

CPC COOPERATIVE PATENT CLASSIFICATION

H ELECTRICITY

(NOTE omitted)

H03 BASIC ELECTRONIC CIRCUITRY

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 [G11C 27/02](#); 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](#))

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.

WARNING

The following IPC groups are not used in the CPC scheme. Subject matter covered by these groups is classified in the following CPC groups :

[H03K 17/695](#)

covered by

[H03K 17/687](#)

3/00	Circuits for generating electric pulses; Monostable, bistable or multistable circuits (H03K 4/00 takes precedence; for digital computers G06F 1/025 , {G06F 1/04})	3/021	. . by the use, as active elements, of more than one type of element or means, e.g. BIMOS, composite devices such as IGBT
3/01	. Details	3/023	. . by the use of differential amplifiers or comparators, with internal or external positive feedback
3/011	. . Modifications of generator to compensate for variations in physical values, e.g. voltage, temperature {(to maintain energy constant H03K 3/015)}	3/0231	. . . Astable circuits {(H03K 3/0315 takes precedence)}
3/012	. . Modifications of generator to improve response time or to decrease power consumption	3/02315	. . . . {Stabilisation of output, e.g. using crystal}
3/013	. . Modifications of generator to prevent operation by noise or interference	3/0232	. . . Monostable circuits
3/014	. . Modifications of generator to ensure starting of oscillations	3/0233	. . . Bistable circuits
3/015	. . Modifications of generator to maintain energy constant	3/02332	. . . . {of the master-slave type}
3/017	. . Adjustment of width or dutycycle of pulses (pulse width modulation H03K 7/08 ; to maintain energy constant H03K 3/015)	3/02335	. . . . {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 G11C 14/00)}
3/02	. Generators characterised by the type of circuit or by the means used for producing pulses (H03K 3/64 - H03K 3/84 take precedence)	3/02337	. . . . {Bistables with hysteresis, e.g. Schmitt trigger (non-regenerative amplitude discriminators G01R 19/165)}

- 3/0234 . . . Multistable circuits
- 3/027 . . by the use of logic circuits, with internal or external positive feedback
- 3/03 . . . Astable circuits
- 3/0307 {Stabilisation of output, e.g. using crystal}
- 3/0315 {Ring oscillators}
- 3/0322 {with differential cells}
- 3/033 . . . Monostable circuits
- 3/037 . . . Bistable circuits
- 3/0372 {of the master-slave type}
- 3/0375 {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 [G11C 14/00](#))}
- 3/0377 {Bistables with hysteresis, e.g. Schmitt trigger (non-regenerative amplitude discriminators [G01R 19/165](#))}
- 3/038 . . . Multistable circuits
- 3/04 . . by the use, as active elements, of vacuum tubes only, with positive feedback ([H03K 3/023](#), [H03K 3/027](#) take precedence)
- 3/05 . . . using means other than a transformer for feedback
- 3/06 using at least two tubes so coupled that the input of one is derived from the output of another, e.g. multivibrator
- 3/08 astable
- 3/09 Stabilisation of output
- 3/10 monostable
- 3/12 bistable
- 3/13 Bistables with hysteresis, e.g. Schmitt trigger
- 3/14 multistable
- 3/16 . . . using a transformer for feedback, e.g. blocking oscillator with saturable core
- 3/22 specially adapted for amplitude comparison, i.e. Multiar
- 3/26 . . by the use, as active elements, of bipolar transistors with internal or external positive feedback ([H03K 3/023](#), [H03K 3/027](#) take precedence)
- 3/28 . . . using means other than a transformer for feedback
- 3/281 using at least two transistors so coupled that the input of one is derived from the output of another, e.g. multivibrator
- 3/282 astable
- 3/2821 {Emitters connected to one another by using a capacitor}
- 3/2823 {using two active transistor of the same conductivity type ([H03K 3/2821](#) takes precedence)}
- 3/2825 {in an asymmetrical circuit configuration}
- 3/2826 {using two active transistors of the complementary type ([H03K 3/2821](#) take precedence)}
- 3/2828 {in an asymmetrical circuit configuration}
- 3/283 Stabilisation of output {, e.g. using crystal}
- 3/284 monostable
- 3/286 bistable
- 3/2865 {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 [G11C 14/00](#))}
- 3/287 using additional transistors in the feedback circuit ([H03K 3/289](#) takes precedence)
- 3/288 using additional transistors in the input circuit ([H03K 3/289](#) takes precedence)
- 3/2885 the input circuit having a differential configuration
- 3/289 of the master-slave type
- 3/2893 Bistables with hysteresis, e.g. Schmitt trigger
- 3/2897 with an input circuit of differential configuration
- 3/29 multistable
- 3/30 . . . using a transformer for feedback, e.g. blocking oscillator
- 3/313 . . by the use, as active elements, of semiconductor devices with two electrodes, one or two potential-jump barriers, and exhibiting a negative resistance characteristic
- 3/315 . . . the devices being tunnel diodes
- 3/33 . . by the use, as active elements, of semiconductor devices exhibiting hole storage or enhancement effect
- 3/335 . . by the use, as active elements, of semiconductor devices with more than two electrodes and exhibiting avalanche effect
- 3/35 . . 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 ([H03K 3/023](#), [H03K 3/027](#) take precedence)
- WARNING**
Not complete; for four layer diodes see also [H03K 3/313](#)
- 3/351 . . . the devices being unijunction transistors ([H03K 3/352](#) takes precedence)
- 3/352 . . . the devices being thyristors
- 3/3525 Anode gate thyristors or programmable unijunction transistors
- 3/353 . . by the use, as active elements, of field-effect transistors with internal or external positive feedback ([H03K 3/023](#), [H03K 3/027](#) take precedence)
- 3/354 . . . Astable circuits
- 3/3545 {Stabilisation of output, e.g. using crystal}
- 3/355 . . . Monostable circuits
- 3/356 . . . Bistable circuits

- 3/356008 {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 [G11C 14/00](#))}
 - 3/356017 {using additional transistors in the input circuit ([H03K 3/356104](#), [H03K 3/3562](#) take precedence)}
 - 3/356026 {with synchronous operation ([H03K 3/356034](#), [H03K 3/356052](#) take precedence)}
 - 3/356034 {the input circuit having a differential configuration}
 - 3/356043 {with synchronous operation}
 - 3/356052 {using pass gates}
 - 3/35606 {with synchronous operation}
 - 3/356069 {using additional transistors in the feedback circuit ([H03K 3/356104](#), [H03K 3/3562](#) take precedence)}
 - 3/356078 {with synchronous operation}
 - 3/356086 {with additional means for controlling the main nodes ([H03K 3/356104](#), [H03K 3/3562](#) take precedence)}
 - 3/356095 {with synchronous operation}
 - 3/356104 {using complementary field-effect transistors ([H03K 3/35625](#) takes precedence)}
- WARNING**
- Subgroups of [H03K 3/356104](#) are not complete.
- 3/356113 {using additional transistors in the input circuit}
 - 3/356121 {with synchronous operation ([H03K 3/35613](#), [H03K 3/356147](#) take precedence)}
 - 3/35613 {the input circuit having a differential configuration}
 - 3/356139 {with synchronous operation}
 - 3/356147 {using pass gates}
 - 3/356156 {with synchronous operation}
 - 3/356165 {using additional transistors in the feedback circuit}
 - 3/356173 {with synchronous operation}
 - 3/356182 {with additional means for controlling the main nodes}
 - 3/356191 {with synchronous operation}
 - 3/3562 of the master-slave type
 - 3/35625 {using complementary field-effect transistors}
 - 3/3565 Bistables with hysteresis, e.g. Schmitt trigger
 - 3/3568 Multistable circuits
 - 3/357 by the use, as active elements, of bulk negative resistance devices, e.g. Gunn-effect devices
 - 3/36 by the use, as active elements, of semiconductors, not otherwise provided for
 - 3/37 by the use, as active elements, of gas-filled tubes, e.g. astable trigger circuits ([H03K 3/55](#) takes precedence)
 - 3/38 by the use, as active elements, of superconductive devices
 - 3/40 by the use, as active elements, of electrochemical cells

- 3/42 by the use, as active elements, of opto-electronic devices, i.e. light-emitting and photoelectric devices electrically- or optically-coupled
- 3/43 by the use, as active elements, of beam deflection tubes
- 3/45 by the use, as active elements, of non-linear magnetic or dielectric devices
- 3/455 {using thin films}
- 3/47 the devices being parametrons
- 3/49 the devices being ferro-resonant
- 3/51 the devices being multi-aperture magnetic cores, e.g. transfluxors
- 3/53 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 ([H03K 3/335](#) takes precedence; working of metal by electro-erosion with spark discharge [B23H](#); for internal combustion engine ignition systems [F02P 3/08](#); electronic lighters [F23Q 2/285](#), [F23Q 3/00](#); flash lamps [H05B 41/30](#))
- 3/537 the switching device being a spark gap
- 3/543 the switching device being a vacuum tube
- 3/55 the switching device being a gas-filled tube having a control electrode
- 3/57 the switching device being a semiconductor device
- 3/59 by the use of galvano-magnetic devices, e.g. Hall effect devices
- 3/64 Generators producing trains of pulses, i.e. finite sequences of pulses
- 3/66 by interrupting the output of a generator
- 3/70 time intervals between all adjacent pulses of one train being equal
- 3/72 with means for varying repetition rate of trains
- 3/78 Generating a single train of pulses having a predetermined pattern, e.g. a predetermined number
- 3/80 Generating trains of sinusoidal oscillations (by interrupting [H03C](#), [H04L](#))
- 3/84 Generating pulses having a predetermined statistical distribution of a parameter, e.g. random pulse generators
- 3/86 Generating pulses by means of delay lines and not covered by the preceding subgroups
- 4/00** **Generating pulses having essentially a finite slope or stepped portions (generation of supply voltages from deflection waveforms [H04N 3/18](#))**
- 4/02 having stepped portions, e.g. staircase waveform
- 4/023 {by repetitive charge or discharge of a capacitor, analogue generators}
- 4/026 {using digital techniques}
- 4/04 having parabolic shape
- 4/06 having triangular shape
- 4/063 {high voltage - or current generators}
- 4/066 {using a Miller-integrator ([H03K 4/08](#) takes precedence)}
- 4/08 having sawtooth shape
- 4/085 {Protection of sawtooth generators}
- 4/10 using as active elements vacuum tubes only
- 4/12 in which a sawtooth voltage is produced across a capacitor

- 4/14 using two tubes so coupled that the input of each one is derived from the output of the other, e.g. multivibrator {(multivibrator generating other pulses [H03K 3/00](#))}
- 4/16 using a single tube with positive feedback through transformer, e.g. blocking oscillator {(blocking oscillators generating other pulses [H03K 3/00](#))}
- 4/18 using a single tube exhibiting negative resistance between two of its electrodes, e.g. transitron, dynatron
- 4/20 using a tube with negative feedback by capacitor, e.g. Miller integrator
- 4/22 combined with transitron, e.g. phantatron, sanatron
- 4/24 Boot-strap generators
- 4/26 in which a sawtooth current is produced through an inductor
- 4/28 using a tube operating as a switching device
- 4/32 combined with means for generating the driving pulses
- 4/34 using a single tube with positive feedback through a transformer
- 4/36 using a single tube exhibiting negative resistance between two of its electrodes, e.g. transitron, dynatron
- 4/38 combined with Miller integrator
- 4/39 using a tube operating as an amplifier
- 4/41 with negative feedback through a capacitor, e.g. Miller-integrator
- 4/43 combined with means for generating the driving pulses
- 4/48 using as active elements semiconductor devices ([H03K 4/787](#) - [H03K 4/84](#) take precedence)
- 4/50 in which a sawtooth voltage is produced across a capacitor
- 4/501 the starting point of the flyback period being determined by the amplitude of the voltage across the capacitor, e.g. by a comparator
- 4/502 the capacitor being charged from a constant-current source
- 4/52 using two semiconductor devices so coupled that the input of each one is derived from the output of the other, e.g. multivibrator {(multivibrators generating other pulses [H03K 3/00](#))}
- 4/54 using a single semiconductor device with positive feedback through a transformer, e.g. blocking oscillator {(blocking oscillators generating other pulses [H03K 3/00](#))}
- 4/56 using a semiconductor device with negative feedback through a capacitor, e.g. Miller integrator
- 4/58 Boot-strap generators
- 4/60 in which a sawtooth current is produced through an inductor
- 4/62 using a semiconductor device operating as a switching device
- 4/625 {using pulse-modulation techniques for the generation of the sawtooth wave, e.g. class D, switched mode}
- 4/64 combined with means for generating the driving pulses {([H03K 4/625](#) takes precedence)}
- 4/66 using a single device with positive feedback, e.g. blocking oscillator
- 4/68 Generators in which the switching device is conducting during the fly-back part of the cycle
- 4/69 using a semiconductor device operating as an amplifier
- 4/693 {operating in push-pull, e.g. class B ([H03K 4/696](#) takes precedence)}
- 4/696 {using means for reducing power dissipation or for shortening the flyback time, e.g. applying a higher voltage during flyback time}
- 4/71 with negative feedback through a capacitor, e.g. Miller-integrator
- 4/72 combined with means for generating the driving pulses
- 4/725 {Push-pull amplifier circuits}
- 4/787 using as active elements semiconductor devices with two electrodes and exhibiting a negative resistance characteristic
- 4/793 using tunnel diodes
- 4/80 using as active elements multi-layer diodes
- 4/83 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
- 4/835 {using pulse-modulation techniques for the generation of the sawtooth wave, e.g. class D, switched mode}
- 4/84 Generators in which the semiconductor device is conducting during the fly-back part of the cycle {([H03K 4/835](#) takes precedence)}
- 4/86 using as active elements gas-filled tubes {or spark-gaps}
- 4/88 using as active elements electrochemical cells {or galvano-magnetic or photo-electric elements}
- 4/90 Linearisation of ramp (modifying slopes of pulses [H03K 6/04](#); scanning correction for television receivers [H04N 3/16](#)); Synchronisation of pulses (in pictorial communication systems [H04N 1/36](#), [H04N 5/04](#); colour synchronisation [H04N 9/44](#))
- 4/92 having a waveform comprising a portion of a sinusoid (generating sinusoidal oscillations [H03B](#))
- 4/94 having trapezoidal shape
- 5/00** **Manipulating pulses not covered by one of the other main groups in this subclass (circuits with regenerative action [H03K 3/00](#), [H03K 4/00](#); by the use of non-linear magnetic or dielectric devices [H03K 3/45](#))**
- NOTE**
- In this group, the input signals are of the pulse type.

- 5/00006 . {Changing the frequency ([modulating pulses H03K 7/00](#); [frequency dividers H03K 21/00 - H03K 29/00](#); [additive or subtractive mixing of two pulse rates into one G06F 7/605](#); [pulse rate dividers G06F 7/68](#))}
- 2005/00013 . {Delay, i.e. output pulse is delayed after input pulse and pulse length of output pulse is dependent on pulse length of input pulse}
- 2005/00019 . . {Variable delay}
- 2005/00026 . . . {controlled by an analog electrical signal, e.g. obtained after conversion by a D/A converter}
- 2005/00032 {Dc control of switching transistors}
- 2005/00039 {having four transistors serially}
- 2005/00045 {Dc voltage control of a capacitor or of the coupling of a capacitor as a load}
- 2005/00052 {by mixing the outputs of fixed delayed signals with each other or with the input signal}
- 2005/00058 . . . {controlled by a digital setting}
- 2005/00065 {by current control, e.g. by parallel current control transistors}
- 2005/00071 {by adding capacitance as a load}
- 2005/00078 . . {Fixed delay}
- 2005/00084 . . . {by trimming or adjusting the delay}
- 2005/00091 {using fuse links}
- 2005/00097 . . . {Avoiding variations of delay using feedback, e.g. controlled by a PLL}
- 2005/00104 {using a reference signal, e.g. a reference clock}
- 2005/0011 {using a separate time interval to calibrate the delay}
- 2005/00117 . . . {Avoiding variations of delay due to line termination}
- 2005/00123 . . . {Avoiding variations of delay due to integration tolerances}
- 2005/0013 . . . {Avoiding variations of delay due to power supply}
- 2005/00136 . . . {Avoiding asymmetry of delay for leading or trailing edge; Avoiding variations of delay due to threshold}
- 2005/00143 . . . {Avoiding variations of delay due to temperature}
- 2005/0015 . . {Layout of the delay element}
- 2005/00156 . . . {using opamps, comparators, voltage multipliers or other analog building blocks}
- 2005/00163 . . . {using bipolar transistors}
- 2005/00169 {using current mirrors}
- 2005/00176 {using differential stages}
- 2005/00182 {using constant current sources}
- 2005/00189 . . . {in BiCMOS technology}
- 2005/00195 . . . {using FET's}
- 2005/00202 {using current mirrors}
- 2005/00208 {using differential stages}
- 2005/00215 {where the conduction path of multiple FET's is in parallel or in series, all having the same gate control}
- 2005/00221 {where the conduction path of the different output FET's is connected in parallel with different gate control, e.g. having different sizes or thresholds, or coupled through different resistors}
- 2005/00228 . . . {having complementary input and output signals}
- 2005/00234 . . . {using circuits having two logic levels}
- 2005/00241 {using shift registers}
- 2005/00247 {using counters}
- 2005/00254 {using microprocessors}
- 2005/0026 {using memories or FIFO's}
- 2005/00267 {using D/A or A/D converters}
- 2005/00273 {using digital comparators}
- 2005/0028 . . . {using varicaps, e.g. gate capacity of a FET with specially defined threshold, as delaying capacitors}
- 2005/00286 . {Phase shifter, i.e. the delay between the output and input pulse is dependent on the frequency, and such that a phase difference is obtained independent of the frequency}
- 2005/00293 . {Output pulse is a delayed pulse issued after a rising or a falling edge, the length of the output pulse not being in relation with the length of the input triggering pulse}
- 5/003 . Changing the DC level ([television signals H04N 3/00](#))
- 5/007 . . Base line stabilisation ([thresholding H03K 5/08](#))
- 5/01 . Shaping pulses ([discrimination against noise or interference H03K 5/125](#))
- 5/02 . . by amplifying ([H03K 5/04 takes precedence](#); [wide-band amplifiers in general H03F](#))
- 5/023 . . . {using field effect transistors}
- 5/026 . . . {with a bidirectional operation}
- 5/04 . . by increasing duration; by decreasing duration
- 5/05 . . . by the use of clock signals or other time reference signals
- 5/06 . . . by the use of delay lines or other analogue delay elements
- 5/065 {using dispersive delay lines}
- 5/07 . . . by the use of resonant circuits
- 5/08 . . by limiting; by thresholding; by slicing, i.e. combined limiting and thresholding ([H03K 5/07 takes precedence](#); [comparing one pulse with another H03K 5/22](#); [providing a determined threshold for switching H03K 17/30](#))
- 5/082 . . . {with an adaptive threshold}
- 5/084 {modified by switching, e.g. by a periodic signal or by a signal in synchronism with the transitions of the output signal}
- 5/086 {generated by feedback}
- 5/088 {modified by switching, e.g. by a periodic signal or by a signal in synchronism with the transitions of the output signal}
- 5/12 . . by steepening leading or trailing edges
- 5/125 . Discriminating pulses ([measuring or indicating G01R 19/00, G01R 23/00, G01R 25/00, G01R 29/00](#); [separation of synchronising signals in television systems H04N 5/08](#))
- 5/1252 . . Suppression or limitation of noise or interference ([specially adapted for transmission systems H04B 15/00, H04L 25/08](#))
- 5/1254 . . . specially adapted for pulses generated by closure of switches, i.e. anti-bouncing devices ([debouncing circuits for electronic time-pieces G04G 5/00](#))
- 5/13 . Arrangements having a single output and transforming input signals into pulses delivered at desired time intervals ([measuring time intervals using electronic timing, e.g. counting means G04F 1/005](#))
- 5/131 . . Digitally controlled

- 5/133 . . . using a chain of active delay devices
- 5/134 . . . with field-effect transistors
- 5/135 . . . by the use of time reference signals, e.g. clock signals
- 5/14 . . . by the use of delay lines ([H03K 5/133 takes precedence](#))
- 5/145 . . . by the use of resonant circuits
- 5/15 . . . Arrangements in which pulses are delivered at different times at several outputs, i.e. pulse distributors ([distributing, switching or gating arrangements H03K 17/00](#))
 - 5/15006 . . . {with two programmable outputs}
 - 5/15013 . . . {with more than two outputs}
 - 5/1502 . . . {programmable}
 - 5/15026 . . . {with asynchronously driven series connected output stages}
 - 5/15033 {using a chain of bistable devices}
 - 5/1504 {using a chain of active delay devices ([H03K 5/15053 takes precedence](#))}
 - 5/15046 {using a tapped delay line}
 - 5/15053 {using a chain of monostable devices}
 - 5/1506 . . . {with parallel driven output stages; with synchronously driven series connected output stages}
 - 5/15066 {using bistable devices ([H03K 5/15093 takes precedence](#))}
 - 5/15073 {using a plurality of comparators}
 - 5/1508 {using a plurality of delay lines}
 - 5/15086 {using a plurality of monostable devices}
 - 5/15093 {using devices arranged in a shift register}
- 5/151 . . . with two complementary outputs
- 5/1515 . . . {non-overlapping}
- 5/153 . . . 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 H03K 17/13](#); [measuring characteristics of individual pulses G01R 29/02](#))
- 5/1532 . . . Peak detectors
- 5/1534 . . . Transition or edge detectors
- 5/1536 . . . Zero-crossing detectors ([in measuring circuits G01R 19/175](#))
- 5/156 . . . Arrangements in which a continuous pulse train is transformed into a train having a desired pattern
- 5/1565 . . . {the output pulses having a constant duty cycle}
- 5/159 . . . Applications of delay lines not covered by the preceding subgroups
- 5/19 . . . Monitoring patterns of pulse trains ([indicating amplitude G01R 19/00](#); [indicating frequency G01R 23/00](#); [measuring characteristics of individual pulses G01R 29/02](#))
- 5/22 . . . 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 G01R 25/00](#))
- 5/24 . . . the characteristic being amplitude
- 5/2409 {using bipolar transistors ([H03K 5/2436 takes precedence](#))}
- 5/2418 {with at least one differential stage}
- 5/2427 {using clock signals}
- 5/2436 {using a combination of bipolar and field-effect transistors}
- 5/2445 {with at least one differential stage}
- 5/2454 {using clock signals}
- 5/2463 {using diodes}
- 5/2472 {using field effect transistors ([H03K 5/2436 takes precedence](#))}
- 5/2481 {with at least one differential stage}
- 5/249 {using clock signals}
- 5/26 . . . the characteristic being duration, interval, position, frequency, or sequence
- 6/00** **Manipulating pulses having a finite slope and not covered by one of the other main groups of this subclass ([circuits with regenerative action H03K 4/00](#))**
- 6/02 . . . Amplifying pulses ([generation of a sawtooth current through an inductor by amplification H03K 4/28, H03K 4/39, H03K 4/43, H03K 4/62, H03K 4/69](#))
- 6/04 . . . Modifying slopes of pulses, {e.g. S-correction}
- 7/00** **Modulating pulses with a continuously-variable modulating signal**
- 7/02 . . . Amplitude modulation, i.e. PAM
- 7/04 . . . Position modulation, i.e. PPM
- 7/06 . . . Frequency or rate modulation, i.e. PFM or PRM
- 7/08 . . . Duration or width modulation ([Duty cycle modulation](#))
- 7/10 . . . Combined modulation, e.g. rate modulation and amplitude modulation
- 9/00** **Demodulating pulses which have been modulated with a continuously-variable signal**
- 9/02 . . . of amplitude-modulated pulses
- 9/04 . . . of position-modulated pulses
- 9/06 . . . of frequency- or rate-modulated pulses
- 9/08 . . . of duration- or width-modulated pulses ([or of duty-cycle modulated pulses](#))
- 9/10 . . . of pulses having combined modulation
- 11/00** **Transforming types of modulations, e.g. position-modulated pulses into duration-modulated pulses**
- 12/00** **Producing pulses by distorting or combining sinusoidal waveforms ([combining sinewaves using elements operating in a non-switching manner H03B](#); [limiting or clipping, e.g. H03G 11/00](#))**
- [WARNING](#)**
Not complete, see also [H03K 5/08](#), [H03K 5/12](#)
- 17/00** **Electronic switching or gating, i.e. not by contact-making or -braking ([selection of the stylus or auxiliary electrode in electric printing B41J 2/405](#); [sample-and-hold arrangements G11C 27/02](#); [switching or interrupting devices in waveguides H01P](#); [gated amplifiers H03F 3/72](#); [switching arrangements for exchange systems using static devices H04Q 3/52](#))**
- 17/002 . . . {Switching arrangements with several input- or output terminals ([code converters H03M 5/00, H03M 7/00](#))}
- 17/005 {with several inputs only}
- 17/007 {with several outputs only}
- 17/04 . . . Modifications for accelerating switching
- 17/0403 {in thyristor switches}
- 17/0406 {in composite switches}

- 17/041 . . without feedback from the output circuit to the control circuit {(H03K 17/0403, H03K 17/0406 take precedence)}
- 17/04106 . . . {in field-effect transistor switches (H03K 17/0412, H03K 17/0416 take precedence)}
- 17/04113 . . . {in bipolar transistor switches (H03K 17/0412, H03K 17/0416 take precedence)}
- 17/0412 . . . by measures taken in the control circuit
- 17/04123 {in field-effect transistor switches}
- 17/04126 {in bipolar transistor switches}
- 17/0414 Anti-saturation measures
- 17/0416 . . . by measures taken in the output circuit
- 17/04163 {in field-effect transistor switches}
- 17/04166 {in bipolar transistor switches}
- 17/042 . . by feedback from the output circuit to the control circuit {(H03K 17/0403, H03K 17/0406 take precedence)}
- 17/04206 . . . {in field-effect transistor switches}
- 17/04213 . . . {in bipolar transistor switches}
- 17/0422 . . . Anti-saturation measures
- 17/0424 . . . by the use of a transformer
- 17/06 . Modifications for ensuring a fully conducting state
- 17/063 . . {in field-effect transistor switches}
- 2017/066 . . {Maximizing the OFF-resistance instead of minimizing the ON-resistance}
- 17/08 . Modifications for protecting switching circuit against overcurrent or overvoltage
- 2017/0803 . . {against radiation hardening}
- 2017/0806 . . {against excessive temperature}
- 17/081 . . without feedback from the output circuit to the control circuit
- 17/08104 . . . {in field-effect transistor switches (H03K 17/0812, H03K 17/0814 take precedence)}
- 17/08108 . . . {in thyristor switches (H03K 17/0812, H03K 17/0814 take precedence)}
- 17/08112 . . . {in bipolar transistor switches (H03K 17/0812, H03K 17/0814 take precedence)}
- 17/08116 . . . {in composite switches (H03K 17/0812, H03K 17/0814 take precedence)}
- 17/0812 . . . by measures taken in the control circuit
- 17/08122 {in field-effect transistor switches}
- 17/08124 {in thyristor switches}
- 17/08126 {in bipolar transistor switches}
- 17/08128 {in composite switches}
- 17/0814 . . . by measures taken in the output circuit
- 17/08142 {in field-effect transistor switches}
- 17/08144 {in thyristor switches}
- 17/08146 {in bipolar transistor switches}
- 17/08148 {in composite switches}
- 17/082 . . by feedback from the output circuit to the control circuit
- 17/0822 . . . {in field-effect transistor switches}
- 17/0824 . . . {in thyristor switches}
- 17/0826 . . . {in bipolar transistor switches}
- 17/0828 . . . {in composite switches}
- 17/10 . Modifications for increasing the maximum permissible switched voltage
- 17/102 . . {in field-effect transistor switches}
- 17/105 . . {in thyristor switches}
- 17/107 . . {in composite switches}
- 17/12 . Modifications for increasing the maximum permissible switched current
- 17/122 . . {in field-effect transistor switches}
- 17/125 . . {in thyristor switches}
- 17/127 . . {in composite switches}
- 17/13 . Modifications for switching at zero crossing (generating an impulse at zero crossing H03K 5/153)
- 17/133 . . {in field-effect transistor switches}
- 17/136 . . {in thyristor switches}
- 17/14 . Modifications for compensating variations of physical values, e.g. of temperature
- 17/145 . . {in field-effect transistor switches}
- 17/16 . Modifications for eliminating interference voltages or currents
- 17/161 . . {in field-effect transistor switches}
- 17/162 . . . {without feedback from the output circuit to the control circuit}
- 17/163 {Soft switching}
- 17/164 {using parallel switching arrangements}
- 17/165 . . . {by feedback from the output circuit to the control circuit}
- 17/166 {Soft switching}
- 17/167 {using parallel switching arrangements}
- 17/168 . . {in composite switches}
- 17/18 . Modifications for indicating state of switch
- 17/20 . Modifications for resetting core switching units to a predetermined state
- 17/22 . Modifications for ensuring a predetermined initial state when the supply voltage has been applied (bi-stable generators H03K 3/12)
- 17/223 . . {in field-effect transistor switches}
- 2017/226 . . {in bipolar transistor switches}
- 17/24 . . Storing the actual state when the supply voltage fails
- 17/26 . Modifications for temporary blocking after receipt of control pulses
- 17/28 . Modifications for introducing a time delay before switching (time-programme switches providing a choice of time-intervals for executing more than one switching action H03K 17/296; {measuring time intervals using electronic timing, e.g. counting means G04F 1/005})
- 17/284 . . in field effect transistor switches
- 17/288 . . in tube switches
- 17/292 . . in thyristor, unijunction transistor or programmable unijunction transistor switches
- 17/296 . 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 G04G 15/00)
- 17/30 . Modifications for providing a predetermined threshold before switching (shaping pulses by thresholding H03K 5/08; for logic circuits H03K 19/0021))
- 17/302 . . {in field-effect transistor switches}
- 17/305 . . {in thyristor switches}
- 2017/307 . . {circuits simulating a diode, e.g. threshold zero}
- 17/51 . characterised by the components used (H03K 17/04 - H03K 17/30, H03K 17/94 take precedence)

- 2017/515 . . . {Mechanical switches; Electronic switches controlling mechanical switches, e.g. relais}
- 17/52 . . . using gas-filled tubes
- 17/54 . . . using vacuum tubes (using diodes [H03K 17/74](#))
- 17/545 . . . {using microengineered devices, e.g. field emission devices}
- 17/56 . . . using semiconductor devices (using diodes [H03K 17/74](#))
- 17/567 . . . Circuits characterised by the use of more than one type of semiconductor device, e.g. BIMOS, composite devices such as IGBT
- 17/58 . . . using tunnel diodes
- 17/60 . . . using bipolar transistors
- 17/601 {using transformer coupling ([H03K 17/61](#) takes precedence)}
- 17/602 {in integrated circuits}
- 17/603 {with coupled emitters}
- 17/605 with galvanic isolation between the control circuit and the output circuit ([H03K 17/78](#) takes precedence)
- 17/61 using transformer coupling
- 17/615 in a Darlington configuration
- 17/62 Switching arrangements with several input- or output-terminals (code converters [H03M 5/00](#), [H03M 7/00](#))
- 17/6207 {without selecting means ([H03K 17/6242](#) - [H03K 17/6285](#) take precedence)}
- 17/6214 {using current steering means}
- 17/6221 {combined with selecting means ([H03K 17/6242](#) - [H03K 17/6285](#) take precedence)}
- 17/6228 {using current steering means}
- 17/6235 {with storage of control signal}
- 17/6242 {with several inputs only and without selecting means}
- 17/625 {using current steering means}
- 17/6257 {with several inputs only combined with selecting means}
- 17/6264 {using current steering means}
- 17/6271 {with several outputs only and without selecting means}
- 17/6278 {using current steering means}
- 17/6285 {with several outputs only combined with selecting means}
- 17/6292 {using current steering means}
- 17/64 having inductive loads {(driving circuits for electromagnets making use of a switching regulator provisionally in [H01H 47/325](#))}
- 17/66 Switching arrangements for passing the current in either direction at will; Switching arrangements for reversing the current at will
- 17/661 {connected to both load terminals}
- 17/662 {each output circuit comprising more than one controlled bipolar transistor}
- 17/663 {using complementary bipolar transistors}
- 17/664 {in a symmetrical configuration}
- 17/665 {connected to one load terminal only}
- 17/666 {the output circuit comprising more than one controlled bipolar transistor}
- 17/667 {using complementary bipolar transistors}
- 17/668 {in a symmetrical configuration}
- 17/68 specially adapted for switching ac currents or voltages
- 17/687 using field-effect transistors
- 17/6871 {the output circuit comprising more than one controlled field-effect transistor}
- 17/6872 {using complementary field-effect transistors}
- 17/6874 {in a symmetrical configuration}
- 2017/6875 {using self-conductive, depletion FETs}
- 17/6877 {the control circuit comprising active elements different from those used in the output circuit}
- 2017/6878 {using multi-gate field-effect transistors}
- 17/689 with galvanic isolation between the control circuit and the output circuit ([H03K 17/78](#) takes precedence)
- 17/6895 {using acoustic means}
- 17/691 using transformer coupling
- 17/693 Switching arrangements with several input- or output-terminals (code converters [H03M 5/00](#), [H03M 7/00](#))
- 17/70 having two electrodes and exhibiting negative resistance (using tunnel diodes [H03K 17/58](#))
- 17/72 having more than two PN junctions; having more than three electrodes; having more than one electrode connected to the same conductivity region
- 17/722 with galvanic isolation between the control circuit and the output circuit ([H03K 17/78](#) takes precedence)
- 17/7225 {using acoustic means}
- 17/723 using transformer coupling
- 17/725 for ac voltages or currents ([H03K 17/722](#), [H03K 17/735](#) take precedence)
- 17/73 for dc voltages or currents ([H03K 17/722](#), [H03K 17/735](#) take precedence)
- 17/731 {with inductive load}
- WARNING**
- Not complete, see also [H03K 17/73](#)
- 17/732 Measures for enabling turn-off
- 17/735 Switching arrangements with several input- or output-terminals ([H03K 17/722](#) takes precedence)
- 17/74 using diodes {(using a combination of diodes and other devices [H03K 17/567](#); using tunnel diodes [H03K 17/58](#))}
- 17/76 Switching arrangements with several input- or output-terminals (code converters [H03M 5/00](#), [H03M 7/00](#))
- 17/78 using opto-electronic devices, i.e. light-emitting and photoelectric devices electrically- or optically-coupled
- 17/785 controlling field-effect transistor switches
- 17/79 controlling {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
- 17/795 controlling bipolar transistors
- 17/7955 {using phototransistors}
- 17/80 using non-linear magnetic devices; using non-linear dielectric devices {([H03K 17/95](#), [H03K 17/97](#) take precedence)}

17/81	. . . Switching arrangements with several input- or output-terminals (code converters H03M 5/00, H03M 7/00)	2017/9609	. . . . . {where the electrode is the object to be switched}
17/82	. . . using transfluxors	2017/9611	. . . . . {where the electrode is a plant}
17/84	. . . using thin-film devices	2017/9613	. . . . . {using two electrodes per touch switch}
17/86	. . . using twistors	2017/9615	. . . . . {using three electrodes per touch switch}
17/88	. . using beam-deflection tubes	17/9618	. . . {using a plurality of detectors, e.g. keyboard}
17/90	. . using galvano-magnetic devices, e.g. Hall effect devices (H03K 17/95, H03K 17/97 take precedence)	17/962	. . . {Capacitive touch switches}
17/92	. . using superconductive devices	17/9622	. . . . {using a plurality of detectors, e.g. keyboard}
17/94	. 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, G06F 3/023, H04L 15/00, H04L 17/00, H04M 1/00)	17/9625	. . . {using a force resistance transducer}
17/941	. . {using an optical detector (H03K 17/968 takes precedence)}	17/9627	. . . {Optical touch switches}
17/943	. . . {using a plurality of optical emitters or detectors, e.g. keyboard}	17/9629	. . . . {using a plurality of detectors, e.g. keyboard}
17/945	. . Proximity switches (H03K 17/96 takes precedence ; proximity fuzes F42C 13/00 ; detecting masses or objects, e.g. by using a magnetic or optical detector G01V, e.g. G01V 3/00, G01V 8/10)	17/9631	. . . . {using a light source as part of the switch}
2017/9455	. . . {constructional details (of proximity switches using a magnetic detector H03K 17/9505)}	2017/9634	. . . . . {using organic light emitting devices, e.g. light emitting polymer [OEP] or OLED}
17/95	. . . using a magnetic detector	17/9636	. . . . . {using a pulsed light source}
17/9502	. . . . {Measures for increasing reliability}	17/9638	. . . . {using a light guide}
17/9505	. . . . {Constructional details}	17/964	. . . {Piezo-electric touch switches}
2017/9507	. . . . {with illumination}	17/9643	. . . . {using a plurality of detectors, e.g. keyboard}
17/951	. . . . {Measures for supplying operating voltage to the detector circuit}	17/9645	. . . {Resistive touch switches}
17/9512	. . . . {using digital techniques}	17/9647	. . . . {using a plurality of detectors, e.g. keyboard}
17/9515	. . . . {using non-linear magnetic devices}	17/965	. . Switches controlled by moving an element forming part of the switch
17/9517	. . . . {using galvanomagnetic devices}	17/967	. . . having a plurality of control members, e.g. keyboard (H03K 17/969, H03K 17/972, H03K 17/98 take precedence)
17/952	. . . . {using inductive coils}	17/968	. . . using opto-electronic devices
17/9522	. . . . . {with a galvanically isolated probe}	17/969	. . . . having a plurality of control members, e.g. keyboard
17/9525	. . . . . {controlled by an oscillatory signal (H03K 17/9537 takes precedence)}	17/97	. . . using a magnetic movable element
2017/9527	. . . . . {Details of coils in the emitter or receiver; Magnetic detector comprising emitting and receiving coils}	2017/9706	. . . . {Inductive element}
17/953	. . . . . {forming part of an oscillator (H03K 17/9537 takes precedence)}	2017/9713	. . . . {Multiposition, e.g. involving comparison with different thresholds}
17/9532	. . . . . {with variable frequency}	17/972	. . . . having a plurality of control members, e.g. keyboard
17/9535	. . . . . {with variable amplitude}	17/975	. . . using a capacitive movable element
17/9537	. . . . . {in a resonant circuit}	2017/9755	. . . . {Ohmic switch;}
17/954	. . . . . {controlled by an oscillatory signal}	17/98	. . . . having a plurality of control members, e.g. keyboard
17/9542	. . . . . {forming part of an oscillator}	19/00	Logic circuits, i.e. having at least two inputs acting on one output; Inverting circuits ({inverting circuits used as delay elements H03K 5/13})
17/9545	. . . . . {with variable frequency}	19/0002	. {Multistate logic (H03K 19/02 takes precedence)}
17/9547	. . . . . {with variable amplitude}	19/0005	. {Modifications of input or output impedance}
17/955	. . . using a capacitive detector		WARNING
17/96	. . Touch switches		Not complete, see also H03K 19/017545
2017/9602	. . . {characterised by the type or shape of the sensing electrodes}	19/0008	. {Arrangements for reducing power consumption}
2017/9604	. . . . {characterised by the number of electrodes}	19/001	. . {in bipolar transistor circuits}
2017/9606	. . . . . {using one electrode only per touch switch}	19/0013	. . {in field effect transistor circuits}
		19/0016	. . {by using a control or a clock signal, e.g. in order to apply power supply}
		19/0019	. . {by energy recovery or adiabatic operation}
		19/0021	. {Modifications of threshold (for electronic switching or gating H03K 17/30)}
		19/0024	. . {in bipolar transistor circuits}
		19/0027	. . {in field effect transistor circuits}
		19/003	. Modifications for increasing the reliability {for protection}

- 19/00307 . . {in bipolar transistor circuits}
- 19/00315 . . {in field-effect transistor circuits}
- 19/00323 . . {Delay compensation}
- 19/0033 . . {Radiation hardening}
- 19/00338 . . . {In field effect transistor circuits}
- 19/00346 . . {Modifications for eliminating interference or parasitic voltages or currents}
- 19/00353 . . . {in bipolar transistor circuits}
- 19/00361 . . . {in field effect transistor circuits}
- 19/00369 . . {Modifications for compensating variations of temperature, supply voltage or other physical parameters}

WARNING

Not complete, see also [H03K 19/00](#)

- 19/00376 . . . {in bipolar transistor circuits}
- 19/00384 . . . {in field effect transistor circuits}
- 19/00392 . . {by circuit redundancy ([H03K 19/0075](#) takes precedence)}
- 19/007 . . Fail-safe circuits
- 19/0075 . . {by using two redundant chains}
- 19/01 . . Modifications for accelerating switching
- 19/013 . . in bipolar transistor circuits
- 19/0133 . . . {by bootstrapping, i.e. by positive feed-back}
- 19/0136 . . . {by means of a pull-up or down element}
- 19/017 . . in field-effect transistor circuits
- 19/01707 . . . {in asynchronous circuits}
- 19/01714 {by bootstrapping, i.e. by positive feed-back}
- 19/01721 {by means of a pull-up or down element}
- 19/01728 . . . {in synchronous circuits, i.e. by using clock signals}
- 19/01735 {by bootstrapping, i.e. by positive feed-back}
- 19/01742 {by means of a pull-up or down element}
- 19/0175 . . Coupling arrangements; Interface arrangements ([interface arrangements for digital computers G06F 3/00, G06F 13/00](#))
- 19/017509 . . {Interface arrangements}
- 19/017518 . . . {using a combination of bipolar and field effect transistors [BIFET]}

WARNING

Not complete, see also [H03K 19/018](#),
[H03K 19/0185](#)

- 19/017527 {with at least one differential stage}
- 19/017536 . . . {using opto-electronic devices}
- 19/017545 . . {Coupling arrangements; Impedance matching circuits}
- 19/017554 . . . {using a combination of bipolar and field effect transistors [BIFET]}

WARNING

Not complete, see also [H03K 19/01806](#),
[H03K 19/018507](#)

- 19/017563 {with at least one differential stage}
- 19/017572 . . . {using opto-electronic devices}
- 19/017581 . . {programmable}
- 19/01759 . . {with a bidirectional operation}
- 19/018 . . using bipolar transistors only
- 19/01806 . . . {Interface arrangements}

- 19/01812 {with at least one differential stage}

WARNING

Not complete, see also [H03K 19/01806](#)

- 19/01818 {for integrated injection logic (I2L)}
- 19/01825 . . . {Coupling arrangements, impedance matching circuits}
- 19/01831 {with at least one differential stage}
- 19/01837 . . . {programmable}
- 19/01843 . . . {with a bidirectional operation}
- 19/0185 . . using field effect transistors only
- 19/018507 . . . {Interface arrangements}
- 19/018514 {with at least one differential stage ([H03K 19/018528](#) and [H03K 19/018542](#) take precedence)}
- 19/018521 {of complementary type, e.g. CMOS}

WARNING

Not complete, see also [H03K 19/018507](#)

- 19/018528 {with at least one differential stage}
- 19/018535 {of Schottky barrier type [MESFET]}

WARNING

Not complete, see also [H03K 19/018507](#)

- 19/018542 {with at least one differential stage}
- 19/01855 {synchronous, i.e. using clock signals}
- 19/018557 . . . {Coupling arrangements; Impedance matching circuits}
- 19/018564 {with at least one differential stage ([H03K 19/018578](#) takes precedence)}
- 19/018571 {of complementary type, e.g. CMOS}
- 19/018578 {with at least one differential stage}
- 19/018585 . . . {programmable}
- 19/018592 . . . {with a bidirectional operation}
- 19/02 . . using specified components ([H03K 19/0005 - H03K 19/0021](#)),
[H03K 19/003 - H03K 19/0175](#) take precedence)
- 19/04 . . using gas-filled tubes
- 19/06 . . using vacuum tubes ([using diode rectifiers H03K 19/12](#))
- 19/08 . . using semiconductor devices ([H03K 19/173](#) takes precedence; wherein the semiconductor devices are only diode rectifiers [H03K 19/12](#))
- 19/0806 . . . {using charge transfer devices (DTC, CCD)}
- 19/0813 . . . {Threshold logic}
- 19/082 . . . using bipolar transistors {(in combination with field-effect transistor [H03K 19/094](#))}
- 19/0823 {Multistate logic}
- 19/0826 {one of the states being the high impedance or floating state}
- 19/084 Diode-transistor logic
- 19/0843 {Complementary transistor logic [CTL]}
- 19/0846 {Schottky transistor logic [STL]}
- 19/086 Emitter coupled logic
- 19/0863 {Emitter function logic [EFL]; Base coupled logic [BCL]}
- 19/0866 {Stacked emitter coupled logic ([H03K 19/1738](#) takes precedence)}
- 19/088 Transistor-transistor logic
- 19/09 Resistor-transistor logic
- 19/091 Integrated injection logic or merged transistor logic

- 19/0912 {Static induction logic [STIL] ([when the logic function is fulfilled by a fet H03K 19/09414](#))}
- 19/0915 {Integrated schottky logic [ISL]}
- 19/0917 {Multistate logic}
- 19/094 using field-effect transistors
- 19/09403 {using junction field-effect transistors ([H03K 19/096 takes precedence](#))}
- 19/09407 {of the same canal type}
- 19/0941 {of complementary type}
- 19/09414 {with gate injection or static induction [STIL] ([H03K 19/0912 takes precedence](#))}
- 19/09418 {in combination with bipolar transistors [BIFET]}
- 19/09421 {Diode field-effect transistor logic ([H03K 19/0956](#), [H03K 19/096 take precedence](#))}
- 19/09425 {Multistate logic ([H03K 19/096 takes precedence](#))}
- 19/09429 {one of the states being the high impedance or floating state}
- 19/09432 {with coupled sources or source coupled logic ([H03K 19/096 takes precedence](#))}
- 19/09436 {Source coupled field-effect logic [SCFL]}
- 19/0944 using MOSFET {or insulated gate field-effect transistors, i.e. IGFET} ([H03K 19/096 takes precedence](#))
- 19/09441 {of the same canal type}
- 19/09443 {using a combination of enhancement and depletion transistors}
- 19/09445 {with active depletion transistors}
- 19/09446 {using only depletion transistors}
- 19/09448 {in combination with bipolar transistors [BIMOS]}
- 19/0948 using CMOS {or complementary insulated gate field-effect transistors}
- 19/09482 {using a combination of enhancement and depletion transistors}
- 19/09485 {with active depletion transistors}
- 19/09487 {using only depletion transistors}
- 19/0952 using Schottky type FET {MESFET} ([H03K 19/09421](#), [H03K 19/09432](#), [H03K 19/096 take precedence](#))
- 19/0956 Schottky diode FET logic ([H03K 19/096 takes precedence](#))
- 19/096 Synchronous circuits, i.e. using clock signals ([H03K 19/01728](#), [H03K 19/01855 take precedence](#))
- 19/0963 {using transistors of complementary type ([H03K 19/0966 takes precedence](#))}
- 19/0966 {Self-timed logic}
- 19/098 using thyristors
- 19/10 using tunnel diodes
- 19/12 using diode rectifiers ([diode-transistor logic H03K 19/084](#))}
- 19/14 using opto-electronic devices, i.e. light-emitting and photoelectric devices electrically- or optically-coupled ([optical logic elements per se G02F 3/00](#))
- 19/16 using saturable magnetic devices
- 19/162 using parametrons
- 19/164 using ferro-resonant devices
- 19/166 using transfluxors
- 19/168 using thin-film devices
- 19/17 using twistors
- 19/173 using elementary logic circuits as components
- 19/1731 {Optimisation thereof}
- 19/1732 {by limitation or reduction of the pin/gate ratio ([for data-processing equipment G06F 1/22](#))}
- 19/1733 {Controllable logic circuits ([H03K 19/177 takes precedence](#))}
- 19/1735 {by wiring, e.g. uncommitted logic arrays}
- 19/1736 {in which the wiring can be modified}
- 19/1737 {using multiplexers ([H03K 19/1738 takes precedence](#))}
- 19/1738 {using cascode switch logic [CSL] or cascode emitter coupled logic [CECL]}
- 19/177 arranged in matrix form
- 19/17704 {the logic functions being realised by the interconnection of rows and columns}
- 19/17708 {using an AND matrix followed by an OR matrix, i.e. programmable logic arrays}
- 19/17712 {one of the matrices at least being reprogrammable}
- 19/17716 {with synchronous operation, i.e. using clock signals, e.g. of I/O or coupling register ([H03K 19/17712 takes precedence](#))}
- 19/1772 {with synchronous operation of at least one of the logical matrixes}
- 19/17724 {Structural details of logic blocks}
- 19/17728 {Reconfigurable logic blocks, e.g. lookup tables}
- 19/17732 {Macro blocks}
- 19/17736 {Structural details of routing resources}
- 19/1774 {for global signals, e.g. clock, reset}
- 19/17744 {for input/output signals}
- 19/17748 {Structural details of configuration resources}
- 19/17752 {for hot reconfiguration}
- 19/17756 {for partial configuration or reconfiguration}
- 19/1776 {for memories}
- 19/17764 {for reliability}
- 19/17768 {for security}
- 19/17772 {for powering on or off}
- 19/17776 {for speeding up configuration or reconfiguration}
- 19/1778 {Structural details for adapting physical parameters}
- 19/17784 {for supply voltage}
- 19/17788 {for I/O voltages}
- 19/17792 {for operating speed}
- 19/17796 {for physical disposition of blocks}
- 19/18 using galvano-magnetic devices, e.g. Hall-effect devices
- 19/185 using dielectric elements with variable dielectric constant, e.g. ferro-electric capacitors
- 19/19 using ferro-resonant devices
- 19/195 using superconductive devices
- 19/1952 {with electro-magnetic coupling of the control current}
- 19/1954 {with injection of the control current}
- 19/1956 {using an inductorless circuit}

- 19/1958 . . . {Hybrid configuration, i.e. using electromagnetic coupling and injection of the control current}
- 19/20 . characterised by logic function, e.g. AND, OR, NOR, NOT circuits ([H03K 19/003](#) - [H03K 19/01](#) take precedence)
- 19/21 . . 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
- 19/212 . . . {using bipolar transistors}
- 19/215 . . . {using field-effect transistors}
- 19/217 {using Schottky type FET [MESFET]}
- 19/23 . . Majority or minority circuits, i.e. giving output having the state of the majority or the minority of the inputs
- 21/00 Details of pulse counters or frequency dividers {(number-of-one counters [G06F 7/607](#))}**
- 21/02 . Input circuits
- 21/023 . . {comprising pulse shaping or differentiating circuits}
- 21/026 . . {comprising logic circuits}
- 21/08 . Output circuits
- 21/10 . . comprising logic circuits
- 21/12 . . with parallel read-out
- 21/14 . . with series read-out of number stored
- 21/16 . Circuits for carrying over pulses between successive decades
- 21/17 . . with field effect transistors
- 21/18 . Circuits for visual indication of the result
- 21/20 . . using glow discharge lamps
- 21/38 . Starting, stopping or resetting the counter ([counters with a base other than a power of two \[H03K 23/48\]\(#\), \[H03K 23/66\]\(#\)](#))
- 21/40 . Monitoring; Error detection; Preventing or correcting improper counter operation
- 21/403 . . {Arrangements for storing the counting state in case of power supply interruption}
- 21/406 . . {Synchronisation of counters}
- 23/00 Pulse counters comprising counting chains; Frequency dividers comprising counting chains ([H03K 29/00](#) takes precedence)**
- 23/001 . {using elements not covered by groups [H03K 23/002](#) and [H03K 23/74](#) - [H03K 23/84](#)}
- 23/002 . {using semiconductor devices ([H03K 23/78](#), [H03K 23/80](#), [H03K 23/84](#) take precedence)}
- 23/004 . {Counters counting in a non-natural counting order, e.g. random counters}
- 23/005 . . {using minimum change code, e.g. Gray Code}
- 23/007 . . {using excess three code}
- 23/008 . . {using biquinary code}
- 23/40 . Gating or clocking signals applied to all stages, i.e. synchronous counters {([H03K 23/74](#) - [H03K 23/84](#) take precedence)}
- 23/42 . . Out-of-phase gating or clocking signals applied to counter stages
- 23/425 . . . {using bistables}
- 23/44 . . . using field-effect transistors {([H03K 23/46](#) and [H03K 23/425](#) take precedence)}
- 23/46 . . . using charge transfer devices, i.e. bucket brigade or charge coupled devices
- 23/48 . . with a base or radix other than a power of two ([H03K 23/42](#) takes precedence)
- 23/483 . . . {with a base which is an odd number}
- 23/486 . . . {with a base which is a non-integer}
- 23/50 . . using bi-stable regenerative trigger circuits ([H03K 23/42](#) - [H03K 23/48](#) take precedence)
- 23/502 . . . {with a base or a radix other than a power of two ([H03K 23/54](#) takes precedence)}
- 23/505 {with a base which is an odd number}
- 23/507 {with a base which is a non-integer}
- 23/52 . . . using field-effect transistors
- 23/54 . . . Ring counters, i.e. feedback shift register counters ([H03K 23/52](#) takes precedence)
- 23/542 {with crossed-couplings, i.e. Johnson counters}
- 23/544 {with a base which is an odd number}
- 23/546 {with a base which is a non-integer}
- 23/548 {Reversible counters}
- 23/56 . . . Reversible counters ([H03K 23/52](#) {and [H03K 23/548](#)} take precedence)
- 23/58 . Gating or clocking signals not applied to all stages, i.e. asynchronous counters ([H03K 23/74](#) - [H03K 23/84](#) take precedence)
- 23/582 . . {with a base or a radix different of a power of two}
- 23/584 . . . {with a base which is an odd number}
- 23/586 . . . {with a base which is a non-integer}
- 23/588 . . {Combination of a synchronous and an asynchronous counter}
- 23/60 . . with field-effect transistors
- 23/62 . . reversible
- 23/64 . with a base or radix other than a power of two ([H03K 23/40](#) - [H03K 23/62](#) take precedence)
- 23/66 . . with a variable counting base, e.g. by presetting or by adding or suppressing pulses
- 23/662 . . . {by adding or suppressing pulses}
- 23/665 . . . {by presetting}
- 23/667 . . . {by switching the base during a counting cycle}
- 23/68 . . with a base which is a non-integer
- 23/70 . . with a base which is an odd number ([H03K 23/66](#) takes precedence)
- 23/72 . . Decade counters ([H03K 23/66](#) takes precedence)
- 23/74 . using relays
- 23/76 . using magnetic cores or ferro-electric capacitors
- 23/763 . . {using superconductive devices}
- 23/766 . . {using thin-film devices}
- 23/78 . using opto-electronic devices
- 23/80 . using semiconductor devices having only two electrodes, e.g. tunnel diode, multi-layer diode{, e.g. with a negative resistance characteristic ([unijunction transistors \[H03K 23/84\]\(#\)](#))}
- 23/82 . using gas-filled tubes
- 23/825 . . {using vacuum tubes}
- 23/84 . using thyristors or unijunction transistors
- 23/86 . reversible ([H03K 23/40](#) - [H03K 23/84](#) take precedence)
- 25/00 Pulse counters with step-by-step integration and static storage; Analogous frequency dividers**
- 25/02 . comprising charge storage, e.g. capacitor without polarisation hysteresis

- 25/04 . . using auxiliary pulse generator triggered by the incoming pulses
- WARNING**
- Not complete, see also [H03K 25/02](#)
- 25/12 . comprising hysteresis storage
- 27/00 Pulse counters in which pulses are continuously circulated in a closed loop; Analogous frequency dividers (feedback shift register counters [H03K 23/54](#))**
- 29/00 Pulse counters comprising multi-stable elements, e.g. for ternary scale, for decimal scale; Analogous frequency dividers**
- 29/04 . using multi-cathode gas discharge tubes
- 29/06 . using beam-type tubes, e.g. magnetrons, cathode-ray tubes
- 99/00 Subject matter not provided for in other groups of this subclass**
- 2217/00 Indexing scheme related to electronic switching or gating, i.e. not by contact-making or -breaking covered by [H03K 17/00](#)**
- 2217/0009 . AC switches, i.e. delivering AC power to a load
- 2217/0018 . Special modifications or use of the back gate voltage of a FET
- 2217/0027 . Measuring means of, e.g. currents through or voltages across the switch
- 2217/0036 . Means reducing energy consumption
- 2217/0045 . Full bridges, determining the direction of the current through the load
- 2217/0054 . Gating switches, e.g. pass gates
- 2217/0063 . High side switches, i.e. the higher potential [DC] or life wire [AC] being directly connected to the switch and not via the load
- 2217/0072 . Low side switches, i.e. the lower potential [DC] or neutral wire [AC] being directly connected to the switch and not via the load
- 2217/0081 . Power supply means, e.g. to the switch driver
- 2217/009 . Resonant driver circuits
- 2217/94 . characterised by the way in which the control signal is generated
- 2217/94005 . . activated by voice or sound
- 2217/9401 . . Calibration techniques
- 2217/94015 . . . Mechanical, e.g. by displacement of a body, a shielding element, or a magnet, in or out of the sensing area
- 2217/94021 . . . with human activation, e.g. processes requiring or being triggered by human intervention, user-input of digital word or analog voltage
- 2217/94026 . . . Automatic threshold calibration; e.g. threshold automatically adapts to ambient conditions or follows variation of input
- 2217/94031 . . . Calibration involving digital processing
- 2217/94036 . . Multiple detection, i.e. where different switching signals are generated after operation of the user is detected at different time instants at different locations during the actuation movement by two or more sensors of the same or different kinds
- 2217/94042 . . Means for reducing energy consumption
- 2217/94047 . . Cascode connected switches
- 2217/94052 . . with evaluation of actuation pattern or sequence, e.g. tapping
- 2217/94057 . . Rotary switches
- 2217/94063 . . . with optical detection
- 2217/94068 . . . with magnetic detection
- 2217/94073 . . . with capacitive detection
- 2217/94078 . . . with acoustic detection
- 2217/94084 . . Transmission of parameters among sensors or between sensor and remote station
- 2217/94089 . . . Wireless transmission
- 2217/94094 . . . Wired transmission, e.g. via bus connection or similar
- 2217/941 . . using an optical detector
- 2217/94102 . . . characterised by the type of activation
- 2217/94104 using a light barrier
- 2217/94106 Passive activation of light sensor, e.g. by ambient light
- 2217/94108 making use of reflection
- 2217/94111 . . . having more than one emitter
- 2217/94112 . . . having more than one receiver
- 2217/94114 . . . Optical multi axis
- 2217/94116 . . . increasing reliability, fail-safe
- 2217/945 . . Proximity switches
- 2217/95 . . . using a magnetic detector
- 2217/952 Detection of ferromagnetic and non-magnetic conductive targets
- 2217/954 Ferromagnetic case
- 2217/956 Negative resistance, e.g. LC inductive proximity switches
- 2217/958 involving transponders
- 2217/96 . . Touch switches
- 2217/96003 . . . using acoustic waves, e.g. ultrasound
- 2217/96007 by reflection
- 2217/96011 with propagation, SAW or BAW
- 2217/96015 . . . Constructional details for touch switches (for capacitive touch switches see [H03K 2217/9607](#))
- 2217/96019 using conductive paint
- 2217/96023 Details of electro-mechanic connections between different elements, e.g.: sensing plate and integrated circuit containing electronics
- 2217/96027 Piezoelectric snap spring
- 2217/96031 . . . Combination of touch switch and LC display
- 2217/96035 . . . by temperature detection, i.e. body heat
- 2217/96038 . . . Inductive touch switches
- 2217/96042 . . . with illumination
- 2217/96046 Key-pad combined with display, back-lit
- 2217/9605 . . . Detection of leakage or discharge current across the touching body to ground
- 2217/96054 . . . Double function: touch detection combined with detection of a movable element
- 2217/96058 . . . Fail-safe touch switches, where switching takes place only after repeated touch
- 2217/96062 . . . with tactile or haptic feedback
- 2217/96066 . . . Thumbwheel, potentiometer, scrollbar or slider simulation by touch switch
- 2217/9607 . . . Capacitive touch switches
- 2217/960705 Safety of capacitive touch and proximity switches, e.g. increasing reliability, fail-safe
- 2217/96071 characterised by the detection principle
- 2217/960715 Rc-timing; e.g. measurement of variation of charge time or discharge time of the sensor

- 2217/96072 Phase comparison, i.e. where a phase comparator receives at one input the signal directly from the oscillator, at a second input the same signal but delayed, with a delay depending on a sensing capacitance
- 2217/960725 Charge-transfer
- 2217/96073 Amplitude comparison
- 2217/960735 characterised by circuit details
- 2217/96074 Switched capacitor
- 2217/960745 Capacitive differential; e.g. comparison with reference capacitance
- 2217/96075 involving bridge circuit
- 2217/960755 Constructional details of capacitive touch and proximity switches
- 2217/96076 with spring electrode
- 2217/960765 Details of shielding arrangements
- 2217/96077 comprising an electrode which is floating
- 2217/960775 Emitter-receiver or "fringe" type detection, i.e. one or more field emitting electrodes and corresponding one or more receiving electrodes
- 2217/96078 Sensor being a wire or a strip, e.g. used in automobile door handles or bumpers
- 2217/960785 with illumination
- 2217/96079 using a single or more light guides
- 2217/960795 using organic light emitting devices, e.g. light emitting polymer [OEP] or OLED
- 2217/965 Switches controlled by moving an element forming part of the switch
- 2217/9651 the moving element acting on a force, e.g. pressure sensitive element
- 2217/9653 with illumination
- 2217/9655 using a single or more light guides
- 2217/9656 using organic light emitting devices, e.g. light emitting polymer [OEP] or OLED
- 2217/9658 Safety, e.g. fail-safe switching requiring a sequence of movements