

XF5131- Battery Charger+ Battery Protection SOC

GENERAL DESCRIPTION

XF5131 is one SOC that it integrates Li-Battery Protection and one High precision & tiny current battery charger in only DFN3x3-10 package.

This SOC can set fast charging current from 1mA to 200mA with 4.2V battery full voltage. It also has the whole battery protection function include V_{cu} 、 V_{dl} 、 I_{ov} 、short protection.

It only need few components and can reduce the BOM area and BOM cost.

FEATURES

- 4.5V to 6.5V Charger Input Range
- 1mA~200mA charging Capability

- Constant-Current/Constant-Voltage Operation with Thermal Regulation to Maximize Charge Rate Without Risk of Overheating
- Preset 4.2V Charge Voltage with $\pm 1\%$ Accuracy
- Charge state pairs of output, no battery and fault status display
- C/10 Charge Termination
- 50uA Supply Current in Shutdown
- 2.9V Trickle Charge Threshold
- Li Protection OCU-4.3V ODU-2.8V
- Li Protection OCP-0.4A
- Have UVLO、OTP、Short protection
- Operating Temperature: -40°C to $+85^{\circ}\text{C}$
- Available in very tiny DFN3X3-10L Package
- RoHS Compliant and 100% Lead(Pb)-Free

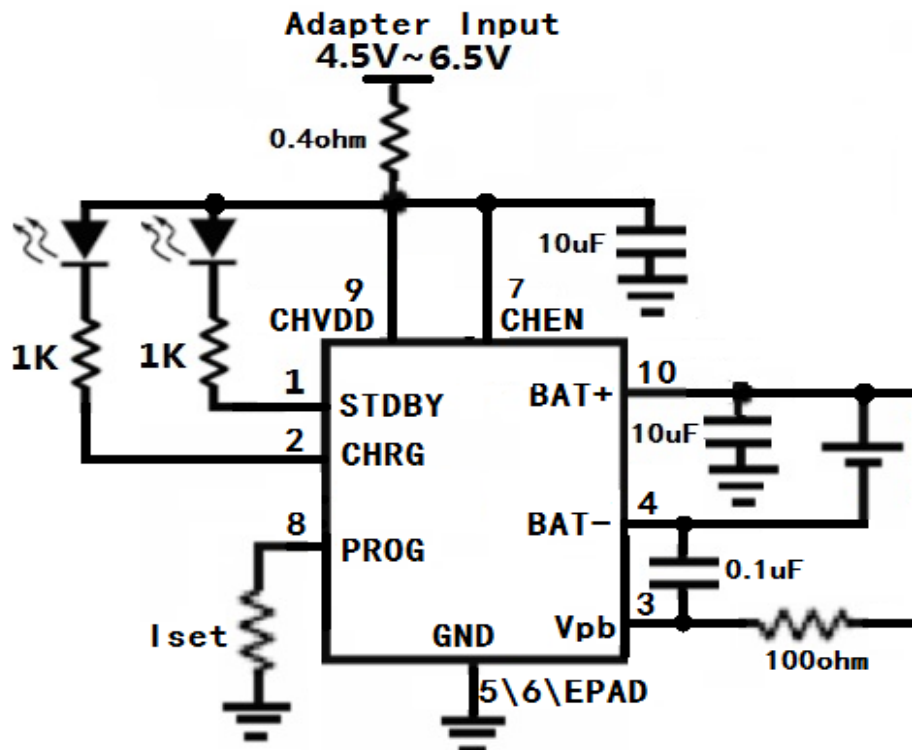


Figure1 . Typical Application Circuit

ORDERING INFORMATION

PART NUMBER	VIN	VBAT	CHARGE CURRENT	V _{cu}	V _{Du}	I _{oc}	PACKAGE	MARK
XF5131	4.5~6V	4.2V	0.2A	4.3V	2.8V	0.4A	DFN3*3-10	XF5131YW

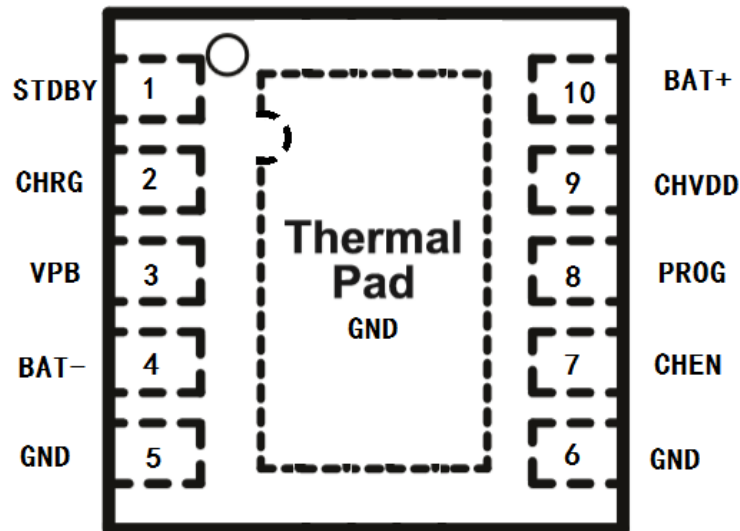
PIN CONFIGURATION


Figure 2. PIN Configuration

PIN DESCRIPTION

PIN NUMBER	PIN NAME	PIN DESCRIPTION
1,	/STBY	The completion of battery charging instructions side.
2	/CHRG	Open-Drain Charge Status Output.
3	Vpb	Power supply of battery protection
4	BAT-	The negative pole of Li-Battery
7	CHEN	The enable pin of battery charger
8	PROG	Charge Current Program, Charge Current Monitor and Shutdown Pin.
9	CHVDD	The Adapter input
5	BAT+	The positive pole of Li-Battery
5、6、EPAD	GND	Ground & Thermal PAD , Please connect with mass metal

ABSOLUTE MAXIMUM RATINGS

(Note: Do not exceed these limits to prevent damage to the device. Exposure to absolute maximum rating conditions for long periods may affect device reliability.)

PARAMETER	VALUE	UNIT
Input Supply Voltage VDD、VPB	VSS-0.3 ~ VSS+7	V
PROG pin Voltage Vprog	VSS-0.3 ~ Vcc+0.3	V
BAT pin Voltage Vbat	Vss-0.3 ~ 7	V
CHAG pin Voltage Vchrg	VSS-0.3 ~ VSS+7	V
BAT pin Current Ibat	0.25	A
PROG pin Current Iprog	2.5	mA
Operating Ambient Temperature	-40 to 85	°C
Maximum Junction Temperature	150	°C
Storage Temperature	-55 to 150	°C
Lead Temperature (Soldering, 10 sec)	260	°C

ELECTRICAL CHARACTERISTICS

(VIN =5V, Vbat=3.6V TA= 25°C unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Voltage Range	VCC		4.25		6.5	V
Input supply current	Icc	Charge mode, RPROG =1K		350	2000	uA
		Standby mode		150	500	uA
		Shutdown mode(RPROG not connected,Vcc<Vbat or Vcc<Vuv)		50	100	uA
BAT pin Current	Ibat	RPROG =1k,Current mode	79	88	97	mA
		RPROG =2k,Current mode	40	44	50	mA
		RPROG =10k,Current mode	7	8	9	mA
		Standby mode,Vbat=4.2V	0	-2.5	-6	uA
		Shutdown mode		1	2.5	uA
		Sleep mode,Vcc=0V		0.3	2.5	uA
Regulated Charge Voltage	Vfloat	0°C≤TA≤85°C, Icharge = 4mA	4.160	4.2	4.242	V
PROG pin Voltage	Vprog	RPROG =10k, Current mode	0.93	1.0	1.07	V
Trickle charge current	Itrikl	Vbat<Vtrikl,Rprog=2k	3	4	5	mA

Trickle charge Threshold Voltage	Vtrikl	R _{PROG} =10K , Vbat Rising	2.7	2.9	3.0	V
Trickle voltage hysteresis voltage	Vtrhys	R _{PROG} =10K	55	120	200	mV
Recharge Battery threshold Voltage	ΔVrecg	V _{FLOAT} - V _{RECHRG}		150	300	mV
UVLO Voltage	Vuvlo	VBAT=3.1V; Rprog=10k;	3.72	3.85	4	V
CHRG pin Output low voltage	Vchrg	Ichrg=5mA		0.35	0.55	V
Overcharge Detection Voltage	V _{CU}		4.25	4.30	4.35	V
Overcharge Release Voltage	V _{CL}		4.05	4.10	4.15	V
Overdischarge Detection Voltage	V _{DL}		2.7	2.8	2.9	V
Overdischarge Release Voltage	V _{DR}		2.9	3.0	3.1	V
Charger Detection Voltage	V _{CHA}			-0.06		V
Overdischarge Current1 Detection	I _{IOV1}	V _{bat} =3.5V		0.4		A
Load Short-Circuiting Detection	I _{SHORT}	V _{bat} =3.5V		20		A
Equivalent FET on Resistance	R _{DS(ON)}	Vbat=3.6V I _{vm} =1.0A	40	45	55	mΩ
Overcharge Voltage Detection Delay Time	t _{CU}			130		mS
Overdischarge Voltage Detection Delay Time	t _{DL}			40		mS
Overdischarge Current Detection Delay Time	t _{IOV}	V _{bat} =3.5V		10		mS
Load Short-Circuiting Detection Delay Time	t _{SHORT}	V _{bat} =3.5V		75		uS

PIN FUNCTION

STDBY (PIN 1): The completion of battery charging instructions side.

When the battery charge is complete, STDBY pulled low by internal switches, indicating the completion of charging. In addition, STDBY pin will be in a high-impedance state.

CHRG (PIN 2): Open-Drain Charge Status Output.

When the battery is charging, the CHRG pin is pulled low by an internal N-channel MOSFET. When the charge cycle is completed, CHRG pin will be in a high-impedance state.

VPB (PIN3): Power supply of battery protection.

This pin Should connect 0.1uF capacitor between Vpb and BAT- as close as possible and 100ohm resistor to BAT+.

CHVDD (PIN 9): Positive Input Supply Voltage.

Provides power to the charger, VCC can range from 4.25V to 6.5V and should be bypassed with at least a 10uF capacitor. When VCC drops to within 30mV of the BAT pin voltage, the XF5131 enters shutdown mode, dropping IBAT to less than 2uA.

PROG (PIN 5): Charge Current Program, Charge Current Monitor and Shutdown Pin.

The charge current is programmed by connecting a 1% resistor, RPROG, to ground. When charging in constant-current mode, this pin servos to 1V. In all modes, the voltage on this pin can be used to measure the charge current using the following formula:

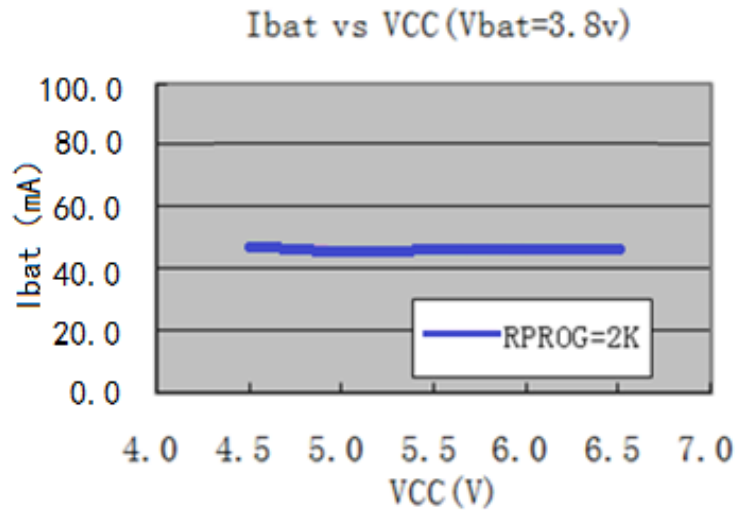
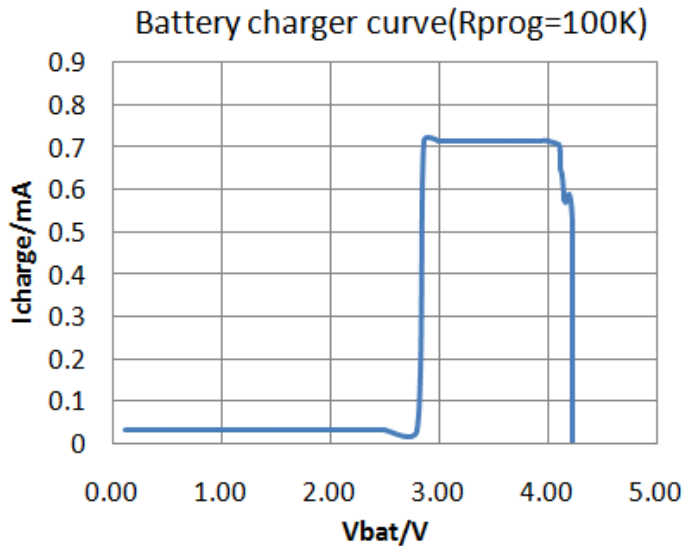
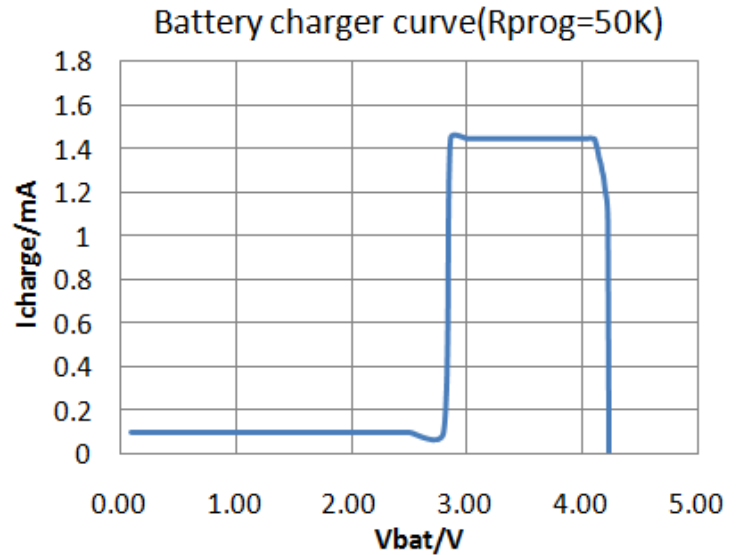
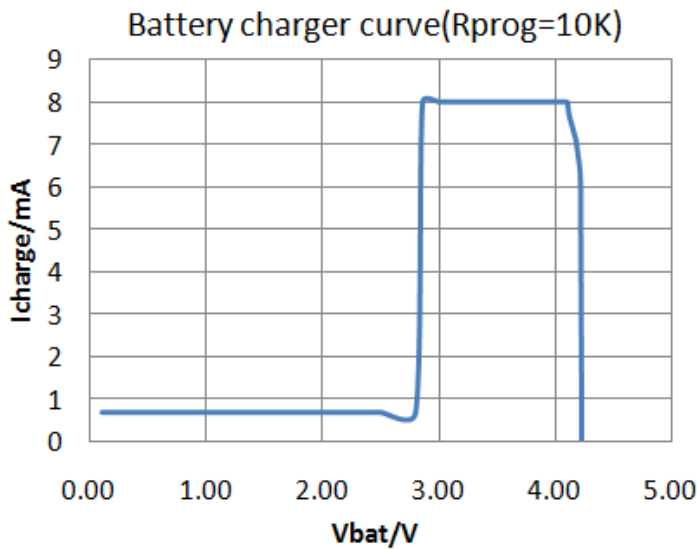
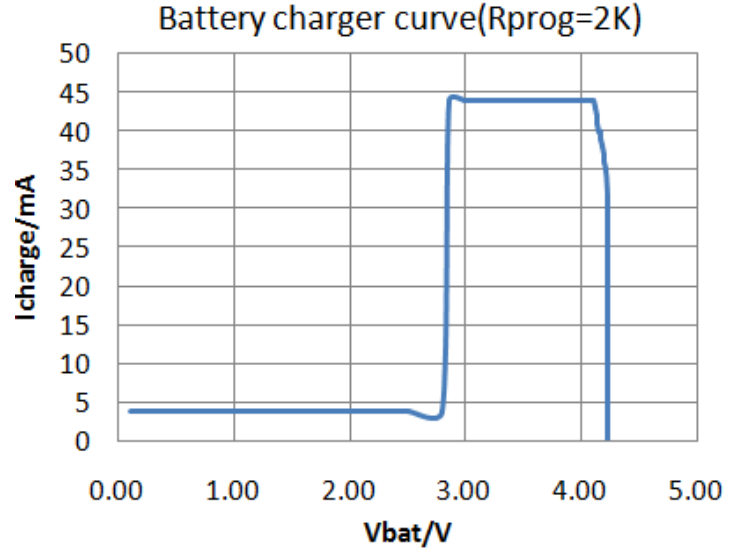
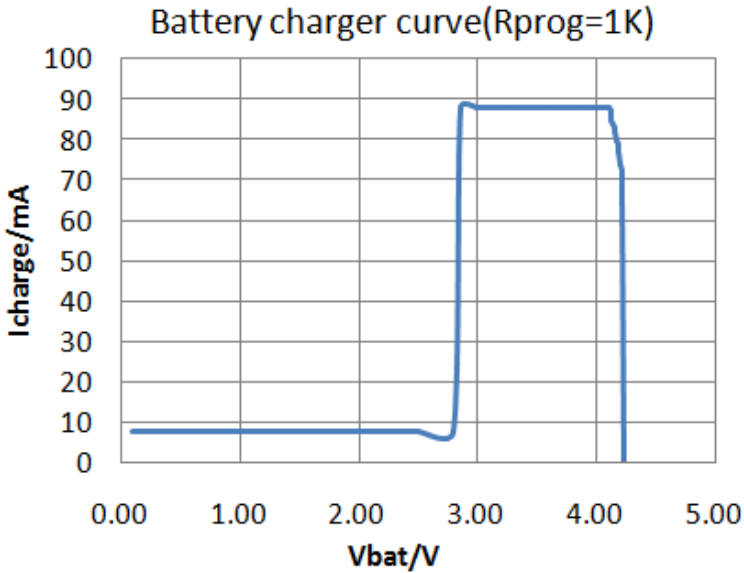
$$IBAT = (VPROG/RPROG) \times 88.$$

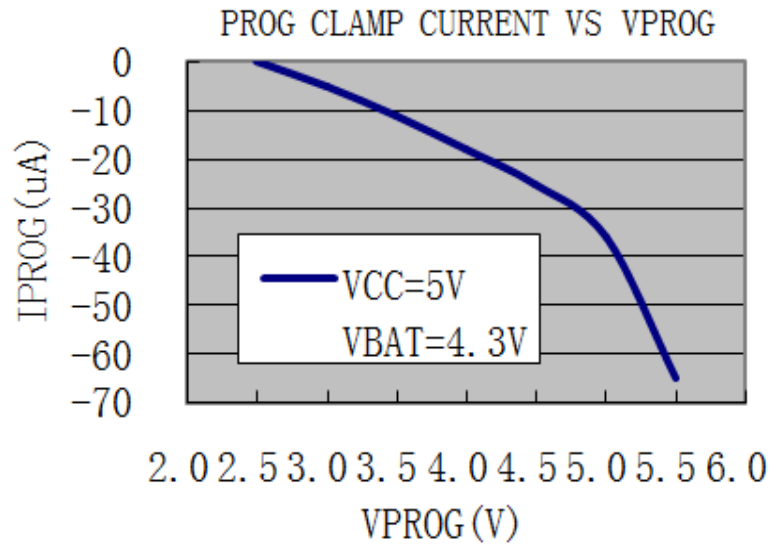
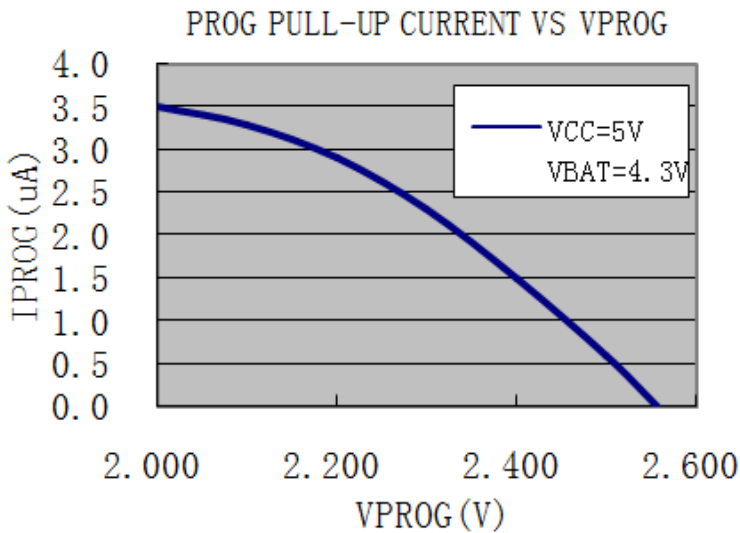
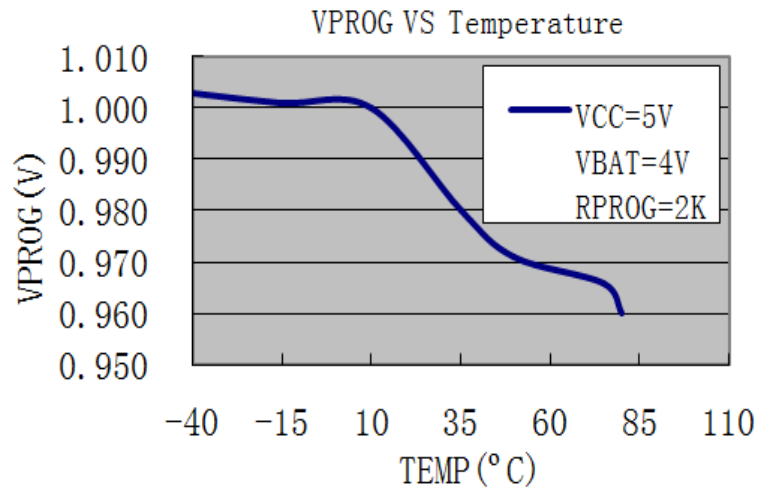
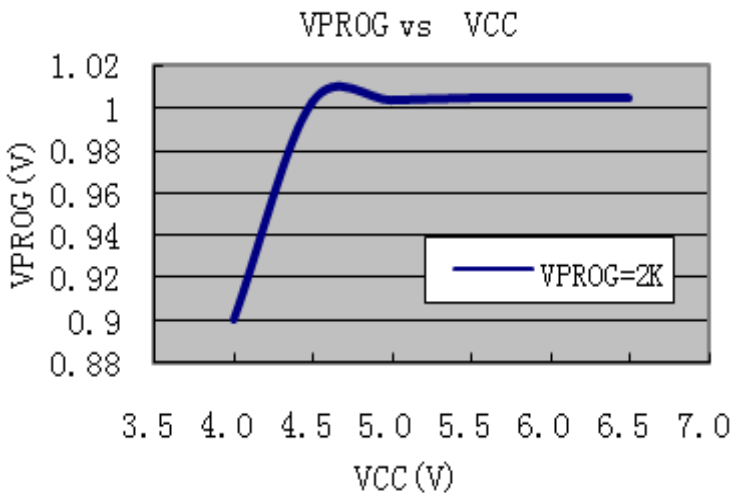
The PROG pin can also be used to shut down the charger. Disconnecting the program resistor from ground allows a 0.05uA current to pull the PROG pin high. When it reaches the 1.21V shutdown threshold voltage, the charger enters shutdown mode, charging stops and the input supply current drops to 50uA. This pin is also clamped to approximately 2.4V. Driving this pin to voltages beyond the clamp voltage will draw currents as high as 1.5mA. Reconnecting RPROG to ground will return the charger to normal operation.

No	Rprog	Ichrg(fast charging current)
1	1K	88mA
2	2K	44mA
3	2.9K	30mA
4	4K	20mA
5	10K	8mA
6	20K	4mA
7	50K	1.5mA
8	100K	0.7mA

Note: Maybe a little different between all XF5131 parts, the data in above sheet is reference for you.

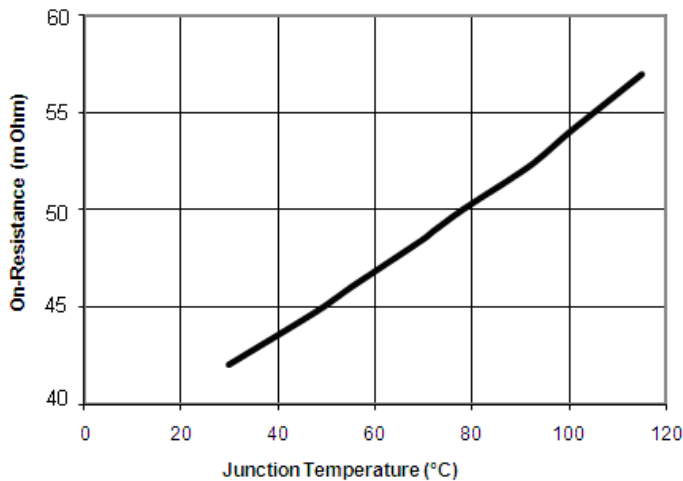
TYPICAL PERFORMANCE CHARACTERISTICS





Li-Protection section internal FET

On-Resistance vs. Junction Temperature



PACKAGE OUTLINE

