General Description

The MDV70XX series is a set of three -terminal low power voltage detectors implemented in CMOS technology. Each voltage detector in the series detects a particular fixed voltage ranging from 1.2V to 7V. The voltage detectors consist of a high-precision and low power consumption standard voltage source, a comparator, hysteresis circuit, and an output driver. CMOS technology ensures low power consumption. Although designed primarily as fixed voltage detectors, these devices can be used with external components to detect user specified threshold voltages

Features

· Low power consumption
· Low temperature coefficient
· Built-in high-stability reference source
· Open drain types:
  NMOS: MDV70XX
  CMOS: 70XXC
· Built-in hysteresis characteristic
· TO-92 package
· SOT-89 package
· SOT-23-3/5 package
· SSOT-24 package

Applications

· Battery checkers
· Level selectors
· Power failure detectors
· Microcomputer reset
· Battery memory backup
· Non-volatile RAM signal storage protectors

Absolute Maximum Ratings

Supply Voltage..... ..... -0.3V to 18V
Output Voltage .....V_{SS}-0.3V to V_{DD}+0.3V
Storage Temperature.....-50℃to 125℃
Operating Temperature.....-40℃to 85℃
Output Current..... 10mA

Power Consumption:

SOT89-3	500mW
TO-92	300mW
SOT23-/5	250mW

Note: These are stress ratings only. Stresses exceeding the range specified under _Absolute Maximum Ratings_ may cause substantial damage to the device. Functional operation of this device at other conditions beyond those listed in the specification is not implied and prolonged exposure to extreme conditions may affect device reliability.

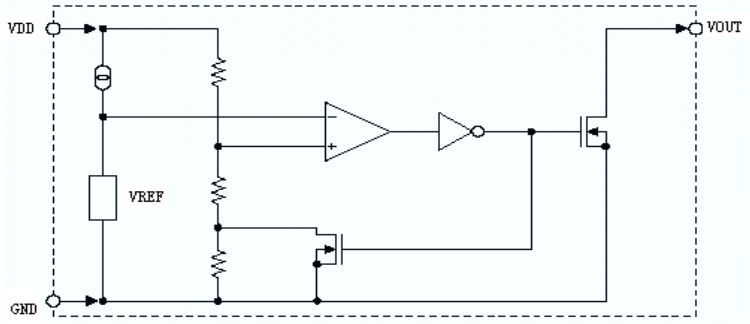
Selection Table

Part No.	Detectable Voltage	Hysteresis Width	Tolerance	Marking		
				TO92/SOT89-3	SOT23-3/5	
MDV7015	1.5V	0.075V	±3%	MD70XX	MD 0XX	NMOS Drain output
MDV7019	1.9V	0.095V	±3%			
MDV7020	2.0V	0.100V	±3%			
MDV7021	2.1V	0.105V	±3%			
MDV7022	2.2V	0.110V	±3%			
MDV7023	2.3V	0.115V	±3%			
MDV7024	2.4V	0.120V	±3%			
MDV7027	2.7V	0.135V	±3%			
MDV7030	3.0V	0.150V	±3%			
MDV7033	3.3V	0.165V	±3%			
MDV7035	3.5V	0.175V	±3%			
MDV7036	3.6V	0.180V	±3%			
MDV7039	3.9V	0.195V	±3%			
MDV7042	4.2V	0.210V	±3%			
MDV7043	4.3V	0.215V	±3%			
MDV7044	4.4V	0.220V	±3%			
MDV7047	4.7V	0.235V	±3%			
MDV7050	5.0V	0.250V	±3%			
MDV7070	7.0V	0.350V	±3%			
MDV7025C	2.5V	0.125V	±3%	MD70XXC	70XXC	CMOS output
MDV7027C	2.7V	0.135V	±3%			
MDV7030C	3.0V	0.150V	±3%			
MDV7033C	3.3V	0.165V	±3%			

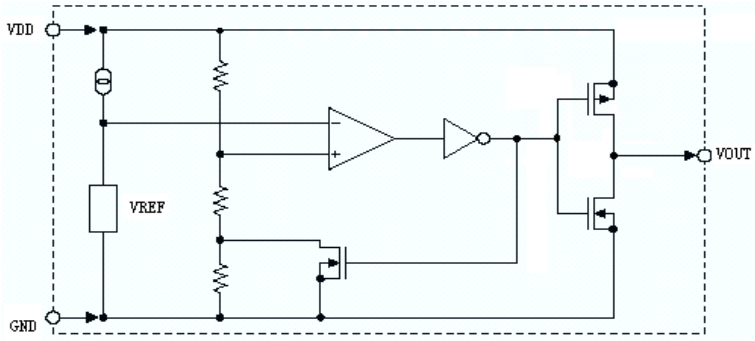
For example: The MDV7044 is a 4.4V, NMOS open drain active low output
For semi-custom parts,selectable regulated voltage range is from 1.2V to 12V in 0.1V increment.
For semi-custom parts,selectable output type CMOS .

Block Diagram

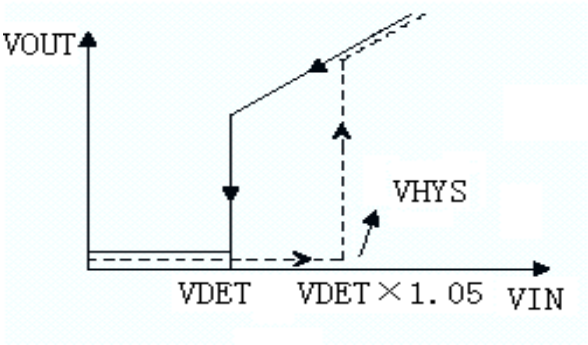
N channel open drain output (normal open; active low)



CMOS output (normal high; active low)

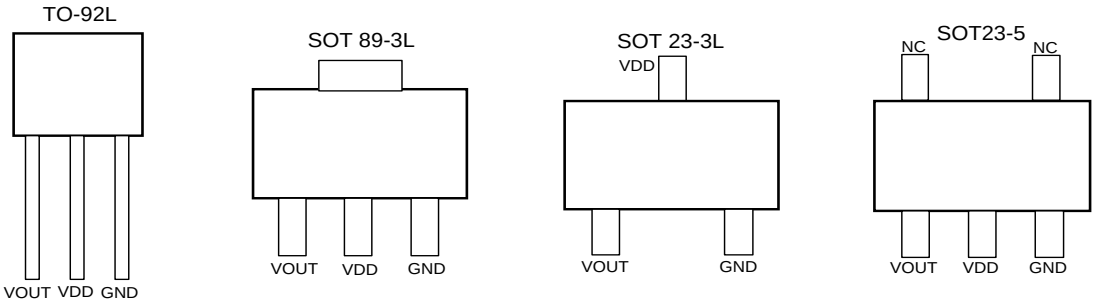


Logical Characteristic(NMOS/CMOS TYPE)



(1) Solid Line .....VIN from Hi→Lo
(2) Dash Line .....VIN from Hi→Lo

Pin Assignment



Electrical Characteristic

MDV7015

$T_{A=25℃}$

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		VDD	Conditions				
VDET	Hi→Lo Detectable Voltage	--	--	1.455	1.5	1.545	V
VHYS	Hysteresis Width	--	--	0.02 VDET	0.05 VDET	0.07 VDET	%
IDD	Operating Current	2.5	No load	--	1.2	3	uA
VDD	Operating Voltage	--	--	1.0	--	15	V
IOL	Output Sink Current	1.4	VOUT=0.2V	1	1.5	--	mA
$\frac{\triangle V_{DET}}{\triangle T_A}$	Temperature Coefficient	--	0℃<Ta<70℃	--	±0.4	--	mV/℃

MDV7019

$T_{A=25℃}$

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		VDD	Conditions				
VDET	Hi→Lo Detectable Voltage	--	--	1.843	1.9	1.957	V
VHYS	Hysteresis Width	--	--	0.02 VDET	0.05 VDET	0.07 VDET	%
IDD	Operating Current	2.9	No load	--	1.2	3	uA
VDD	Operating Voltage	--	--	1.5	--	15	V
IOL	Output Sink Current	1.8	VOUT=0.2V	1	2	--	mA
$\frac{\triangle V_{DET}}{\triangle T_A}$	Temperature Coefficient	--	0℃<Ta<70℃	--	±0.5	--	mV/℃

MDV7020

$T_{A=25℃}$

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		VDD	Conditions				
VDET	Hi→Lo Detectable Voltage	--	--	1.94	2.0	2.06	V
VHYS	Hysteresis Width	--	--	0.02 VDET	0.05 VDET	0.07 VDET	%
IDD	Operating Current	3.0	No load	--	1.2	3	uA
VDD	Operating Voltage	--	--	1.5	--	15	V
IOL	Output Sink Current	1.9	VOUT=0.2V	1	2	--	mA
$\frac{\triangle V_{DET}}{\triangle T_A}$	Temperature Coefficient	--	0℃<Ta<70℃	--	±0.5	--	mV/℃

MDV7021

$T_{A=25℃}$

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		VDD	Conditions				
VDET	Hi→Lo Detectable Voltage	--	--	2.037	2.1	2.163	V
VHYS	Hysteresis Width	--	--	0.02 VDET	0.05 VDET	0.07 VDET	%
IDD	Operating Current	3.1	No load	--	1.2	3	uA
VDD	Operating Voltage	--	--	1.5	--	15	V
IOL	Output Sink Current	2.0	VOUT=0.2V	1	2	--	mA
$\frac{\triangle V_{DET}}{\triangle T_A}$	Temperature Coefficient	--	0℃<Ta<70℃	--	±0.5	--	mV/℃

MDV7022 $T_{A=}25℃$

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		VDD	Conditions				
VDET	Hi→Lo Detectable Voltage	--	--	2.134	2.2	2.266	V
VHYS	Hysteresis Width	--	--	0.02 VDET	0.05 VDET	0.07 VDET	%
IDD	Operating Current	3.2	No load	--	1.2	3	uA
VDD	Operating Voltage	--	--	1.5	--	15	V
IOL	Output Sink Current	2	VOUT=0.2V	1.5	3	--	mA
$\frac{\triangle V_{DET}}{\triangle T_A}$	Temperature Coefficient	--	0℃<Ta<70℃	--	±0.5	--	mV/℃

MDV7023 $T_{A=}25℃$

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		VDD	Conditions				
VDET	Hi→Lo Detectable Voltage	--	--	2.231	2.3	2.369	V
VHYS	Hysteresis Width	--	--	0.02 VDET	0.05 VDET	0.07 VDET	%
IDD	Operating Current	3.3	No load	--	1.2	3	uA
VDD	Operating Voltage	--	--	1.5	--	15	V
IOL	Output Sink Current	2.1	VOUT=0.2V	1	3	--	mA
$\frac{\triangle V_{DET}}{\triangle T_A}$	Temperature Coefficient	--	0℃<Ta<70℃	--	±0.5	--	mV/℃

MDV7024 $T_{A=}25℃$

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		VDD	Conditions				
VDET	Hi→Lo Detectable Voltage	--	--	2.328	2.4	2.472	V
VHYS	Hysteresis Width	--	--	0.02 VDET	0.05 VDET	0.07 VDET	%
IDD	Operating Current	3.4	No load	--	1.2	3	uA
VDD	Operating Voltage	--	--	1.5	--	15	V
IOL	Output Sink Current	2.2	VOUT=0.2V	1.5	3	--	mA
$\frac{\triangle V_{DET}}{\triangle T_A}$	Temperature Coefficient	--	0℃<Ta<70℃	--	±0.5	--	mV/℃

MDV7025 $T_{A=}25℃$

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		VDD	Conditions				
VDET	Hi→Lo Detectable Voltage	--	--	2.425	2.5	2575	V
VHYS	Hysteresis Width	--	--	0.02 VDET	0.05 VDET	0.07 VDET	%
IDD	Operating Current	3.5	No load	--	1.2	3	uA
VDD	Operating Voltage	--	--	1.5	--	15	V
IOL	Output Sink Current	2.3	VOUT=0.2V	1.5	3	--	mA
$\frac{\triangle V_{DET}}{\triangle T_A}$	Temperature Coefficient	--	0℃<Ta<70℃	--	±0.5	--	mV/℃

MDV7027

$T_{A=}25℃$

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		VDD	Conditions				
VDET	Hi→Lo Detectable Voltage	--	--	2.619	2.7	2.781	V
VHYS	Hysteresis Width	--	--	0.02 VDET	0.05 VDET	0.07 VDET	%
IDD	Operating Current	3.7	No load	--	1.2	3	uA
VDD	Operating Voltage	--	--	1.5	--	15	V
IOL	Output Sink Current	2.5	VOUT=0.2V	2	4	--	mA
$\frac{\triangle V_{DET}}{\triangle T_A}$	Temperature Coefficient	--	0℃<Ta<70℃	--	±0.5	--	mV/℃

MDV7030

$T_{A=}25℃$

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		VDD	Conditions				
VDET	Hi→Lo Detectable Voltage	--	--	2.91	3.0	3.09	V
VHYS	Hysteresis Width	--	--	0.02 VDET	0.05 VDET	0.07 VDET	%
IDD	Operating Current	4.0	No load	--	1.2	3	uA
VDD	Operating Voltage	--	--	1.5	--	15	V
IOL	Output Sink Current	2.7	VOUT=0.2V	2	4	--	mA
$\frac{\triangle V_{DET}}{\triangle T_A}$	Temperature Coefficient	--	0℃<Ta<70℃	--	±0.5	--	mV/℃

MDV7033

$T_{A=}25℃$

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		VDD	Conditions				
VDET	Hi→Lo Detectable Voltage	--	--	3.201	3.3	3.399	V
VHYS	Hysteresis Width	--	--	0.02 VDET	0.05 VDET	0.07 VDET	%
IDD	Operating Current	4.3	No load	--	1.2	3	uA
VDD	Operating Voltage	--	--	1.5	--	15	V
IOL	Output Sink Current	3.1	VOUT=0.2V	2	4	--	mA
$\frac{\triangle V_{DET}}{\triangle T_A}$	Temperature Coefficient	--	0℃<Ta<70℃	--	±0.5	--	mV/℃

MDV7035

$T_{A=}25℃$

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		VDD	Conditions				
VDET	Hi→Lo Detectable Voltage	--	--	3.395	3.5	3.605	V
VHYS	Hysteresis Width	--	--	0.02 VDET	0.05 VDET	0.07 VDET	%
IDD	Operating Current	4.5	No load	--	1.2	3	uA
VDD	Operating Voltage	--	--	1.5	--	15	V
IOL	Output Sink Current	3.2	VOUT=0.2V	2	4	--	mA
$\frac{\triangle V_{DET}}{\triangle T_A}$	Temperature Coefficient	--	0℃<Ta<70℃	--	±0.5	--	mV/℃

MDV7036 $T_{A=}25℃$

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V_{DD}	Conditions				
V_{DET}	Hi→Lo Detectable Voltage	--	--	3.492	3.6	3.708	V
V_{HYS}	Hysteresis Width	--	--	0.02 V_{DET}	0.05 V_{DET}	0.07 V_{DET}	%
I_{DD}	Operating Current	4.6	No load	--	1.2	3	uA
V_{DD}	Operating Voltage	--	--	1.5	--	15	V
I_{OL}	Output Sink Current	3.4	V_{OUT}=0.2V	3	6	--	mA
$\frac{\triangle V_{DET}}{\triangle T_A}$	Temperature Coefficient	--	0℃<Ta<70℃	--	±0.5	--	mV/℃

MDV7039 $T_{A=}25℃$

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V_{DD}	Conditions				
V_{DET}	Hi→Lo Detectable Voltage	--	--	3.783	3.9	4.017	V
V_{HYS}	Hysteresis Width	--	--	0.02 V_{DET}	0.05 V_{DET}	0.07 V_{DET}	%
I_{DD}	Operating Current	4.9	No load	--	.22	3	uA
V_{DD}	Operating Voltage	--	--	1.5	--	15	V
I_{OL}	Output Sink Current	3.7	V_{OUT}=0.2V	3	6	--	mA
$\frac{\triangle V_{DET}}{\triangle T_A}$	Temperature Coefficient	--	0℃<Ta<70℃	--	±0.5	--	mV/℃

MDV7042 $T_{A=}25℃$

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V_{DD}	Conditions				
V_{DET}	Hi→Lo Detectable Voltage	--	--	4.074	4.2	4.326	V
V_{HYS}	Hysteresis Width	--	--	0.02 V_{DET}	0.05 V_{DET}	0.07 V_{DET}	%
I_{DD}	Operating Current	5.2	No load	--	1.2	3	uA
V_{DD}	Operating Voltage	--	--	1.5	--	15	V
I_{OL}	Output Sink Current	3.8	V_{OUT}=0.2V	3	6	--	mA
$\frac{\triangle V_{DET}}{\triangle T_A}$	Temperature Coefficient	--	0℃<Ta<70℃	--	±0.6	--	mV/℃

MDV7043 $T_{A=}25℃$

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V_{DD}	Conditions				
V_{DET}	Hi→Lo Detectable Voltage	--	--	4.171	4.3	4.429	V
V_{HYS}	Hysteresis Width	--	--	0.02 V_{DET}	0.05 V_{DET}	0.07 V_{DET}	%
I_{DD}	Operating Current	5.3	No load	--	1.2	3	uA
V_{DD}	Operating Voltage	--	--	1.5	--	15	V
I_{OL}	Output Sink Current	4.0	V_{OUT}=0.2V	4	8	--	mA
$\frac{\triangle V_{DET}}{\triangle T_A}$	Temperature Coefficient	--	0℃<Ta<70℃	--	±0.6	--	mV/℃

MDV7044 $T_{A=25℃}$

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V_{DD}	Conditions				
V_{DET}	Hi→Lo Detectable Voltage	--	--	4.268	4.4	4.532	V
V_{HYS}	Hysteresis Width	--	--	0.02 V_{DET}	0.05 V_{DET}	0.07 V_{DET}	%
I_{DD}	Operating Current	5.4	No load	--	1.2	3	uA
V_{DD}	Operating Voltage	--	--	1.5	--	15	V
I_{OL}	Output Sink Current	4.0	V_{OUT}=0.2V	4	8	--	mA
$\frac{\triangle V_{DET}}{\triangle T_A}$	Temperature Coefficient	--	0℃<Ta<70℃	--	±0.6	--	mV/℃

MDV7047 $T_{A=25℃}$

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V_{DD}	Conditions				
V_{DET}	Hi→Lo Detectable Voltage	--	--	4.559	4.7	4.841	V
V_{HYS}	Hysteresis Width	--	--	0.02 V_{DET}	0.05 V_{DET}	0.07 V_{DET}	%
I_{DD}	Operating Current	5.7	No load	--	1.2	3	uA
V_{DD}	Operating Voltage	--	--	1.5	--	15	V
I_{OL}	Output Sink Current	4.0	V_{OUT}=0.2V	4	8	--	mA
$\frac{\triangle V_{DET}}{\triangle T_A}$	Temperature Coefficient	--	0℃<Ta<70℃	--	±0.6	--	mV/℃

MDV7050 $T_{A=25℃}$

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V_{DD}	Conditions				
V_{DET}	Hi→Lo Detectable Voltage	--	--	4.850	5.0	5.150	V
V_{HYS}	Hysteresis Width	--	--	0.02 V_{DET}	0.05 V_{DET}	0.1 V_{DET}	%
I_{DD}	Operating Current	6.0	No load	--	1.2	3	uA
V_{DD}	Operating Voltage	--	--	1.5	--	15	V
I_{OL}	Output Sink Current	4.8	V_{OUT}=0.2V	4	8	--	mA
$\frac{\triangle V_{DET}}{\triangle T_A}$	Temperature Coefficient	--	0℃<Ta<70℃	--	±0.6	--	mV/℃

MDV7070 $T_{A=25℃}$

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V_{DD}	Conditions				
V_{DET}	Hi→Lo Detectable Voltage	--	--	6.790	7.0	7.210	V
V_{HYS}	Hysteresis Width	--	--	0.02 V_{DET}	0.05 V_{DET}	0.07 V_{DET}	%
I_{DD}	Operating Current	8.0	No load	--	1.2	3	uA
V_{DD}	Operating Voltage	--	--	1.0	--	15	V
I_{OL}	Output Sink Current	6.7	V_{OUT}=0.2V	5	8	--	mA
$\frac{\triangle V_{DET}}{\triangle T_A}$	Temperature Coefficient	--	0℃<Ta<70℃	--	±0.8	--	mV/℃

Functional Description

The MDV70XX series is a set of voltage detectors equipped with a high stability voltage reference which is connected to the negative input of a comparator----denoted as V_{REF} in the following figure for NMOS output voltage detector.
When the voltage drop to the positive input of the comparator (i,e,V_B) is higher than V_{REF}, VOUT goes high, M1 turns off, and V_B is expressed as $V_{BH}=VDD\times(RB+RC)/(RA+RB+RC)$.
If VDD is decreased so that V_B falls to a value less than V_{REF}, the comparator output inverts from high to low, VOUT goes low, V_C is high, M1 turns on, RC is bypassed, and V_B becomes: $V_{BL}=VDD\times RB/(RA+RB)$, which is less than V_{BH}. By so doing, the comparator output will stay low to prevent the circuit from oscillating when $V_B \approx V_{REF}$.
If VDD falls below the minimum operating voltage, the output becomes undefined. When VDD goes from low to $VDD\times RB/(RA+RB) > V_{REF}$, the comparator output and VOUT goes high.
The detectable voltage is defined as:

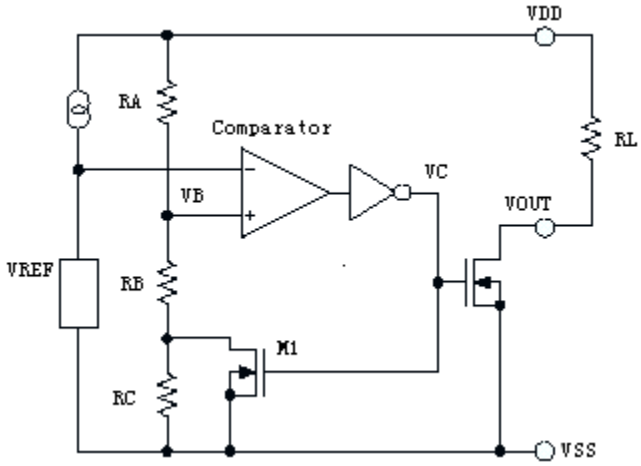
$$V_{DET}(-) = \frac{RA+RB+RC}{RB+RC}\times V_{REF}$$

The release voltage is defined as:

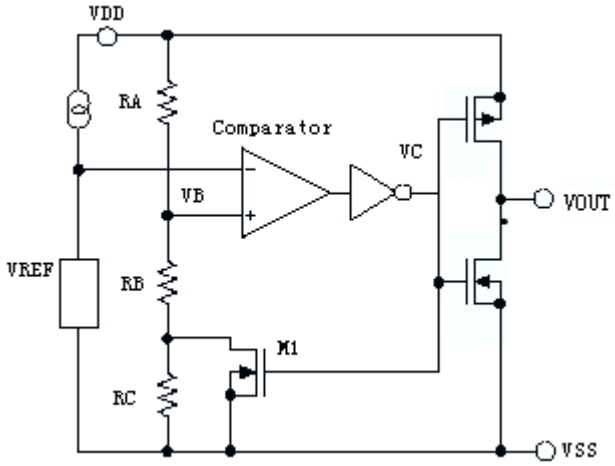
$$V_{DET}(+) = \frac{RA+RB}{RB}\times V_{REF}$$

The hysteresis width is:
$V_{HYS} = V_{DET}(+) - V_{DET}(-)$
The figure demonstrates the NMOS output type with positive output polarity (VOUT is normally open, active low). The MDV70XX series also supplies options for other output types with active high outputs. Application circuits shown are examples of positive output polarity (normally open, active low) unless otherwise specified.

NMOS output voltage detector



CMOS output voltage detector

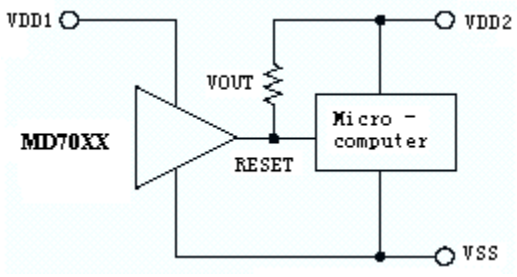


Application Circuits

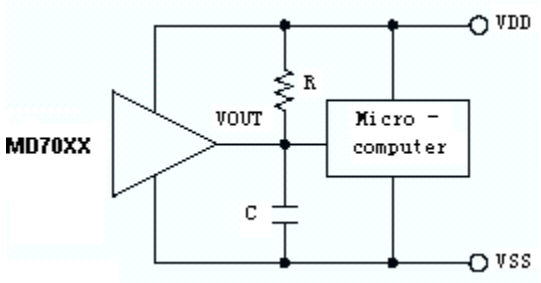
Microcomputer reset circuit

Normally a reset circuit is required to protect the microcomputer system from malfunctions due to power line interruptions. The following .examples show how different output configurations perform a reset function in various systems.

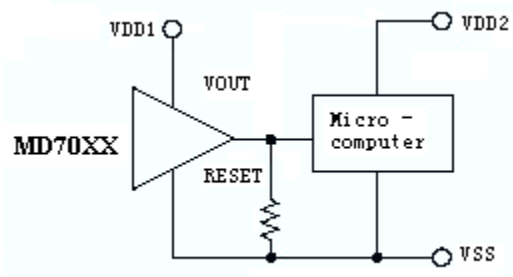
- NMOS open drain output application for separate power supply



- NMOS open drain output application with R-C delay

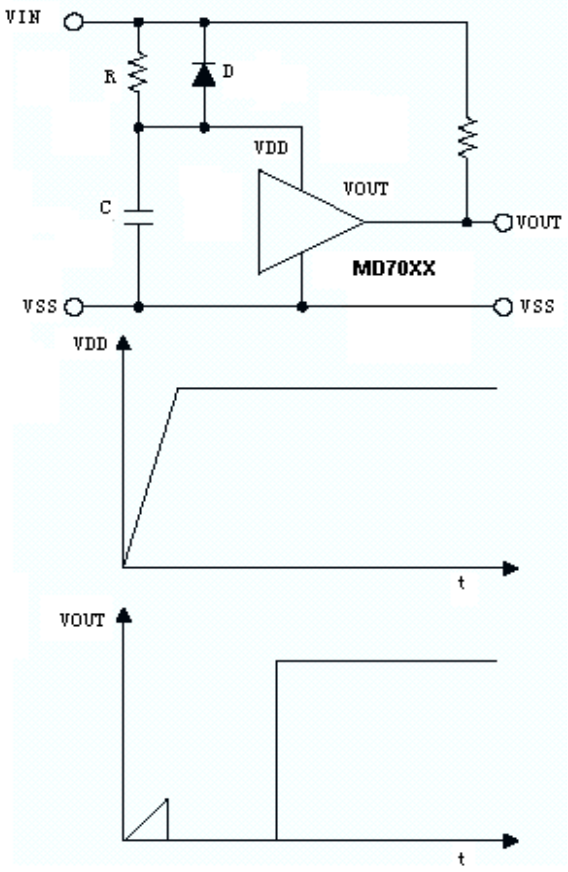


- PMOS open drain output application for separate power supply



- Power-on reset circuit

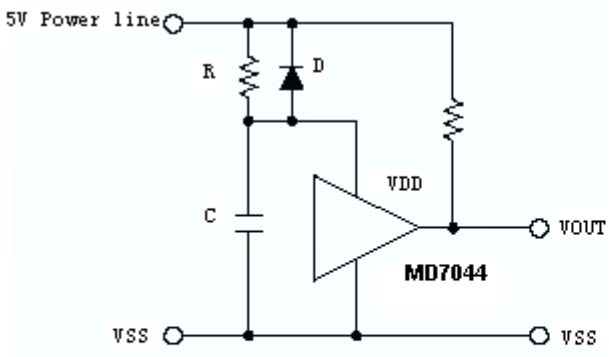
With several external components, the NMOSopen drain type of the MDV70XX series can be used to perform a power-on reset function as shown:



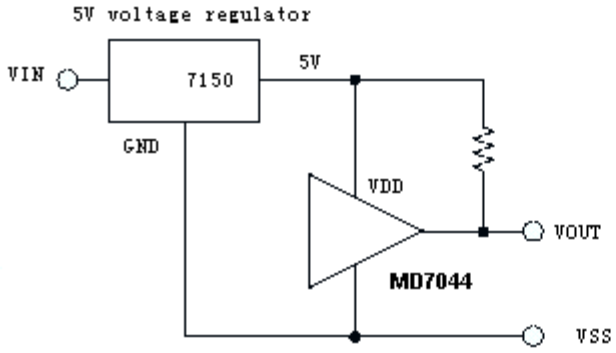
5V power line monitoring circuit

Generally, a minimum operating voltage of 4.5V is guaranteed in a 5V power line system. The MDV7044 is recommended for use as 5V power line monitoring circuit.

・5V power line monitor with power-on reset



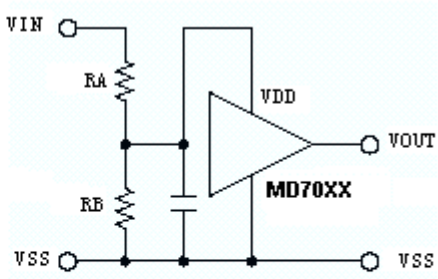
・ with 5V voltage regulator



Change of detectable voltage

If the required voltage is not found in the standard product selection table, it is possible to change it by using external resistance dividers or diodes.

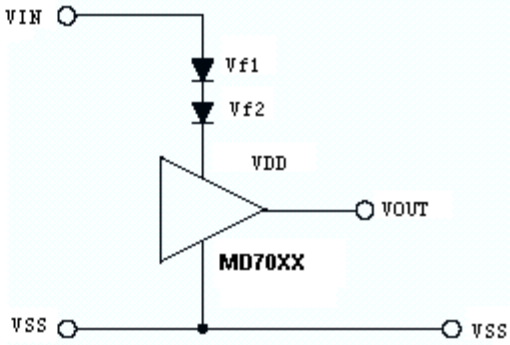
・Varying the detectable voltage with a resistance divider



$$\text{Detectable voltage} = \frac{RA + RB}{RB} \times V_{DET}$$

$$\text{Hysteresis width} = \frac{RA + RB}{RB} \times V_{HYS}$$

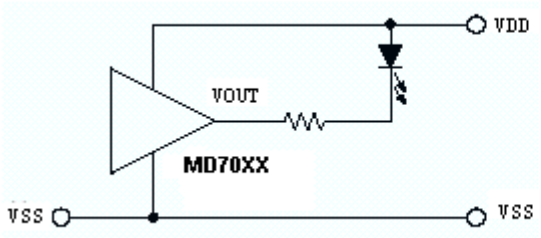
・ Varying the detectable voltage with a diode



Detectable Voltage = $V_{f1}+V_{f2}+V_{DET}$

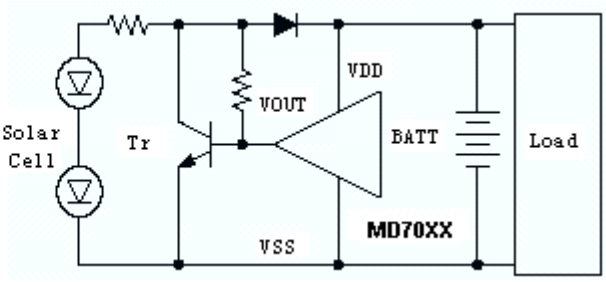
Malfunction analysis

The following circuit demonstrates the way a circuit analyzes malfunctions by monitoring the variation or spike noise of power supply voltage.



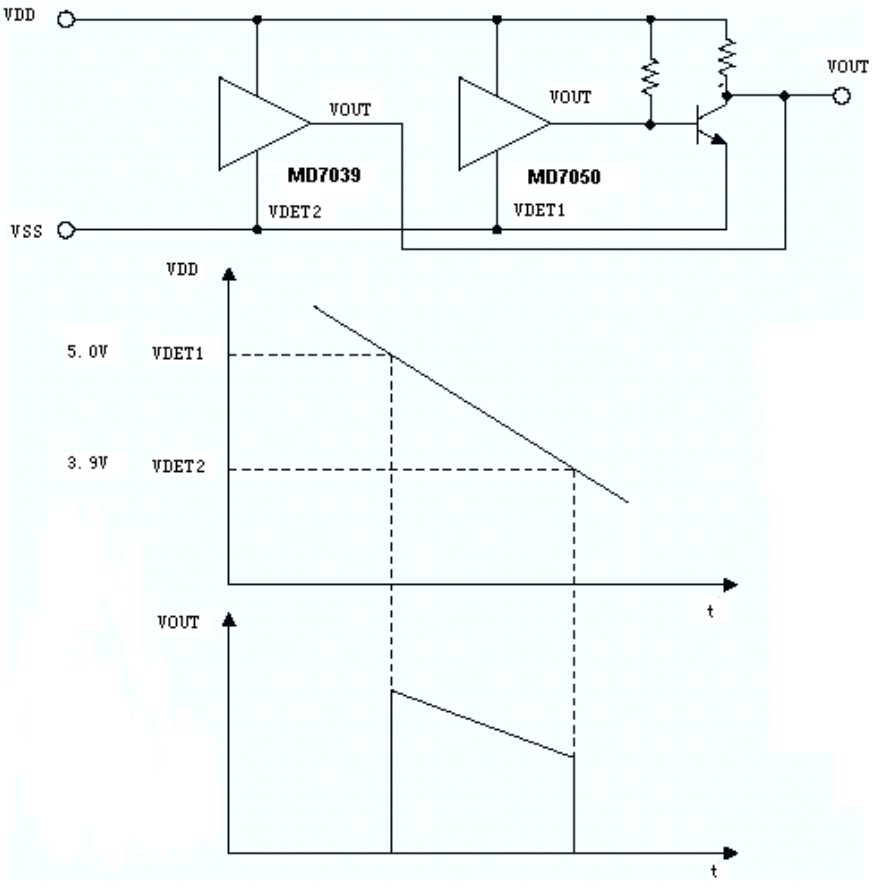
Charge monitoring circuit

The following circuit shows a charged monitor for protection against battery deterioration by overcharging. When the voltage of the battery is higher than the set detectable voltage, the transistor turns on to bypass the charge current, protecting the battery from overcharging.



Level selector

The following diagram illustrates a logic level selector.

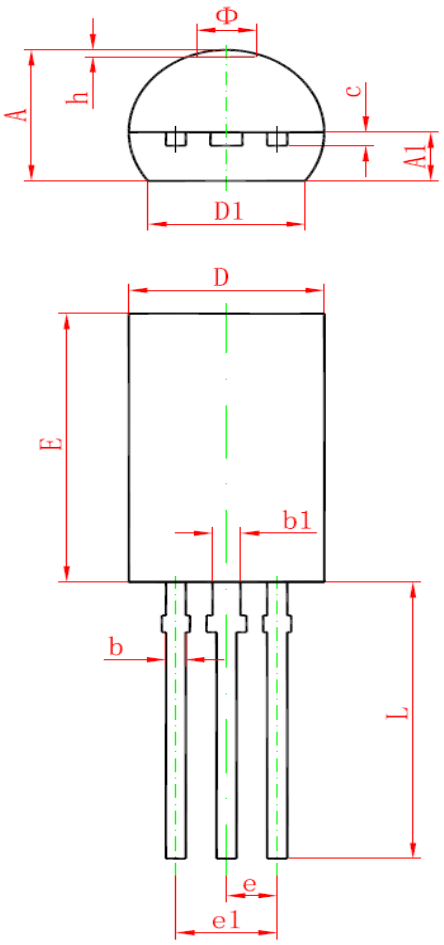


Order Information

MODEL	ORDER NUMBER	PACKAGE DESCRIPTION	PACKAGE OPTION
MDV70XX	"XX"express voltage , output default is NMOS Drain Output,,the model is MDV70XXCexpress output type is CMOS,For example MDV7033C the detection voltage 3.3V,output type COMS.	SOT89-3	Tape and Reel, 1000
		TO-92	Tape and Bag, 1000
		SOT23-3	Tape and Reel, 3000
		SOT23-5	Tape and Reel, 3000

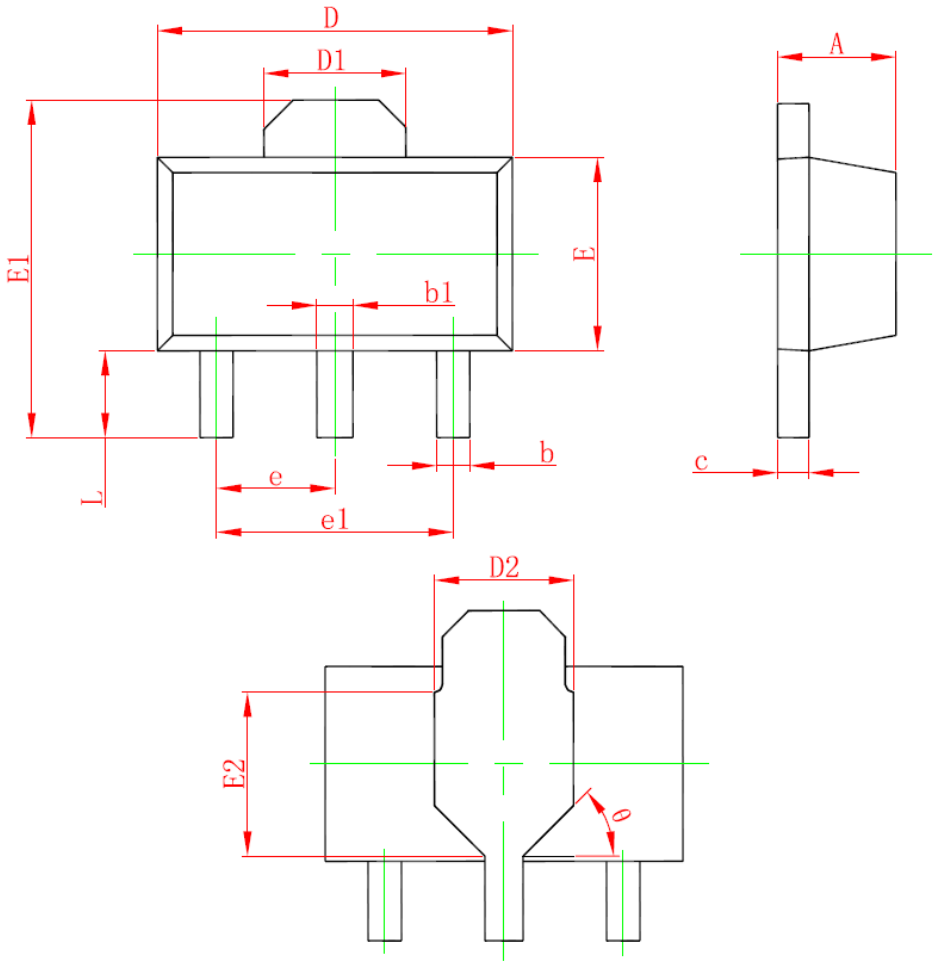
Package Description

TO92 package outline diemensions



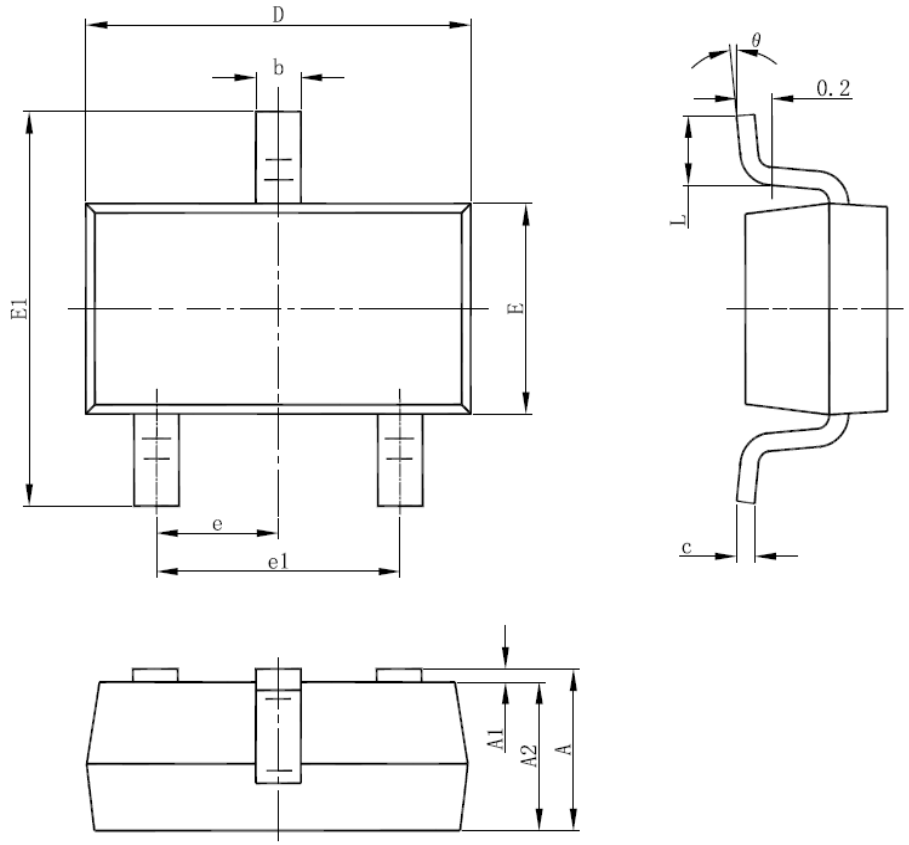
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	3.750	4.050	0.148	0.159
A1	1.280	1.580	0.050	0.062
b	0.380	0.550	0.015	0.022
b1	0.620	0.780	0.024	0.031
c	0.350	0.450	0.014	0.018
D	4.750	5.050	0.187	0.199
D1	4.000		0.157	
E	7.850	8.150	0.309	0.321
e	1.270 TYP.		0.050 TYP.	
e1	2.440	2.640	0.096	0.104
L	13.800	14.200	0.543	0.559
Φ		1.600		0.063
h	0.000	0.300	0.000	0.012

SOT89-3L package outline diemensions



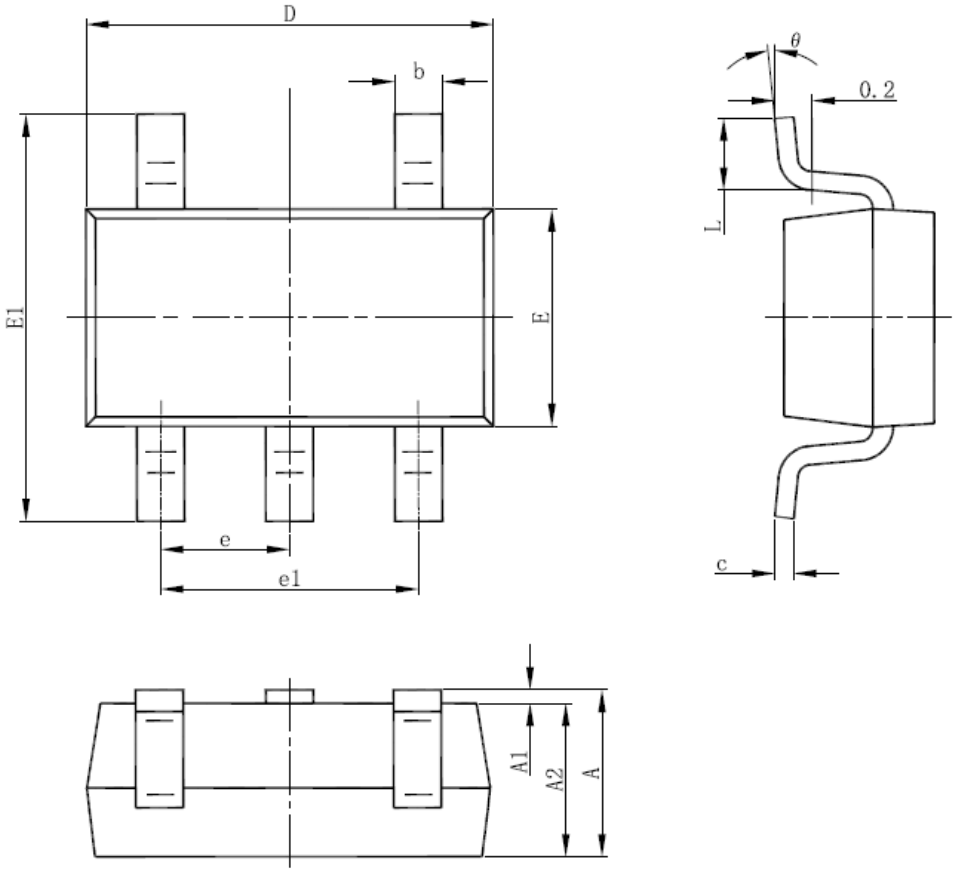
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.020
b1	0.400	0.580	0.016	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF.		0.061 REF.	
D2	1.750 REF.		0.069 REF.	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
E2	1.900 REF.		0.075 REF.	
e	1.500 TYP.		0.060 TYP.	
e1	3.000 TYP.		0.118 TYP.	
L	0.900	1.200	0.035	0.047
θ	45°		45°	

SOT23-3L package outline diemensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

SOT-23-5L package outline diemensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

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