

**4X Linear Fan Driver for 12V DC Fan****Features**

- VO Follows 4.0 Times of VSET
- 0.5V Dropout @ 0.5A
- Over Current and Over Temperature Protection
- Enable Pin
- 100 μ A Quiescent Current in Shutdown
- Power TO-252-5, SOP-8 with power pad Package

Applications

- Notebook Computer Fan Driver
- Projector Cooling Fan
- Battery Powered Systems
- Motherboards
- Peripheral Cards

General Description

The G9941 is a high performance positive voltage regulator designed for use in applications requiring very low dropout voltage at up to 0.5 Amps. The G9941 VO output voltage follows the 4.0 times of VSET voltage until it reaches VIN voltage. The VSET voltage must be larger than 1V to guarantee VO 4.0 times of VSET. An enable pin further reduces power dissipation while shut down. The G9941 provides excellent regulation over variations in line, load and temperature.

The G9941 is available in the power TO-252-5 and SOP-8 with power pad package.

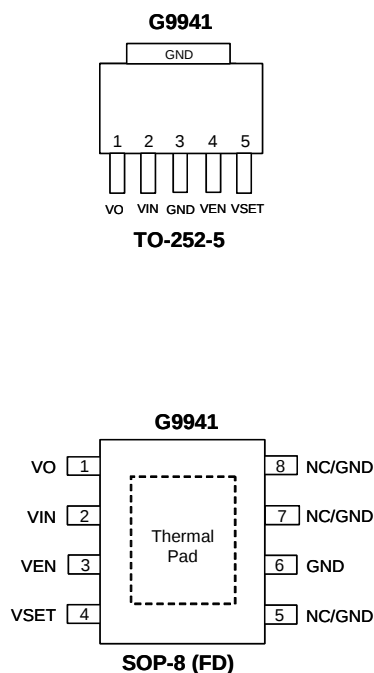
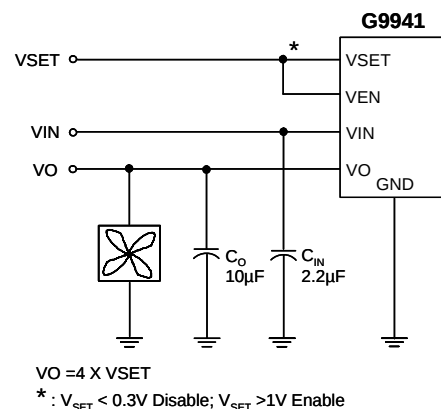
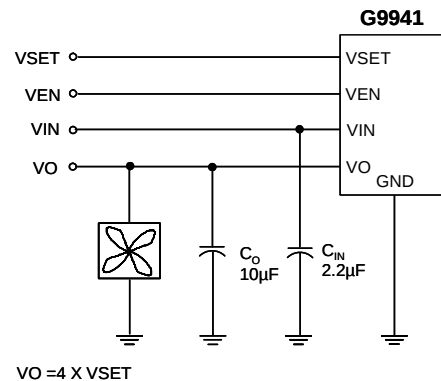
Ordering Information

ORDER NUMBER	MARKING	TEMP. RANGE	PACKAGE (Green)
G9941TJ1U	G9941	-40°C ~ +85°C	TO-252-5
G9941F11U	G9941	-40°C ~ +85°C	SOP-8 (FD)

Note: TJ: TO-252-5 F1: SOP (FD)

1: Bonding Code

U: Tape & Reel

Pin Configuration**Typical Application Circuit**

**Absolute Maximum Ratings** (Note 1)

Input Voltage17V
 V_{SET} , V_{EN} Voltage.....6V
 Power Dissipation Internally Limited (Note 2)
 Maximum Junction Temperature150°C
 Storage Temperature Range . . . -65°C ≤ T_J ≤ +150°C
 Reflow Temperature (soldering, 10sec).260°C
 Thermal Resistance Junction to Ambient, (θ_{JA}) (Note 3)
 TO-252-5 100°C/W

SOP-8 (FD) 110°C/W
 Thermal Resistance Junction to Case, (θ_{JC})
 TO-252-512°C/W
 SOP-8 (FD)12°C/W
 ESD Rating (Human Body Model)2kV
 Input Voltage8V ~15V
 Temperature Range -40°C ≤ T_A ≤ +85°C

Electrical Characteristics

$V_{SET}=2V$, $V_{EN}=5V$, $V_{IN}=13V$, $I_O=0.5A$, $C_{IN}=2.2\mu F$, $C_{OUT}=10\mu F$, $T_A=T_J=25^\circ C$.

The device is not guaranteed to function outside its operating conditions. Parameters with MIN and/or MAX limits are 100% tested at +25°C, unless otherwise specified.

PARAMETER	CONDITION	MIN	TYP	MAX	UNIT
VIN					
Supply Voltage Range		8	---	15	V
Quiescent Current	$V_{EN} = 5V$	---	3	--	mA
	$V_{EN} = 0V$	---	100	--	μA
VO					
Output Voltage/ V_{SET} voltage	$V_{SET} = 2V$	7.76	8	8.24	V/V
Line Regulation	$V_{IN} = 9V$ to 14V	---	0.1	0.5	%
Load Regulation	$V_{SET} = 3V$ 10mA ≤ I_O ≤ 0.5A	---	0.5	2	%
Output Resistance	$I_O = 0.5A$, $V_{SET} = 4V$	---	0.7	---	Ω
Short Circuit Current		---	0.2	---	A
VSET					
Minimum V_{SET} voltage		---	1	5.5	V
V_{SET} pin Current		---	100	---	nA
VEN					
V_{EN} Voltage High		1	---	---	V
V_{EN} Voltage Low		---	---	0.3	V
V_{EN} pin Bias Current	$V_{EN} = 0V$	---	3	---	μA
Over Temperature Protection					
Over Temperature		---	150	---	°C
Over Temperature Hysteresis		---	25	---	°C

Note 1: Absolute Maximum Ratings are limits beyond which damage to the device may occur. Operating Conditions are conditions under which the device functions but the specifications might not be guaranteed. For guaranteed specifications and test conditions see the Electrical Characteristics.

Note2: The maximum power dissipation is a function of the maximum junction temperature, T_{Jmax}; total thermal resistance, θ_{JA}, and ambient temperature T_A. The maximum allowable power dissipation at any ambient temperature is (T_{Jmax}-T_A) / θ_{JA}. If this dissipation is exceeded, the die temperature will rise above 150°C and IC will go into thermal shutdown.

Note3: The package is placed on a 2-layer PCB (1oz/1oz) with minimum footprint.

Definitions**Line Regulation**

The change in output voltage for a change in input voltage. The measurement is made under conditions of low dissipation or by using pulse techniques such that average chip temperature is not significantly affected.

Load Regulation

The change in output voltage for a change in load current at constant chip temperature. The measurement is made under conditions of low dissipation or by

using pulse techniques such that average chip temperature is not significantly affected.

Maximum Power Dissipation

The maximum total device dissipation for which the regulator will operate within specifications.

Quiescent Bias Current

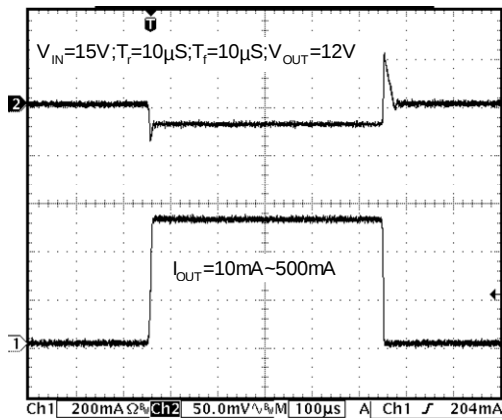
Current which is used to operate the regulator chip and is not delivered to the load.



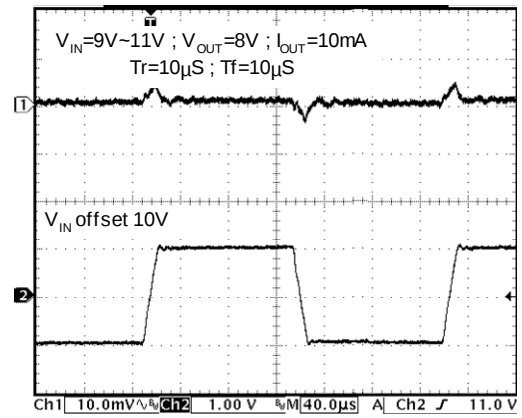
Typical Performance Characteristics

$V_{SET}=2V$, $V_{EN}=5V$, $V_{IN}=12V$, $I_O=0.5A$, $C_{IN}=2.2\mu F$, $C_{OUT}=10\mu F$, $T_A=T_J=25^\circ C$.

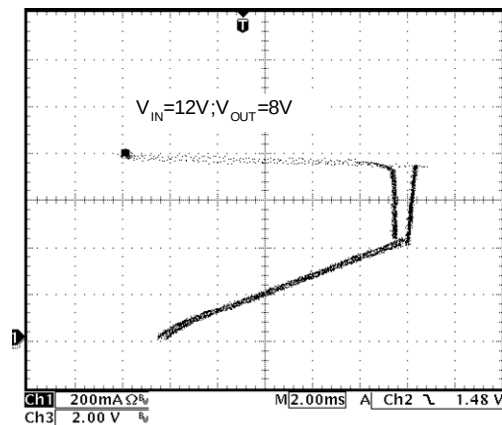
Load Transient



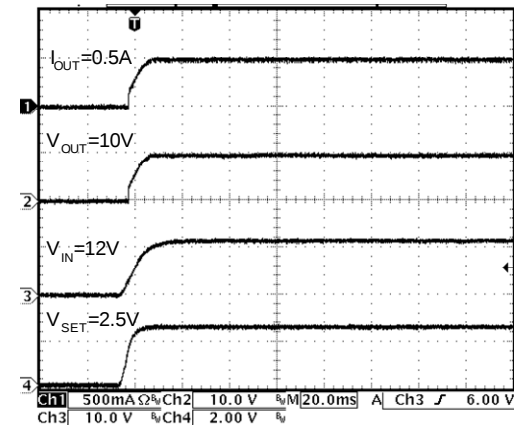
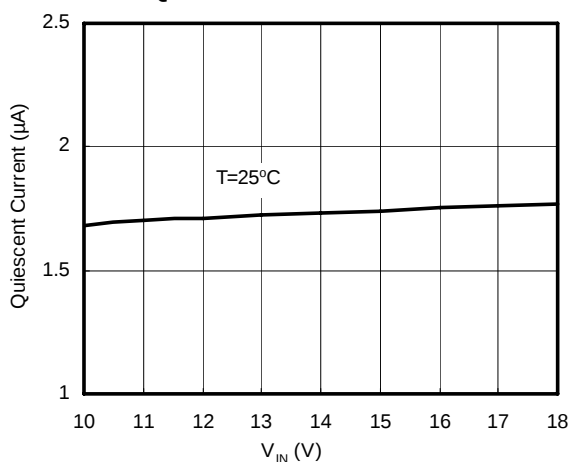
Line Transient



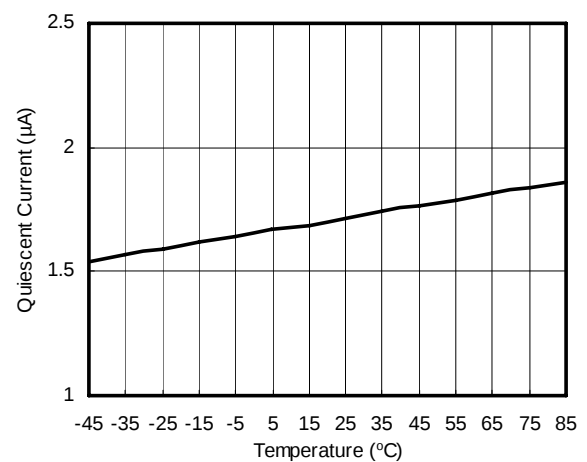
Overcurrent Protection Characteristics



Start Up

Quiescent Current vs. V_{IN} 

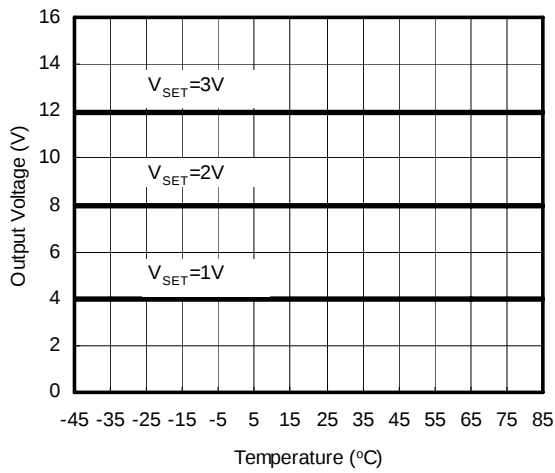
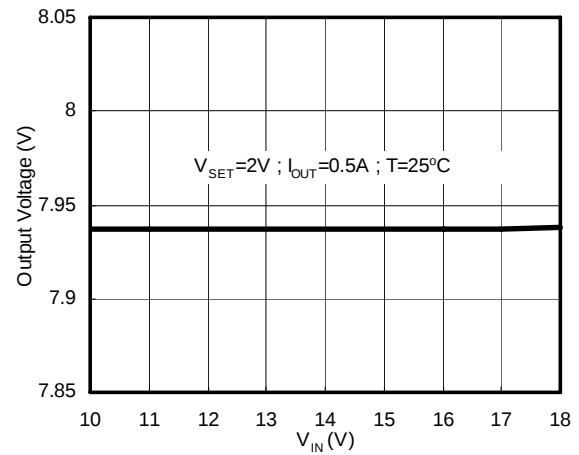
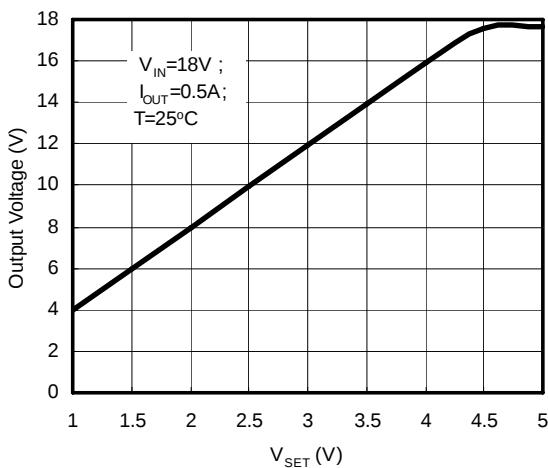
Quiescent Current vs. Temperature



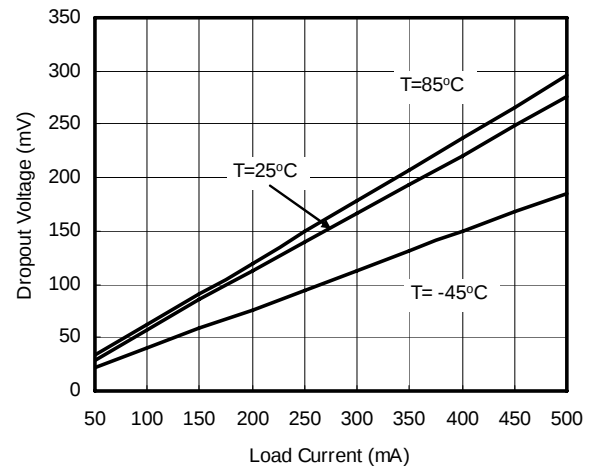


Typical Performance Characteristics (continued)

Output Voltage vs. Temperature

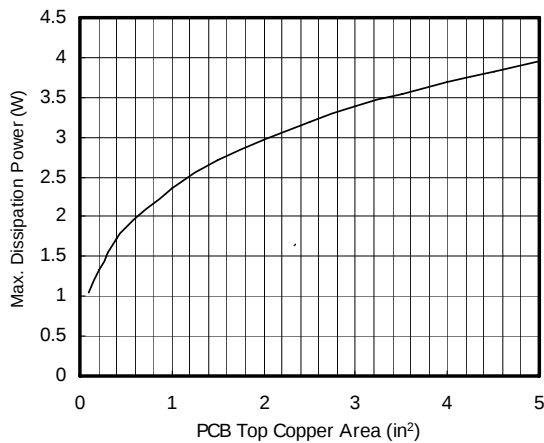
Output Voltage vs. V_{IN} Output Voltage vs. V_{SET} 

Dropout Voltage vs. Load Current

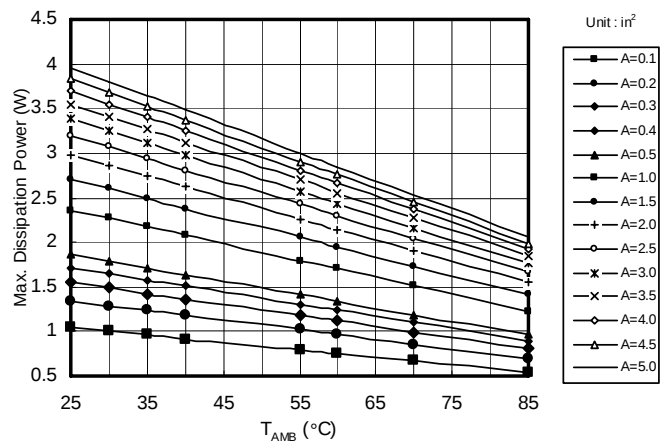


Typical Performance Characteristics (continued)

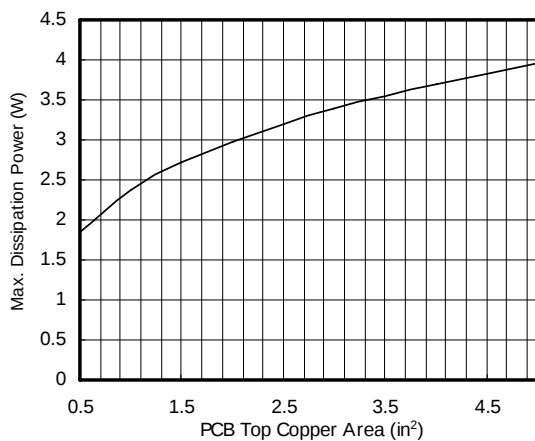
TO-252 Max. Power Dissipation vs.
PCB Top Copper Area
 $T_{AMB} = 25^{\circ}\text{C}$; Still Air



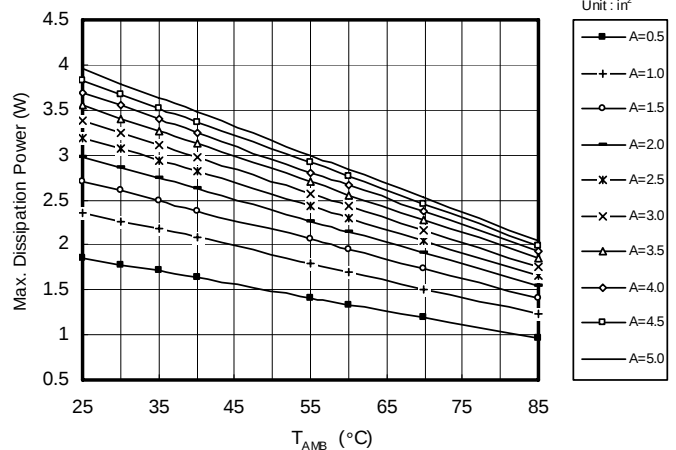
TO-252 Max. Power Dissipation
vs. T_{AMB} (still air)
(Different PCB Top Copper Area)



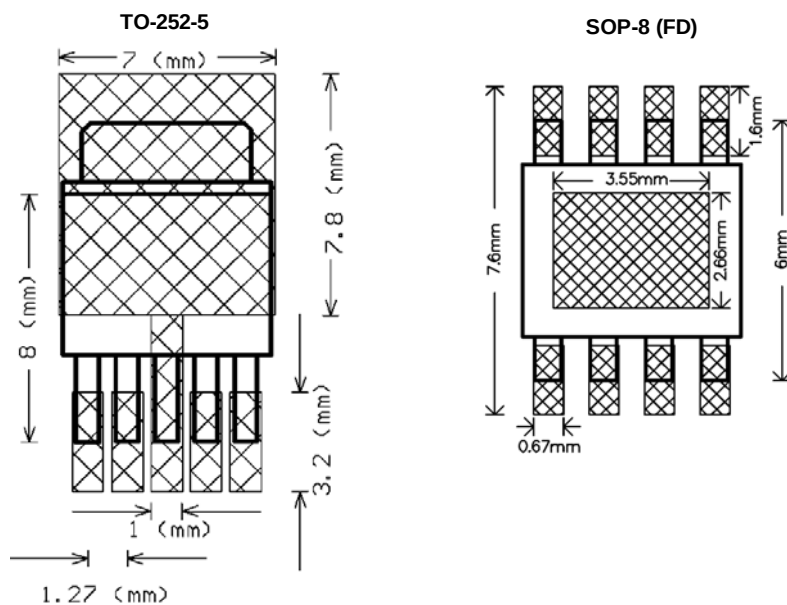
SOP-8 (FD) Max. Power Dissipation vs.
PCB Top Copper Area
 $T_{AMB} = 25^{\circ}\text{C}$; Still Air



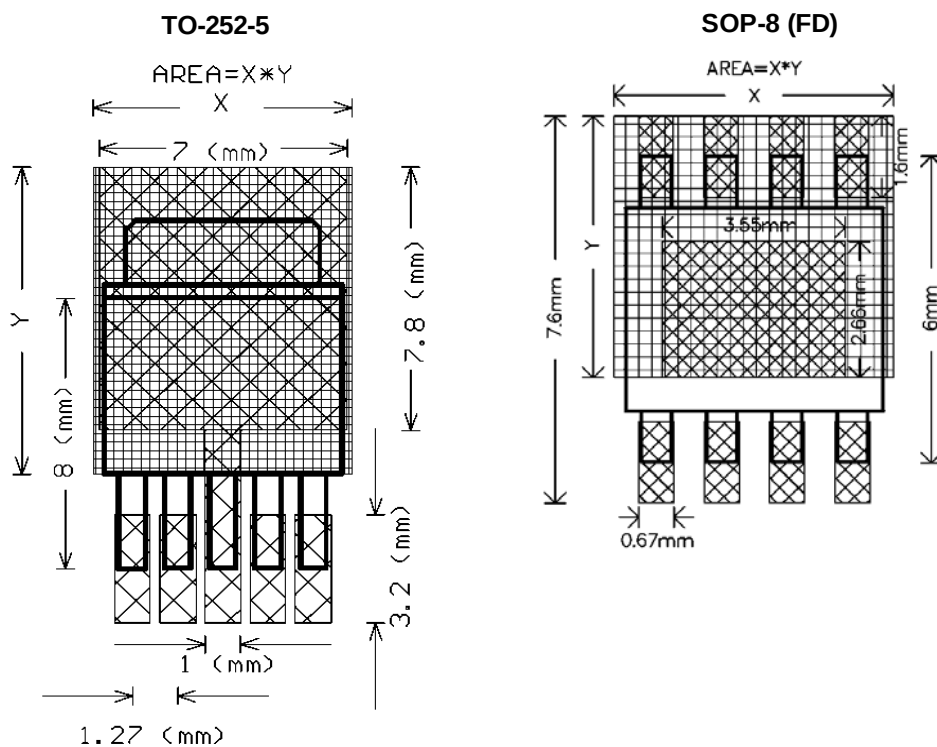
SOP-8 (FD) Max. Power Dissipation
vs. T_{AMB} (still air)
(Different PCB Top Copper Area)



Recommended Minimum Footprint

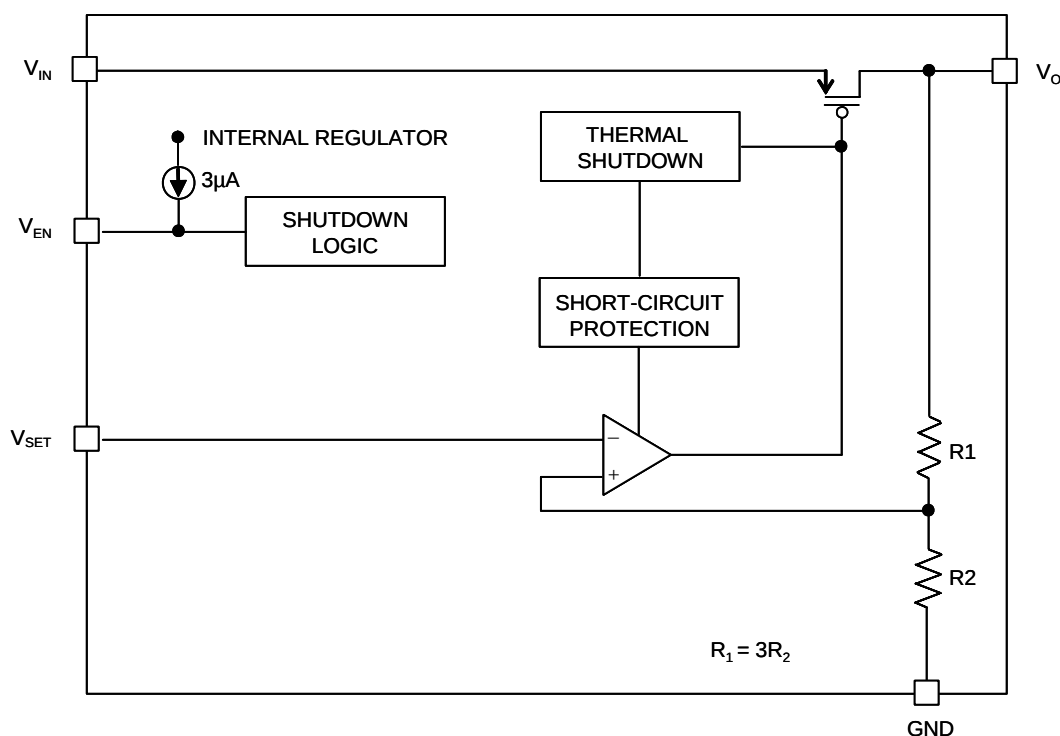


Recommended Ground Layout for Power Dissipation

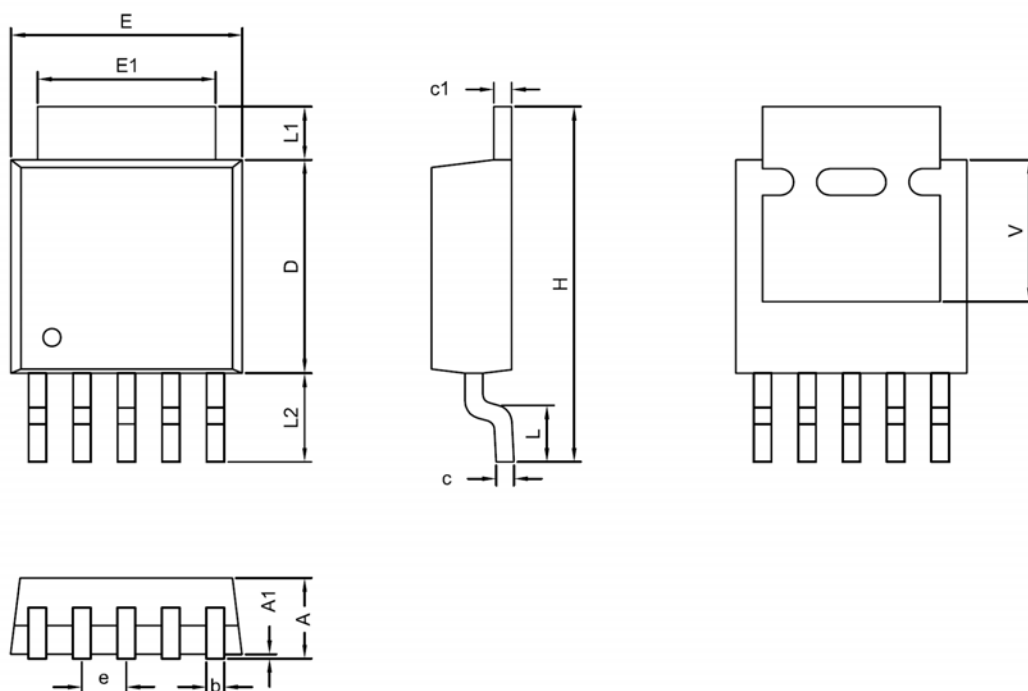


**Pin Description**

PIN		NAME	FUNCTION
TO-252-5	SOP-8 (FD)		
1	1	VO	The pin is the power output of the device. Its voltage is 4.0 times of VSET.
2	2	VIN	Input voltage.
4	3	VEN	Enable Input. Pulling this pin below 0.3V turns the regulator off, reducing the quiescent current to a fraction of its operating value. Internal weakly pull-high is implemented. If let this pin open, it is still activated.
5	4	VSET	This pin sets the output voltage. Its voltage must be larger than 1V to guarantee VO 4.0 times of VSET.
3	6	GND	Reference ground. Use all four pins on the SO-8 device for heatsinking.
	5,7,8	NC/GND	This pin is no internal connection and should connect to the Ground for power dissipation.
	Thermal Pad		Recommend connecting the Thermal Pad to the GND for excellent power dissipation.

Block Diagram

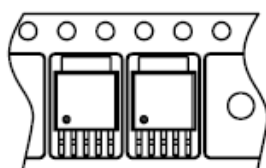
Package Information



TO-252-5 (TJ) Package

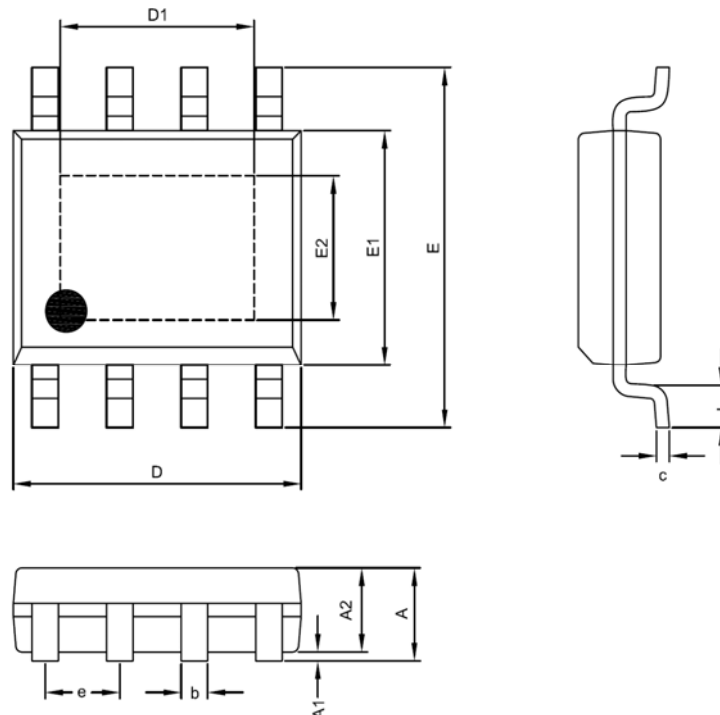
Symble	DIMENSION IN MM			DIMENSION IN INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	2.19	2.30	2.38	0.086	0.091	0.094
A1	0.02	---	1.27	0.001	---	0.050
D	5.30	5.90	6.40	0.209	0.232	0.252
E	6.35	6.50	6.80	0.250	0.256	0.268
E1	5.20	5.35	5.50	0.205	0.211	0.217
c	0.40	0.50	0.60	0.016	0.020	0.024
c1	0.40	0.50	0.60	0.016	0.020	0.024
b	0.55	0.70	0.85	0.022	0.028	0.033
e	1.27 BSC			0.050 BSC		
L	1.00	1.60	1.80	0.039	0.063	0.071
L1	0.50	1.20	1.80	0.020	0.047	0.071
L2	2.40	2.60	2.80	0.094	0.102	0.110
H	9.20	9.80	10.40	0.362	0.386	0.410
V	3.80	---	4.32	0.150	---	0.170

Taping Specification



Feed Direction

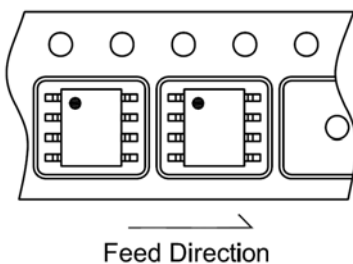
PACKAGE	Q'TY/REEL
TO-252-5	2,500 ea



SOP- 8 (FD) Package

Symble	DIMENSION IN MM			DIMENSION IN INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	1.35	1.55	1.65	0.053	0.061	0.065
A1	0.00	---	0.15	0.000	---	0.006
A2	1.15	1.35	1.50	0.045	0.053	0.059
D	4.80	4.90	5.00	0.189	0.192	0.197
D1	2.29	---	3.71	0.090	---	0.146
E	5.80	6.00	6.20	0.228	0.236	0.244
E1	3.80	3.90	4.00	0.150	0.153	0.157
E2	2.29	---	2.64	0.090	---	0.104
c	0.19	0.23	0.27	0.007	0.009	0.011
b	0.33	0.43	0.53	0.013	0.017	0.021
e	1.27 BSC			0.050 BSC		
L	0.40	0.70	1.00	0.016	0.028	0.039

Taping Specification



PACKAGE	Q'TY/REEL
SOP-8 (FD)	2,500 ea

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