | 125 | °C |
| T_A | Operating Ambient Temperature | -40 | 85 | °C |

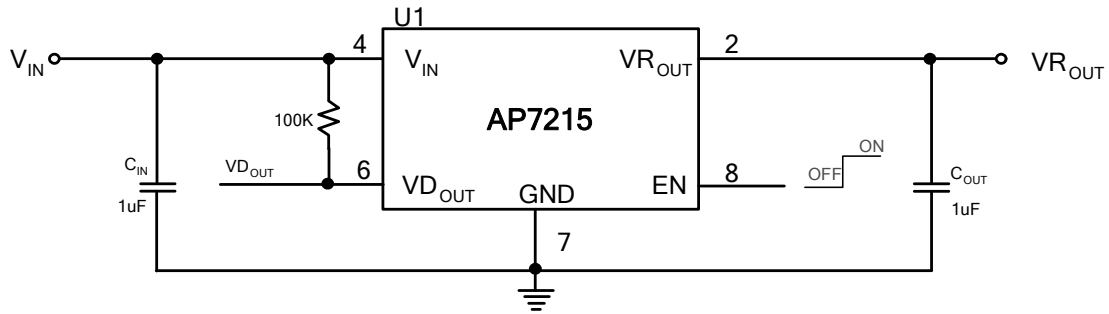
Electrical Characteristics

($T_A = 25^\circ\text{C}$, $C_{IN} = 1\mu\text{F}$, $C_{OUT} = 1\mu\text{F}$, $V_{IN} = 5.0\text{V}$, $V_{EN} = V_{IN}$, unless otherwise noted)

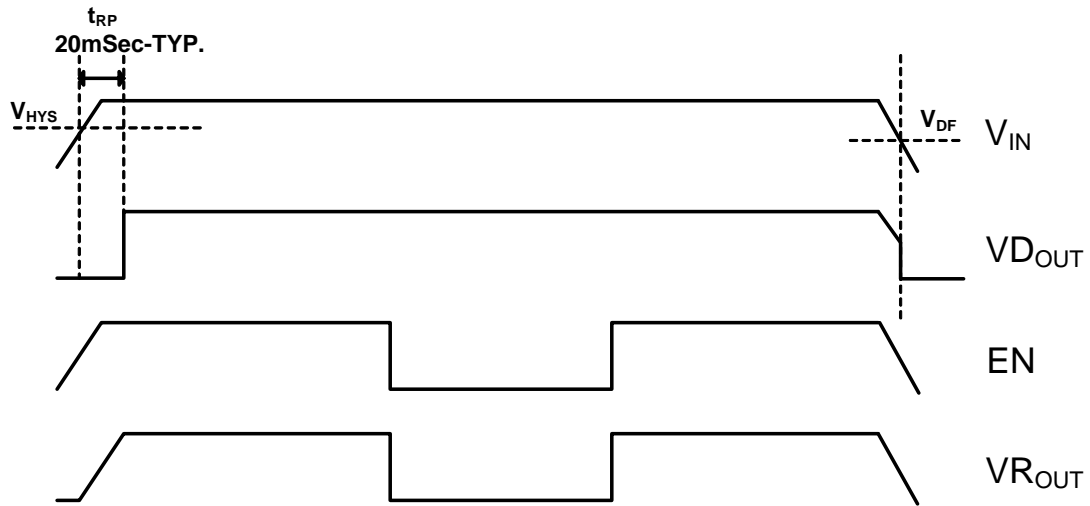
| Symbol | Parameter | Test Conditions | Min | Typ. | Max | Unit |
|--|--|--|----------------------|----------------------|----------------------|---------------------------|
| I_{CCQ} | Quiescent Current | $I_{OUT} = 0\text{mA}$ | - | 50 | 80 | μA |
| I_{STBY} | Standby Current | $V_{EN} = \text{GND}$ $V_{IN} = 5.0\text{V}$ | | 15 | 30 | μA |
| $V_{R_{OUT}}$ | Output Voltage Accuracy | $I_{OUT} = 30\text{mA}$, $V_{IN} = 5\text{V}$ | 3.234 | 3.300 | 3.366 | V |
| $\Delta V_{R_{OUT}}/\Delta T_A/V_{R_{OUT}}$ | $V_{R_{OUT}}$ Temperature Coefficient | $T_A = -40^\circ\text{C}$ to 85°C , $I_{OUT} = 30\text{mA}$ | | ± 100 | | ppm / $^\circ\text{C}$ |
| V_{DO} | Dropout Voltage | $I_{OUT} = 30\text{mA}$ | | 60 | 100 | mV |
| | | $I_{OUT} = 100\text{mA}$ | | 100 | 250 | mV |
| I_{OUT} | Maximum Output Current | $V_{IN} = 5.3\text{V}$ | 600 | | | mA |
| I_{LIMIT} | Current Limit | $V_{IN} = 5.3\text{V}$ | | 750 | | mA |
| I_{SHORT} | Short Circuit Current | $V_{IN} = 5.3\text{V}$ | | 50 | | mA |
| $\Delta V_{R_{OUT}}/\Delta V_{IN}/V_{R_{OUT}}$ | Line Regulation | $4.3\text{V} \leq V_{IN} \leq 5.5\text{V}$, $I_{OUT} = 30\text{mA}$ | | 0.01 | ± 0.2 | %/V |
| $\Delta V_{R_{OUT}}$ | Load Regulation | $1\text{mA} \leq I_{OUT} \leq 100\text{mA}$, $V_{IN} = 5.3\text{V}$ | | 15 | 50 | mV |
| PSRR | Power Supply Rejection | $V_{IN} = 4.3\text{V} + 0.5\text{Vp-pAC}$, $I_{OUT} = 50\text{mA}$, $F = 1\text{KHz}$ | | 55 | | dB |
| V_{EH} | EN Input Threshold | Output ON | 1.6 | | | V |
| V_{EL} | | Output OFF | | | 0.25 | V |
| I_{EN} | Enable Pin Current | | -0.1 | | 0.1 | μA |
| V_{DF} | V_{IN} Detection Voltage | Detect $V_{D_{OUT}}$ fall | 3.83 | 3.91 | 3.98 | V |
| V_{HYS} | V_{DF} Hysteresis Range | | $V_{DF} \times 1.02$ | $V_{DF} \times 1.05$ | $V_{DF} \times 1.08$ | V |
| $I_{VD_{OUT}}$ | $V_{D_{OUT}}$ Sink Current | $V_{D_{OUT}} = 0.5\text{V}$, $V_{IN} = 2.0\text{V}$ | | 20 | | mA |
| | | $V_{D_{OUT}} = 0.5\text{V}$, $V_{IN} = 3.0\text{V}$ | | 30 | | |
| t_{RP} | $V_{D_{OUT}}$ Delay Time | | 10 | 20 | 40 | ms |
| θ_{JA} | Thermal Resistance Junction-to-Ambient | SOP-8L (Note 3) | | 124 | | $^\circ\text{C}/\text{W}$ |
| | | SOT89-3L (Note 3) | | 173 | | |
| θ_{JC} | Thermal Resistance Junction-to-Case | SOP-8L (Note 3) | | 25 | | $^\circ\text{C}/\text{W}$ |
| | | SOT89-3L (Note 3) | | 42 | | |

Notes: 3. Test conditions for SOP-8L, SOT89-3L: Device mounted on FR-4 substrate, single sided PC board, 2oz copper, with minimum recommended pad layout.

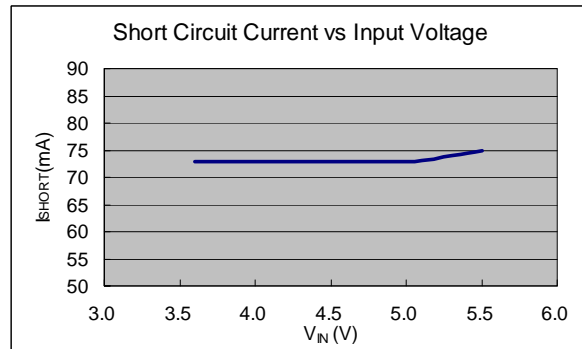
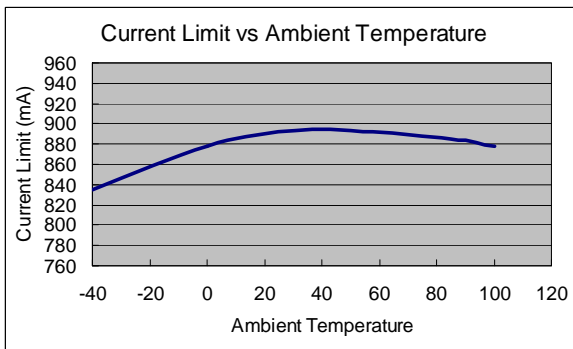
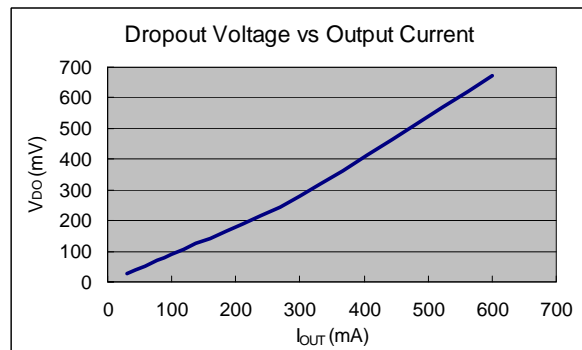
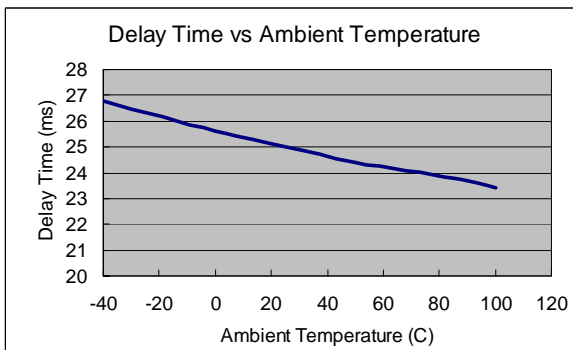
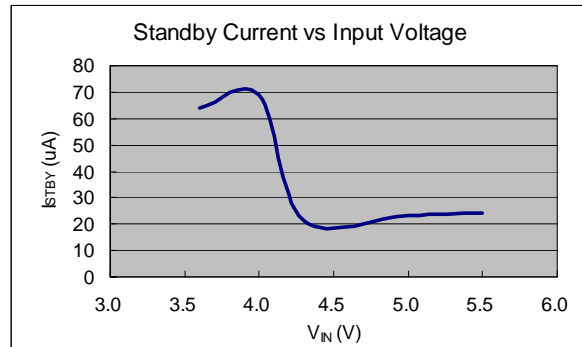
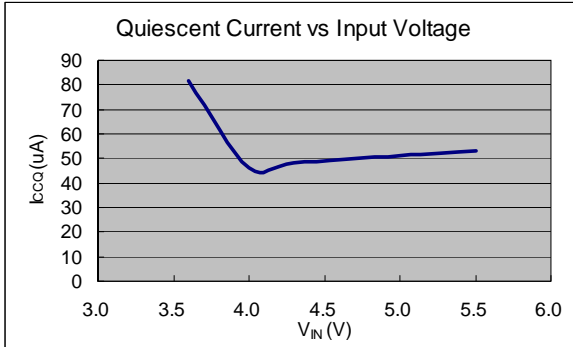
Typical Application



Timing Diagram

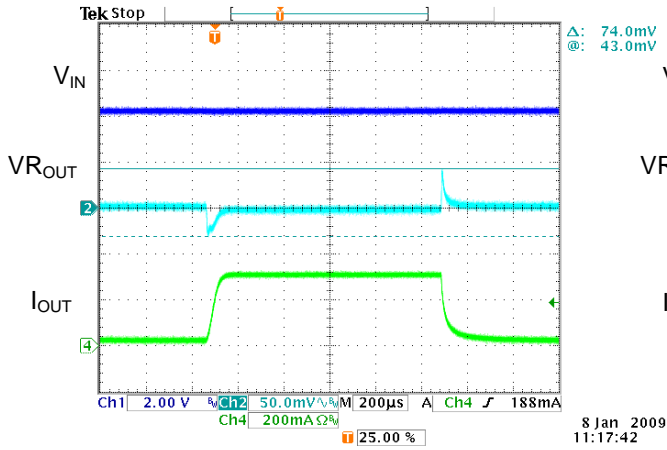


Typical Performance Characteristics

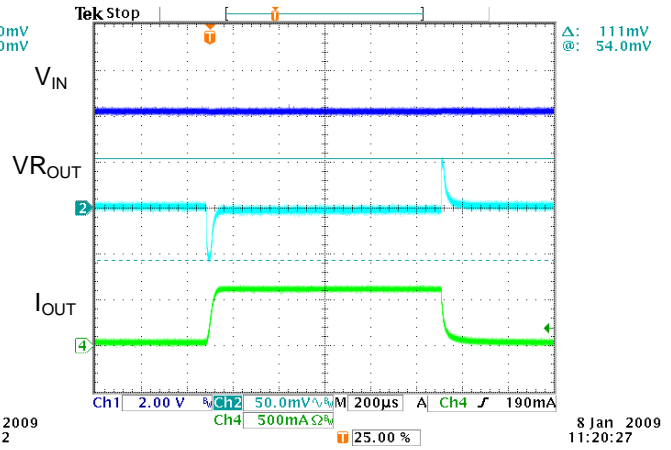


Typical Performance Characteristics (Continued)

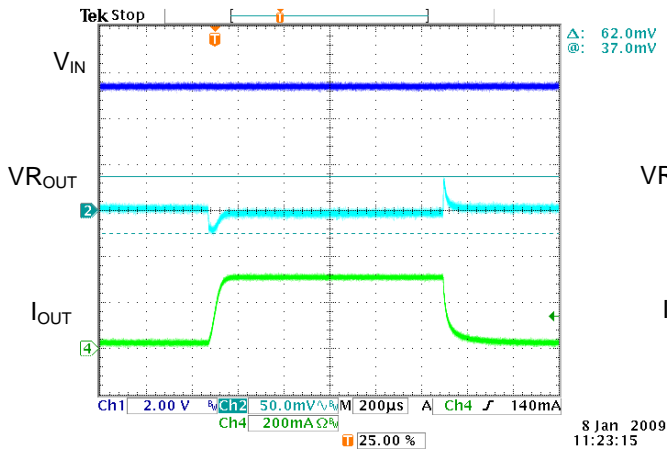
Load Transient Response
($V_{IN}=4.3V$, $I_{OUT}=10mA \sim 300mA$)



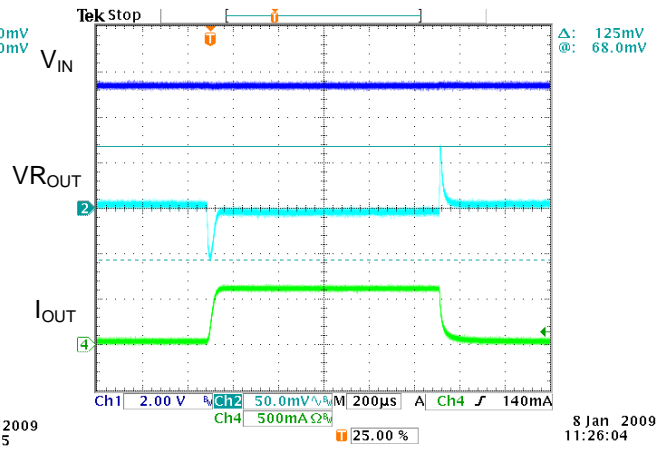
Load Transient Response
($V_{IN}=4.3V$, $I_{OUT}=10mA \sim 600mA$)



Load Transient Response
($V_{IN}=5.5V$, $I_{OUT}=10mA \sim 300mA$)



Load Transient Response
($V_{IN}=5.5V$, $I_{OUT}=10mA \sim 600mA$)



Application Note

Input Capacitor

A 1 μ F ceramic capacitor is recommended to connect between V_{IN} and GND pins to decouple input power supply glitch and noise. The amount of the capacitance may be increased without limit. A lower ESR (Equivalent Series Resistance) capacitor allows the use of less capacitance, while higher ESR type requires more capacitance. This input capacitor must be located as close as possible to the device to assure input stability and less noise. For PCB layout, a wide copper trace is required for both V_{IN} and GND.

Suggested Input Capacitance

| Vendor | Capacitance | Type | Series |
|-------------|-------------|---------|---------|
| TAIYO YUDEN | 1 μ F | Ceramic | LMK212B |

Output Capacitor

The output capacitor is required to stabilize and help the transient response of the LDO. The AP7215 is designed to have excellent transient response for most applications with a small amount of output capacitance. The AP7215 is stable with any small ceramic output capacitors of 1.0 μ F or higher value, and the temperature coefficients of X7R or X5R type. Additional capacitance helps to reduce undershoot and overshoot during transient. For PCB layout, the output capacitor must be placed as close as possible to VR_{OUT} and GND pins, and keep the leads as short as possible.

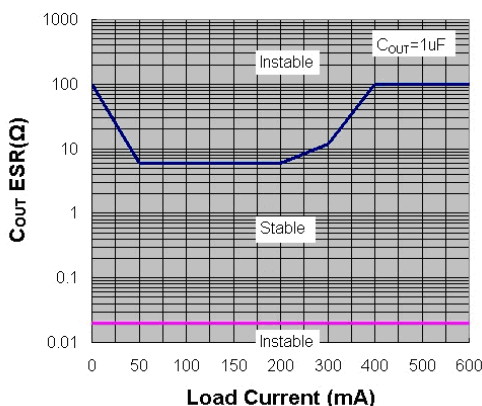
Suggested Output Capacitance

| Vendor | Capacitance | Type | Series |
|-------------|-------------|---------|---------|
| TAIYO YUDEN | 1 μ F | Ceramic | LMK212B |

Suggested Resistance

| Vendor | Capacitance | Type |
|--------|-------------|-------|
| YAGEO | SMD | FR-SK |

Region of Stable C_{OUT} ESR vs. Load Current



ENABLE/SHUTDOWN Operation

The AP7215 is turned on by setting the EN pin high, and is turned off by pulling it low. If this feature is not used, the EN pin should be tied to V_{IN} pin to keep the regulator output on at all time. To ensure proper operation, the signal source used to drive the EN pin must be able to swing above and below the specified turn-on/off voltage thresholds listed in the Electrical Characteristics section under V_{EH} and V_{EL} .

| | VR_{OUT} | VD_{OUT} |
|------|------------|------------|
| EN=0 | 0V | ϕ |
| EN=1 | 3.3V | ϕ |

Current Limit Protection

When output current at VR_{OUT} pin is higher than current limit threshold, the current limit protection will be triggered and clamp the output current to approximately 750mA to prevent over-current and protect the regulator from damage due to overheating.

Short circuit protection

When VR_{OUT} pin is shorted to GND or VR_{OUT} voltage is less than 200mV, short circuit protection will be triggered and clamp the output current to approximately 50mA.

VD_{OUT} (reset output)

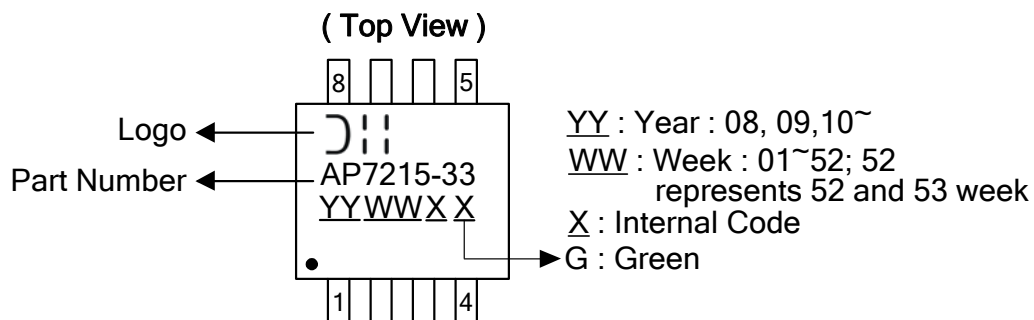
---Open-Drain Active-Low reset output---

In general, VD_{OUT} is pulled up by a resistor (100K Ω) to V_{IN} . The AP7215 microprocessor (μ P) supervisory circuitry asserts a guaranteed logic-low reset during power-up and power-down. Reset is asserted when V_{IN} is below the reset threshold and remain asserted for at least t_{RP} after V_{IN} rises above the reset threshold.

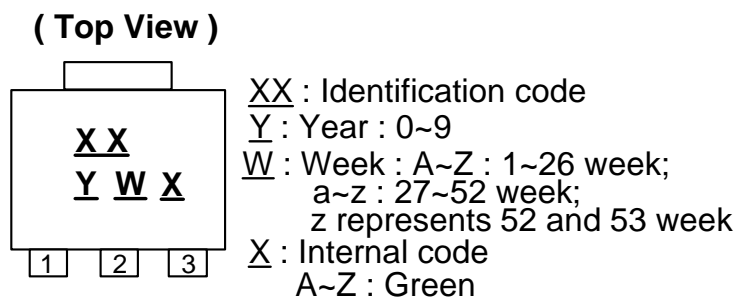
As long as V_{IN} is lower than the reset threshold, VD_{OUT} remains at logic "0". When V_{IN} becomes higher than V_{HYS} , a logic "1" is asserted after a 20ms time delay defined by t_{RP} .

Marking Information

(1) SOP-8L



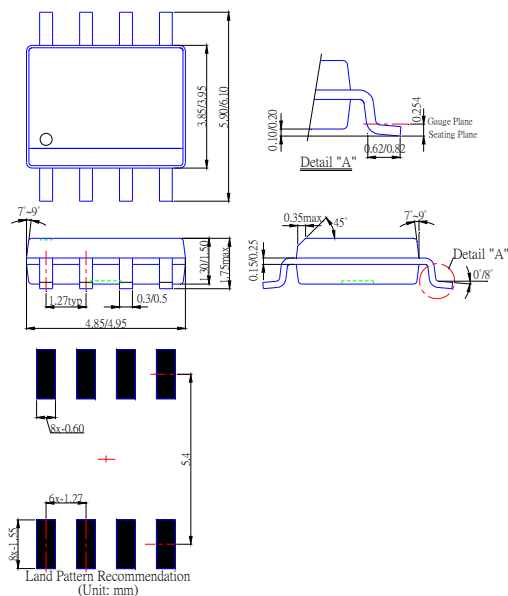
(2) SOT89-3L



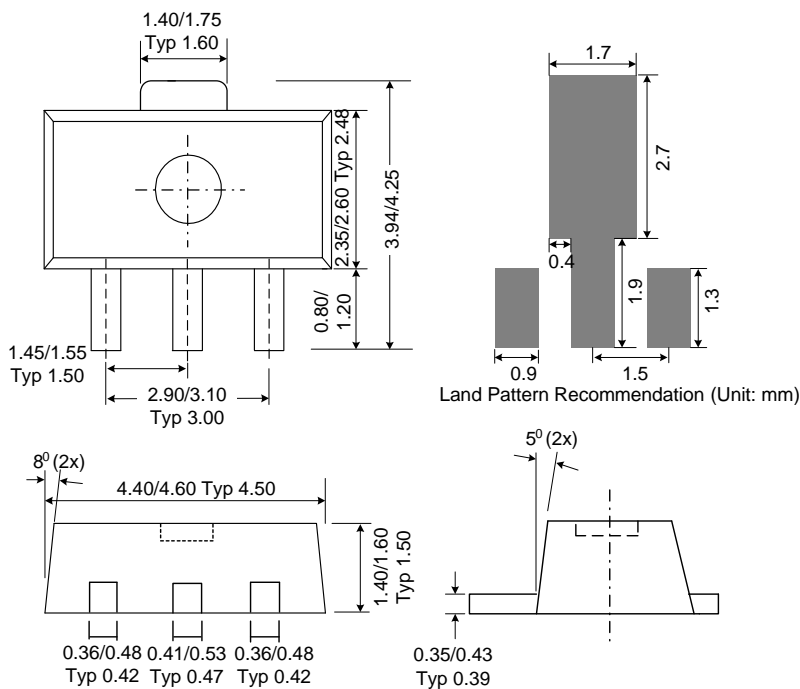
| Device | Package type | Identification Code |
|---------|--------------|---------------------|
| AP7215Y | SOT89-3L | N8 |

Package Information (All Dimensions in mm)

(1) Package Type: SOP-8L



(2) Package Type: SOT89-3L



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