GOLDEN GATE
INTEGRATED CIRCUITS

Golden Gate Integrated Circuits

Introduction
New Product Presentation

November 2012

www.goldengate-ic.com

Mission Statement

Our Mission Is To Provide Advanced Products for Smart Lighting, Wireless Networks, Energy Harvesting, Power Management, and Transient Voltage Suppression (TVS) Supporting Energy Efficient Applications

- Goal is to quickly grow a substantial product portfolio for high value Analog, Discrete, Circuit Protection (TVS), & Power Management applications.
- Best-in-class Standby Efficiency meet stringent “ENERGY STAR®” / “Green Initiative” requirements to support energy efficient applications.

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Golden Gate IC Company Overview

Founded	Founded and Incorporated in 2012 by a group of Technology Innovators and Business Leaders from Silicon Valley, USA, with backgrounds at TI, National, Analog Devices, Fairchild, Maxim, Cirrus Logic, Intersil, Sony, Raytheon, TRW, & MIT
Technology	World-Class IC and discrete processes, & leading-edge Packaging Technology
Products	Power Management, Circuit Protection (TVS), LED Lighting, WSN & Energy Harvesting product lines feature 40+ devices.
Manufacturing	Multi-sourced, Power, Discrete, & Mixed-Signal Fabs and Assembly / Test Locations
Quality	TS16949-Certified Factories

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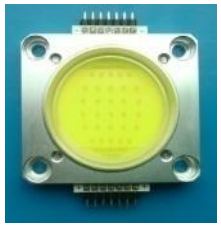
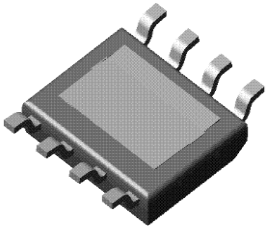
Golden Gate IC Portfolio





LED Drivers

- LED Drivers – DC-DC & AC-DC
- Power Factor Correction

LED Modules

- COB
- Ceramic

Protection Devices

- ESD Diodes
- TVS, Single, & Multi-Channel
- HDMI & High Speed

Energy Harvesting

- Energy Harvesting PMIC

Linear Low Dropout Regulators (LDO)

- Fast Transient Response LDO
- High Power Supply Rejection Ratio (PSRR)
- CMOS LDO
  - Low Power / Low Shutdown Current

Step Down (Buck) DC-DC Regulators

- Synchronous and Non-Synchronous w/ Internal and w/ External Compensation

Step Up (Boost) DC-DC Regulators

- Wide input voltage range of 1.8 to 15V

AC-DC Converters

- PSR (Primary Side Regulation)
- Power Factor Correction

RoHS compliant

Pb free

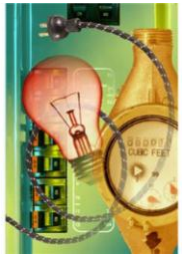
GOLDEN GATE INTEGRATED CIRCUITS

Golden Gate IC offers improved pin compatible crosses to many popular devices from Semtech, Micrel, Active Semi, Infineon, National, Analog Devices, Maxim, Linear Technology, Texas Instruments, Fairchild, and many others !!

Markets & Applications

- ❑ Consumer Electronics (STB / TV)
- ❑ Computing / Servers / Laptops / Tablets
- ❑ Enterprise Networking / Hubs / Routers
- ❑ Wired / Wireless Communication
- ❑ Instrumentation / ATE
- ❑ Industrial & Medical
- ❑ LED lighting
- ❑ Video Security (CCTV)
- ❑ Automotive DVD / GPS

Lighting



CCTV

Car DVD / GPS

Cable / Satellite STB

Digital Water Meter

Basestation Repeater

Medical Patient Monitor

Digital Oscilloscope

Home Appliance

HDD

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Circuit Protection Devices

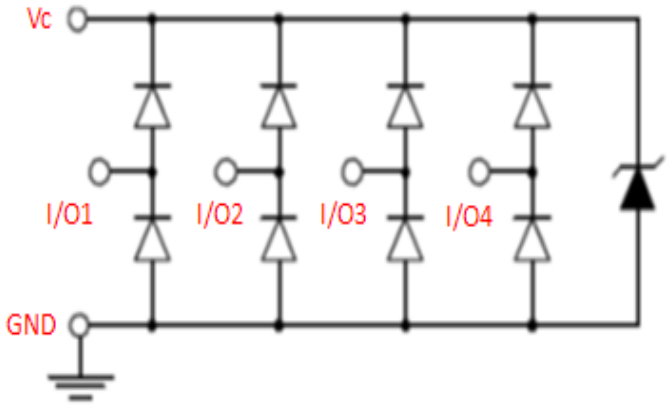
TVS (Transient Voltage Suppression)

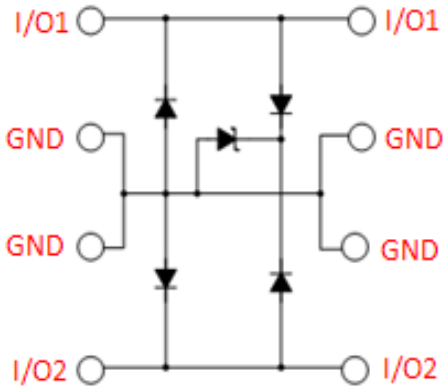
Transient Voltage Suppression (ESD)

Features:

- Ultra-low capacitance: <0.5pF
- Low Voltage solutions: 2.5V – 3.3V
- Low clamping voltage
- ESD protection + EMI/RFI filtering
- Single & multi-line protection
- Small packages
- RoHS Compliant

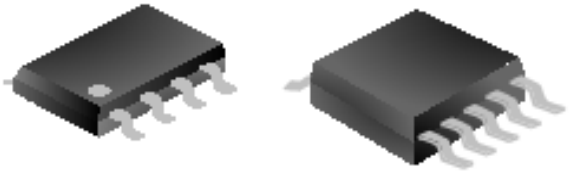
Typical Equivalent Circuits





Applications

- HDMI, DVI, Display Port, SIM Cards, Antenna, SD Card
- USB2.0 / 3.0
- High Speed (Ethernet, Telecom, Datacom, SATA)
- MDDI Ports
- PCI Express
- High Current
- LED Lighting
- Cell Phone, MP3
- HDTV, Set Top Box, Monitors, Touch Screen Display
- Servers, Desktop, Notebooks, Tablets



SOP-8-225-1.27 MSOP-10-0.5

DFN-10-2.5X1.0X0.6-0.5 SOT-23-6L

TVS Specs

- Devices to protect sensitive circuitry from:
  - Electrostatic Discharge (ESD)
  - Electrical Fast Transients (EFT)
  - Lightning
  - Cable Discharge Events (CDE)
  - Electrical overstress (EOS)
- Meet the industry's immunity standards:
  - IEC 61000-4-2 (ESD)
  - IEC 61000-4-4 (EFT)
  - IEC 61000-4-5 (Lightning)
  - Telcordia GR-1089
  - ITU K.20, K.21

TVS Products

Part Number	Peak Pulse Current Max(A)	Operating Supply Voltage Max(V)	ESD for Air Max (kV)	ESD for Contact Max(kV)	Reverse Breakdown Voltage Min(V)	C_{IN} Max (pF)	Topology	Package Type
GG2025S	8.5	6	±22	±15	5	15	Bi-directional	SOD-523
GG0524A6/B6	5	6	±16	±12	5	0.9	4-channel	SOT-23-6L/ SOT-363-6L
GG0524P	5	6	±12	±8	5	0.6	4-channel	DFN-10-2.5x1.0x0.6-0.5
GG0524L	5	6	±16	±12	5	0.9	4-channel	MSOP-10D-0.5
GG1045A6	5	6	±15	±10	5	0.9	4-channel	SOT-23-6L
GG1065L8/P1	5	6	±15	±8	5	0.4	6-channel	MSOP8 DFN-10-4.1x2x0.5-0.80
GG199A6	5	6	±17	±15	5	1.5	4-channel	SOT-23-6L
GG0514P	5	6	±12	±8	5	0.4	4-channel	DFN-10-2.5x1.0x0.6-0.5
GG4045A6	5	6	±12	±8	5	0.6	4-channel	SOT-23-6L; SOT-263-6L
GG1025Q	6	6	±15	±8	5	1.4	2-channel	SOT-143-4L
GG2045FN/FB	5	6	±15	±10	5	0.9	1-channel	DFN-2-1.0x0.6x0.5-0.65 FBP-02C-1.0X0.6X0.5-0.62
GG2025FN/FB	8.5	6	±22	±15	5	15	Bidirectional	DFN-2-1.0x0.6x0.5-0.65 FBP-02C-1.0X0.6X0.5-0.62
GG0504A6	25	5	±15	±8	6	5	4-channel	SOT-23-6L
GG2075FN/FB	8.7	6	±30	±30	5	65	1-channel	DFN-2-1.0x0.6x0.5-0.65 FBP-02C-1.0X0.6X0.5-0.62
GG2504	25	6	±25	±25	6	5	4-ch Rectifier Bridge	SOT-23-6L
GG2504P	25	6	±25	±25	5	5	4-ch Rectifier Bridge	DFN-10-2.5x1.0x0.6-0.5
GG0306SA	100	6	±30	±30	6	25	2-ch Rectifier Bridge	SOP-8-225-1.27
GG0333SA	100	3.3	±30	±30	3.8	25	2-ch Rectifier Bridge	SOP-8-225-1.27

Discrete Devices

Low Voltage MOSFETs

Vds	Part Number	Parameters		Package Type
		ID	RDSON (max)	
40V	GGVD1404T	162A	4 mΩ	T: TO-220-3L ;
55V	GGVD3205T	110A	8 mΩ	T: TO-220-3L ;
60V	GGVD50N06T/D/M	50A	23 mΩ	T: TO-220-3L ; D: TO-252-2L; M: TO-251-3L;
	GGVD55N06T	55A	16.5 mΩ	T: TO-220-3L ;
75V	GGVD75N08T	75A	16.5 mΩ	T: TO-220-3L ;
100V	GGVD3710T	57A	23 mΩ	T: TO-220-3L ;
200V	GGVD630T/F	9A	0.4Ω	T: TO-220-3L ; F: TO-220F-3L ;
	GGVD640T/F	18A	0.18Ω	T: TO-220-3L ; F: TO-220F-3L ;
250V	GGVD634T	8A	0.45Ω	T: TO-220-3L ; F: TO-220F-3L ;

High Voltage VDMOS MOSFETs (1)

Vds	Part Number	Parameters		Package Type
		ID	RDSON (max)	
400V	GGVD730T/F/M	6A	0.95Ω	T: TO-220-3L ; F: TO-220F-3L; M: TO-251-3L;
	GGVD740T/F	10A	0.55Ω	T: TO-220-3L ; F: TO-220F-3L
450V	GGVD2NE45T/F	2A	2.45Ω	T: TO-220-3L ; F: TO-220F-3L
500V	GGVD830T/F	5A	1.5Ω	T: TO-220-3L ; F: TO-220F-3L
	GGVD840T/F	8A	0.9Ω	T: TO-220-3L ; F: TO-220F-3L
	GGVD13N50T/F	13A	0.52Ω	T: TO-220-3L ; F: TO-220F-3L
	GGVD15NE50PN	15A	0.4Ω	PN: TO-3PN
600V	GGVD1N60DB	0.5A	15Ω	B: TO-92-3L
	GGVD1N60T/D/M/B	1A	11Ω	T: TO-220-3L ; D: TO-252-2L; M: TO-251-3L; B: TO-92-3L
	GGVD2N60T/F/D/M	2A	4.6Ω	T: TO-220-3L ; F: TO-220F-3L;D: TO-252-2L; M: TO-251-3L;
	GGVD4N60T/F/D	4A	2.4Ω	T: TO-220-3L ; F: TO-220F-3L;D: TO-252-2L
	GGVD5N60T/F	5A	2.1Ω	T: TO-220-3L ; F: TO-220F-3L
	GGVD7N60T/F	7A	1.2Ω	T: TO-220-3L ; F: TO-220F-3L
	GGVD8N60T/F	8A	1.2Ω	T: TO-220-3L ; F: TO-220F-3L
	GGVD10N60T/F	10A	1.0Ω	T: TO-220-3L ; F: TO-220F-3L
	GGVD12N60T/F	12A	0.8Ω	T: TO-220-3L ; F: TO-220F-3L

High Voltage VDMOS MOSFETs (2)

Vds	Part Number	Parameters		Package Type
		ID	RDSON (max)	
650V	GGVD2N65T/F	2A	5.6Ω	T: TO-220-3L ; F: TO-220F-3L
	GGVD4N65T/F	4A	3.0Ω	T: TO-220-3L ; F: TO-220F-3L
	GGVD7N65AF	7A	1.4Ω	F: TO-220F-3L
	GGVD8N65T/F	8A	1.4Ω	T: TO-220-3L ; F: TO-220F-3L
	GGVD9N65F	9A	1.2Ω	F: TO-220F-3L
	GGVD10N65T/F	10A	1.0Ω	T: TO-220-3L ; F: TO-220F-3L
	GGVD12N65T/F	12A	0.8Ω	T: TO-220-3L ; F: TO-220F-3L
700V	GGVD2N70T/F/M	2A	6.5Ω	T: TO-220-3L ; F: TO-220F-3L; M: TO-251-3L;
800V	GGVD1N80T/M/B	1A	16Ω	T: TO-220-3L; M: TO-251-3L; B: TO-92-3L

High Voltage MOSFETs (1)

Vds	Part Number	Parameter		Package
		ID	RDSON (max)	
400V	GGVF730T/F/D/M	6A	0.95Ω	T: TO-220-3L ; F: TO-220F-3L;D: TO-252-2L;M:TO-251-3L;
	GGVF740T/F	10A	0.55Ω	T: TO-220-3L ; F: TO-220F-3L
500V	GGVF5NE50T/F	5A	1.25Ω	T: TO-220-3L ; F: TO-220F-3L
	GGVF830T/F/D	5A	1.5Ω	T: TO-220-3L ; F: TO-220F-3L;D: TO-252-2L;
	GGVF840T/F/D	8A	0.9Ω	T: TO-220-3L ; F: TO-220F-3L;D: TO-252-2L;
	GGVF13N50T/F	13A	0.52Ω	F: TO-220F-3L; T:TO-220-3L
	GGVF16N50/F	16	0.38Ω	F: TO-220F-3L;
	GGVF18N50F/T/PN	18	0.265Ω	F: TO-220F-3L; T: TO-220-3L; PN:TO-3PN
	GGVF20N50F/T/PN	20	0.26Ω	F: TO-220F-3L; T: TO-220-3L; PN:TO-3PN
	GGVF20NE50PN	20	0.27Ω	PN:TO-3PN
600V	GGVF1N60D/M/B/N	1A	11Ω	D: TO-252-2L;M:TO-251-3L;B:TO-92-3L;N:TO-126-3L
	GGVF2N60T/F/D/M/N	2A	4.6Ω	T: TO-220-3L ; F: TO-220F-3L;D: TO-252-2L;M:TO-251-3L;N:TO-126-3L
	GGVF4N60T/F/D/M/K	4A	2.4Ω	T: TO-220-3L ; F: TO-220F-3L;D: TO-252-2L;M:TO-251-3L;K:TO-262-3L
	GGVF5N60T/F/D	5A	2.1Ω	T: TO-220-3L ; F: TO-220F-3L;D: TO-252-2L;
	GGVF6N60F/D	6A	1.5Ω	F: TO-220F-3L;D: TO-252-2L;
	GGVF7N60T/F/K	7A	1.2Ω	T: TO-220-3L ; F: TO-220F-3L;K:TO-262-3L
	GGVF8N60T/F	8A	1.2Ω	T: TO-220-3L ; F: TO-220F-3L;

High Voltage MOSFETs (2)

Vds	Part Number	Parameters		Package Type
		ID	RDSON (max)	
600V	GGVF10N60T/F/K	10A	1.0Ω	T: TO-220-3L ; F: TO-220F-3L;K:TO-262-3L
	GGVF12N60T/F/K	12A	0.8Ω	T: TO-220-3L ; F: TO-220F-3L;K:TO-262-3L
	GGVF1N60AT/D/M/B	1A	7.7Ω	T: TO-220-3L ; D: TO-252-2L;M:TO-251-3L;B:TO-92-3L
	GGVF4N60AT/F/D	4A	2.2Ω	T: TO-220-3L ; F:TO-220F-3L;D: TO-252-2L;
	GGVF5N60AF	5A	1.5Ω	F:TO-220F-3L
	GGVF6N60AD	6A	1.25Ω	D: TO-252-2L;
	GGVF8N60AF	8A	1.0Ω	F:TO-220F-3L
	GGVF10N60AF	10A	0.8Ω	F:TO-220F-3L
	GGVF13N60AF	13A	0.43Ω	F:TO-220F-3L
	GGVF20N60T/F/PN	20A	0.43Ω	T: TO-220-3L ; F:TO-220F-3L;PN: TO-3PN;
650V	GGVF2N65F/N/MJ	1A	11Ω	F:TO-220F-3L;N: TO-126-3L; MJ:TO-251J-3L
	GGVF4N65T/F/D/M	4A	2.7Ω	T: TO-220-3L ; F:TO-220F-3L;D: TO-252-2L;M:TO-251-3L;
	GGVF7N65T/F	7A	1.4Ω	T: TO-220-3L ; F:TO-220F-3L;
	GGVF8N65T/F	8A	1.4Ω	T: TO-220-3L ; F:TO-220F-3L;
	GGVF10N65T/F	10A	1.0Ω	T: TO-220-3L ; F:TO-220F-3L;
	GGVF12N65T/F	12A	0.8Ω	T: TO-220-3L ; F:TO-220F-3L;

High Voltage MOSFETs (3)

Vds	Part Number	Parameters		Package Type
		ID	RDSON (max)	
700V	GGVF1N70M/B	1A	13.5Ω	M:TO-251-3L;B:TO-92-3L
	GGVF2N70F/D/M	2A	6.5Ω	F:TO-220F-3L;D: TO-252-2L;M:TO-251-3L
	GGVF4N70F	4A	2.7Ω	F:TO-220F-3L
	GGVF6N70F	6A	1.7Ω	F:TO-220F-3L
	GGVF8N70F	6A	1.2Ω	F:TO-220F-3L
800V	GGVF2N80AD	2A	2.7Ω	D: TO-252-2L
	GGVF3N80T/F/D/M	3A	4.8Ω	T: TO-220-3L ; F:TO-220F-3L;D: TO-252-2L;M:TO-251-3L
	GGVF4N80F/D	4A	3.6Ω	F:TO-220F-3L; D: TO-252-2L
	GGVF5N80F	5A	2.6Ω	F:TO-220F-3L
	GGVF7N80T/F	7A	1.55Ω	T: TO-220-3L ; F:TO-220F-3L
	GGVF8N80T/F	8A	1.55Ω	T: TO-220-3L ; F:TO-220F-3L
900V	GGVF4N90F	4A	3.5Ω	F:TO-220F-3L
	GGVF9N90F/PN	9A	1.4Ω	F:TO-220F-3L;PN:TO-3PN

Shottky Barrier Diodes

Part Number	Key Parameters					Package Type
	Repetitive Peak Reverse voltage (V)	Average Forward Rectifier (A)	Peak Forward Surge Current (A)	Forward Voltage (V)	Reverse Current (mA)	
GGBD10C45T/ F	40	10	120	0.65	50	TO-220-3L/TO-220F-3L
GGBD10C60T/ F	60	10	120	0.71	50	TO-220-3L/TO-220F-3L
GGBD20C40T/ F	40	20	150	0.65	50	TO-220-3L/TO-220F-3L
GGBD20C45T/ F	40	20	150	0.65	50	TO-220-3L/TO-220F-3L
GGBD20C60T / F	60	20	150	0.71	50	TO-220-3L/TO-220F-3L
GGBD10C100T/ F	100	10	120	0.85	50	TO-220-3L/TO-220F-3L
GGBD20C100T/ F	100	20	150	0.85	50	TO-220-3L/TO-220F-3L
GGBD10C150T / F	150	10	120	0.9	50	TO-220-3L/TO-220F-3L
GGBD20C150T / F	150	20	150	0.9	50	TO-220-3L/TO-220F-3L
GGBD10C200T/ F	200	10	120	0.93	50	TO-220-3L/TO-220F-3L
GGBD20C200T/ F	200	20	150	0.93	50	TO-220-3L/TO-220F-3L

Fast Recovery Diodes

Part Number	Key Parameters				Package Type
	Voltage (V)	Current (A)	Forward Voltage (V)	Reverse Recovery Time (ns)	
GGFR12S20T/ F	200	12	0.95	35	TO-220-3L/TO-220F-3L
GGFR16S20T/ F	200	16	1.25	35	TO-220-3L/TO-220F-3L
GGFR20S20T/F	200	20	0.95	35	TO-220-3L/TO-220F-3L
GGFR20U20PN	200	20	0.97	20	TO-3PN
GGFR16S40T	400	16	1.25	35	TO-220-3L
GGFR08S40T2	400	8	1.25	35	T-220-2L
GGFR08S60T2/F2/D	700	8	2.6	35	TO-220-2L/TO-220F-2L/TO-252-2L
GGFR08S60AF2/T2	600	8	2.0	35	TO-220F-2L/TO-220-2L
GGFR10S40T2	400	10	1.3	35	TO-220-2L
GGFR10U40F2	400	10	1.7	20	TO-220F-2L
GGFR20U35F2	350	20	1.8	20	TO-220F-2L
GGFR12S60F2	600	12	2.9	25	TO-220F-2L
GGFR20F60T2	600	20	2.4	60	TO-220-2L
GGFR30F60T2/PN	600	30	2.4	60	TO-220-2L/TO-3PN
GGFR50F60T2/PN	600	50	2.4	60	TO-220-2L/TO-3PN

Current Regulator Diodes (Constant Current Diode)

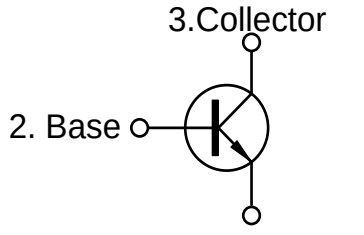
Part Number	Key Parameters						Package Type
	Current Range (mA)	Operating Voltage MAX (V)	Limiting Current		Limiting Current ratio I_{VMAX}/Ip	Temperature Coefficient (%/°C)	
			Vk(V)	Ik(mA)			
GGDH102S	0.88~1.32	100	1.7	Min.0.8Ip	max.1.1	-0.10~ -0.37	SOD-123
GGDH562S	5.00~6.50	100	4.5	Min.0.8Ip	max.1.1	-0.25~ -0.53	SOD-123
GGDH153S	12~18	50	4.3	Min.0.8Ip	max.1.0	-0.25~ -0.45	SOD-123
GGDH183S/H	16~20	50	4.6	Min.0.8Ip	max.1.0	-0.25~ -0.45	SOD-123 / SOT-223-3L
GGDH253H	22~28	45	5.5	Min.0.8Ip	max.1.0	-0.25~ -0.45	SOT-223-3L
GGDH303H	27~33	45	6.0	Min.0.8Ip	max.1.0	-0.25~ -0.45	SOT-223-3L

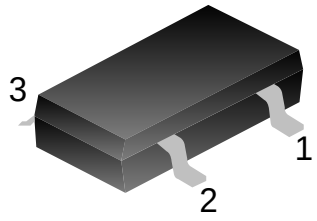
High-Frequency Transistor Products

GGFT3356 - 7GHz NPN Silicon Epitaxial High-Frequency Transistor

Part No.	Main Parameter						Package
	VCBO (V)	VCEO (V)	VEBO (V)	Ic (mA)	HFE	f_T (GHz)	
GGFT3356	20	12	3	100	50-300	7	SOT-23-3L

- **Features**
  - Low Noise and High Gain: NF=1.1dB TYP, Ga=11dB TYP.@VCE=10V, IC =7mA, f=1.0 GHz
  - High Power Gain: MAG=13dB TYP.@VCE =10V, IC= 20mA, f=1.0GHz
  - HFE Spec: 50-300;
- **Applications**
  - Low Noise amplifier for VHF,UHF & CATV band





1. Emitter 2.Base 3.Collector

SOT-23-3L

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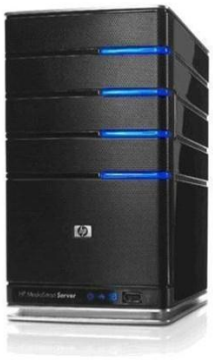
INTEGRATED CIRCUITS

Power Management

The “ENERGY STAR®” / “Green Initiative” Opportunity

- US & Europe “ENERGY STAR®”Regulations target low power/standby mode power efficiency in Appliances.
- MAX power consumption depends on the complexity of the system and varies by product type under “ENERGY STAR®” guidelines.
- Strict efficiency standards & demands for higher computing power are creating a new emerging “Green” market.
- Examples of this trend:
  - California State Regulation for Set-Top-Boxes limits power dissipation to 8W during normal operation, 1W in Standby.
  - Recent EPA Congressional Report indicates that Data Centers are responsible for 3% of power consumed in the US.
    - Servers meeting “ENERGY STAR®” regulations feature 54% lower power consumption.



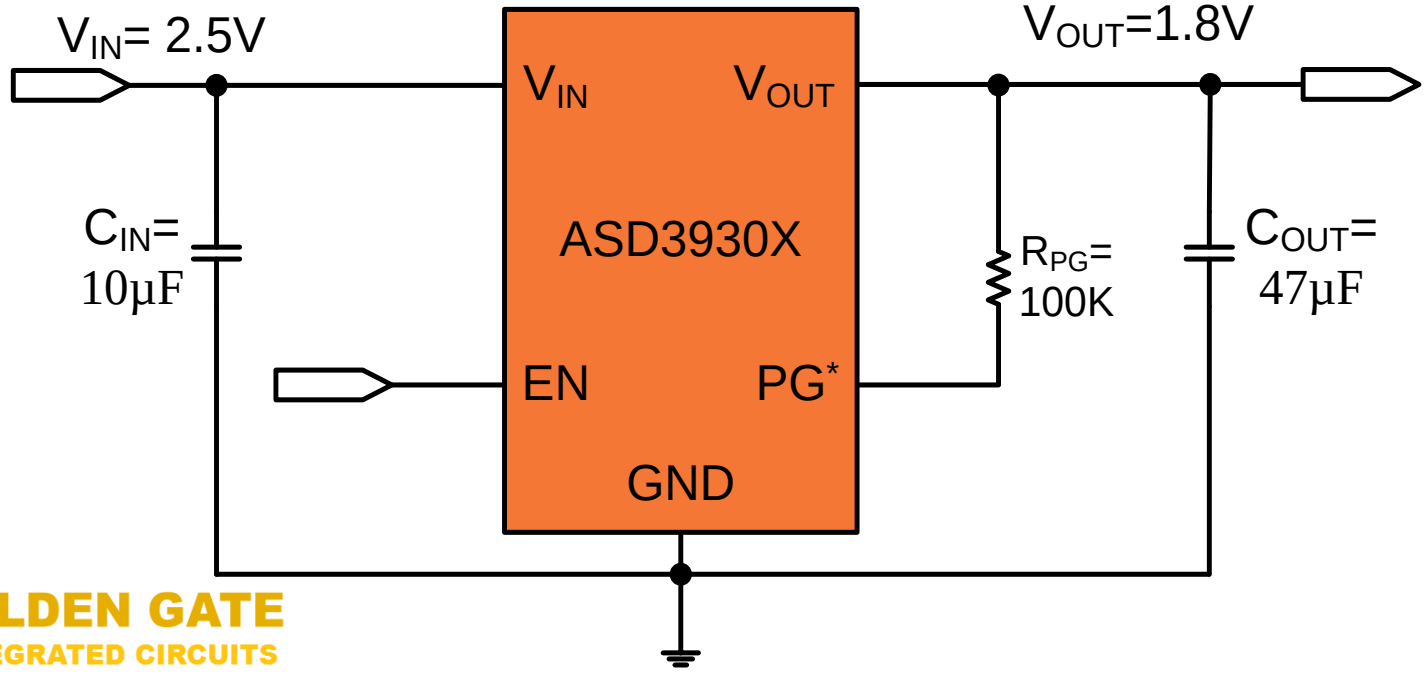
GOLDEN GATE
INTEGRATED CIRCUITS

Linear Regulators (LDOs)

- The simplest, lowest cost, & most popular technique for stepping down a DC voltage is the basic 3-terminal Linear Low Drop Out (LDO) Regulator.
- Golden Gate IC offers a wide variety of low dropout (LDO) regulators.
- Our CMOS LDOs provide a power management solution meeting the needs of low power, space-conscious designs while meeting challenging cost targets.
- Tailored for battery-operated devices, Golden Gate IC's CMOS LDOs offer designers superior performance for point-of-load applications.
- Features
  - Adjustable Outputs 0.9 to 6V.
  - Excellent Load Regulation
  - Power-saving Shutdown Control
  - Low Ground Currents
  - All are stable with **space-saving Ceramic Capacitors**.

Key Features of our LDO products

- Key Features: excellent transient response, Power Good, a Bypass pin for high PSRR, reverse battery protection, & low shutdown currents to drastically reduce energy consumption.
- Reduced the overall cost (cheaper components)



Low-Current LDO Product Summary

Part #	I_{OUT} (mA)	V_{IN} Range	Min Vout	Vout (V)	Dropout (Full Load)	Supply Current	Load Reg	Enable	Power Good	Bypass	Package
ASD2301	150	2.5-16V	1.24	2.0, 2.5, 3.3, 5.0, ADJ	270mV	1.1mA	0.2%	Yes	No	Yes	SOT23-5
ASD2303	300	2.7-7V	0.9	1.8, 3.3, ADJ	300mV	50µA	1.5%	Yes	No	Yes	SOT23-5
ASD2306	600	2.7-7V	1.2	1.2, 1.8, 3.3, ADJ	600mV	50µA	1.5%	Yes	No	Yes	SOT23-5 / DFN3X3-8
ASD2931	100	3.0-30V	1.24	1.25, 1.5, 1.8, 2.5, 3.3, 5.0, ADJ	100mV	3.0mA	0.15%	Yes	No	No	TO-92 / SOIC-8
ASD2950	100	3.0-30V	1.24	1.25, 1.5, 1.8, 2.5, 3.3, 5.0, ADJ	360mV	2.7mA	0.24%	Yes	No	No	TO-92

High-Current LDO Product Summary

Part #	I_{OUT} (A)	V_{IN} Range	Min Vout	Vout (V)	Dropout (Full Load)	Supply Current	Load Reg	Enable	Power Good	Bypass	Package
ASD29150	1.5	2.25-26V	1.24	1.25, 1.5, 1.8, 2.5, 3.3, 5.0, ADJ	420mV	14mA	0.3%	Yes	Yes	No	TO-252 / TO263
ASD29151	1.5	2.25-26V	1.24	1.25, 1.5, 1.8, 2.5, 3.3, 5.0, ADJ	420mV	14mA	0.3%	Yes	Yes	No	TO-252 / TO263
ASD29152	1.5	2.25-26V	1.24	1.25, 1.5, 1.8, 2.5, 3.3, 5.0, ADJ	420mV	14mA	0.3%	Yes	Yes	No	TO-252 / TO263
ASD29153	1.5	2.25-26V	1.24	1.25, 1.5, 1.8, 2.5, 3.3, 5.0, ADJ	420mV	14mA	0.3%	Yes	Yes	No	TO-252 / TO263
ASD39100	1	2.25-16V	1.24	1.25, 1.5, 1.8, 2.5, 3.3, 5.0, ADJ	250mV	12mA	0.2%	Yes	Yes	No	SOT223 / SOIC-EDP
ASD39101	1	2.25-16V	1.24	1.25, 1.5, 1.8, 2.5, 3.3, 5.0, ADJ	250mV	12mA	0.2%	Yes	Yes	No	SOT223 / SOIC-EDP
ASD39102	1	2.25-16V	1.24	1.25, 1.5, 1.8, 2.5, 3.3, 5.0, ADJ	250mV	12mA	0.2%	Yes	Yes	No	SOT223 / SOIC-EDP
ASD39300	3	2.25-16V	1.24	1.25, 1.5, 1.8, 2.5, 3.3, 5.0, ADJ	400mV	20mA	0.12%	Yes	Yes	No	TO-220 / TO263
ASD39301	3	2.25-16V	1.24	1.25, 1.5, 1.8, 2.5, 3.3, 5.0, ADJ	400mV	20mA	0.12%	Yes	Yes	No	TO-220 / TO263
ASD39302	3	2.25-16V	1.24	1.25, 1.5, 1.8, 2.5, 3.3, 5.0, ADJ	400mV	20mA	0.12%	Yes	Yes	No	TO-220 / TO263
ASD39500	5	2.25-16V	1.24	1.25, 1.5, 1.8, 2.5, 3.3, 5.0, ADJ	520mV	70mA	0.12%	Yes	Yes	No	TO263
ASD39501	5	2.25-16V	1.24	1.25, 1.5, 1.8, 2.5, 3.3, 5.0, ADJ	520mV	70mA	0.12%	Yes	Yes	No	TO263
ASD39502	5	2.25-16V	1.24	1.25, 1.5, 1.8, 2.5, 3.3, 5.0, ADJ	520mV	70mA	0.12%	Yes	Yes	No	TO263

General Purpose Linear Regulator Product Summary

Part #	I_{OUT} (A)	V_{IN} Range (V)	Vout (V)	Dropout (V) (Full Load)	Supply Current (mA)	Package
ASD317	1.5	3.0-37	1.25, 1.5, 1.8, 2.5, 3.3, 5.0, ADJ	2.0	3.5	TO-220
GGA1117	1	3.0-15	1.2, 1.5, 1.8, 2.5, 3.3, 5.0, ADJ	1.2	5	SOT-223/TO-252-2L
GGA1117B	0.8	3.0-15	1.2,1.5, 1.8, 2.5, 3.3, 5.0, ADJ	1.2	5	SOT-223/TO-252-2L
ASD1086	1.5	2.7-7.0	1.25, 1.5, 1.8, 2.5, 3.3, 5.0, ADJ	1.3	7	SOT223/TO-252/TO-263
ASD1085	3	3.0-12	1.25, 1.5, 1.8, 2.5, 3.3, 5.0, ADJ	1.3	7	TO-252/TO-220
GGA1085	3	3.0-12	1.18, 1.5, 1.8, 2.5, 3.3, 5.0, ADJ	1.3	7	TO-252-2L/TO-263-2L
GGA1084	5	3.0-12	1.5, 1.8, 2.5, 3.3, 5.0, ADJ	1.5	10	TO-252-2L/TO-263-2L
ASD780X	1.5	3.0-35	Fixed	2.0	10	TO-252
GGA78RXX	1	3.0-35	3.3, 5, 9, 12,15, ADJ	0.15		TO-220F-4L/TO-252-5L
GGA278RXX	2	3.0-35	3.3, 5, 9, 12,15, ADJ	0.3		TO-220F-4L/TO-252-5L
GG3A78RXX	3	3.0-35	3.3, 5, 9, 12,15, ADJ	0.3		TO-220F-4L
ASD78L0X	0.1	3.0-30	1.24	0.36	2.7	SOT89
GGA78RLXX	1	3.0-30	5, 9, ADJ	0.15		TO-220F-4L/TO-252-5L

Step-Down (Buck) Switching Regulators

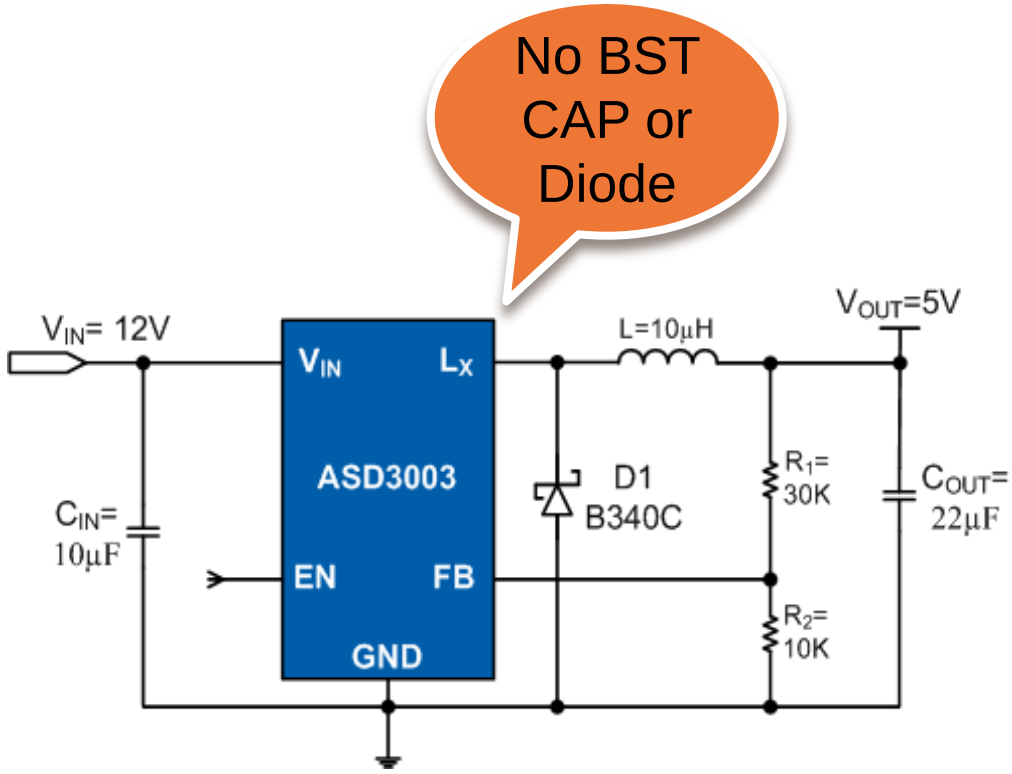
- Our single output Non-Synchronous Step-Down Switching Regulators are general purpose, Point-Of-Load (POL) devices.
- Targeted for loads below 3A
- We meet the Standby Mode efficiency requirements of “ENERGY STAR®”
- 70-75% Standby-mode Efficiencies at Load Currents as low as 10mA vs. competition’s 55%.
- Our products allow you to design & optimize robust power supplies w/ a minimum set of external components.
- Product Family Features:
  - Wide Input Voltage Ranges of 4.5 to 30V,
  - Internal Compensation
  - 100% duty cycle
  - Very high Conversion Efficiencies

Highlight Product: ASD3003

1.5A, Asynchronous Step Down Regulator w/ 100% Duty Cycle

- V_{IN} Range: 4.5 – 30 Volts
- Adjustable V_{OUT} as low as 1.25V
- 1.5A MAX Output Current
- 1mA of Typical Supply current
  - High Efficiency at light loads
- 100% Duty Cycle capability
  - Well suited for back up battery App.
- 450kHz oscillator frequency
- Enable pin for electrical on/off
- Internal compensation
  - Minimizes the BOM & mfg Cost
- 500µs internal soft start
- Current limit protection
- Thermal shutdown
- -40 to 85°C Temperature range
- Available in SOIC-8 EDP & DFN3X3-8 packages

Typical Application



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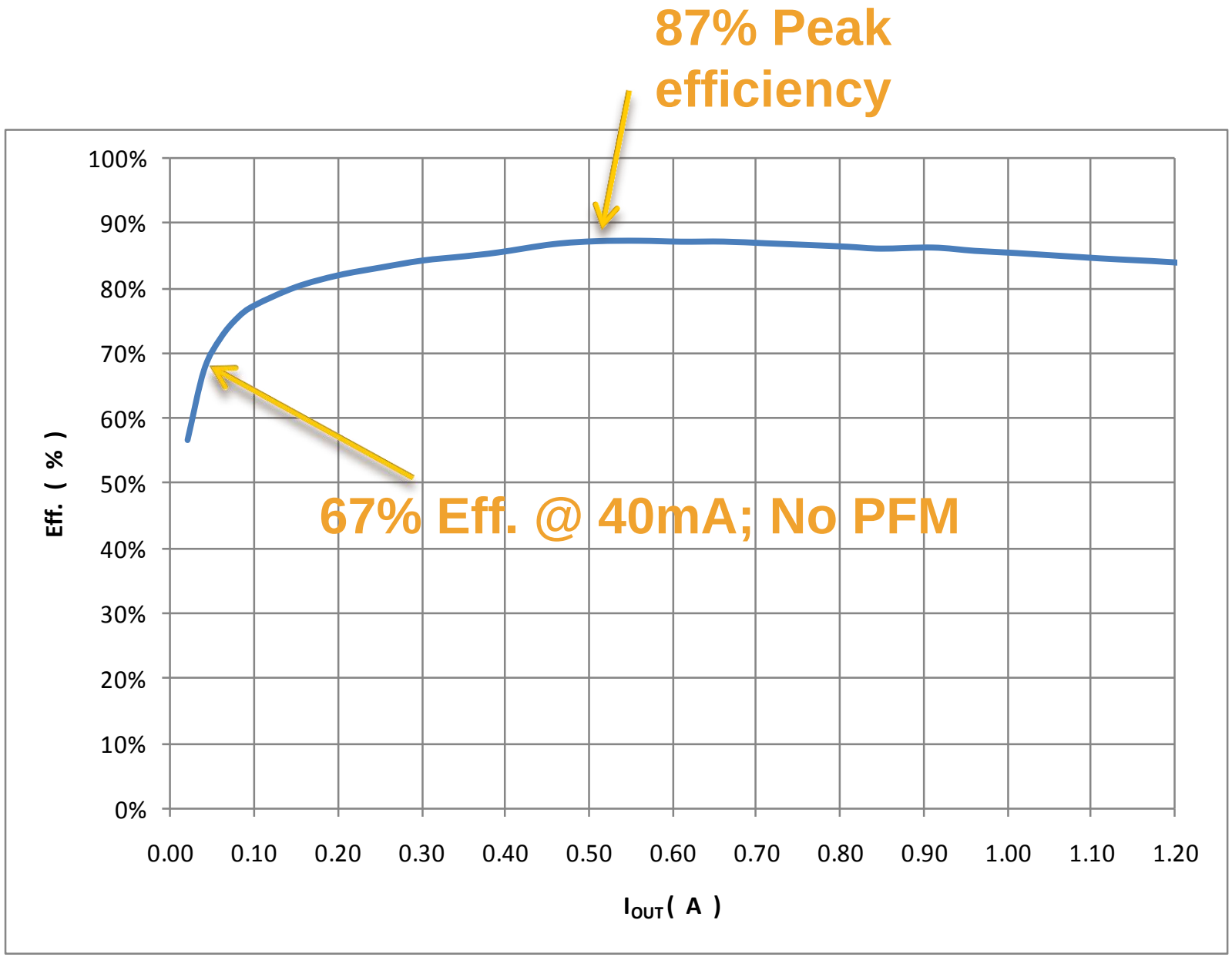
ASD3003 Load Current Vs. Efficiency

Conditions:
V_{IN} = 12V
V_{OUT} = 5V



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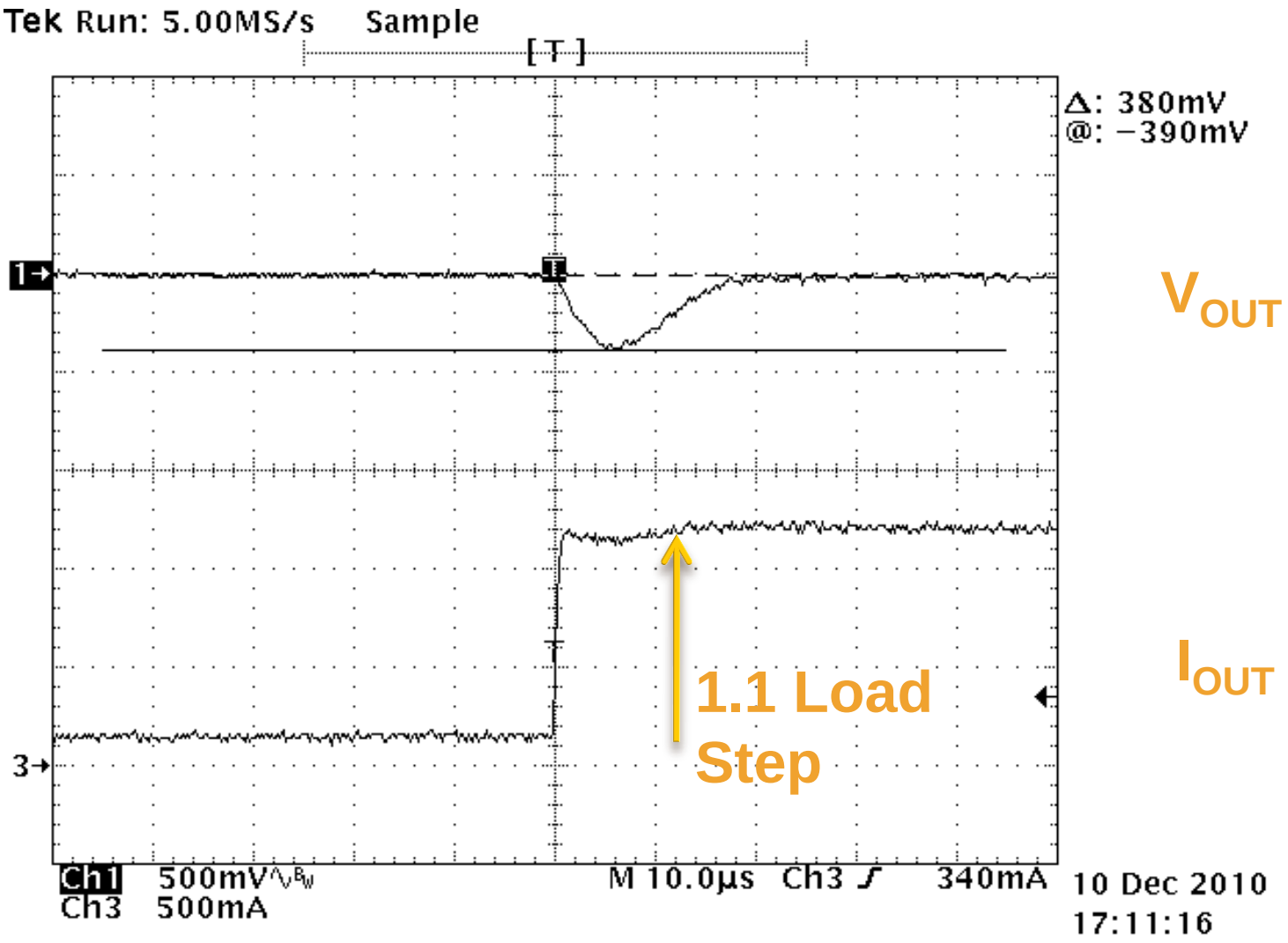
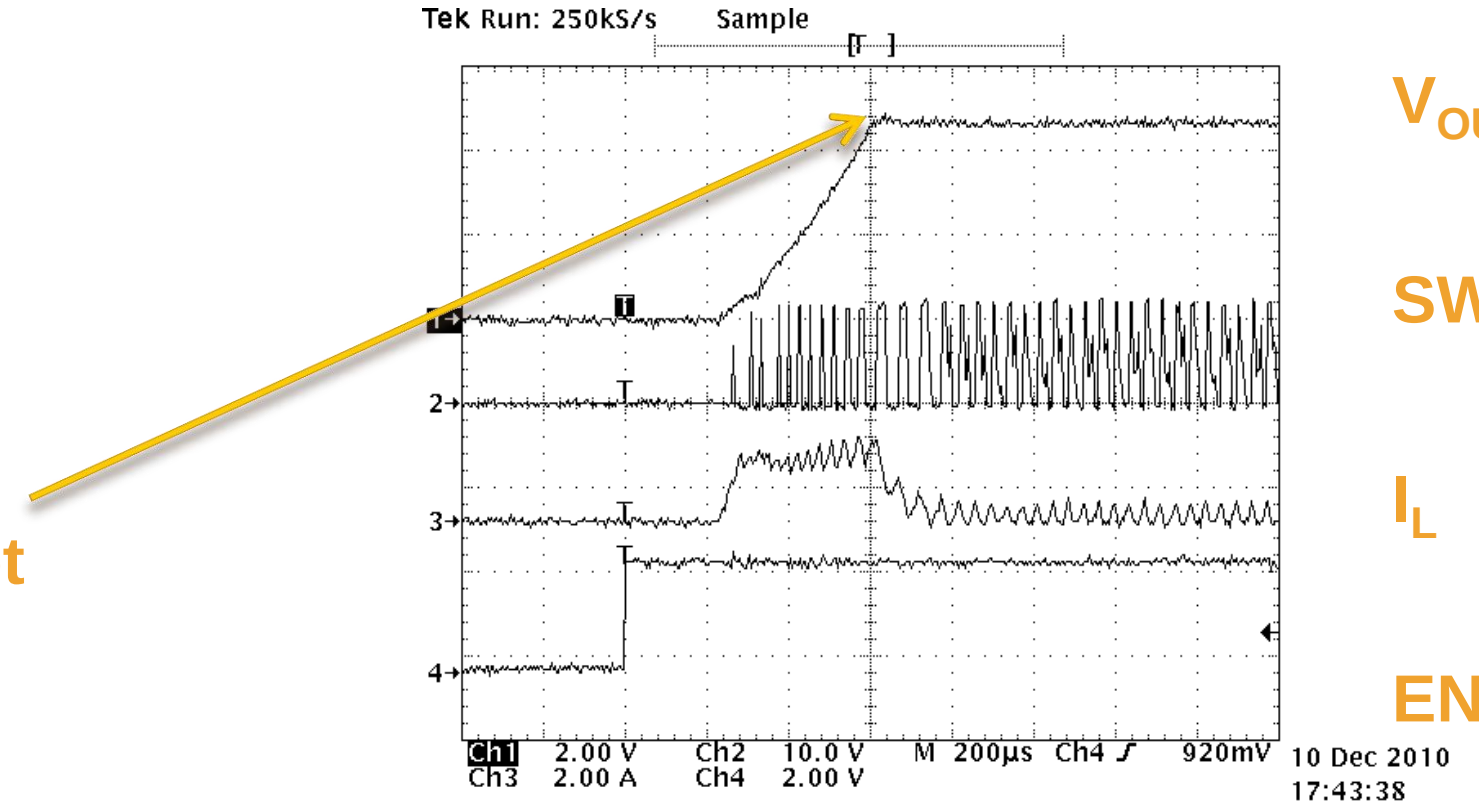
ASD3003 Transient Response

Conditions:
V_{IN} = 12V
V_{OUT} = 5V



ASD3003 Enable Startup

Conditions:
V_{IN} = 12V
V_{OUT} = 5V



V_{OUT}

SW

I_L

EN

No OverShoot

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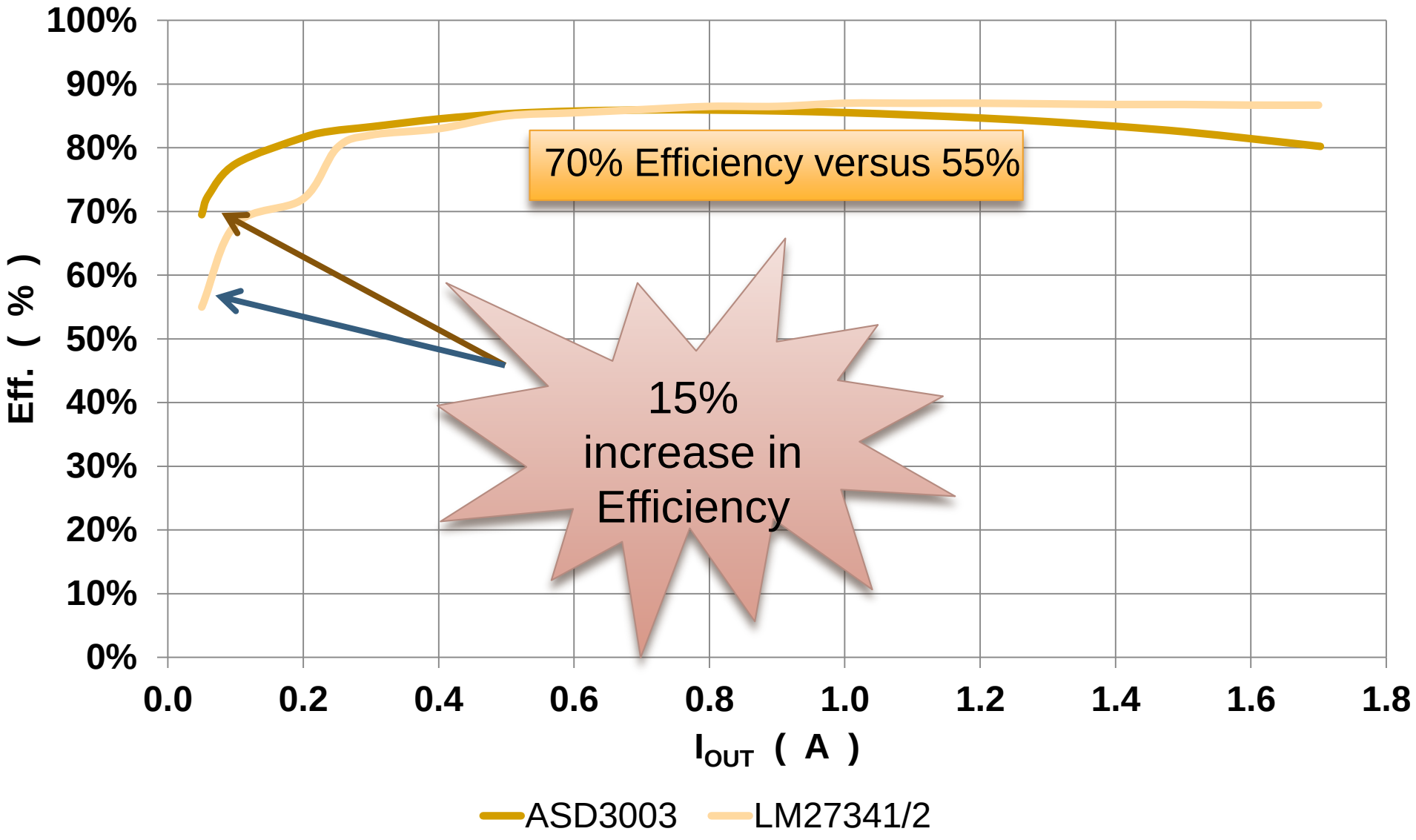
Performance Comparison - GGIC vs TI



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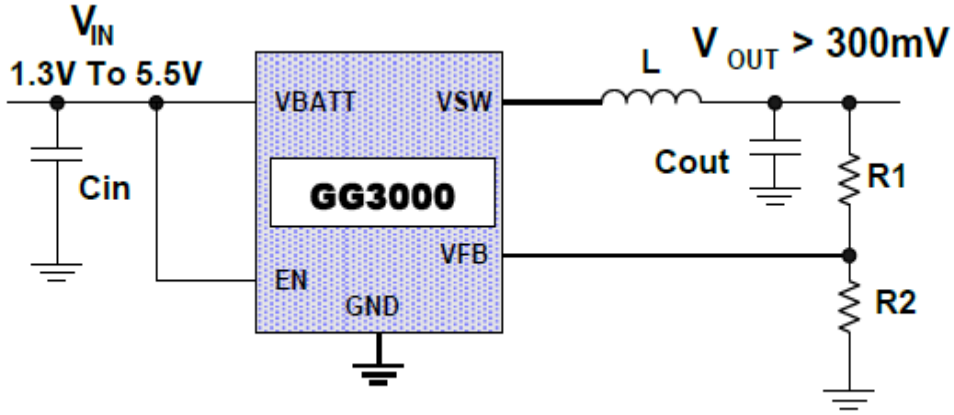
GG3000 - 300mA, High Efficiency, Low Input Voltage, Adj Synchronous Step-Down DC-DC Regulator

Features

- Replace step-up & linear reg combos to enhance overall efficiency of regulation, & lower BOM & board space.
- Low Input Voltage (1.3 - 5.5V)
- Output Current up to 300mA
- Sync. Operation w/ Built-In Power Transistors (No external diodes required)
- Adjustable Output Voltage ≥ 300mV
- High Efficiency up to 90%
- Low Ripple of < 10mV
- 10% - 90% Duty Cycle
- 2% Output Accuracy
- Shutdown Current of < 1µA
- 300mV Internal Reference Voltage
- Built-in Soft Start
- Small 8-pin QFN Package

Operates from either 2 or 3 "household" AA or AAA (Alkaline, NiCad, NiMH) batteries, or from single Lithium (Li-Ion, Li-Metal) battery!!



Applications

- Mobile Phones
- Digital Still Cameras / PDAs
- Portable Instruments
- Battery Powered Equipment
- Personal Information Appliances
- MP3 Players

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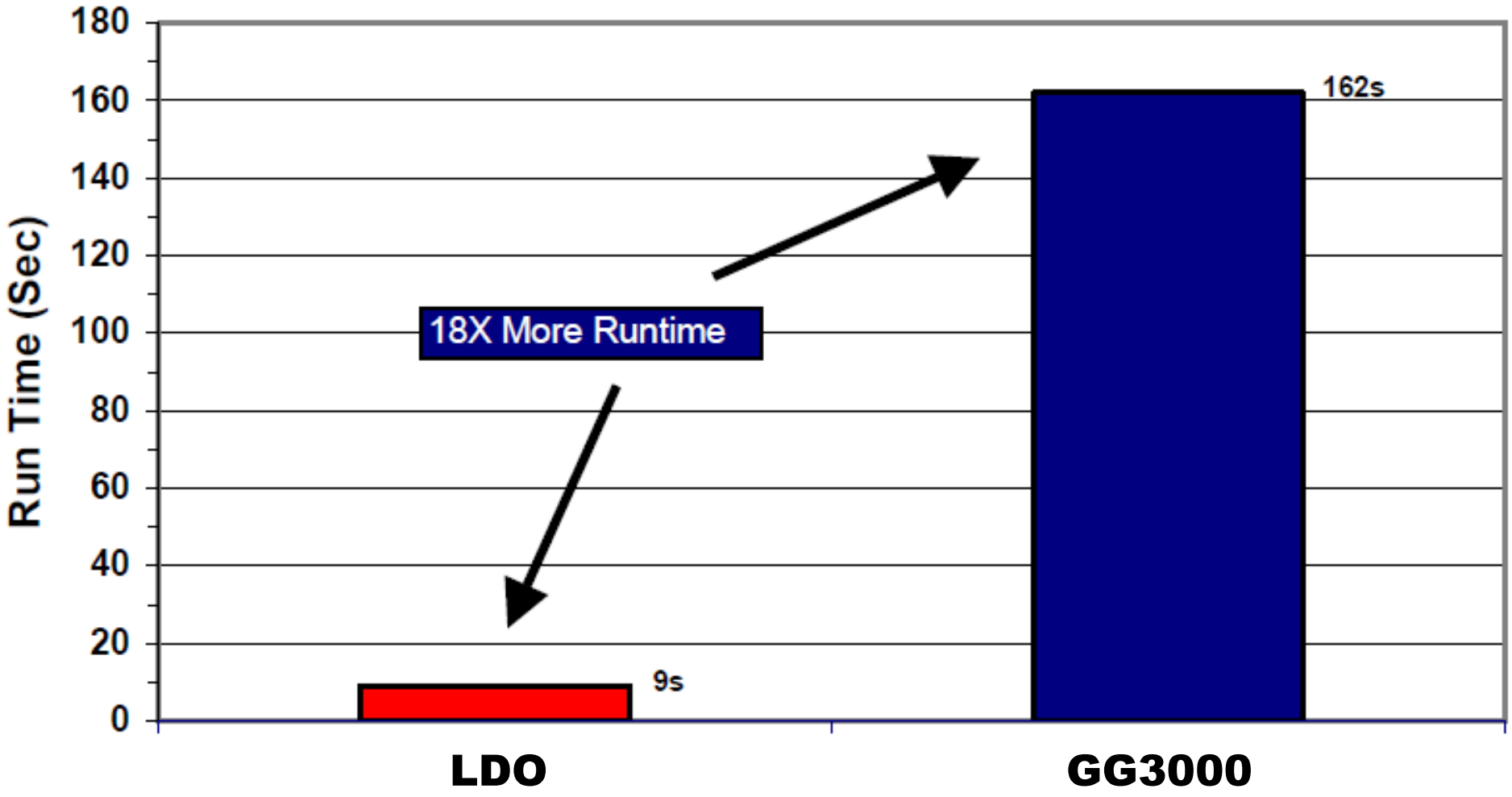
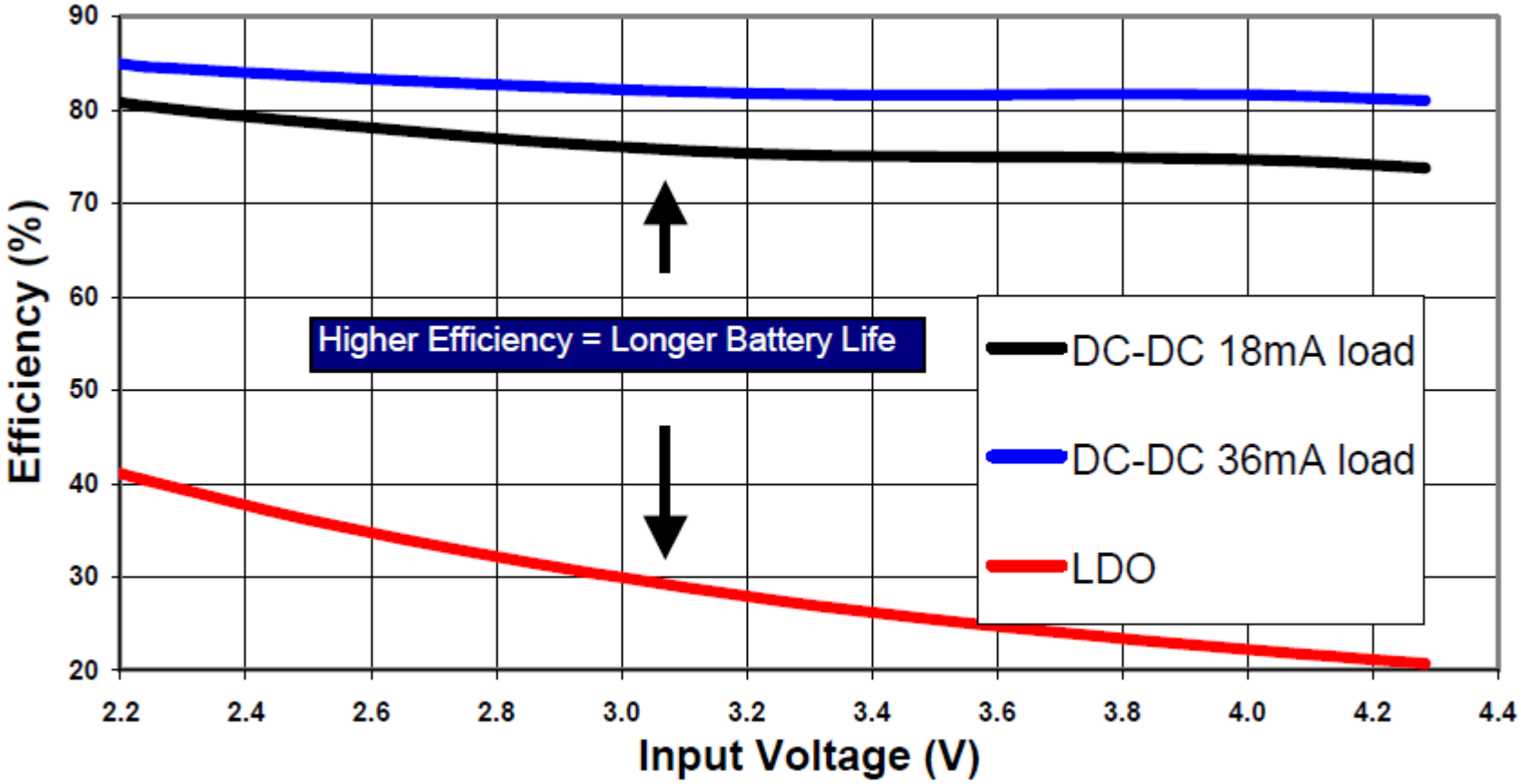
GG3000 - Battery Runtime Comparison at Output of 900mV, 36mA Load



GG3000 - Efficiency vs. Input Voltage for 900mV Output



- Input can be as low as 1.3V
- Output can be as low as 300mV
- Accuracy is better than 2%

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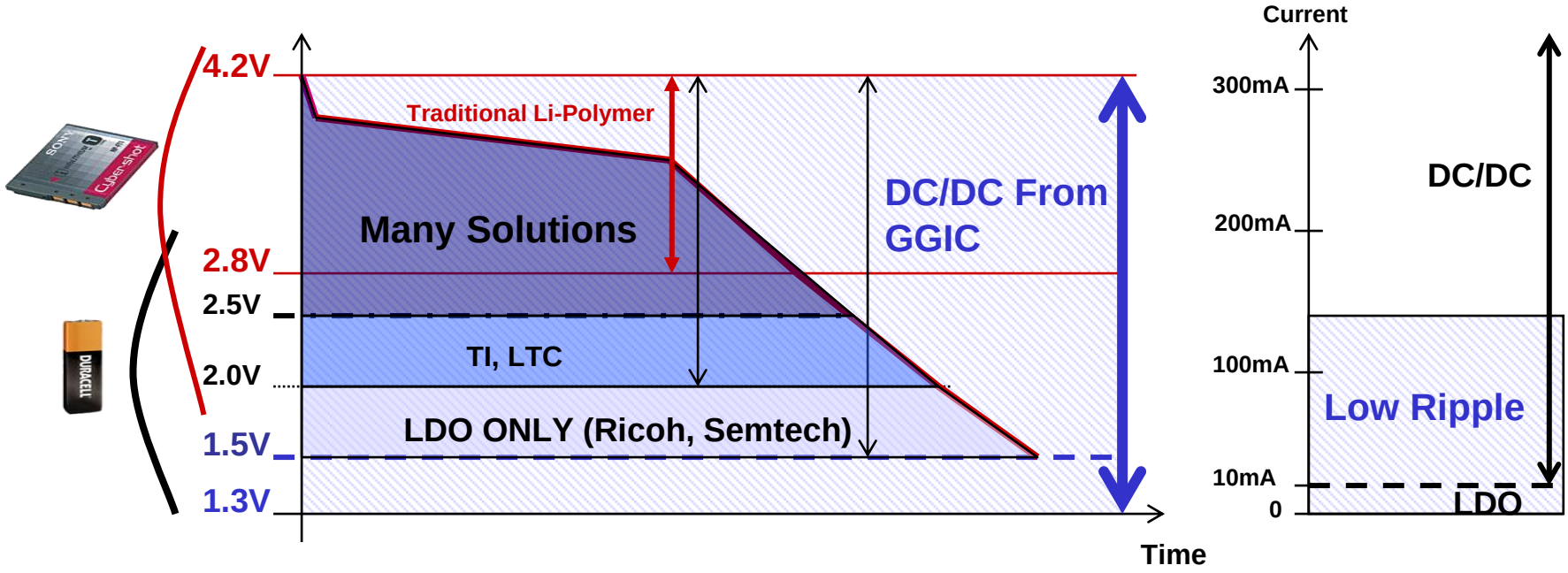
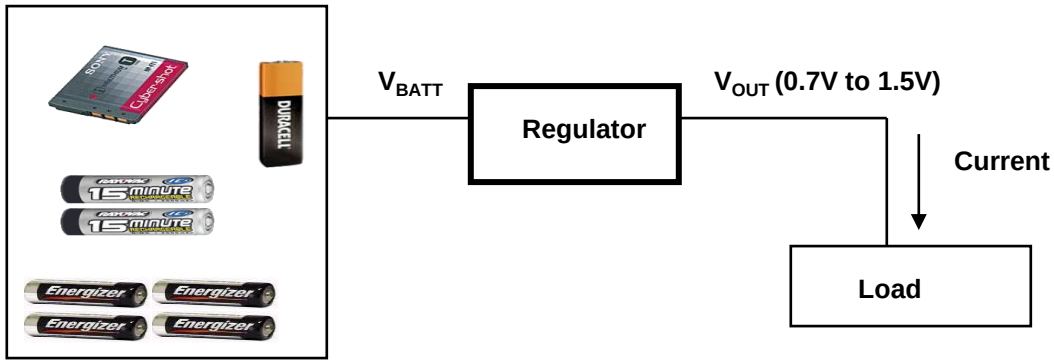
Technology & Batteries





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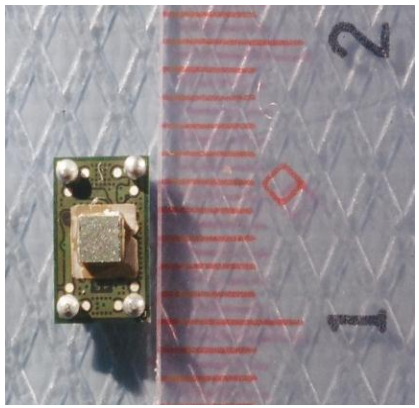
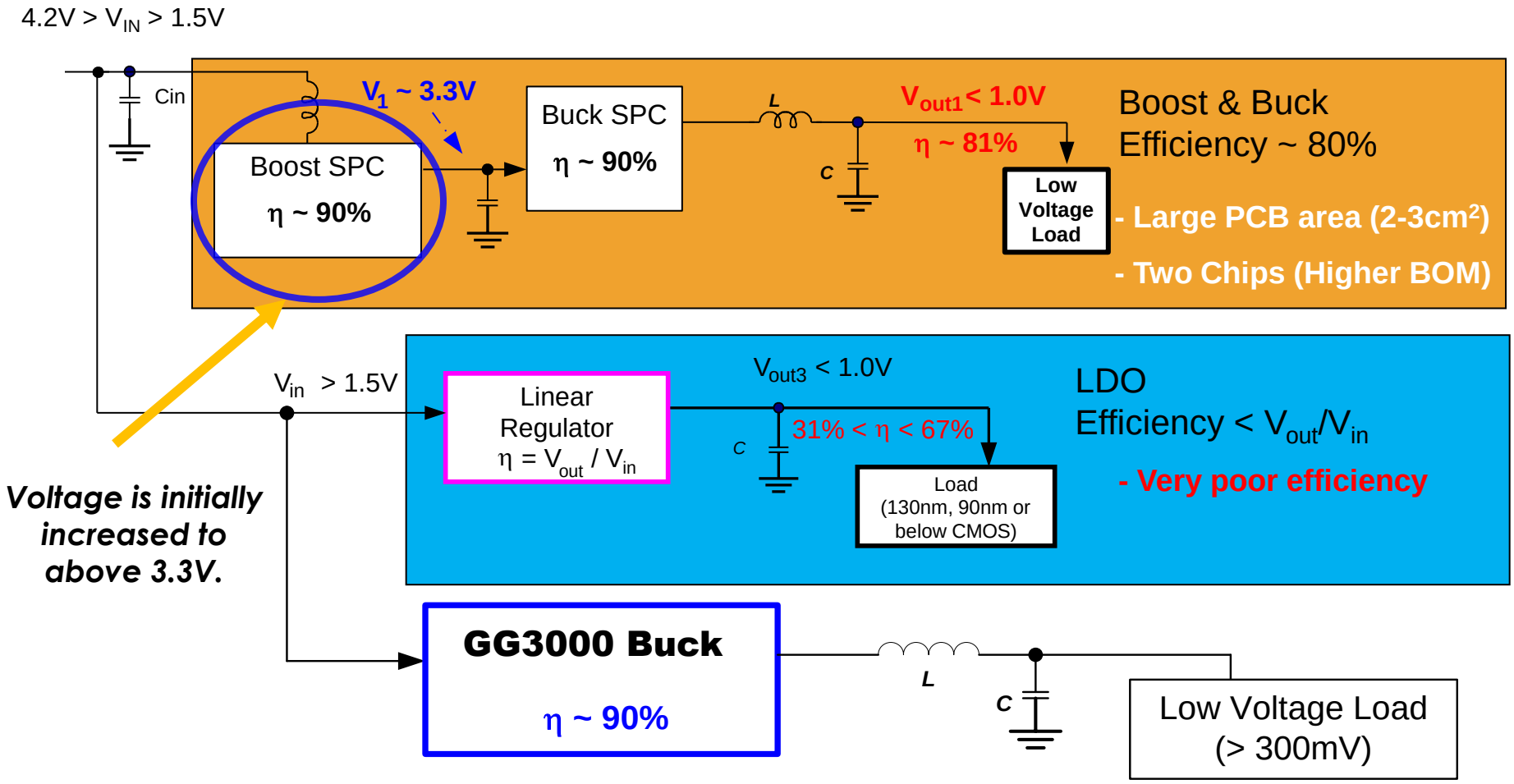
Technology

- ONLY Monolithic Solution
  - The Widest Input Voltage Range
    - V_{IN} of 1.3V to 5.5V
  - Efficiency > 90%
  - $V_{out} \geq 300mV$
    - 50mV Feedback is POSSIBLE to do.
  - Low Ripple for All Conditions
  - Small Passives
  - Lower Solution Cost & Smaller
  - Higher Reliability (Less Components)



Different Methods of Creating1.5-4V Input to 1.2V Output



Low input voltage with high Efficiency ~ 90%

GG3000 Comparison: 1.4V - 4.2V Input, 1.2V Output Discrete Solution

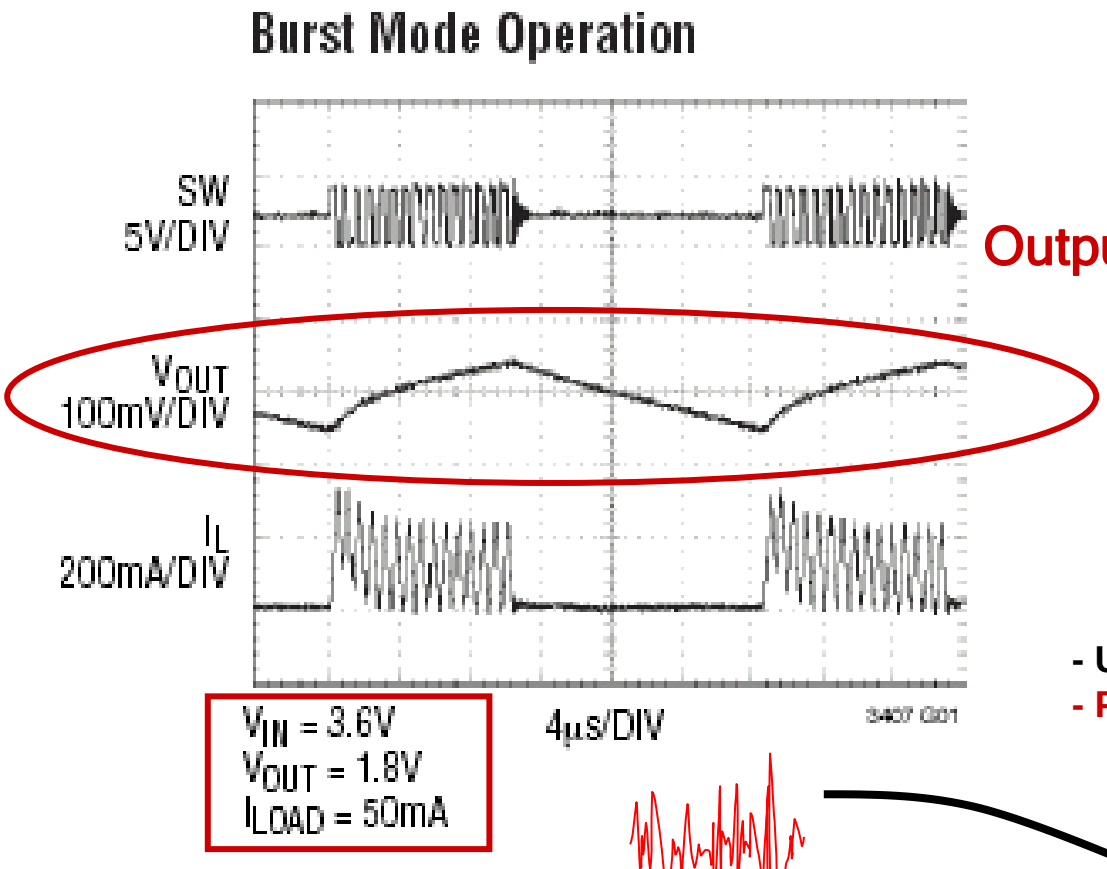
Specifications	GG3000 DC/DC	Supplier 1 DC/DC	Supplier 2 DC/DC	Supplier 3 DC/DC	LDO
Extra Components	5	17	20	16	4
Component Area $(mm)^2$	22	63	103	84	29
Relative Size	1x	2.9x	4.7x	3.8x	1.3x
Efficiency @ 50mA	93%	72%	81%	76%	60%*
Power Loss @ 50mW	4.5mW	23.3mW	14.1mW	18.9mW	40mW*
Power Loss for 10 Regulators	45mW	233mW	141mW	189mW	400mW*
Relative Power Loss	1x	5.18x	3.13x	4.2x	8.89x

Advantages: Size, Simplicity, Cost & Battery Life

GG3000 Advantages

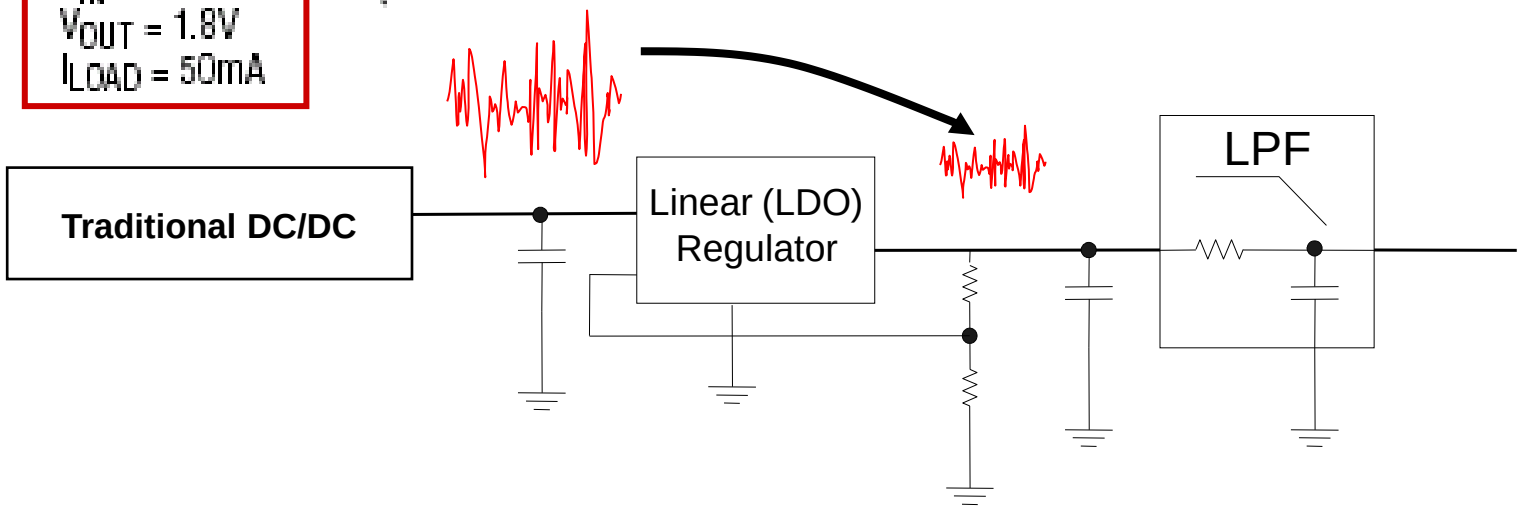
- High Power Efficiency → Longer Battery Life
- Small Size (Footprint & Height)
- Low Ripple Voltage @ Low Power Load
- Widest Operating Voltage (Use All of Battery Energy)
- Low BOM → Reduced Solution Cost
- Complete MCM or SIP Solution (Small Solution Size)

Competition IC @ 50mA or Less



Output Noise is 100mV @ 50mA or Lower

- **Using LDO is Common Suggestion**
- **PROBLEM → Typical LDO is a High-pass Filter**



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Step Up (Boost) Regulators

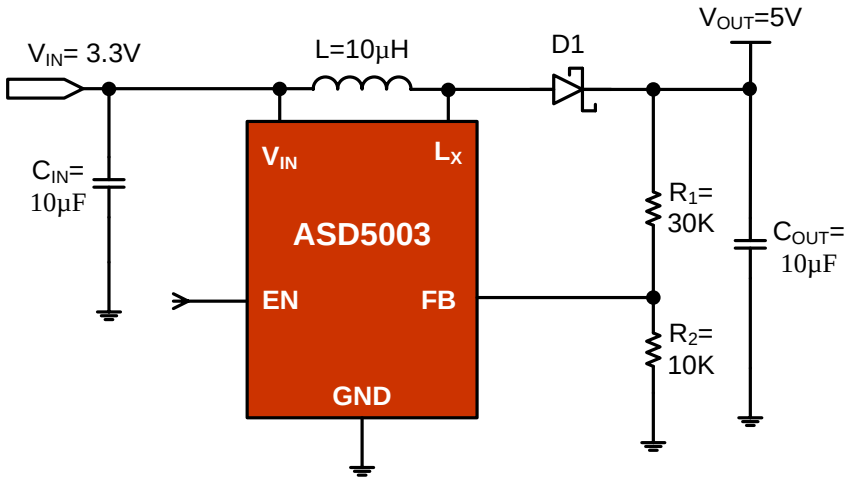
- Operate w/ wide input voltage range of 1.8-15V & steps up input to higher output voltage.
- Output voltage capability up to 30V w/ input currents up to 1A.
- Features include non-synchronous operation, 250kHz switching frequency, tight reference voltage accuracy, current mode control & excellent transient response.
- Addresses “ENERGY STAR®” regulation w/ high standby efficiency.
- Applications include TFT display, AA alkaline battery, & LED backlighting.

ASD5001 / ASD5003

250kHz, 30V Step Up Regulator w/ 500mA/1A switch

- V_{IN} Range: 1.8 – 15V
- Adjustable V_{OUT} as low as 1.25V
  - Maximum: 30V
- 500mA Switch current (ASD5001)
- 1A Switch current (ASD5003)
- Enable pin for electrical on/off
- Low Supply Current
- 250kHz Switching frequency
- Internal soft start
- Protection
  - Internal Soft Start
  - Hiccup mode current limit
  - Thermal shutdown
- -40 to +85°C Temperature Range
- Available in SOT23-5 package

Typical Application



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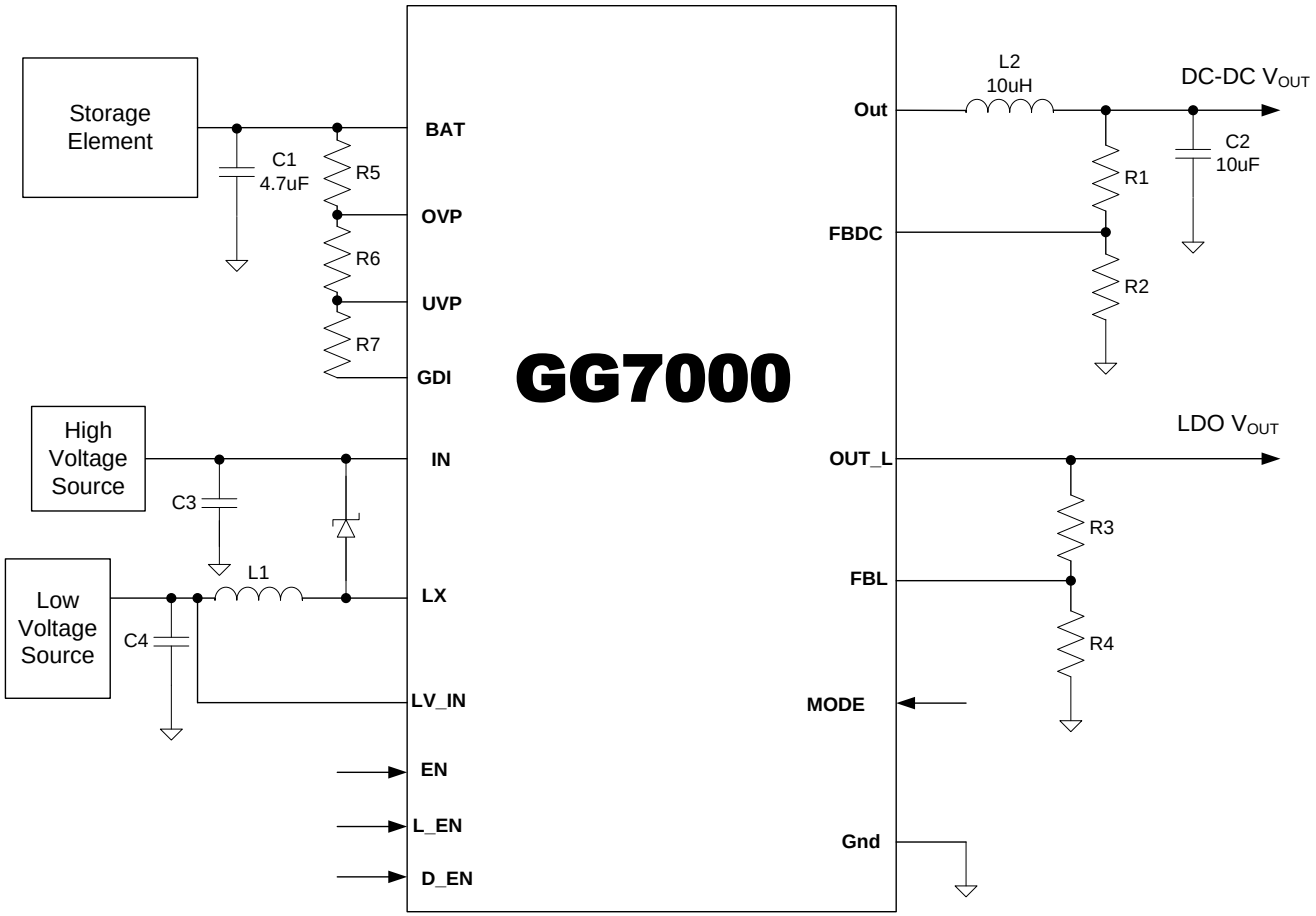
Energy Harvesting

Energy Harvesting System Overview

- Energy Harvesting Power-Train
- Customized Power Supply Solutions For Smart Gas Meters
- Duty Cycle << 100%
  - Average System Power Active Power of 2W for 2 Seconds (4 Joules)
  - Sleep Power TBD
- PV Cell Powered (Low-Light Or Shade)
  - Operating Time (10 to 20 Years) High-Cycle (> 10,000 Cycles) Storage Device
  - Low Leakage Storage Device

GG7000 Multi-Channel Low Power (PMIC) for Energy Harvesting



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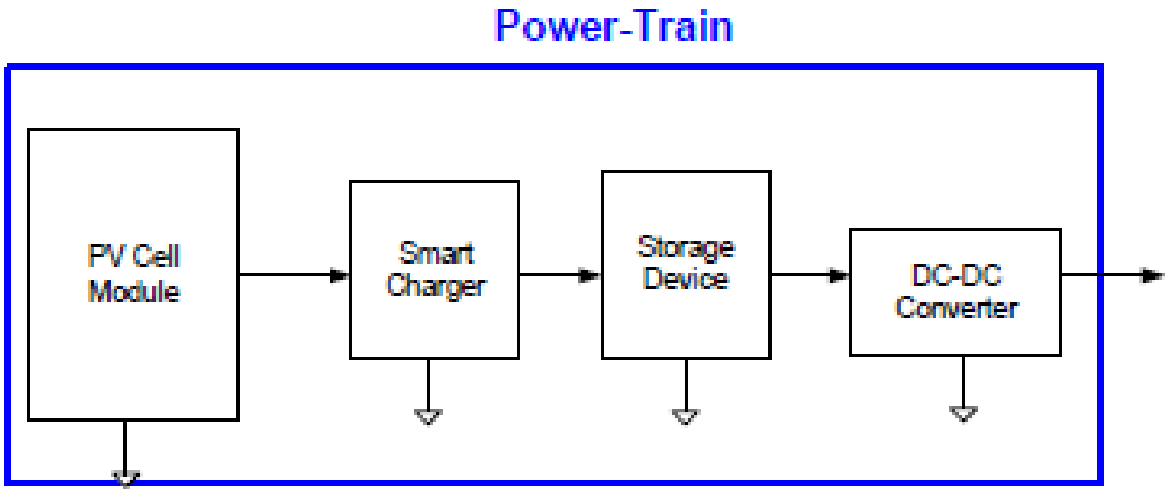
Power-Train For WSN and Other Applications

- System Can Be Powered
  - Choice 1 - Use Smart Charger, Storage, & DC-DC
  - Choice 2 - Straight from PV Cell
    - PV Cell Must Be Constant Voltage
- Input Power Indoor Lights
  - ~ 100uW
- Output Power
  - Sleep 10uW
  - Active 100mW
- Storage Device Choices
  - High Cycle (100,000 Cycles)
  - Ultra Low Leakage (< 100nA)
- Ultra Efficient DC-DC
- Smart Charger



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LED Drivers

Coming Soon!

AC-DC Converters

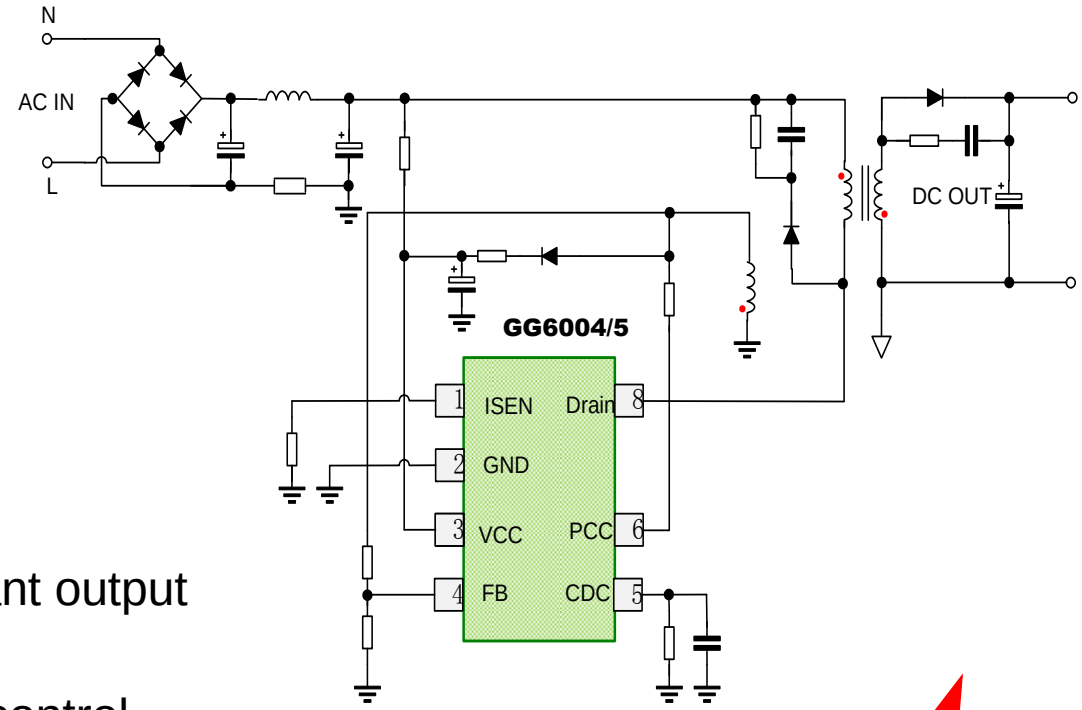
- AC-DC Converters

GG6004/GG6005

PSR (Primary Side Regulation) w/ Integrated MOSFET for 4W-5W Charger

Features

- Low Start-up current (Max. 20uA)
- Standby Power <100mW.
- PFM operation
- Pulse by pulse current limiting
- Constant voltage & constant current
- OVP, OLP, OTP, UVLO
- Leading edge blanking
- Built-in MOSFET(GG6004), Pmax=4W
- Built-in MOSFET(GG6005), Pmax=5W
- Input line voltage compensation for constant output current limiting
- Cable compensation for constant voltage control
- No secondary feedback, eliminates optocoupler
- Built-in Soft start
- DIP-8 Package



No optocoupler
No TL431

Applications

- Charger
- Adapter

GOLDEN GATE
INTEGRATED CIRCUITS

Thank You!