GT2153

CMOS Positive Voltage Regulator

Description

The GT2153 of positive, linear regulators feature low quiescent current (30μA typ.) with low dropout voltage, making them ideal for battery applications.

This rugged device has both Thermal Shutdown, and Current Fold-back to prevent device failure under the "Worst" of operating conditions.

The SOT-26 version also features a "Power Good" detector, which pulls low when the output is out of regulation. The GT2153 is stable with an output capacitance of 2.2μF or greater.

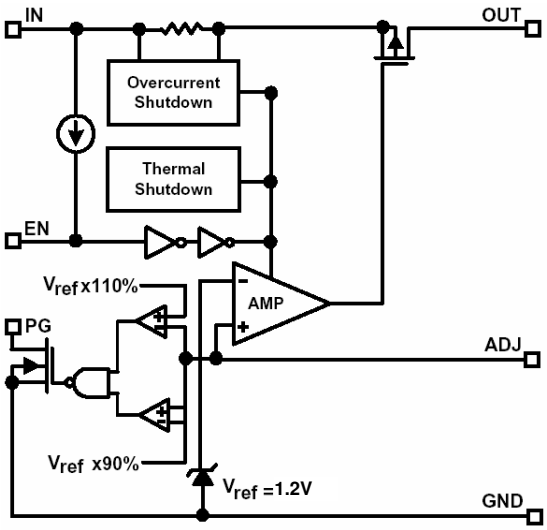
Features

- Very Low Dropout Voltage
- Guaranteed 300mA output
- Over-Temperature Shutdown
- Current Limiting
- Short Circuit Current Fold-back
- Typical Accurate± 2.0%
- Adjustable output voltages
- Power-saving Shutdown Mode
- Power Good Detector
- Low Temperature coefficient

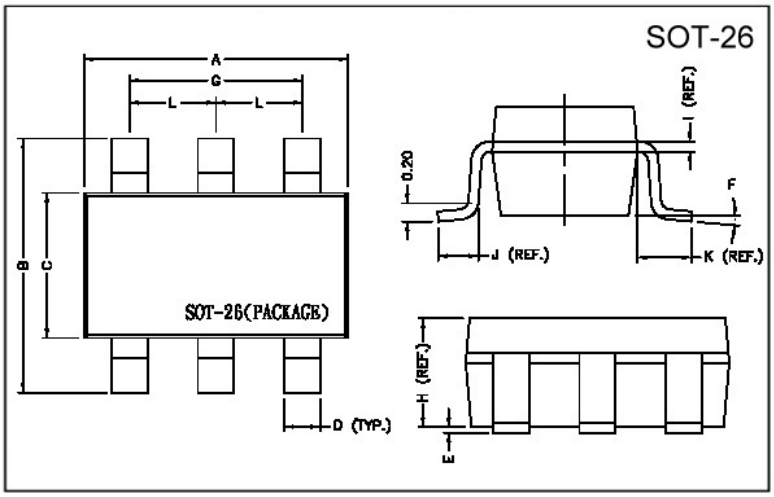
Applications

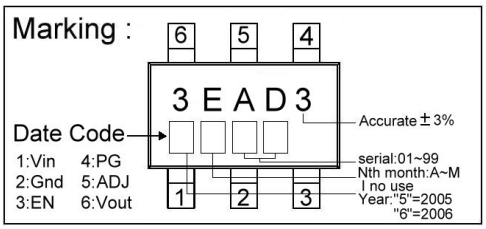
- Battery Powered Widgets
- Instrumentation
- Wireless Devices
- PC Peripherals
- Portable Electronics
- Cordless Phones
- Electronic Scales

Functional Block Diagram



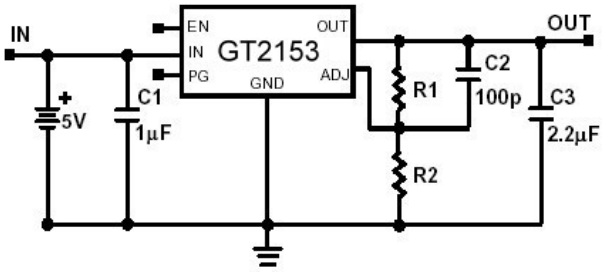
Package Dimensions





REF.	Millimeter		REF.	Dimensions
	Min.	Max.		Millimeter
A	2.70	3.10	G	1.90 REF.
B	2.60	3.00	H	1.20 REF.
C	1.40	1.80	I	0.12 REF.
D	0.30	0.55	J	0.37 REF.
E	0	0.10	K	0.60 REF.
F	0°	10°	L	0.95 REF.

Typical Application Circuit



Vout=1.2(R1+r2)/R2

C2 is unnecessary when R1 or R2 < 20k

PG pin is only available in the SOT-26 package option

Absolute Maximum Ratings

Parameter	Symbol	Ratings	Unit
Input Max Voltage	V_{IN}	8	V
Output Current	I_{OUT}	$P_D/(V_{IN}-V_O)$	mA
Input, Output Voltage		GND-0.3 to V_{IN}+0.3	V
Operating Ambient Temperature	Topr	-40 ~ +85	℃
Junction Temperature	Tj	-40 ~ +125	℃
Maximum Junction Temperature	$T_{j\,Max}$	150	℃
Thermal Resistance	θja	260	℃/W
Power Dissipation(△T=100℃)	PD	380	mW
EDS Classification		B	

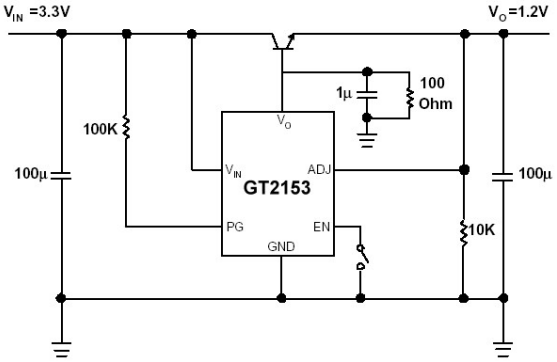
Electrical Characteristics Ta=25℃ V_{IN}=5V, unless otherwise noted

Parameter	Symbol	Condition		Min	TYP	Max	Unit
Output Voltage	V_O	V_{IN}=5V, I_O=1mA		-3%	-	3%	V
Output Current	I_O	V_{IN}=5V, V_O>1.2		300	-	-	mA
Current Limit	I_{LIM}	V_{IN}=5V, V_O>1.2		300	450	-	mA
Load Regulation	REG_{LOAD}	V_{IN}=5V, I_O=1mA to 300mA		-	0.2	1	%
Dropout Voltage	$V_{DROPOUT}$	I_O=300mA $V_O=V_{O(NOM)}$-2%	1.2V≦$V_{O(NOM)}$≦2.0V	-	-	1300	mV
			2.0V<$V_{O(NOM)}$≦2.8V	-	-	400	
			2.8V<$V_{O(NOM)}$<3.8V	-	-	300	
Quiescent Current	I_Q	V_{IN}=5V, I_O=0mA		-	30	50	μA
Ground Pin Current	I_{GND}	V_{IN}=5V, I_O=1mA~300mA		-	35	-	μA
Line Regulation	REG_{LINE}	I_O=5mA $V_{IN}=V_O$+1 to V_O+2	V_O<2.0V	-	-	0.15	%
			V_O≧2.0V	-	0.02	0.1	
Input Voltage	V_{IN}			Note1	-	7	V
Over Temperature Shutdown	OTS			-	150	-	℃
Over Temperature Hysterisis	OTH			-	30	-	℃
Vo Temperature Coefficient	TC			-	30	-	ppm/℃
Short Circuit Current(Note2)	I_{SC}	V_{IN}=5V, V_O<0.8V		-	150	300	mA
Power Supply Rejection	PSRR	V_{IN}=5V I_O=100mA Co=2.2Mf	f=1kHz	-	50	-	dB
			f=10kHz	-	20	-	
			f=100kHz	-	15	-	
Output Voltage Noise	eN	f=10Hz~100kHz I_O=10mA C_{BYP}=0μF	Co=2.2μF	-	30	-	μVrms
ADJ Input Bias Current	I_{ADJ}			-	1	-	μA
ADJ Reference Voltage	V_{REF}			1.176	1.2	1.224	V
EN Input Threshold	V_{EH}	V_{IN}=2.7V to 7V		2.0	-	V_{IN}	V
	V_{EL}	V_{IN}=2.7V to 7V		0	-	0.4	V
EN Input Bias Current	I_{EH}	$V_{EN}=V_{IN}$, V_{IN}=2.7V to 7V		-	-	0.1	μA
	I_{EL}	V_{EN}= 0V, V_{IN}=2.7V to 7V		-	-	0.5	μA
Shutdown Supply Current	I_{SD}	V_{IN}=5V, V_O=0V, V_{EN}<V_{EL}		-	0.5	1	μA
Shutdown Output Voltage	$V_{O,SD}$	Io=35μA, V_{EN}<V_{EL}		0	-	0.1	V
Output Under Voltage	V_{UV}			-	-	85	$\%V_{O(NOM)}$
Output Over Voltage	V_{OV}			115	-	-	$\%V_{O(NOM)}$
PG Leakage Current	I_{LC}	V_{PG}=7V		-	-	1	μA
PG Voltage Rating	V_{PG}	V_O in regulation		-	-	7	V
PG Voltage Low	V_{OL}	I_{SINK}=0.4mA		-	-	0.4	V

Note 1: $V_{IN\,(MIN)}=V_{OUT}+V_{DROPOUT}$

2: To prevent the Short Circuit Current protection feature from being prematurely activated, the input voltage must be applied before a current source load is applied.

Advanced Application



Ordering Information (contd.)

Part Number	Marking	Output Voltage	Part Number	Marking	Output Voltage
GT2153-AD	3EAD3 XXXX	Adjustable			

Detailed Description

The GT2153 of COMS regulators contain a PMOS pass transistor, voltage reference, error amplifier, over-current protection, thermal shutdown and Power Good detection circuitry.

The P-channel pass transistor receives data from the error amplifier, over-current shutdown, and thermal protection circuits. During normal operation, the error amplifier compares the output voltage to a precision reference. Over-current and Thermal shutdown circuits become active when the junction temperature exceeds 150℃, or the current exceeds 300mA. During thermal shutdown, the output voltage remains low. Normal operation is restored when the junction temperature drops below 120℃.

The GT2153 switches from voltage mode to current mode when the load exceeds the rated output current. This prevents over-stress. The GT2153 also incorporates current fold-back to reduce power dissipation when the output is short circuited. This feature becomes active when the output drops below 0.8 volts, and reduces the current flow by 65%. Full current is restored when the voltage exceeds 0.8 volts.

External Capacitors

The GT2153 is stable with an output capacitance to ground of 2.2µF or greater. Ceramic capacitors have the lowest ESR, and will offer the best AC performance. Conversely, Aluminum Electrolytic capacitors exhibit the highest ESR, resulting in the poorest AC response. Unfortunately, large value ceramic capacitors are comparatively expensive. One option is to parallel a 0.1µF ceramic capacitor with a 10µF Aluminum Electrolytic. The benefit is low ESR, high capacitance, and low overall cost.

A second capacitor is recommended between the input and ground to stabilize Vin. The input capacitor should be at least 0.1µF to have a beneficial effect.

All capacitors should be placed in close proximity to the pins. A “Quiet” ground termination is desirable. This can be achieved with a “Star” connection.

Enable

The Enable pin normally floats high. When actively, pulled low, the PMOS pass transistor shuts off, and all internal circuits are powered down. In this state, the quiescent current is less than 1µA. This pin behaves much like an electronic switch.

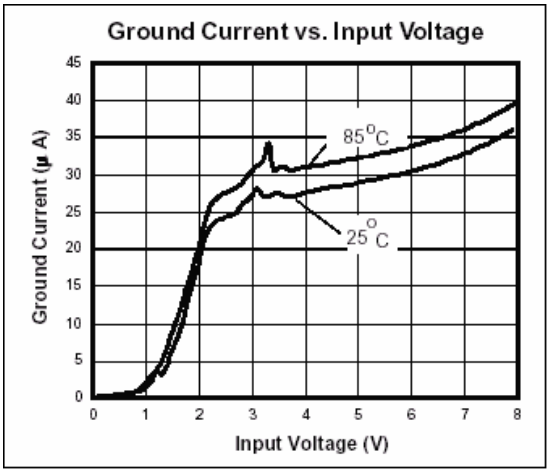
Power Good

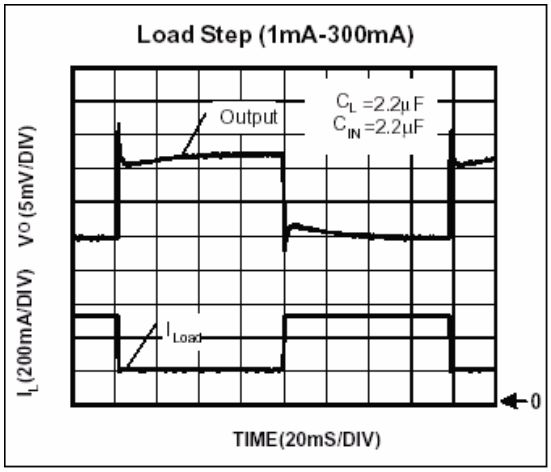
The GT2153 includes the Power Good feature. When the output is not within ±15% of the specified voltage, it pulls low. This can occur under the following conditions:

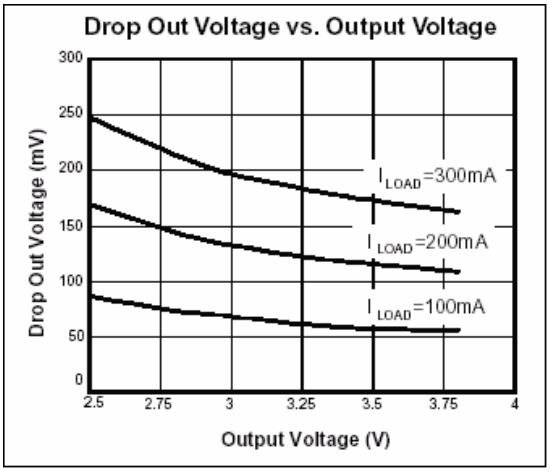
1) Input Voltage too low.
2) During Over-Temperature.
3) During Over-Current.
4) If output is pulled up.

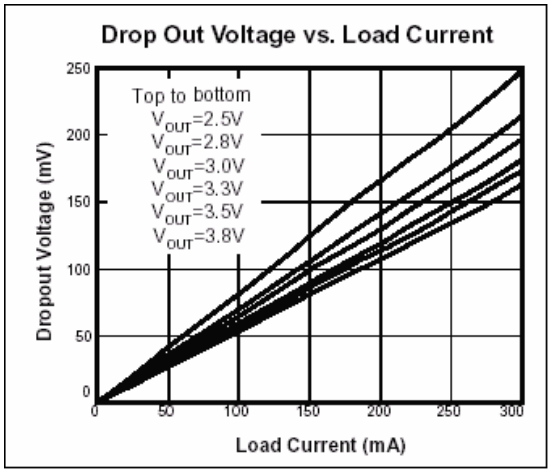
(Note: PG pin is an open-drain output.)

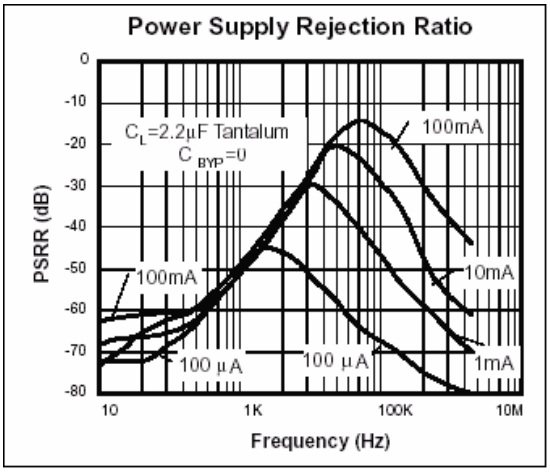
Characteristics Curve

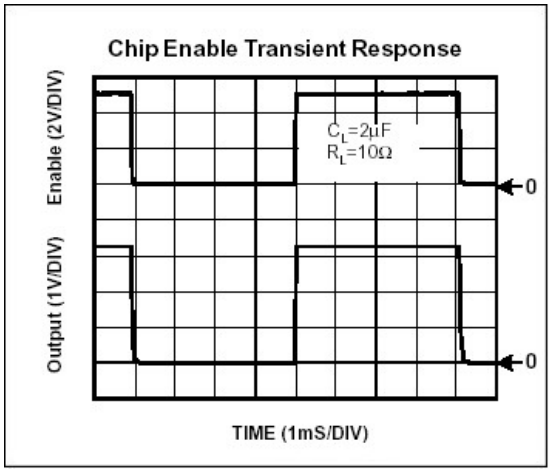


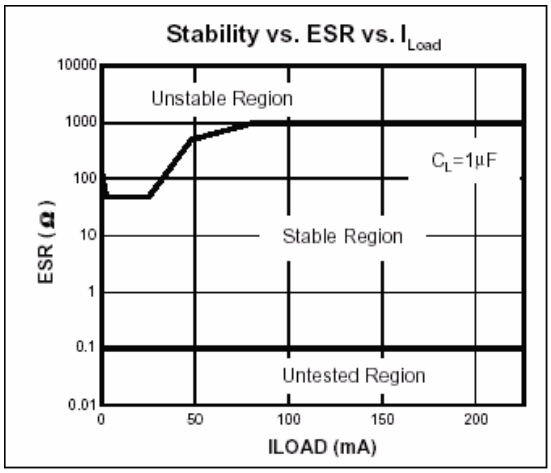


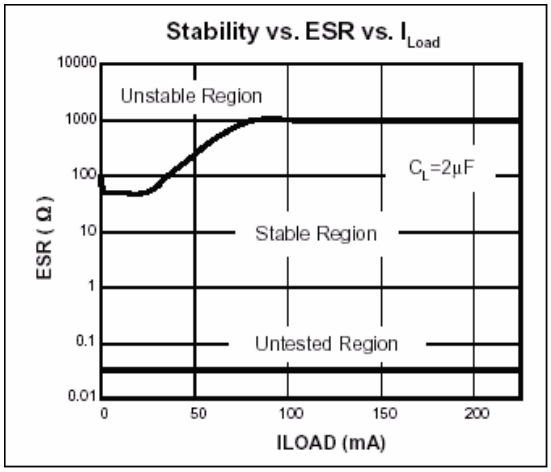


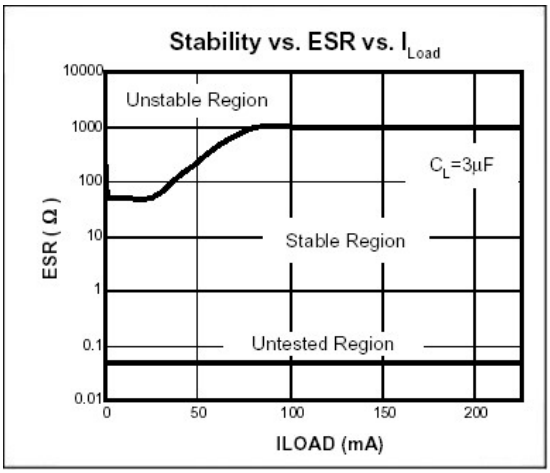


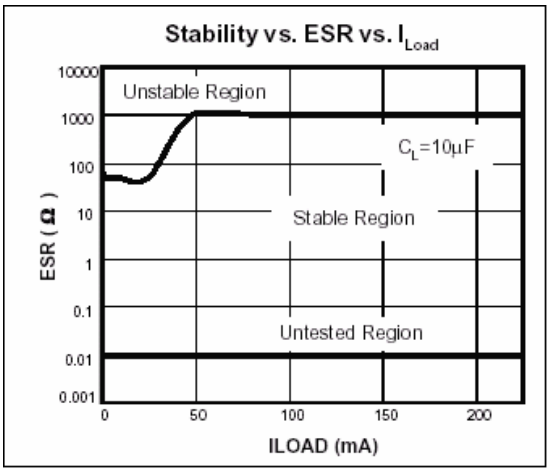


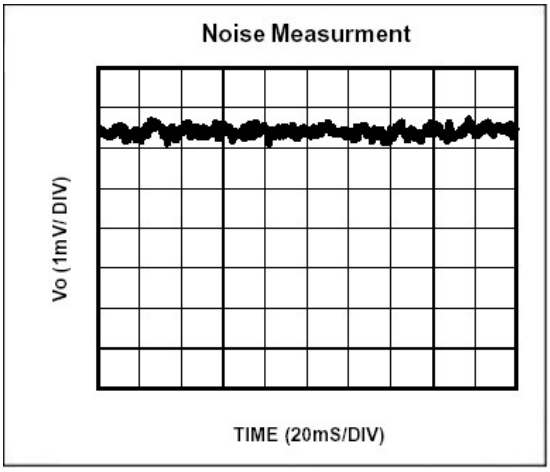


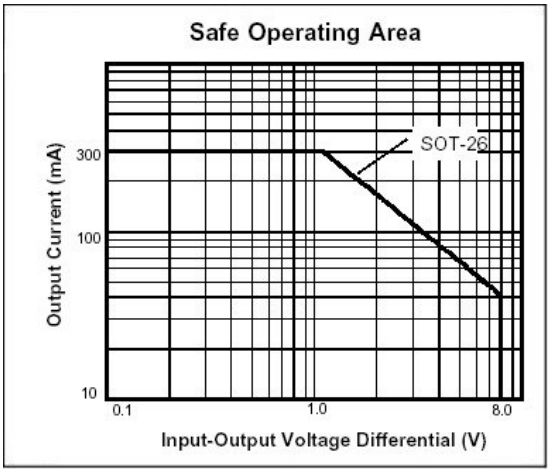












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