

HIGH CURRENT – 3 AMP - PROGRAMMABLE LED DRIVER WITH DIMMING CONTROL

GENERAL DESCRIPTION

The BSC74K9130HV is an adjustable monolithic IC designed for a step-down DC/DC converter capable of driving 3A load without an additional transistor. The device can operate from an input voltage from 5.5V to 60V and source a linear current upto 3A without any additional power transistor typically required for this current level. The BSC74K9130HV operates at a switching frequency of 52kHz. A single resistor on the Rext pin sets the operating current from 10mA upto to 3A.

In addition, the BSC74K9130HV offers an externally controlled dimming function on the EN pin. As the voltage on the EN pin is increased from 0.07V to 0.67V, the voltage on the Rext pin falls from 200mV to 0, reducing the I_{LED} current all the way down to zero.

The BSC74K9130HV is available in standard TO220-5, and TO263-5 packages. ESOP8 with heat sink and TO252-5 packages are also available. However, these packages have limited heat dissipation and the I_{LED} is suggested to be below 2A max.

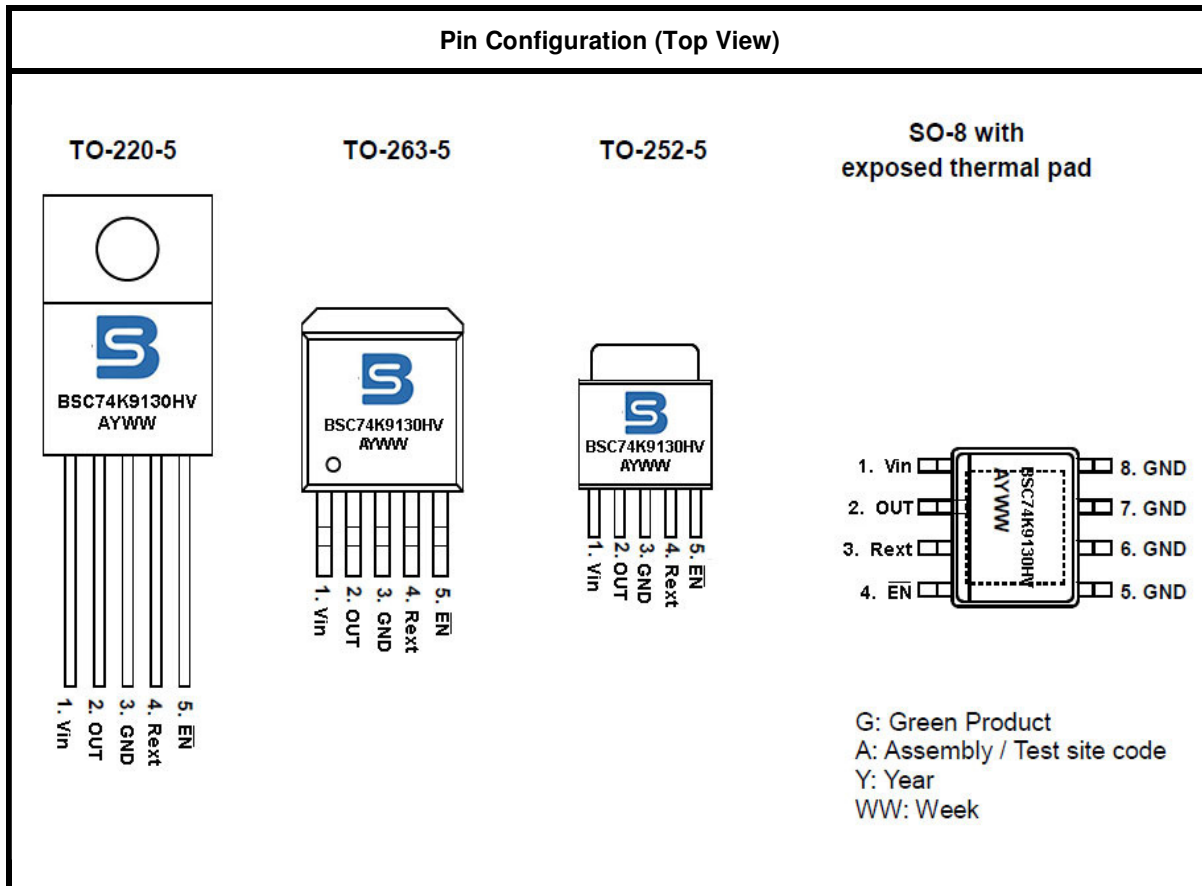
FEATURES

- High Current Source
 - Adjustable from 0mA to 3A with external resistor selection
- Wide input voltage range upto 60V
- Thermal protection for overheating
- EN pin for brightness dimming

APPLICATIONS

Architectural LED lighting
Channel letters for advertising, LED strips for decorative lighting
Retail lighting in vending machines
Emergency lighting (e.g. steps lighting, exit way sign etc.)
Digital Display Signage

PIN CONFIGURATION



PIN DESCRIPTION

No.	Pin	Description
	OUT	Output source current.
	V _{IN}	Power Input for the IC.
	EN	Low Active Enable Pin.
	Rext	LED Source Current Value Selection.
	GND	Ground connection for the IC.
	NC	Floating or Connect to GND.

Note: Pin Number varies depending on package selection

ABSOLUTE MAXIMUM RATINGS¹

Parameter	Symbol	Ratings	Unit
Maximum Supply Voltage	V _{IN}	63	V
Maximum Output Current	I _{OUT}	3	A
Minimum Output Voltage	V _{OUT}	-0.8	V
Maximum Voltage at pin EN	V _{EN}	-0.3 to V _{IN}	V
Maximum Voltage at pin Rext	V _{Rext}	-0.3 to V _{IN}	V
Reverse voltage between all terminals	V _R	0.5	V
Maximum junction temperature ²	T _J	150	°C
ESD (HBM)	ESD	±2	kV

Note 1: Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other condition beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Ratings	Unit
Operating Junction Temperature	T _J	-40...+125	°C
Operating Supply voltage	V _{IN}	5.5...60	V

ELECTRICAL CHARACTERISTICS

All Conditions, including Temperature are as noted

Parameter	Symbol	Conditions	T _J , °C	Value			Unit
				Min	Typ	Max	
Standby Current	I _{STANDBY}	V _{EN} = 5V, V _{IN} = 60V	T _J = -40°C ~+125°C		50	200	µA
Quiescent Current	I _Q	V _{REXT} = 1.5V	25°C		5.3	10	mA
Voltage at R _{EXT} Pin	V _{REXT}	5.5V ≤ V _{IN} ≤ 12V, I _{RLOAD} = 350mA, V _{EN} = 0V	25°C	184	200	216	mV
			T _J = -40°C ~+125°C	180	200	220	
R _{EXT} Input Current	I _{REXT}	V _{REXT} = 250mV, V _{EN} = 0V	25°C		50	150	nA
			T _J = -40°C ~+125°C			500	
Oscillator Frequency	F _{OSC}		25°C	47	52	58	kHz
			T _J = -40°C ~+125°C	42		63	
Dimming Voltage *	V _{EN}	V _{IN} = 12V, I _{RLOAD} = 0mA	25°C	600	670	750	mV
Current Limit	I _{RLOAD}		25°C	3.7	5.0	6.7	A
Efficiency	η		25°C		65		%
Saturation Voltage	V _{SAT}	I _{OUT} = 3A	T _J = -40°C ~+125°C		1.35	1.7	V
Output Leakage Current	I _{LO}	V _{IN} = 60V, V _{OUT} = 0V, V _{REXT} = 1.5V	25°C	-0.3	-0.07		mA
		V _{IN} = 60V, V _{OUT} = - 0.8V, V _{REXT} = 1.5V		-30	-8		mA
EN Pin Threshold Voltage	V _{EN ON/FF}		25°C	1.0	1.4	2.0	V
			T _J = -40°C ~+125°C	0.8		2.2	

* Note: See Figure 1 for Dimming Voltage Relationship to V_{REXT}

TYPICAL PERFORMANCE CHARACTERISTICS

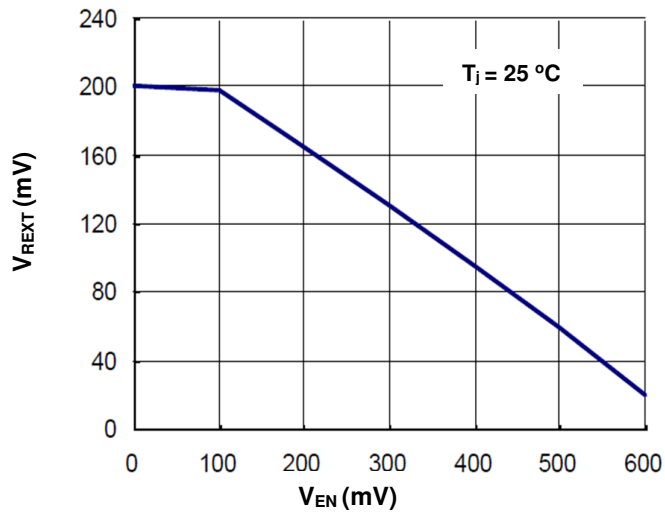
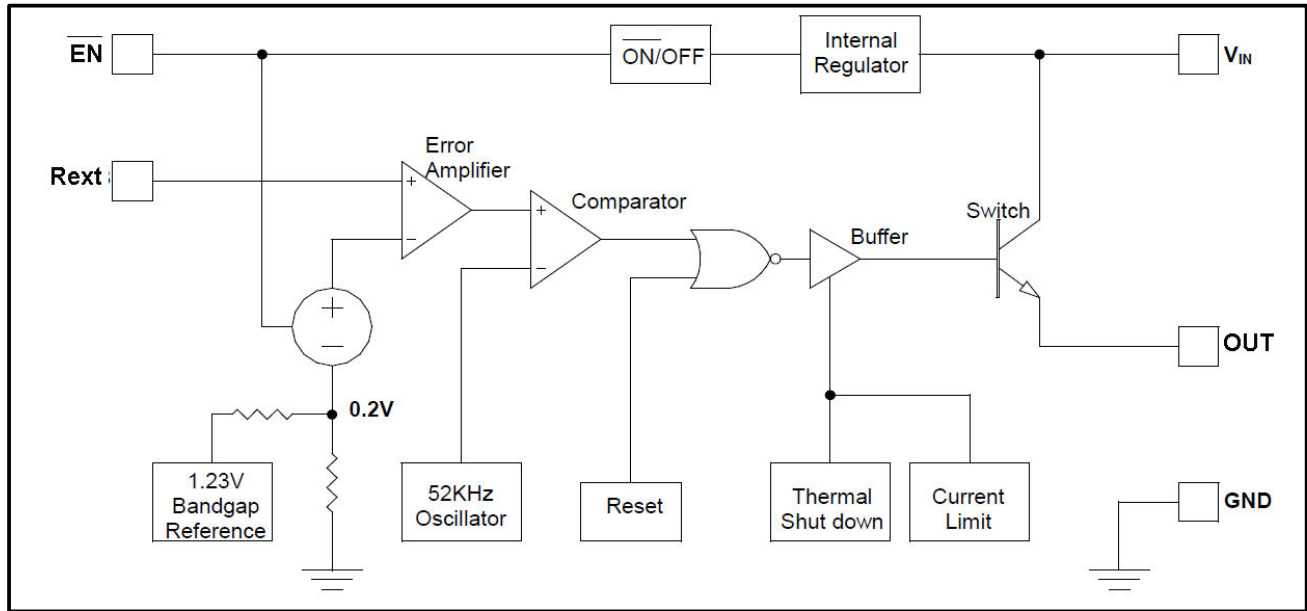


Figure 1 Dimming Voltage vs. V_{REXT}

FUNCTIONAL BLOCK DIAGRAM



APPLICATION INFORMATION

The BSC74K9130HV is a low cost single channel linear source current driver with integrated dimming control. The device can source LED current upto 3A. This device offers a low-cost single chip solution for LED lighting applications where high current levels are required. Please see Typical Application Circuit – Figure 2, pages 12.

An external resistor, R_{LOAD} , is used to setup the optimal current value for OUT channel to drive the LED string. An external PWM control can be utilized through the low active EN pin to adjust the LED intensity level.

PROGRAMMING THE OUTPUT CURRENT

A single programming resistor (R_{LOAD}) controls the source current setting for LED string. The programming resistor value may be approximately calculated using the following Equation (1):

$$I_{LED} = V_{REXT} / R_{LOAD}$$

Where I_{OUT} is in mA, and R_{EXT} is in $k\Omega$, and typical $V_{REXT} = 200mA$

Thus, a desired output current of 100mA would require a corresponding external resistance of R_{LOAD} of 2Ω .

THERMAL CONSIDERATIONS

Given the high level of source current generated by the BSC74K9130H practically all commercially available LEDs could be powered by this device. However, thermal dissipation is critical in the device operation and heat considerations must be followed.

The formula below describes the relationship between junction temperature T_J , device power and package thermal resistance for proper consideration.

$$T_J = P_{IC} \times \Theta_{JA} + T_A$$

Where P_{IC} is the power dissipation of BSC74K9130HV and Θ_{JA} is the thermal resistance (junction to ambient).

As an example, for the TO263-5 package Θ_{JA} is $50^\circ C/W$, the safe operating power would be:

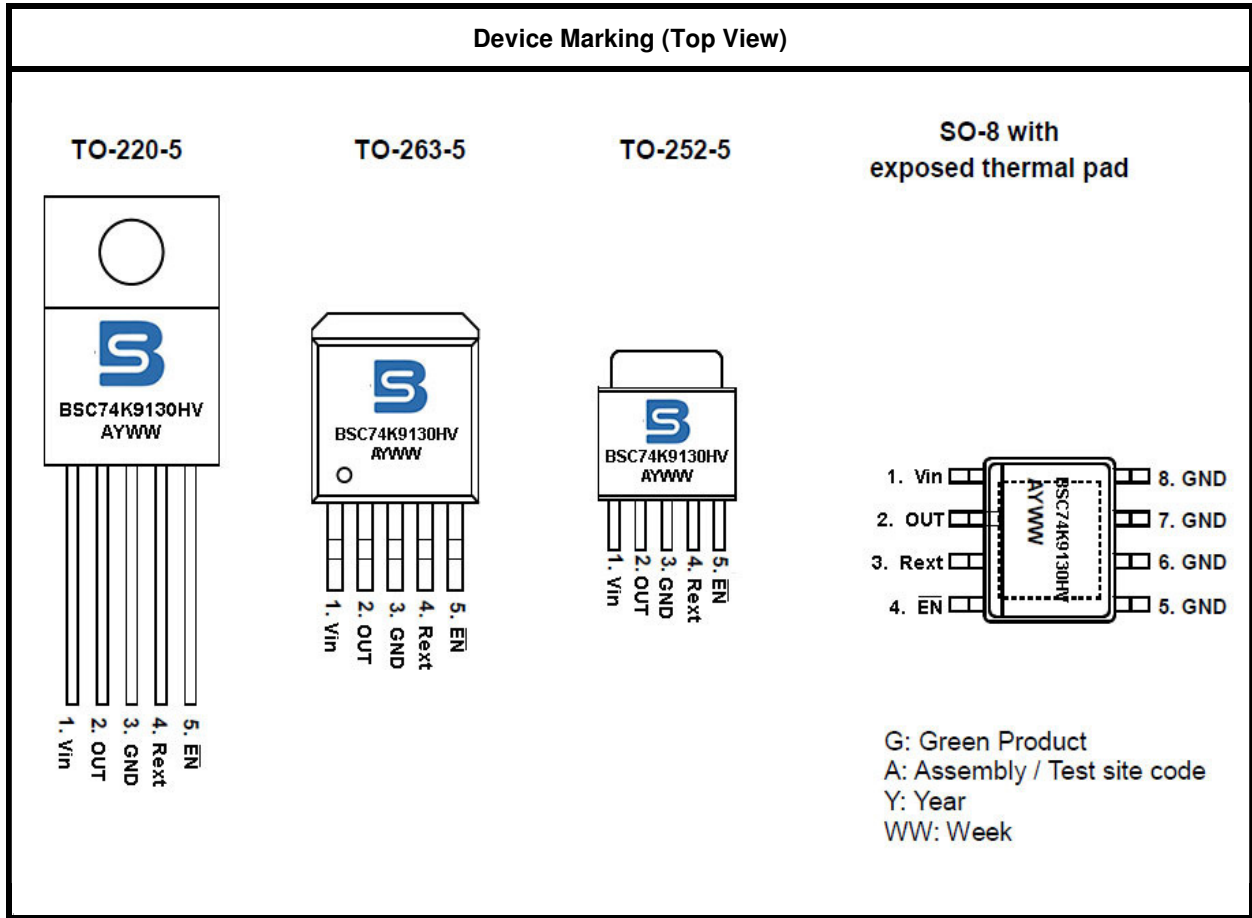
$$P_{IC} = (T_J - T_A) / \Theta_{JA} = (150 - 25) / 50 = 2.5W \text{ and}$$

$$P_{IC} = P_{IN} - P_{LED}, \text{ where}$$

$$P_{IN} = V_{IN} \times I_{IN}, \text{ and}$$

$$P_{LED} = V_{OUT} \times I_{LED}, (V_{OUT} = V_F \times \text{Number of LEDs in a string})$$

DEVICE MARKING



ORDERING INFORMATION

Industrial Range: -40°C To +125°C

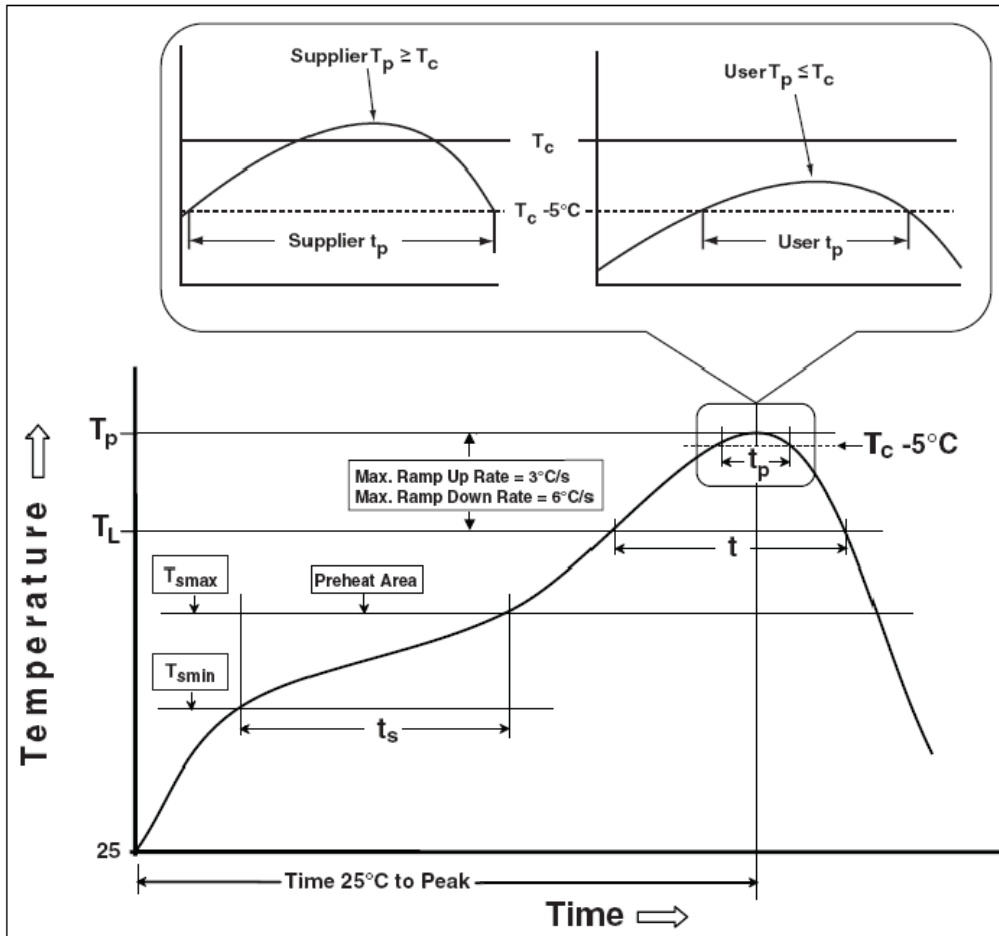
Order Part No.	Package	QTY
BSC74K9130HV-TA5RG	TO263-5, Lead-free Tape and Reel	800/Reel
BSC74K9130HV-TB5TG	TO220-5, Lead-free Tube	50/Tube
BSC74K9130HV-TC5RG	TO252-5, Lead-free Tape and Reel	2,500/Reel
BSC74K9130HV-TA5RG	ESOP-8, Lead-free Tape and Reel	2,500/Reel

Copyright © 2020 Brave Semiconductor Corporation. All rights reserved. Brave Semiconductor Corporation reserves the right to make changes to this specification and its products at any time without notice. Brave Semiconductor Corporation assumes no liability arising out of the application or use of any information, products or services described herein. Customers are advised to obtain the latest version of this device specification before relying on any published information and before placing orders for products.

Brave Semiconductor Corporation does not recommend the use of any of its products in life support applications where the failure or malfunction of the product can reasonably be expected to cause failure of the life support system or to significantly affect its safety or effectiveness. Products are not authorized for use in such applications.

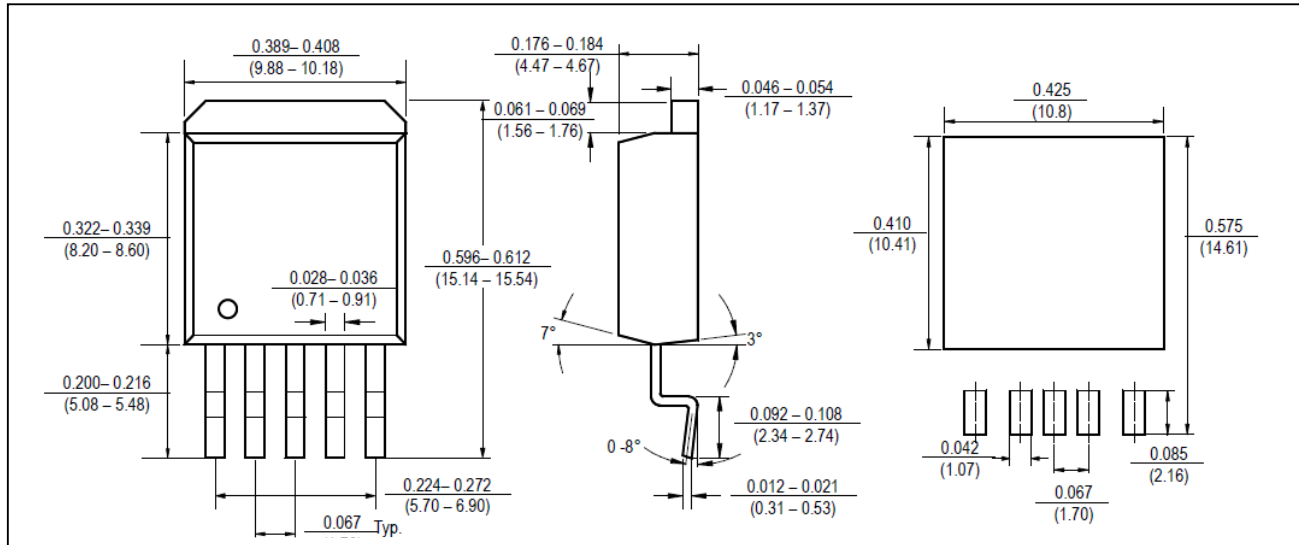
CLASSIFICATION REFLOW PROFILES

Profile Feature	Pb-Free Assembly
Preheat & Soak	
Temperature min (T _{smin})	150°C
Temperature max (T _{smax})	200°C
Time (T _{smin} to T _{smax}) (t _s)	60-120 seconds
Average ramp-up rate (T _{smax} to T _p)	3°C/second max.
Liquidous temperature (T _L)	217°C
Time at liquidous (t _L)	60-150 seconds
Peak package body temperature (T _p)*	Max 260°C
Time (t _p)** within 5°C of the specified classification temperature (T _c)	Max 30 seconds
Average ramp-down rate (T _p to T _{smax})	6°C/second max.
Time 25°C to peak temperature	8 minutes max.

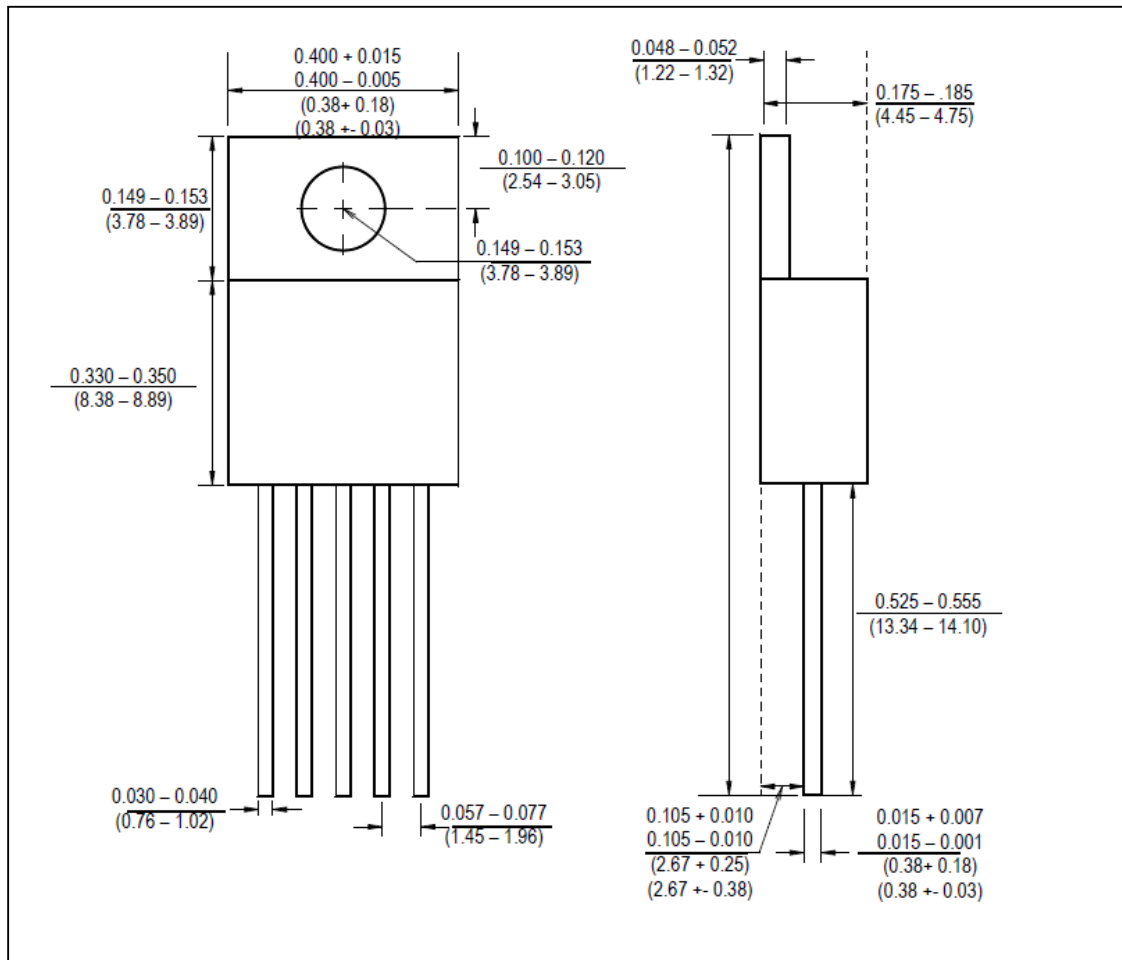


PACKAGE INFORMATION

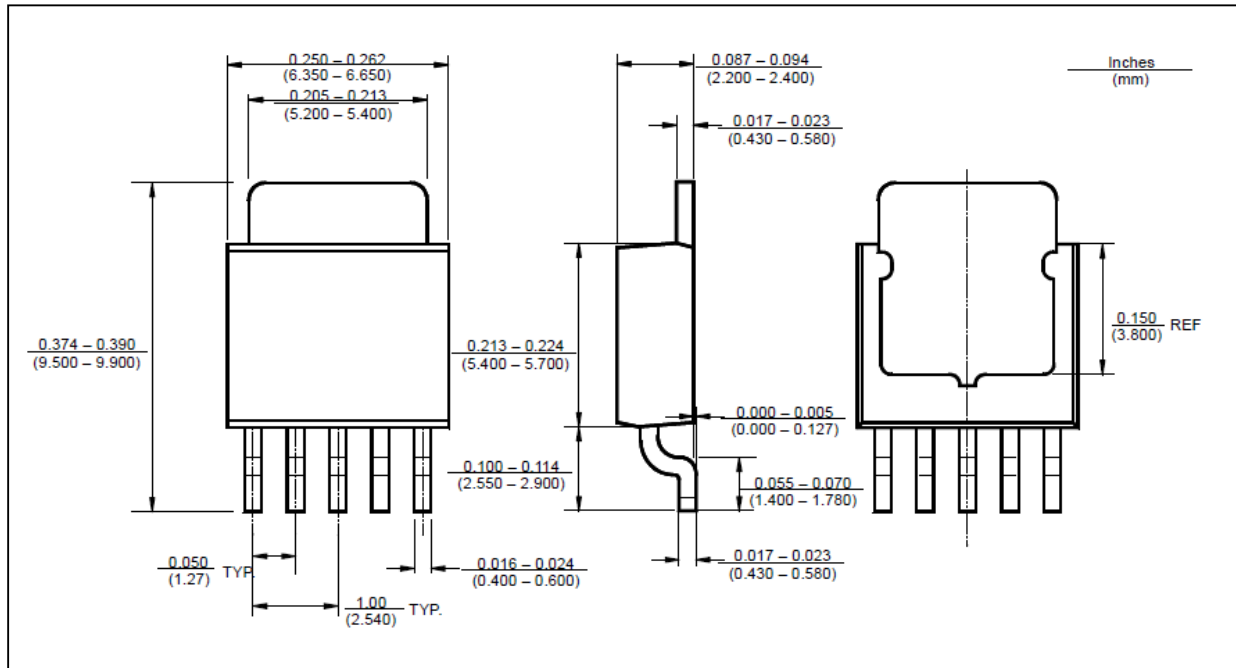
Package Outline Dimensions – TO-263-5



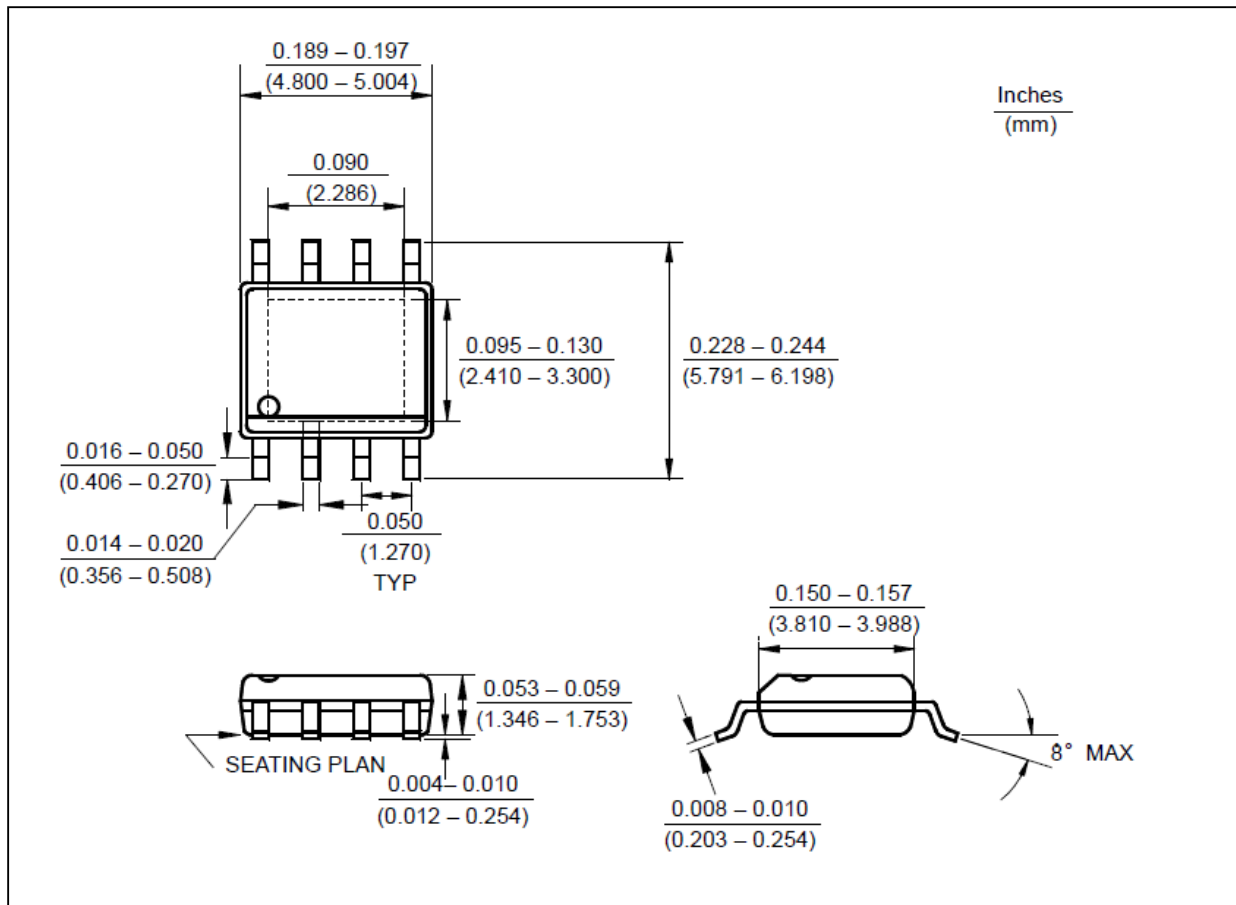
Package Outline Dimensions – TO-220-5



Package Outline Dimensions – TO-252-5



Package Outline Dimensions – PSOP 8



PACKAGE THERMAL RESISTANCE

Package	θ_{JA} Thermal Resistance Junction-to-Ambient
TO220-5	45°C/W
TO263-5	50°C/W
TO252-5	70°C/W
ESOP-8	36.5°C/W *

*2 square inches of FR-4, double sided, 1oz, minimum copper weight, is recommended

SECRET

TYPICAL APPLICATION CIRCUITS

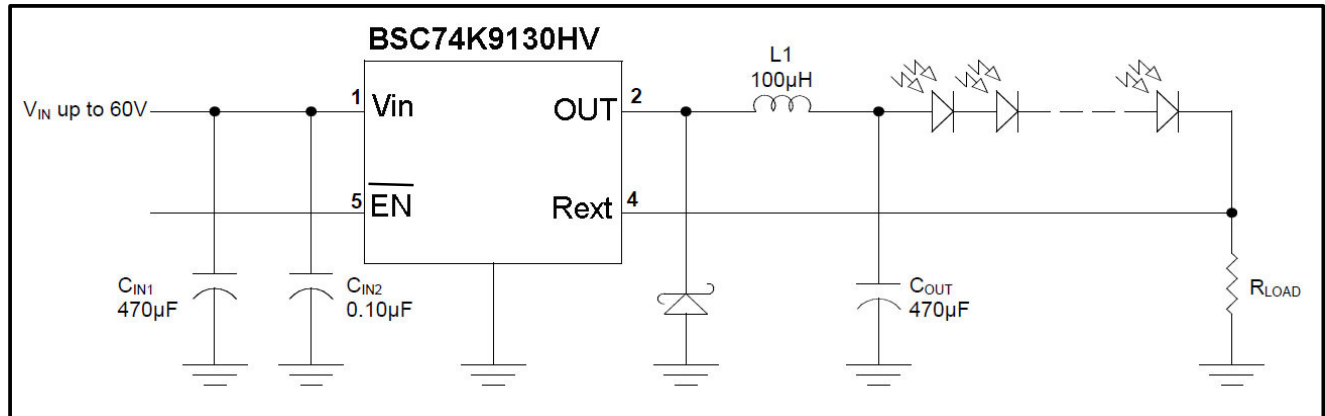


Figure 2 Typical Application Circuit

REVISION HISTORY

Revision	Detail Information	Date
A	Initial Release	2020.08.01

Copyright © 2020 Brave Semiconductor Corporation. All Rights Reserved.

Information in this document is subject to change without prior notice.

Brave Semiconductor name and the Brave Semiconductor logo are trademarks or registered trademarks of Brave Semiconductor Corporation.

Other brands, names, trademarks or registered trademarks may be claimed as the property of their respective owners.