

5.5V, 0.8A, Synchronous Buck Converter

TD6808

General Description

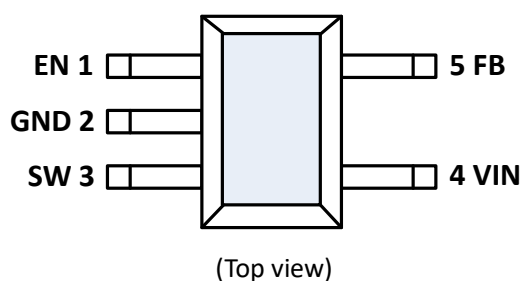
The TD6808 is a compact 5V Buck Converter which can deliver 0.8A output current.

TD6808 employs a proprietary control loop to achieve a fast transient load response. It keeps high converting efficiency in both light load and heavy load. TD6808 is equipped with all kinds of protection, such as input over voltage protection, output short circuit protection, over current protection and over temperature protection.

TD6808 is consists of internal power tree generator, bandgap voltage reference module, under-voltage-lockout(UVLO) module, error amplifier, protection circuitry, driver block, current sensing block and two power MOSFETs.

TD6808 is available in SOT23-5L packages.

Pin Configurations



Features

- Input operation range: 2.7 – 5.5V
- Input over voltage protection at 6V
- 40uA quiescent current in operation
- Output current up to 0.8A
- Efficiency up to 95%
- OCP, SCP and OTP protection
- SOT23-5L package

Application

- Set-top Box
- Solid State Drive
- WIFI and Network Devices
- Security surveillance system
- Toys
- TV
- All other electronic devices

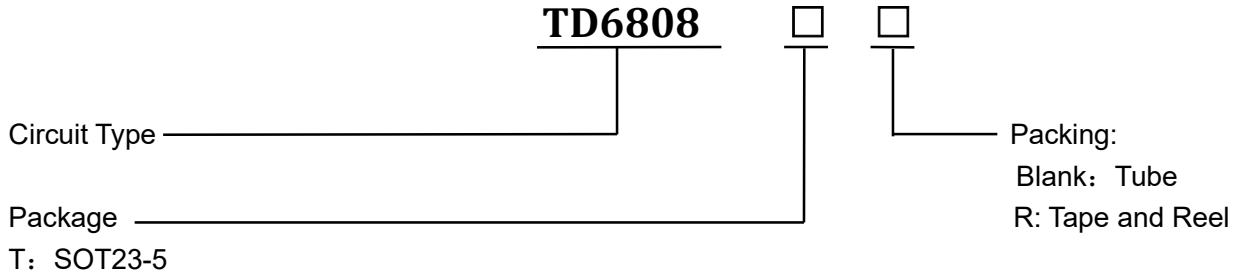
Pin Description

Pin Number	Pin Name	Description
1	EN	Chip enable pin, pull high to turn on the chip.
2	GND	Ground
3	SW	Power Switch Output. It is the switch node connection to Inductor. This pin connects to the drains of the internal P-ch and N-ch MOSFET switches.
4	VIN	Power Supply Input. Must be closely decoupled to GND with a 10 μ F or greater ceramic Capacitor.
5	FB	Feedback node, with Vfb at 0.6V

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Ordering Information



Function Block

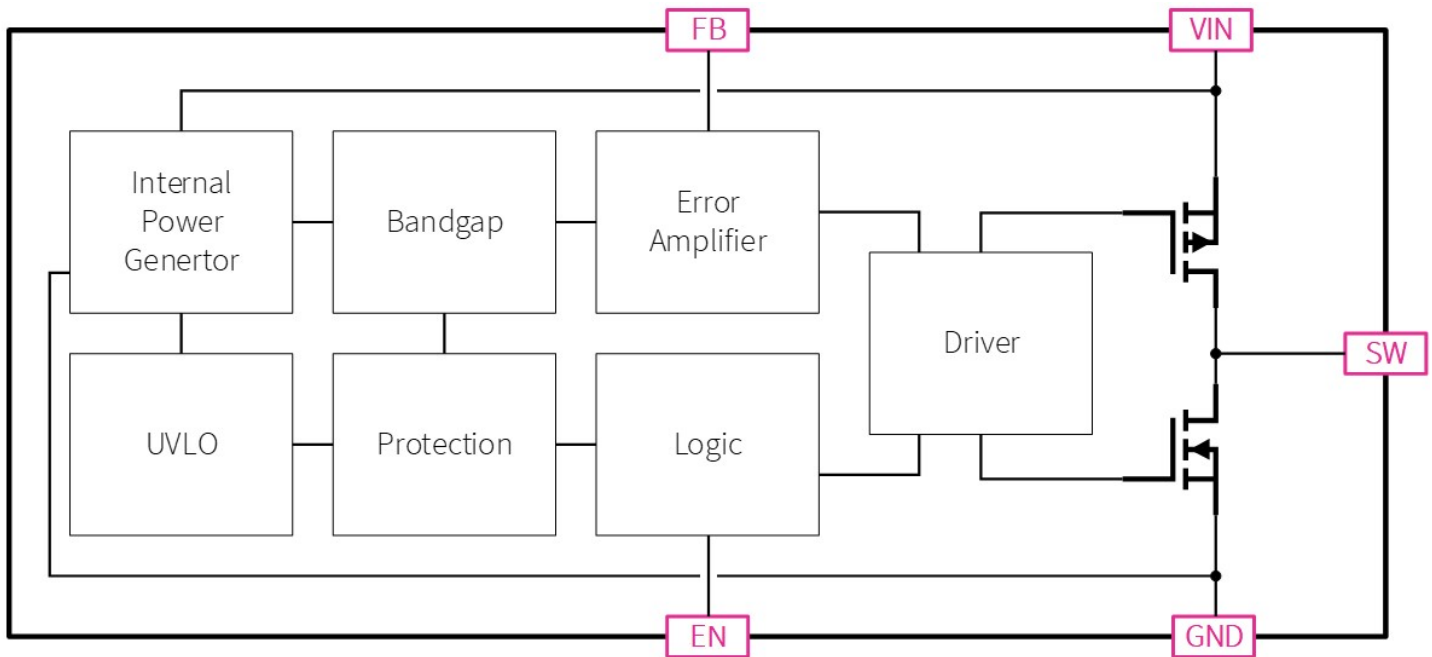


Figure1 Function Block Diagram of TD6808

Absolute Maximum Ratings (at $T_A=25^{\circ}\text{C}$)

Symbol	Parameter	Rating	Unit
V_{IN}	V_{IN} pin voltage	-0.3 to 6	V
V_{OUT}		-0.3 to +5.5	V
P_D	Continuous Power Dissipation ($T_A = 25^{\circ}\text{C}$)	0.4	W
θ_{JA}	Junction-to-Ambient Resistance in free air	170	$^{\circ}\text{C/W}$

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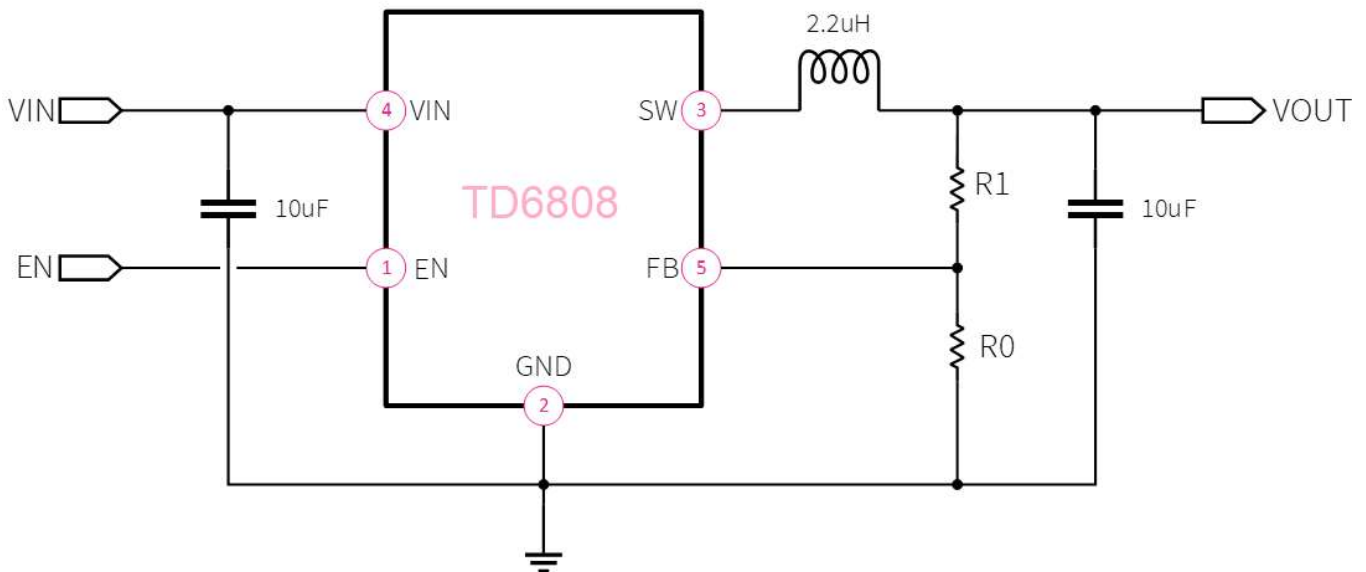
θ_{JC}	Junction-to-Case Resistance in free air	75	°C/W
T_J	Operating Junction Temperature	-40 to 125	°C
T_{STG}	Storage Temperature	-55 ~ 150	°C
T_{SDR}	Maximum Lead Soldering Temperature (10 Seconds)	260	°C

Electrical Characteristics

Unless otherwise specified, these specifications apply over $V_{IN}=5V$, $T_J = 25^\circ C$.

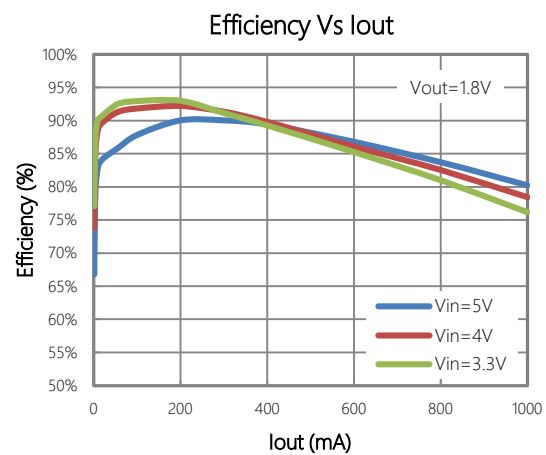
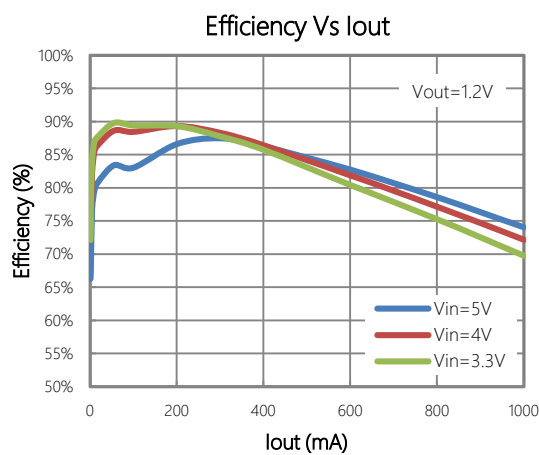
Symbol	Characteristics	Conditions	Min	Typ	Max	Units
V_{IN}	Input Voltage Range		2.7	-	5.5	V
V_{OVP}	VIN Over Voltage Protection	Input overvoltage threshold	5.8	6.0	6.5	V
UVLO		Rising	-	2.35	2.70	V
		Falling	2.15	2.50	-	V
I_Q	Quiescent Current	$V_{IN}=5V$	20	40	60	μA
I_{SD}	Shutdown Current	$V_{IN}=5V$, $V_{EN}=0V$	-	0.1	2	μA
V_{FB}	FB Pin Voltage	No load	588	600	612	mV
I_{LIM}	Current Limit	$V_{IN} = 5V$, $V_{OUT} = 3.3V$	1	1.2	-	A
	Line regulation	$V_{IN} = 3$ to 5V	-	0.2	-	%/V
	Load regulation	$I_{LOAD}=0.1-0.8A$	-	0.1	2	%/A
f_{SW}	Switching Frequency	$V_{IN}=5V$	1	1.5	2	MHz
R_{ONP}	PMOSFET $R_{DS(ON)}$	$V_{IN}=5V$	-	380	-	m Ω
R_{ONN}	NMOSFET $R_{DS(ON)}$	$V_{IN}=5V$	-	250	-	m Ω
V_{ENH}	EN input threshold ON	$V_{IN}=5V$	-	0.9	1.1	V
V_{ENL}	EN input threshold OFF	$V_{IN}=5V$	0.4	0.7	-	V
	EN input pull down resistor		-	750	-	K Ω
R_{pd}	Output discharge resistor	$V_{IN}=5V$	-	600	-	Ω
T_{SD}	Thermal Shutdown		-	150	-	°C
T_{SD_HYS}	Thermal Shutdown Protection hysteresis		-	40	-	°C

Typical Application Circuit

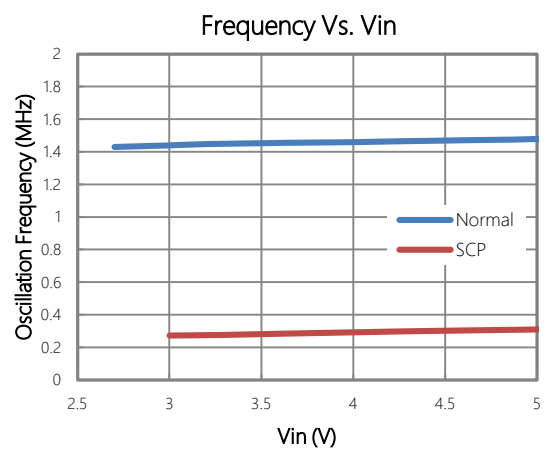
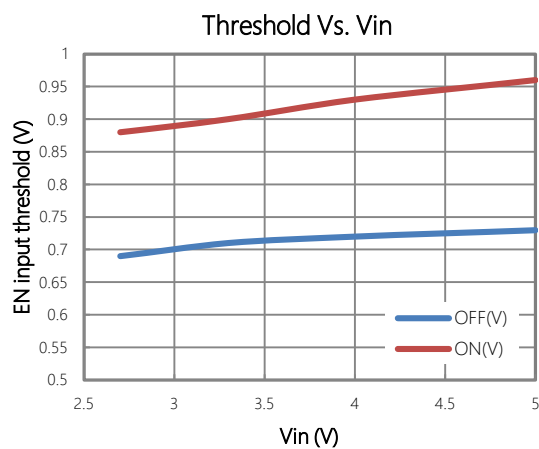
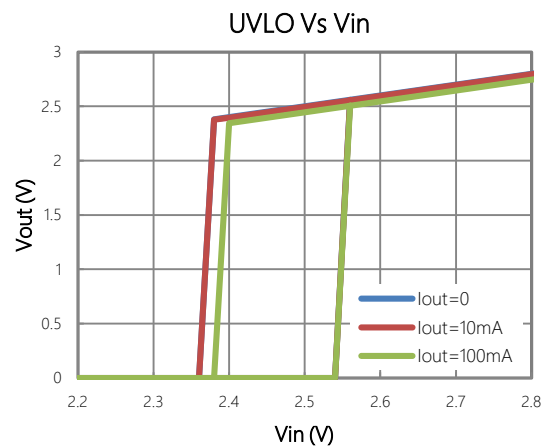
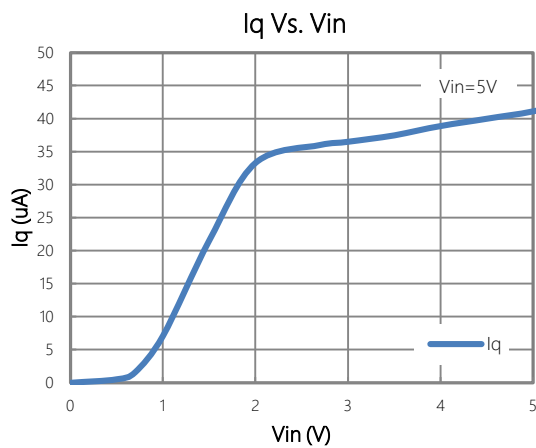
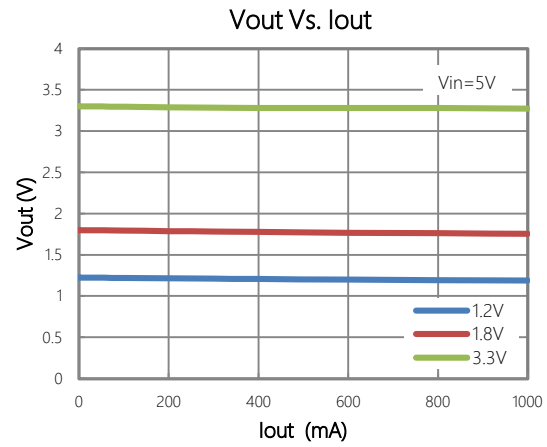
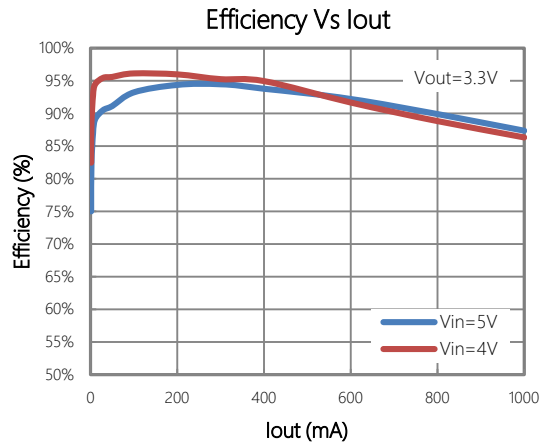


Typical Operating Characteristics

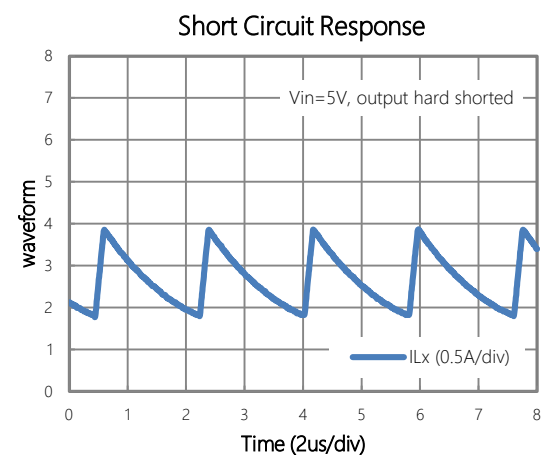
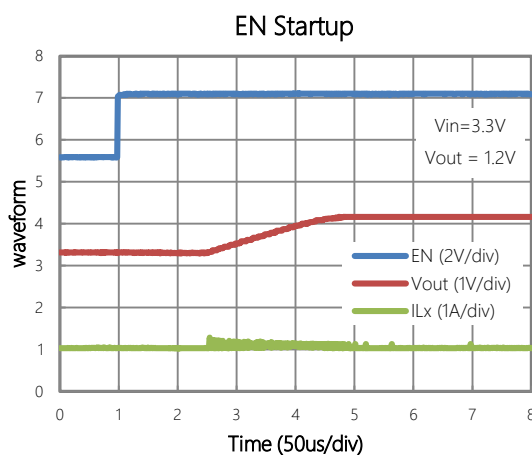
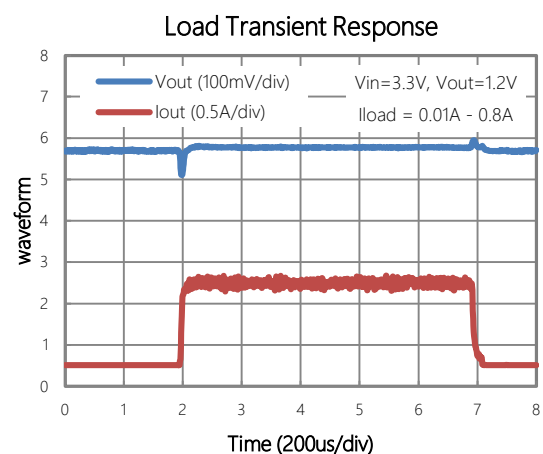
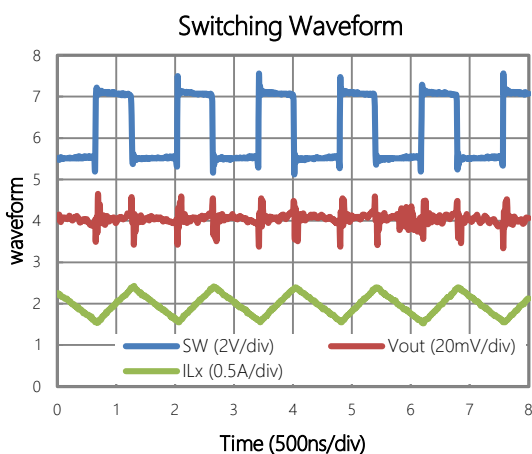
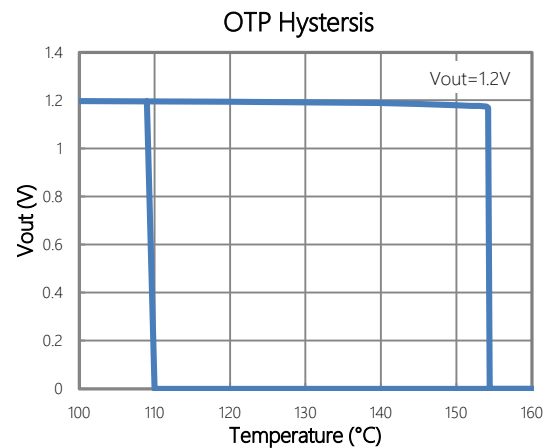
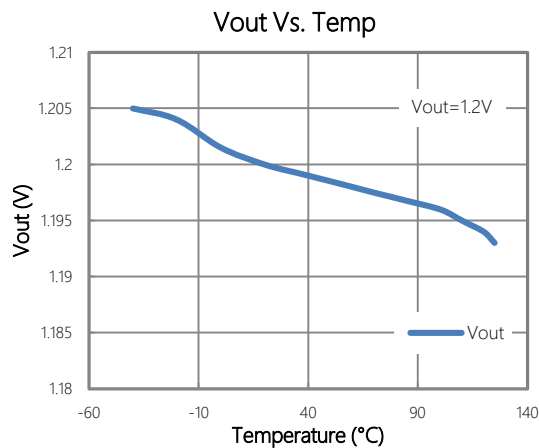
$C_{IN}=C_{OUT}=10\mu F$, $L=2.2\mu H$, $T_A=25^\circ C$, unless otherwise noted.



Typical Operating Characteristics(cont.)



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APPLICATION INFORMATION

Output Voltage Setting

TD6808's feedback voltage is set at 0.6V, and it requires a resistor from FB node to ground, named R0, which is suggested to be less than 120K. Assuming the resistor between output node and FVB node is R1, the output voltage of DC-DC converting system is given by

$$V_{out} = \frac{0.6V}{R_0} \times (R_1 + R_0)$$

Capacitor Selection

TD6808 requires one minimal 10uF MLCC capacitor at VIN node and one 10uF MLCC capacitor at VOUT node, however, it is always recommended to have two 10uF MLCC capacitors placed in parallel both at VIN and VOUT node to minimize the noise and withstand the current surge. It is also essential to place both input capacitors and output capacitors as close to TD6808's VIN pin and VOUT pin as possible. An PCB layout example is shown at PCB layout recommendation section.

Inductor Selection

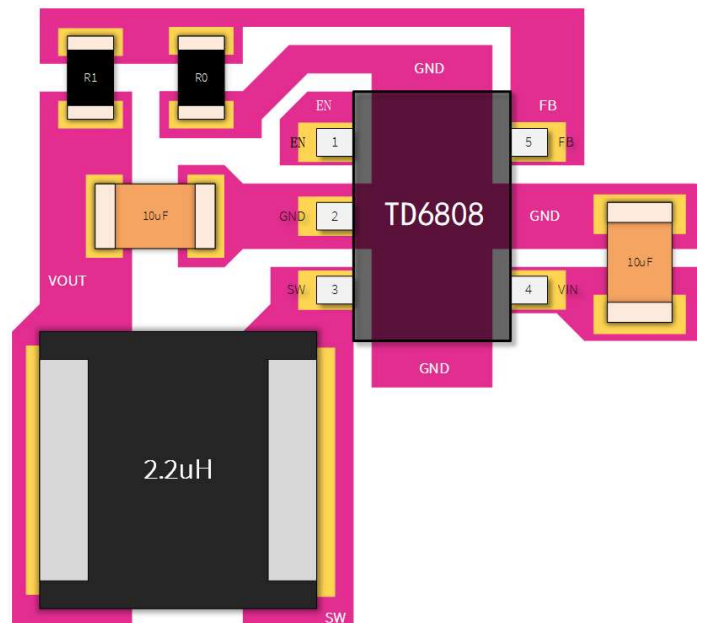
TD6808 works at a 1.5MHz oscillating frequency which helps to have a small voltage ripple at output. And 2.2uH inductor is found the most suitable value while meeting requirements on small output voltage ripple as well as a high-power conversion efficiency.

Thermal Considerations

Though TD6808 is a high efficiency DC/DC converter, there will always be some power lost during conversion, most of which becomes heat to make junction temperature higher. PCB design to ensure a good heat dissipation is important. Because the heat dissipation of the SOT23-5L package is conducted through the pin No. 2, which is GND node of TD6808, please make sure the ground plate of PCB is big enough to carry away the heat generated in the chip.

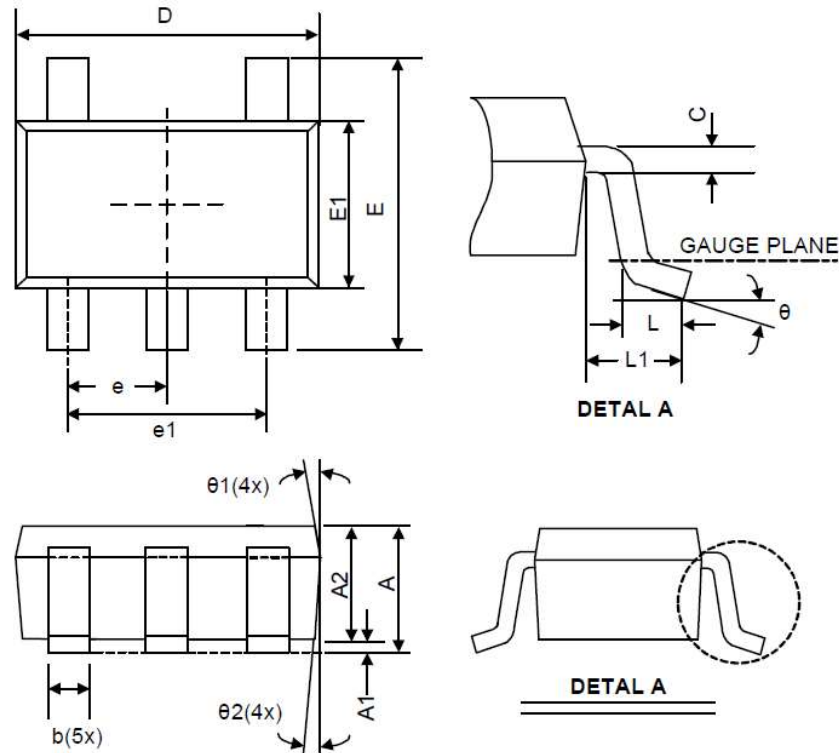
PCB Layout

An illustration of PCB layout recommendation with key elements is laid out as following. Please follow this PCB instruction to place the key peripheral devices such as input capacitors, output capacitors and inductor. And star-like connection for ground node is essential. And keeping power loop area as small as possible will improve the EMI performance.



Package Information

SOT23-5 Package Outline Dimensions



Symbol	Dimensions in Millimeters			Dimensions in Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	1.05	-	1.35	0.041	-	0.053
A1	0.05	-	0.15	0.002	-	0.006
A2	1.00	1.10	1.20	0.039	0.043	0.047
b	0.30	-	0.50	0.012	-	0.020
C	0.08	-	0.22	0.003	-	0.009
D	2.80	2.90	3.00	0.110	0.114	0.118
E1	1.50	1.60	1.70	0.059	0.063	0.067
E	2.60	2.80	3.00	0.102	0.110	0.118
L	0.30	-	0.60	0.012	-	0.024
L1	0.50	0.60	0.70	0.020	0.024	0.028
e1	1.80	1.90	2.00	0.071	0.075	0.079
e	0.85	0.95	1.05	0.033	0.037	0.041
θ	0°	4°	8°	0°	4°	8°
θ1	5°	10°	15°	5°	10°	15°
θ2	5°	10°	15°	5°	10°	15°

Design Notes