High Side Switch

OBSOLETE PRODUCT
DATA SHEET FOR REFERENCE ONLY
Consult www.linear.com for possible alternate source.

FEATURES

- 7.5A Switch Capability
- Low Series Drop (< 1.5V at 7.5A)
- Logic Input (Positive or Negative Logic)
- Current Limited
- Thermal Overload
- 5mA Quiescent Current
- 10µs Risetime

DESCRIPTION

The LT®1089 is a logic driven, high current, high side switch utilizing bipolar technology. The device is capable of driving loads up to 7.5A with a low series drop of only 1.5V, and the series drop is specified over the full range of switch currents. The device has internal current limiting and thermal overload protection. The input logic is designed so that the output can drive loads referenced either above or below the device ground pin. Either positive or negative logic can be used to drive the input. The device is available in both TO-3 metal can and TO-220 plastic packages.

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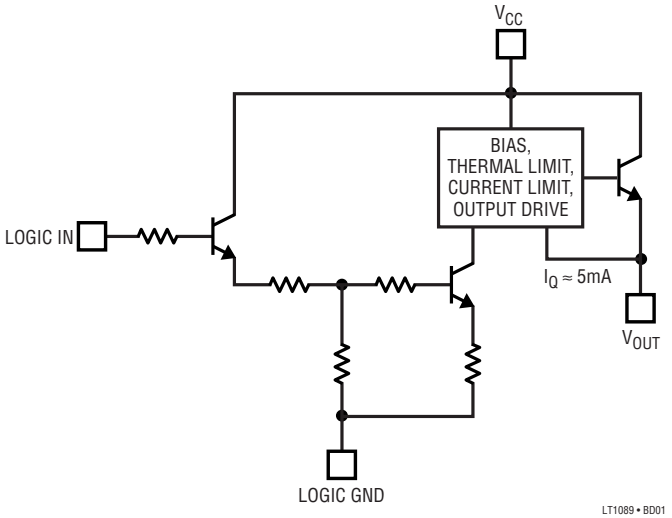
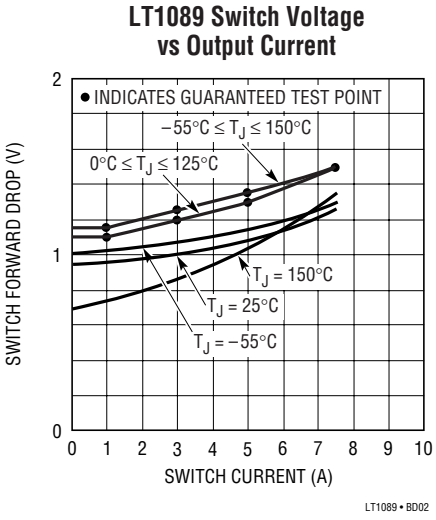
BLOCK DIAGRAM





ABSOLUTE MAXIMUM RATINGS

(Note 1)

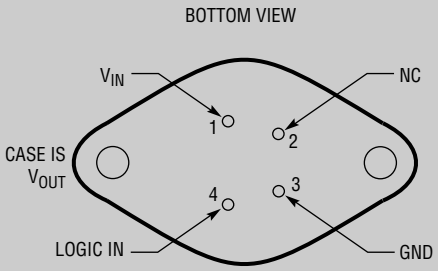
Switch Voltage (V_{CC} – V_{OUT}) 30V
Logic Input Voltage (V_{IN} – GND) 15V
Logic Input Voltage Range (V_{IN}) .. (V_{CC} – 30V) < V_{IN} < V_{CC}
Ground Pin Voltage Range (GND) .. (V_{CC} – 30V) < GND < V_{CC}
Operating Junction Temperature Range
LT1089M Grades ..... –55°C to 150°C
LT1089C Grades ..... 0°C to 125°C
Storage Temperature Range ..... –65°C to 150°C
Lead Temperature (Soldering, 10 sec)..... 300°C

MAXIMUM OPERATING SPECIFICATIONS*

Switch Voltage (V_{CC} – V_{OUT}) 20V
Logic Input Voltage (V_{IN} – GND) 5V
Logic Input Voltage Range (V_{IN}) ..... (V_{CC} – 20V) < V_{IN} < V_{CC}
Ground Pin Voltage Range (GND).... (V_{CC} – 20V) < GND < V_{CC}

*Maximum operating specifications are the maximum recommended operating voltages. The device is fully specified up to the maximum operating specifications. For voltages greater than the maximum operating specifications some device parameters may exceed the data sheet limits.

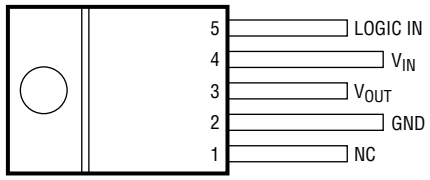
PACKAGE/ORDER INFORMATION



K PACKAGE
4-LEAD TO-3 METAL CAN

OBSOLETE PACKAGE
Consider the T Package as an Alternate Source

ORDER PART NUMBER
LT1089MK
LT1089CK



T PACKAGE
5-LEAD TO-220

ORDER PART NUMBER
LT1089CT

LT1089 • POI01

Consult LTC Marketing for parts specified with wider operating temperature ranges.

ELECTRICAL CHARACTERISTICS

The ● denotes the specifications which apply over full operating temperature range. (Note 1)

PARAMETER	CONDITIONS (NOTE 2)		MIN	TYP	MAX	UNITS
Output Saturation Voltage	I_{SWITCH} = 7.5A, (V_{IN} – GND) = 5V, 4V (V_{CC} – GND) < 20V	●		1.3	1.5	V
Input Voltage (V_{IN} – GND)	Switch ON, (Note 3) 4V < (V_{CC} – GND) < 20V	 ●	 2.4	1.5		V V
	Switch OFF, (Note 4) 4V < (V_{CC} – GND) < 20V	 ●		1.5	 0.8	V V
Input Current	Switch ON, (V_{IN} – GND) = 5V	 ●		–20	 –100	µA µA
	Switch OFF, (V_{IN} – GND) = 0V	 ●		0	 ±5	µA µA
Ground Pin Current	Switch ON, (V_{IN} – GND) = 5V	 ●		3.5	 5.0	mA mA
	Switch OFF, (V_{IN} – GND) = 0V	 ●		0	 ±20	µA µA
Output Current	Switch OFF, (V_{IN} – GND) = 0V	●		5	10	mA
Current Limit	Switch ON, (V_{IN} – GND) = 5V (V_{CC} – V_{OUT}) = 5V (V_{CC} – V_{OUT}) = 20V	 ● ●	 8.0 0.5	 9.5 1.0	 12.0 1.5	 A A
Turn-On Delay		 ●		1	 10	µs µs
Turn-Off Delay		 ●		5	 20	µs µs
Output Risetime	R_{LOAD} = 4Ω	 ●		10	 25	µs µs
Output Falltime	R_{LOAD} = 4Ω (Note 5)	 ●		10	 25	µs µs
Thermal Resistance	K Package T Package				1.6 2.0	°C/W °C/W

Note 1: Absolute Maximum Ratings are those values beyond which the life of a device may be impaired.

Note 2: Unless otherwise specified, (V_{CC} – GND) = 20V and the output load is referred to the ground pin (GND) of the device. Positive current values are defined to flow out of the device.

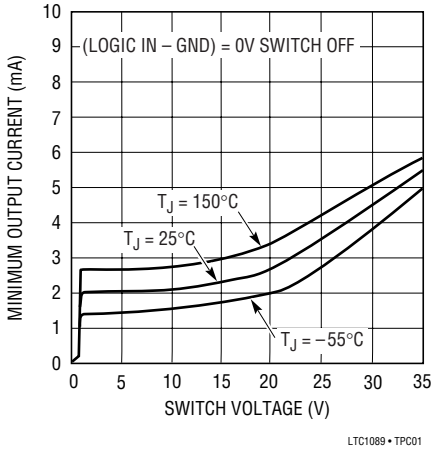
Note 3: For input voltages greater than 2.4V the device Is guaranteed to be turned on. 1.5V is the typical threshold at 25°C.

Note 4: For input voltages less than 0.8V, the device is guaranteed to be in an off state. 1.5V is the typical switch threshold at 25°C.

Note 5: For reactive loads such as large capacitors, the output falltime will be determined by the load.

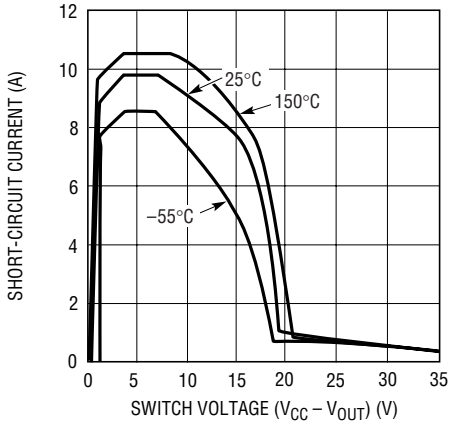
TYPICAL PERFORMANCE CHARACTERISTICS

Minimum Output Current



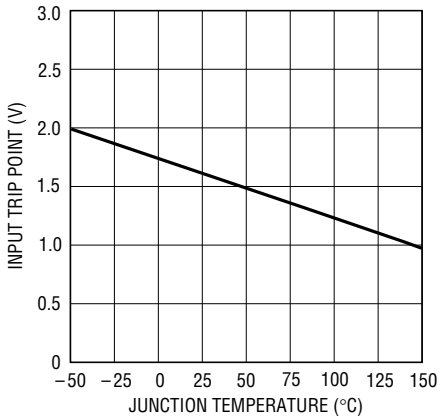
LTC1089 • TPC01

Short-Circuit Current



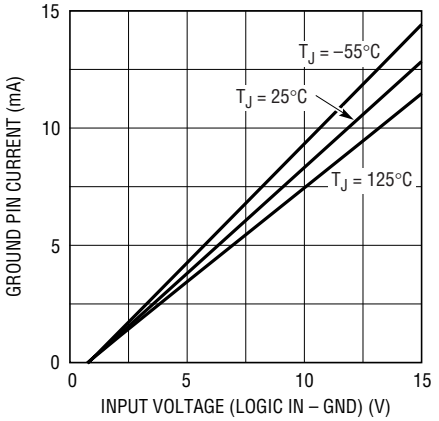
LTC1089 • TPC02

Input Trip Voltage (Logic In – GND)



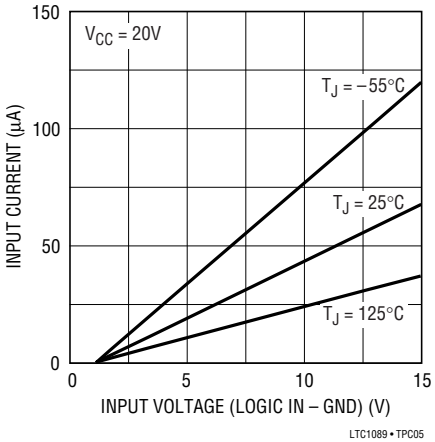
LTC1089 • TPC03

Ground Pin Current



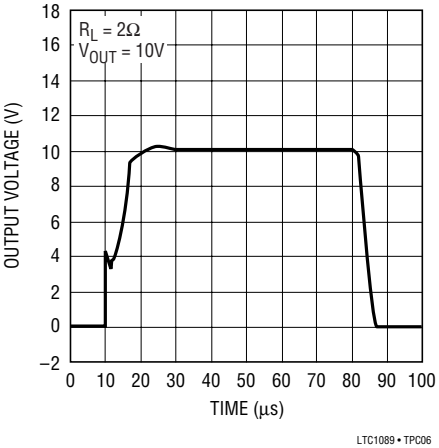
LTC1089 • TPC04

Logic Input Current



LTC1089 • TPC05

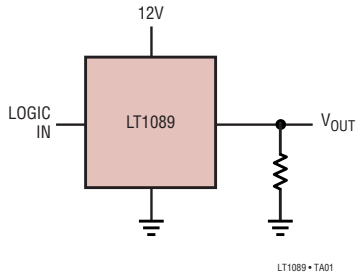
Rise and Fall Times



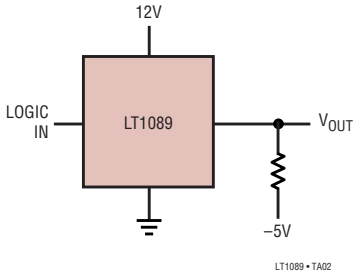
LTC1089 • TPC06

TYPICAL APPLICATIONS

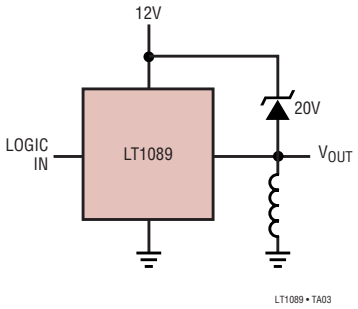
Driving Ground Referred Loads



Driving Negative Referred Loads



Driving Inductive Loads



APPLICATION HINTS

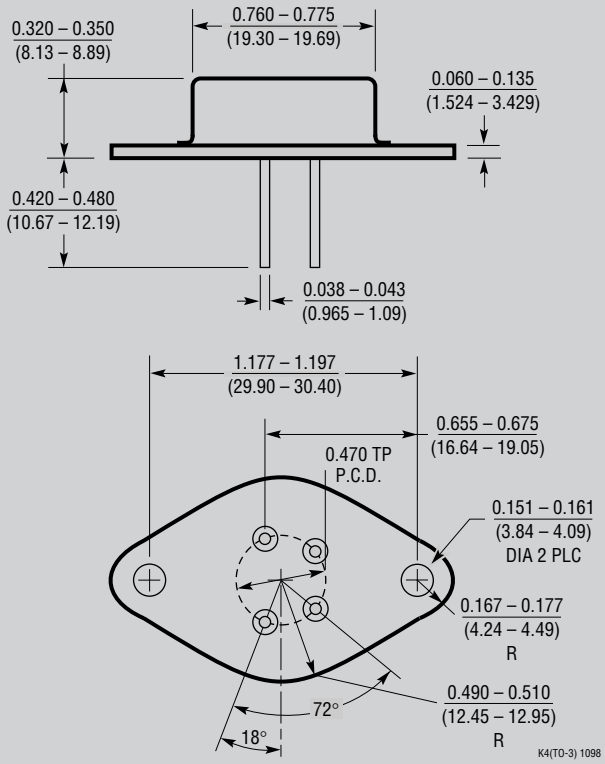
The logic and ground pins function as a differential logic input with a common-mode range of V_{CC} to V_{CC} – 20V and a differential threshold voltage (V_{LOGIC} – GND) of 1.5V. Note that if either Logic In or GND are left open the switch remains inactive.

The LT1089 must be protected against overvoltage at turn-off when driving inductive loads. The inductive flyback voltage can easily exceed the maximum operating switch voltage (V_{CC} – V_{OUT}) of 20V, potentially damaging the switch. The solution is to clamp the switch voltage to 20V or less with a zener diode. Remember that the switch can handle 7.5A and the Zener may be required to handle the same amount of current.

Care must be exercised when operating near the maximum switch voltage. A high current or capacitive load may trip the current limit circuit at turn-on, thereby adversely affecting the risetime of V_{OUT}. The risetime is then governed by the current limit divided by the load capacitance, while the falltime is a function of the complex load. In addition, at switch voltages greater than 18V the switch current must be less than 0.5A or the device output will not pull up. Check the short circuit current characteristics for more detailed information.

PACKAGE DESCRIPTION

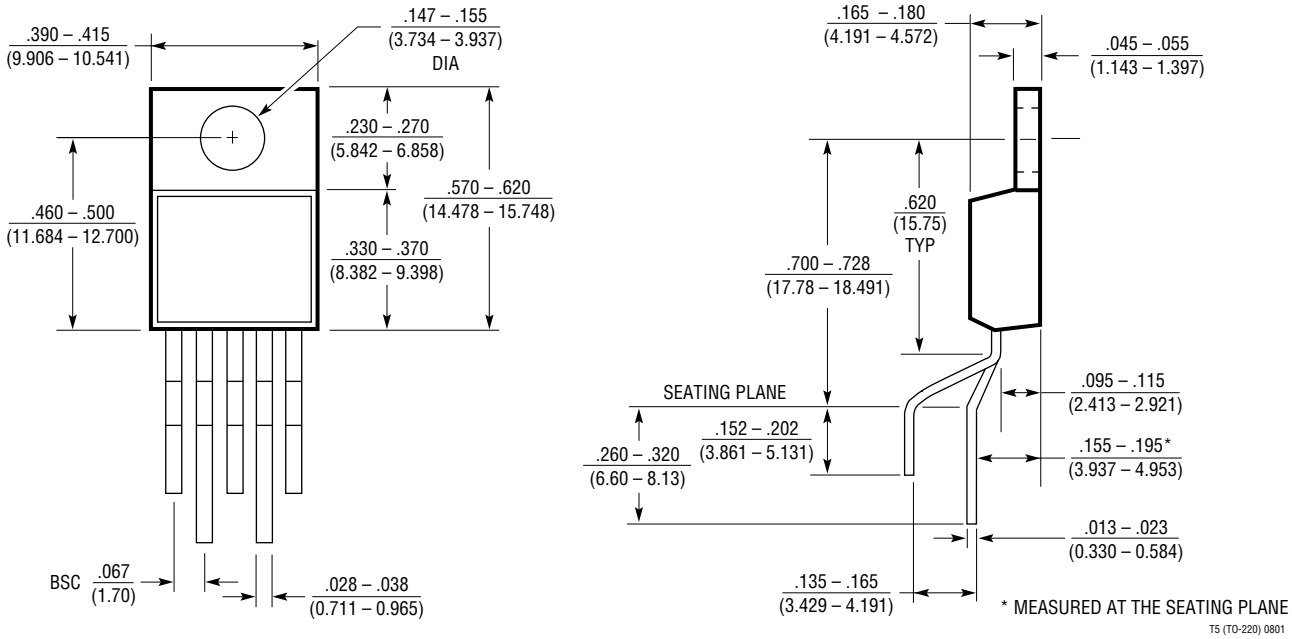
K Package
4-Lead TO-3 Metal Can
(Reference LTC DWG # 05-08-1311)



OBSOLETE PACKAGE

PACKAGE DESCRIPTION

T Package
5-Lead Plastic TO-220 (Standard)
(Reference LTC DWG # 05-08-1421)



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RELATED PARTS

PART NUMBER	DESCRIPTION	COMMENTS
LTC1155	Dual High Side Micropower MOSFET Driver	No External Charge Pump Required; N-Channel MOSFET
LT1160/LT1162	Half/Full-Bridge N-Channel MOSFET Drivers	60V Floating Switch; Prevent Shoot Through
LTC1693	High Speed Single/Dual N-Channel MOSFET Drivers	SO-8; 1.5A Peak Output Current
LTC1693-5	High Speed Single P-Channel MOSFET Driver	16ns Rise/Fall Times at V_{CC} = 12V, C_L = InF
LTC1710	SMBus Dual High Side Switch	Two 0.4Ω/300mA N-Channel Switches
LTC1981/LTC1982	Single and Dual Micropower High Side Switch Controllers in SOT-23	No External Components Required
LTC4412	Low Loss PowerPath Controller	Automatic Switching Between DC Sources

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