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MP2636

3.0A Single Cell Switch Mode Battery Charger with Power Path Management (PPM) and 3.0A System Boost Current

The Future of Analog IC Technology

DESCRIPTION

The MP2636 is a highly-integrated, flexible switch-mode battery charger with system power path management, designed for single-cell Li-ion or Li-Polymer batteries used in a wide range of portable applications.

The MP2636 can operate in both charge mode and boost mode to allow full system management and battery power management.

When input power is present, the device operates in charge mode. It automatically detects the battery voltage and charges the battery in three phases: trickle current, constant current and constant voltage. Other features include charge termination and auto-recharge. This device also integrates both input current limit and input voltage regulation in order to manage input power and meet the priority of the system power demand.

In the absence of an input source, the MP2636 switches to boost mode through the MODE pin to power the SYS pins from the battery. The OLIM pin programs the output current limit in boost mode. The MP2636 also allows an output short circuit protection to completely disconnect the battery from the load in the event of a short circuit fault. Normal operation will recover as soon as the short circuit fault is removed. The MP2636 provides full operating status indication to distinguish charge mode from boost mode. In addition, the MP2636 can report the real battery current in both charge and boost mode via IB pin.

The MP2636 achieves good EMI/EMC performance with well controlled switching edges.

To guarantee safe operation, the MP2636 limits the die temperature to a preset value of 120°C. Other safety features include input over-voltage protection, battery over-voltage protection, thermal shutdown, battery temperature monitoring, and a programmable timer to prevent prolonged charging of a dead battery.

FEATURES

- Up to 16V Sustainable Input Voltage
- 4.5V-to-6V Operation Voltage Range
- Power Management Function, Integrated Input-Current Limit, Input Voltage Regulation
- Up to 3.0A Programmable Charge Current
- Trickle-Charge Function
- Analog Voltage Output IB pin for Battery Current Monitor
- Selectable 4.2V / 4.3V / 4.35V Charge Voltage with 0.5% Accuracy
- Negative Temperature Coefficient Pin for Temperature Monitoring
- Programmable Timer Back-up Protection
- Thermal Regulation and Thermal Shutdown
- Internal Battery Reverse Leakage Blocking
- Integrated Over Current Protection and Over Voltage Protection for Pass-through Path
- Reverse Boost Operation Mode for System Power
- Up to 3.0A Programmable Output Current Limit for Boost Mode
- Integrated Short Circuit Protection and Output Over Voltage Protection for Boost Mode

APPLICATIONS

- Sub-Battery Applications
- Power-bank Applications for Smart-Phone, Tablet and Other Portable Devices

All MPS parts are lead-free and adhere to the RoHS directive. For MPS green status, please visit MPS website under Products, Quality Assurance page.

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TYPICAL APPLICATION

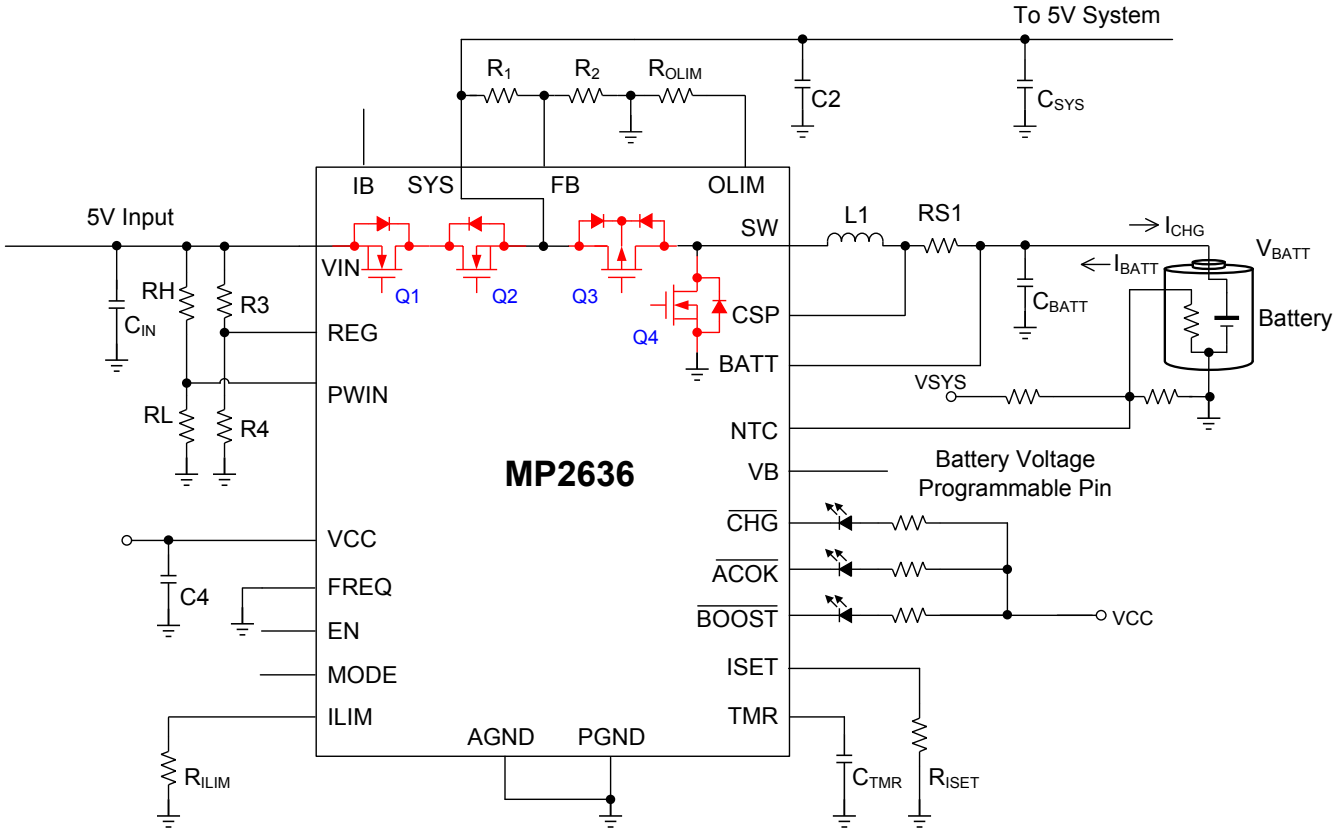

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Table 1: Operation Mode

Power Source		MODE	EN	Operating Mode	$\overline{ACOK}$	Q1,Q2	Q3	Q4
VIN	PWIN							
V_{BATT}+300mV <V_{IN} < 6V	PWIN>0.8V	X	Low	Only Pass Through Mode	Low	On	Off	Off
			High	Charging Mode		On	SW	SW
V_{IN} <V_{BATT}+300mV	X	High	X	Boost Discharge Mode	High	Off	SW	SW
X	PWIN<0.8V							
X	PWIN<0.8V	Low	X	SYS Force-off Mode	High	Off	Off	Off
V_{IN} > 6V	X			Input OVP		Off	Off	Off
V_{IN}<2V	X			Sleep Mode		Off	Off	Off

X=Don’t Care.

On = Fully Turn On

Off = Fully Off

SW = Switching

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ORDERING INFORMATION

Part Number	Package	Top Marking
MP2636GR	QFN-30 (4mmx4mm)	*See Below*

* For Tape & Reel, add suffix –Z (e.g. MP2636GR–Z)

TOP MARKING

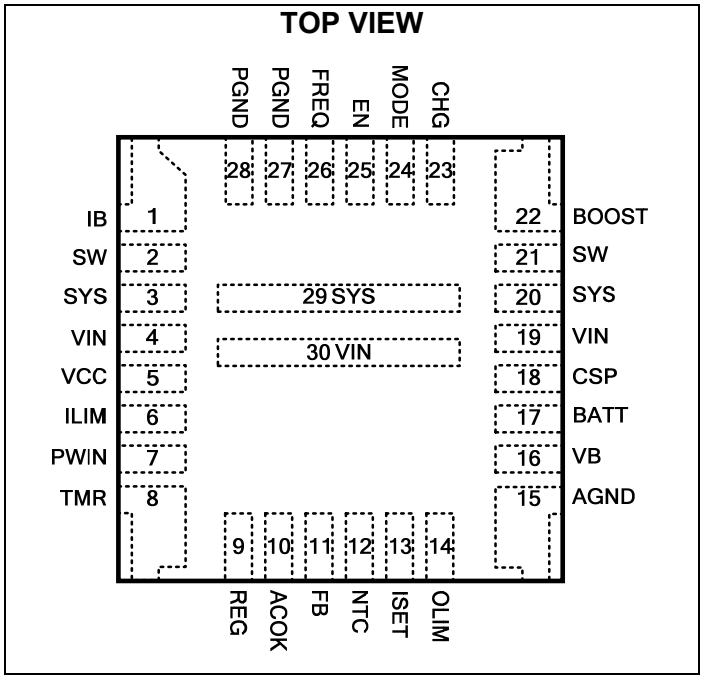
MPSYWW

MP2636

LLLLLL

MPS: MPS prefix:
Y: year code;
WW: week code:
MP2636: part number;
LLLLLL: lot number;

PACKAGE REFERENCE



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ABSOLUTE MAXIMUM RATINGS (1)

VIN to PGND .....-0.3V to +20V
SYS to PGND .....-0.3V to +6.5V
SW to PGND.....-0.3V (-2V for 20ns)
..... To + 6.5V (8.8V for 20ns)
BATT to PGND .....-0.3V to +5V
ACOK, CHG, BOOST to AGND
…... .....-0.3V to +6.5V
All Other Pins to AGND.....-0.3V to +6.5V
Continuous Power Dissipation (T_A=+25°C) (2)
..... 2.97W
Junction Temperature.....150ºC
Lead Temperature 260ºC
Storage Temperature.....–65°C to +150ºC

Recommended Operating Conditions (3)

Supply Voltage VIN.....4.5V to 6V
Battery Voltage BATT .....2.5V to 4.35V
Operating Junction Temp (T_J).. -40°C to +125°C

Thermal Resistance (4) θ_{JA} θ_{JC}

	θ_{JA}	θ_{JC}	
QFN-30 (4mmx4mm)	42	9	°C/W

Notes:

1) Exceeding these ratings may damage the device.
2) The maximum allowable power dissipation is a function of the maximum junction temperature T_J (MAX), the junction-to-ambient thermal resistance θ_{JA}, and the ambient temperature T_A. The maximum allowable continuous power dissipation at any ambient temperature is calculated by P_D (MAX) = (T_J (MAX)-T_A)/θ_{JA}. Exceeding the maximum allowable power dissipation will cause excessive die temperature, and the regulator will go into thermal shutdown. Internal thermal shutdown circuitry protects the device from permanent damage.
3) The device is not guaranteed to function outside of its operating conditions.
4) Measured on JESD51-7, 4-layer PCB.

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ELECTRICAL CHARACTERISTICS

V_{IN} = 5V, T_A= +25ºC, unless otherwise noted.

Parameters	Symbol	Condition	Min	Typ	Max	Units
IN to SYS NMOS On Resistance	$R_{IN\ to\ SYS}$			30		mΩ
High-side PMOS On Resistance	R_{H_DS}			25		mΩ
Low-side NMOS On Resistance	R_{L_DS}			25		mΩ
Peak Current Limit for High-side PMOS	I_{PEAK_HS}	Charger CC Mode/ Boost Mode		8		A
		Charger TC Mode		4		
Peak Current Limit for Low-side NMOS	I_{PEAK_LS}	Boost Mode		5.5		A
Operating Frequency	F_{SW}	FREQ=LOW		600		kHz
VCC UVLO	V_{CC_UVLO}		2	2.2	2.4	V
VCC UVLO Hysteresis				85		mV
PWIN Threshold	V_{PWIN_L}		0.75	0.8	0.85	V
PWIN Threshold Hysteresis				45		mV
Charge Mode						
Input Quiescent Current	I_{IN}	EN=4V, BATT Float			2.5	mA
		EN=0V,			1.5	mA
Trickle Charge Current	I_{TC}	RS1 = 20mΩ, R_{ISET}< 60k, as percentage of I_{CC}		10		%
Minimum Trickle Charge Current	I_{TC_MIN}	RS1 = 20mΩ, R_{ISET}>= 60k		200		mA
Trickle Charge Voltage Threshold	V_{BATT_TC}	Connect VB to GND	2.91	3.01	3.112	V
		Leave VB floating	2.94	3.043	3.145	
		Connect VB to High Logic	2.84	2.94	3.04	
Trickle Charge Hysteresis		V_{BATT} falling		240		mV
Constant Charge (CC) Current	I_{CC}	RS1 = 20mΩ, R_{ISET}= 60.4k	1725	1987	2250	mA
		RS1 = 20mΩ, R_{ISET} = 47.5k	2225	2525	2825	
Termination Charge Current	I_{BF}	I_{CHG} falling		150		mA
Terminal Battery Voltage	V_{BATT_FULL}	Connect VB to GND	4.278	4.3	4.321	V
		Leave VB floating	4.328	4.35	4.371	
		Connect to VCC	4.179	4.2	4.221	
Recharge Threshold	V_{RECH}	Connect VB to GND	4.023	4.085	4.147	V
		Leave VB floating	4.07	4.132	4.195	
		Connect to VCC	3.93	3.99	4.05	

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ELECTRICAL CHARACTERISTICS *(continued)*

V_{IN} = 5V, T_A= +25ºC, unless otherwise noted.

Parameters	Symbol	Condition	Min	Typ	Max	Units
Recharge Threshold Hysteresis		Connect VB to GND		200		mV
		Leave VB floating		200		
		Connect to VCC		200		
Battery Over Voltage Threshold		As percentage of V_{BATT_FULL}		102.5		%
Input Voltage and Input Current Based Power Path						
Input Voltage Regulation Reference	V_{REG}		1.18	1.2	1.22	V
Input Current Limit	I_{IN_LMT}	R_{ILIM} = 86.6k	380	450	500	mA
		R_{ILIM} = 51k	720	810	900	
		R_{ILIM} = 13k	2940	3270	3600	
Input Over Current Threshold	I_{IN_OCP}	R_{ILIM} = 86.6k		593		mA
		R_{ILIM} = 51k		1000		mA
		R_{ILIM} = 13k(5)		4.09		A
Input Over Current Shutdown Blanking Time(5)	$T_{INOCBLK}$			120		µs
Input Over Current Shutdown Recover Time(5)	$T_{INRECVR}$			100		ms
Boost Mode						
SYS Voltage Range			4.2		6	V
Feedback Voltage			1.18	1.2	1.22	V
Feedback Input Current		V_{FB}=1V			200	nA
SYS Over Voltage Protection Threshold for Boost	$V_{SYS(OVP)}$	Threshold over V_{SYS} to turn off the converter during boost mode	5.8	6	6.2	V
SYS Over Voltage Protection Threshold Hysteresis		V_{SYS} falling from $V_{SYS(OVP)}$		125		mV
Boost Quiescent Current		I_{SYS}= 0, V_{SYS} = 5V, V_{FB} = 2.0V, MODE = high, BATT = 4.2V		430	500	µA

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ELECTRICAL CHARACTERISTICS *(continued)*

V_{IN} = 5V, T_A= +25ºC, unless otherwise noted.

Parameters	Symbol	Condition	Min	Typ	Max	Units
Programmable Boost Output Current Limit Accuracy	I_{OLIM}	V_{SYS} = 5V, RS1 = 20m, R_{OLIM} = 120k	774	910	1046	mA
		V_{SYS}=5V, RS1 =20m, R_{OLIM} = 47.5k	2088	2320	2552	
SYS Over Current Blanking Time(5)	$T_{SYSOCBLK}$			120		µs
SYS Over Current Recover Time(5)	$T_{SYSRECVR}$			1.5		ms
Weak Battery Threshold	$V_{BATT(LOW)}$	During boosting		2.5		V
		Before Boost starts		2.9	3.05	
Sleep Mode						
Battery Leakage Current	I_{BATT}	V_{BATT}=4.2V, SYS Float, V_{IN}=GND, MODE=0V			40	µA
Indication& Logic						
$\overline{ACOK}$, $\overline{CHG}$, $\overline{BOOST}$ pin output low voltage		Sinking 1.5mA			450	mV
$\overline{ACOK}$, $\overline{CHG}$, $\overline{BOOST}$ pin leakage current		Connected to 5V			1	uA
NTC and Time-out Fault Blinking Frequency(5)		C_{TMR} = 0.1µF, I_{CHG} = 1A		13.7		Hz
EN, MODE Input Logic Low Voltage					0.4	V
EN, MODE Input High Voltage			1.4			V
FREQ Input Logic Low Voltage					0.8	V
FREQ Input Logic High Voltage			1.8			V
VB Input Logic Low Voltage					0.8	V
VB Input Logic High Voltage			1.8			V
IB Voltage Output		I_{CHG}=1A in charge mode		0.36		V
		I_{DIS}=1A in boost mode		0.40		V
Protection						
Trickle Charge Time		C_{TMR}=0.1µF, Stay in TC Mode, I_{CHG}= 2A		17		Mins
Total Charge Time		C_{TMR}=0.1µF, I_{CHG}= 2.5A		140		Mins

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ELECTRICAL CHARACTERISTICS *(continued)*

V_{IN} = 5V, T_A= +25ºC, unless otherwise noted.

Parameters	Symbol	Condition	Min	Typ	Max	Units
NTC Low Temp Rising Threshold		R_{NTC}=NCP18XH103(0ºC)	65.6%	66.6%	67.6%	V_{CC}
NTC Low Temp Rising Threshold Hysteresis				1%		
NTC High Temp Rising Threshold		R_{NTC}=NCP18XH103(50ºC)	34%	35%	36%	V_{CC}
NTC Low Temp Rising Threshold Hysteresis				1%		
Charging Current Fold-back Threshold(5)		Charge Mode		120		ºC
Thermal Shutdown Threshold(5)				150		ºC

Notes:

5) Guaranteed by Design

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PIN FUNCTIONS

Pin #	Name	Description
1	IB	Charge Current Represent. The voltage at this pin indicates the charge current to the battery in charge mode and discharge current out of the battery in boost mode.
2, 21	SW	Switch Output Node. It is recommended not to place Via's on the SW plane during PCB layout.
3, 20, 29	SYS	System Output. **A minimum of 22µF ceramic cap is required to be put as close as possible to the SYS and PGND pins. Total capacitance should NOT be lower than 44µF.**
4, 19, 30	VIN	Adapter Input. Place a bypass capacitor close to this pin to prevent large voltage spikes.
5	VCC	Internal Circuit Power Supply. Bypass this pin to GND with a 100nF ceramic capacitor. **This Pin CANNOT carry any external load.**
6	ILIM	Input Current Set. Connect to GND with an external resistor to program input current limit in charge mode.
7	PWIN	Input pin to detect the presence of valid input power. Pulling this pin to GND will turn off the IN-to-SYS pass through MOSFET.
8	TMR	Oscillator Period Timer. Connect a timing capacitor between this pin and GND to set the oscillator period for charge timer. Short to GND to disable the Timer function.
9	REG	Input voltage feedback for the input voltage regulation loop. Connect to tap of an external resistor divider from VIN to GND to program the input voltage regulation. Once the voltage at REG pin drops to the inner threshold, the charge current is reduced to maintain the input voltage at the regulation value.
10	$\overline{\text{ACOK}}$	Valid Input Supply Indicator. Logic LOW at this pin indicates the presence of a valid power supply.
11	FB	System Voltage Feedback Input.
12	NTC	Negative Temperature Coefficient (NTC) Thermistor
13	ISET	Charge Current Set. Connect an external resistor to GND to program the charge current.
14	OLIM	Programmable Output-Current Limit for Boost mode. Connect an external resistor to GND to program the system current in Boost mode.
15	AGND	Analog Ground
16	VB	Programmable Battery-Full Voltage. Connect to GND for 4.3V, leave floating to 4.35V, and connect to logic HIGH for 4.2V.
17	BATT	Positive Battery Terminal / Battery Charge Current Sense Negative Input.
18	CSP	Battery Charge Current Sense Positive Input.
22	$\overline{\text{BOOST}}$	Boost operation indicator. Logic LOW indicates boost operation. The pin becomes an open drain when the part operates at charge mode or sleep mode.
23	$\overline{\text{CHG}}$	Charging Completion Indicator. Logic LOW indicates charge mode. The pin becomes an open drain once the charging has completed or is suspended.
24	MODE	Mode Select. Logic HIGH→boost mode. Logic LOW→sleep mode. Active only when $\overline{\text{ACOK}}$ is high (Input power is not available).

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PIN FUNCTIONS *(continued)*

Pin #	Name	Description
25	EN	Charging Control Input. Logic HIGH enables charging. Logic LOW disables charging. Active only when $\overline{ACOK}$ is low (Input power is Ok)
26	FREQ	Connect to GND to figure the operating frequency to 600kHz.
27, 28	PGND	Power Ground.

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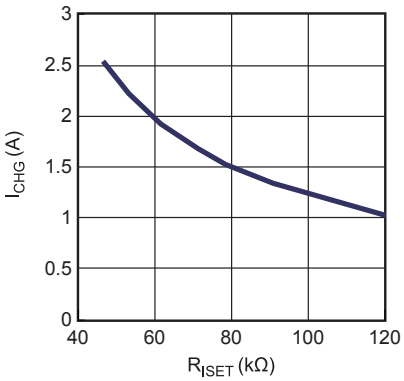
TYPICAL CHARACTERISTICS

V_{IN} = 5V, C_{IN} = C_{BATT} = C_{SYS} = C2 = 22µF, L1 = 1.5µH, RS1 = 20mΩ, C4 = C_{TMR} = 0.1µF, Battery Simulator, unless otherwise noted.

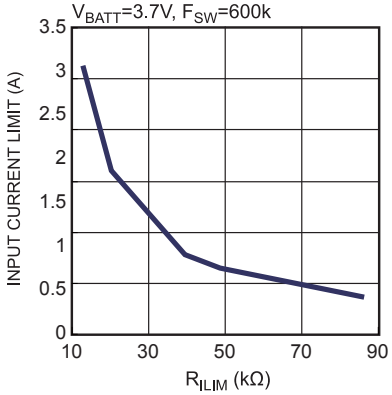
Programmable Charge Current, Charge Mode

V_{IN}=5V, V_{BATT_FULL}=4.2V, V_{BATT}=3.7V, F_{SW}=600k



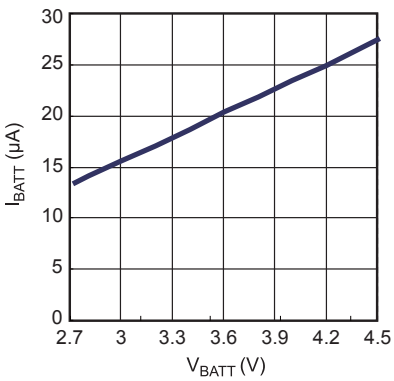
Programmable Input Current Limit, Charge Mode

V_{IN}=5V, V_{BATT_FULL}=4.2V, V_{BATT}=3.7V, F_{SW}=600k



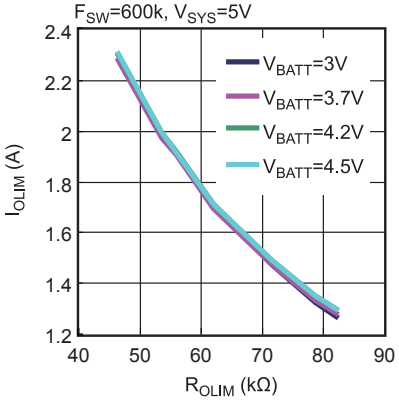
Battery Leakage Current, Sleep Mode

MODE=Low



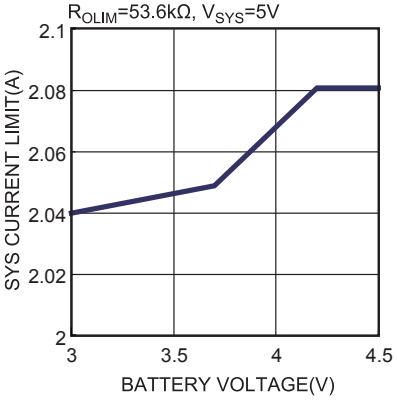
Programmable Output Current Limit, Boost Mode

F_{SW}=600k, V_{SYS}=5V

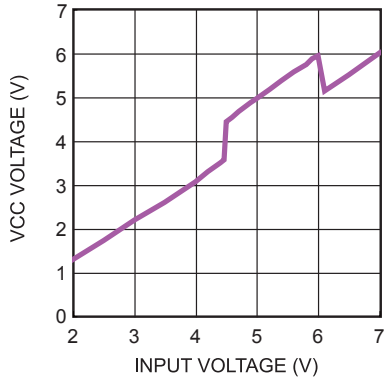


Programmable Output Current Limit vs. Battery

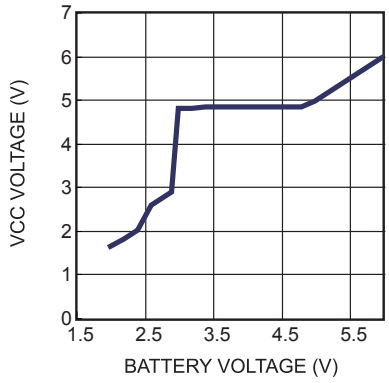
R_{OLIM}=53.6kΩ, V_{SYS}=5V



VCC @ Charge Mode

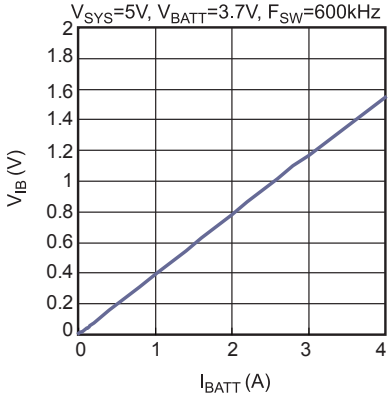


VCC @ Boost Mode



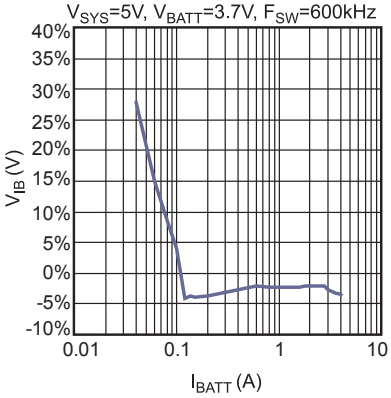
IB Voltage vs. Battery Current @ Boost Mode

V_{SYS}=5V, V_{BATT}=3.7V, F_{SW}=600kHz



Accuray of the IB Monitor @ Boost Mode

V_{SYS}=5V, V_{BATT}=3.7V, F_{SW}=600kHz



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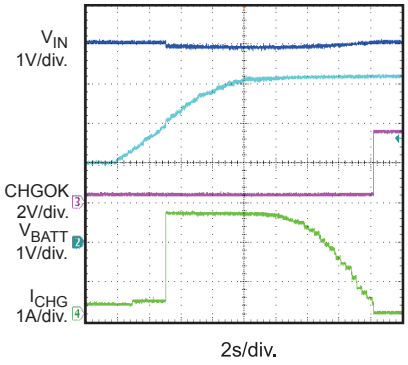
TYPICAL PERFORMANCE CHARACTERISTICS

V_{IN} = 5V, C_{IN} = C_{BATT} = C_{SYS} = C2 = 22µF, L1 = 1.5µH, RS1 = 20mΩ, C4 = C_{TMR} = 0.1µF, Battery Simulator, Unless Otherwise Noted.

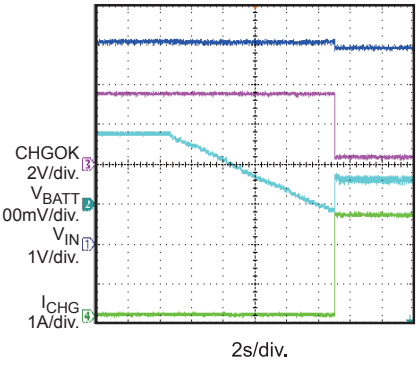
Battery Charge Curve

V_{BATT_FULL}=4.2V



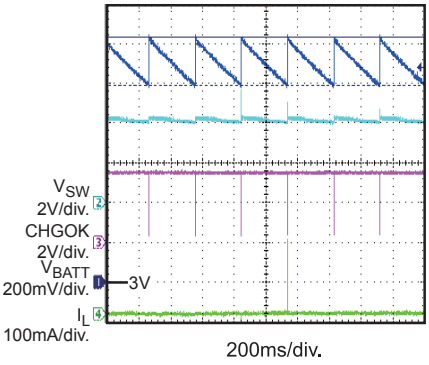
Auto Recharge

V_{BATT_FULL}=4.2V



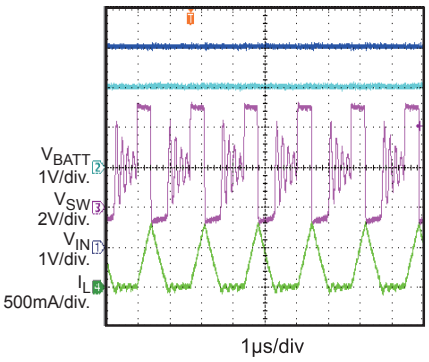
Battery Float Steady State

V_{BATT_FULL}=4.2V



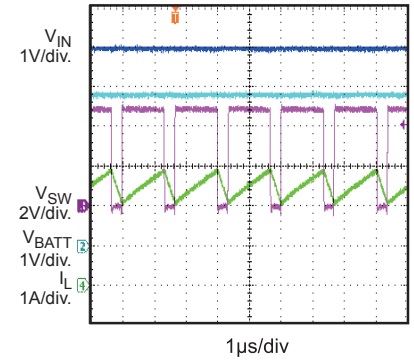
TC Charge Steady State

V_{BATT_FULL}=4.2V, V_{BATT} =2V,
F_{SW}=600kHz



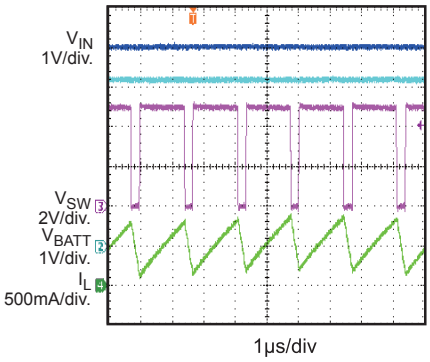
CC Charge Steady State

V_{BATT_FULL}=4.2V, V_{BATT} =3.7V,
F_{SW}=600kHz



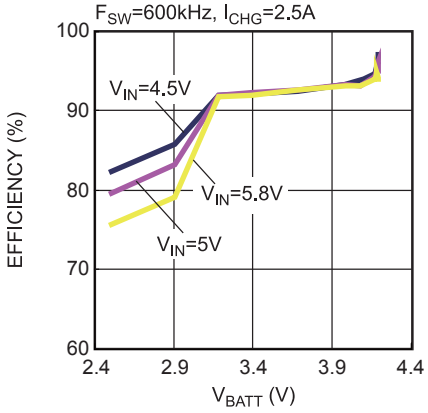
CV Charge Steady State

V_{BATT_FULL}=4.2V, V_{BATT} =4.2V,
F_{SW}=600kHz



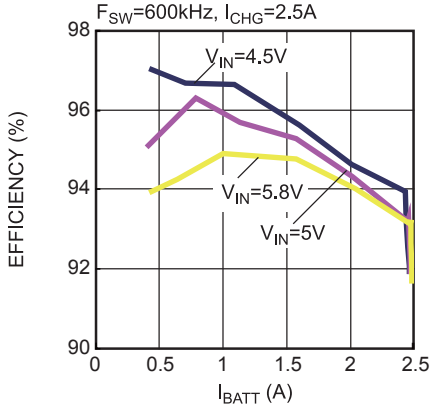
Constant Current Charge Efficiency

V_{BATT_FULL}=4.2V, V_{BATT} =2.5-4.2V,
F_{SW}=600kHz, I_{CHG}=2.5A



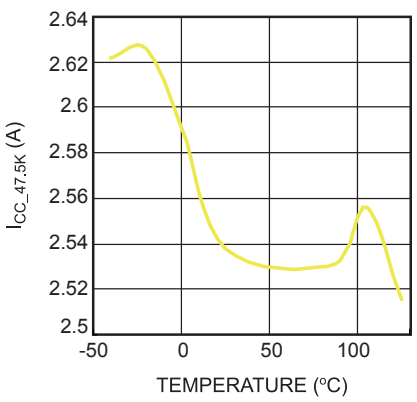
Constant Voltage Charge Efficiency

V_{BATT_FULL}=4.2V, V_{BATT} =4.2V,
F_{SW}=600kHz, I_{CHG}=2.5A



CC Charge Current vs. Temperature

R_{ISET}=47.5kΩ



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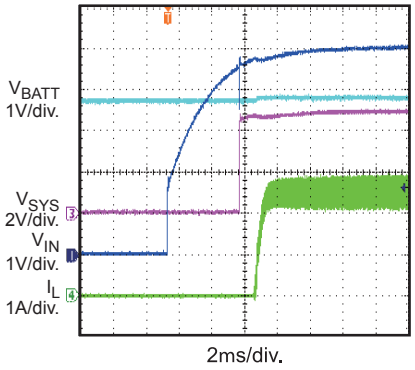
TYPICAL PERFORMANCE CHARACTERISTICS *(continued)*

V_{IN} = 5V, C_{IN} = C_{BATT} = C_{SYS} = C2 = 22µF, L1 = 1.5µH, RS1 = 20mΩ, C4 = C_{TMR} = 0.1µF, Battery Simulator, Unless Otherwise Noted.

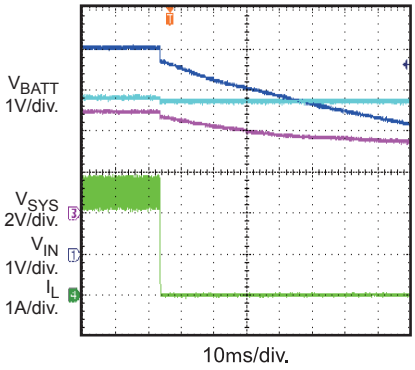
Power On, Charge Mode

V_{BATT_FULL}=4.2V, V_{BATT}=3.7V, I_{CHG}=2.5A



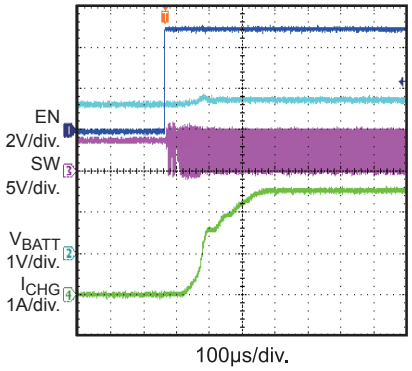
Power Off, Charge Mode

V_{BATT_FULL}=4.2V, V_{BATT}=3.7V, I_{CHG}=2.5A



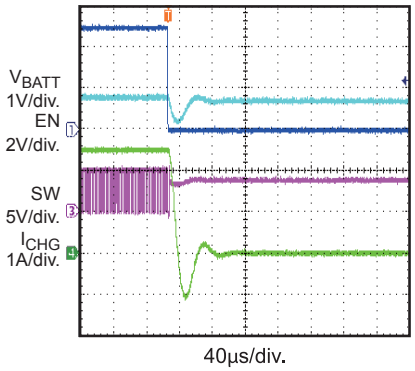
EN On, Charge Mode

V_{BATT_FULL}=4.2V, V_{BATT}=3.7V, I_{CHG}=2.5A



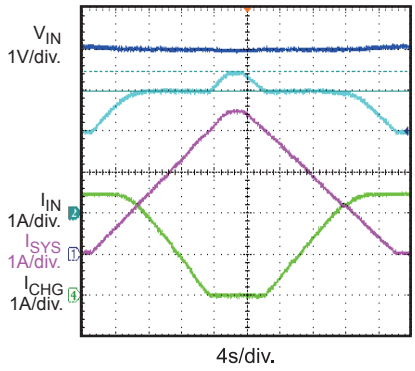
En Off, Charge Mode

V_{BATT_FULL}=4.2V, V_{BATT}=3.7V, I_{CHG}=2.5A



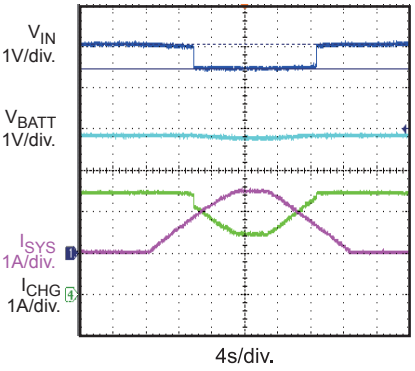
Input Current Limit

V_{BATT_FULL}=4.2V, V_{BATT}=3.7V



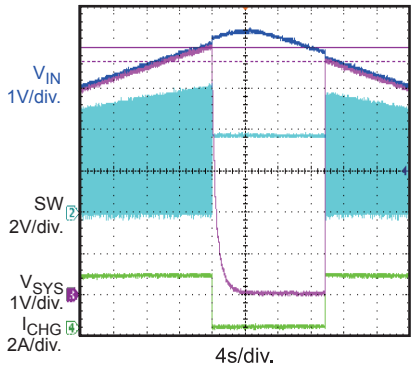
Input Voltage Clamp

V_{BATT_FULL}=4.2V, V_{BATT}=3.7V



Input Over Voltage Protection

V_{IN}=5V to 6.5V, V_{BATT}=3.7V, Enabled Charger



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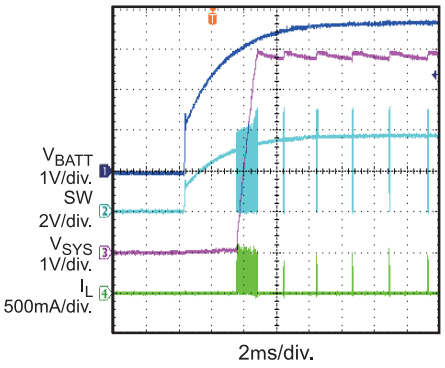
TYPICAL PERFORMANCE CHARACTERISTICS *(continued)*

V_{IN} = 0V, V_{BATT}=3.7V, C_{IN} = C_{BATT} = C_{SYS} = C2 = 22µF, L1 = 1.5µH, RS1 = 20mΩ, C4 = C_{TMR} = 0.1µF, Battery Simulator, Unless Otherwise Noted.

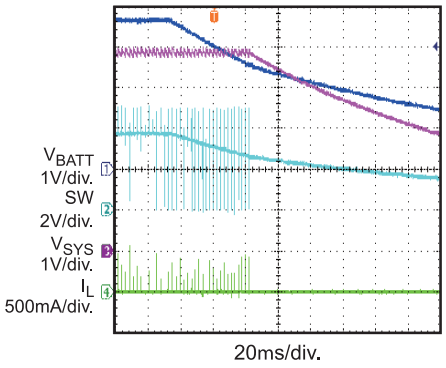
Power On, Boost Mode

V_{SYS_SET}=5V, V_{BATT}=3.7V,
No SYS Load



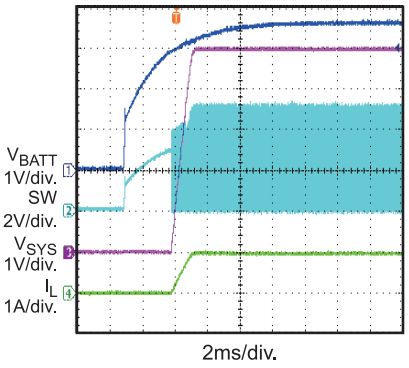
Power Off, Boost Mode

V_{SYS_SET}=5V, V_{BATT}=3.7V,
No SYS Load



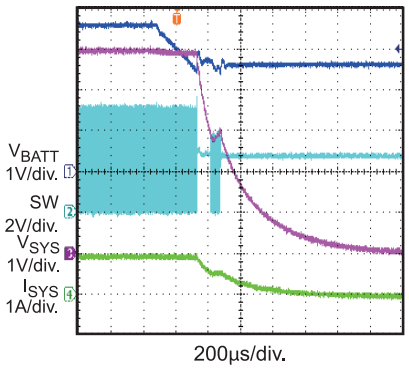
Power On, Boost Mode

V_{SYS_SET}=5V, V_{BATT}=3.7V,
R_{SYS_LOAD}=5Ω



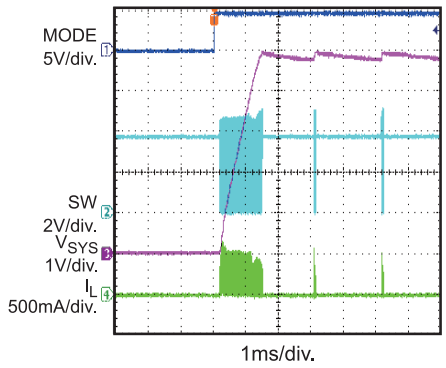
Power Off, Boost Mode

V_{SYS_SET}=5V, V_{BATT}=3.7V,
R_{SYS_LOAD}=5Ω



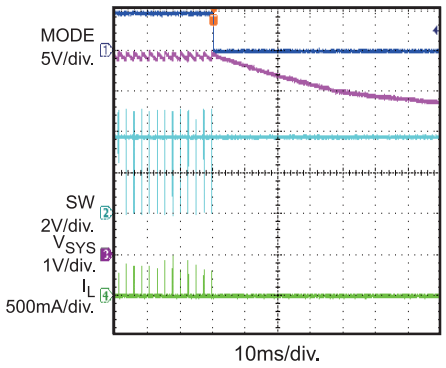
Mode On, Boost Mode

V_{SYS_SET}=5V, V_{BATT}=3.7V,
No SYS Load



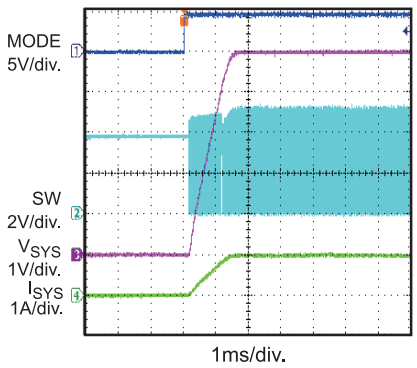
Mode Off, Boost Mode

V_{SYS_SET}=5V, V_{BATT}=3.7V,
No SYS Load



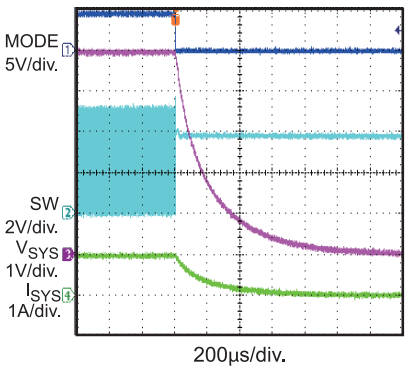
Mode On, Boost Mode

V_{SYS_SET}=5V, V_{BATT}=3.7V,
R_{SYS_LOAD}=5Ω



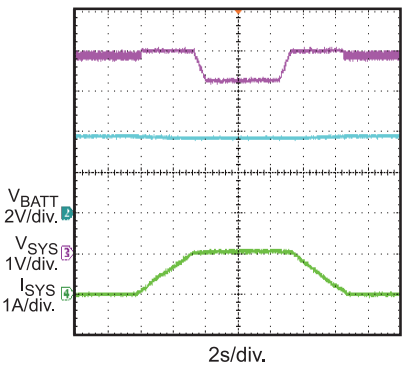
Mode Off, Boost Mode

V_{SYS_SET}=5V, V_{BATT}=3.7V,
R_{SYS_LOAD}=5Ω



SYS Output Current Limit

V_{SYS_SET}=5V, V_{BATT}=3.7V,
I_{OLIM_SET}=1A



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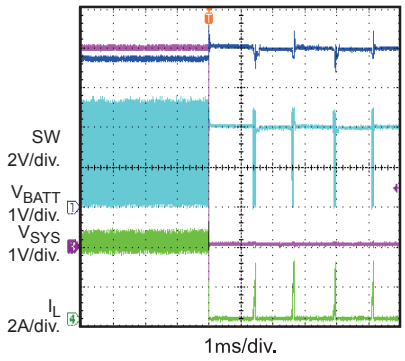
TYPICAL PERFORMANCE CHARACTERISTICS *(continued)*

V_{IN} = 0V, V_{BATT}=3.7V, C_{IN} = C_{BATT} = C_{SYS} = C2 = 22µF, L1 = 1.5µH, RS1 = 20mΩ, C4 = C_{TMR} = 0.1µF, Battery Simulator, Unless Otherwise Noted.

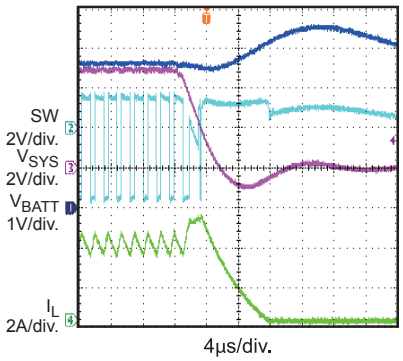
SYS Short Circuit Entry

V_{SYS_SET}=5V, V_{BATT}=3.7V, I_{SYS}= 2.6A



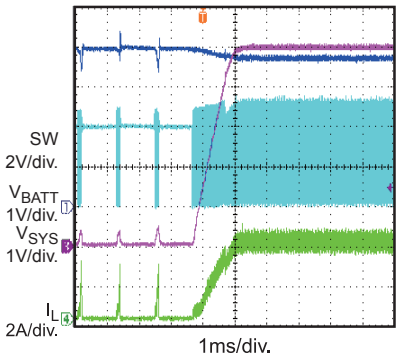
SYS Short Circuit Entry

V_{SYS_SET}=5V, V_{BATT}=3.7V, I_{SYS}= 2.6A



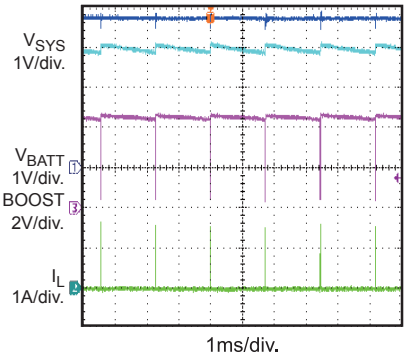
SYS Short Circuit Recovery

V_{SYS_SET}=5V, V_{BATT}=3.7V, I_{SYS}= 2.6A



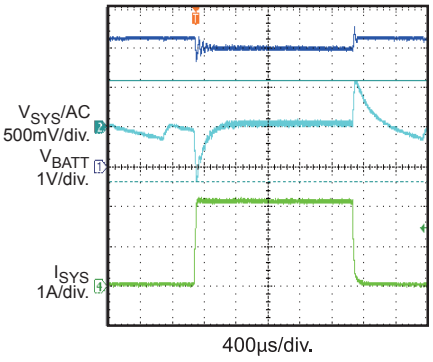
SYS Over Voltage Protection

V_{SYS_SET}=6.5V, V_{BATT}=3.7V



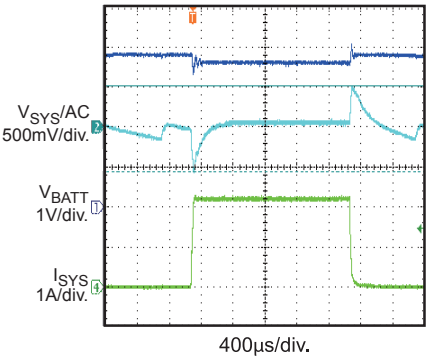
SYS Load Transient

V_{SYS_SET}=5V, V_{BATT}=3V, I_{SYS}= 0A to 2.2A



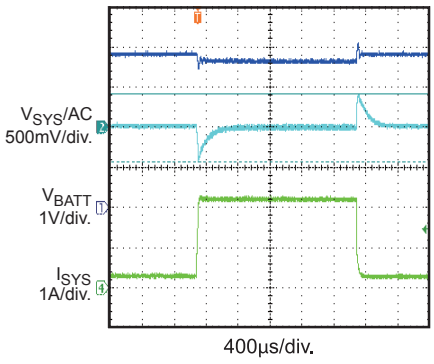
SYS Load Transient

V_{SYS_SET}=5V, V_{BATT}=3.7V, I_{SYS}= 0A to 2.2A



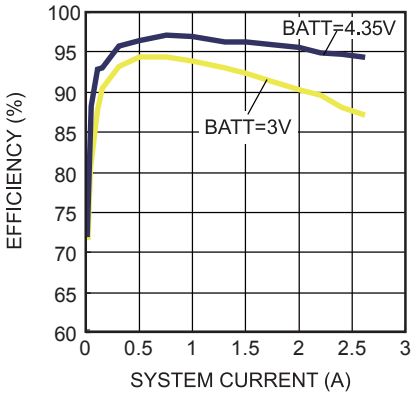
SYS Load Transient

V_{SYS_SET}=5V, V_{BATT}=3.7V, I_{SYS}= 0.3A to 2.2A



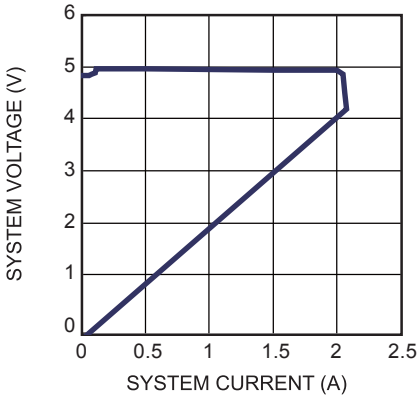
Boost Efficiency

V_{SYS_SET}=5V, F_S=600kHz



Boost Output V-I Curve

V_{BATT}=3.7V, V_{SYS}=5V, R_{OLIM}=53.6kΩ



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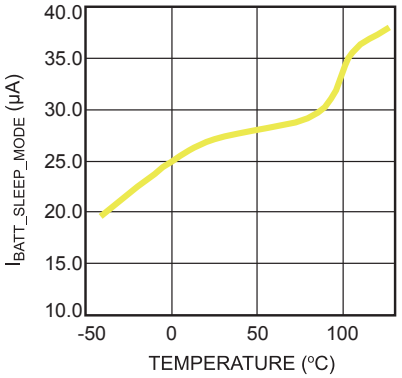
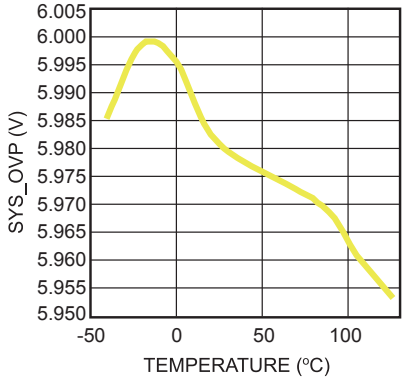
TYPICAL PERFORMANCE CHARACTERISTICS *(continued)*

V_{IN} = 5V (typ.), V_{BATT}=3.7V (typ.), C_{IN} = C_{BATT} = C_{SYS} = C2 = 22µF, L1 = 1.5µH, RS1 = 20mΩ, C4 = C_{TMR} = 0.1µF, Battery Simulator, Unless Otherwise Noted.

Sleep_Mode_Battery Current vs. Temperature

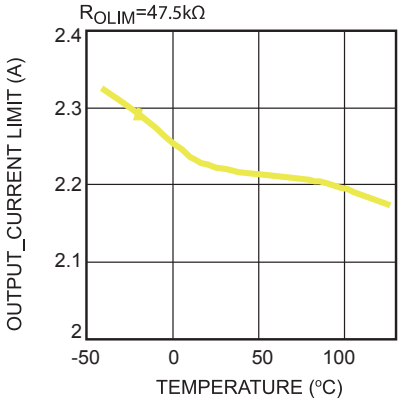


SYS_OVP vs. Temperature



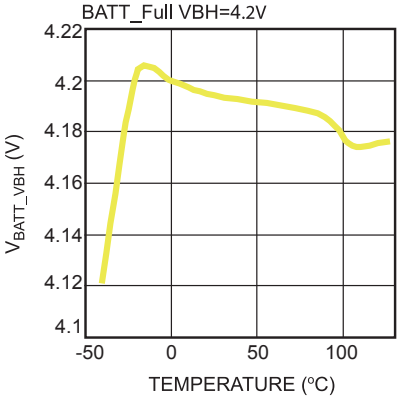
Output_Current_Limit_2.2A vs. Temperature

R_{OLIM}=47.5kΩ



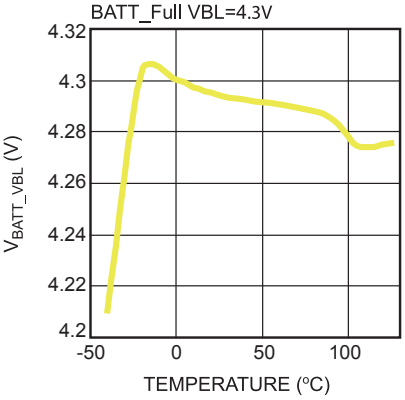
BATT_Full VBH vs. Temperature

BATT_Full VBH=4.2V



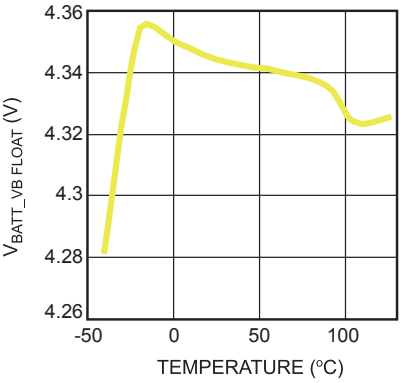
BATT_Full VBL vs. Temperature

BATT_Full VBL=4.3V

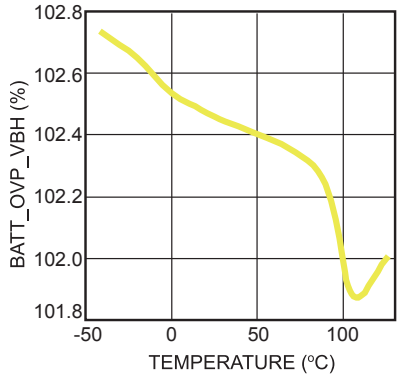


BATT_Full VB Float vs. Temperature

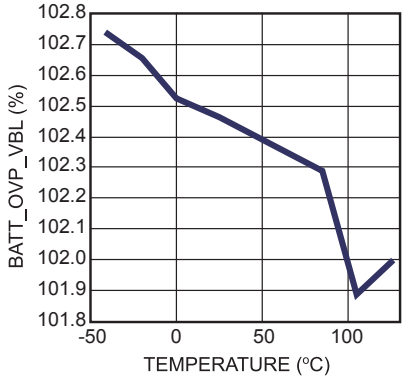
BATT_Full VB_ Float=4.35V



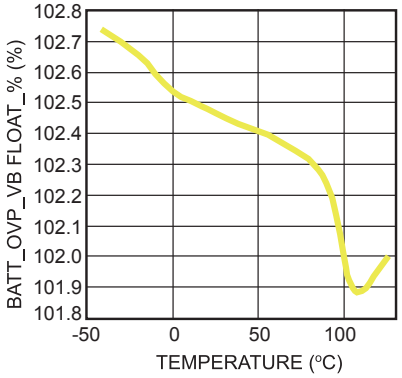
BATT_OVP_VBH_% vs. Temperature



BATT_OVP_VBL_% vs. Temperature



BATT_OVP_VB Float_% vs. Temperature



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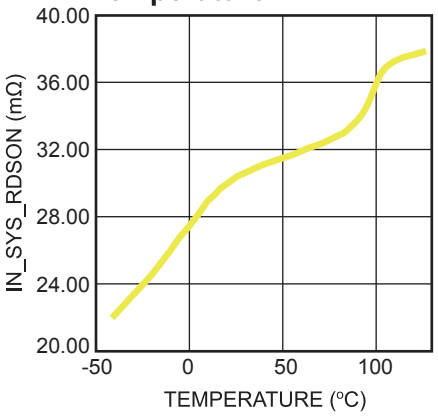
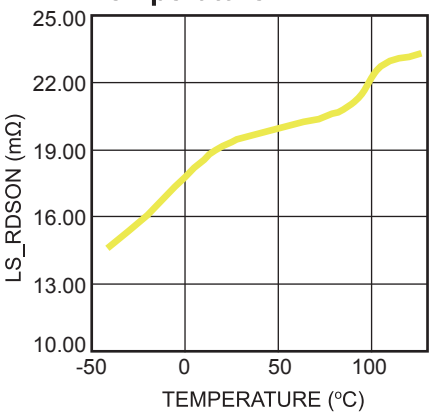
TYPICAL PERFORMANCE CHARACTERISTICS *(continued)*

V_{IN} = 5V (typ.), V_{BATT}=3.7V (typ.), C_{IN} = C_{BATT} = C_{SYS} = C2 = 22µF, L1 = 1.5µH, RS1 = 20mΩ, C4 = C_{TMR} = 0.1µF, Battery Simulator, Unless Otherwise Noted.

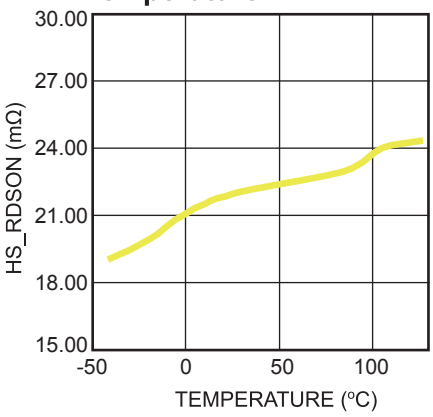
IN_SYS_Rdson vs. Temperature



LS_Rdson vs. Temperature



HS_Rdson vs. Temperature



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FUNCTIONAL BLOCK DIAGRAM *(Charge Mode)*

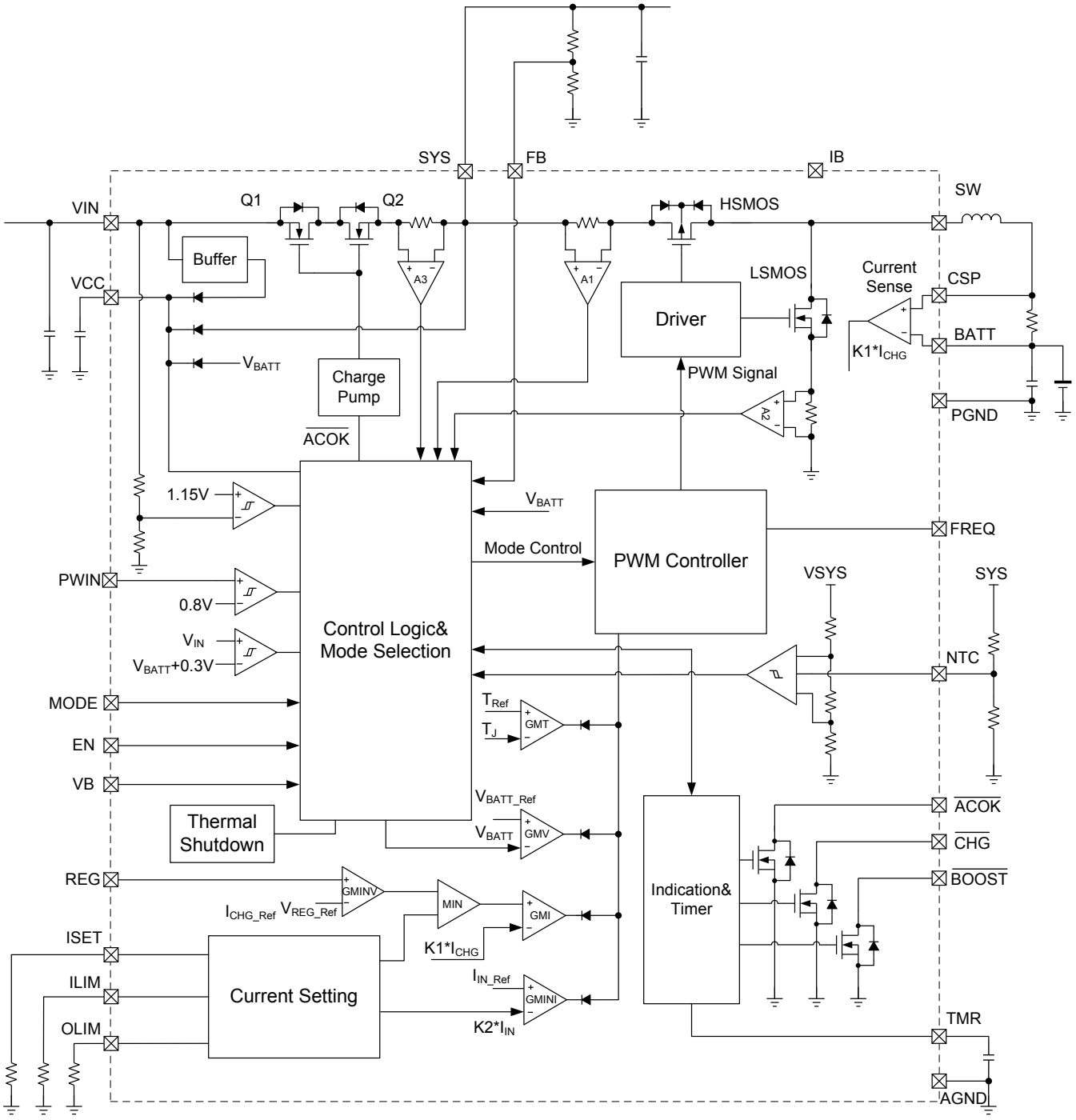

Figure 1 : Functional Block Diagram in Charger Mode

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FUNCTIONAL BLOCK DIAGRAM *(Boost Mode)*

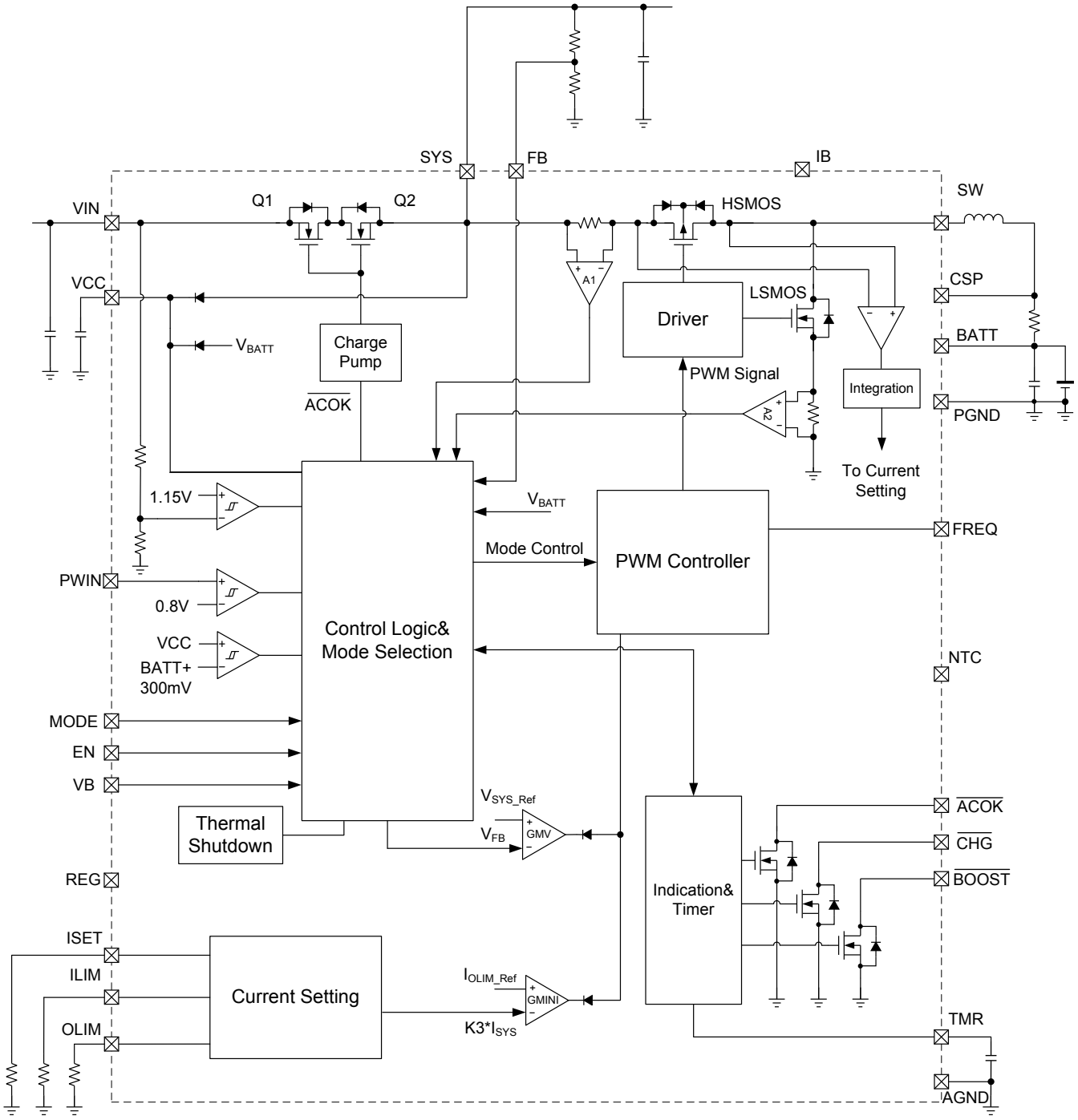

Figure 2 : Functional Block Diagram in Boost Mode

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OPERATION FLOW CHART

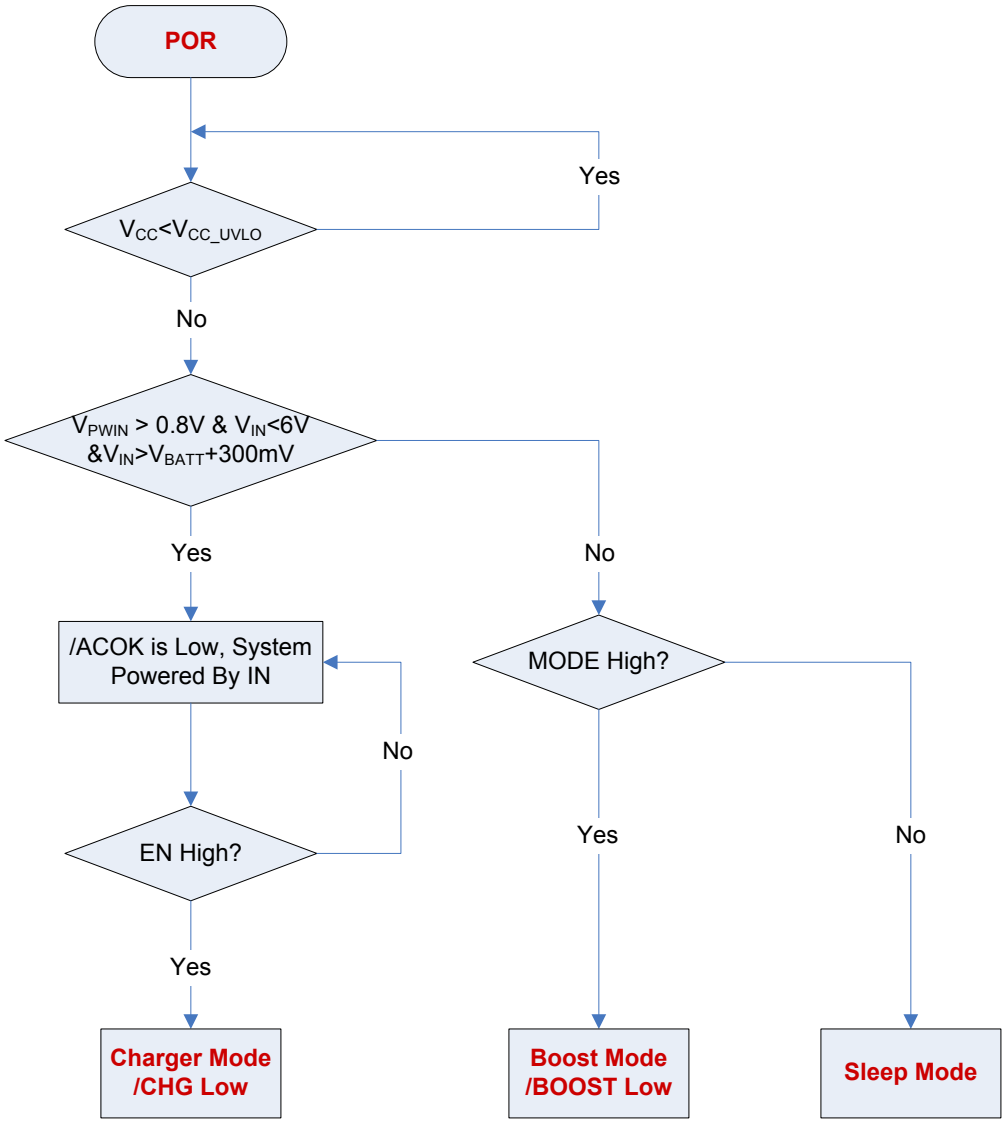

Figure 3: Mode Selection Flow Chart

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OPERATION FLOW CHART *(Continued)*

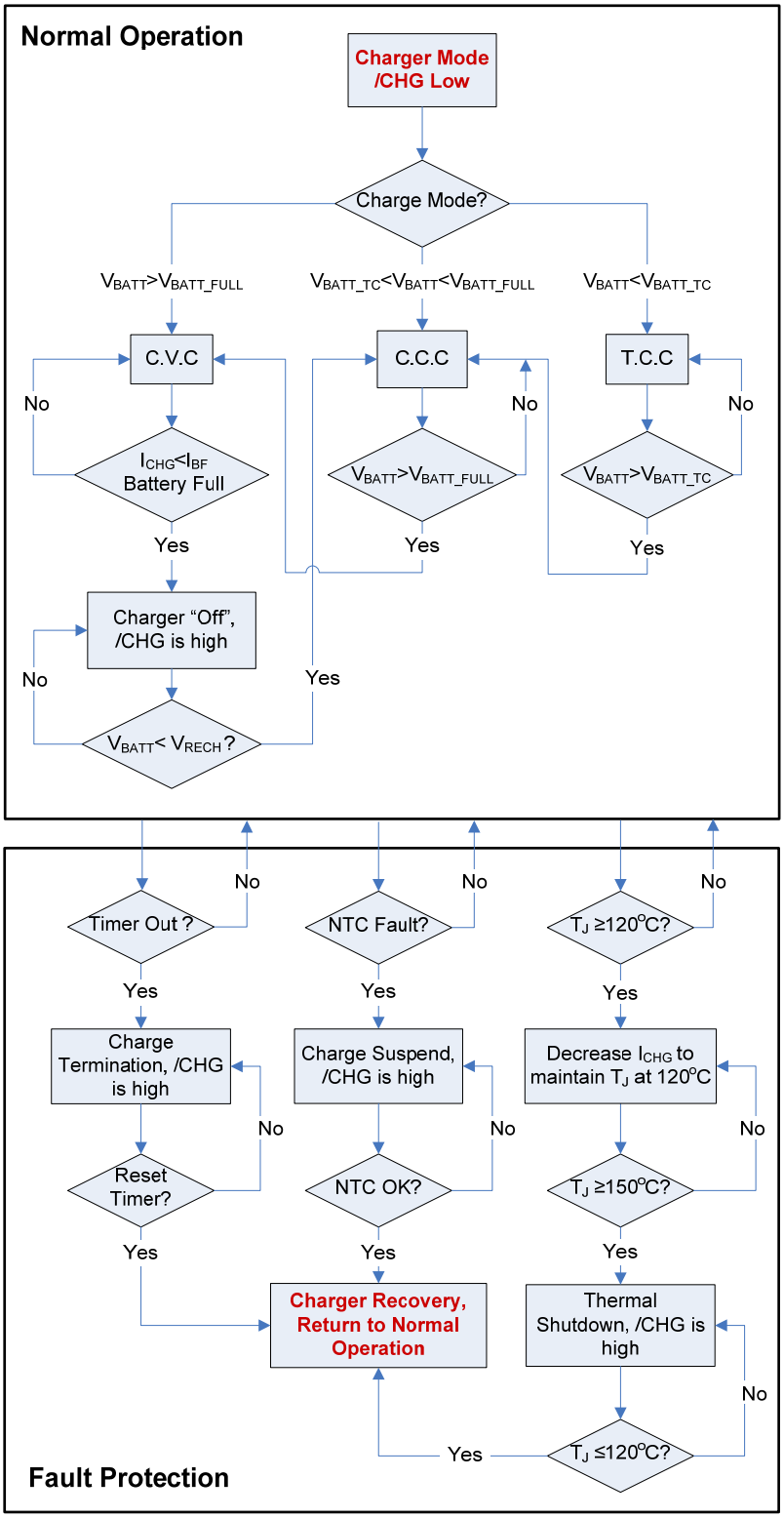

Figure 4: Operation Flow Chart in Charger Mode

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OPERATION FLOW CHART *(Continued)*

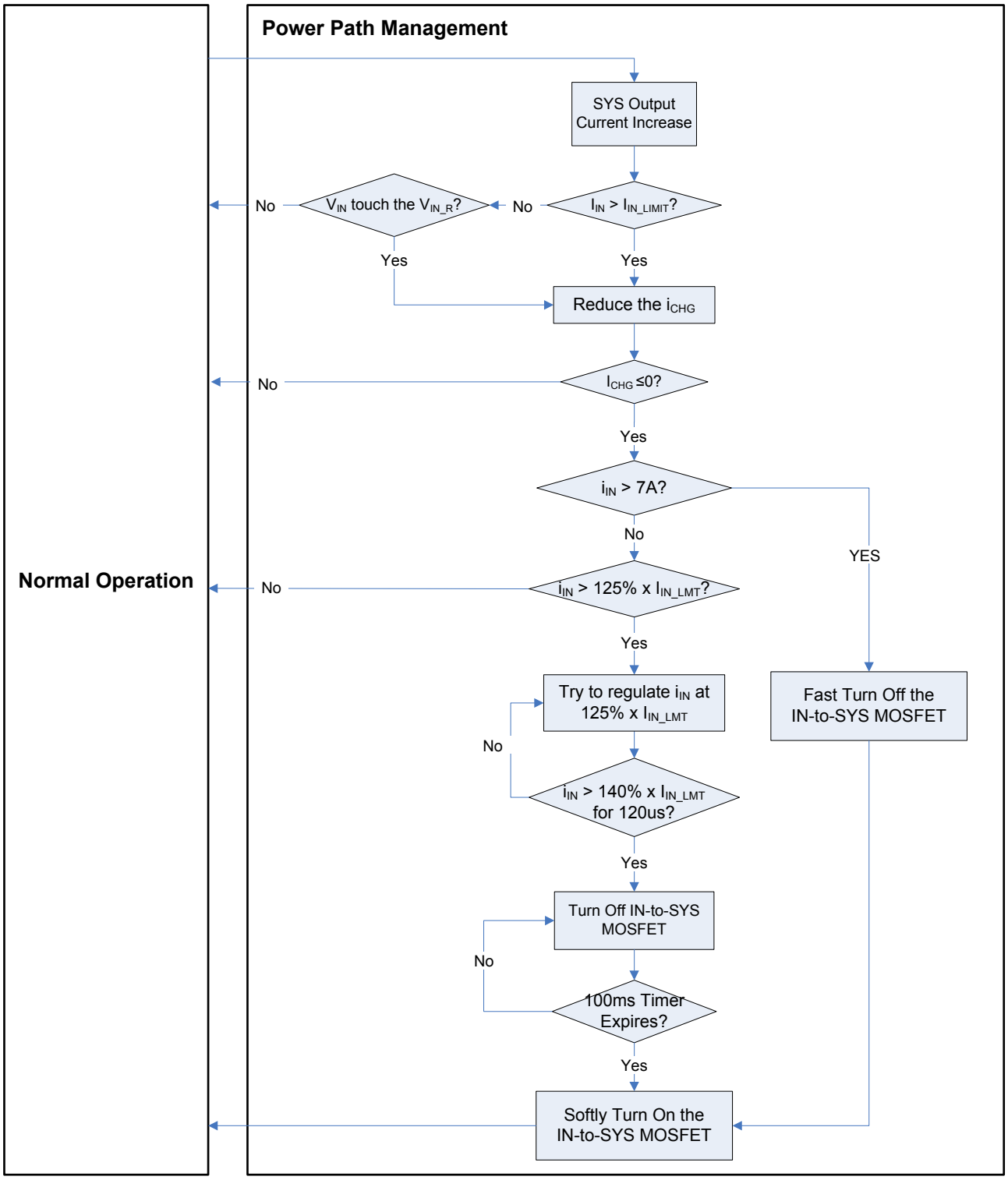

Figure 5: Power-path Management in Charge Mode

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OPERATION FLOW CHART *(Continued)*

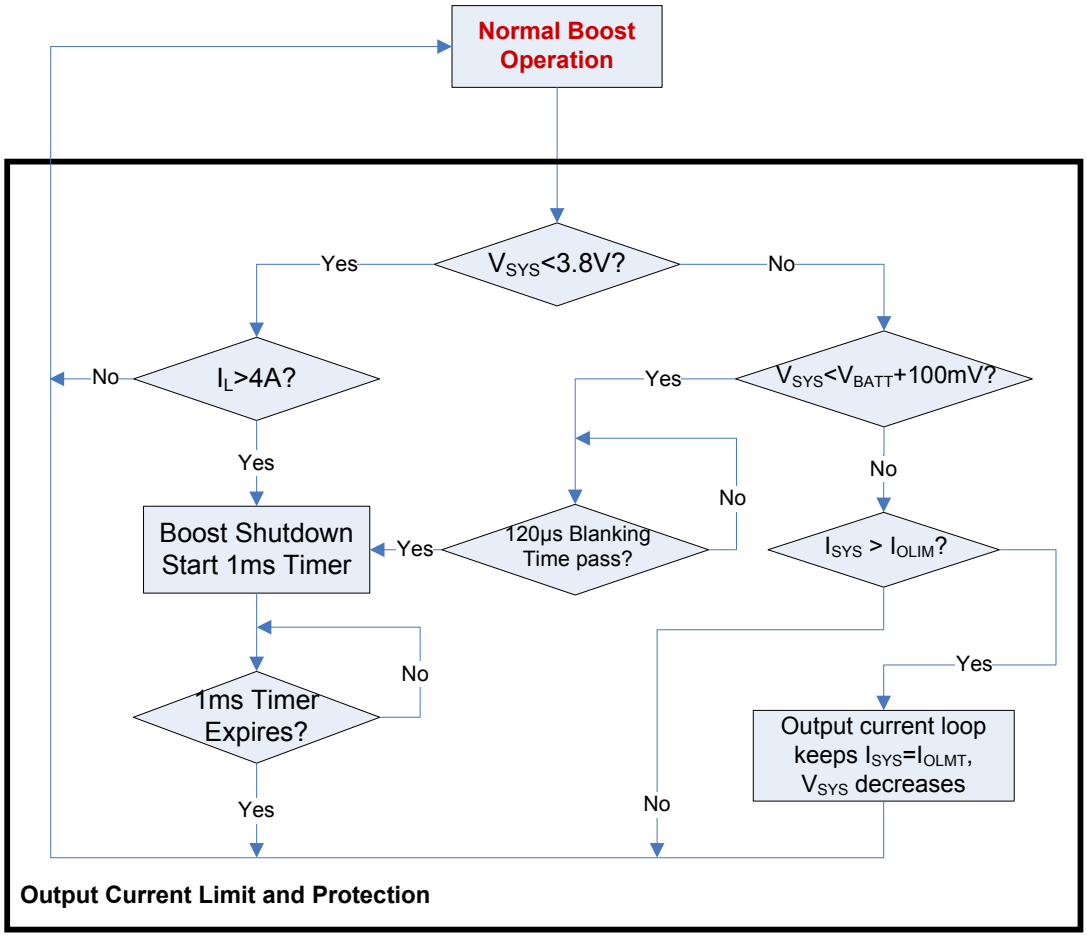

Figure 6: Operation Flow Chart in Boost Mode

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START UP TIME FLOW IN CHARGE MODE

Condition: EN = 5V, Mode = 0V, /ACOK and /CHG are always pulled up to an external constant 5V

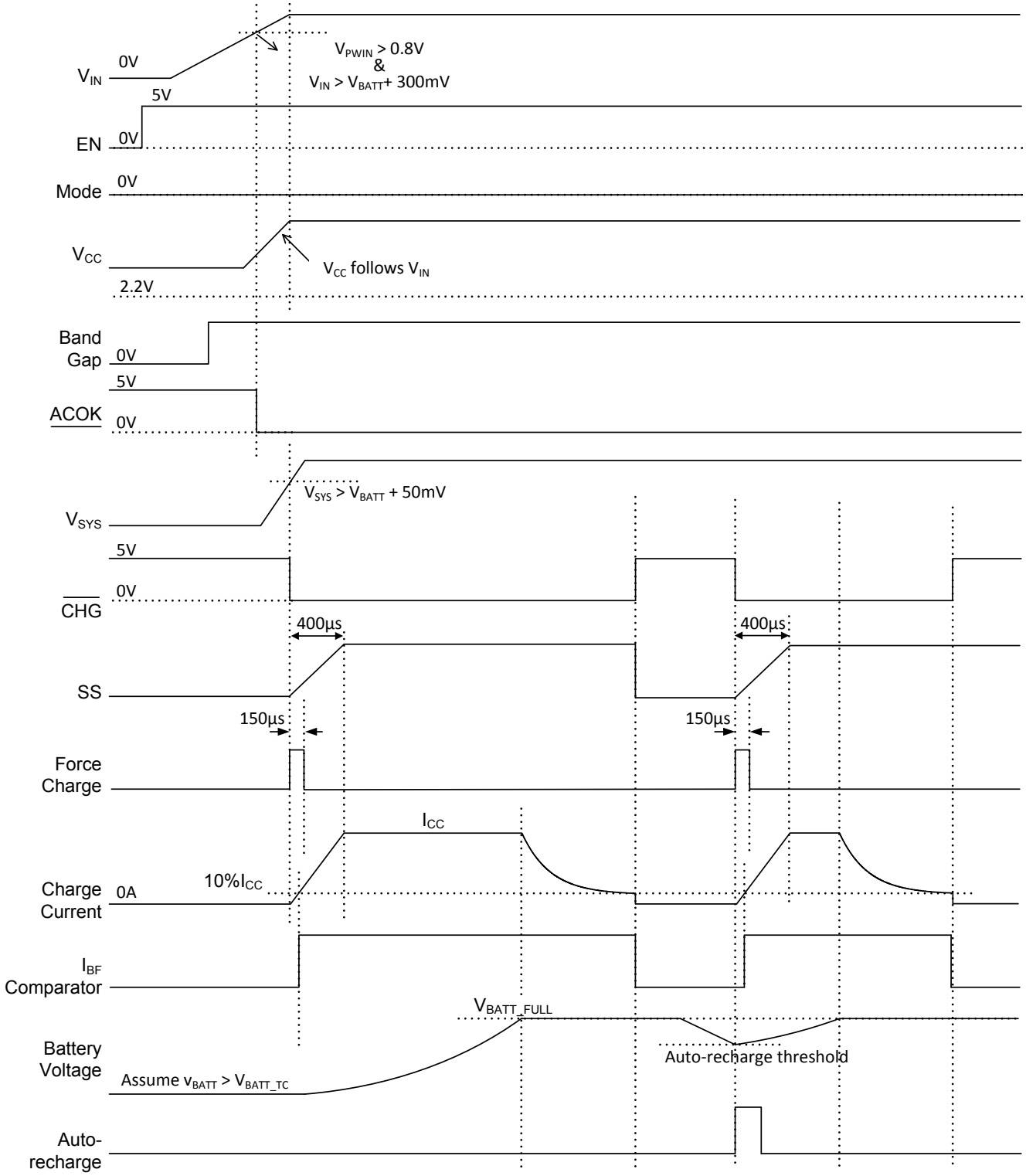

Figure 7: Input Power Start-up Time Flow in Charge Mode

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