

# Off-the-Shelf ECUs Summary. All units fully automotive qualified.

| Form Factor                  | 24 Pin                             |                                     |                     | 48 Pin  |  |                                      |  | 70 Pin  | 80 Pin                                 | 112 Pin                                     | 128 Pin   |  |                                   |
|------------------------------|------------------------------------|-------------------------------------|---------------------|---|--|--------------------------------------|--|---|--|---|---|--|-----------------------------------|
| Intended Control Function    | Engine / Powertrain                | General Purpose                     | General Purpose     | Engine / Powertrain                           | Engine / Powertrain                        | General Purpose                      | Hydraulic  | Engine / Powertrain   | Engine / Powertrain                    | Engine / Powertrain                         | Engine / Powertrain   |  |                                   |
| Series                       | ECMS12-24                          | GCMS12-24                           | GCMS65-24           | ECMS55-48                                     | ECM-563-48                                 | GCMS63-48                            | HCM563-48  | ECMS12X-70  | ECMS55-80                              | ECMS554-112                                 | ECMS65-128  |  |                                   |
| Core                         | Microcontroller                    | Freescale HCS12                     | Freescale HCS12     | Freescale MPC565                              | Freescale MPC555                           | Freescale MPC563                     | Freescale MPC563   | Freescale HCS12XE   | Freescale MPC555                       | Freescale MPC553 or 5654                    | Freescale MPC565  |  |                                   |
|                              | Clock Frequency                    | 24 MHz                              | 24 MHz              | 56 MHz  | 40 MHz                                     | 56 MHz                               | 56 MHz   | 50 MHz  | 40 MHz                                 | 40 MHz                                      | 56 MHz  |  |                                   |
| Memory                       | Internal Flash                     | 128 k                               | 128 k               | 1 M   | 448 k                                      | 512 k                                | 512 k  | 512 k   | 256 k<br>(1M on dev't version)         | 448 k                                       | 2 M   | 1 M  |                                   |
|                              | External Flash                     |                                     |                     | 256 M   |  |                                      |  |   | 2M on dev't version only               |   |   |  |                                   |
|                              | EEPROM                             | 2 k internal, (8 k serial optional) | 2 k internal        |   | 4 k or 8 k (serial) (dev't version: 128 k) | 16 k (serial) (dev't version: 128 k) | 16 k (serial) (dev't version: 128 k)                                       | 16 k (serial) (dev't version: 128 k)                        | 4 k internal + 8 k (serial)            | 8 k (serial) (dev't version: 128 k)         | 32 k (serial)   | 8 k (serial), opt. 128 k (parallel)                    |                                   |
|                              | Internal SRAM                      | 2 k                                 | 2 k                 | 36 k  | 26 k                                       | 32 k                                 | 32 k   | 32 k  | 16 k<br>(64 k on dev't version)        | 26 k  | 64 k  | 36 k   |                                   |
|                              | External SRAM                      |                                     |                     | 512 k   |  |                                      |  |   |  |   | 512 k (dev't version only)  | 512 k (optional)                                       |                                   |
| Inputs                       | Supply Voltage                     | 8-16 V                              | 8-16 V              | 9-32 V (limitations apply)                    | 8-16 V                                     | 8-16 V                               | 8-32 V   | 8-32 V (0802 only: 8-16 V)                                  | 8-16 V                                 | 8-16 V                                      | 8-16 V  | 8-32 V   |                                   |
|                              | Emergency Stop Inputs              |                                     |                     |   | 1  |                                      | 1  | 1   | 1                                      | 1   | 1   |  |                                   |
|                              | Switch Inputs                      |                                     | 4 switch to battery |   |  |                                      |  |   | 4 switch to GND                        | 1 switch to GND                             |   |  |                                   |
|                              | Frequency Inputs                   |                                     |                     |   | 4 Hall-type (PU)                           | 1 VR/Hall (SW selectable)            | Up to 6 Hall-type (PU), and up to 2 VR/Hall (SW selectable)                | Up to 4 Hall-type (PU), and up to 2 VR/Hall (SW selectable) | 3 Hall-type (PU)                       | 3 Hall-type (PU)                            | Up to 4 Hall-type (PU)  | Up to 8 Hall-type (PU), and 4 VR/Hall (SW Selectable)  |                                   |
|                              | Crank Position Input Type          | VR/Hall mode (SW selectable)        |                     |   | VR or Hall (most dependent)                | VR/Hall (SW selectable)              |  |   | Both VR and Hall input pins available  | Both VR and Hall input pins available       | Both VR and Hall input pins available                                   | VR/Hall (SW selectable)                                |                                   |
|                              | Analog Inputs (10-bit)             | 7-12                                | 6                   | 6   | 12   | Up to 16                             | Up to 18   | Up to 16  | 18                                     | Up to 16                                    | 33  | Up to 34   |                                   |
| Knock Inputs                 |                                    |                                     |                     | 1 or 2 (DSP)                                  | 1 (DSP, optional)                          |                                      | 0 or 1 (DSP)   | 2 (DSP)   | 2 (DSP)                                | 2 (DSP)                                     | 2 or 4 (DSP)  |  |                                   |
| O <sub>2</sub> Sensor Inputs | 1 single-ended EGO (opt.)          |                                     |                     |   | 3 single-wire EGO (optional)               |                                      |  | 2 single-ended EGO  | 2 differential EGO (optional)          | 4 differential EGO                          | 2 UEGO (Bosch wide-range); 2 differential EGO (opt.); 2 single-wire EGO |  |                                   |
| Outputs                      | High-Current Drivers (10A)         |                                     |                     |   | 1 or 2 low-side (PWM)                      |                                      |  | 1 low-side (PWM)  | 1 low-side                             |   |   |  |                                   |
|                              | Medium-Current Drivers (3A)        | 1-4 low-side                        |                     |   | 1 low-side PWM, 1 low-side discrete        | up to 5 low-side (up to 2 PWM)       | 4 low-side PWM (2 w/ current sense), 1 low-side and 2 high-side (discrete) | 6 low-side PWM w/current sense, 5 low-side (discrete)       | 2 low-side PWM                         | Up to 6 low-side PWM                        | 4 low-side (w/HEGO diagnostics)   | 10 low-side PWM (2 w/current sense)                    |                                   |
|                              | Current-Controlled Drivers         |                                     | 5 low-side          |   |  |                                      |  |   |  |   | 2 (1 A)   |  |                                   |
|                              | Low-Current Drivers (500 mA)       | 1 low-side                          |                     |   | 1 low-side PWM                             | 1 low-side                           | 1 low-side   | 1 low-side  | 1 low-side PWM                         | 2 low-side                                  | 5 low-side  | 1  |                                   |
|                              | Relay Drivers (<250 mA)            |                                     |                     |   |  |                                      |  |   | 5                                      |   | 2 low-side  |  |                                   |
|                              | Main Power Relay Low-Side Driver   |                                     |                     |   | 1  | 1                                    | 1  | 1   | 1                                      | 1   |   | 1  |                                   |
|                              | Injector Drivers                   | 1 (up to 4 high-impedance loads)    |                     |   | 4 (high-impedance)                         | 4 (high-impedance)                   |  |   | 4 (high-impedance)                     | 12 (3A/1A peak/hold)                        | 8 (high-impedance)  | 12 - 3 A/1 A peak/hold (6 are 7 A/2.5 A SW selectable) |                                   |
|                              | Logic Outputs or Spark Triggers    | 0 or 3 (5 V) triggers               |                     |   | 4 (5 V), 1 (12 V)                          | 8 (5 V), 1 (12 V)                    |  | 1 (5 V)   | 1 (5 V)                                | 1 (12 V)                                    | 8 (5 V) triggers  | 8 (5 V) triggers, 1 (12 V)                             | 12 or 16 (5 A) triggers, 1 (12 V) |
|                              | Direct Ignition Coil Drivers       |                                     |                     |   |  |                                      |  |   | 2 or 3                                 |   |   |  |                                   |
|                              | Low-Current H-bridge Driver        | 0 or 1 (5 A) w/ current sense       |                     |   |  | 1 or 2 (5 A) w/current sense         |  |   |  | 1 (5 A, opt.)                               | 1 (5 A w/current sense)   |  |                                   |
| High-Current H-bridge Driver |                                    |                                     |                     |   |  | 1 (15 A w/current sense)             |  |   | 1 (12 A discrete, optional)            | 1 (12 A discrete)                           | 3 (15 A w/current sense)  |  |                                   |
| Sensor Excitation            | 1 (5 V) sensor supply (250 mA max) | 1 (5 V) sensor supply (250 mA max)  |                     | 1 (5 V) sensor supply, 350 mA max.            | 1 or 2 (5 V) sensor supply, 350 mA max.    | 1 (5 V) sensor supply, 300 mA max.   | 1 (5 V) sensor supply, 300 mA max.   | 1 or 2 (5 V) sensor supplies, 100 mA max.                   | 2 (5 V) sensor supplies, (350 mA max.) | 2 (5 V) sensor supplies, (50 mA and 100 mA) | 2 (5 V) sensor supplies, (350 mA max.)                                  |  |                                   |
| Communications               | CAN 2.0B                           | 1 or 2                              | 2                   | 2   | 1  | 1 or 2                               | 3  | 2   | 1 or 2                                 | 1 or 2                                      | 3   | 2  |                                   |
|                              | USB1.1                             |                                     |                     |   | 1 host, 1 end-link                         |                                      |  |   |  |   |   |  |                                   |
|                              | Serial                             |                                     |                     | RS-232  | RS-485                                     |                                      |  |   | RS-485                                 | RS-485                                      | RS-485  | RS-485, ISO9141  |                                   |
|                              | Shutdown                           | Not SW controlled                   | SW controlled       | SW controlled, battery backed up SRAM and RTC | SW controlled, battery (via MPRD relay)    | SW controlled                        | SW controlled  | SW controlled   | SW controlled                          | SW controlled (via MPRD relay)              | SW controlled   | SW controlled  |                                   |
| Environmental                | Operating Temperature Range        | -40-105 °C                          | -40-105 °C          | -20-80 °C                                     | -40-85 °C                                  | -40-105 °C                           | -40-85 °C  | -40-85 °C   | -40-85 °C                              | -40-105 °C                                  | -40-105 °C  | -40-105 deg °C   |                                   |
|                              | Construction                       | Plastic housing                     | Plastic housing     | Plastic housing                               | Stamped Aluminum                           | Stamped Aluminum                     | Stamped Aluminum   | Stamped Aluminum  | Stamped Aluminum                       | Cast Aluminum with E-Coat                   | Cast Aluminum with E-Coat   | Cast Aluminum  |                                   |
|                              | Connector                          | 24-pin Delphi                       | 24-pin Delphi       | 24-pin Delphi                                 | 48-pin Tyco                                | 48-pin Tyco                          | 48-pin Tyco  | 48-pin Tyco   | 70-pin Tyco                            | 80-pin Tyco                                 | 112-pin Molex   | 80- and 48-pin Tyco                                    |                                   |
| Availability                 | In Production                      | In Production                       | In Production       | In Production                                 | In Production                              | In Production                        | In Production  | In Production   | In Development, SOP in Q3-09           | In Production                               | In Production   | In Production  |                                   |

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