

ECLA**EUROPEAN CLASSIFICATION****H03K**

PULSE TECHNIQUE (measuring pulse characteristics G01R; mechanical counters having an electrical input G06M; information storage devices in general G11; sample-and-hold arrangements in electric analogue stores [G11C27/02](#); construction of switches involving contact making and breaking for generation of pulses, e.g. by using a moving magnet, H01H; static conversion of electric power H02M; generation of oscillations by circuits employing active elements which operate in a non-switching manner H03B; modulating sinusoidal oscillations with pulses H03C, H04L; discriminator circuits involving pulse counting H03D; automatic control of generators H03L; starting, synchronisation or stabilisation of generators where the type of generator is irrelevant or unspecified H03L; coding, decoding or code conversion in general H03M)

[N: **WARNING**

1. The following IPC groups are not used in the internal ECLA classification scheme. Subject matter covered by these groups is classified in the following ECLA groups :

[H03K17/695](#)

covered by

[H03K17/687](#)

]

Notes

1. This subclass covers:

- methods, circuits, devices, or apparatus using active elements operating in a discontinuous or switching manner for generating, counting, amplifying, shaping, modulating, demodulating, or otherwise manipulating signals;
- electronic switching not involving contact-making and braking;
- logic circuits handling electric pulses.

2. In this subclass, the following expression is used with the meaning indicated:

- "active element" exercises control over the conversion of input energy into an oscillation or a discontinuous flow of energy.

3. In this subclass, where the claims of a patent document are not limited to a specific circuit element, the document is classified at least according to the elements used in the described embodiment.

H03K3/00

Circuits for generating electric pulses; Monostable, bistable or multistable circuits ([H03K4/00](#) takes precedence; for digital computers [G06F1/025](#), [N: [G06F1/04](#)])

H03K3/01

- . Details

H03K3/011

- . . Modifications of generator to compensate for variations in physical values, e.g. voltage, temperature [N: (to maintain energy constant [H03K3/015](#))] [N9507]

H03K3/012

- . . Modifications of generator to improve response time or to decrease power

- consumption [N9507]
- H03K3/013 . . Modifications of generator to prevent operation by noise or interference
- H03K3/014 . . Modifications of generator to ensure starting of oscillations [N9507]
- H03K3/015 . . Modifications of generator to maintain energy constant [N9507]
- H03K3/017 . . Adjustment of width or dutycycle of pulses (pulse width modulation [H03K7/08](#); [N: to maintain energy constant [H03K3/015](#)])
- H03K3/02 . Generators characterised by the type of circuit or by the means used for producing pulses ([H03K3/64](#) to [H03K3/84](#) take precedence)
- H03K3/021 . . by the use, as active elements, of more than one type of element or means, e.g. BIMOS, composite devices such as IGBT [N9507]
- H03K3/023 . . by the use of differential amplifiers or comparators, with internal or external positive feedback
- H03K3/0231 . . . Astable circuits [N: [H03K3/03D](#) takes precedence] [N9507] [C0301]
- H03K3/0231B [N: Stabilisation of output, e.g. using crystal] [N9507]
- H03K3/0232 . . . Monostable circuits [N9507]
- H03K3/0233 . . . Bistable circuits [N9507]
- H03K3/0233B [N: of the master-slave type] [N9507]
- H03K3/0233D [N: provided with means for increasing reliability; for protection; for ensuring a predetermined initial state when the supply voltage has been applied; for storing the actual state when the supply voltage fails (digital storage cells each combining volatile and non-volatile storage properties [G11C14/00](#))] [N9507]
- H03K3/0233F [N: Bistables with hysteresis, e.g. Schmitt trigger (non-regenerative amplitude discriminators [G01R19/165](#))] [N9507]
- H03K3/0234 . . . Multistable circuits [N9507]
- H03K3/027 . . by the use of logic circuits, with internal or external positive feedback
- H03K3/03 . . . Astable circuits
- H03K3/03B [N: Stabilisation of output, e.g. using crystal]
- H03K3/03D [N: Ring oscillators] [N0301]
- H03K3/03D2 [N: with differential cells] [N0301]
- H03K3/033 . . . Monostable circuits
- H03K3/037 . . . Bistable circuits
- H03K3/037B [N: of the master-slave type]
- H03K3/037C [N: provided with means for increasing reliability; for protection; for ensuring a predetermined initial state when the supply voltage has been applied; for storing the actual state when the supply voltage fails (digital storage cells each combining volatile and non-volatile storage properties [G11C14/00](#))]
- H03K3/037F [N: Bistables with hysteresis, e.g. Schmitt trigger (non-regenerative amplitude discriminators [G01R19/165](#))] [N9507]
- H03K3/038 . . . Multistable circuits [N9507]
- H03K3/04 . . by the use, as active elements, of vacuum tubes only, with positive feedback ([H03K3/023](#), [H03K3/027](#) take precedence)
- H03K3/05 . . . using means other than a transformer for feedback
- H03K3/06 using at least two tubes so coupled that the input of one is derived from the output of another, e.g. multivibrator
- H03K3/08 astable

| | | |
|-------------|-----------|---|
| H03K3/09 | | Stabilisation of output |
| H03K3/10 | | monostable |
| H03K3/12 | | bistable |
| H03K3/13 | | Bistables with hysteresis, e.g. Schmitt trigger [N9507] |
| H03K3/14 | | multistable |
| H03K3/16 | | using a transformer for feedback, e.g. blocking oscillator with saturable core |
| H03K3/22 | | specially adapted for amplitude comparison, i.e. Multiar |
| H03K3/26 | | by the use, as active elements, of bipolar transistors with internal or external positive feedback (H03K3/023 , H03K3/027 take precedence) |
| H03K3/28 | | using means other than a transformer for feedback |
| H03K3/281 | | using at least two transistors so coupled that the input of one is derived from the output of another, e.g. multivibrator |
| H03K3/282 | | astable |
| H03K3/282B | | [N: Emitters connected to one another by using a capacitor] |
| H03K3/282C | | [N: using two active transistor of the same conductivity type (H03K3/282B takes precedence)] |
| H03K3/282C1 | | {7 dots} [N: in an asymmetrical circuit configuration] |
| H03K3/282D | | [N: using two active transistors of the complementary type (H03K3/282B take precedence)] |
| H03K3/282D1 | | {7 dots} [N: in an asymmetrical circuit configuration] |
| H03K3/283 | | Stabilisation of output [N: e.g. using crystal] |
| H03K3/284 | | monostable |
| H03K3/286 | | bistable |
| H03K3/286B | | [N: ensuring a predetermined initial state when the supply voltage has been applied; storing the actual state when the supply voltage fails (digital storage cells each combining volatile and non-volatile storage properties G11C14/00)] |
| H03K3/287 | | using additional transistors in the feedback circuit (H03K3/289 takes precedence) |
| H03K3/288 | | using additional transistors in the input circuit (H03K3/289 takes precedence) |
| H03K3/2885 | | {7 dots} the input circuit having a differential configuration |
| H03K3/289 | | of the master-slave type |
| H03K3/2893 | | Bistables with hysteresis, e.g. Schmitt trigger [N9507] |
| H03K3/2897 | | {7 dots} with an input circuit of differential configuration [N9507] |
| H03K3/29 | | multistable |
| H03K3/30 | | using a transformer for feedback, e.g. blocking oscillator |
| H03K3/313 | | by the use, as active elements, of semiconductor devices with two electrodes, one or two potential-jump barriers, and exhibiting a negative resistance characteristic |
| H03K3/315 | | the devices being tunnel diodes |
| H03K3/33 | | by the use, as active elements, of semiconductor devices exhibiting hole storage or enhancement effect |
| H03K3/335 | | by the use, as active elements, of semiconductor devices with more than two electrodes and exhibiting avalanche effect |
| H03K3/35 | | by the use, as active elements, of bipolar semiconductor devices with more than two PN junctions, or more than three electrodes, or more than one electrode |

connected to the same conductivity region ([H03K3/023](#), [H03K3/027](#) take precedence)

[N: **WARNING**

Not complete; for four layer diodes see also [H03K3/313](#)]

- H03K3/351 . . . the devices being unijunction transistors ([H03K3/352](#) takes precedence)
- H03K3/352 . . . the devices being thyristors
- H03K3/3525 Anode gate thyristors or programmable unijunction transistors [N9507]
- H03K3/353 . . by the use, as active elements, of field-effect transistors with internal or external positive feedback ([H03K3/023](#), [H03K3/027](#) take precedence)
- H03K3/354 . . . Astable circuits
- H03K3/354B [N: Stabilisation of output, e.g. using crystal]
- H03K3/355 . . . Monostable circuits
- H03K3/356 . . . Bistable circuits
- H03K3/356C [N: ensuring a predetermined initial state when the supply voltage has been applied; storing the actual state when the supply voltage fails (digital storage cells each combining volatile and non-volatile storage properties [G11C14/00](#))]
- H03K3/356D [N: using additional transistors in the input circuit ([H03K3/356G](#), [H03K3/3562](#) take precedence)]
- H03K3/356D1 [N: with synchronous operation ([H03K3/356D2](#), [H03K3/356D4](#) take precedence)]
- H03K3/356D2 [N: the input circuit having a differential configuration]
- H03K3/356D2B [N: with synchronous operation]
- H03K3/356D4 [N: using pass gates]
- H03K3/356D4B [N: with synchronous operation]
- H03K3/356E [N: using additional transistors in the feedback circuit ([H03K3/356G](#), [H03K3/3562](#) take precedence)]
- H03K3/356E2 [N: with synchronous operation]
- H03K3/356F [N: with additional means for controlling the main nodes ([H03K3/356G](#), [H03K3/3562](#) take precedence)]
- H03K3/356F2 [N: with synchronous operation]
- H03K3/356G [N: using complementary field-effect transistors ([H03K3/3562B](#) takes precedence)]

[N: **WARNING**

Subgroups of [H03K3/356G](#) are not complete.]

- H03K3/356G2 [N: using additional transistors in the input circuit] [N9711]
- H03K3/356G2B [N: with synchronous operation ([H03K3/356G2D](#), [H03K3/356G2F](#) take precedence)] [N9711]
- H03K3/356G2D [N: the input circuit having a differential configuration] [N9711]
- H03K3/356G2D2 {7 dots} [N: with synchronous operation] [N9711]
- H03K3/356G2F [N: using pass gates] [N9711]
- H03K3/356G2F2 {7 dots} [N: with synchronous operation] [N9711]
- H03K3/356G4 [N: using additional transistors in the feedback circuit] [N9711]
- H03K3/356G4B [N: with synchronous operation] [N9711]

- H03K3/356G6 [N: with additional means for controlling the main nodes] [N9711]
- H03K3/356G6B [N: with synchronous operation] [N9711]
- H03K3/3562 of the master-slave type [N9507]
- H03K3/3562B [N: using complementary field-effect transistors] [N9507]
- H03K3/3565 Bistables with hysteresis, e.g. Schmitt trigger [N9507]
- H03K3/3568 Multistable circuits [N9507]
- H03K3/357 . . . by the use, as active elements, of bulk negative resistance devices, e.g. Gunn-effect devices
- H03K3/36 . . . by the use, as active elements, of semiconductors, not otherwise provided for
- H03K3/37 . . . by the use, as active elements, of gas-filled tubes, e.g. astable trigger circuits ([H03K3/55](#) takes precedence)
- H03K3/38 . . . by the use, as active elements, of superconductive devices
- H03K3/40 . . . by the use, as active elements, of electrochemical cells
- H03K3/42 . . . by the use, as active elements, of opto-electronic devices, i.e. light-emitting and photoelectric devices electrically- or optically-coupled
- H03K3/43 . . . by the use, as active elements, of beam deflection tubes
- H03K3/45 . . . by the use, as active elements, of non-linear magnetic or dielectric devices
- H03K3/45B [N: using thin films]
- H03K3/47 the devices being parametrons
- H03K3/49 the devices being ferro-resonant
- H03K3/51 the devices being multi-aperture magnetic cores, e.g. transfluxors
- H03K3/53 . . . by the use of an energy-accumulating element discharged through the load by a switching device controlled by an external signal and not incorporating positive feedback ([H03K3/335](#) takes precedence; [N: working of metal by electro-erosion with spark discharge [B23H](#); for internal combustion engine ignition systems [F02P3/08](#); electronic lighters [F23Q2/28C](#), [F23Q3/00](#); flash lamps [H05B41/30](#)])
- H03K3/537 the switching device being a spark gap
- H03K3/543 the switching device being a vacuum tube
- H03K3/55 the switching device being a gas-filled tube having a control electrode
- H03K3/57 the switching device being a semiconductor device
- H03K3/59 . . . by the use of galvano-magnetic devices, e.g. Hall effect devices
- H03K3/64 . . . Generators producing trains of pulses, i.e. finite sequences of pulses
- H03K3/66 by interrupting the output of a generator
- H03K3/70 time intervals between all adjacent pulses of one train being equal
- H03K3/72 with means for varying repetition rate of trains
- H03K3/78 . . . Generating a single train of pulses having a predetermined pattern, e.g. a predetermined number
- H03K3/80 . . . Generating train of sinusoidal oscillations (by interrupting [H03C](#), [H04L](#))
- H03K3/84 . . . Generating pulses having a predetermined statistical distribution of a parameter, e.g. random pulse generators
- H03K3/86 . . . Generating pulses by means of delay lines and not covered by the preceding sub-groups

H03K4/00

Generating pulses having essentially a finite slope or stepped portions (generation of supply voltages from deflection waveforms [H04N3/18](#))

- H03K4/02 . having stepped portions, e.g. staircase waveform
- H03K4/02C . . [N: by repetitive charge or discharge of a capacitor, analogue generators]
- H03K4/02D . . [N: using digital techniques]
- H03K4/04 . having parabolic shape
- H03K4/06 . having triangular shape
- H03K4/06H . . [N: high voltage - or current generators]
- H03K4/06M . . [N: using a Miller-integrator ([H03K4/08](#) takes precedence)]
- H03K4/08 . . having sawtooth shape
- H03K4/08B . . . [N: Protection of sawtooth generators]
- H03K4/10 . . . using as active elements vacuum tubes only
- H03K4/12 in which a sawtooth voltage is produced across a capacitor
- H03K4/14 using two tubes so coupled that the input of each one is derived from the output of the other, e.g. multivibrator [N: (multivibrator generating other pulses [H03K3/00](#))]
- H03K4/16 using a single tube with positive feedback through transformer, e.g. blocking oscillator [N: (blocking oscillators generating other pulses [H03K3/00](#))]
- H03K4/18 using a single tube exhibiting negative resistance between two of its electrodes, e.g. transitron, dynatron
- H03K4/20 using a tube with negative feedback by capacitor, e.g. Miller integrator
- H03K4/22 combined with transitron, e.g. phantastron, sanatron
- H03K4/24 Boot-strap generators
- H03K4/26 in which a sawtooth current is produced through an inductor
- H03K4/28 using a tube operating as a switching device
- H03K4/32 combined with means for generating the driving pulses
- H03K4/34 {7 dots} using a single tube with positive feedback through a transformer
- H03K4/36 {7 dots} using a single tube exhibiting negative resistance between two of its electrodes, e.g. transitron, dynatron
- H03K4/38 {8 dots} combined with Miller integrator
- H03K4/39 using a tube operating as an amplifier
- H03K4/41 with negative feedback through a capacitor, e.g. Miller-integrator
- H03K4/43 combined with means for generating the driving pulses
- H03K4/48 . . . using as active elements semiconductor devices ([H03K4/787](#) to [H03K4/84](#) take precedence)
- H03K4/50 in which a sawtooth voltage is produced across a capacitor
- H03K4/501 the starting point of the flyback period being determined by the amplitude of the voltage across the capacitor, e.g. by a comparator [N9509]
- H03K4/502 the capacitor being charged from a constant-current source [N9509]
- H03K4/52 using two semiconductor devices so coupled that the input of each one is

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| | | | | derived from the output of the other, e.g. multivibrator [N: (multivibrators generating other pulses H03K3/00)] |
| H03K4/54 | . | . | . | using a single semiconductor device with positive feedback through a transformer, e.g. blocking oscillator [N: (blocking oscillators generating other pulses H03K3/00)] |
| H03K4/56 | . | . | . | using a semiconductor device with negative feedback through a capacitor, e.g. Miller integrator |
| H03K4/58 | . | . | . | Boot-strap generators |
| H03K4/60 | . | . | . | in which a sawtooth current is produced through an inductor |
| H03K4/62 | . | . | . | using a semiconductor device operating as a switching device |
| H03K4/62D | . | . | . | [N: using pulse-modulation techniques for the generation of the sawtooth wave, e.g. class D, switched mode] |
| H03K4/64 | . | . | . | combined with means for generating the driving pulses [N: (H03K4/62D takes precedence)] |
| H03K4/66 | . | . | . | {7 dots} using a single device with positive feedback, e.g. blocking oscillator |
| H03K4/68 | . | . | . | Generators in which the switching device is conducting during the fly-back part of the cycle |
| H03K4/69 | . | . | . | using a semiconductor device operating as an amplifier |
| H03K4/69B | . | . | . | [N: operating in push-pull, e.g. class B (H03K4/69F takes precedence)] |
| H03K4/69F | . | . | . | [N: using means for reducing power dissipation or for shortening the flyback time, e.g. applying a higher voltage during flyback time] |
| H03K4/71 | . | . | . | with negative feedback through a capacitor, e.g. Miller-integrator |
| H03K4/72 | . | . | . | combined with means for generating the driving pulses |
| H03K4/72B | . | . | . | {7 dots} [N: Push-pull amplifier circuits] |
| H03K4/787 | . | . | . | using as active elements semiconductor devices with two electrodes and exhibiting a negative resistance characteristic |
| H03K4/793 | . | . | . | using tunnel diodes |
| H03K4/80 | . | . | . | using as active elements multi-layer diodes |
| H03K4/83 | . | . | . | using as active elements semiconductor devices with more than two PN junctions or with more than three electrodes or more than one electrode connected to the same conductivity region |
| H03K4/83D | . | . | . | [N: using pulse-modulation techniques for the generation of the sawtooth wave, e.g. class D, switched mode] |
| H03K4/84 | . | . | . | Generators in which the semiconductor device is conducting during the fly-back part of the cycle [N: (H03K4/83D takes precedence)] |
| H03K4/86 | . | . | . | using as active elements gas-filled tubes [N: or spark-gaps] |
| H03K4/88 | . | . | . | using as active elements electrochemical cells [N: or galvano-magnetic or photo-electric elements] |
| H03K4/90 | . | . | . | Linearisation of ramp (modifying slopes of pulses H03K6/04 ; scanning correction for television receivers H04N3/16); Synchronisation of pulses (in pictorial communication systems H04N1/36 , H04N5/04 ; colour synchronisation H04N9/44) |
| H03K4/92 | . | . | . | having a waveform comprising a portion of a sinusoid (generating sinusoidal oscillations H03B) |
| H03K4/94 | . | . | . | having trapezoidal shape |

H03K5/00

Manipulating pulses not covered by one of the other main groups in this subclass
(circuits with regenerative action [H03K3/00](#), [H03K4/00](#); by the use of non-linear magnetic or dielectric devices [H03K3/45](#))

Note

In this group, the input signals are of the pulse type.

- H03K5/00C
 - [N: Changing the frequency (modulating pulses [H03K7/00](#); frequency dividers [H03K21/00](#) to [H03K29/00](#); additive or subtractive mixing of two pulse rates into one [G06F7/60H](#); pulse rate dividers [G06F7/68](#))]
- H03K5/003
 - Changing the DC level (television signals [H04N3/00](#)) [N9511]
- H03K5/007
 - . Base line stabilisation (thresholding [H03K5/08](#)) [N9511]
- H03K5/01
 - Shaping pulses (discrimination against noise or interference [H03K5/125](#)) [C9511]
- H03K5/02
 - . by amplifying ([H03K5/04](#) takes precedence; wide-band amplifiers in general [H03F](#))
- H03K5/02B
 - . . [N: using field effect transistors]
- H03K5/02D
 - . . [N: with a bidirectional operation]
- H03K5/04
 - . by increasing duration; by decreasing duration
- H03K5/05
 - . . by the use of clock signals or other time reference signals [C9511]
- H03K5/06
 - . . by the use of delay lines or other analogue delay elements [C9511]
- H03K5/06B
 - . . . [N: using dispersive delay lines]
- H03K5/07
 - . . by the use of resonant circuits
- H03K5/08
 - . by limiting; by thresholding; by slicing, i.e. combined limiting and thresholding ([H03K5/07](#) takes precedence; comparing one pulse with another [H03K5/22](#); providing a determined threshold for switching [H03K17/30](#))
- H03K5/08B
 - . . [N: with an adaptive threshold]
- H03K5/08B2
 - . . . [N: modified by switching, e.g. by a periodic signal or by a signal in synchronism with the transitions of the output signal]
- H03K5/08B4
 - . . . [N: generated by feedback]
- H03K5/08B4B
 - [N: modified by switching, e.g. by a periodic signal or by a signal in synchronism with the transitions of the output signal]
- H03K5/12
 - . by steepening leading or trailing edges
- H03K5/125
 - Discriminating pulses (measuring or indicating [G01R19/00](#), [G01R23/00](#), [G01R25/00](#), [G01R29/00](#); separation of synchronising signals in television systems [H04N5/08](#)) [N9511]
- H03K5/1252
 - . Suppression or limitation of noise or interference (specially adapted for transmission systems [H04B15/00](#), [H04L25/08](#)) [N9511]
- H03K5/1254
 - . . specially adapted for pulses generated by closure of switches, i.e. anti-bouncing devices (debouncing circuits for electronic time-pieces [G04G5/00](#)) [N9511]
- H03K5/13
 - Arrangements having a single output and transforming input signals into pulses delivered at desired time intervals [N: (measuring time intervals using electronic timing, e.g. counting means [G04F1/00B](#))]
- H03K5/13B
 - . [N: digitally controlled]
- H03K5/13D
 - . [N: using a chain of active delay devices]
- H03K5/13D2
 - . . [N: with field-effect transistors]

- H03K5/135 . . by the use of time reference signals, e.g. clock signals
- H03K5/14 . . by the use of delay lines [N: (using active delay devices [H03K5/13D](#))]
- H03K5/145 . . by the use of resonant circuits

- H03K5/15 . Arrangements in which pulses are delivered at different times at several outputs, i.e. pulse distributors (distributing, switching or gating arrangements [H03K17/00](#))
- H03K5/15C . . [N: with two programmable outputs]
- H03K5/15D . . [N: with more than two outputs]
- H03K5/15D2 . . . [N: programmable]
- H03K5/15D4 . . . [N: with asynchronously driven series connected output stages]
- H03K5/15D4B [N: using a chain of bistable devices]
- H03K5/15D4D [N: using a chain of active delay devices ([H03K5/15D4M](#) takes precedence)]
- H03K5/15D4L [N: using a tapped delay line]
- H03K5/15D4M [N: using a chain of monostable devices]
- H03K5/15D6 . . . [N: with parallel driven output stages; with synchronously driven series connected output stages]
- H03K5/15D6B [N: using bistable devices ([H03K5/15D6S](#) takes precedence)]
- H03K5/15D6C [N: using a plurality of comparators]
- H03K5/15D6L [N: using a plurality of delay lines]
- H03K5/15D6M [N: using a plurality of monostables devices]
- H03K5/15D6S [N: using devices arranged in a shift register]
- H03K5/151 . . with two complementary outputs [N9511]
- H03K5/151B . . . [N: non-overlapping] [N9511]

- H03K5/153 . Arrangements in which a pulse is delivered at the instant when a predetermined characteristic of an input signal is present or at a fixed time interval after this instant (switching at zero crossing [H03K17/13](#); [N: measuring characteristics of individual pulses [G01R29/02](#)] [C9602])
- H03K5/1532 . . Peak detectors [N9511] [C9602]
- H03K5/1534 . . Transition or edge detectors [N9511]
- H03K5/1536 . . Zero-crossing detectors (in measuring circuits [G01R19/175](#)) [N9511]

- H03K5/156 . Arrangements in which a continuous pulse train is transformed into a train having a desired pattern
- H03K5/156D . . [N: the output pulses having a constant duty cycle]

- H03K5/159 . Applications of delay lines not covered by the preceding subgroups

- H03K5/19 . Monitoring patterns of pulse trains (indicating amplitude [G01R19/00](#); indicating frequency [G01R23/00](#); measuring characteristics of individual pulses [G01R29/02](#))

- H03K5/22 . Circuits having more than one input and one output for comparing pulses or pulse trains with each other according to input signal characteristics, e.g. slope, integral (indicating phase difference of two cyclic pulse trains [G01R25/00](#))

- H03K5/24 . . the characteristic being amplitude
- H03K5/24B . . . [N: using bipolar transistors ([H03K5/24C](#) takes precedence)]
- H03K5/24B2 [N: with at least one differential stage]

- H03K5/24B4 [N: using clock signals]
- H03K5/24C [N: using a combination of bipolar and field-effect transistors]
- H03K5/24C2 [N: with at least one differential stage]
- H03K5/24C4 [N: using clock signals]
- H03K5/24D [N: using diodes]
- H03K5/24F [N: using field effect transistors ([H03K5/24C](#) takes precedence)]
- H03K5/24F2 [N: with at least one differential stage]
- H03K5/24F4 [N: using clock signals]
- H03K5/26 . . the characteristic being duration, interval, position, frequency, or sequence

H03K6/00 **Manipulating pulses having a finite slope and not covered by one of the other main groups of this subclass** ([circuits with regenerative action H03K4/00](#))

- H03K6/02 . Amplifying pulses [N: ([generation of a sawtooth current through an inductor by amplification H03K4/28](#), [H03K4/39](#), [H03K4/43](#), [H03K4/62](#), [H03K4/69](#))]
- H03K6/04 . Modifying slopes of pulses, [N: e.g. [S-correction](#)]

H03K7/00 **Modulating pulses with a continuously-variable modulating signal**

- H03K7/02 . Amplitude modulation, i.e. PAM
- H03K7/04 . Position modulation, i.e. PPM
- H03K7/06 . Frequency or rate modulation, i.e. PFM or PRM
- H03K7/08 . Duration or width modulation [N: [Duty cycle modulation](#)]
- H03K7/10 . Combined modulation, e.g. rate modulation and amplitude modulation

H03K9/00 **Demodulating pulses which have been modulated with a continuously-variable signal**

- H03K9/02 . of amplitude-modulated pulses
- H03K9/04 . of position-modulated pulses
- H03K9/06 . of frequency- or rate-modulated pulses
- H03K9/08 . of duration- or width-modulated pulses [N: [or of duty-cycle modulated pulses](#)]
- H03K9/10 . of pulses having combined modulation

H03K11/00 **Transforming types of modulations, e.g. position-modulated pulses into duration-modulated pulses**

H03K12/00 **Producing pulses by distorting or combining sinusoidal waveforms** ([combining sinewaves using elements operating in a non-switching manner H03B](#); [N: [limiting or clipping](#), e.g. [H03G11/00](#)])

[N: WARNING]

Not complete, see also [H03K5/08](#), [H03K5/12](#)
]

H03K17/00

Electronic switching or gating, i.e. not by contact-making or -braking (selection of the stylus or auxiliary electrode in electric printing [B41J2/405](#); sample-and-hold arrangements [G11C27/02](#); switching or interrupting devices in waveguides [H01P](#); gated amplifiers [H03F3/72](#); switching arrangements for exchange systems using static devices [H04Q3/52](#))

- H03K17/00M . [N: Switching arrangements with several input- or output terminals (code converters [H03M5/00](#), [H03M7/00](#))]
- H03K17/00M2 . . [N: with several inputs only]
- H03K17/00M4 . . [N: with several outputs only]
- H03K17/04 . Modifications for accelerating switching
- H03K17/04C . . [N: in thyristor switches]
- H03K17/04E . . [N: in composite switches]
- H03K17/041 . . without feedback from the output circuit to the control circuit [N: ([H03K17/04C](#), [H03K17/04E](#) take precedence)] [N9509]
- H03K17/041B . . . [N: in field-effect transistor switches ([H03K17/0412](#), [H03K17/0416](#) take precedence)] [N9509]
- H03K17/041D . . . [N: in bipolar transistor switches ([H03K17/0412](#), [H03K17/0416](#) take precedence)] [N9509]
- H03K17/0412 . . . by measures taken in the control circuit [N9509]
- H03K17/0412B [N: in field-effect transistor switches] [N9509]
- H03K17/0412D [N: in bipolar transistor switches] [N9509]
- H03K17/0414 Anti-saturation measures [N9509]
- H03K17/0416 . . . by measures taken in the output circuit [N9509]
- H03K17/0416B [N: in field-effect transistor switches] [N9509]
- H03K17/0416D [N: in bipolar transistor switches] [N9509]
- H03K17/042 . . by feedback from the output circuit to the control circuit [N: ([H03K17/04C](#), [H03K17/04E](#) take precedence)] [N9509]
- H03K17/042B . . . [N: in field-effect transistor switches] [N9509]
- H03K17/042D . . . [N: in bipolar transistor switches] [N9509]
- H03K17/0422 . . . Anti-saturation measures [N9509]
- H03K17/0424 . . . by the use of a transformer [N9509]
- H03K17/06 . Modifications for ensuring a fully conducting state
- H03K17/06B . . [N: in field-effect transistor switches]
- H03K17/08 . Modifications for protecting switching circuit against overcurrent or overvoltage
- H03K17/081 . . without feedback from the output circuit to the control circuit [N9509] [C9701]
- H03K17/081B . . . [N: in field-effect transistor switches ([H03K17/0812](#), [H03K17/0814](#) take precedence)] [N9509]

| | |
|---------------|--|
| H03K17/081C | . . . [N: in thyristor switches(H03K17/0812 , H03K17/0814 take precedence)][N9509] |
| H03K17/081D | . . . [N: in bipolar transistor switches (H03K17/0812 , H03K17/0814 take precedence)] [N9509] |
| H03K17/081E | . . . [N: in composite switches(H03K17/0812 , H03K17/0814 take precedence)][N9701] |
| H03K17/0812 | . . . by measures taken in the control circuit [N9509] |
| H03K17/0812B | [N: in field-effect transistor switches] [N9509] |
| H03K17/0812C | [N: in thyristor switches] [N9509] |
| H03K17/0812D | [N: in bipolar transistor switches] [N9509] |
| H03K17/0812E | [N: in composite switches] [N9701] |
| H03K17/0814 | . . . by measures taken in the output circuit [N9509] |
| H03K17/0814B | [N: in field-effect transistor switches] [N9509] |
| H03K17/0814C | [N: in thyristor switches] [N9509] |
| H03K17/0814D | [N: in bipolar transistor switches] [N9509] |
| H03K17/0814E | [N: in composite switches] [N9701] |
| H03K17/082 | . . by feedback from the output circuit to the control circuit [N9509] [C9701] |
| H03K17/082B | . . . [N: in field-effect transistor switches] [N9509] |
| H03K17/082C | . . . [N: in thyristor switches] [N9509] |
| H03K17/082D | . . . [N: in bipolar transistor switches] [N9509] |
| H03K17/082E | . . . [N: in composite switches] [N9701] |
| H03K17/10 | . Modifications for increasing the maximum permissible switched voltage |
| H03K17/10B | . . [N: in field-effect transistor switches] |
| H03K17/10C | . . [N: in thyristor switches] |
| H03K17/10E | . . [N: in composite switches] [N0101] |
| H03K17/12 | . Modifications for increasing the maximum permissible switched current |
| H03K17/12B | . . [N: in field-effect transistor switches] |
| H03K17/12C | . . [N: in thyristor switches] |
| H03K17/12E | . . [N: in composite switches] [N0405] |
| H03K17/13 | . Modifications for switching at zero crossing (generating an impulse at zero crossing H03K5/153) |
| H03K17/13B | . . [N: in field-effect transistor switches] |
| H03K17/13C | . . [N: in thyristor switches] |
| H03K17/14 | . Modifications for compensating variations of physical values, e.g. of temperature |
| H03K17/14B | . . [N: in field-effect transistor switches] |
| H03K17/16 | . Modifications for eliminating interference voltages or currents |
| H03K17/16B | . . [N: in field-effect transistor switches] |
| H03K17/16B2 | . . . [N: without feedback from the output circuit to the control circuit] |
| H03K17/16B2B | [N: Soft switching] |
| H03K17/16B2B2 | [N: using parallel switching arrangements] |
| H03K17/16B4 | . . . [N: by feedback from the output circuit to the control circuit] |

- H03K17/16B4B [N: Soft switching]
- H03K17/16B4B2 [N: using parallel switching arrangements]
- H03K17/16E . . [N: in composite switches] [N0001]

- H03K17/18 . Modifications for indicating state of switch

- H03K17/20 . Modifications for resetting core switching units to a predetermined state

- H03K17/22 . Modifications for ensuring a predetermined initial state when the supply voltage has been applied (bi-stable generators [H03K3/12](#))
- H03K17/22B . . [N: in field-effect transistor switches] [N0001]
- H03K17/24 . . Storing the actual state when the supply voltage fails

- H03K17/26 . Modifications for temporary blocking after receipt of control pulses

- H03K17/28 . Modifications for introducing a time delay before switching (time-programme switches providing a choice of time-intervals for executing more than one switching action [H03K17/296](#); [N: measuring time intervals using electronic timing, e.g. counting means [G04F1/00B](#)])

- H03K17/284 . . in field effect transistor switches
- H03K17/288 . . in tube switches
- H03K17/292 . . in thyristor, unijunction transistor or programmable unijunction transistor switches

- H03K17/296 . Time-programme switches providing a choice of time-intervals for executing more than one switching action and automatically terminating their operation after the programme is completed (electronic clocks comprising means to be operated at preselected times or after preselected time-intervals [G04G15/00](#))

- H03K17/30 . Modifications for providing a predetermined threshold before switching (shaping pulses by thresholding [H03K5/08](#); [N: for logic circuits [H03K19/00T](#)])
- H03K17/30B . . [N: in field-effect transistor switches]
- H03K17/30C . . [N: in thyristor switches]

- H03K17/51 . characterised by the components used ([H03K17/04](#) to [H03K17/30](#), [H03K17/94](#) take precedence)
- H03K17/52 . . using gas-filled tubes
- H03K17/54 . . using vacuum tubes (using diodes [H03K17/74](#))
- H03K17/54B . . . [N: using micro-engineered devices, e.g. field emission devices]
- H03K17/56 . . using semiconductor devices (using diodes [H03K17/74](#))
- H03K17/567 . . . Circuits characterised by the use of more than one type of semiconductor device, e.g. BIMOS, composite devices such as IGBT [N9602]

- H03K17/58 . . . using tunnel diodes
- H03K17/60 . . . using bipolar transistors
- H03K17/60C [N: using transformer coupling ([H03K17/61](#) takes precedence)] [C9602]
- H03K17/60D [N: in integrated circuits]
- H03K17/60E [N: with coupled emitters]
- H03K17/605 with galvanic isolation between the control circuit and the output circuit ([H03K17/78](#) takes precedence)

| | | |
|--------------|-----------|---|
| H03K17/61 | | using transformer coupling |
| H03K17/615 | | in a Darlington configuration |
| H03K17/62 | | Switching arrangements with several input- or output-terminals (code converters H03M5/00, H03M7/00) |
| H03K17/62B | | [N: without selecting means (H03K17/62E to H03K17/62H take precedence)] |
| H03K17/62B2 | | [N: using current steering means] |
| H03K17/62C | | [N: combined with selecting means(H03K17/62E to H03K17/62H take precedence)] |
| H03K17/62C2 | | [N: using current steering means] |
| H03K17/62D | | [N: with storage of control signal] |
| H03K17/62E | | [N: with several inputs only and without selecting means] |
| H03K17/62E2 | | [N: using current steering means] |
| H03K17/62F | | [N: with several inputs only combined with selecting means] |
| H03K17/62F2 | | [N: using current steering means] |
| H03K17/62G | | [N: with several outputs only and without selecting means] |
| H03K17/62G2 | | [N: using current steering means] |
| H03K17/62H | | [N: with several outputs only combined with selecting means] |
| H03K17/62H2 | | [N: using current steering means] |
| H03K17/64 | | having inductive loads [N: (driving circuits for electromagnets making use of a switching regulator provisionally in H01H47/32B)] |
| H03K17/66 | | Switching arrangements for passing the current in either direction at will; Switching arrangements for reversing the current at will |
| H03K17/66B | | [N: connected to both load terminals] |
| H03K17/66B2 | | [N: each output circuit comprising more than one controlled bipolar transistor] |
| H03K17/66B2C | | {7 dots} [N: using complementary bipolar transistors] |
| H03K17/66B2D | | {7 dots} [N: in a symmetrical configuration] |
| H03K17/66D | | [N: connected to one load terminal only] |
| H03K17/66D2 | | [N: the output circuit comprising more than one controlled bipolar transistor] |
| H03K17/66D2C | | {7 dots} [N: using complementary bipolar transistors] |
| H03K17/66D2D | | {7 dots} [N: in a symmetrical configuration] |
| H03K17/68 | | specially adapted for switching ac currents or voltages |
| H03K17/687 | | using field-effect transistors |
| H03K17/687B | | [N: the output circuit comprising more than one controlled field-effect transistor] |
| H03K17/687B2 | | [N: using complementary field-effect transistors] |
| H03K17/687B4 | | [N: in a symmetrical configuration] |
| H03K17/687D | | [N: the control circuit comprising active elements different from those used in the output circuit] |
| H03K17/689 | | with galvanic isolation between the control circuit and the output circuit (H03K17/78 takes precedence) |
| H03K17/689B | | [N: using acoustic means] |
| H03K17/691 | | using transformer coupling |

- H03K17/693 Switching arrangements with several input- or output-terminals ([code converters H03M5/00, H03M7/00](#))
- H03K17/70 having two electrodes and exhibiting negative resistance ([using tunnel diodes H03K17/58](#))
- H03K17/72 having more than two PN junctions; having more than three electrodes; having more than one electrode connected to the same conductivity region
- H03K17/722 with galvanic isolation between the control circuit and the output circuit ([H03K17/78 takes precedence](#))
- H03K17/722B [N: [using acoustic means](#)]
- H03K17/723 using transformer coupling
- H03K17/725 for ac voltages or currents ([H03K17/722, H03K17/735 take precedence](#))
- H03K17/73 for dc voltages or currents ([H03K17/722, H03K17/735 take precedence](#))
- H03K17/73L [N: [with inductive load](#)]
- [N: **WARNING**
Not complete, see also [H03K17/73](#)]
- H03K17/732 Measures for enabling turn-off
- H03K17/735 Switching arrangements with several input- or output-terminals ([H03K17/722 takes precedence](#))
- H03K17/74 using diodes [N: [\(using a combination of diodes and other devices H03K17/567; using tunnel diodes H03K17/58\)](#)]
- H03K17/76 Switching arrangements with several input- or output-terminals ([code converters H03M5/00, H03M7/00](#))
- H03K17/78 using opto-electronic devices, i.e. light-emitting and photoelectric devices electrically- or optically-coupled
- H03K17/785 controlling field-effect transistor switches
- H03K17/79 controlling [N: [bipolar](#)] semiconductor switches with more than two PN-junctions, or more than three electrodes, or more than one electrode connected to the same conductivity region
- H03K17/795 controlling bipolar transistors
- H03K17/795B [N: [using phototransistors](#)]
- H03K17/80 using non-linear magnetic devices; using non-linear dielectric devices [N: [\(H03K17/95, H03K17/97 take precedence\)](#)]
- H03K17/81 Switching arrangements with several input- or output-terminals ([code converters H03M5/00, H03M7/00](#))
- H03K17/82 using transfluxors
- H03K17/84 using thin-film devices
- H03K17/86 using twistors
- H03K17/88 using beam-deflection tubes
- H03K17/90 using galvano-magnetic devices, e.g. Hall effect devices ([H03K17/95, H03K17/97 take precedence](#))
- H03K17/92 using superconductive devices
- H03K17/94 characterised by the way in which the control signal is generated ([mechanical structural details of control members of switches or keyboards, such as keys, push-buttons, levers or other mechanisms for transferring force to the activated elements, not directly producing electronic effects H01H; keyboards for special applications, see the relevant places, e.g. \[B41J, G06F3/023, H04L15/00, H04L17/00, H04M1/00\]\(#\)](#))

| | | |
|---------------|-------------|--|
| H03K17/94L | . . | [N: using an optical detector (H03K17/968 takes precedence)] |
| H03K17/94L1 | . . . | [N: using a plurality of optical emitters or detectors, e.g. keyboard] |
| H03K17/945 | . . | Proximity switches (H03K17/96 takes precedence; [N: proximity fuzes F42C13/00 ; detecting masses or objects, e.g. by using a magnetic or optical detector G01V , e.g. G01V3/00 , G01V8/10] [C9412] |
| H03K17/95 | . . . | using a magnetic detector |
| H03K17/95B | | [N: Measures for increasing reliability] |
| H03K17/95C | | [N: Constructional details] |
| H03K17/95D | | [N: Measures for supplying operating voltage to the detector circuit] |
| H03K17/95E | | [N: using digital techniques] |
| H03K17/95F | | [N: using non-linear magnetic devices] |
| H03K17/95G | | [N: using galvanomagnetic devices] |
| H03K17/95H | | [N: using inductive coils] |
| H03K17/95H2 | | [N: with a galvanically isolated probe] |
| H03K17/95H4 | | [N: controlled by an oscillatory signal(H03K17/95H8 takes precedence)] |
| H03K17/95H6 | | [N: forming part of an oscillator (H03K17/95H8 takes precedence)] |
| H03K17/95H6B | | [N: with variable frequency] |
| H03K17/95H6D | | [N: with variable amplitude] |
| H03K17/95H8 | | [N: in a resonant circuit] |
| H03K17/95H8B | | [N: controlled by an oscillatory signal] |
| H03K17/95H8D | | [N: forming part of an oscillator] |
| H03K17/95H8D2 | | {7 dots} [N: with variable frequency] |
| H03K17/95H8D4 | | {7 dots} [N: with variable amplitude] |
| H03K17/955 | . . . | using a capacitive detector |
| H03K17/96 | . . | Touch switches |
| H03K17/96B | . . . | [N: using a plurality of detectors, e.g. keyboard] |
| H03K17/96C | . . . | [N: Capacitive touch switches] [C9411] |
| H03K17/96C1 | | [N: using a plurality of detectors, e.g. keyboard] |
| H03K17/96F | . . . | [N: using a force resistance transducer] [N9411] |
| H03K17/96L | . . . | [N: Optical touch switches] [N9411] |
| H03K17/96L1 | | [N: using a plurality of detectors, e.g. keyboard] [N9411] |
| H03K17/96L3 | | [N: using a light source as part of the switch] [N9411] |
| H03K17/96L3P | | [N: using a pulsed light source] [N9411] |
| H03K17/96L5 | | [N: using a light guide] [N9411] |
| H03K17/96P | . . . | [N: Piezo-electric touch switches] [C9411] |
| H03K17/96P1 | | [N: using a plurality of detectors, e.g. keyboard] |
| H03K17/96R | . . . | [N: Resistive touch switches] [N9411] |
| H03K17/96R1 | | [N: using a plurality of detectors, e.g. keyboard] [N9411] |
| H03K17/965 | . . | Switches controlled by moving an element forming part of the switch |
| H03K17/967 | . . . | having a plurality of control members, e.g. keyboard (H03K17/969 , H03K17/972 , H03K17/98 take precedence) |
| H03K17/968 | . . . | using opto-electronic devices |
| H03K17/969 | | having a plurality of control members, e.g. keyboard |

- H03K17/97 . . . using a magnetic movable element
- H03K17/972 having a plurality of control members, e.g. keyboard
- H03K17/975 . . . using a capacitive movable element
- H03K17/98 having a plurality of control members, e.g. keyboard

H03K19/00 **Logic circuits, i.e. having at least two inputs acting on one output; Inverting circuits** [N: (inverting circuits used as delay elements [H03K5/13](#))] [C9502]

- H03K19/00E . [N: Multistate logic ([H03K19/02](#) takes precedence)]
- H03K19/00L . [N: Modifications of input or output impedance]
- [N: **WARNING**
Not complete, see also [H03K19/0175C](#)
]
- H03K19/00P . [N: Arrangements for reducing power consumption]
- H03K19/00P2 . . [N: in bipolar transistor circuits]
- H03K19/00P4 . . [N: in field effect transistor circuits]
- H03K19/00P6 . . [N: by using a control or a clock signal, e.g. in order to apply power supply]
- H03K19/00P8 . . [N: by energy recovery or adiabatic operation] [N9909]
- H03K19/00T . [N: Modifications of threshold (for electronic switching or gating [H03K17/30](#))]
- H03K19/00T2 . . [N: in bipolar transistor circuits]
- H03K19/00T4 . . [N: in field effect transistor circuits]
- H03K19/003 . Modifications for increasing the reliability [N: for protection]
- H03K19/003B . . [N: in bipolar transistor circuits]
- H03K19/003C . . [N: in field-effect transistor circuits]
- H03K19/003D . . [N: Delay compensation]
- H03K19/003H . . [N: Radiation hardening]
- H03K19/003H2 . . . [N: In field effect transistor circuits]
- H03K19/003J . . [N: Modifications for eliminating interference or parasitic voltages or currents]
- H03K19/003J2 . . . [N: in bipolar transistor circuits]
- H03K19/003J4 . . . [N: in field effect transistor circuits]
- H03K19/003K . . [N: Modifications for compensating variations of temperature, supply voltage or other physical parameters]
- [N: **WARNING**
Not complete, see also [H03K19/00](#)
]
- H03K19/003K2 . . . [N: in bipolar transistor circuits]
- H03K19/003K4 . . . [N: in field effect transistor circuits]
- H03K19/003R . . [N: by circuit redundancy ([H03K19/007B](#) takes precedence)]
- H03K19/007 . Fail-safe circuits
- H03K19/007B . . [N: by using two redundant chains]

- H03K19/01 . Modifications for accelerating switching
- H03K19/013 . . in bipolar transistor circuits
- H03K19/013B . . . [N: by bootstrapping, i.e. by positive feed-back]
- H03K19/013C . . . [N: by means of a pull-up or down element]
- H03K19/017 . . in field-effect transistor circuits
- H03K19/017B . . . [N: in asynchronous circuits]
- H03K19/017B1 [N: by bootstrapping, i.e. by positive feed-back]
- H03K19/017B2 [N: by means of a pull-up or down element]
- H03K19/017C . . . [N: in synchronous circuits, i.e. by using clock signals]
- H03K19/017C1 [N: by bootstrapping, i.e. by positive feed-back]
- H03K19/017C2 [N: by means of a pull-up or down element]

- H03K19/0175 . Coupling arrangements; Interface arrangements (interface arrangements for digital computers [G06F3/00](#), [G06F13/00](#))
- H03K19/0175B . . [N: Interface arrangements]
- H03K19/0175B2 . . . [N: using a combination of bipolar and field effect transistors (BIFET)]

- [N: **WARNING**
Not complete, see also [H03K19/018](#), [H03K19/0185](#)
]
- H03K19/0175B2D [N: with at least one differential stage]
- H03K19/0175B4 . . . [N: using opto-electronic devices]
- H03K19/0175C . . [N: Coupling arrangements; Impedance matching circuits]
- H03K19/0175C2 . . . [N: using a combination of bipolar and field effect transistors (BIFET)]

- [N: **WARNING**
Not complete, see also [H03K19/018B](#), [H03K19/0185B](#)
]
- H03K19/0175C2D [N: with at least one differential stage]
- H03K19/0175C4 . . . [N: using opto-electronic devices]
- H03K19/0175P . . [N: programmable]
- H03K19/0175R . . [N: with a bidirectional operation]
- H03K19/018 . . using bipolar transistors only
- H03K19/018B . . . [N: Interface arrangements]
- H03K19/018B2 [N: with at least one differential stage]

- [N: **WARNING**
Not complete, see also [H03K19/018B](#)
]
- H03K19/018B4 [N: for integrated injection logic (I²L)]
- H03K19/018C . . . [N: Coupling arrangements, impedance matching circuits]
- H03K19/018C2 [N: with at least one differential stage]
- H03K19/018P . . . [N: programmable]
- H03K19/018R . . . [N: with a bidirectional operation]
- H03K19/0185 . . using field effect transistors only

| | | |
|----------------|-----------|--|
| H03K19/0185B | . . . | [N: Interface arrangements] |
| H03K19/0185B2 | | [N: with at least one differential stage (H03K19/0185B4D and H03K19/0185B6D take precedence)] |
| H03K19/0185B4 | | [N: of complementary type, e.g. CMOS] |
| | | [N: WARNING Not complete, see also H03K19/0185B] |
| H03K19/0185B4D | | [N: with at least one differential stage] |
| H03K19/0185B6 | | [N: of Schottky barrier type (MESFET)] |
| | | [N: WARNING Not complete, see also H03K19/0185B] |
| H03K19/0185B6D | | [N: with at least one differential stage] |
| H03K19/0185B8 | | [N: synchronous, i.e. using clock signals] |
| H03K19/0185C | . . . | [N: Coupling arrangements; Impedance matching circuits] |
| H03K19/0185C2 | | [N: with at least one differential stage (H03K19/0185C4D takes precedence)] |
| H03K19/0185C4 | | [N: of complementary type, e.g. CMOS] |
| H03K19/0185C4D | | [N: with at least one differential stage] |
| H03K19/0185P | . . . | [N: programmable] |
| H03K19/0185R | . . . | [N: with a bidirectional operation] |
| H03K19/02 | . . | using specified components ([N: H03K19/00L to H03K19/00T], H03K19/003 to H03K19/0175 take precedence) [C9612] |
| H03K19/04 | . . | using gas-filled tubes |
| H03K19/06 | . . | using vacuum tubes (using diode rectifiers H03K19/12) |
| H03K19/08 | . . | using semiconductor devices (H03K19/173 takes precedence; wherein the semiconductor devices are only diode rectifiers H03K19/12) |
| H03K19/08A | . . . | [N: using charge transfer devices (DTC, CCD)] |
| H03K19/08L | . . . | [N: Threshold logic] |
| H03K19/082 | . . . | using bipolar transistors [N: (in combination with field-effect transistor H03K19/094)] |
| H03K19/082M | | [N: Multistate logic] |
| H03K19/082M2 | | [N: one of the states being the high impedance or floating state] |
| H03K19/084 | | Diode-transistor logic |
| H03K19/084B | | [N: Complementary transistor logic (CTL)] |
| H03K19/084S | | [N: Schottky transistor logic (STL)] |
| H03K19/086 | | Emitter coupled logic |
| H03K19/086B | | [N: Emitter function logic (EFL); Base coupled logic (BCL)] |
| H03K19/086S | | [N: Stacked emitter coupled logic (H03K19/173C4 takes precedence)] |
| H03K19/088 | | Transistor-transistor logic |
| H03K19/09 | | Resistor-transistor logic |
| H03K19/091 | | Integrated injection logic or merged transistor logic |
| H03K19/091B | | [N: Static induction logic (STIL) (when the logic function is fulfilled by a fet H03K19/094B3)] |

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| H03K19/091C | | [N: Integrated schottky logic (ISL)] |
| H03K19/091M | | [N: Multistate logic] |
| H03K19/094 | | using field-effect transistors |
| H03K19/094B | | [N: using junction field-effect transistors (H03K19/096 takes precedence)] |
| H03K19/094B1 | | [N: of the same canal type] |
| H03K19/094B2 | | [N: of complementary type] |
| H03K19/094B3 | | [N: with gate injection or static induction (STIL) (H03K19/091B takes precedence)] |
| H03K19/094B4 | | [N: in combination with bipolar transistors (BIFET)] |
| H03K19/094E | | [N: Diode field-effect transistor logic (H03K19/0956 , H03K19/096 take precedence)] [C9602] |
| H03K19/094M | | [N: Multistate logic (H03K19/096 takes precedence)] [C9602] |
| H03K19/094M2 | | [N: one of the states being the high impedance or floating state] |
| H03K19/094S | | [N: with coupled sources or source coupled logic (H03K19/096 takes precedence)] [C9602] |
| H03K19/094S2 | | [N: Source coupled field-effect logic (SCFL)] |
| H03K19/0944 | | using MOSFET [N: or insulated gate field-effect transistors, i.e. IGFET] (H03K19/096 takes precedence) |
| H03K19/0944B | | [N: of the same canal type] |
| H03K19/0944B2 | | [N: using a combination of enhancement and depletion transistors] |
| H03K19/0944B2A | | {7 dots} [N: with active depletion transistors] |
| H03K19/0944B4 | | [N: using only depletion transistors] |
| H03K19/0944C | | [N: in combination with bipolar transistors (BIMOS)] |
| H03K19/0948 | | using CMOS [N: or complementary insulated gate field-effect transistors] [C9412] |
| H03K19/0948B | | [N: using a combination of enhancement and depletion transistors] |
| H03K19/0948B2 | | {7 dots} [N: with active depletion transistors] |
| H03K19/0948D | | [N: using only depletion transistors] |
| H03K19/0952 | | using Schottky type FET [N: MESFET] ([N: H03K19/094E , H03K19/094S], H03K19/096 take precedence) |
| H03K19/0956 | | Schottky diode FET logic (H03K19/096 takes precedence) |
| H03K19/096 | | Synchronous circuits, i.e. using clock signals [N: (H03K19/017C , H03K19/0185B8 take precedence)] [C9412] |
| H03K19/096C | | [N: using transistors of complementary type (H03K19/096T takes precedence)] [C0203] |
| H03K19/096T | | [N: Self-timed logic] [N0203] |
| H03K19/098 | | using thyristors |
| H03K19/10 | | using tunnel diodes |
| H03K19/12 | | using diode rectifiers [N: (diode-transistor logic H03K19/084)] |
| H03K19/14 | | using opto-electronic devices, i.e. light-emitting and photoelectric devices electrically- or optically-coupled (optical logic elements per se G02F3/00) |
| H03K19/16 | | using saturable magnetic devices |
| H03K19/162 | | using parametrons |
| H03K19/164 | | using ferro-resonant devices |
| H03K19/166 | | using transfluxors |

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| H03K19/168 | . . . | using thin-film devices |
| H03K19/17 | . . | using transistors |
| H03K19/173 | . . | using elementary logic circuits as components |
| H03K19/173B | . . . | [N: Optimisation thereof] |
| H03K19/173B2 | | [N: by limitation or reduction of the pin/gate ratio (for data-processing equipment G06F1/22)] [N9411] |
| H03K19/173C | . . . | [N: Controllable logic circuits (H03K19/177 takes precedence)] [C9807] |
| H03K19/173C1 | | [N: by wiring, e.g. uncommitted logic arrays] |
| H03K19/173C1A | | [N: in which the wiring can be modified] |
| H03K19/173C2 | | [N: using multiplexers (H03K19/173C4 takes precedence)] |
| H03K19/173C4 | | [N: using cascode switch logic (CSL) or cascode emitter coupled logic (CECL)] |
| H03K19/177 | . . . | arranged in matrix form |
| H03K19/177B | | [N: the logic functions being realised by the interconnection of rows and columns] [C9807] |
| H03K19/177B2 | | [N: using an AND matrix followed by an OR matrix, i.e. programmable logic arrays] |
| H03K19/177B2A | | [N: one of the matrices at least being reprogrammable] |
| H03K19/177B2C | | [N: with synchronous operation, i.e. using clock signals, e.g. of I/O or coupling register (H03K19/177B2A takes precedence)] |
| H03K19/177B2C2 | | {7 dots} [N: with synchronous operation of at least one of the logical matrixes] |
| H03K19/177D | | [N: Structural details of logic blocks] [N1204] |
| H03K19/177D2 | | [N: Reconfigurable logic blocks, e.g. lookup tables] [N1204] |
| H03K19/177D4 | | [N: Macro blocks] [N1204] |
| H03K19/177F | | [N: Structural details of routing resources] [N1204] |
| H03K19/177F2 | | [N: for global signals, e.g. clock, reset] [N1204] |
| H03K19/177F4 | | [N: for input/output signals] [N1204] |
| H03K19/177H | | [N: Structural details of configuration resources] [N1204] |
| H03K19/177H1 | | [N: for hot reconfiguration] [N1204] |
| H03K19/177H2 | | [N: for partial configuration or reconfiguration] [N1204] |
| H03K19/177H3 | | [N: for memories] [N1204] |
| H03K19/177H4 | | [N: for reliability] [N1204] |
| H03K19/177H5 | | [N: for security] [N1204] |
| H03K19/177H6 | | [N: for powering on or off] [N1204] |
| H03K19/177H7 | | [N: for speeding up configuration or reconfiguration] [N1204] |
| H03K19/177J | | [N: Structural details for adapting physical parameters] [N1204] |
| H03K19/177J2 | | [N: for supply voltage] [N1204] |
| H03K19/177J4 | | [N: for I/O voltages] [N1204] |
| H03K19/177J6 | | [N: for operating speed] [N1204] |
| H03K19/177J8 | | [N: for physical disposition of blocks] [N1204] |
| H03K19/18 | . . | using galvano-magnetic devices, e.g. Hall-effect devices |
| H03K19/185 | . . | using dielectric elements with variable dielectric constant, e.g. ferro-electric capacitors |

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| H03K19/19 | . . . using ferro-resonant devices |
| H03K19/195 | . . using superconductive devices |
| H03K19/195C | . . . [N: with electro-magnetic coupling of the control current] |
| H03K19/195D | . . . [N: with injection of the control current] |
| H03K19/195D2 | [N: using an inductorless circuit] |
| H03K19/195H | . . . [N: Hybrid configuration, i.e. using electromagnetic coupling and injection of the control current] |
| H03K19/20 | . characterised by logic function, e.g. AND, OR, NOR, NOT circuits (H03K19/003 to H03K19/01 take precedence) |
| H03K19/21 | . . EXCLUSIVE-OR circuits, i.e. giving output if input signal exists at only one input; COINCIDENCE circuits, i.e. giving output only if all input signals are identical |
| H03K19/21B | . . . [N: using bipolar transistors] |
| H03K19/21C | . . . [N: using field-effect transistors] |
| H03K19/21C2 | [N: using Schottky type FET (MESFET)] [N9412] |
| H03K19/23 | . . Majority or minority circuits, i.e. giving output having the state of the majority or the minority of the inputs |
| H03K21/00 | Details of pulse counters or frequency dividers [N: (number-of-one counters G06F7/60P)] |
| H03K21/02 | . Input circuits |
| H03K21/02B | . . [N: comprising pulse shaping or differentiating circuits] |
| H03K21/02C | . . [N: comprising logic circuits] |
| H03K21/08 | . Output circuits |
| H03K21/10 | . . comprising logic circuits |
| H03K21/12 | . . . with parallel read-out |
| H03K21/14 | . . . with series read-out of number stored |
| H03K21/16 | . Circuits for carrying over pulses between successive decades |
| H03K21/17 | . . with field effect transistors |
| H03K21/18 | . Circuits for visual indication of the result |
| H03K21/20 | . . using glow discharge lamps |
| H03K21/38 | . Starting, stopping or resetting the counter (counters with a base other than a power of two H03K23/48 , H03K23/66) |
| H03K21/40 | . Monitoring; Error detection; Preventing or correcting improper counter operation |
| H03K21/40M | . . [N: Arrangements for storing the counting state in case of power supply interruption] |
| H03K21/40S | . . [N: Synchronisation of counters] |
| H03K23/00 | Pulse counters comprising counting chains; Frequency dividers comprising counting chains (H03K29/00 takes precedence) |

- H03K23/00B . [N: using elements not covered by groups [H03K23/00C](#) and [H03K23/74](#) to [H03K23/84](#)] [N9611]
- H03K23/00C . [N: using semiconductor devices ([H03K23/78](#), [H03K23/80](#), [H03K23/84](#) take precedence)] [N9611]
- H03K23/00N . [N: Counters counting in a non-natural counting order, e.g. random counters]
 [N: **WARNING**
 Group [H03K23/00N](#) and subgroups are not complete, see also [H03K23/00](#) and [H03K23/02](#) to [H03K23/30](#)]
- H03K23/00N2 . . [N: using minimum change code, e.g. Gray Code]
- H03K23/00N3 . . [N: using excess three code]
- H03K23/00N5 . . [N: using biquinary code]
- H03K23/40 . Gating or clocking signals applied to all stages, i.e. synchronous counters [N: ([H03K23/74](#) to [H03K23/84](#) take precedence)]
 [N: **WARNING**
 Groups [H03K23/40](#) and subgroups are not complete, see also groups [H03K23/24](#) to [H03K23/30](#)]
- H03K23/42 . . Out-of-phase gating or clocking signals applied to counter stages
- H03K23/42B . . . [N: using bistables]
- H03K23/44 . . . using field-effect transistors [N: ([H03K23/46](#) and [H03K23/42B](#) take precedence)]
- H03K23/46 . . . using charge transfer devices, i.e. bucket brigade or charge coupled devices
- H03K23/48 . . with a base or radix other than a power of two ([H03K23/42](#) takes precedence)
- H03K23/48K . . . [N: with a base which is an odd number]
- H03K23/48N . . . [N: with a base which is a non-integer]
- H03K23/50 . . using bi-stable regenerative trigger circuits ([H03K23/42](#) to [H03K23/48](#) take precedence)
- H03K23/50B . . . [N: with a base or a radix other than a power of two ([H03K23/54](#) takes precedence)]
- H03K23/50B2 [N: with a base which is an odd number]
- H03K23/50B4 [N: with a base which is a non-integer]
- H03K23/52 . . . using field-effect transistors
- H03K23/54 . . . Ring counters, i.e. feedback shift register counters ([H03K23/52](#) takes precedence)
- H03K23/54J [N: with crossed-couplings, i.e. Johnson counters]
- H03K23/54K [N: with a base which is an odd number]
- H03K23/54N [N: with a base which is a non-integer]
- H03K23/54R [N: Reversible counters]
- H03K23/56 . . . Reversible counters ([H03K23/52](#) [N: and [H03K23/54R](#)] take precedence)
- H03K23/58 . Gating or clocking signals not applied to all stages, i.e. asynchronous counters ([H03K23/74](#) to [H03K23/84](#) take precedence)

[N: WARNING]

Groups [H03K23/58](#) and subgroups are not complete, see also groups [H03K23/02](#) to [H03K23/08](#)

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- H03K23/58B . . [N: with a base or a radix different of a power of two]
- H03K23/58B2 . . . [N: with a base which is an odd number]
- H03K23/58B4 . . . [N: with a base which is a non-integer]
- H03K23/58C . . [N: Combination of a synchronous and an asynchronous counter]
- H03K23/60 . . with field-effect transistors
- H03K23/62 . . reversible
- H03K23/64 . with a base or radix other than a power of two ([H03K23/40](#) to [H03K23/62](#) take precedence)
- H03K23/66 . . with a variable counting base, e.g. by presetting or by adding or suppressing pulses
 - H03K23/66A . . . [N: by adding or suppressing pulses]
 - H03K23/66P . . . [N: by presetting]
 - H03K23/66S . . . [N: by switching the base during a counting cycle]
- H03K23/68 . . with a base which is a non-integer
- H03K23/70 . . with a base which is an odd number ([H03K23/66](#) takes precedence)
- H03K23/72 . . Decade counters ([H03K23/66](#) takes precedence)
- H03K23/74 . using relays
- H03K23/76 . using magnetic cores or ferro-electric capacitors
- H03K23/76C . . [N: using superconductive devices]
- H03K23/76F . . [N: using thin-film devices]
- H03K23/78 . using opto-electronic devices
- H03K23/80 . using semiconductor devices having only two electrodes, e.g. tunnel diode, multi-layer diode, [N: e.g. with a negative resistance characteristic ([unijunction transistors H03K23/84](#))]
- H03K23/82 . using gas-filled tubes
- H03K23/82B . . [N: using vacuum tubes]
- H03K23/84 . using thyristors or unijunction transistors
- H03K23/86 . reversible ([H03K23/40](#) to [H03K23/84](#) take precedence)
- H03K25/00** **Pulse counters with step-by-step integration and static storage; Analogous frequency dividers**
- H03K25/02 . comprising charge storage, e.g. capacitor without polarisation hysteresis
- H03K25/04 . . using auxiliary pulse generator triggered by the incoming pulses

[N: **WARNING**
Not complete, see also [H03K25/02](#)
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[H03K25/12](#) . comprising hysteresis storage

[H03K27/00](#) **Pulse counters in which pulses are continuously circulated in a closed loop; Analogous frequency dividers** ([feedback shift register counters](#) [H03K23/54](#))

[H03K29/00](#) **Pulse counters comprising multi-stable elements, e.g. for ternary scale, for decimal scale; Analogous frequency dividers**

[H03K29/04](#) . using multi-cathode gas discharge tubes

[H03K29/06](#) . using beam-type tubes, e.g. magnetrons, cathode-ray tubes

[H03K99/00](#) **Subject matter not provided for in other groups of this subclass** [\[N1208\]](#)