



PROFET™+

Benchmark Robustness and Diagnostics in Modular Packages



Introduction

Infineon launches its next generation of discrete smart high-side switches – PROFET™+. The family is designed to drive light bulbs and LEDs in the harsh automotive environment but can also be used for industrial applications.

The devices provide state-of-the-art diagnostics and protection features. Their high current sense accuracy (KILIS) is able to diagnose even the smallest loads, such as LEDs. The very high short-circuit robustness across the whole family sets the market benchmark. Infineon is the first company to specify the short-circuit robustness of a device in the datasheet. 100k cycles SC robustness (PROFET™+ 12V) is a factor 200 improvement towards today's smart high-side drivers in the market.

Based on the identical footprint of its packages, maximum design flexibility is provided, allowing loads and devices to be changed without major modification of the board layout.



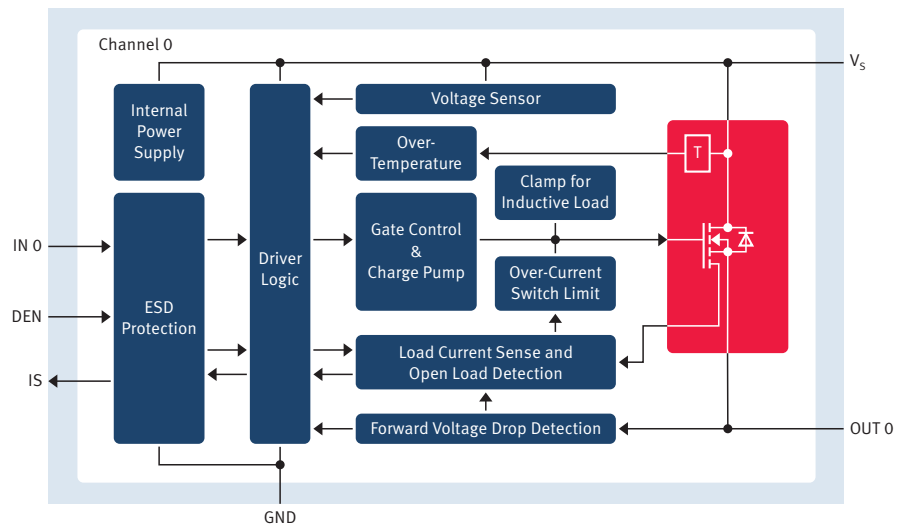
Applications Overview

- 12V grounded high-side loads from 10A down to 0.5A (permanent/channel)
- Qualified for automotive applications, such as lighting, body control modules, heating, energy/power distribution
- Capacitive loads, such as bulb lamps with high inrush currents or LEDs with low currents
- Resistive loads, such as heating streamer
- Inductive loads, such as electromagnetic valves
- Replacement of electromechanical relays, fuses and discrete circuits

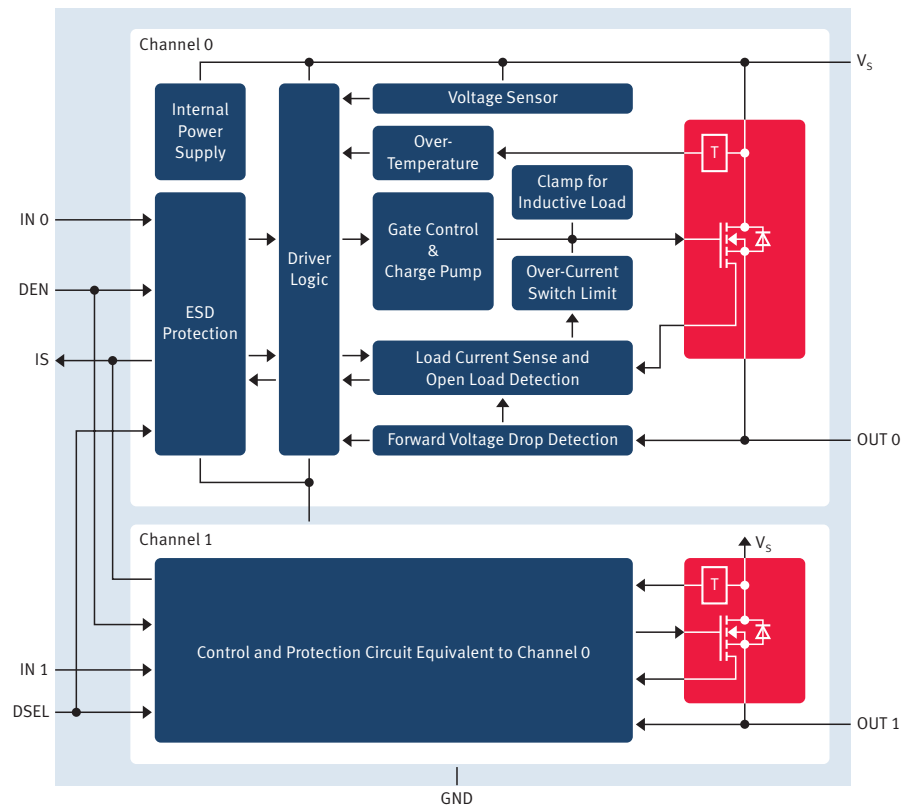
PROFET™+ Product Concept

Block Diagram

1 Channel



2 Channel



Features

Basic Features

- High-side switches (0.5–10A load current)
- RoHS compliant & AEC qualified
- Operating battery: Min. = 4.1V; Max. = 28V
- Very low stand-by current (< 0.5µA max., 0.1µA typical)
- ESD protection, optimized EMC
- PWM capability up to 200Hz
- Very low power DMOS leakage current in OFF
- 3.3V and 5V-compatible logic inputs
- Improved heat dissipation of DSO-package

Protection Features

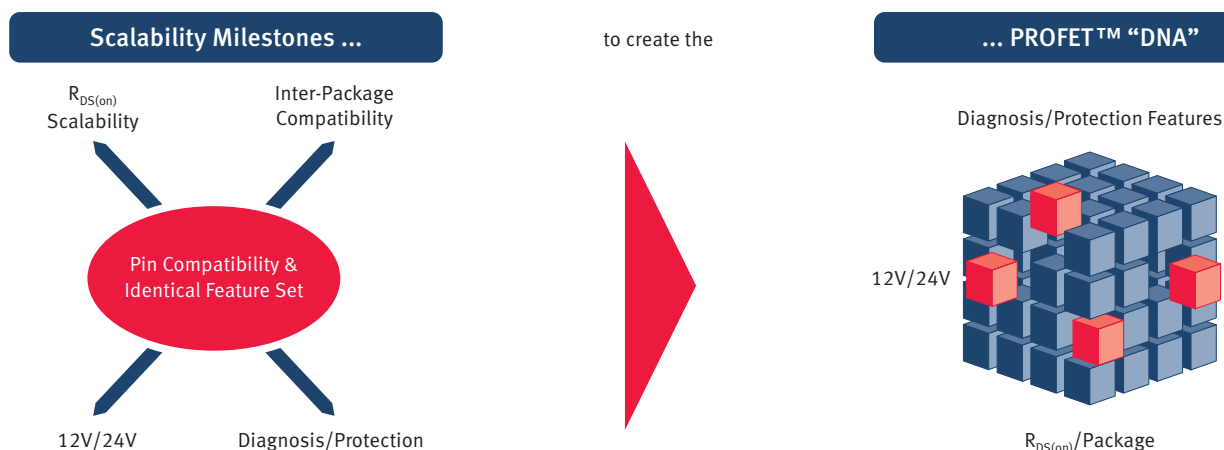
- Load dump: 42V
- Current limitation and secondary protection
- Thermal shutdown with restart
- Enhanced short-circuit operation 100k
- Loss of ground/battery protection
- Stable behavior at undervoltage
- Overvoltage protection (ext. components)
- Voltage-dependent current limitation
- Reverse polarity compliant (ext. components)

Diagnostic Features

- Proportional load current sense (1IS and 2SEN pins for 2-ch devices)
- Open load in ON and OFF
- Short circuit to battery and ground
- Over-temperature sense
- Current sense matching between channels
- Stable diagnostic signal during short circuit
- Enhanced kILIS accuracy with calibration

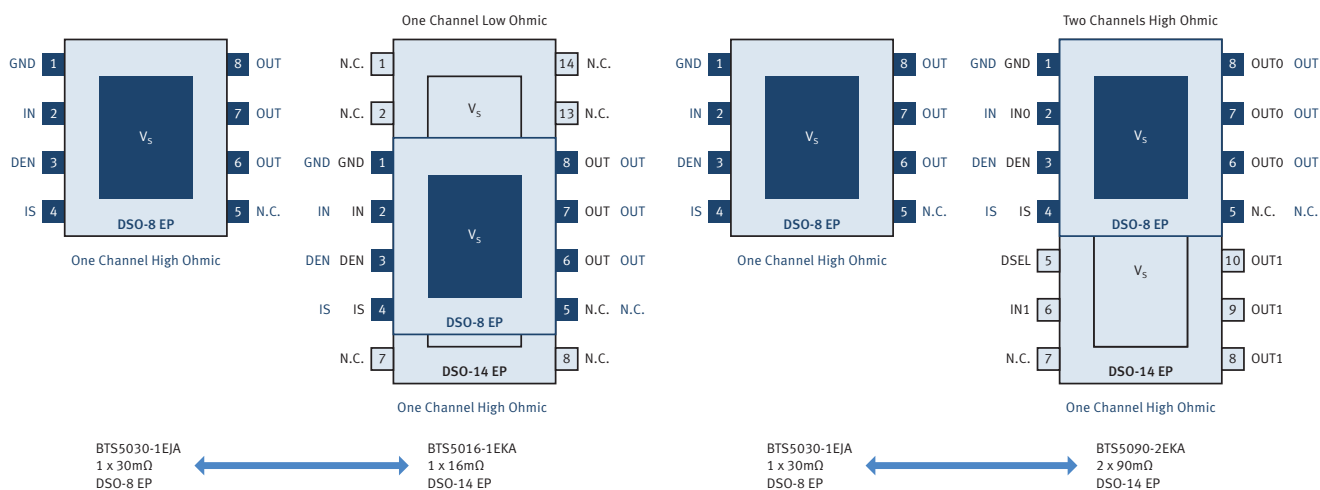
PROFET™+ Product Concept

PROFET™+ offers ultimate modularity and scalability



Package Information

PROFET™+ is fully layout-compatible on 150mil packages for 1+2 channel low/high $R_{DS(on)}$



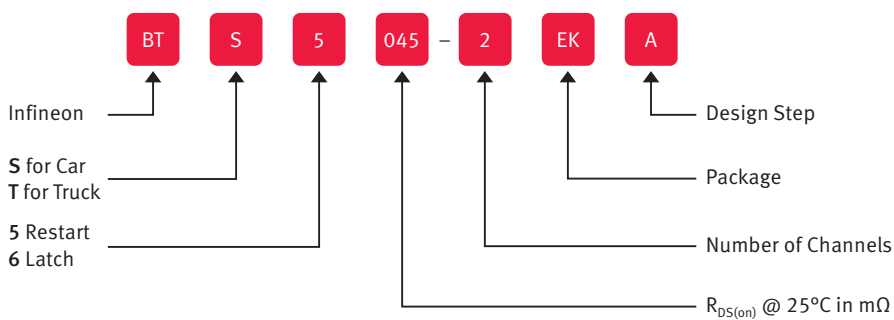
- Identical pin-out logic: communication to microcontroller (left side), power output (right side)
- Power supply comes from the bottom (slug)
- Compatibility between single and dual channels is possible if heat slug (width) is planned for within the PCB layout.

Product Portfolio Overview

PROFET™+ 12V Family Overview

	DSO-8	DSO-14	VSON-14	Channels
1×8mΩ		BTS5008-1EKB		1 Channel
1×10mΩ		BTS5010-1EKA/B		
1×12mΩ		BTS5012-1EKA/B		
1×16mΩ		BTS5016-1EKB		
1×20mΩ ¹⁾		BTS5020-1EKA		
1×30mΩ	BTS5030-1EJA			
1×45mΩ	BTS5045-1EJA			
1×90mΩ	BTS5090-1EJA			
2×8mΩ ²⁾			BTS5008-2LAA	2 Channels
2×10mΩ ²⁾			BTS5010-2LAA	
2×12mΩ ²⁾			BTS5012-2LAA	
2×16mΩ ²⁾		BTS5016-2LAA		
2×20mΩ		BTS5020-2EKA		
2×30mΩ		BTS5030-2EKA		
2×45mΩ		BTS5045-2EKA		
2×90mΩ		BTS5090-2EKA		
2×120mΩ		BTS5120-2EKA		
2×180mΩ		BTS5180-2EKA		
4×200mΩ ³⁾		BTS5200-4EKA		4 Channels

PROFET™+ Product Naming System



1) Planned for Q1/2012

2) Planned for Q3/2012

3) Planned for Q3/2012

Product Table

Parameter	Package	Load	No. of Channels	Typical kILIS Ratio	Max. Power	Inductive Energy	Operating Current (max. value)		Junction to Ambient	Nominal Load Current	
							1 Ch. active	2 Ch. active		1 Ch. active	2 Ch. active
Unit		W		–	W	mJ	mA	mA	K/W	A	A
Symbol		P_{LOAD}		kILIS	P_{TOT}	EAS@3A	I_{GND_1}	I_{GND_2}	R_{thJA}	I_{nom1}	I_{nom2}
BTS5020-2EKA	DSO-14 EP	$2 \times 21 + 5$	2	3000	1.9	100	6	9	30	7.0	5.0
BTS5030-2EKA	DSO-14 EP	2×21	2	2185	1.9	80	6	9	31	6.0	4.0
BTS5045-2EKA	DSO-14 EP	1×27	2	1480	1.9	50	6	9	32	4.5	3.0
BTS5090-2EKA	DSO-14 EP	1×21	2	1480	1.9	40	6	9	34	3.5	2.5
BTS5120-2EKA	DSO-14 EP	1×10	2	560	1.4	10	6	9	37	2.5	2.0
BTS5180-2EKA	DSO-14 EP	1×5	2	560	1.4	10	6	9	40	2.0	1.5
BTS5008-1EKB	DSO-14 EP	65	1	4500	2.0	370	9	–	27	12.0	–
BTS5010-1EKB	DSO-14 EP	65	1	4250	2.0	230	9	–	28	10.0	–
BTS5012-1EKB	DSO-14 EP	60	1	4000	2.0	160	9	–	28	10.0	–
BTS5016-1EKB	DSO-14 EP	55	1	3500	2.0	140	9	–	29	8.0	–
BTS5020-1EKA	DSO-14 EP	$2 \times 21 + 5$	1	3000	1.8	100	6	–	33	6.5	–
BTS5030-1EJA	DSO-8 EP	2×21	1	2150	1.7	90	6	–	38	5.0	–
BTS5045-1EJA	DSO-8 EP	27	1	1500	1.6	50	6	–	40	4.0	–
BTS5090-1EJA	DSO-8 EP	21	1	1500	1.5	50	6	–	42	3.0	–

On-State Resistance		Inverse Current Capability	Slew Rate 30%–70%	Load Current Limitation			Short-Circuit Average Current after Several Minutes of Thermal Toggling	Open Load Threshold in ON State	Open Load Threshold in ON State		Sense Signal Maximum Current in Fault Condition (min. value)	I _L for kILIS3	I _L for kILIS4	kILIS3	kILIS4	Ordering Code
T _J = 25°C	T _J = 150°C			Min.	Typ.	Max.			Min.	Max.						
mW	mW	A	V/μs	A	A	A	A	μA	mA	mA	mA	A	A	A	A	
R _{DS(on)}		-I _{L(INV)} ²³	dV/dt _{ON}	I _{LS(SC)}			I _{L(RMS)}	I _{IS(OL)}	I _{L(OL)}		I _{IS(Fault)}	I _{L3}	I _{L4}	I _{L3}	I _{L4}	
20	44	5.0	0.25	50	65	80	6.5	4.0	5.0	30.0	6	4	7	±7%	±5.5%	SP000369172
30	60	4.0	0.25	36	47	57	5.0	5.6	5.0	30.0	6	4	7	±6.5%	±5.5%	SP000389642
45	90	3.0	0.25	25	32	40	3.0	8.0	5.0	30.0	6	2	4	±7%	±6.5%	SP000857484
90	180	2.0	0.25	20	30	40	3.0	8.0	5.0	30.0	6	2	4	±7%	±6.5%	SP000639242
120	240	1.5	0.25	9	12	15	2.0	21.0	5.0	30.0	6	1	2	±7.5%	±6%	SP000639244
180	360	1.0	0.25	8	11	15	2.0	21.0	5.0	30.0	6	1	2	±7.5%	±6%	SP000639238
8	16	8.6	0.25	65	80	105	10.0	4.0	7.5	45.0	7	4	10	±18%	±17%	SP000865464
10	20	7.6	0.25	50	65	80	8.0	4.0	7.0	42.5	7	4	10	±18%	±17%	SP000865466
12	24	6.9	0.25	50	65	80	8.0	4.0	6.5	40.0	7	4	10	±18%	±17%	SP000865468
16	32	5.9	0.25	50	65	80	8.0	4.0	6.0	35.0	7	4	10	±18%	±17%	SP000865462
8	16	5.0	0.25	50	65	80	6.5	4.0	5.0	30.0	6	4	7	±9%	±8%	SP000840718
10	20	4.0	0.25	36	47	57	5.0	5.6	5.0	30.0	6	4	7	±9%	±8%	SP000746730
12	24	3.0	0.25	25	32	40	4.0	8.0	5.0	30.0	6	2	4	±9%	±8%	SP000746732
16	32	2.5	0.25	20	30	40	3.0	8.0	5.0	30.0	6	2	4	±9%	±8%	SP000767082

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