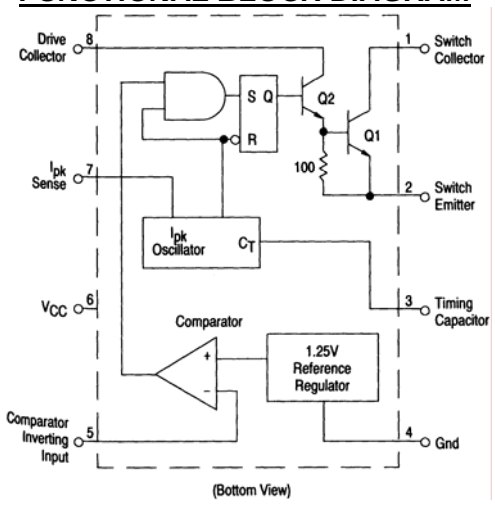
KGM34063AS

The KGM34063AS is a monolithic control circuit containing the primary functions required for DC-to-DC converters. These devices consist of an internal temperature compensated reference, comparator, controlled duty cycle oscillator with an active current limit circuit, driver and high current output switch. This series was specifically designed to be incorporated in Step-Down and Step-Up and Voltage-Inverting applications with a minimum number of external components.

FEATURES

- Operation from 3.0 V to 40 V Input
- Low Standby Current
- Current Limiting
- Output Switch Current to 1.5 A
- Output Voltage Adjustable
- Frequency Operation to 100 kHz
- Precision 2% Reference

FUNCTIONAL BLOCK DIAGRAM

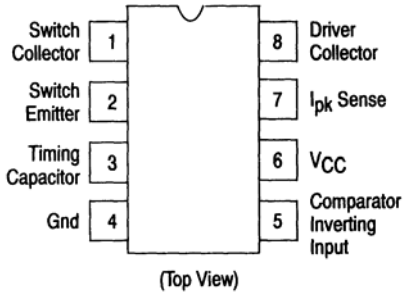


MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Power Supply Voltage	V_{CC}	40	Vdc
Comparator Input Voltage Range	V_{IR}	-0.3 to +40	Vdc
Switch Collector Voltage	$V_{C(switch)}$	40	Vdc
Switch Emitter Voltage (Vpin 1 = 40 V)	$V_{E(switch)}$	40	Vdc
Switch Collector to Emitter Voltage	$V_{CE(switch)}$	40	Vdc
Driver Collector Voltage	$I_{C(driver)}$	40	Vdc
Driver Collector Current (Note 1)	$I_{C(driver)}$	100	mA
Switch Current	I_{SW}	1.5	A
Power Dissipation and Thermal Characteristics Ceramic Package, U Suffix T_A = +25°C Thermal Resistance Plastic Package, P Suffix T_A = +25°C Thermal Resistance SOIC Package, D Suffix TA = +25°C Thermal Resistance	 P_D $R_{\theta JA}$ P_D $R_{\theta JA}$ P_D $R_{\theta JA}$	 1.25 100 1.25 100 625 160	 W °C/W W °C/W mW °C/W
Operating Junction Temperature	TJ	+150	°C
Operating Ambient Temperature Range	T_A	0 to +70	°C
Storage Temperature Range	Tstg	-65to+150	°C

ORDERING INFORMATION

Device	Temperature Range	Package
KGM34063ASD	0° to +70°C	SO-8
KGM34063ASN	0° to +70°C	Plastic DIP



ELECTRICAL CHARACTERICISTICS

(V_{CC} = 5.0 V, T_A= 0 to +70°C unless otherwise specified.)

Characteristics	Symbol	Min	Typ	Max	Unit
OSCILLATOR					
Frequency ($V_{Pin\ 5}$ = 0 V, C_T = 1.0 nF, T_A = 25°C)	fosc	24	33	42	kHz
Charge Current (V_{CC} = 5.0 V to 40 V, T_A = 25°C)	Ichg	24	33	42	μA
Discharge Current (V_{CC} = 5.0 V to 40 V, T_A = 25°C)	Idischg	140	200	260	μA
Discharge to Charge Current Ratio (Pin7 to Vcc, T_A=25°C)	Idischg/Ichg	5.2	6.2	7.5	—
Current Limit Sense Voltage (Ichg = Idischg, T_A = 25°C)	Vlpk(sense)	250	300	350	mV
OUTPUT SWITCH (Note 3)					
Saturation Voltage, Darlington Connection (I_{SW} = 1.0 A, Pins 1, 8 connected)	V_{CE}(sat)	—	1.0	1.3	V
Saturation Voltage (I_{SW} = 1.0 A, $R_{Pin\ 8}$ = 82 Ω to V_{CC}. Forced β = 20)	V_{CE}(sat)	—	0.45	0.7	V
DC Current Gain (I_{SW} = 1.0 A, V_{CE} = 5.0 V, T_A = 25°C)	h_{FE}	50	120	—	—
Collector Off-State Current (V_{CE} = 40V)	I_C(off)	—	0.01	100	μA
COMPARATOR					
Threshold Voltage (T_A = 25°C) (T_A = T_{LOW} to T_{HIGH})	Vth	1.225 1.21	1.25 —	1.275 1.29	V
Threshold Voltage (T_A = 25°C) **	**Vth**	**1.2375**	**1.25**	**1.2625**	**V**
Threshold Voltage Line Regulation (V_{CC} = 3 0 V to 40 V)	Regline		1.4	5.0	mV
Input Bias Current (Vin=0V)	I_{IB}	—	-40	-400	nA
TOTAL DEVICE					
Supply Current (V_{CC} = 5 0 V to 40 V, C_T = 1 0 nF, V_{pin7} = V_{CC}. V_{Pin5} > Vth, Pin 2 = Gnd, Remaining pins open)	I_{CC}		2.5	4.0	mA

NOTES:

1. Maximum package power dissipation limits must be observed.
2. Low duty cycle pulse techniques are used during test to maintain Junction temperature as close to ambient temperature as possible
3. If the output switch is driven into hard saturation (non Darlington configuration) at low switch currents (< 300 mA) and high driver currents (>30 mA), it may take up to 2.0 μs to come out of saturation This condition will shorten the off' time at frequencies > 30 kHz, and is magnified at high temperatures This condition does not occur with a Darlington configuration, since the output switch cannot saturate If a non Darlington configuration is used, the following output drive condition is recommended

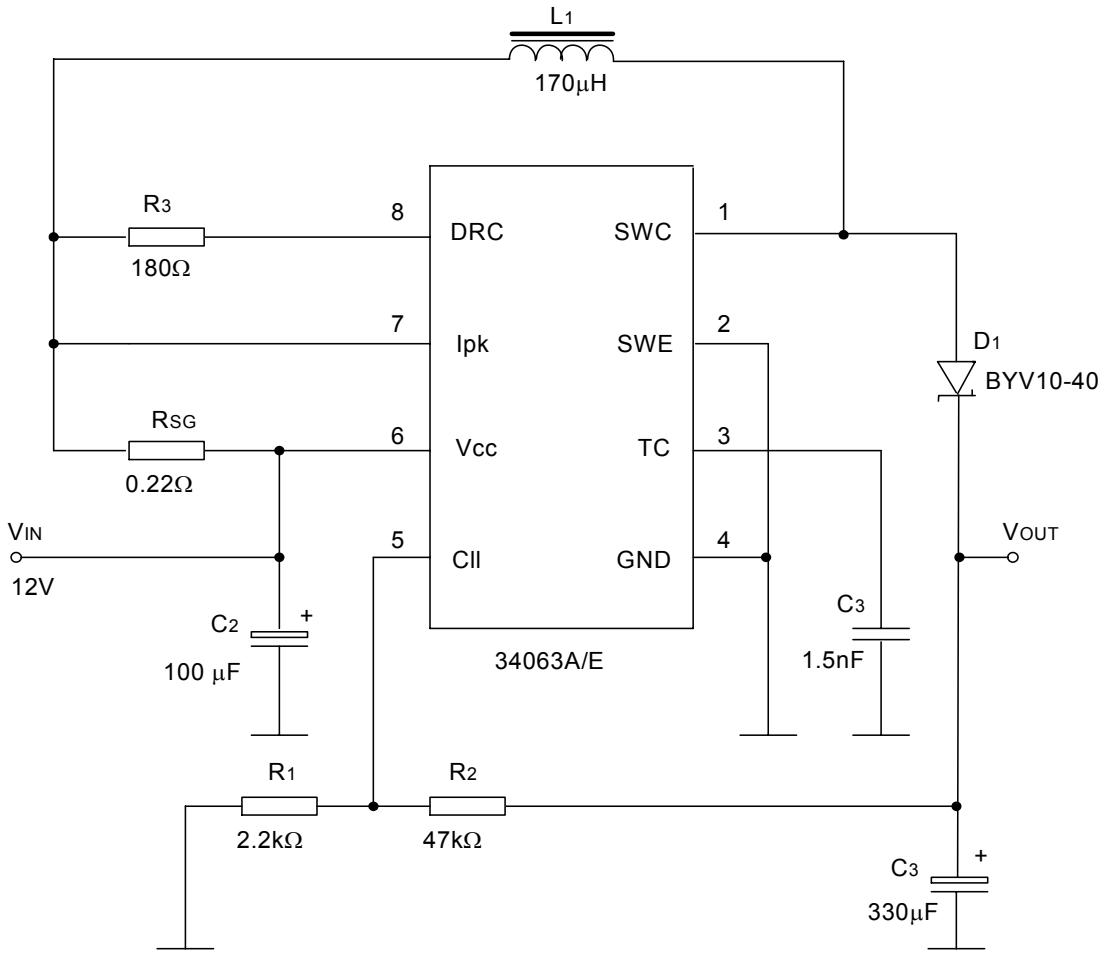
Forced β of output switch = I_C, output/(Ic, driver -7.0 mA*) > 10

*The 100 Ω. resistor in the emitter of the driver device requires about 7.0 mA before the output switch conducts

****Possible version for shipment**

TYPICAL APPLICATION CIRCUIT

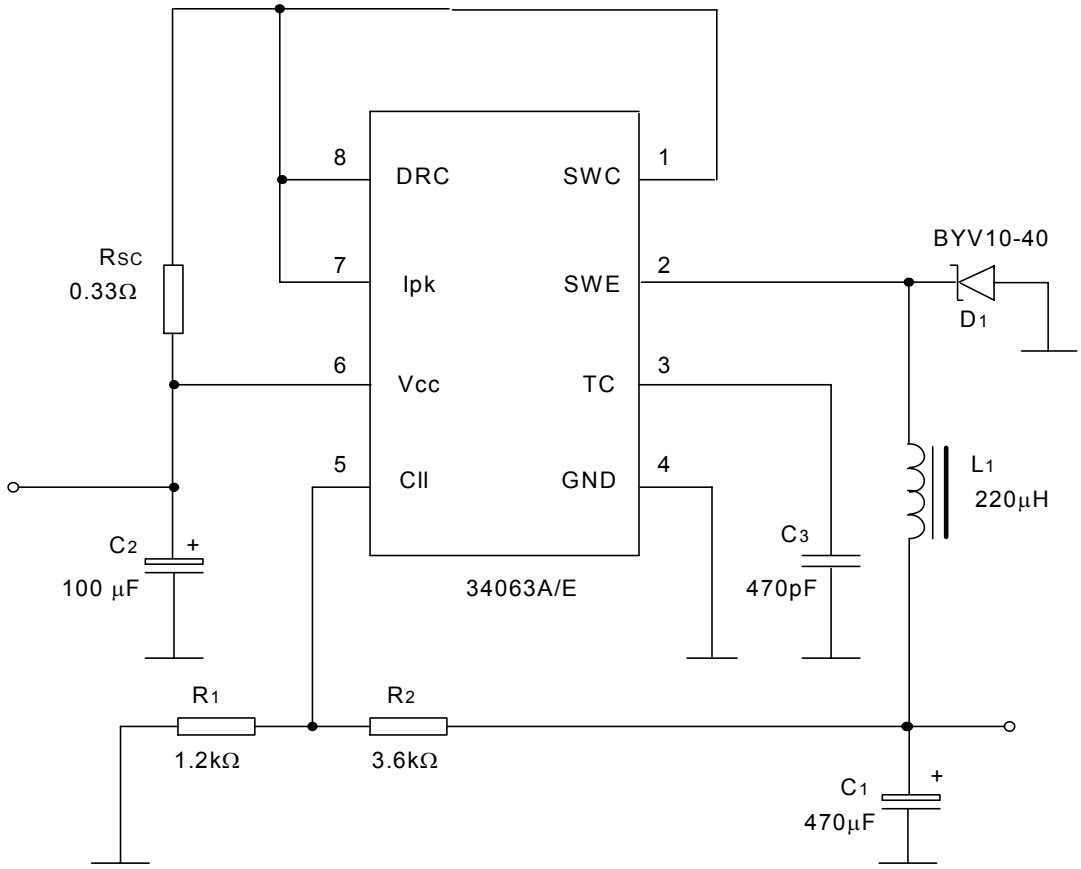
Step-Up Converter



Test Condition (V_{OUT} = 28 V)

Test	Conditions	Value (Typ)	Unit
Line Regulation	V_{IN} = 8 to 16 V, I_O = 175 mA	30	mV
Load Regulation	V_{IN} = 12 V, I_O = 75 to 175 mA	10	mV
Output Ripple	V_{IN} = 12 V, I_O = 175 mA	300	mV
Efficiency	V_{IN} = 12 V, I_O = 175 mA	89	%

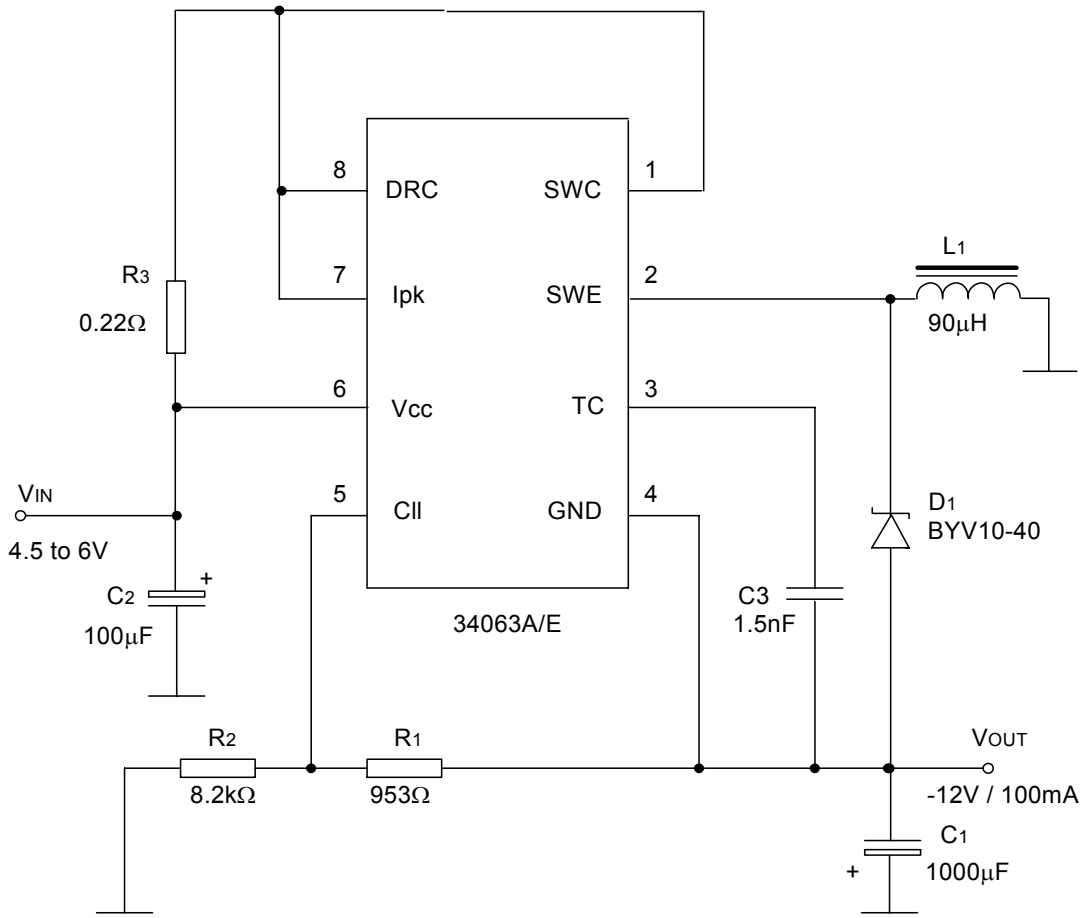
Step-Down Converter



Test Condition (V_{OUT} = 5 V)

Test	Conditions	Value (Typ)	Unit
Line Regulation	V_{IN} = 15 to 25 V, I_O = 500 mA	5	mV
Load Regulation	V_{IN} = 25 V, I_O = 50 to 500 mA	30	mV
Output Ripple	V_{IN} = 25 V, I_O = 500 mA	100	mV
Efficiency	V_{IN} = 25 V, I_O = 500 mA	80	%
ISC	V_{IN} = 25 V, RLOAD = 0.1 Ω	1.2	A

Voltage Inverting Converter



Test Condition (V_{OUT} = -12 V)

Test	Conditions	Value (Typ)	Unit
Line Regulation	V_{IN} = 4.5 to 6 V, I_O = 100 mA	15	mV
Load Regulation	V_{IN} = 5 V, I_O = 10 to 100 mA	20	mV
Output Ripple	V_{IN} = 5 V, I_O = 100 mA	230	mV
Efficiency	V_{IN} = 5 V, I_O = 100 mA	58	%
ISC	V_{IN} = 5 V, RLOAD = 0.1 Ω	0.9	A

Calculation

Parameter	Step-Up (Discontinuous mode)	Step-Down (Continuous mode)	Voltage Inverting (Discontinuous mode)
t_{on}/t_{off}	$\frac{V_{out}+V_F-V_{in(min)}}{V_{in(min)}-V_{sat}}$	$\frac{V_{out}+V_F}{V_{in(min)}-V_{sat}-V_{out}}$	$\frac{\lvert V_{out}\rvert+V_F}{V_{in}-V_{sat}}$
$(t_{on}+t_{off})max$	$1/f_{min}$	$1/f_{min}$	$1/f_{min}$
C_T	$4.5x10^{-5}t_{on}$	$4.5x10^{-5}t_{on}$	$4.5x10^{-5}t_{on}$
$I_{PK(switch)}$	$2I_{out(max)}[(t_{on}/t_{off})+1]$	$2I_{out(max)}$	$2I_{out(max)}[(t_{on}/t_{off})+1]$
R_{SC}	$0.3/I_{PK(switch)}$	$0.3/I_{PK(switch)}$	$0.3/I_{PK(switch)}$
C_O	$\equiv \frac{I_{out}t_{on}}{V_{ripple(p-p)}}$	$\frac{I_{PK(switch)}(t_{on}+t_{off})}{8V_{ripple(p-p)}}$	$\equiv \frac{I_{out}t_{on}}{V_{ripple(p-p)}}$
L(min)	$\frac{V_{in(min)}-V_{sat}}{I_{PK(switch)}} t_{on(max)}$	$\frac{V_{in(min)}-V_{sat}-V_{out}}{I_{PK(switch)}} t_{on(max)}$	$\frac{V_{in(min)}-V_{sat}}{I_{PK(switch)}} t_{on(max)}$

NOTES:

V_{sat} = Saturation voltage of the output switch

V_F = Forward voltage drop of the output rectifier

THE FOLLOWING POWER SUPPLY CHARACTERISTICS MUST BE CHOSEN:

V_{in} = Nominal input voltage

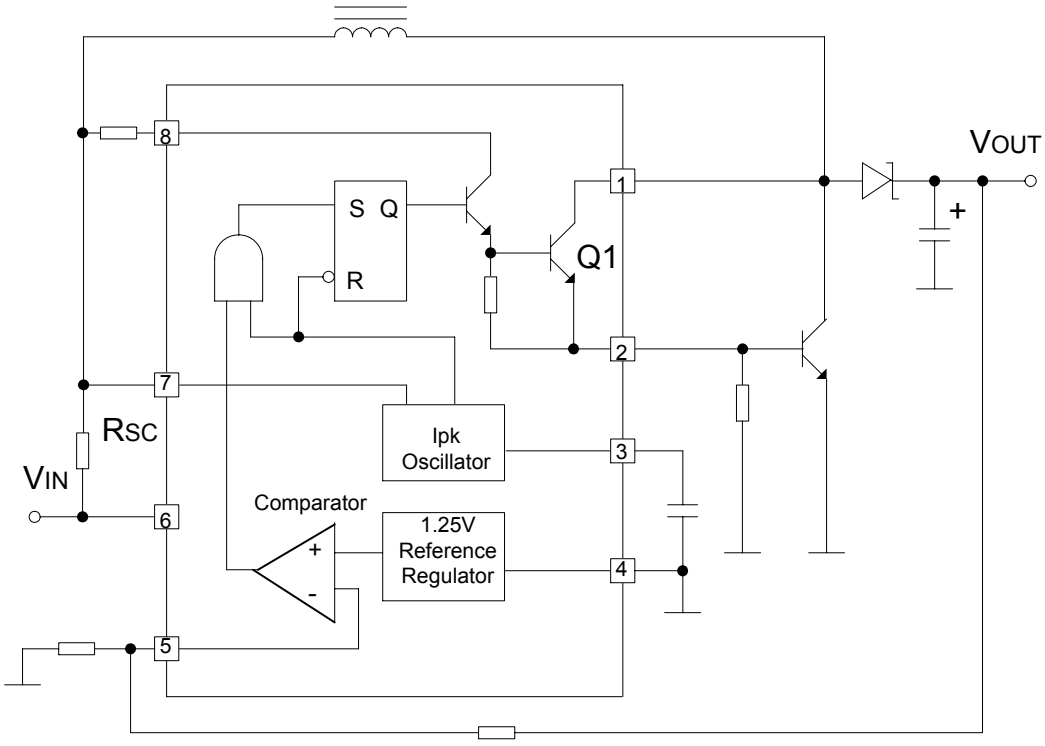
V_{out} = Desired output voltage, $\lvert V_{out}\rvert = 1.25(1+R_2/R_1)$

I_{out} = Desired output current

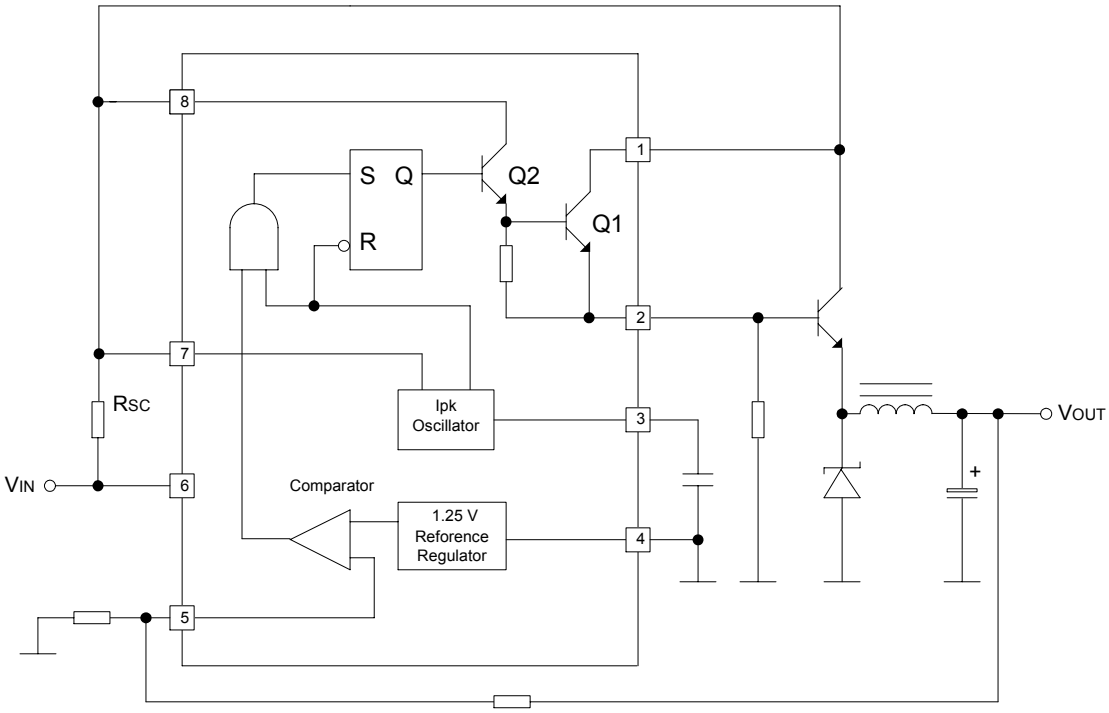
fmin = Minimum desired output switching frequency at the selected values of Vin and Io

V_{ripple} = Desired peak to peak output ripple voltage. In practice, the calculated capacitor value will and to be increased due to its equivalent series resistance and board layout. The ripple voltage should be kept to a low value since it will directly affect the line and load regulation.

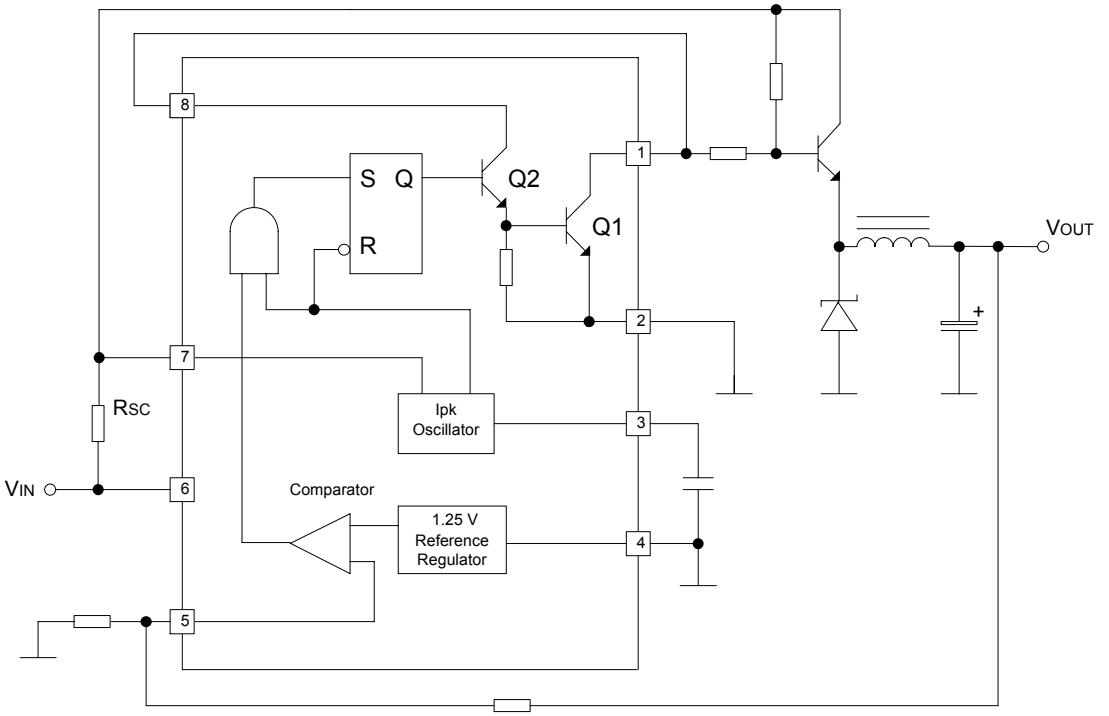
Step-up With External NPN Switch



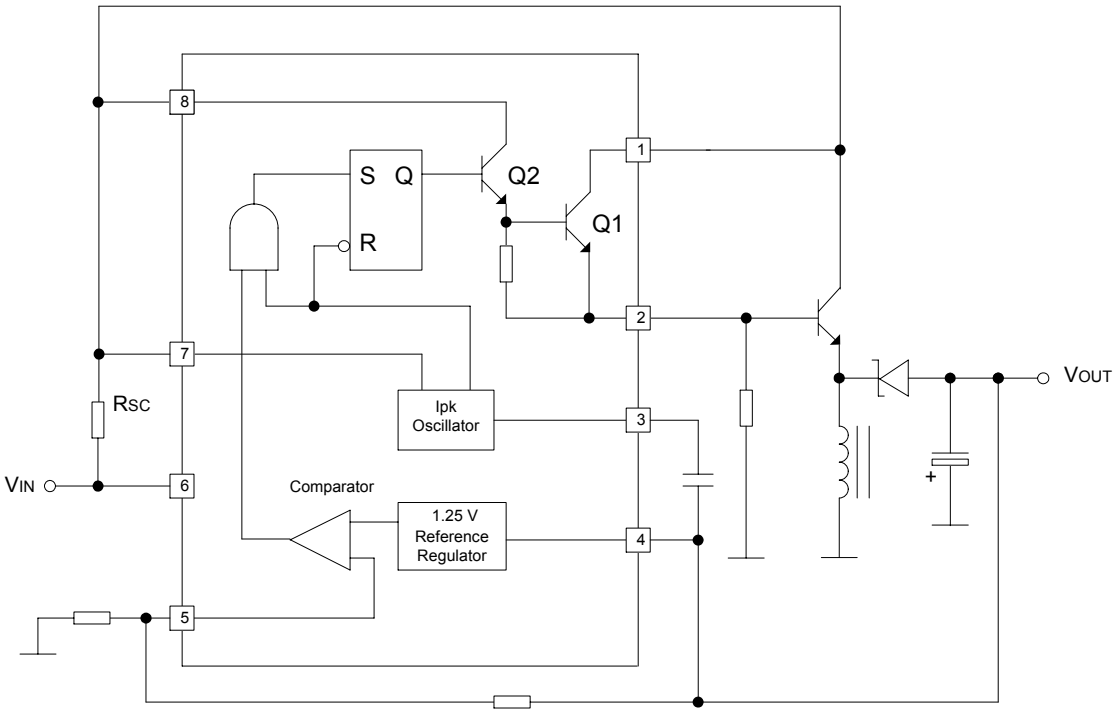
Step-down With External NPN Switch



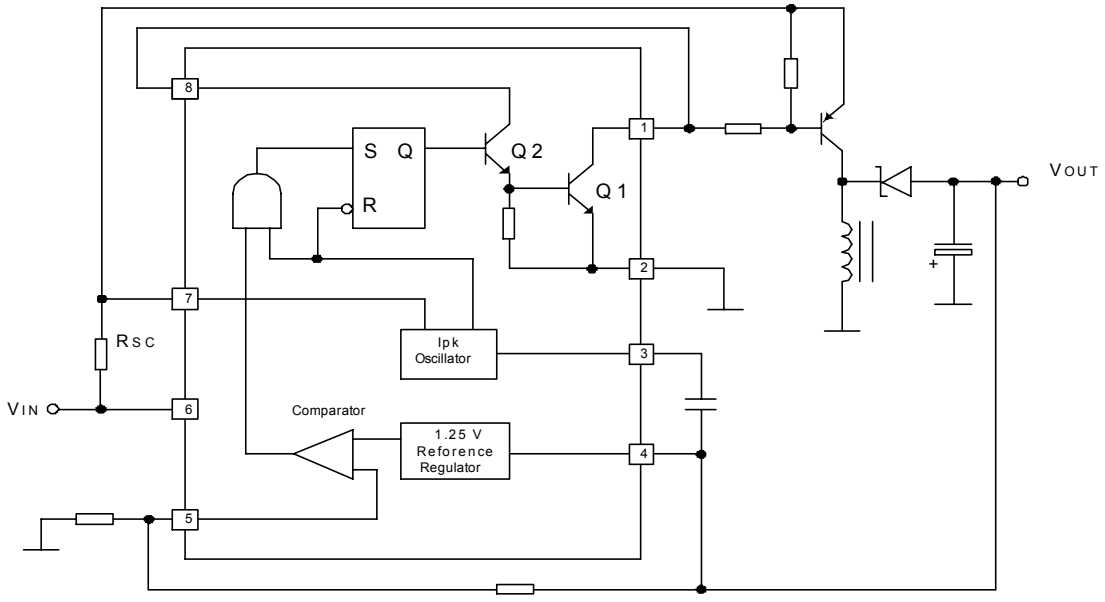
Step-down With External PNP Switch



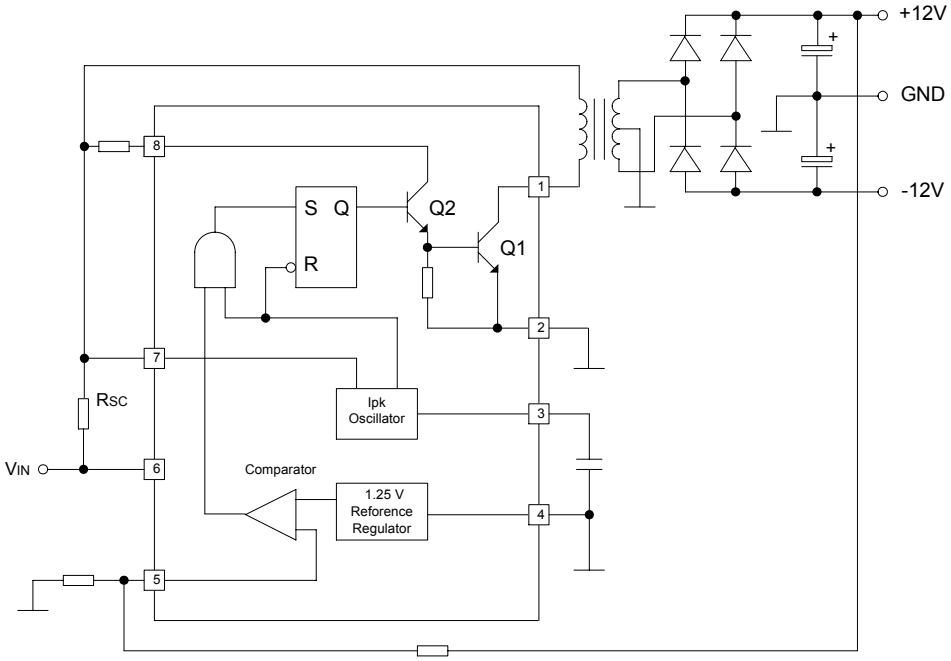
Voltage Inverting With External NPN Switch



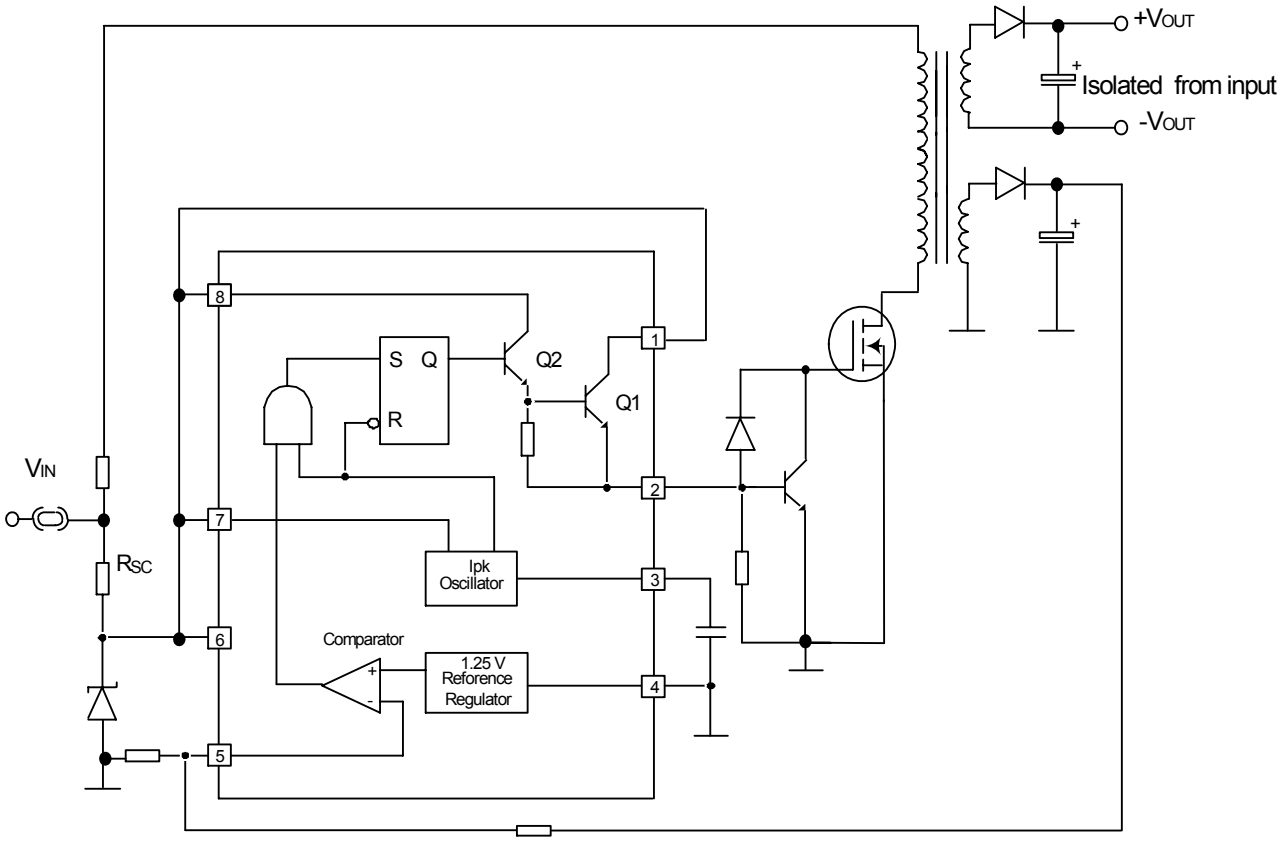
Voltage Inverting With External PNP Saturated Switch

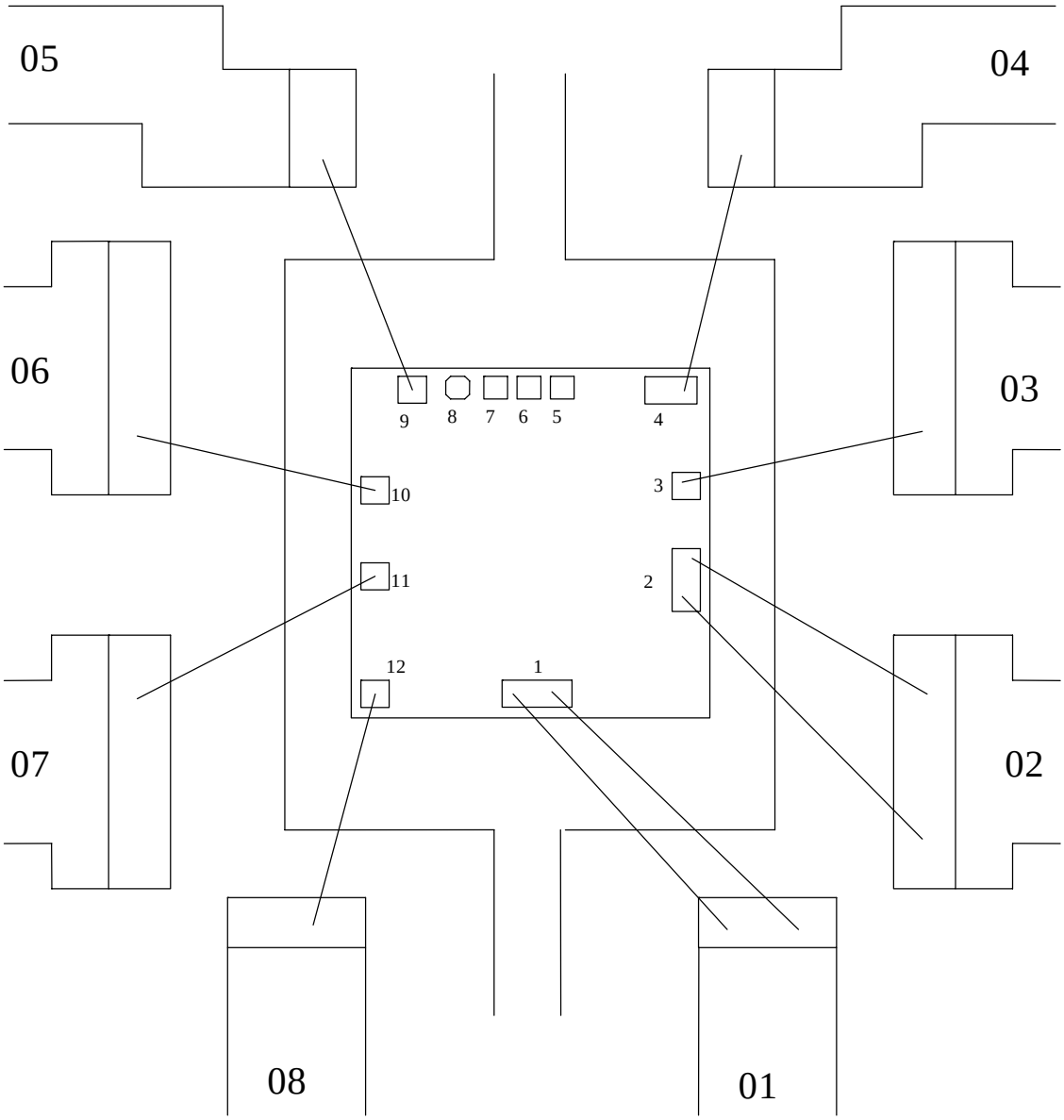


Dual Output Voltage

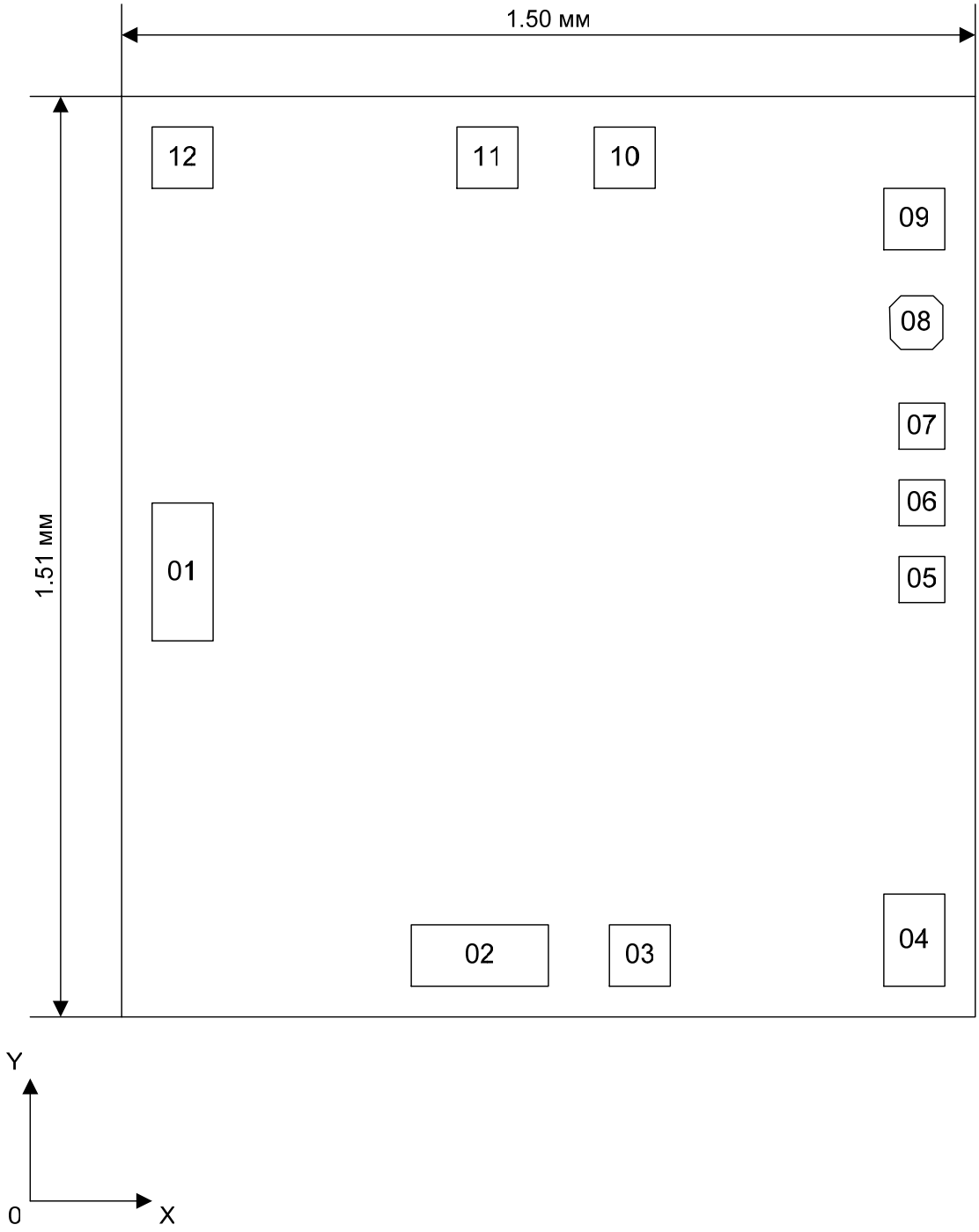


Higher Output Power, Higher Input Voltage





Bonding diagram of KGM34063AS



Pad size 05 - 08 not for bonding

Pads location of KGM34063AS

Die size Xr = 1.50mm, Yr =1.51mm
Coordinates of pads

No of pad	Coordinates left bottom, mm		Pad size, mm
	X	Y	
01	0,075	0,564	0,090×0,220
02	0,652	0,075	0,220×0,090
03	0,956	0,075	0,090×0,090
04	1,337	0,075	0,090×0,150
05*	1,320	0,665	0,072×0,072
06*	1,320	0,788	0,072×0,072
07*	1,320	0,921	0,072×0,072
08*	1,318	1,039	0,074×0,074
09	1,305	1,230	0,074×0,074
10	0,863	1,345	0,090×0,090
11	0,577	1,345	0,090×0,090
12	0,075	1,345	0,090×0,090

* technological pads

DESCRIPTION

Pin	No of pad	Symbol	Function
01	01	C	Switch Collector
02	02	E	Switch Emitter
03	03	CT	Timing Capacitor
04	04	GND	Ground
05	09	IN	Comparator Inverting Input
06	10	Vcc	Supply Voltage
07	11	CO	Ipk Sense
08	12	DC	Driver Collector