SECTION H — ELECTRICITY

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) **[4]**

Note(s)

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 breaking;
   - 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.

Subclass index

3/00 **Circuits for generating electric pulses; Monostable, bistable or multistable circuits** (H03K 4/00 takes precedence; for digital computers G06F 1/025) **[5]**

3/01 • Details **[3]**

3/011 • • Modifications of generator to compensate for variations in physical values, e.g. voltage, temperature **[6]**

3/012 • • Modifications of generator to improve response time or to decrease power consumption **[6]**

3/013 • • Modifications of generator to prevent operation by noise or interference **[3]**

3/014 • • Modifications of generator to ensure starting of oscillations **[6]**

3/015 • • Modifications of generator to maintain energy constant **[6]**

3/017 • • Adjustment of width or dutycycle of pulses (pulse width modulation H03K 7/08) **[3]**

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)

3/021 • • by the use, as active elements, of more than one type of element or means, e.g. BIMOS, composite devices such as IGBT **[6]**

3/023 • • by the use of differential amplifiers or comparators, with internal or external positive feedback **[3]**

3/0231 • • • Astable circuits **[6]**

3/0232 • • • Monostable circuits **[6]**

3/0233 • • • Bistable circuits **[6]**

3/0234 • • • Multistable circuits **[6]**

3/027 • • by the use of logic circuits, with internal or external positive feedback **[3]**

3/03 • • • Astable circuits **[3]**

3/033 • • • Monostable circuits **[3]**

3/037 • • • Bistable circuits **[3]**

3/038 • • • Multistable circuits **[6]**

3/04 • • by the use, as active elements, of vacuum tubes only, with positive feedback (H03K 3/023, H03K 3/027 take precedence) **[3]**

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 **[2]**
3/10 • • • • • monostable
3/12 • • • • • bistable
3/13 • • • • • • Bistables with hysteresis, e.g. Schmitt trigger **[6]**
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) **[2]**
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
3/283 • • • • • • Stabilisation of output **[2]**
3/284 • • • • • monostable
3/286 • • • • • bistable **[3]**
3/287 • • • • • • using additional transistors in the feedback circuit (H03K 3/289 takes precedence) **[3]**
3/288 • • • • • • using additional transistors in the input circuit (H03K 3/289 takes precedence) **[3]**
3/2885 • • • • • • • the input circuit having a differential configuration **[5]**
3/289 • • • • • • of the master-slave type **[3]**
3/2893 • • • • • • Bistables with hysteresis, e.g. Schmitt trigger **[6]**
3/2897 • • • • • • • with an input circuit of differential configuration **[6]**
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]**
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) **[3]**
3/351 • • • the devices being unijunction transistors (H03K 3/352 takes precedence) **[3]**
3/352 • • • the devices being thyristors **[3]**
3/3525 • • • • Anode gate thyristors or programmable unijunction transistors **[6]**
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) **[2, 3]**
3/354 • • • Astable circuits **[3]**
3/355 • • • Monostable circuits **[3]**
3/356 • • • Bistable circuits **[3]**
3/3562 • • • • of the master-slave type **[6]**
3/3565 • • • • Bistables with hysteresis, e.g. Schmitt trigger **[6]**
3/3568 • • • Multistable circuits **[6]**
3/357 • • by the use, as active elements, of bulk negative resistance devices, e.g. Gunn-effect devices **[2]**
3/36 • • by the use, as active elements, of semiconductors, not otherwise provided for **[2]**
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]**
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
3/47 • • • 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)
3/537 • • • the switching device being a spark gap **[3]**
3/543 • • • the switching device being a vacuum tube **[3]**
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 **[2]**
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 **[2]**
3/86 • Generating pulses by means of delay lines and not covered by the preceding subgroups **[2]**

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
4/04 • having parabolic shape

4/06 • having triangular shape
4/08 • • having sawtooth shape
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
4/16 • • • • • using a single tube with positive feedback through transformer, e.g. blocking oscillator
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. phantastron, 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 **[3]**
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 **[3]**
4/41 • • • • • • with negative feedback through a capacitor, e.g. Miller integrator **[3]**
4/43 • • • • • • combined with means for generating the driving pulses **[3]**
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 **[6]**
4/502 • • • • • • the capacitor being charged from a constant-current source **[6]**
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
4/54 • • • • • using a single semiconductor device with positive feedback through a transformer, e.g. blocking oscillator
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 **[3]**
4/64 • • • • • • combined with means for generating the driving pulses
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 **[3]**
4/71 • • • • • • with negative feedback through a capacitor, e.g. Miller integrator **[3]**
4/72 • • • • • • combined with means for generating the driving pulses
4/787 • • • using as active elements semiconductor devices with two electrodes and exhibiting a negative resistance characteristic **[2]**
4/793 • • • • using tunnel diodes **[2]**
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 **[2]**
4/84 • • • • Generators in which the semiconductor device is conducting during the fly-back part of the cycle
4/86 • • • using as active elements gas-filled tubes
4/88 • • • using as active elements electrochemical cells
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) **[2]**
4/92 • having a waveform comprising a portion of a sinusoid (generating sinusoidal oscillations H03B) **[2]**
4/94 • having trapezoidal shape **[2]**

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(s)

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

5/003 • Changing the DC level (television signals H04N 3/00) **[6]**
5/007 • • Base line stabilisation (thresholding H03K 5/08) **[6]**
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)
5/04 • • by increasing duration; by decreasing duration
5/05 • • • by the use of clock signals or other time reference signals **[3]**
5/06 • • • by the use of delay lines or other analogue delay elements **[3]**
5/07 • • • by the use of resonant circuits **[3]**
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) **[3]**
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) **[6]**

5/1252 • • Suppression or limitation of noise or interference (specially adapted for transmission systems H04B 15/00, H04L 25/08) **[6]**

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) **[6]**

5/13 • Arrangements having a single output and transforming input signals into pulses delivered at desired time intervals

5/135 • • by the use of time reference signals, e.g. clock signals **[3]**

5/14 • • by the use of delay lines **[3]**

5/145 • • by the use of resonant circuits **[3]**

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) **[2]**

5/151 • • with two complementary outputs **[6]**

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)

5/1532 • • Peak detectors (measuring characteristics of individual pulses G01R 29/02) **[6]**

5/1534 • • Transition or edge detectors **[6]**

5/1536 • • Zero-crossing detectors (in measuring circuits G01R 19/175) **[6]**

5/156 • Arrangements in which a continuous pulse train is transformed into a train having a desired pattern

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) **[3]**

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) **[3]**

5/24 • • the characteristic being amplitude **[3]**

5/26 • • the characteristic being duration, interval, position, frequency, or sequence **[3]**

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)

Note(s)

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

6/02 • Amplifying pulses

6/04 • Modifying slopes of pulses, e.g. S-correction (S-correction in television H04N 3/23)

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

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

9/10 • of pulses having combined modulation

11/00 Transforming types of modulation, e.g. position-modulated pulses into duration-modulated pulses

12/00 Producing pulses by distorting or combining sinusoidal waveforms (shaping pulses H03K 5/01; combining sinewaves using elements operating in a non-switching manner H03B) **[3]**

17/00 Electronic switching or gating, i.e. not by contact-making and -breaking (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)

17/04 • Modifications for accelerating switching **[3]**

17/041 • • without feedback from the output circuit to the control circuit **[6]**

17/0412 • • • by measures taken in the control circuit **[6]**

17/0414 • • • • Anti-saturation measures **[6]**

17/0416 • • • by measures taken in the output circuit **[6]**

17/042 • • by feedback from the output circuit to the control circuit **[6]**

17/0422 • • • Anti-saturation measures **[6]**

17/0424 • • • by the use of a transformer **[6]**

17/06 • Modifications for ensuring a fully conducting state **[3]**

17/08 • Modifications for protecting switching circuit against overcurrent or overvoltage **[3]**

17/081 • • without feedback from the output circuit to the control circuit **[6]**

17/0812 • • • by measures taken in the control circuit **[6]**

17/0814 • • • by measures taken in the output circuit **[6]**

17/082 • • by feedback from the output to the control circuit **[6]**

17/10 • Modifications for increasing the maximum permissible switched voltage **[3]**

17/12 • Modifications for increasing the maximum permissible switched current **[3]**

17/13 • Modifications for switching at zero crossing (generating an impulse at zero crossing H03K 5/1536) **[3]**

17/14 • Modifications for compensating variations of physical values, e.g. of temperature **[3]**

17/16 • Modifications for eliminating interference voltages or currents **[3]**

17/18 • Modifications for indicating state of switch **[3]**

17/20 • Modifications for resetting core switching units to a predetermined state **[3]**

17/22 • Modifications for ensuring a predetermined initial state when the supply voltage has been applied (bi-stable generators H03K 3/12) **[3]**

17/24 • • Storing the actual state when the supply voltage fails **[3]**

17/26 • Modifications for temporary blocking after receipt of control pulses **[3]**

17/28 • Modifications for introducing a time delay before switching (modifications to provide a choice of time-intervals for executing more than one switching action H03K 17/296) **[3]**

17/284 • • in field-effect transistor switches **[3]**

17/288 • • in tube switches **[3]**

17/292 • • in thyristor, unijunction transistor or programmable unijunction transistor switches **[3]**
17/296 • Modifications to provide 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) **[3]**
17/30 • Modifications for providing a predetermined threshold before switching (shaping pulses by thresholding H03K 5/08) **[3]**
17/51 • characterised by the use of specified components (H03K 17/04-H03K 17/30, H03K 17/94 take precedence) **[3]**
17/52 • • by the use, as active elements, of gas-filled tubes **[3]**
17/54 • • by the use, as active elements, of vacuum tubes (using diodes H03K 17/74) **[3]**
17/56 • • by the use, as active elements, of semiconductor devices (using diodes H03K 17/74) **[3]**
17/567 • • • Circuits characterised by the use of more than one type of semiconductor device, e.g. BIMOS, composite devices such as IGBT **[6]**
17/58 • • • the devices being tunnel diodes **[3]**
17/60 • • • the devices being bipolar transistors (bipolar transistors having four or more electrodes H03K 17/72) **[3]**
17/605 • • • • with galvanic isolation between the control circuit and the output circuit (H03K 17/78 takes precedence) **[5]**
17/61 • • • • • using transformer coupling **[5]**
17/615 • • • • in a Darlington configuration **[5]**
17/62 • • • • Switching arrangements with several input- or output-terminals, e.g. multiplexers, distributors (logic circuits H03K 19/00; code converters H03M 5/00, H03M 7/00) **[3]**
17/64 • • • • having inductive loads **[3]**
17/66 • • • • Switching arrangements for passing the current in either direction at will; Switching arrangements for reversing the current at will **[3]**
17/68 • • • • specially adapted for switching ac currents or voltages **[3]**
17/687 • • • the devices being field-effect transistors **[3]**
17/689 • • • • with galvanic isolation between the control circuit and the output circuit (H03K 17/78 takes precedence) **[5]**
17/691 • • • • • using transformer coupling **[5]**
17/693 • • • • Switching arrangements with several input- or output-terminals, e.g. multiplexers, distributors (logic circuits H03K 19/00; code converters H03M 5/00, H03M 7/00) **[3]**
17/695 • • • • having inductive loads (protecting switching circuit against inductive flyback voltage H03K 17/08) **[6]**
17/70 • • • the devices having only two electrodes and exhibiting negative resistance (the devices being tunnel diodes H03K 17/58) **[3]**
17/72 • • • Bipolar semiconductor devices with more than two PN junctions, e.g. thyristors, programmable unijunction transistors, or with more than three electrodes, e.g. silicon controlled switches, or with more than one electrode connected to the same conductivity region, e.g. unijunction transistors **[3]**
17/722 • • • • with galvanic isolation between the control circuit and the output circuit (H03K 17/78 takes precedence) **[5]**
17/723 • • • • • using transformer coupling **[5]**
17/725 • • • • for ac voltages or currents (H03K 17/722, H03K 17/735 take precedence) **[3, 5]**
17/73 • • • • for dc voltages or currents (H03K 17/722, H03K 17/735 take precedence) **[3, 5]**
17/732 • • • • • Measures for enabling turn-off **[5]**
17/735 • • • • Switching arrangements with several input- or output-terminals, e.g. multiplexers, distributors (H03K 17/722 takes precedence; logic circuits H03K 19/00; code converters H03M 5/00, H03M 7/00) **[3, 5]**
17/74 • • by the use, as active elements, of diodes (by the use of more than one type of semiconductor device H03K 17/567; by the use of tunnel diodes H03K 17/58; by the use of negative resistance diodes H03K 17/70) **[3]**
17/76 • • • Switching arrangements with several input- or output-terminals, e.g. multiplexers, distributors (logic circuits H03K 19/00; code H03M 5/00, H03M 7/00) **[3]**
17/78 • • by the use, as active elements, of opto-electronic devices, i.e. light-emitting and photoelectric devices electrically- or optically-coupled **[3]**
17/785 • • • controlling field-effect transistor switches **[5]**
17/79 • • • controlling semiconductor switches with more than two PN-junctions, or more than three electrodes, or more than one electrode connected to the same conductivity region **[5]**
17/795 • • • controlling bipolar transistors **[5]**
17/80 • • by the use, as active elements, of non-linear magnetic or dielectric devices **[3]**
17/81 • • • Switching arrangements with several input- or output-terminals, e.g. multiplexers, distributors (logic circuits H03K 19/00; code converters H03M 5/00, H03M 7/00) **[3]**
17/82 • • • the devices being transfluxors **[3]**
17/84 • • • the devices being thin-film devices **[3]**
17/86 • • • the devices being twistors **[3]**
17/88 • • by the use, as active elements, of beam-deflection tubes **[3]**
17/90 • • by the use, as active elements, of galvano-magnetic devices, e.g. Hall-effect devices (H03K 17/95, H03K 17/97 take precedence) **[2, 3]**
17/92 • • by the use, as active elements, of superconductive devices **[2, 3]**
17/94 • characterised by the way in which the control signals are 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) **[3, 4]**
17/945 • • Proximity switches (H03K 17/96 takes precedence) **[3]**
17/95 • • • using a magnetic detector **[3]**
17/955 • • • using a capacitive detector **[3]**
17/96 • • Touch switches (specially adapted for electronic time-pieces with no moving parts G04G 21/08) **[3]**
17/965 • • Switches controlled by moving an element forming part of the switch **[3]**
17/967 • • • having a plurality of control members, e.g. keyboard (H03K 17/969, H03K 17/972, H03K 17/98 take precedence) **[4]**
17/968 • • • using opto-electronic devices **[4]**

17/969 • • • • having a plurality of control members, e.g. keyboard **[4]**
17/97 • • • using a magnetic movable element **[3]**
17/972 • • • • having a plurality of control members, e.g. keyboard **[4]**
17/975 • • • using a capacitive movable element **[3]**
17/98 • • • • having a plurality of control members, e.g. keyboard **[4]**

19/00 Logic circuits, i.e. having at least two inputs acting on one output (circuits for computer systems using fuzzy logic G06N 7/02)**; Inverting circuits**
19/003 • Modifications for increasing the reliability **[3]**
19/007 • Fail-safe circuits **[3]**
19/01 • Modifications for accelerating switching **[3]**
19/013 • • in bipolar transistor circuits **[3]**
19/017 • • in field-effect transistor circuits **[3]**
19/0175 • Coupling arrangements; Interface arrangements (interface arrangements for digital computers G06F 3/00, G06F 13/00) **[5]**
19/018 • • using bipolar transistors only **[5]**
19/0185 • • using field-effect transistors only **[5]**
19/02 • using specified components (H03K 19/003-H03K 19/0175 take precedence) **[3, 5]**
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) **[3]**
19/082 • • • using bipolar transistors **[3]**
19/084 • • • • Diode–transistor logic **[3]**
19/086 • • • • Emitter coupled logic **[3]**
19/088 • • • • Transistor–transistor logic **[3]**
19/09 • • • • Resistor–transistor logic **[3]**
19/091 • • • • Integrated injection logic or merged transistor logic **[3]**
19/094 • • • using field-effect transistors **[3]**
19/0944 • • • • using MOSFET (H03K 19/096 takes precedence) **[5]**
19/0948 • • • • • using CMOS **[5]**
19/0952 • • • • using Schottky type FET (H03K 19/096 takes precedence) **[5]**
19/0956 • • • • Schottky diode FET logic (H03K 19/096 takes precedence) **[5]**
19/096 • • • • Synchronous circuits, i.e. using clock signals **[3]**
19/098 • • • using thyristors **[3]**
19/10 • • • using tunnel diodes **[3]**
19/12 • • using diode rectifiers
19/14 • • using opto-electronic devices, i.e. light-emitting and photoelectric devices electrically- or optically-coupled (optical logic elements 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 **[3]**
19/177 • • • arranged in matrix form **[3]**
19/18 • • using galvano-magnetic devices, e.g. Hall-effect devices **[2]**
19/185 • • using dielectric elements with variable dielectric constant, e.g. ferro-electric capacitors **[2]**
19/19 • • • using ferro-resonant devices **[2]**
19/195 • • using superconductive devices **[2, 3]**
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 **[3]**
19/23 • • Majority or minority circuits, i.e. giving output having the state of the majority or the minority of the inputs **[3]**

21/00 Details of pulse counters or frequency dividers
21/02 • Input circuits **[4]**
21/08 • Output circuits **[4]**
21/10 • • comprising logic circuits
21/12 • • with parallel read-out **[4]**
21/14 • • with series read-out of number stored **[4]**
21/16 • Circuits for carrying-over pulses between successive decades
21/17 • • with field-effect transistors **[4]**
21/18 • Circuits for visual indication of the result **[4]**
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) **[4]**
21/40 • Monitoring; Error detection; Preventing or correcting improper counter operation **[4]**

23/00 Pulse counters comprising counting chains; Frequency dividers comprising counting chains (H03K 29/00 takes precedence)
23/40 • Gating or clocking signals applied to all stages, i.e. synchronous counters **[4]**
23/42 • • Out-of-phase gating or clocking signals applied to counter stages **[4]**
23/44 • • • using field-effect transistors **[4]**
23/46 • • • using charge transfer devices, i.e. bucket brigade or charge coupled devices **[4]**
23/48 • • with a base or radix other than a power of two (H03K 23/42 takes precedence) **[4]**
23/50 • • using bi-stable regenerative trigger circuits (H03K 23/42-H03K 23/48 take precedence) **[4]**
23/52 • • • using field-effect transistors **[4]**
23/54 • • • Ring counters, i.e. feedback shift register counters (H03K 23/52 takes precedence) **[4]**
23/56 • • • Reversible counters (H03K 23/52 takes precedence) **[4]**
23/58 • Gating or clocking signals not applied to all stages, i.e. asynchronous counters (H03K 23/74-H03K 23/84 take precedence) **[4]**
23/60 • • with field-effect transistors **[4]**
23/62 • • reversible **[4]**
23/64 • with a base or radix other than a power of two (H03K 23/40-H03K 23/62 take precedence) **[4]**
23/66 • • with a variable counting base, e.g. by presetting or by adding or suppressing pulses **[4]**
23/68 • • with a base which is a non-integer **[4]**
23/70 • • with a base which is an odd number (H03K 23/66 takes precedence) **[4]**
23/72 • • Decade counters (H03K 23/66 takes precedence) **[4]**
23/74 • using relays **[4]**
23/76 • using magnetic cores or ferro-electric capacitors **[4]**
23/78 • using opto-electronic devices **[4]**

23/80 • using semiconductor devices having only two electrodes, e.g. tunnel diode, multi-layer diode **[4]**
23/82 • using gas-filled tubes **[4]**
23/84 • using thyristors or unijunction transistors **[4]**
23/86 • reversible (H03K 23/40-H03K 23/84 take precedence) **[4]**

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 **[4]**
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) **[4]**

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 **[4]**
29/06 • using beam-type tubes, e.g. magnetrons, cathode-ray tubes **[4]**