3TL76K **3A-60V LED Step-Down Converter**

March 2011 - revised February 2012

GENERAL DESCRIPTION

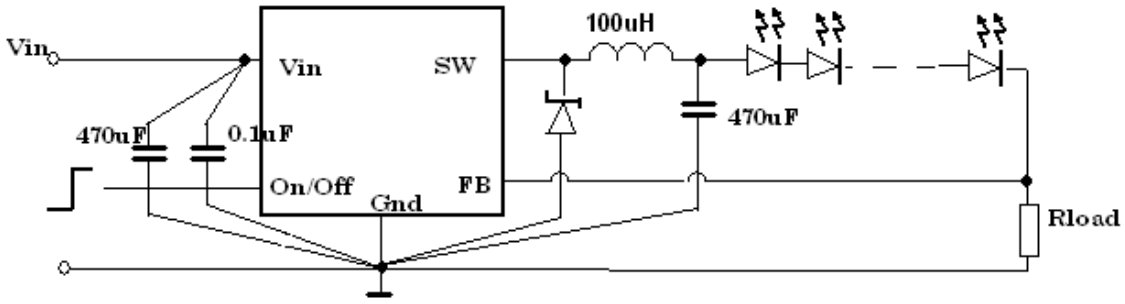
3TL76K is the monolithic IC designed for a step-down DC/DC converter capable of driving 3A load without an additional transistor. The input voltage range is up to 60V. Its feedback voltage, V_{FB}, is 200mV. The 3TL76K operates at a switching frequency of 52kHz. The external shutdown function is controlled by a logic level on the ON/OFF pin and then the circuit comes into the standby mode with I_{STBY}~50μA (typ.). The ON/OFF pin may be used for the analog dimming. As the voltage on the ON/OFF pin is increased from 0.07V to 0.67V, the voltage on the FB pin falls from 200mV to 0.
The self-protection features include a cycle-by-cycle current limit and a thermal protection.
The 3TL76K is available in standard TO-220, TO-263 packages and SOP-8 package (for I_{LOAD} < 2.1A).

FEATURES

- $V_{IN\ Max}$ = 60V
- V_{FB} = 200mV
- Frequency 52kHz
- $I_{LED\ Max}$ 3A
- On/Off input may be used for the Analog Dimming
- Thermal protection
- Cycle-by-cycle current limit
- I_{LOAD} max =3A
- V_{OUT} from 0.2V to 55V

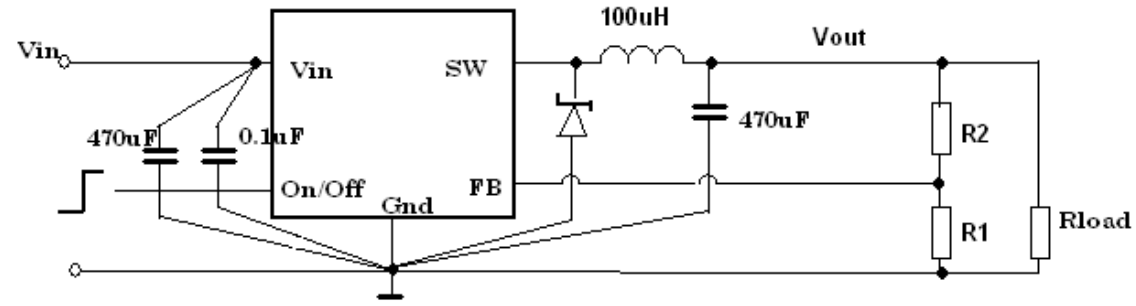
TYPICAL APPLICATION

LED Step-Down Converter



Iled=200mV/Rload

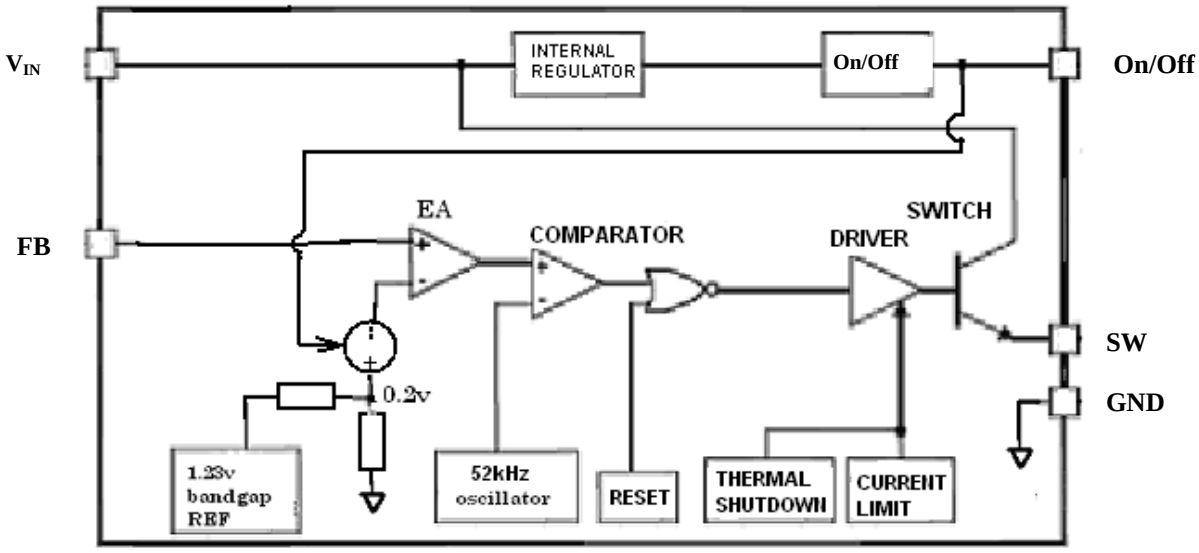
DC-DC Step-Down Converter



Vout=200mV×(1+R2/R1)
R1<10kOhm

C_{IN}, C_{OUT}, L should be kept close to the pins. Keep the feedback wiring away from the inductor flux.

BLOCK DIAGRAM



PIN ASSIGNMENT

PIN	SOP-8 (SO-8 is used at I_{LED} < 2.1A)	TO-220, TO-263
1	V_{IN}	V_{IN}
2	SW	SW
3	FB	GND
4	On/Off and Dimming	FB
5 to 8	GND	On/Off and Dimming (pin 5)

ABSOLUTE MAXIMUM RATING

$V_{IN\ Max}$	V_{IN}	63V
On/Off pin input voltage	$V_{On/Off}$	-0.3V to V_{IN}
FB (Feedback) pin voltage	V_{FB}	-0.3V to V_{IN}
SW voltage (Min)	V_{SW}	-0.8V
Minimum ESD rating, HBM (C = 100pF, R = 1.5k)	ESD	2000V
Maximum junction temperature	$T_{J\ Max}$	150°C

OPERATING RATINGS

Operating $V_{IN\ Max}$	V_{IN}	60V
Operating temperature range	T_{Op}	-40°C to +125°C

ELECTRICAL CHARACTERISTICS

V_{IN} = 12V, I_{LOAD} = 350mA, unless otherwise specified.

SYMBOL	PARAMETER	CONDITION	T_J,°C	MIN	TYP	MAX	UNITS
V_{FB}	Feedback voltage	V_{IN} = 12V, I_{LOAD} = 350mA, On/Off = 0	25	190	200	210	mV
		5.5V < V_{IN} < 60V; 0.2A < I_{LOAD} < 3A, On/Off = 0 (**Note 1**)	25	184		216	
			-40°C to +125°C	180		220	
η	Efficiency	V_{IN} = 12V, I_{LOAD} = 3A	25		65		%
I_{FB}	FB input current	V_{FB}=250mV, On/Off = 0	25	-150	-50	150	nA
			-40°C to +125°C	- 500		500	
F_{OSC}	Oscillator frequency		25	47	52	58	kHz
			-40°C to +125°C	42		63	
V_{SAT}	Saturation voltage	I_{SW} = 3A	25		1.35	1.50	V
			-40°C to +125°C			1.70	
CL	Current limit		25	3.7	5	6.7	A
$DC_{(Max)}$	Max duty cycle		25	100	100		%
I_{Lo}	SW leakage current	V_{IN} =60V, Vsw = 0, V_{FB} = 1.5V	25	-0.3	-0.07		mA
		V_{IN} = 60V, Vsw = - 1V, V_{FB} = 1.5V	25	-30	-8		mA
V_{TH} On/Off	Threshold voltage On/Off		25	1.0	1.4	2.0	V
			-40°C to +125°C	0.8		2.2	
I_{IH}	Input current On/Off	$V_{On/Off}$ = 2.5V	25	-5	0.01	5	µA
I_{IL}		$V_{On/Off}$ = 0V	25	-2	-0.3		µA
I_Q	Quiescent current	V_{FB} = 1.5V	25		5.3	10	mA
I_{STBY}	Standby current	$V_{On/Off}$ = 5V, V_{IN} = 60V	25		50	200	µA
$V_{On/Off}$	Dimming voltage (On/Off pin)	I_{LED} =0, V_{IN} = 12V	25	600	670	750	mV

Note 1. LED must be ensured with load current (I_{LOAD}) at $V_{IN\ Min}$.

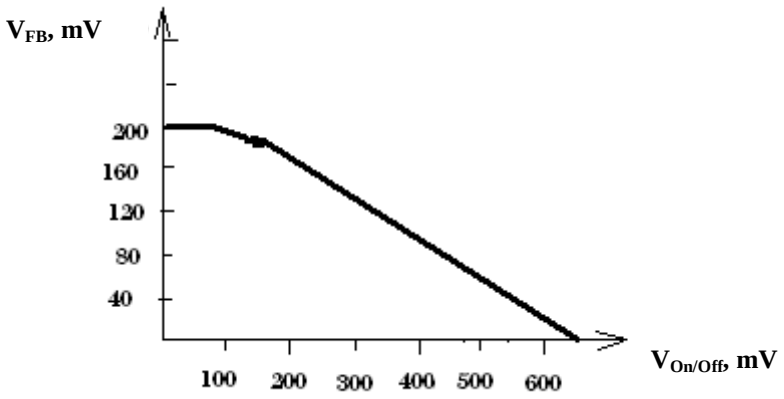
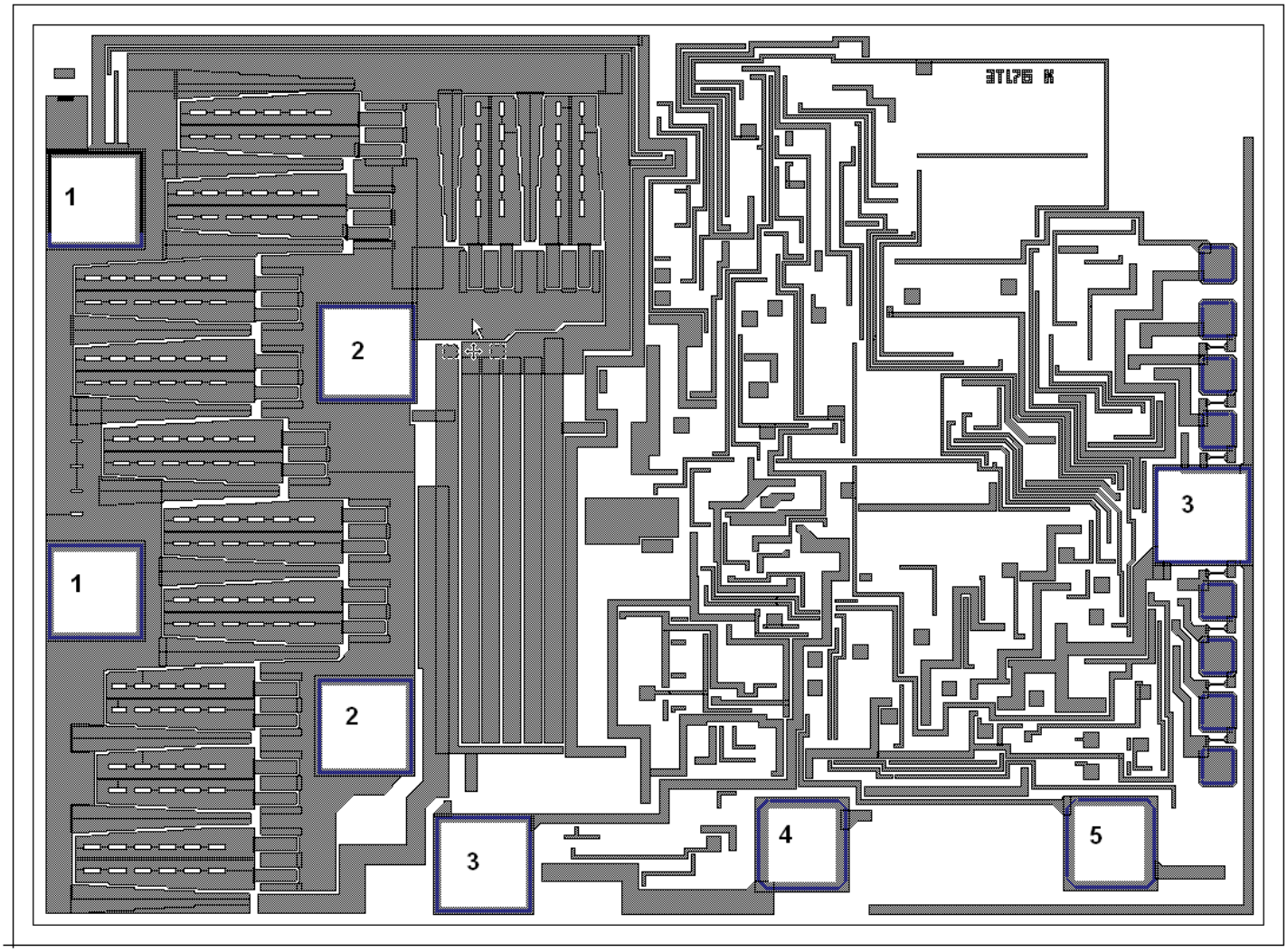


Fig.1. Dimming voltage (typical), $V_{FB} = f(V_{On/Off})$

3TL76K PAD LOCATION



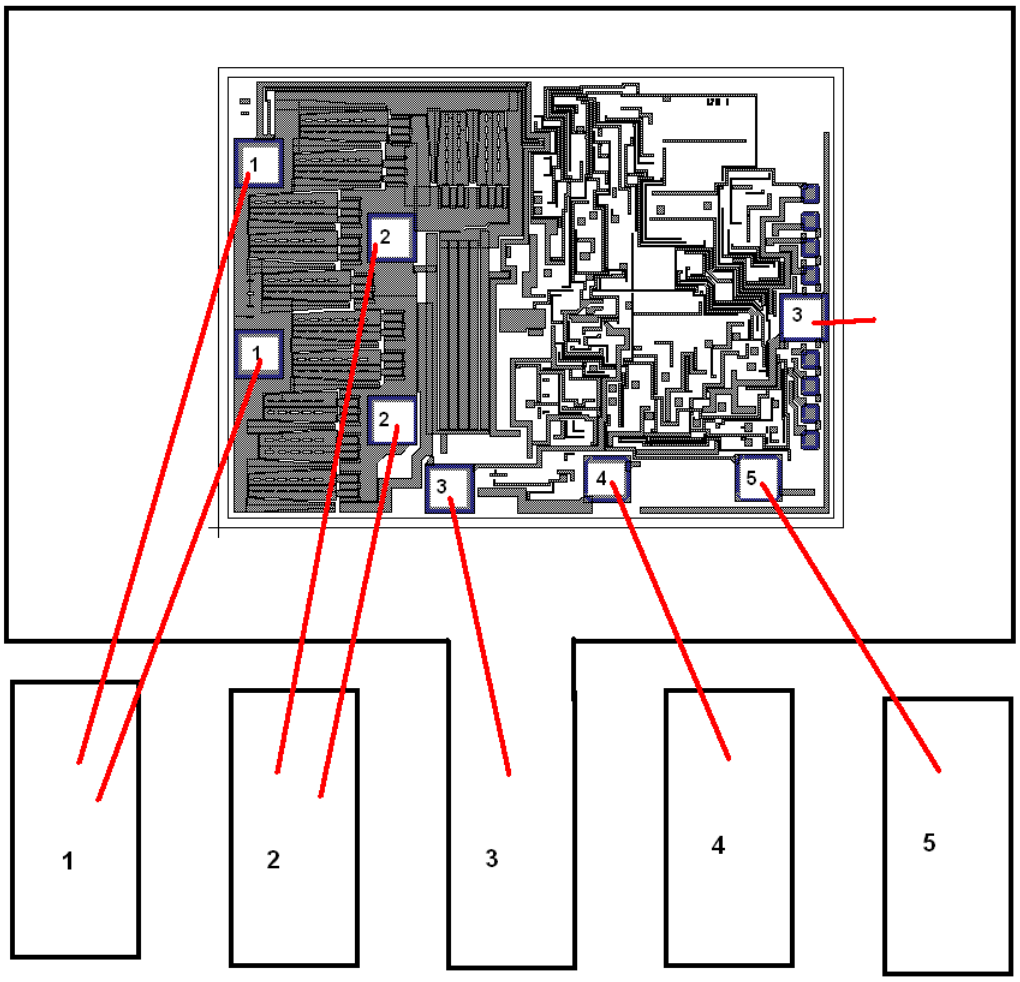
Chip size: 2.54 mm x 1.87 mm

PAD NAMES, SIZES AND COORDINATES

PAD	NAME	COORDINATES, µm		PAD SIZE, µm
		X	Y	
1	V_{IN}	165	1485	190 x 190
1	V_{IN}	165	703	190 x 190
2	SW	707	1177	190 x 190
2	SW	707	435	190 x 190
3	GND	940	160	190 x 190
3	GND	2380	855	190 x 190
4	FB	1578	199	178 x 178
5	On/Off	2192	201	178 x 178

3TL76K BONDING DIAGRAM

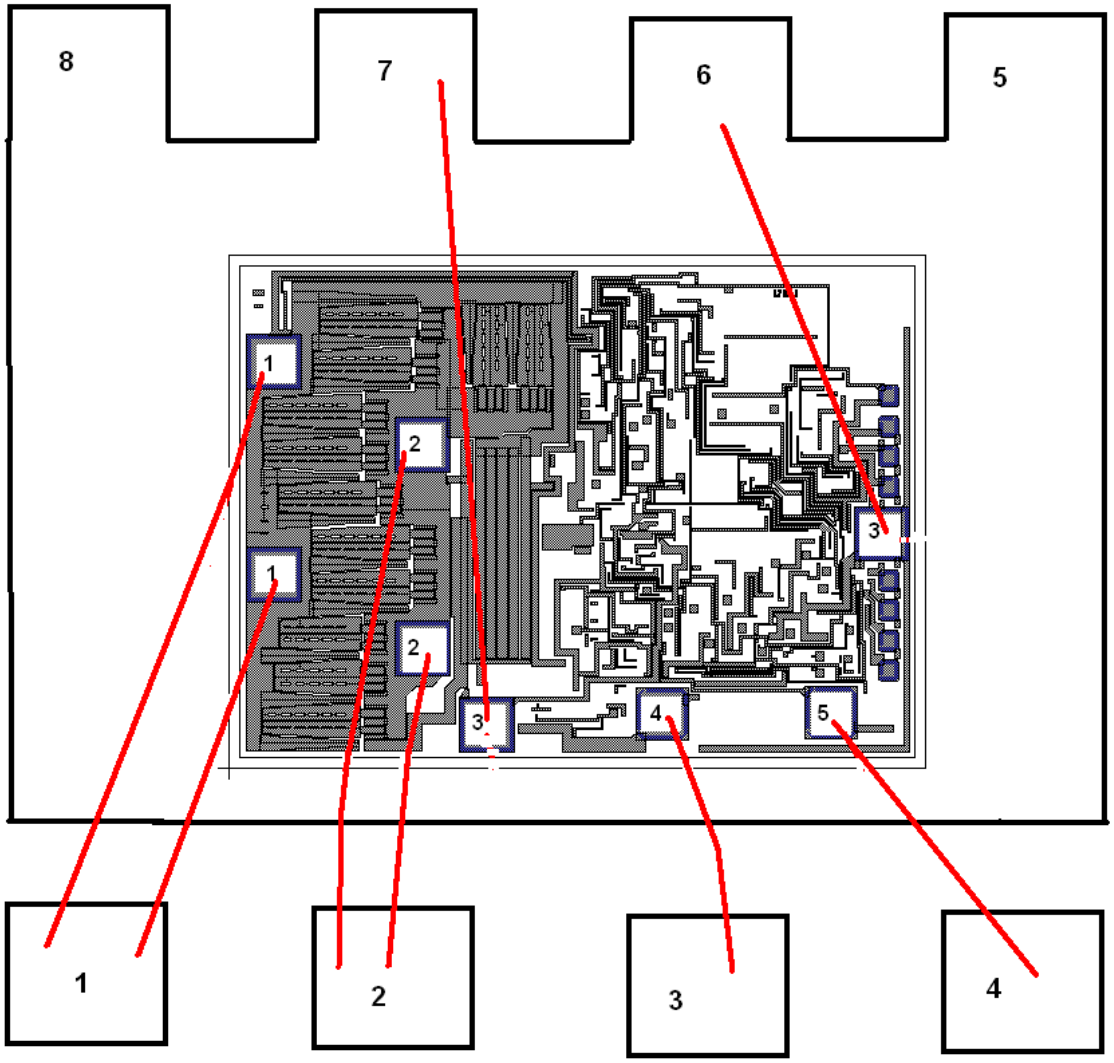
TO-220, TO-263 Packages



PAD	NAME
1	V_{IN}
2	SW
3	GND
4	FB (Feedback)
5	On/Off

3TL76K BONDING DIAGRAM

SOP-8 Package



PAD	NAME
1	V_{IN}
2	OUTPUT
3	FB
4	On/Off
5-8	GND