

Features

- Wide 4.75V to 30V Input Voltage Range
- 3.3V,5V,12V, and adjustable versions
- Output Adjustable from 1.23V to 28V
- Maximum Duty Cycle 100%
- Minimum Drop Out 1.5V
- Fixed 150KHz Switching Frequency
- 3A Constant Output Current Capability
- Internal Optimize Power Transistor
- Up to 90% Efficiency
- Excellent line and load regulation
- TTL shutdown capability
- Built in Frequency Compensation
- Built in Thermal Shutdown Function
- Built in Current Limit Function
- Built in Short Protection Function
- Available in TO-252 package

Applications

- LCD Monitor and LCD TV
- Digital Photo Frame
- Set-up Box
- ADSL Modem
- Telecom / Networking Equipment

General Description

The XL1507 is a 150 KHz fixed frequency PWM buck (step-down) DC/DC converter, capable of driving a 3A load with high efficiency, low ripple and excellent line and load regulation. Requiring a minimum number of external components, the regulator is simple to use and include internal frequency compensation and a fixed-frequency oscillator.

The PWM control circuit is able to adjust the duty ratio linearly from 0 to 100%. An enable function, an over current protection function and a short circuit protection function are built inside. When OCP or SCP happens, the operation frequency will be reduced from 150KHz to 50KHz. An internal compensation block is built in to minimize external component count.

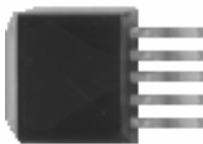


Figure1. Package Type of XL1507 (TO252-5L)

Pin Configurations (TO252-5L)

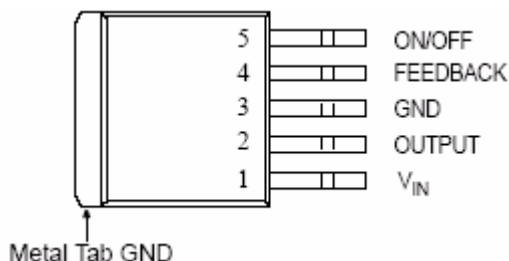


Figure2. Pin Configuration of XL1507 (Top View)

Table 1 Pin Description

| Pin Number | Pin Name | Description |
|------------|----------|--|
| 1 | Vin | Supply Voltage Input Pin. XL1507 operates from a 4.75V to 30V DC voltage. Bypass Vin to GND with a suitably large capacitor to eliminate noise on the input. |
| 2 | Output | Power Switch Output Pin (SW). Output is the switch node that supplies power to the output. |
| 3 | GND | Ground Pin. Care must be taken in layout. This pin should be placed outside of the Schottky Diode to output capacitor ground path to prevent switching current spikes from inducing voltage noise into XL1507. |
| 4 | Feedback | Feedback Pin (FB). Through an external resistor divider network, Feedback senses the output voltage and regulates it. The feedback threshold voltage is 1.23V. |
| 5 | ON/OFF | Enable Pin. Drive ON/OFF pin low to turn on the device, drive it high to turn it off. Floating is default low. |

Function Block

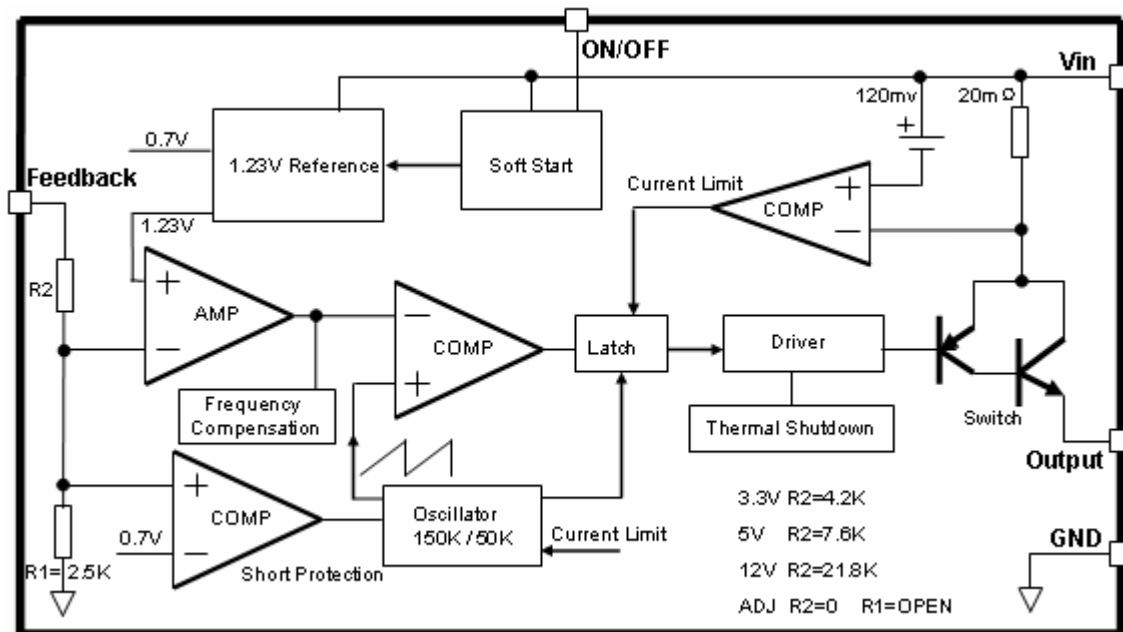


Figure3. Function Block Diagram of XL1507

Typical Application Circuit

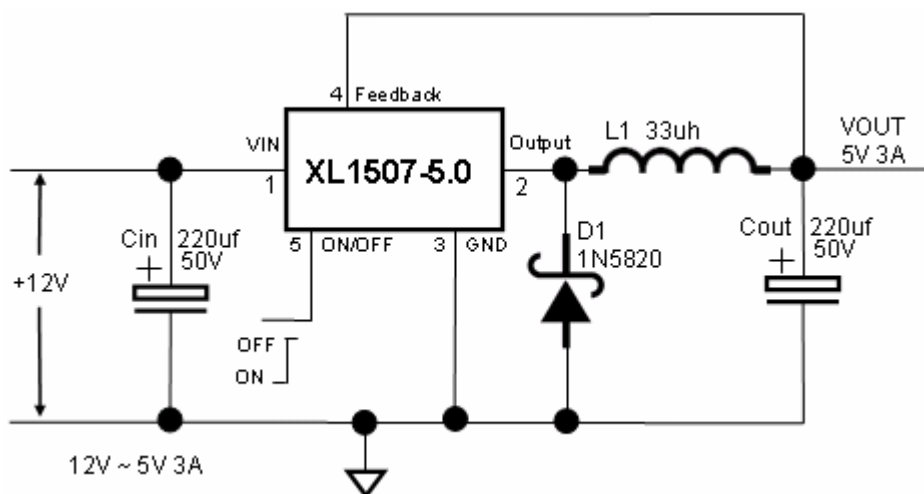


Fig4. XL1507 Typical Application Circuit 12V-5V/3A

3A 150KHz 30V Buck DC to DC Converter

XL1507

Absolute Maximum Ratings (Note1)

| Parameter | Symbol | Value | Unit |
|--|---------------------|-------------------------|------|
| Input Voltage | V _{in} | -0.3 to 32 | V |
| Feedback Pin Voltage | V _{FB} | -0.3 to V _{in} | V |
| ON/OFF Pin Voltage | V _{ON/OFF} | -0.3 to V _{in} | V |
| Output Switch Pin Voltage | V _{Output} | -0.3 to V _{in} | V |
| Power Dissipation | P _D | Internally limited | mW |
| Thermal Resistance (TO252) (Junction to Ambient, No Heatsink, Free Air) | R _{JA} | 60 | °C/W |
| Operating Junction Temperature | T _J | -40 to 125 | °C |
| Storage Temperature | T _{STG} | -65 to 150 | °C |
| Lead Temperature (Soldering, 10 sec) | T _{LEAD} | 260 | °C |
| ESD (HBM) | | 4000 | V |

Note1: Stresses greater than those listed under Maximum Ratings may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operation is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

Electrical Characteristics (DC Parameters)

V_{in} = 12V for the 3.3V,5V,and Adjustable versions and V_{in}=24V for the 12V version, GND=0V, V_{in} & GND parallel connect a 220uf/50V capacitor; I_{out}=500mA, T_a = 25 ; the others floating unless otherwise specified.

| Parameters | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|----------------------------------|---------------------|---|------|------|------|------|
| Input operation voltage | V _{in} | | 4.75 | | 30 | V |
| Shutdown Supply Current | I _{STBY} | V _{ON/OFF} =5V | | 100 | 200 | uA |
| Quiescent Supply Current | I _q | V _{ON/OFF} =Gnd, V _{FB} =V _{in} | | 2 | 5 | mA |
| Switch Current Limit | I _L | V _{FB} =0 | 3.6 | 4.8 | 6.9 | A |
| ON/OFF Pin Threshold | V _{ON/OFF} | V _{FB} =0V, V _{ON/OFF} from 0.5V~2V | | 1.3 | | V |
| ON/OFF Pin Input Leakage Current | I _H | V _{ON/OFF} =2.5V (OFF) | | 5 | 15 | uA |
| | I _L | V _{ON/OFF} =0.5V (ON) | | 0.2 | 5 | uA |
| Output Saturation Voltage | V _{CE} | V _{FB} =0V I _{out} =3A | | 1.3 | 1.6 | V |
| Max. Duty Cycle | D _{MAX} | V _{FB} =0V | | 100 | | % |

Electrical Characteristics (System Parameters 3.3V Version)

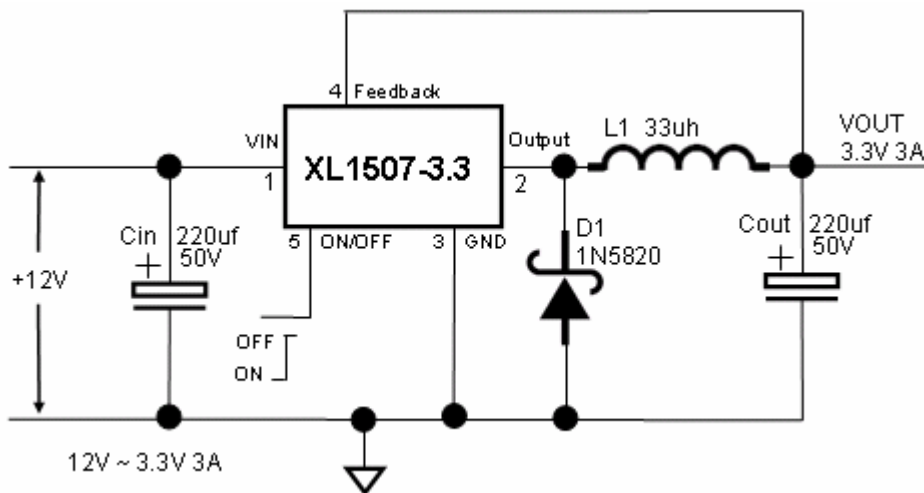


Fig5. XL1507 System Parameters Test Circuit

$T_a = 25$; unless otherwise specified.

| Parameters | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|----------------------|--------------|---|-------|------|-------|------|
| Feedback Voltage | V_{FB} | $V_{in} = 6V \text{ to } 30V$ $V_{out}=3.3V, I_{out}=0.5A$ | 3.168 | 3.3 | 3.432 | V |
| VOUT Line Regulation | R_{LINE} | $V_{in} = 6V \text{ to } 30V$ $V_{out}=3.3V, I_{out}=0.5A$ | | 0.5 | 2 | % |
| VOUT Load Regulation | R_{LOAD} | $V_{in}=12V, V_{out}=3.3V$ $I_{out}=0.2 \text{ to } 3A$ | | 0.8 | 2 | % |
| Switching Frequency | F_{output} | $V_{in}=12V, V_{out}=3.3V$ $I_{out}=0.5A$ | 127 | 150 | 173 | KHz |
| Efficiency(12V~3.3V) | η | $V_{in}=12V, V_{out}=3.3V$ $I_{out}=3A$ | - | 75 | - | % |

Electrical Characteristics (System Parameters 5V Version)

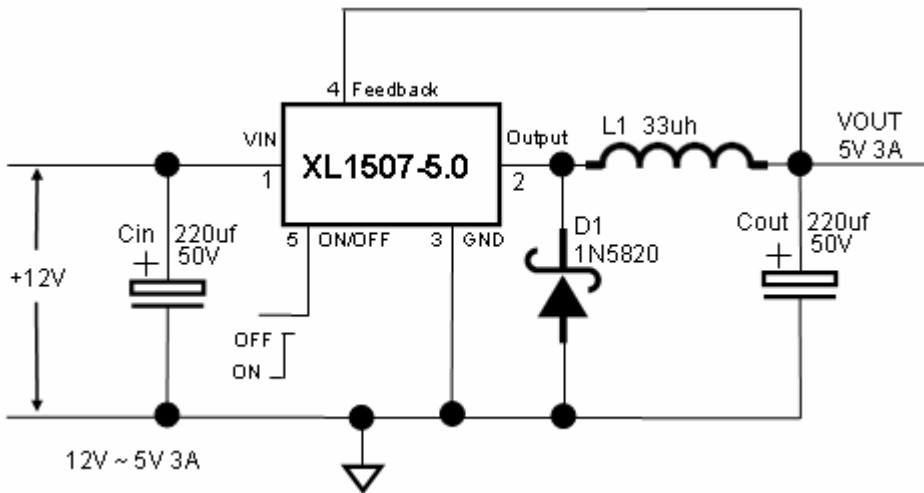


Fig6. XL1507 System Parameters Test Circuit

$T_a = 25$; unless otherwise specified.

| Parameters | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|----------------------|--------------|--|------|------|------|------|
| Feedback Voltage | V_{FB} | $V_{in} = 8V$ to $30V$ $V_{out}=5V, I_{out}=0.5A$ | 4.8 | 5 | 5.2 | V |
| VOUT Line Regulation | R_{LINE} | $V_{in} = 8V$ to $30V$ $V_{out}=5V, I_{out}=0.5A$ | | 0.5 | 2 | % |
| VOUT Load Regulation | R_{LOAD} | $V_{in}=12V, V_{out}=5V$ $I_{out}=0.2$ to $3A$ | | 0.8 | 2 | % |
| Switching Frequency | F_{output} | $V_{in}=12V, V_{out}=5V$ $I_{out}=0.5A$ | 127 | 150 | 173 | KHz |
| Efficiency(12V~5V) | η | $V_{in}=12V, V_{out}=5V$ $I_{out}=3A$ | - | 80 | - | % |

Electrical Characteristics (System Parameters 12V Version)

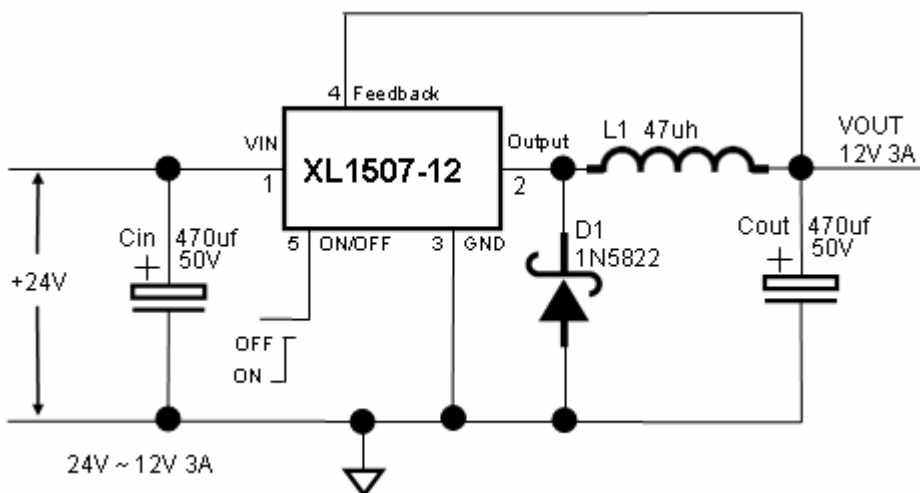


Fig7. XL1507 System Parameters Test Circuit

$T_a = 25$; unless otherwise specified.

| Parameters | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|----------------------|--------------|---|-------|------|-------|------|
| Feedback Voltage | V_{FB} | $V_{in} = 15V \text{ to } 30V$ $V_{out}=12V, I_{out}=0.5A$ | 11.52 | 12 | 12.48 | V |
| VOUT Line Regulation | R_{LINE} | $V_{in} = 15V \text{ to } 30V$ $V_{out}=12V, I_{out}=0.5A$ | | 0.6 | 2 | % |
| VOUT Load Regulation | R_{LOAD} | $V_{in}=24V, V_{out}=12V$ $I_{out}=0.2 \text{ to } 3A$ | | 0.8 | 2 | % |
| Switching Frequency | F_{output} | $V_{in}=24V, V_{out}=12V$ $I_{out}=0.5A$ | 127 | 150 | 173 | KHz |
| Efficiency(24V~12V) | η | $V_{in}=24V, V_{out}=12V$ $I_{out}=3A$ | - | 89 | - | % |

Electrical Characteristics (System Parameters ADJ Version)

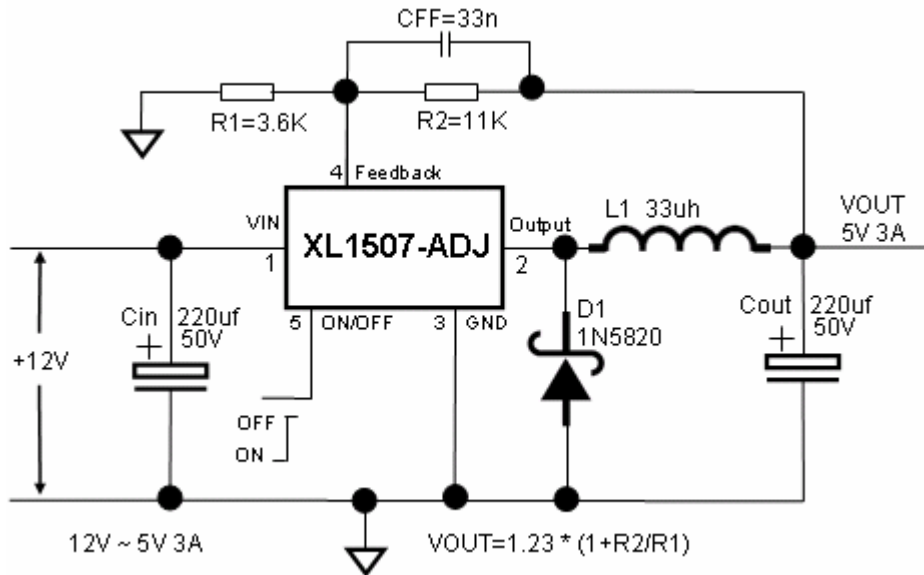


Fig8. XL1507 System Parameters Test Circuit

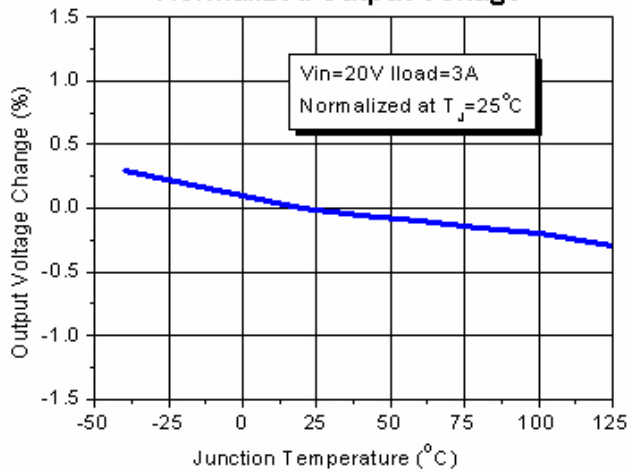
(The CFF is optional. It provides additional stability for high output voltages, low input-output voltages, and/or very low ESR output capacitors, such as solid tantalum capacitors)

T_a = 25 °C unless otherwise specified.

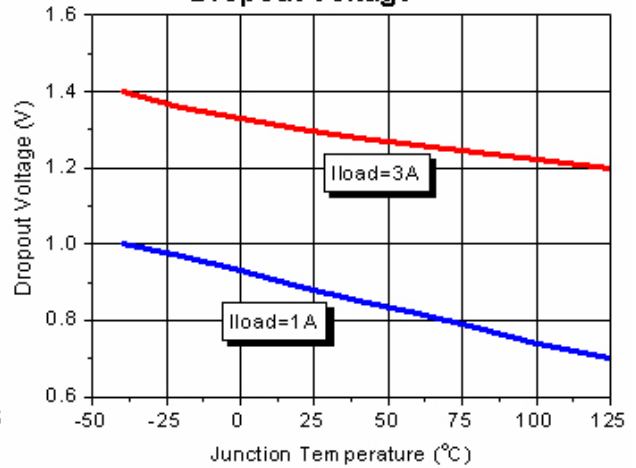
| Parameters | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|----------------------|---------------------|---|-------|------|-------|------|
| Feedback Voltage | V _{FB} | V _{in} = 8V to 30V V _{out} =5V, I _{out} =0.5A | 1.193 | 1.23 | 1.267 | V |
| VOUT Line Regulation | R _{LINE} | V _{in} = 8V to 30V V _{out} =5V, I _{out} =0.5A | | 0.5 | 2 | % |
| VOUT Load Regulation | R _{LOAD} | V _{in} =12V, V _{out} =5V I _{out} =0.2 to 3A | | 0.8 | 2 | % |
| Switching Frequency | F _{output} | V _{in} =12V, V _{out} =5V I _{out} =0.5A | 127 | 150 | 173 | KHz |
| Efficiency(12V~5V) | η | V _{in} =12V, V _{out} =5V I _{out} =3A | - | 80 | - | % |

Typical Performance Characteristics (Circuit of Figure 8)

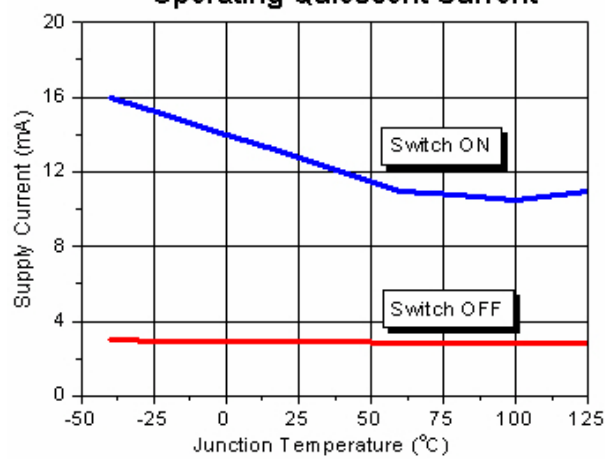
Normalized Output Voltage



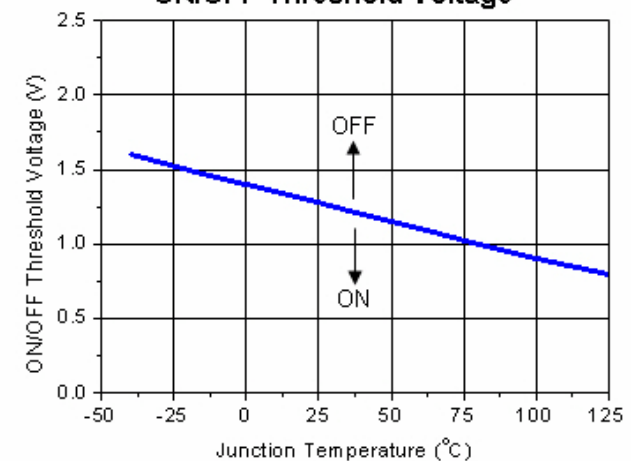
Dropout Voltage



Operating Quiescent Current

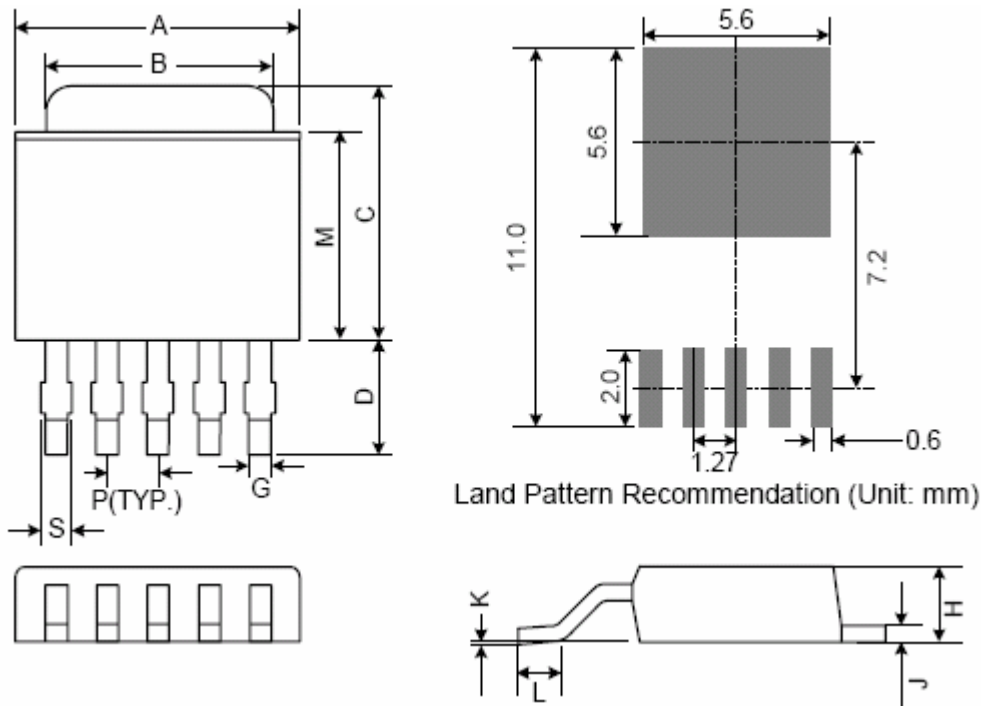


ON/OFF Threshold Voltage



Package Information

(1) TO252-5L



| Symbol | Dimensions In Millimeters | | | Dimensions In Inches | | |
|--------|---------------------------|------|------|----------------------|-------|-------|
| | Min. | Nom. | Max. | Min. | Nom. | Max. |
| A | 6.35 | 6.60 | 6.85 | 0.250 | 0.260 | 0.270 |
| B | 5.20 | 5.35 | 5.50 | 0.205 | 0.211 | 0.217 |
| C | 6.80 | 7.00 | 7.30 | 0.268 | 0.276 | 0.287 |
| D | 2.20 | 2.50 | 2.80 | 0.087 | 0.098 | 0.110 |
| P | 1.27 REF. | | | 0.050 REF. | | |
| S | 0.50 | 0.65 | 0.80 | 0.020 | 0.026 | 0.031 |
| G | 0.40 | 0.50 | 0.63 | 0.016 | 0.020 | 0.025 |
| H | 2.20 | 2.30 | 2.40 | 0.087 | 0.091 | 0.094 |
| J | 0.45 | 0.52 | 0.58 | 0.018 | 0.020 | 0.023 |
| K | 0.00 | 0.08 | 0.15 | 0.000 | 0.003 | 0.006 |
| L | 0.90 | 1.20 | 1.63 | 0.035 | 0.047 | 0.064 |
| M | 5.40 | 5.80 | 6.20 | 0.213 | 0.228 | 0.244 |