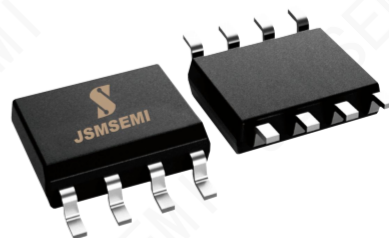


General Description

TPS54331DR-JSM是一款40V、3A非同步降压转换器，集成有一个低RDS(on)的高侧MOSFET。为了提高轻负载条件下的效率，将自动激活脉冲跳跃Eco-mode特性。此外，10 μ A的关断电源电流使得此器件可用于电池供电类应用。具有内部斜坡补偿的电流模式控制简化了外部补偿计算，并在允许使用陶瓷输出电容器的同时减少了元件数量。一个电阻分压器对输入欠压锁定的迟滞进行编程。过压瞬态保护电路可限制启动期间和瞬态条件下的电压过冲。逐周期电流限制方案、频率折返和热关断特性可在过载条件下对器件和负载施加保护。



Features

- 3.3V 至 40V 输入电压范围
- 可调版本，可调节输出电压低至 1.25V
- 固定输出电压版本3.3V、5.0V、12V
- 集成式 80m Ω 高侧 MOSFET 支持高达 3A 的持续输出电流
- 使用脉冲跳跃 Eco-mode 在轻负载条件下实现高效率
- 10 μ A 关断静态电流 (典型值)
- 可编程 UVLO 阈值
- 过压瞬态保护
- 逐周期电流限制、频率折返和热关断保护
- 400kHz 固定开关频率

Applications

- 消费类应用，诸如机顶盒、CPE 设备、LCD 显示屏、外设和电池充电器
- 工业用和车载音频电源
- 3.3V、5V、12V和24V分布式电源系统

Absolute Maximum Ratings (Note1)

Symbol	Parameter	Rating	Unit
V _{IN}	VIN Supply Voltage (VIN to Gnd)	-0.3 ~ 40	V
V _{SW}	SW to GND Voltage	-0.3 to 40	V
	All Other Pins	-0.3 ~ 40	V
P _D	Power Dissipation	Internally Limited	W
θ_{JA}	Junction-to-Ambient Resistance in free air (Note 2)	50	°C/W
T _J	Junction Temperature	150	°C
T _{OP}	Operation Temperature	-40 ~ 125	°C
T _{STG}	Storage Temperature	-65 ~ 150	°C
T _{SDR}	Maximum Lead Soldering Temperature (10 Seconds)	260	°C

Note1: 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 conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

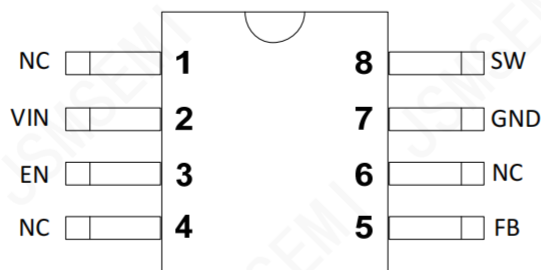
Note 2: θ_{JA} is measured with the component mounted on a high effective thermal conductivity test board in free air.

Recommended Operation Conditions (Note3)

Symbol	Parameter	Range	Unit
V _{IN}	VIN Supply Voltage	4.5 ~ 40	V
V _{OUT}	Converter Output Voltage	V _{FB} ~ V _{IN} *90%	V

Note 3: Refer to the typical application circuit

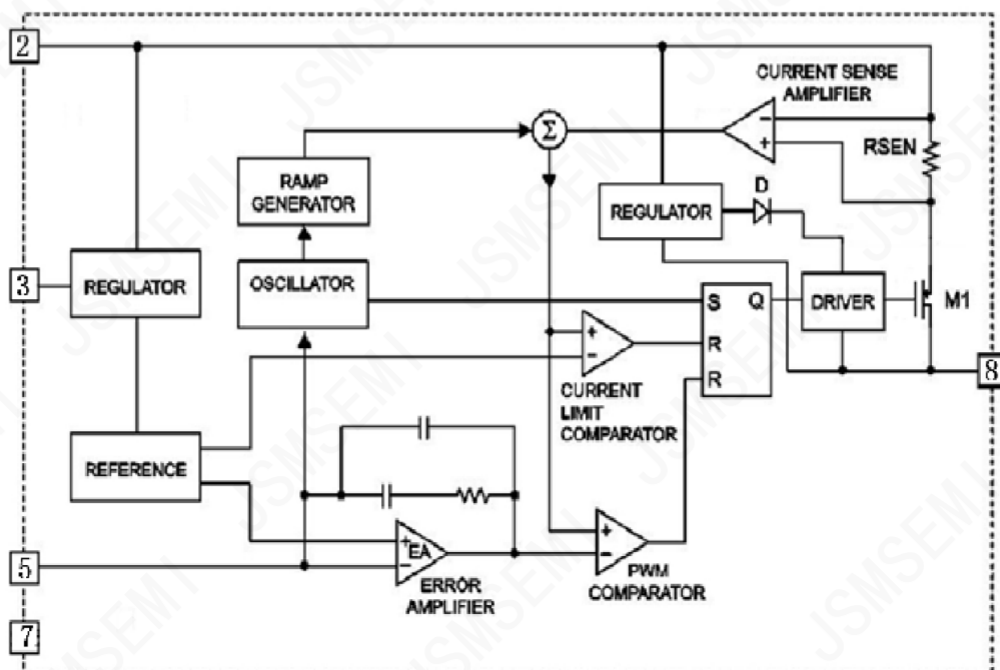
Pin Configurations



Pin Description

引脚		I/O	说明
编号	名称		
1	NC	-	悬空脚
2	VIN	I	该引脚为 3.3V 至 40V 输入电源电压。对地须加 100nF 陶瓷电容
3	EN	I	此引脚是使能引脚。要关闭系统，该脚位拉至 0.5V 以下。悬空此引脚或电压大于 1.25V 即可启用。可使用两个电阻器对输入欠压锁定进行编程。
4	NC	-	悬空脚
5	FB	O	该引脚是跨导 (gm) 误差放大器的反馈脚。
6	NC	-	悬空脚
7	GND	-	地
8	SW	O	该引脚是内部高侧功率 MOSFET 的漏极

Function Block



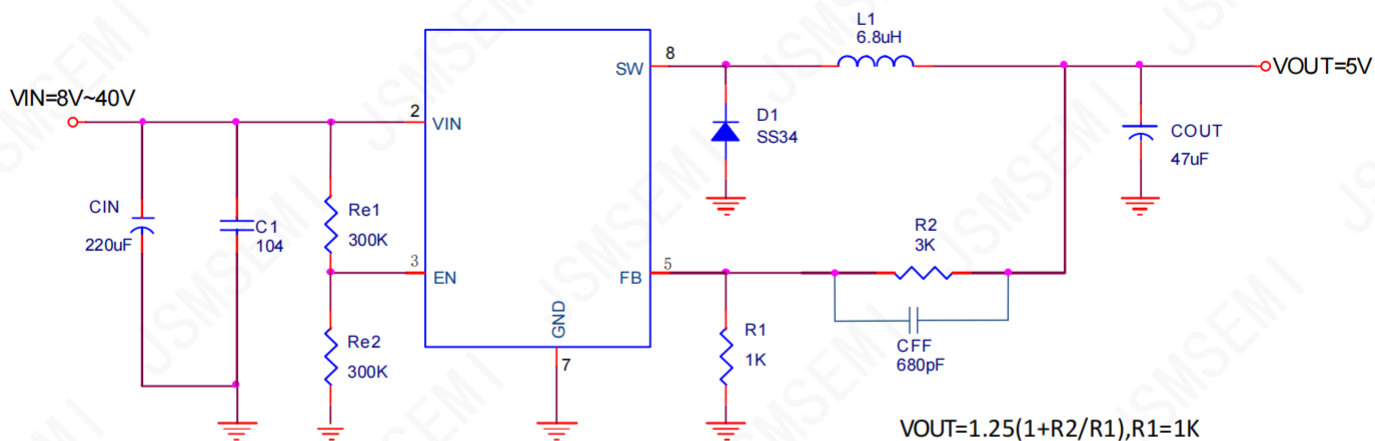
Electrical Characteristics

(Refer to the test circuit, $V_{IN}=12V$ for 3.3V, 5V, adjustable version and $V_{IN}=24V$ for the 12V version, $I_{LOAD}=0.5A$)

Characteristics	Symbol	Test Conditions	Min	Typ	Max	Unit
Feedback Bias Current	I_{FB}	$V_{FB}=1.3V$ (Adjustable version only)		50	100	nA
Oscillator Frequency	F_{OSC}		350	400	450	kHz
Saturation Voltage	V_{SAT}	$I_{OUT}=3A$, No outside circuit $V_{FB}=0V$ force driver on		0.5	1.0	V
Max. Duty Cycle(ON)	DC	$V_{FB}=0V$ force driver on	93	98		%
Min. Duty Cycle(OFF)		$V_{FB}=12V$ force driver off		0		
Current Limit	I_{CL}	Peak current, No outside circuit $V_{FB}=0V$ force driver on	5.0	8.0		A
SW Leakage Current(Output=0)	I_L	No outside circuit $V_{FB}=12V$ force driver off			2	mA
SW Leakage Current (Output=-1)		$V_{IN}=24V$		5	20	
Quiescent Current	I_Q	$V_{FB}=12V$ force driver off		2	6	mA
Standby Quiescent Current	I_{STBY}	ON/OFF pin=5V $V_{IN}=24V$		10	20	μA
EN pin Logic Input Threshold Voltage	V_{IL}	Low(regulator OFF)			0.5	V
	V_{IH}	High(regulator ON)	1.2			
EN pin Logic Input Current	I_H	$V_{LOGIC}=5.0V$ (OFF)		0	1	μA
EN pin Input Current	I_L	$V_{LOGIC}=0.5V$ (ON)		0	1	
Thermal Resistance	Θ_{JC}	Junction to case		15		$^{\circ}C/W$
Thermal Resistance with Copper Area of Approximately 3 in ²	Θ_{JA}	Junction to ambient		70		$^{\circ}C/W$
Output Feedback	V_{FB}	$3.3V \leq V_{IN} \leq 40V$ $0.2A \leq I_{LOAD} \leq 3A$ V_{OUT} programmed for 3V	1.225	1.250	1.275	V
Efficiency	η	$V_{IN}=12V$, $I_{LOAD}=3A$		90		%

Typical Application Circuit

Adjustable Type Circuit



Application Information

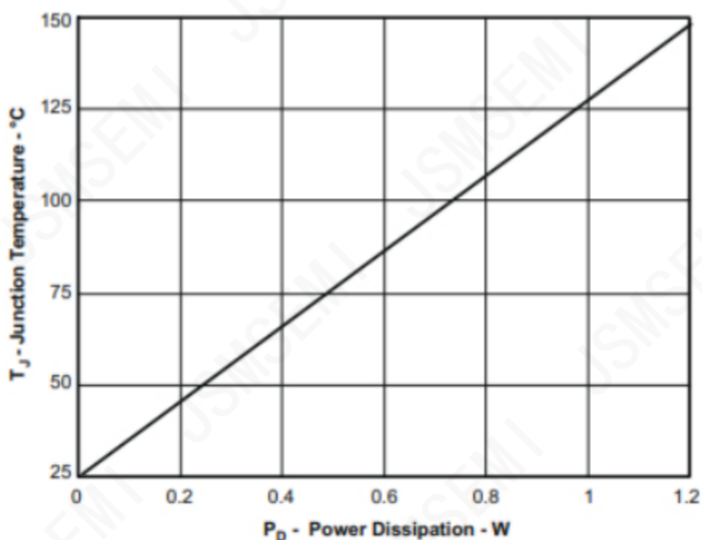
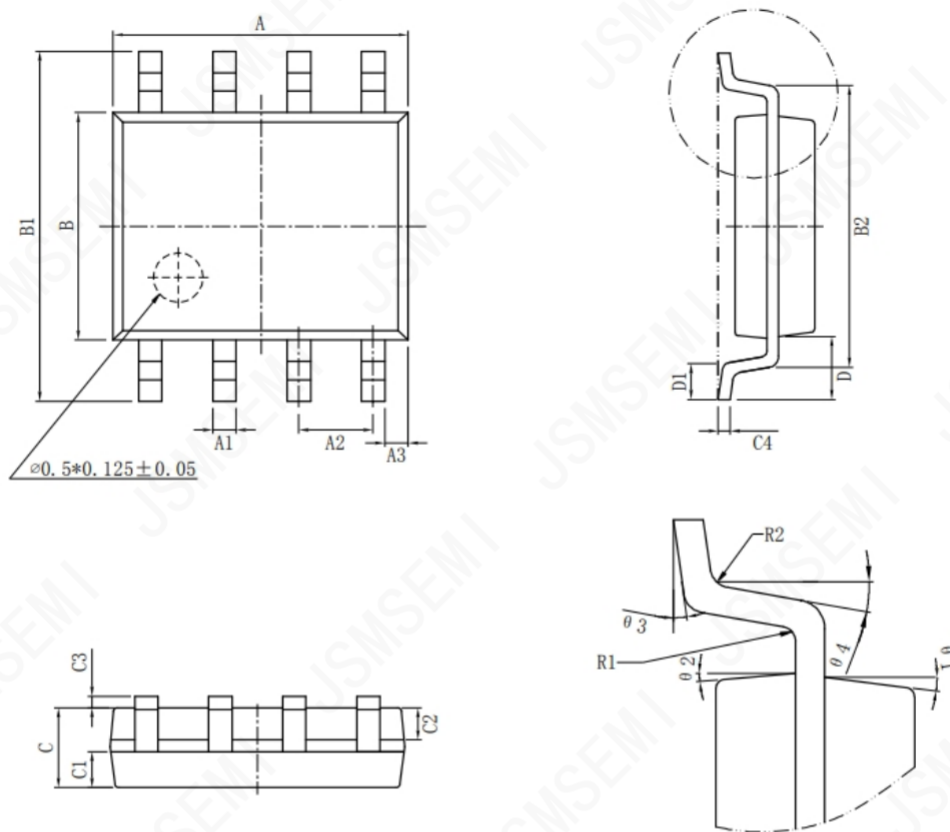


图 8-14. 最大功率损耗与结温的关系

器件设计为在 3.3V 至 40V 的输入电源电压范围内工作。该输入电源必须经过良好调节。如果输入电源距离转换器超过几英寸，那么除了陶瓷旁路电容器之外，还需要额外的大容量电容。通常，选择值为 100μF 的电解电容器。

SOP - 8 Package Outline Dimensions



标注	尺寸	MIN (mm)	MAX (mm)	标注	尺寸	MIN (mm)	MAX (mm)
A		4.80	5.00	C3		0.05	0.20
A1		0.356	0.456	C4		0.203	0.233
A2		1.27TYP		D		1.05TYP	
A3		0.345TYP		D1		0.40	0.80
B		3.80	4.00	R1		0.20TYP	
B1		5.80	6.20	R2		0.20TYP	
B2		5.00TYP		θ 1		17° TYP4	
C		1.30	1.60	θ 2		13° TYP4	
C1		0.55	0.65	θ 3		0° ~ 8°	
C2		0.55	0.65	θ 4		4° ~ 12°	

Revision History

Rev.	Change	Date
V1.0	Initial version	6/27/2021

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