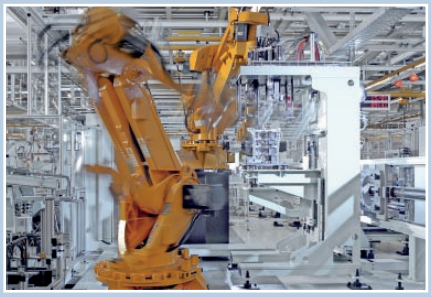
Flex MultiChannel Low-Side Switches

Solutions for Powertrain, Safety and Industrial Applications



[www.infineon.com/flex]

Infineon *Flex* MultiChannel Switches Solutions for Automotive and Industrial Applications

Over the past 40 years, we have developed extensive and in-depth experience in the development of semiconductor solutions for automotive and industrial applications. Our solutions are designed specifically to meet the market demands. Infineon's new *Flex* family fits powertrain perfectly, especially engine management system requirements for higher performance, lower emissions, and reduced fuel consumption.

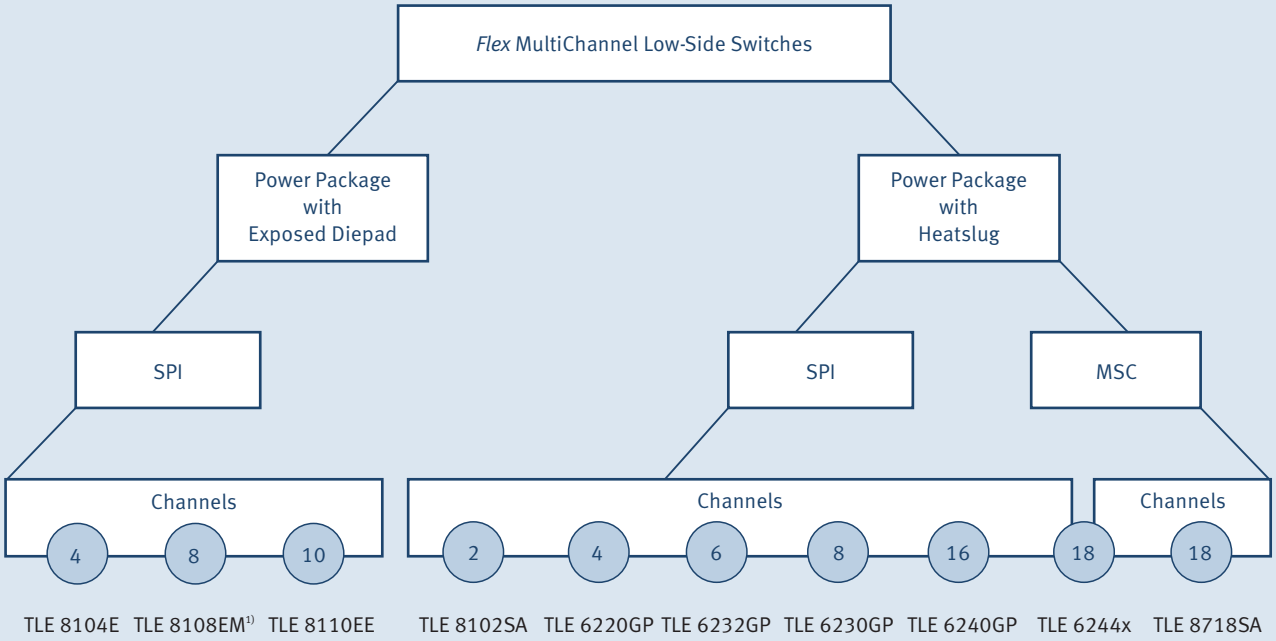
Flex MultiChannel Low-Side Switches

The *Flex* MultiChannel Low-Side Switches family for powertrain, safety and industrial applications is specially designed to drive a various range of loads from relays, injector valves, oxygen-probe heaters and general-purpose solenoids, up to unipolar stepper motors. We offer a complete family concept with full scalability from 2 to 18 channels and leading-edge technology. All *Flex* MultiChannel Switches are equipped with embedded protection functions and enhanced diagnosis, which are used in numerous industrial platforms and are fully approved. For details, please refer to tables on pages 5 and 6.

Benefits

- One family concept
- Designed for dedicated applications, but also available for off-the-shelf use as standard products
- Integrated self-protection and diagnosis
- Enhanced error detection for improved system reliability
- Control via standard SPI Bus or MicroSecond Channel (TLE 6244X, TLE 8718SA) or direct inputs. Suitable for daisy-chain configuration to save I/O ports
- Support of safety-critical applications by overvoltage protection on all pins (TLE 6244X, TLE 8718SA)
- High quality ensured with automotive excellence program on Zero Defect strategy

Selection Tree – *Flex* MultiChannel Low-Side Switches



Features

- Overload protection
- Current limitation
- Overtemperature detection
- Overvoltage protection
- Active Zener clamping
- Short-circuit protection
- Diagnostic feedback
- 5V and 3.3V µC compatible inputs and outputs
- Overcurrent shutdown
- ElectroStatic Discharge (ESD) protection
- 8/16-bit SPI interface
- 2-bit diagnosis per channel
  - Open-load detection
  - Short to battery
  - Short to ground
  - Normal operation
- Direct input control (PWM)

1) Available in 2011

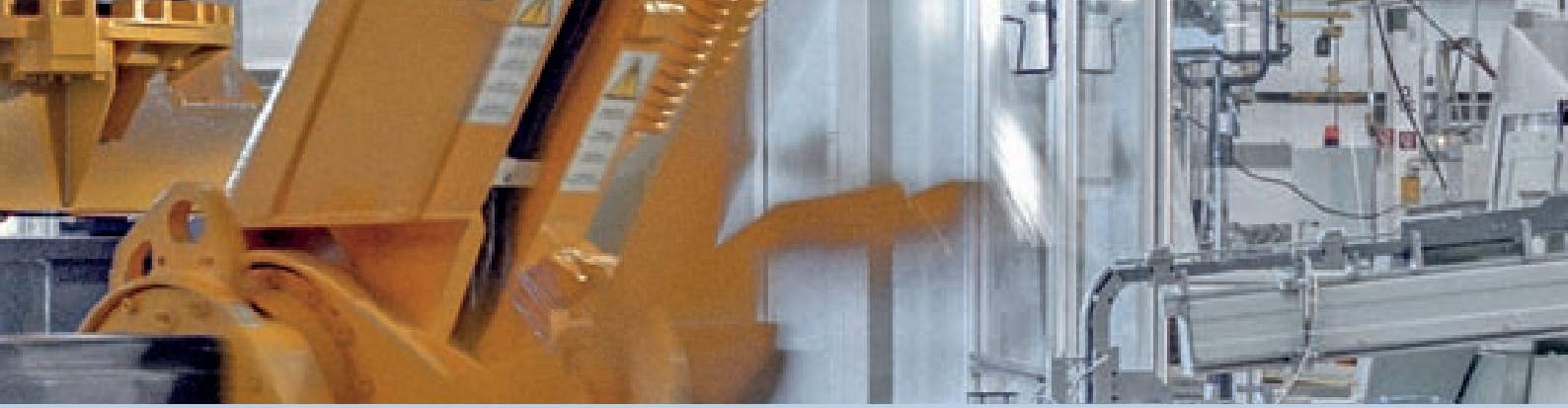
Feature Comparison

Channels	Type	RoHS	V_{CL} (max) [V]	$R_{DS(on)}$ (typ) [mΩ] @T_j = 25°C	$I_{D(MAX)}$ (min) [A]	Package[1]
2	TLE 8102SG	•	60	2 x 180	2 x 9.0	PG-DSO-12 (Heatslug)
4	TLE 8104E	•	60	4 x 320	4 x 3.0	PG-DSO-20 (Exposed Diepad)
4	TLE 6220GP	•	60	4 x 320	4 x 3.0	PG-DSO-20 (Heatslug)
6	TLE 6232GP	•	60	4 x 250 2 x 500	4 x 3.0 2 x 1.5	PG-DSO-36 (Heatslug)
8	TLE 6230GP	–	60	8 x 800	8 x 1.0	PG-DSO-36 (Heatslug)
8	TLE 8108EM[2]	•	60	8 x 800	8 x 1.0	PG-SSOP-24 (Exposed Diepad)
10	TLE 8110EE	•	60	2 x 250 4 x 300 4 x 600	4 x 2.6 4 x 1.7 2 x 3.7	PG-DSO-36 (Exposed Diepad)
16	TLE 6240GP	•	60	4 x 300 4 x 350 8 x 1000	8 x 3.0 8 x 1.0	PG-DSO-36 (Heatslug)
18	TLE 6244x	•	60	2 x 220 8 x 300 4 x 320 4 x 620	4 x 1.1 2 x 3.0 12 x 2.2	PG-MQFP-64 (Heatslug)
18	TLE 8718SA	•	60	4 x 190 4 x 270 6 x 310 4 x 1000	2 x 3.0/6.0 2 x 3.0 10 x 2.2 4 x 0.6	PG-DSO-36 (Heatslug)

1) For package details, please refer to page 15
2) Available in 2011

Function Table

		TLE 8102SG	TLE 8104E	TLE 6220GP
Electrical Specification	$R_{DS(on)}$ (typ) [mΩ] @T_j = 25°C	2 x 180	4 x 320	4 x 320
	$I_{D(MAX)}$ (min) [A]	2 x 9.0	4 x 3.0	4 x 3.0
Supply	Supply voltage [V]	4.5–5.5	4.5–5.5	4.5–5.5
	Standby mode	Y	Y	Y
	Undervoltage shutdown	Y	Y	Y
Control	SPI interface	8-bit	8-bit	8-bit
	Daisy-chain capability	Y	Y	Y
	MicroSecond channel			
	Direct input control	2	4	4
	Active high/low programmable input			
Protection	Overload shutdown	Y		
	Auto restart	Y	Y	Y
	Latch after shutdown	Y	Y	Y
	Current limitation	Y	Y	Y
	Overtemperature shutdown	Y	Y	Y
	Overvoltage protection			
Diagnosis	Short to ground detection	Y	Y	Y
	Short to battery detection	Y	Y	Y
	Open-load detection state	off/on	off	off
	Status outputs	Y		
	General fault flag	Y	Y	Y
Channel		2	4	4



TLE 6232GP	TLE 6230GP	TLE 8108EM	TLE 8110EE	TLE 6240GP	TLE 6244x	TLE 8718SA
4 x 250 2 x 500	8 x 800	8 x 800	2 x 250 4 x 300 4 x 600	4 x 300 4 x 350 8 x 1000	2 x 220 8 x 300 4 x 320 4 x 620	4 x 190 4 x 270 6 x 310 4 x 1000
4 x 3.0 2 x 1.5	8 x 1.0	8 x 1.0	4 x 2.6 4 x 1.7 2 x 3.7	8 x 3.0 8 x 1.0	4 x 1.1 2 x 3.0 12 x 2.2	2 x 3.0/6.0 2 x 3.0 10 x 2.2 4 x 0.6
4.5–5.5	4.5–5.5	4.5–5.5	4.5–5.5	4.5–5.5	4.5–5.5	4.5–5.5
Y			Y	Y	Y	Y
Y	Y	Y	Y	Y	Y	Y
16-bit	16-bit	16-bit	16-bit	16-bit	16-bit	
Y	Y	Y	Y	Y	Y	
					Y	Y
6	8	4	10	12	16	
Y	Y					
Y			Y	Y	Y	Y
Y	Y	Y	Y	Y	Y	Y
Y	Y	Y	Y	Y	Y	Y
Y	Y	Y		Y	Y	Y
Y	Y	Y	Y	Y	Y	Y
						< 36V all pins
Y	Y	Y	Y	Y	Y	Y
Y	Y	Y	Y	Y	Y	Y
off	off	off	off	off	off	off
Y	Y	Y	Y	Y	Y	Y
6	8	8	10	16	18	18

Engine Management Systems

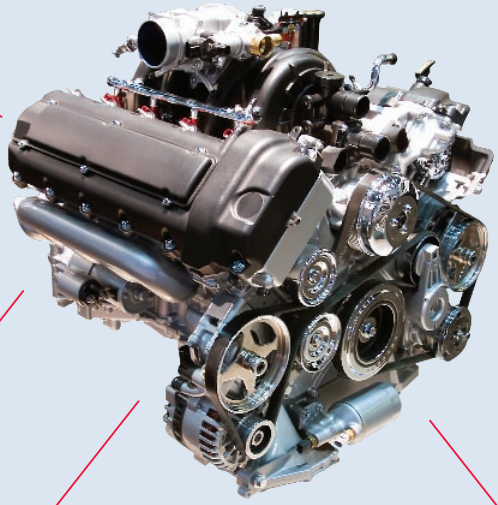
Unipolar Stepper Motor

TLE 8110EE

Lambda Sensor with Current Sense/ High Current Loads

TLE 8102SG

MPI (Multi Port Injection)
DDI (Diesel Direct Injection)
GDI (Gasoline Direct Injection)



MPI Injectors/ Solenoid

TLE 8718SA
TLE 6244X
TLE 6240GP
TLE 8110EE
TLE 6232GP
TLE 8104E
TLE 6220GP

Small Signals

TLE 8718SA
TLE 6244x
TLE 6240GP
TLE 8110EE
TLE 6232GP
TLE 8104E
TLE 6220GP
TLE 8102SG

Relays

TLE 8718SA
TLE 6244x
TLE 6240GP
TLE 8110EE
TLE 8108EM[1)]
TLE 6230GP
TLE 6232GP
TLE 8104E
TLE 6220GP
TLE 8102SG

Lambda Sensors

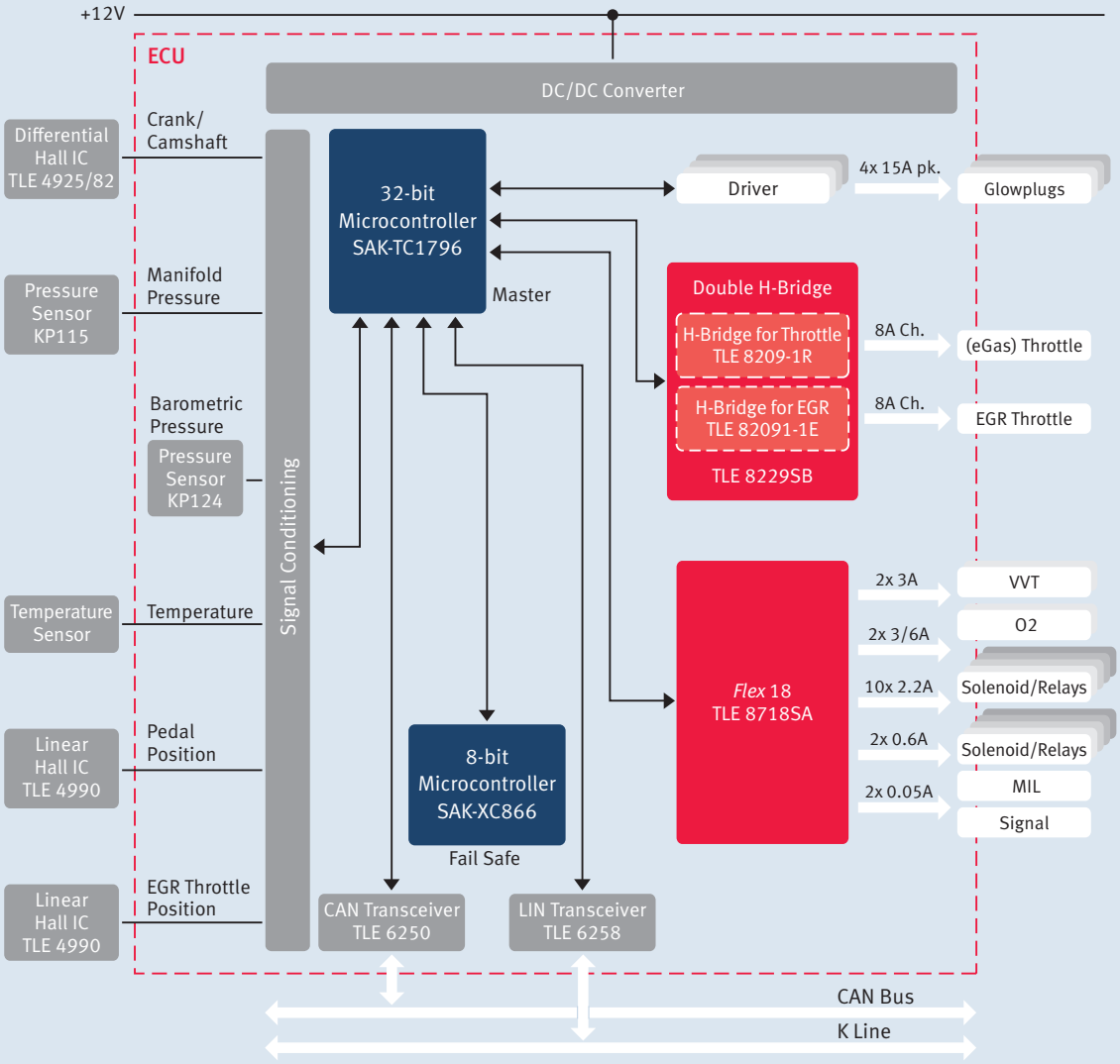
TLE 8718SA
TLE 8110EE
TLE 8102SG

LEDs

TLE 8718SA
TLE 8110EE
TLE 8108EM[1)]

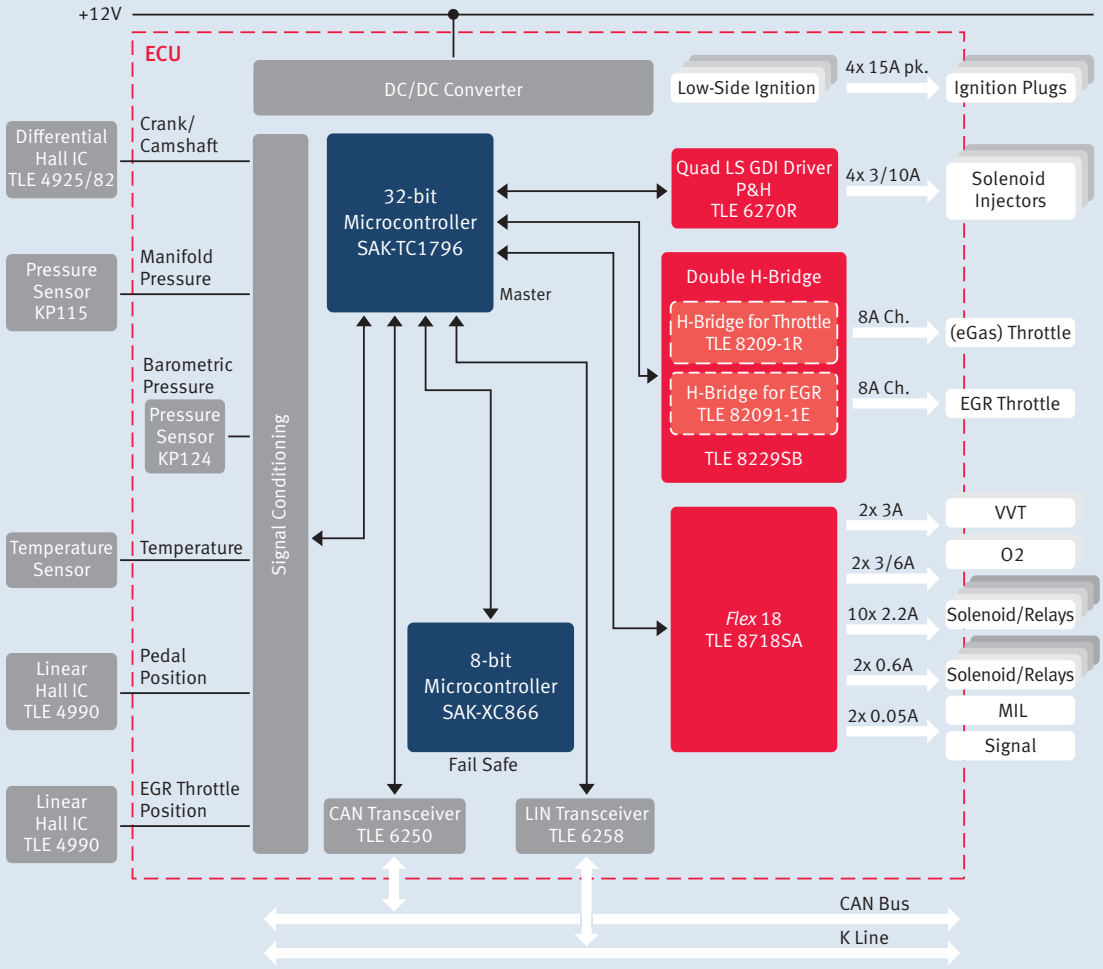
1) Available in 2011

Diesel Direct Injection



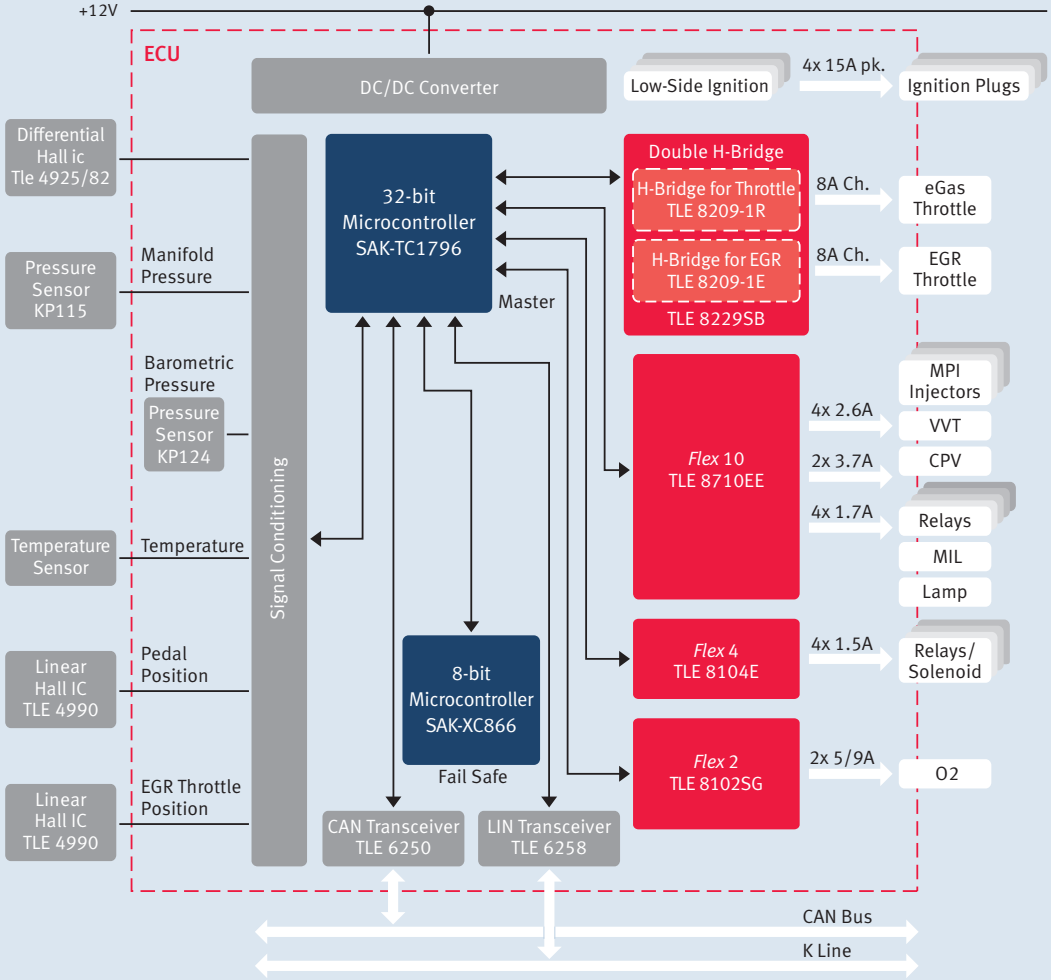
Besides high-pressure direct injection, diesel engines contain a broad variance of different loads like relays, variable valve timing, O_2-heating, MIL lamp, solenoids and others. A combination of Infineon's *Flex* MultiChannel Switches can be adapted to every load scenario.

Gasoline Direct Injection



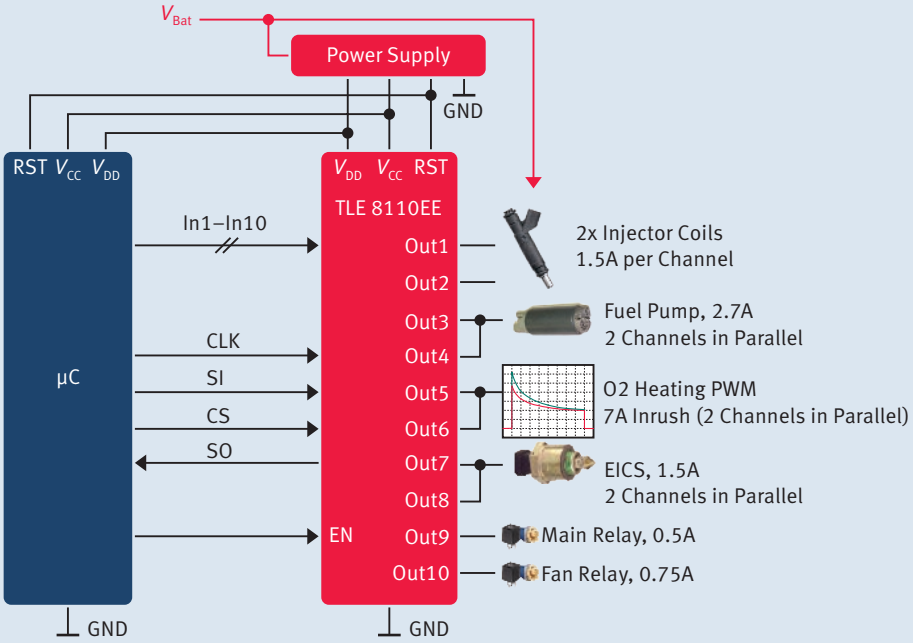
The combination of Infineon's *Flex* MultiChannel Switches together with H-Bridges and GDI-Driver delivers effortlessly the demands of high-precision direct injection and high reliable power-control with integrated devices.

Multi Port Injection

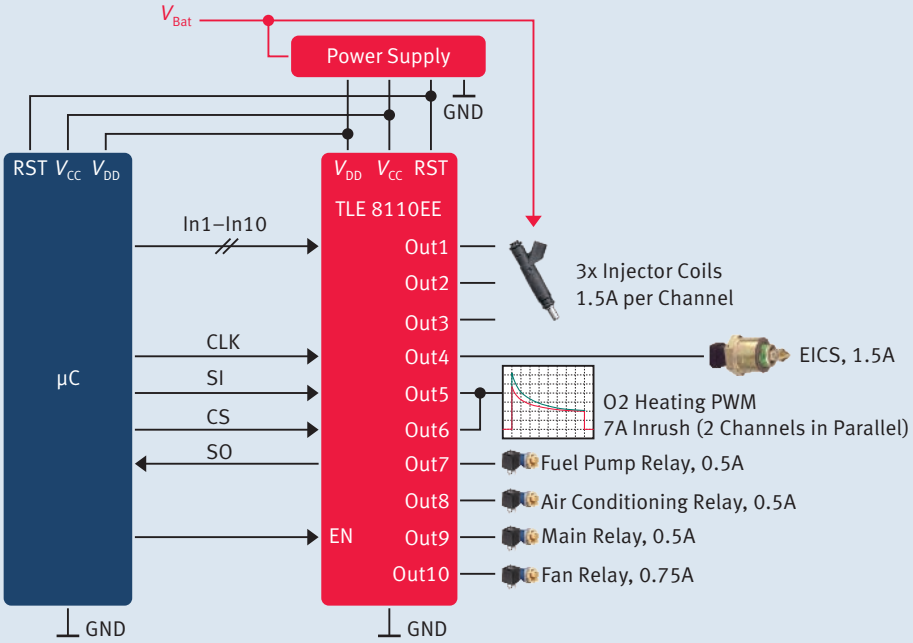


Powerful engine control unit for Multi Port Injection (MPI) utilizing the latest semiconductor technologies ensuring little effort to cope with high demands of today's stringent emissions and performance requirements. Infineon's integrated *Flex* MultiChannel Switches make it possible to drive MPI-Injectors, O_2-Heaters and all kinds of inductive or resistive load directly with the optimal trade-off between performance, reliability and diagnostic capabilities.

2-Cylinder Motorcycle

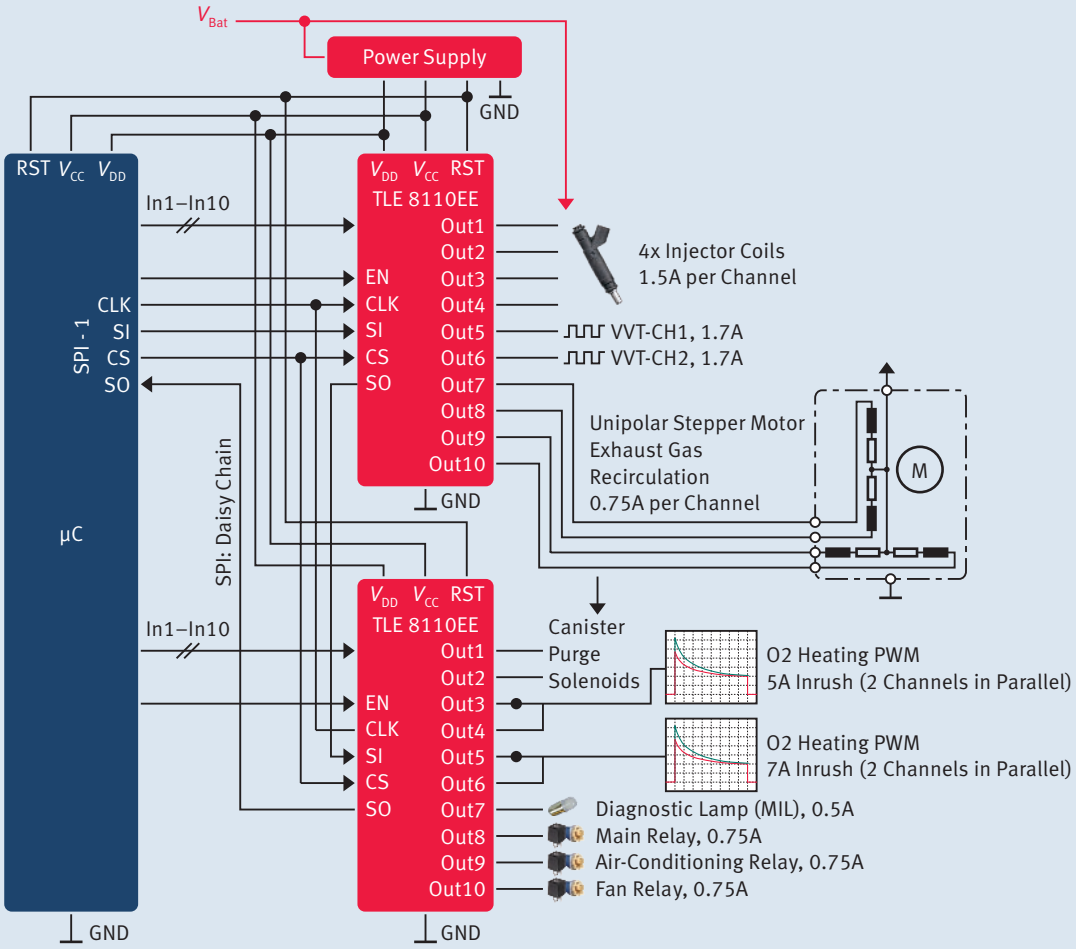


3-Cylinder MPI



Cost-effective yet high performance partitioning with TLE 8110EE as single MultiChannel Low-Side Switch driving injectors, fuel pump, O_2-heater.

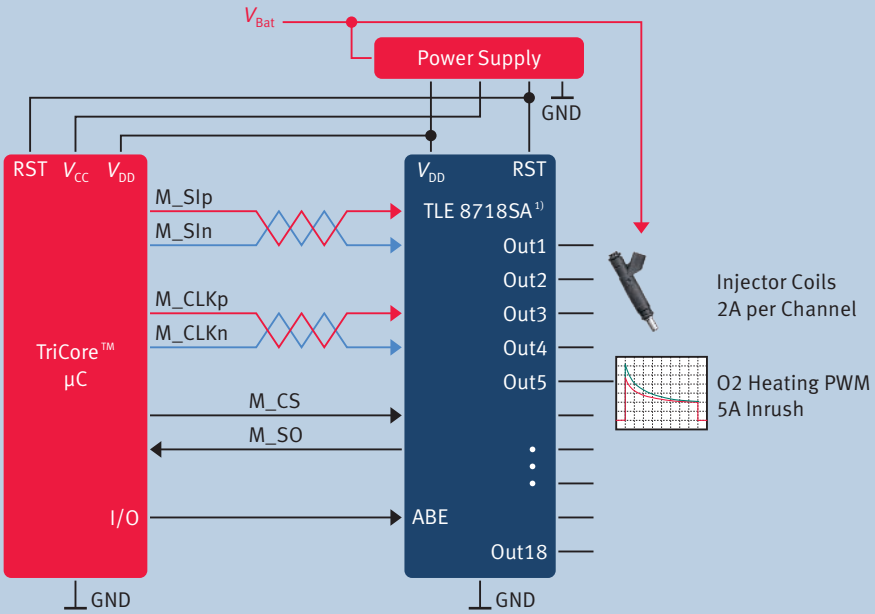
4-Cylinder Motorcycle MPI



TLE 8110EE is our newest and most flexible device from the *Flex* MultiChannel Switches family. The device is able to drive unipolar stepper motors as well as various inductive and resistive loads like injectors, VVTs (Variable Valve Timing), relays and O_2-heaters directly. Up to four channels can be driven without major losses in a specially designed parallel mode to drive higher loads. The parallel mode can be programmed and configured via SPI. Application note to drive a unipolar stepper motor can be downloaded from [www.infineon.com/flex].

Compact control offers the possibility to control the device with lowest work load on the microcontroller side with a highly efficient command set to control parts of the output pins and read out diagnosis at the same time. A unique device setting (LOTCx) allows the behavior of TLE 8110EE to be controlled when overcurrent and overtemperature are detected.

Application Example with Innovative MicroSecond Channel

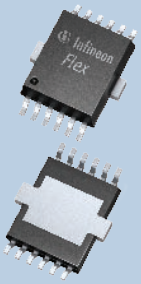


MicroSecond Channel

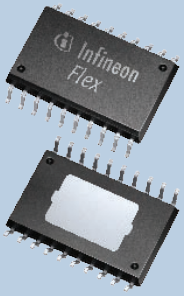
TLE 8718SA will be the first MultiChannel Switch which supports advanced MicroSecond Channel (MSC) with 3.3V LVDS differential input controls. All 18 output channels can be controlled with four to six lines including PWM (Pulse Width Modulation) and diagnosis. It supports single-ended MSC (3.3/5V) with up to 10MHz and differential ended (LVDS, 1.3V) MSC with a maximum frequency of 40MHz. As there are no direct input controls required, the device will come in a fairly attractive and small Power-DSO-36 package. Infineon's TriCore™ 32-bit Microcontroller has direct MSC support for LVDS pins and enables effective and easy software programming. The CMOS and TTL-compatible single-ended MSC of TLE 8718SA can be driven by any other microcontroller as well.
TLE 8718SA has a wide variety of power output drivers and can be used in MPI, GDI and DDI as well as in industrial applications. Engineering samples, which can be controlled via MSC, are available with ten and twelve channels on request.

Packages

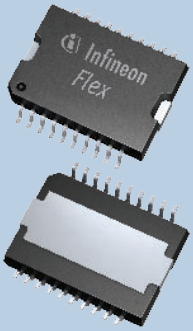
PG-DSO-12 (Heatslug)



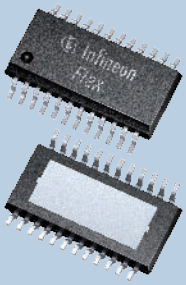
PG-DSO-20 (Exposed Diepad)



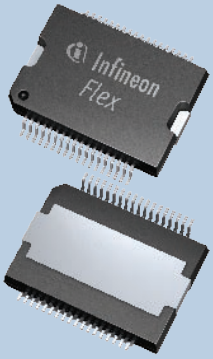
PG-DSO-20 (Heatslug)



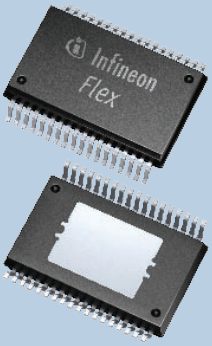
PG-SSOP-24 (Exposed Diepad)



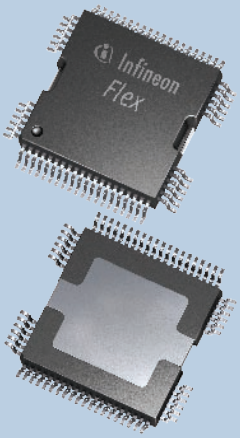
PG-DSO-36 (Heatslug)



PG-DSO-36 (Exposed Diepad)



PG-MQFP-64 (Heatslug)



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