ANPEC

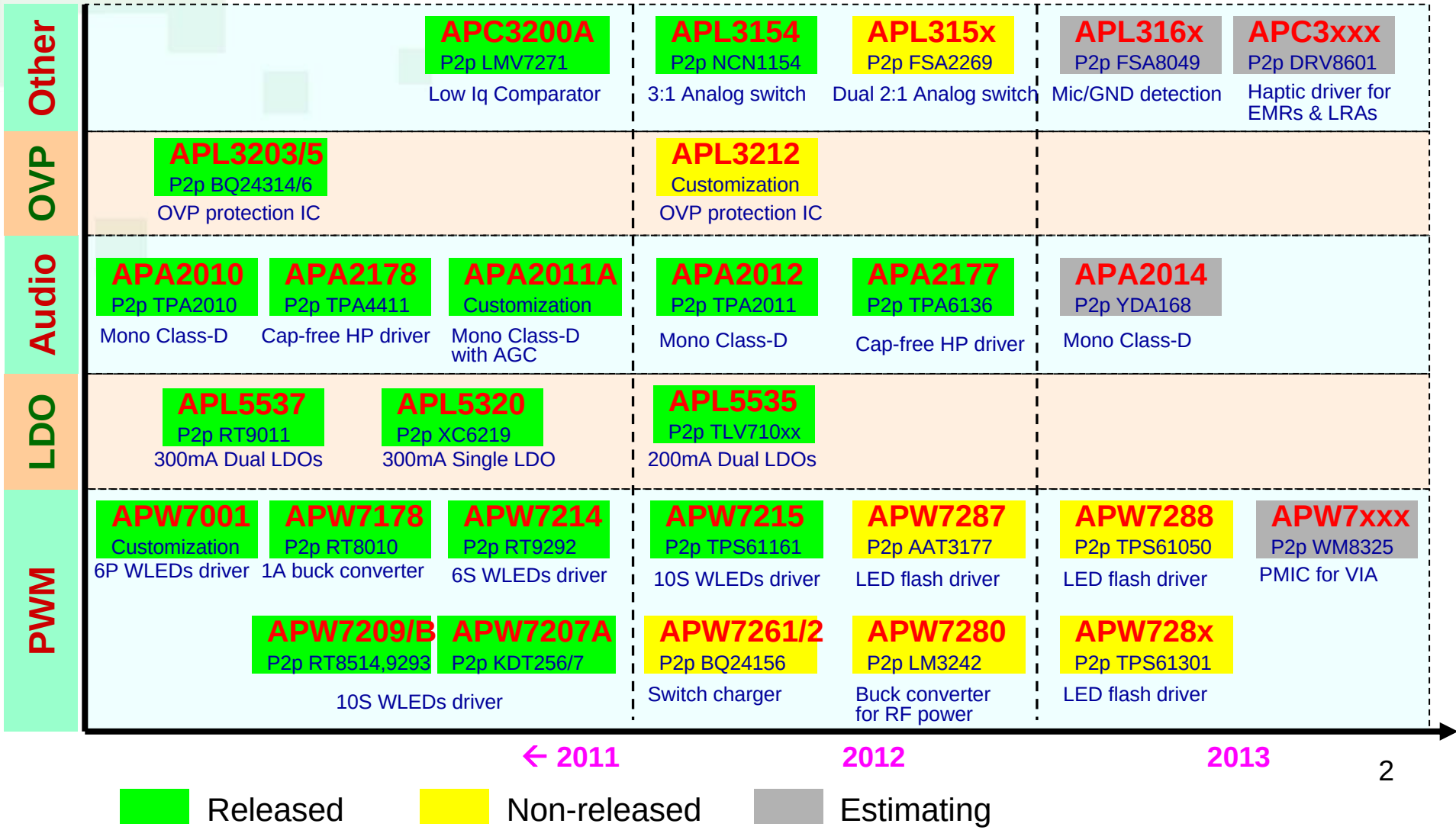
Smart Phone Promotion Tool

TME Dept.

2012/7

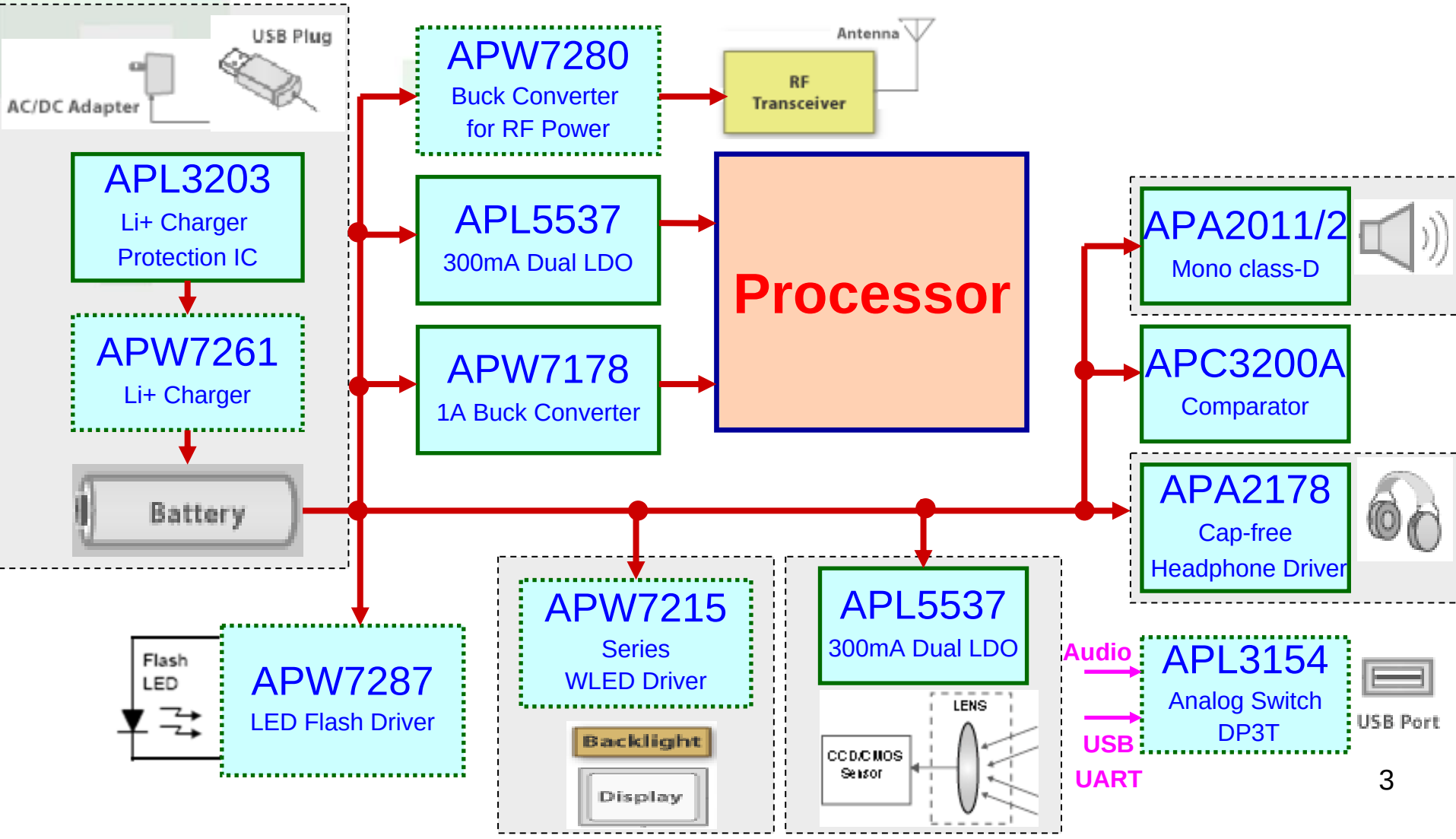
ANPEC

ANPEC Products Roadmap for Smart Phone



Released Non-released Estimating

Smart Phone Power Structure



ANPEC Smart Phone Power Offering

Speak, Headphone Driver Audio Amplifier
APA2010/1/2
APA2178/7

Li+ Switch Charger
APW7261
Li+ Charger Protection IC
APL3203/5, APL3212

RF power Hi-PSRR LDO
APL5320
RF power Converter
APW7280

Hook Switch Detection
APC3200A

Analog Switch
APL3154, APL315x

LED Backlight, OLED
APW7214 /5,
APW7207/9
APW7137
LED Charge Pump
APW7001
LED Flash Driver
APW7287/8

Dual LDO
APL5537/5
Buck Converter
APW7178

Camera Module
APL5537/5

Mic/GND Detection
APL316x

Haptic Driver for EMRs & LRAs
APC3xxx

ANPEC Power Solution List

Product Field	Part number	Cross reference	Remark
Audio AMP	**APA2010**	TPA2010, TPA2005	1.5x1.5mm WLCSP
	APA2011		Class D with AGC
	APA2012	TPA2011	1.2x1.2mm WLCSP
	APA2600	SSM2302	Stereo class-D
Headphone Driver	**APA2178**	TPA4411, MAX4411	WLCSP-16
LED Charge Pump driver	**APW7001**		6 Parallel LEDs
Regulator	**APL5320**	XC6219, RT9193	SOT-25, VTDFN-4
	APL5537	RT9011	TDFN-6(1.6x1.6)
Li+ Protection IC	**APL3203A/B**	BQ24314/6	TDFN-8

ANPEC Power Solution List

Product Field	Part number	Cross reference	Remark
Li+ Charger	**APL3209**	ISL9205D	TDFN-10(3x3)
OLED	**APW7137**	RT9284A, TPS61040	FB=1.235V
WLED	**APW7214**	RT9292,MP3030	TSOT-26,DFN-8
Buck Converter	**APW7178**	RT8010	1A / Adj Ouput
Comparator	**APC3200A**	OPA369	

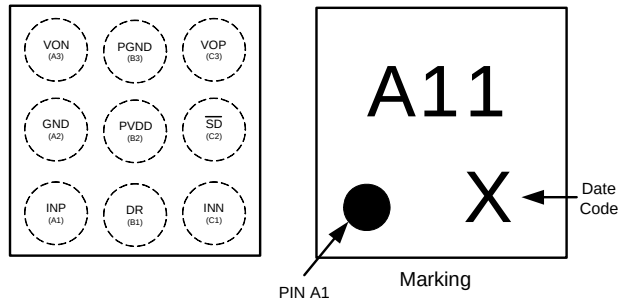
APA2011/A 2.8W Mono Class-D Audio Amplifier with DRC/AGC Function

Key Features:

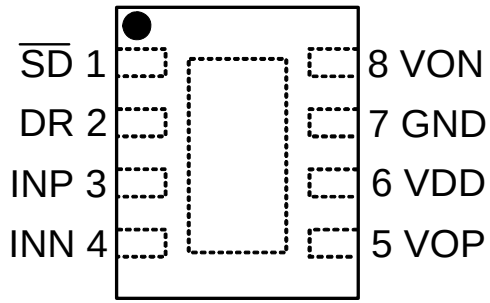
- Operating voltage 2.4~5.5V
- High Efficiency up to 90%
- Low supply current:
  - I_{DD}=2mA @ V_{DD}=5V
  - I_{DD}=1.6mA @ V_{DD}=3.6V
- Output power:
  2.1W into RL=4Ω at V_{DD}=5V with 1% THD+N
  2.8W into RL=4Ω at V_{DD}=5V with 10% THD+N
- Auto gain control (AGC) Provide Maximum 15dB Control (2:1 Compression Ratio)
- Default gain is fixed at 27dB
- Low shutdown current 1uA at 5V
- Less external components required
- High PSRR 80dB at 217HZ
- Thermal shutdown/over current protection
- Fast Startup Time (4mS)
- Output pins compliance to IEC61000-4-2 (Level 4)
  Contact: ±8KV, Air: ±15KV
- Compact Package WLCSP-9, TDFN3x3-8

Mass Production

Pin-out

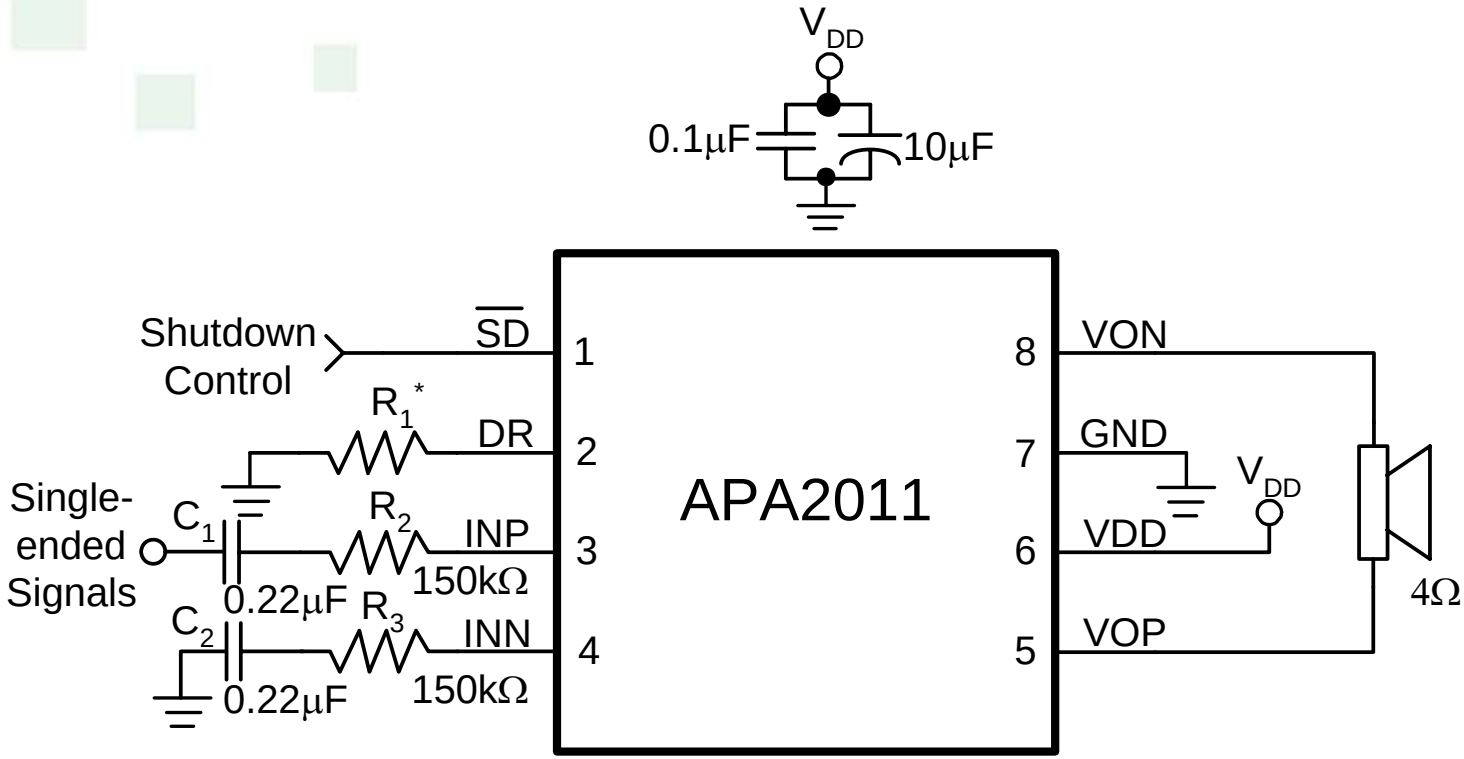


WLCSP-9 Top View



TDFN3x3-8 Top View

APA2011/A Application Circuit



R_1: Setting the Maximum Output Power

$$V_{DR} = \frac{R_1}{R_1 + 10k\Omega} \times V_{DD} \qquad P_O = \frac{2(V_{DR} - 0.5V_{DD})^2}{R_{Spk}}$$

R_{spk}: Speaker Resistor

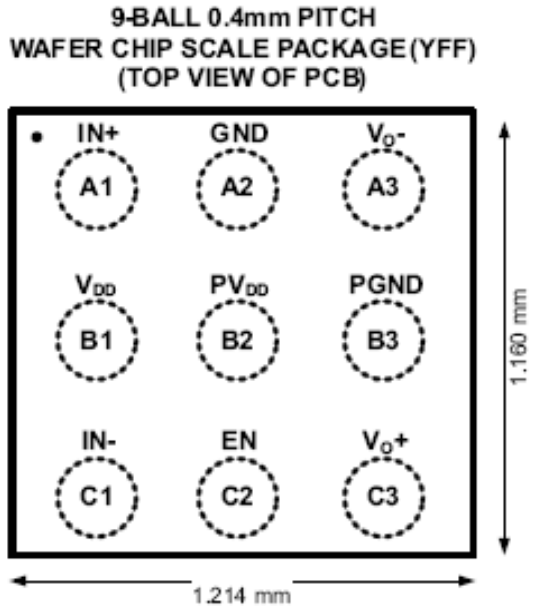
APA2012 2.8W Mono Class-D Audio Amplifier

Mass Production

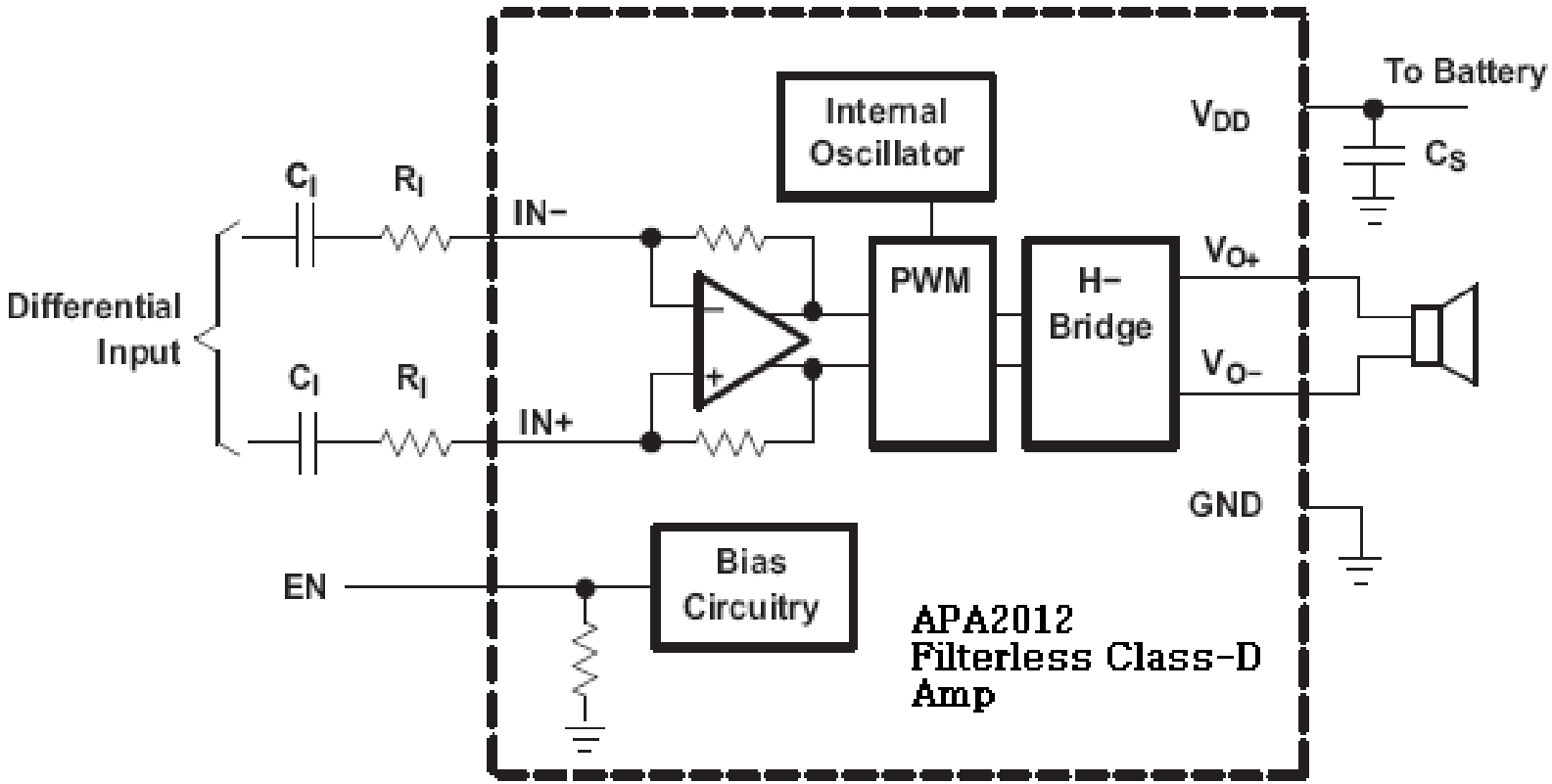
Key Features:

- Operating voltage 2.4~5.5V
- High Efficiency up to 90%
- Low supply current:
  - I_{DD}=1.5mA @ V_{DD}=3.6V
- Output power:
  1.8W into RL=8Ω at V_{DD}=5V with 1% THD+N
  3.2W into RL=4Ω at V_{DD}=5V with 10% THD+N
- Low shutdown current 1uA at 5V
- Integrated Feedback Resistor of 300KΩ
- Less external components required
- High PSRR 80dB at 217HZ
- Thermal shutdown/over current protection
- Fast Startup Time (4mS)
- Output pins compliance to IEC61000-4-2 (Level 4)
  Contact: ±8KV, Air: ±15KV
- Compact Package: 1.2x1.2mm WLCSP-9

Pin-out



APA2012 Application Circuit



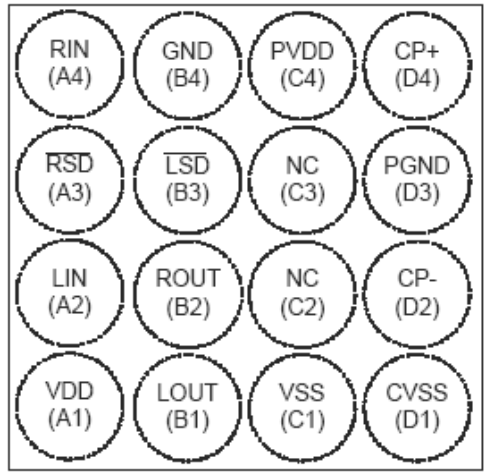
APA2178 270mW Stereo Cap-free Headphone Driver

Mass Production

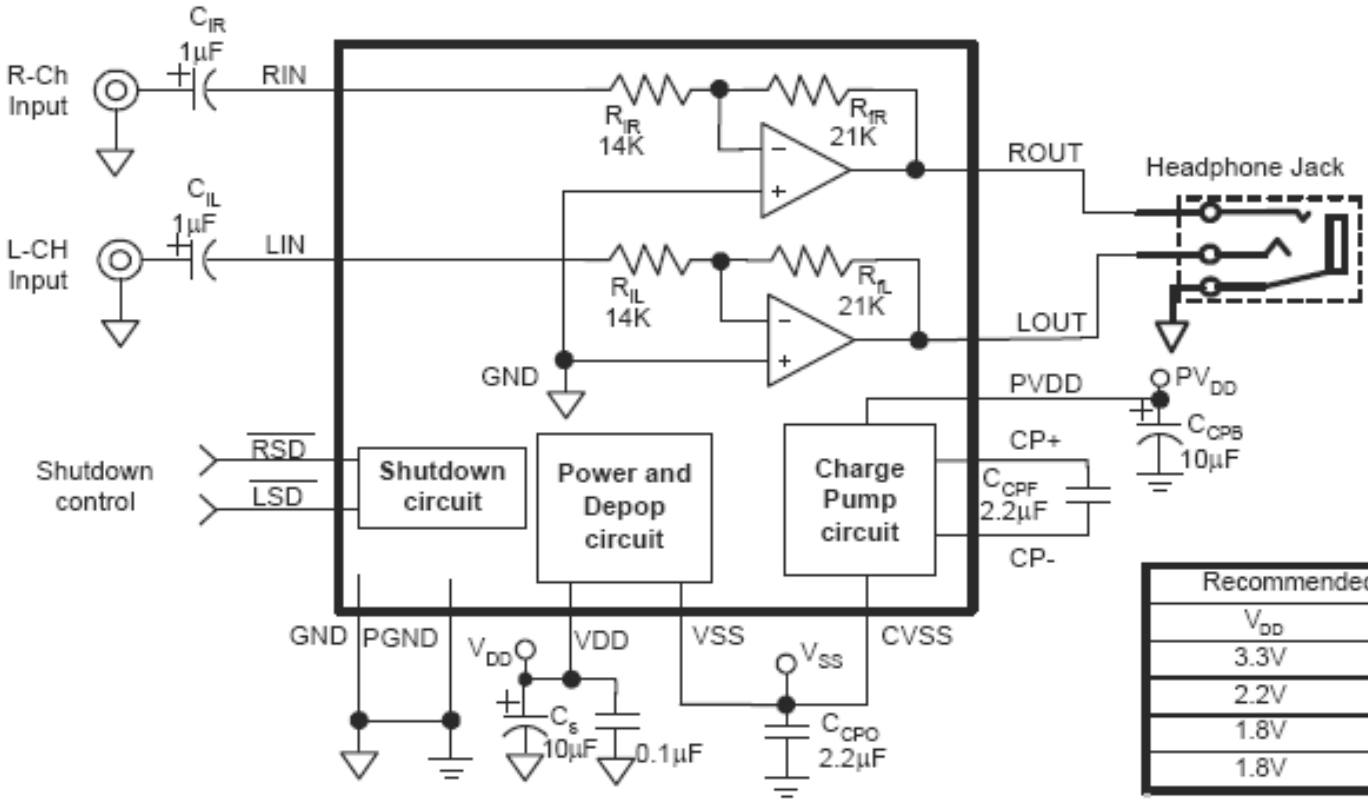
Key Features

- P2p MAX4411, TPA4411
- No Output Capacitor Required
- Dual Supply Voltage (PV_{DD}>V_{DD})
  - V_{DD}=2.2~4.5V
  - PV_{DD}=2.2~5.5V
- Meeting VISTA Requirements
- Output Power at 10% THD+N
  - 270mW at V_{DD}=3.3V, PV_{DD}=5.0V, RL=16Ω
  - 70mW at V_{DD}=1.8V, PV_{DD}=3.0V, RL=16Ω
- Less External Components Required
- High PSRR: 80dB at 217Hz
- Fast Start-up Time: 120uS
- Short Circuit and Thermal Protection
- Surface-Mount Package
  - WLCSP 2X2mm-16 Bump
- Lead Free Available (RoHS compliant)

Pin-out Diagram



APA2178 Application Circuit



Recommended Supply Voltage	
V_{DD}	PV_{DD}
3.3V	5.0V
2.2V	3.6V
1.8V	3.0V
1.8V	2.4V

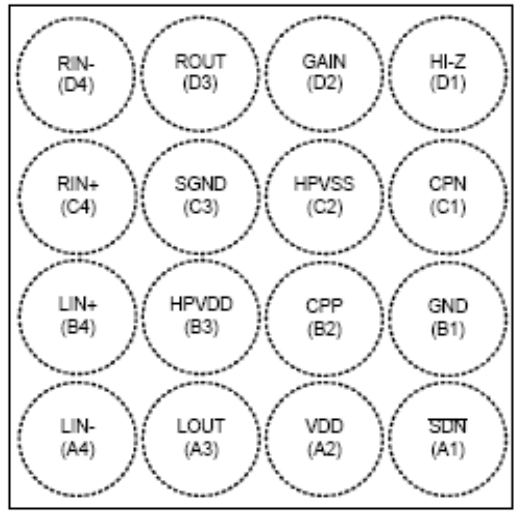
APA2177 Stereo Cap-free Headphone Driver

2012/2Q MP

Key Features

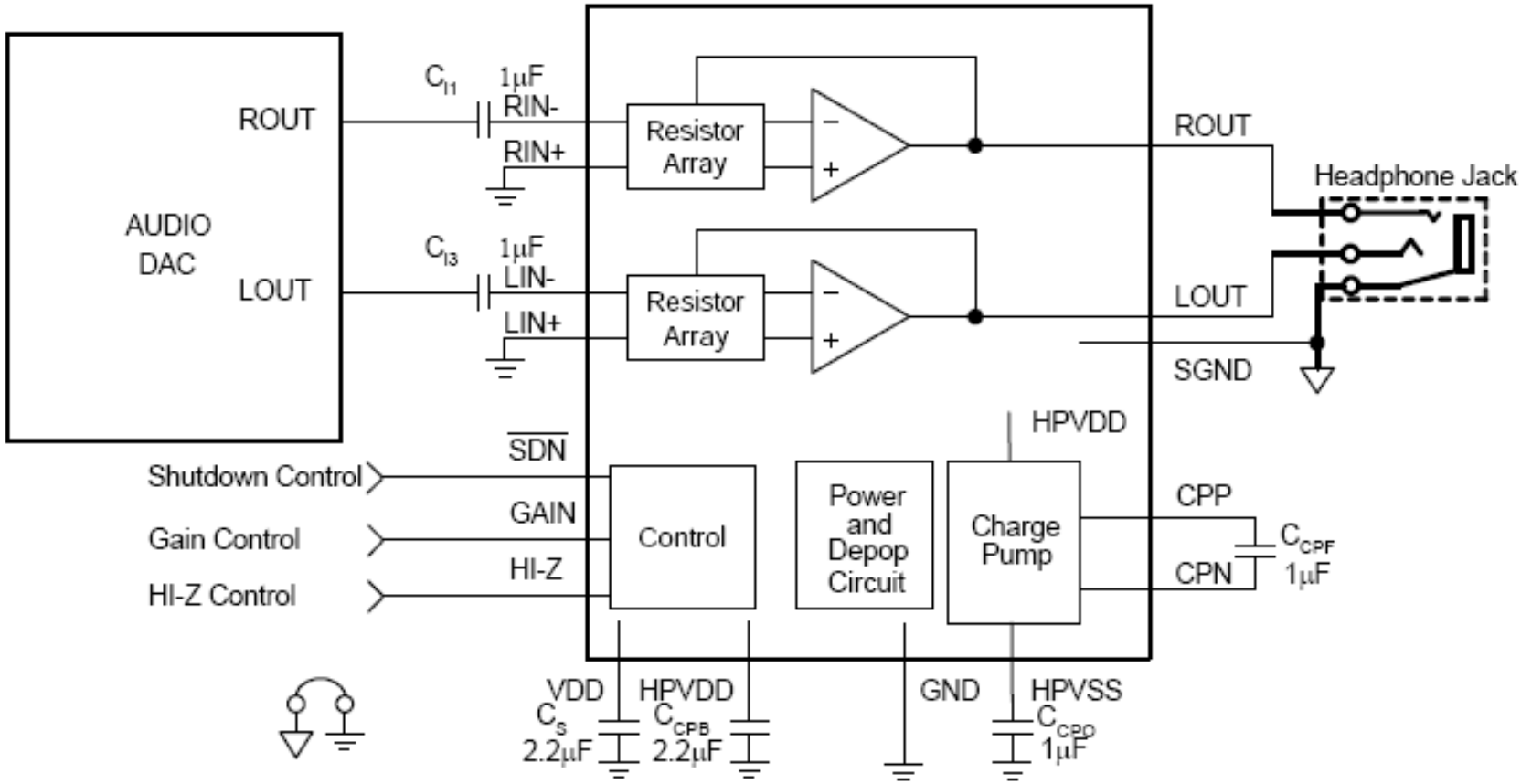
- Operating Voltage: 2.4V~5.5V
- Supply Current
  - I_{DD}=2.1mA at V_{DD}=3.6V
- Ground Reference Output
  - No output Capacitor Required
  - Save the PCB Space
  - Improve the Low Frequency Response
- Output Power at 1% THD+N
  - 25mW at V_{DD}=3.6V, RL=16Ω
  - 20mW at V_{DD}=3.6V, RL=32Ω
- Integrate the De-pop Cirucitry
- High PSRR: 100dB at 217Hz
- Fast Start-up Time: 4mS
- Short Circuit and Thermal Protection
- Surface-Mount Package
  - WLCSP 1.6x1.6mm-16 Bump
- Lead Free Available (RoHS compliant)

Pin-out



WLCSP-16

APA2177 Application Circuit



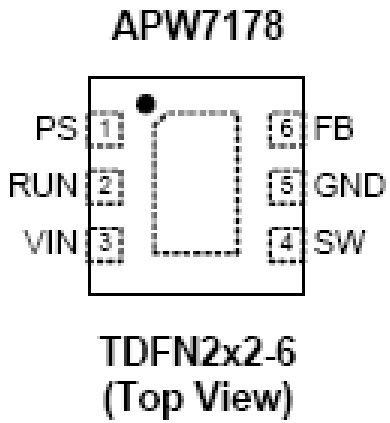
APW7178 1A, Low Iq Sync Buck Converter

Mass Production

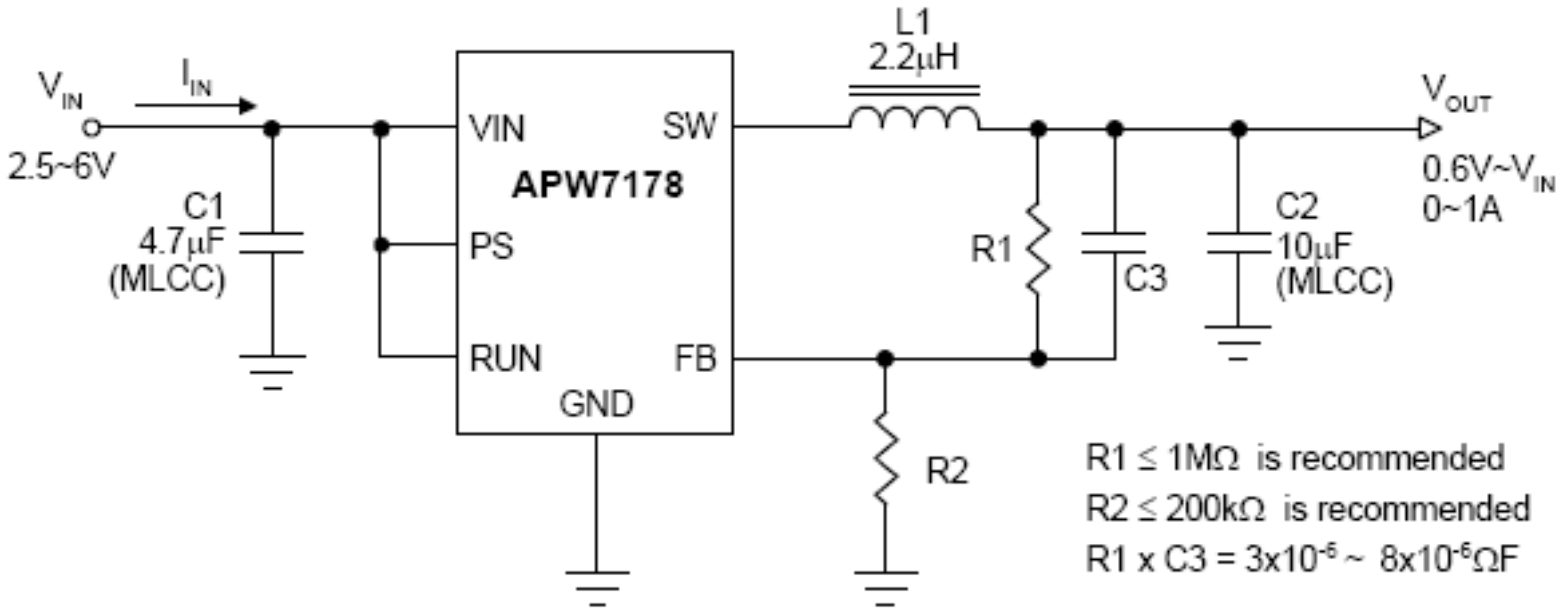
Key Features:

- High-Efficiency Synchronous Step-Down Converter
- 2.5V~6.0V Input Voltage Range
- 0.6V Low Reference Voltage
- Adjustable Output Voltage Range From 0.6V~VI
- Fixed Output Voltage: 1.0V,1.2V, 1.8V, 3.3V
- Up to 1A Output Current
- 1.5MHz Fixed Frequency PWM Operation
- PWM / Burst Mode Switching Control
- 20uA Quiescent Current
- 100% Duty Cycle Low-Dropout Operation
- Soft-Start Function
- Available in 2x2mm TDFN-6 Package

Pin-out



APW7178 Application Circuit



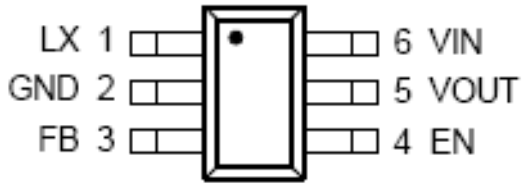
APW7214 6 Series LEDs Driver

Mass Production

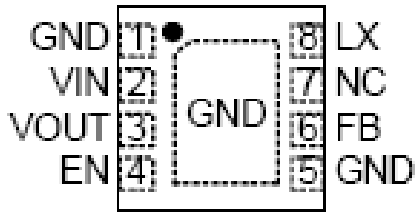
Key Features:

- Operating Voltage,Vin:2.5V~6V
- High Operating Frequency : 1MHZ
- High Output Voltage: 30V
- Reference Voltage: A:0.104V/B:0.25V/C:0.3V
- 700mA Current limit
- Digital Dimming 100Hz to 200KHz
- Built-in Diode
- Low $R_{DS(ON)}$=0.3mΩ
- High Efficiency up to 85% at Vin=5V
- Shutdown current <1uA
- Built-in Soft-Start,OCP,OTP and Open LEDs protect (APW7213: Clamping, APW7214: Shutdown)
- Lead free Available (ROHS Compliant)

Pin-out

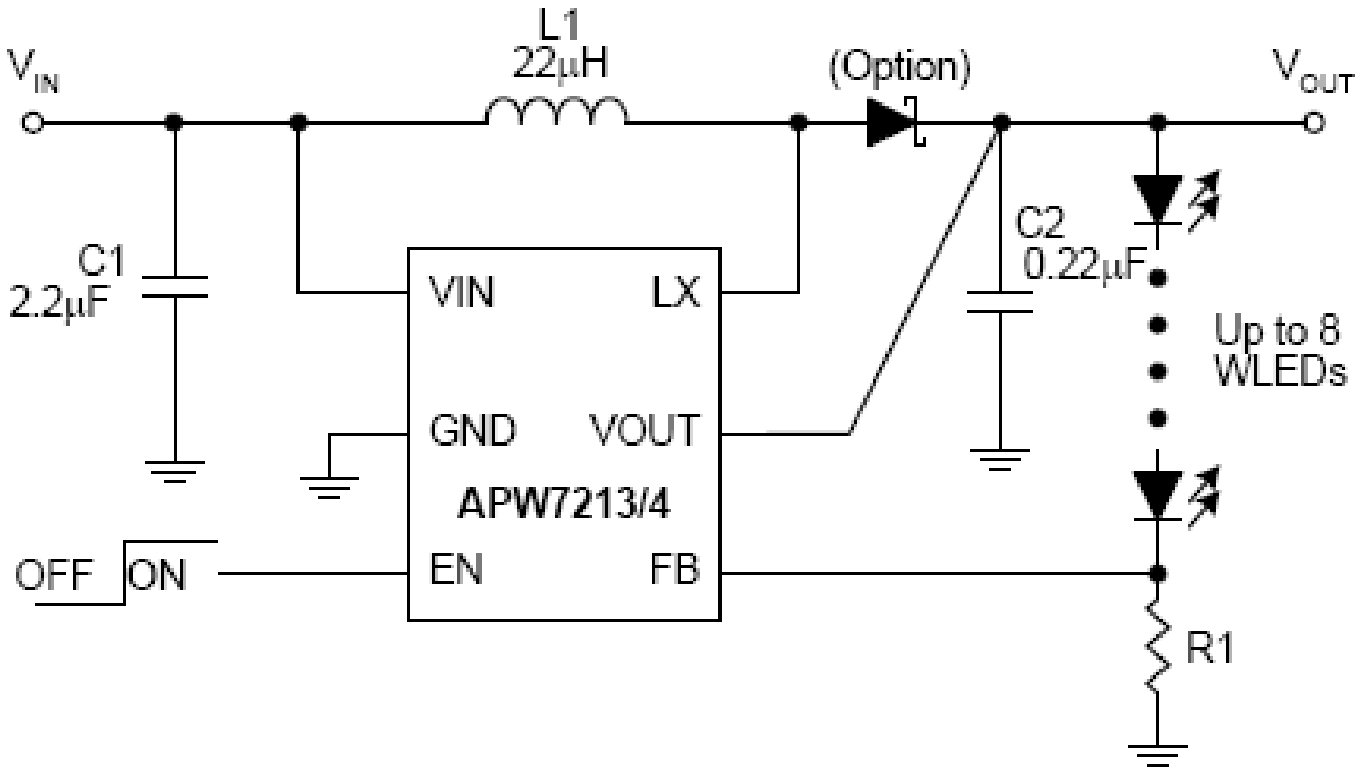


SOT-23-6/TSOT-23-6A
(Top View)



TDFN2x2-8
(Top View)

APW7214 Application Circuit



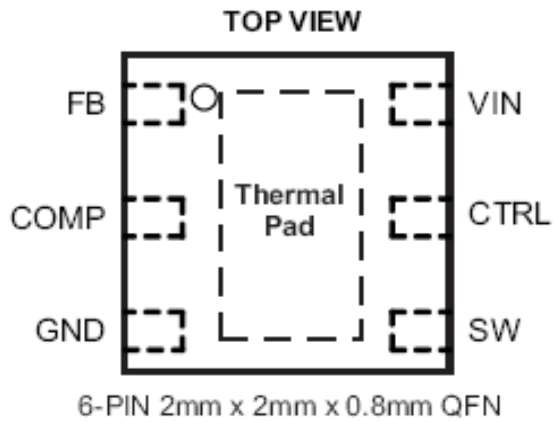
APW7215 10 Series LEDs Driver

2012/2Q MP

Key Features:

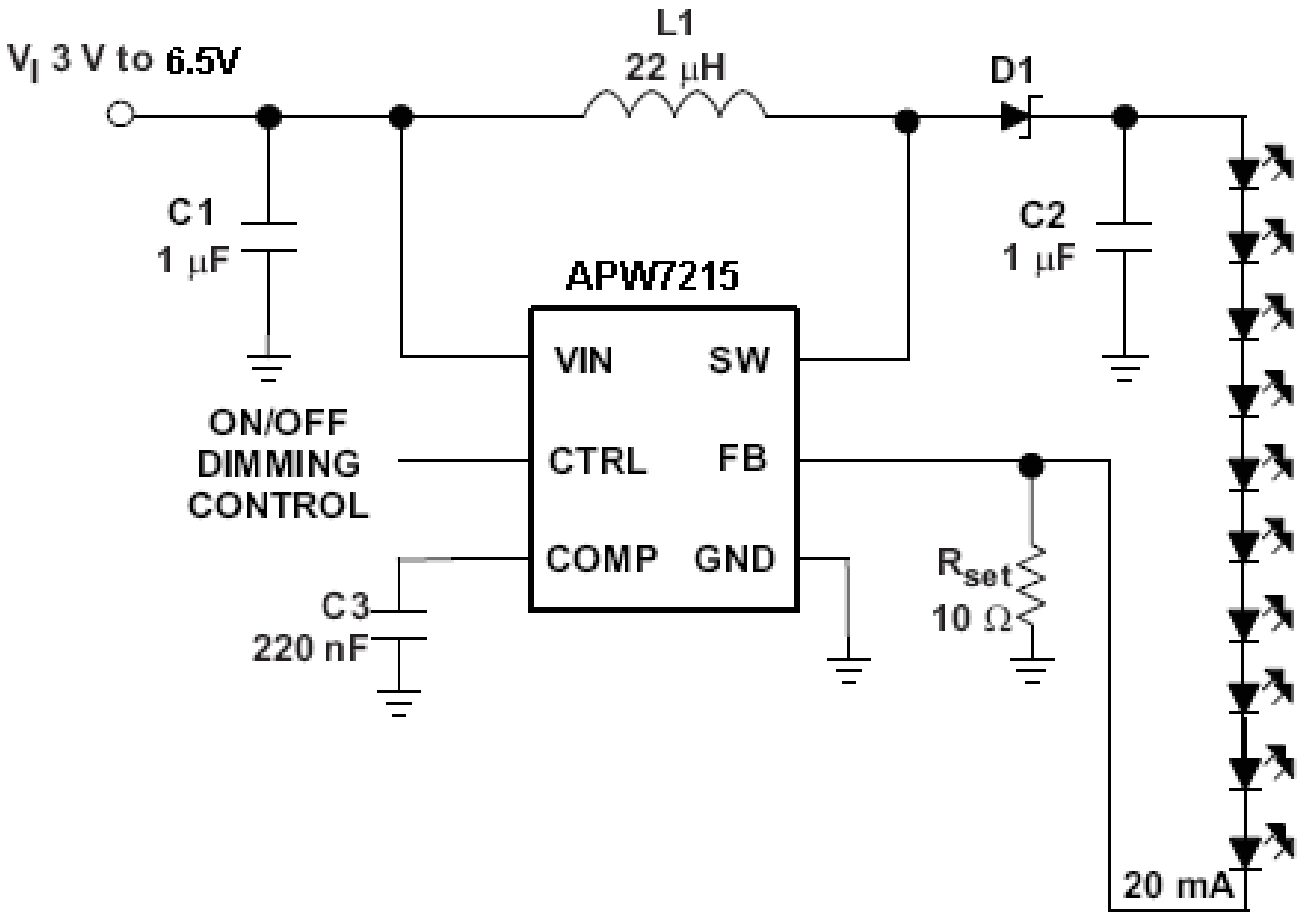
- Wide Input Voltage from 2.7V to 6.5V
- Fixed 600KHz Switching Frequency
- Reference Voltage: 0.2V ±3% Accuracy
- Brightness Control:
  - Dimming Frequency: 5KHz to 100KHz
- Current Limit Protection: 1.5A
- Built-in Power N-MOS: 0.4Ω at 3.6V
- Internal Open-LED Protection: 38V
- Under-Voltage Lockout Protection
- Built-in Soft-start
- Over-Temperature Protection
- <1uA Quiescent Current During Shutdown
- 2x2mm TDFN-6 Package
- Lead Free Green Devices Available (RoHS Compliant)

Pin-out Diagram



6-PIN 2mm x 2mm x 0.8mm QFN

APW7215 Application Circuit



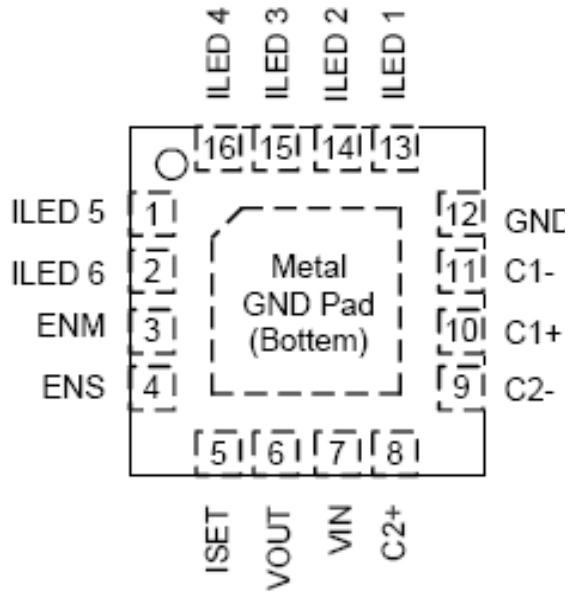
APW7001 6 Parallel Charge Pump LEDs Driver

Mass Production

Key Features:

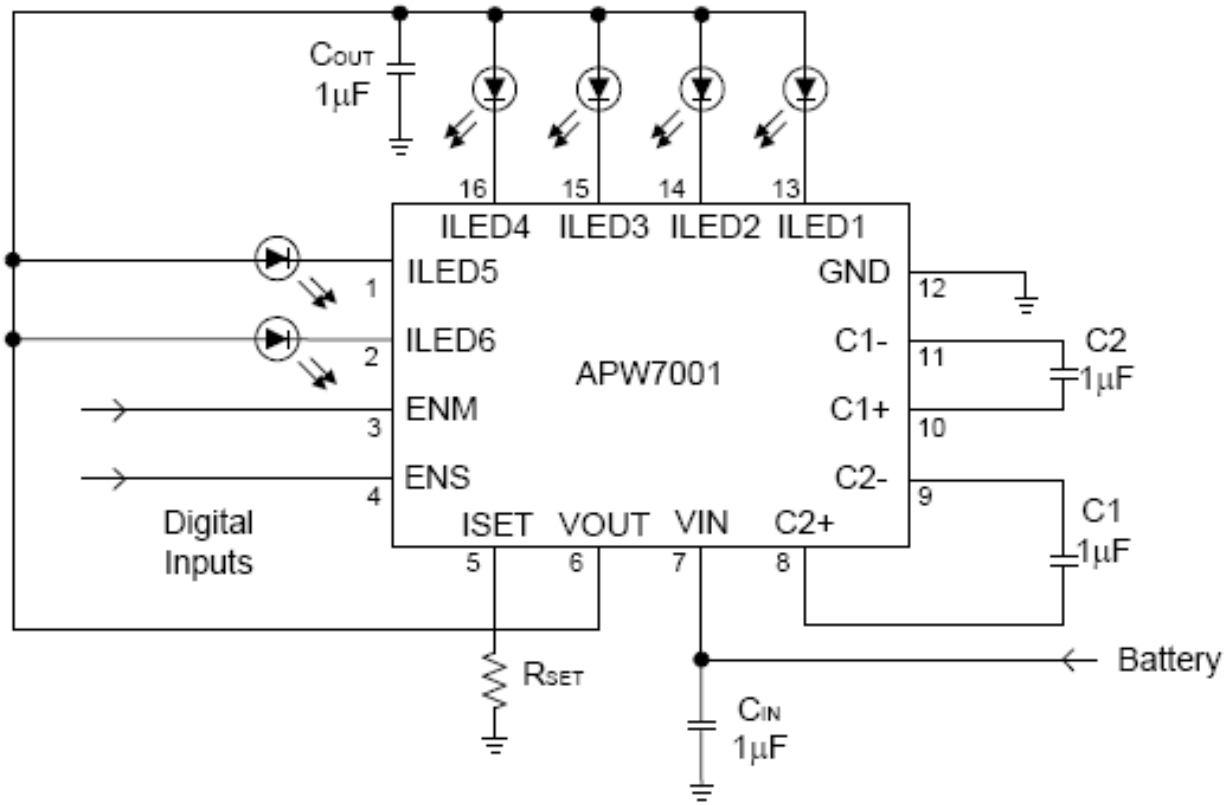
- Power main and Sub-Display LEDs
- Operating voltage 2.6~5.5V
- Up to 6 LEDs
- 1X/1.5X/ 2X charger pump mode
- High efficiency up to 90%
- ±1.5% LED current matching
- Up to 30mA current per LED
- OVP, Thermal Shutdown protection
- Low shutdown current 2uA maximum
- Soft-start limits inrush current
- Compact Package 4x4mm QFN-16

Pin-out



APW7001
QFN4x4-16 Top View

APW7001 Application Circuit



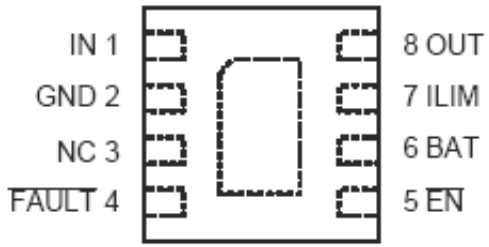
APL3203 Li+ Charger Protection IC

Mass Production

Key Features:

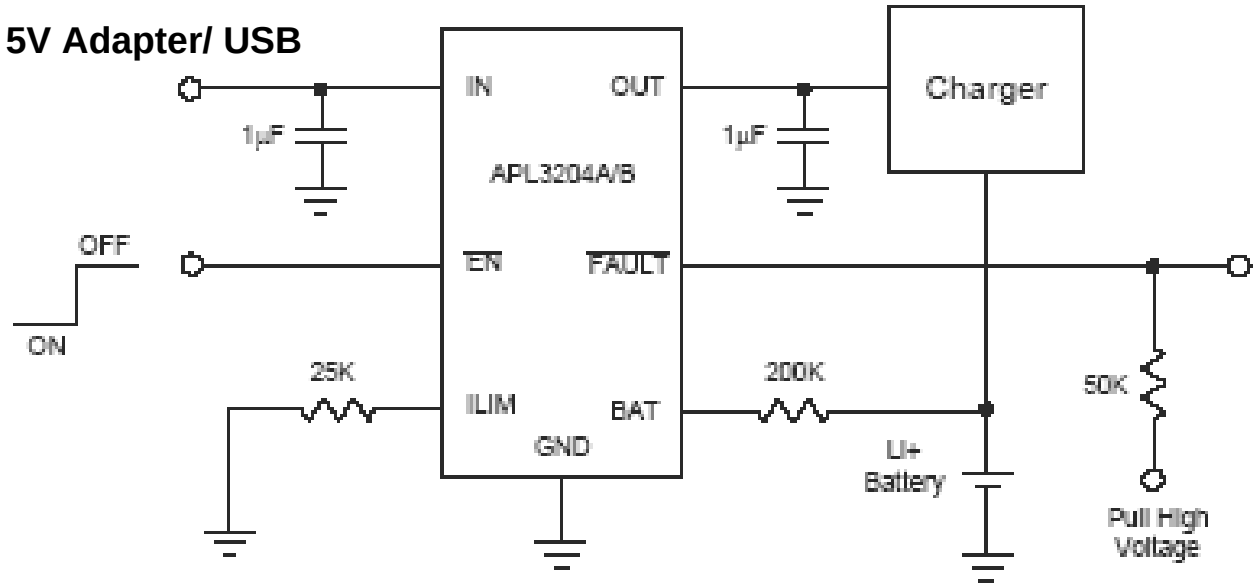
- **APL3203** P2p BQ24314/6
- Fully Integrated protection Circuit for **three protected variables (OVP, OCP and OTP)**
- High accuracy protection thresholds
- User programmable over current protection threshold
- Input over voltage protection in less than 1us
- High immunity of false trigging under transient.
- Warning output to indicate the occurrence of faults
- Enable input
- Easy to use
- Thermal enhanced TDFN-8 (2X2), TDFN-12(4X3) package
- “Lithium-Safe” Criteria

Pin-out



APL3203 DFN-8 (2X2)

APL3203 Application Circuit



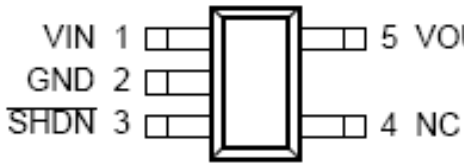
APL5320 High PSRR LDO 300mA Output

Mass Production

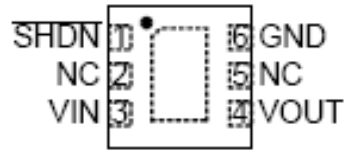
Key Features:

- Wide Operating 2.5V to 6V Input voltage
- Low Dropout Voltages: 290mV @ 3V/300mA
- Fixed Output Voltage:1.2~3.6V with step 100mV and 2.85V
- High PSRR: 70dB
- Guaranteed 300mA Output Current
- Current Limit Protection
- Controlled Short Circuit Current: 50mA
- Over Temperature Protection
- Stable With 1uF Capacitor For Any Load
- Excellent Load / Line Transient
- SOT-23-5 & SC70-5 & 1.6x1.6mm TDFN-6 & 1.2x1.6mm VTDFN-4 Packages
- Lead Free Available (RoHS Compliant)

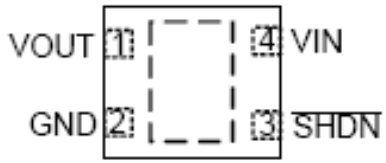
Pin-out



SOT23-5/SC-70-5
(Top View)



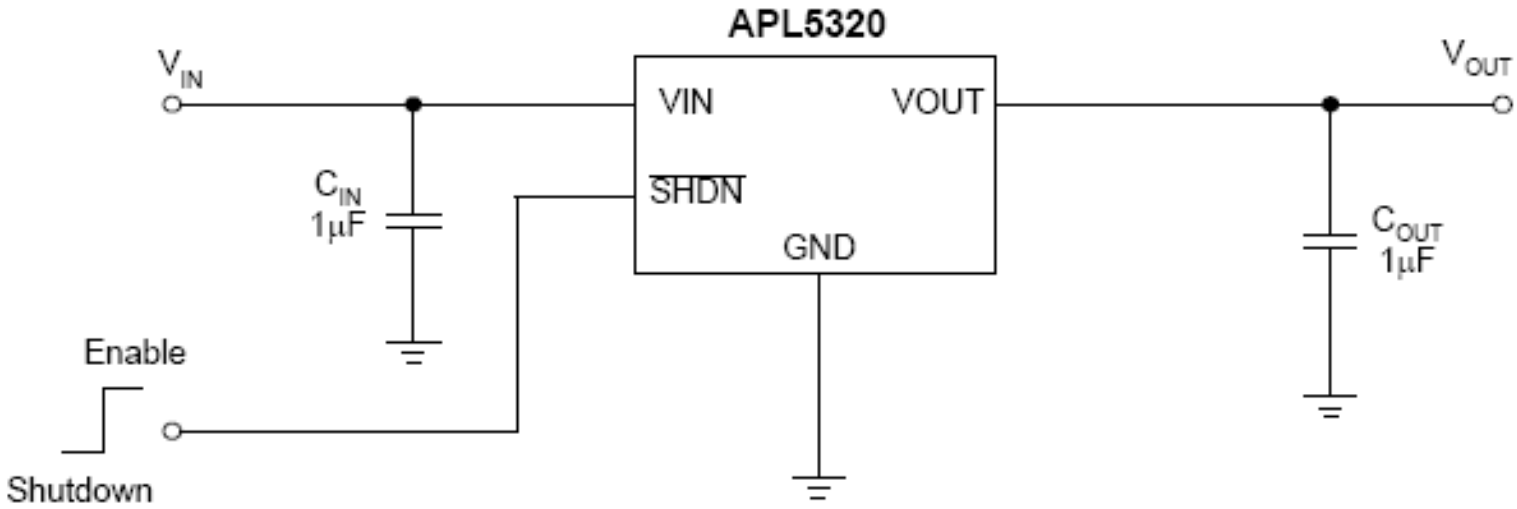
TDFN1.6x1.6-6
(Top View)



VTDFN1.2x1.6-4
(Top View)

= Exposed Pad (connected to ground plane for better heat dissipation)

APL5320 Application Circuit



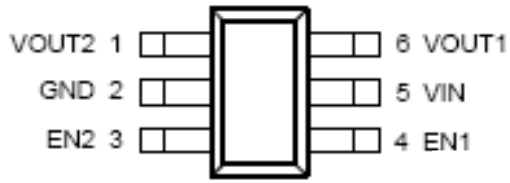
APL5537 Low Iq & High PSRR Dual LDO 300mA/Each

Mass Production

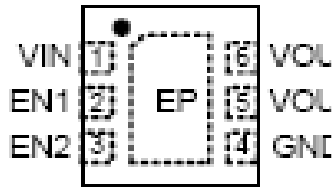
Key Features:

- Dual regulator Outputs
- Wide Operating 2.5V to 5.5V Input Voltage
- Low Dropout Voltage: 240mV @ 300mA
- High PSRR: 70dB before 1KHz
- Low Quiescent Current: Typical 58uA
- Current Limit Protection
- Short Circuit Current Limit Protection
- Over Temperature Protection
- Low Shutdown Current:<1uA
- TSOT-23-5 & 1.6x1.6mm TDFN-6 Packages
- Lead Free and Green Device Available (RoHS Compliant)

Pin-out

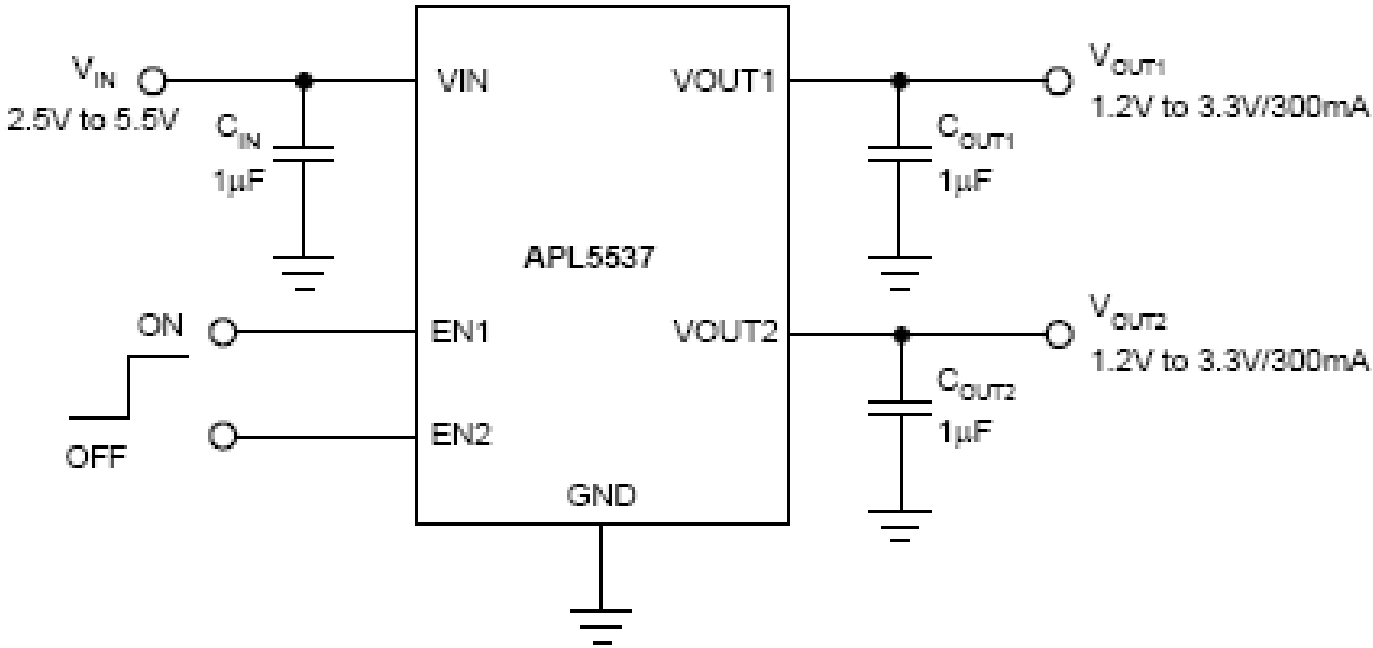


TSOT-23-6
(Top View)



TDFN1.6x1.6-
(Top View)

APL5537 Application Circuit



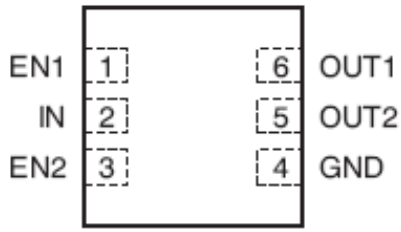
APL5535 Low Iq & High PSRR Dual LDO 200mA/Each

2012/2Q MP

Key Features:

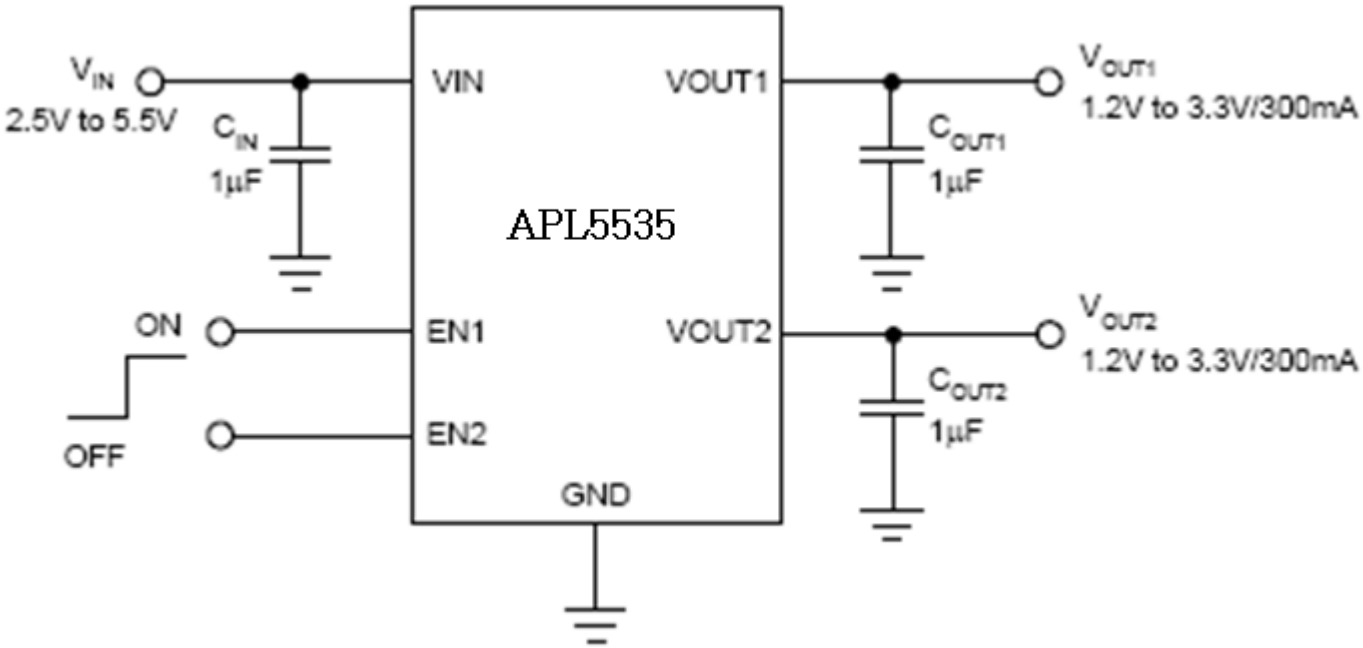
- Dual regulator Outputs
- Wide Operating 2.0V to 5.5V Input Voltage
- Low Dropout Voltage: 160mV @ 200mA
- High PSRR: 70dB before 1KHz
- Low Quiescent Current: 29uA(each)
- Current Limit Protection
- Short Circuit Current Limit Protection
- Over Temperature Protection
- Low Shutdown Current:<1uA
- 1.5x1.5mm TDFN-6 Packages
- Lead Free and Green Device Available (RoHS Compliant)

Pin-out



1.6x1.6mm TDFN-6

APL5535 Application Circuit



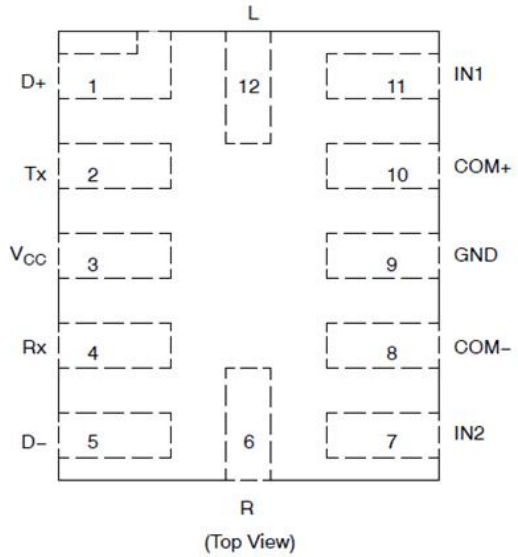
APL3154 DP3T Analog Switch

2012/2Q MP

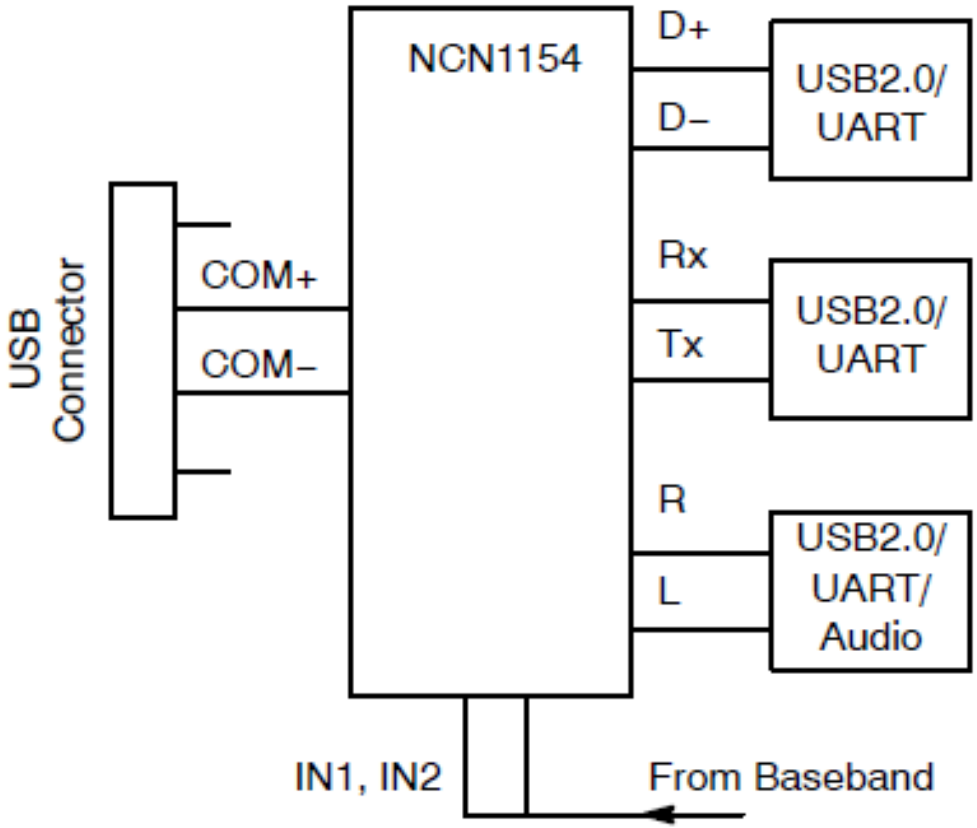
Key Features:

- 3:1 High Speed Switch
- 480 Mbps, USB 2.0 Capable on all Channels
- High Bandwidth of 820 MHz on D+/D−
- Capable of Passing Negative Swing Signals Down to −2 V on R/L Channel
- 1.8 V Compatible Control Pins for 2.7 V ≦ VCC ≦ 4.2V
- Audio Channel Shunt Resistors for Pop & Click Noise Reduction
- Ultra Low THD+N in Audio Mode: 0.01% into 16Ω Load
- 5.25 V Tolerant Common Pins
- This is a Pb−Free Device
- 2x1.7mm TQFN-12 (flip chip)

Pin-out



APL3154 Application Circuit



APC3200/A Low Iq Comparator

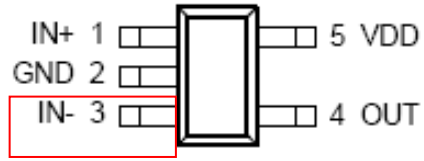
Key Features:

- Wide Input Voltage Range: 1.7V~5.5V
- Ultra Low Supply Current: 10uA
- Input Threshold Voltage: 0.5V (APC3200)
- High PSRR: 60dB
- Lead Free and Green Devices Available
- Compact Package: SC-70-5

Mass Production

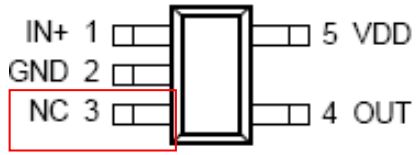
Pin-out

APC3200A



SC-70-5
(Top View)

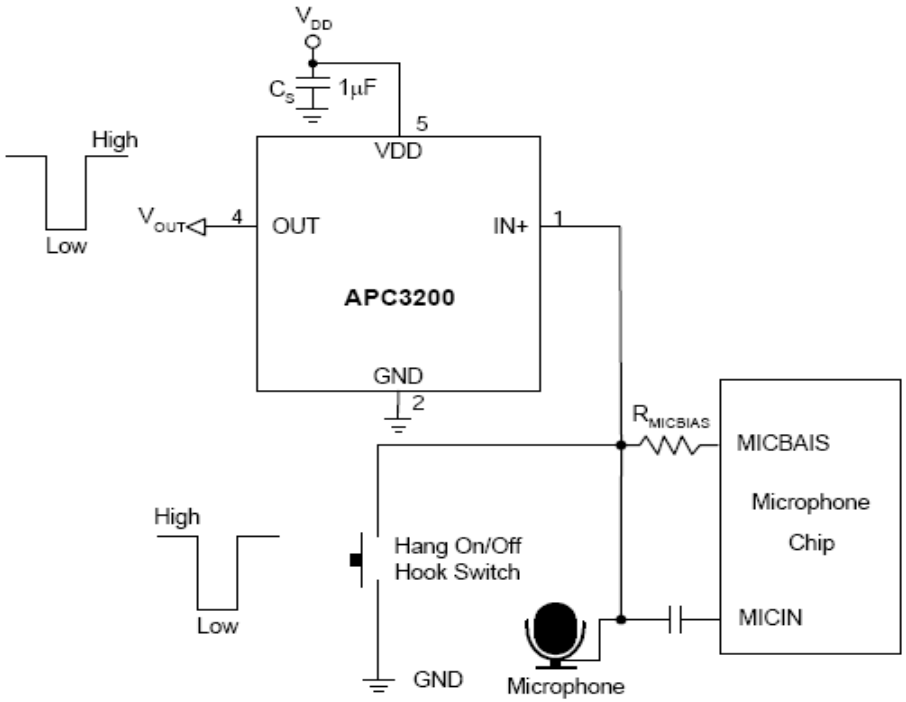
APC3200

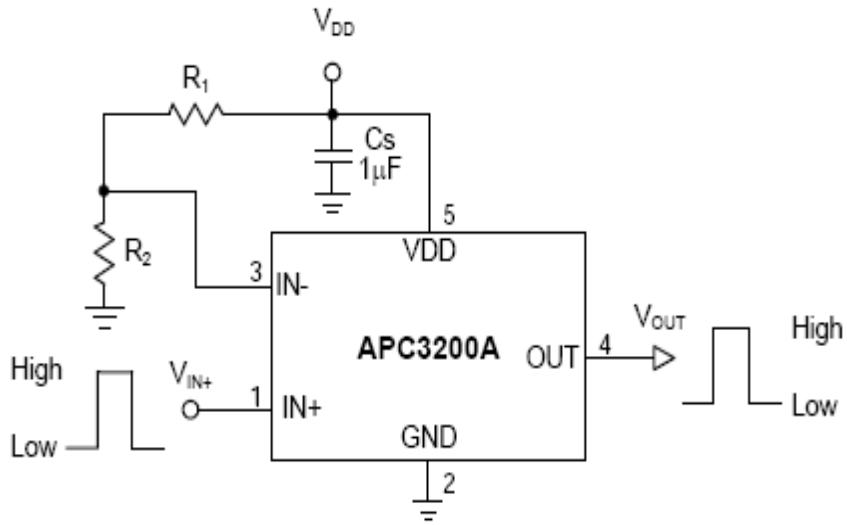


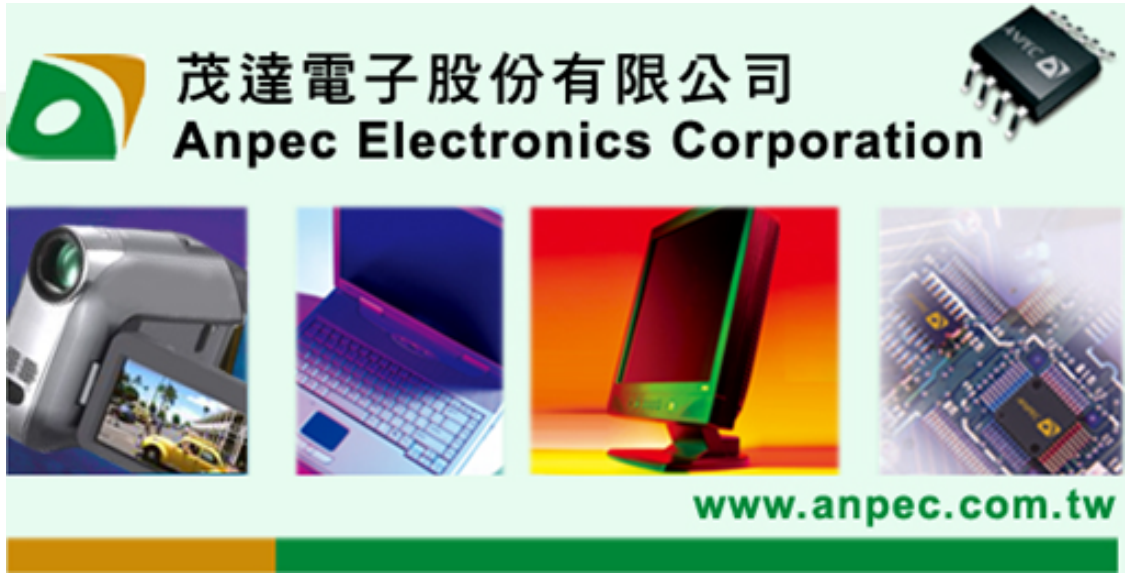
SC-70-5
(Top View)

APC3200/A Application Circuit

Truth Table		
Hang On/Off Hook Switch	H	L (Pressed Down)
OUT Status	H	L



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Thank You!