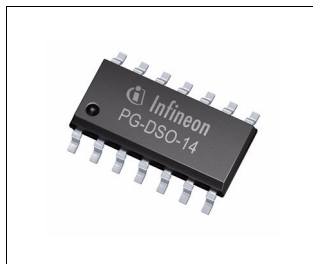




## Overview

## Features

- Optimized for headlight beam control applications
- Current-peak-blanking (no electrolytic capacitor at  $V_S$ )
- Delivers up to 0.8 A continuous
- Low saturation voltage; typ.1.2 V total @ 25 °C; 0.4 A
- Output protected against short circuit
- Overtemperature protection with hysteresis
- Over- and undervoltage lockout
- No crossover current
- Internal clamp diodes
- Enhanced power packages
- Green Product (RoHS compliant)
- AEC Qualified



**PG-DSO-14-22**

Type	Ordering Code	Package
TLE 4206G	on request	PG-DSO-14-22

## Description

The TLE 4206G is a protected H-Bridge Driver designed specifically for automotive headlight beam control and industrial servo control applications. The part is built using the Siemens bipolar high voltage power technology DOPL.

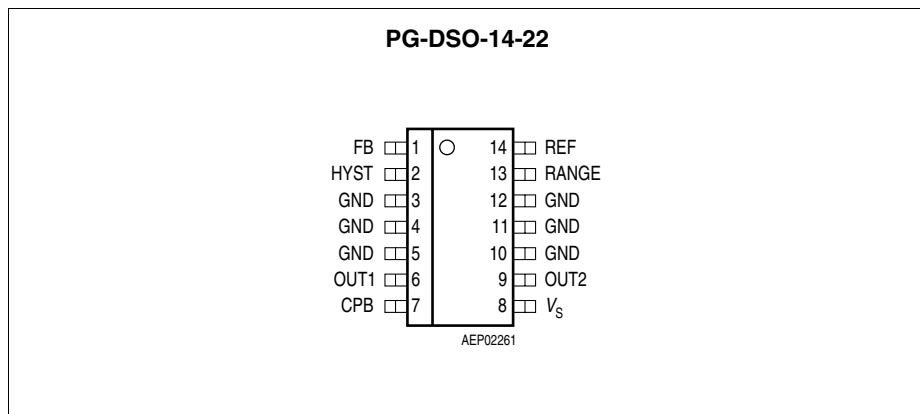
The standard enhanced power PG-DSO-14-22 package meets the application requirements and saves PCB-board space and costs. Moreover the package is RoHS compliant.

The servo-loop-parameter pos.- and neg. Hysteresis, pos.- and neg. deadband and angle-amplification are programmable with external resistors.

An internal window-comparator controls the input line. In the case of a fault condition, like short circuit to GND, short circuit to supply-voltage, and broken wire, the TLE 4206 stops the motor immediately (brake condition).

The “programmable current-peak-blanking” disables the servo-loop during the  $V_S$  voltage drop caused by the stall current spike. So there is no need of an electrolytic blocking capacitor at the  $V_S$ -terminal.

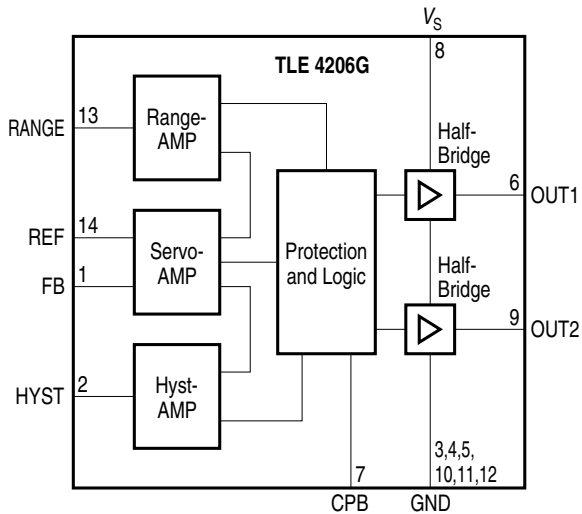
Furthermore the built in features like over- and undervoltage-lockout, short-circuit-protection and over-temperature-protection will open a wide range of automotive- and industrial applications.



**Figure 1 Pin Configuration** (top view)

### Pin Definitions and Functions

Pin No. P-DSO-14-8	Symbol	Function
1	FB	Feedback Input
2	HYST	Hysteresis I/O
3, 4, 5, 10, 11, 12	GND	Ground
6	OUT1	Power Output 1
7	CPB	Current Peak Blanking Input
8	$V_S$	Power Supply Voltage
9	OUT2	Power Output 2
13	RANGE	Range Input
14	REF	Reference Input



**Figure 2 Block Diagram**

## Absolute Maximum Ratings

Parameter	Symbol	Limit Values		Unit	Remarks
		min.	max.		

## Voltages

Supply voltage	$V_S$	- 0.3	45	V	—
Supply voltage	$V_S$	- 1	—	V	$t < 0.5 \text{ s}; I_S > - 2 \text{ A}$
Logic input voltages (FB, REF, RANGE, HYST, CPB)	$V_I$	- 0.3	20	V	—

## Currents

Output current (OUT1, OUT2)	$I_{OUT}$	—	—	A	internally limited
Output current (Diode)	$I_{OUT}$	- 1	1	A	—
Input current (FB, REF, RANGE, HYST)	$I_{IN}$	- 2 - 6	2 6	mA mA	$t < 2 \text{ ms}; t/T < 0.1$

## Temperatures

Junction temperature	$T_j$	- 40	150	°C	—
Storage temperature	$T_{stg}$	- 50	150	°C	—

## Thermal Resistances

Junction pin (PG-DSO-14-22)	$R_{thj-pin}$	—	25	K/W	measured to pin 5
Junction ambient (PG-DSO-14-22)	$R_{thjA}$	—	65	K/W	—

*Note: Maximum ratings are absolute ratings; exceeding any one of these values may cause irreversible damage to the integrated circuit.*

## Operating Range

Parameter	Symbol	Limit Values		Unit	Remarks
		min.	max.		
Supply voltage	$V_S$	8	18	V	After $V_S$ rising above $V_{UV\ ON}$
Supply voltage increasing	$V_S$	– 0.3	$V_{UV\ ON}$	V	Outputs in tristate
Supply voltage decreasing	$V_S$	– 0.3	$V_{UV\ OFF}$	V	Outputs in tristate
Output current	$I_{OUT1-2}$	– 0.8	0.8	A	–
Input current (FB, REF)	$I_{IN}$	– 50	500	$\mu A$	–
Junction temperature	$T_j$	– 40	150	$^{\circ}C$	–

## Electrical Characteristics

$8\text{ V} < V_S < 18\text{ V}$ ;  $I_{\text{OUT}1-2} = 0\text{ A}$ ;  $-40\text{ }^{\circ}\text{C} < T_j < 150\text{ }^{\circ}\text{C}$   
(unless otherwise specified)

Parameter	Symbol	Limit Values			Unit	Test Condition
		min.	typ.	max.		

## Current Consumption

Supply current	$I_S$	–	12	20	mA	–
Supply current	$I_S$	–	20	30	mA	$I_{\text{OUT}1} = 0.4\text{ A}$ $I_{\text{OUT}2} = -0.4\text{ A}$
Supply current	$I_S$	–	30	50	mA	$I_{\text{OUT}1} = 0.8\text{ A}$ $I_{\text{OUT}2} = -0.8\text{ A}$

## Over- and Under Voltage Lockout

UV Switch ON voltage	$V_{\text{UV ON}}$	–	7.4	8	V	$V_S$ increasing
UV Switch OFF voltage	$V_{\text{UV OFF}}$	6.3	6.9	–	V	$V_S$ decreasing
UV ON/OFF Hysteresis	$V_{\text{UVHY}}$	–	0.5	–	V	$V_{\text{UV ON}} - V_{\text{UV OFF}}$
OV Switch OFF voltage	$V_{\text{OV OFF}}$	–	20.5	23	V	$V_S$ increasing
OV Switch ON voltage	$V_{\text{OV ON}}$	17.5	20	–	V	$V_S$ decreasing
OV ON/OFF Hysteresis	$V_{\text{OVHY}}$	–	0.5	–	V	$V_{\text{OV OFF}} - V_{\text{OV ON}}$

### Electrical Characteristics (cont'd)

$8\text{ V} < V_S < 18\text{ V}$ ;  $I_{\text{OUT}1-2} = 0\text{ A}$ ;  $-40\text{ }^{\circ}\text{C} < T_j < 150\text{ }^{\circ}\text{C}$

(unless otherwise specified)

Parameter	Symbol	Limit Values			Unit	Test Condition
		min.	typ.	max.		

### Outputs OUT1-2

#### Saturation Voltages

Source (upper) $I_{\text{OUT}} = -0.2\text{ A}$	$V_{\text{SAT U}}$	–	0.85	1.15	V	$T_j = 25\text{ }^{\circ}\text{C}$
Source (upper) $I_{\text{OUT}} = -0.4\text{ A}$	$V_{\text{SAT U}}$	–	0.90	1.20	V	$T_j = 25\text{ }^{\circ}\text{C}$
Sink (upper) $I_{\text{OUT}} = -0.8\text{ A}$	$V_{\text{SAT U}}$	–	1.10	1.50	V	$T_j = 25\text{ }^{\circ}\text{C}$
Sink (lower) $I_{\text{OUT}} = 0.2\text{ A}$	$V_{\text{SAT L}}$	–	0.15	0.23	V	$T_j = 25\text{ }^{\circ}\text{C}$
Sink (lower) $I_{\text{OUT}} = 0.4\text{ A}$	$V_{\text{SAT L}}$	–	0.25	0.40	V	$T_j = 25\text{ }^{\circ}\text{C}$
Sink (lower) $I_{\text{OUT}} = 0.8\text{ A}$	$V_{\text{SAT L}}$	–	0.45	0.75	V	$T_j = 25\text{ }^{\circ}\text{C}$

Total drop $I_{\text{OUT}} = 0.2\text{ A}$	$V_{\text{SAT}}$	–	1.0	1.4	V	$V_{\text{SAT}} = V_{\text{SAT U}} + V_{\text{SAT L}}$
Total drop $I_{\text{OUT}} = 0.4\text{ A}$	$V_{\text{SAT}}$	–	1.2	1.7	V	$V_{\text{SAT}} = V_{\text{SAT U}} + V_{\text{SAT L}}$
Total drop $I_{\text{OUT}} = 0.8\text{ A}$	$V_{\text{SAT}}$	–	1.6	2.5	V	$V_{\text{SAT}} = V_{\text{SAT U}} + V_{\text{SAT L}}$

#### Clamp Diodes

Forward voltage; upper	$V_{\text{FU}}$	–	1	1.5	V	$I_F = 0.4\text{ A}$
Upper leakage current	$I_{\text{LKU}}$	–	–	5	mA	$I_F = 0.4\text{ A}$
Forward voltage; lower	$V_{\text{FL}}$	–	0.9	1.4	V	$I_F = 0.4\text{ A}$

## Electrical Characteristics (cont'd)

$8\text{ V} < V_S < 18\text{ V}$ ;  $I_{\text{OUT}1-2} = 0\text{ A}$ ;  $-40\text{ }^{\circ}\text{C} < T_j < 150\text{ }^{\circ}\text{C}$

(unless otherwise specified)

Parameter	Symbol	Limit Values			Unit	Test Condition
		min.	typ.	max.		

## Input-Interface

### Input REF

Quiescent voltage	$V_{\text{REF}q}$	–	200	–	mV	$I_{\text{REF}} = 0\text{ }\mu\text{A}$
Input resistance	$R_{\text{REF}}$	–	6	–	k $\Omega$	$0\text{ V} < V_{\text{REF}} < 0.5\text{ V}$

### Input FB

Quiescent voltage	$V_{\text{FB}q}$	–	200	–	mV	$I_{\text{FB}} = 0\text{ }\mu\text{A}$
Input resistance	$R_{\text{FB}}$	–	6	–	k $\Omega$	$0\text{ V} < V_{\text{FB}} < 0.5\text{ V}$

## Input/Output HYST

Current Amplification $A_{\text{HYST}} = I_{\text{HYST}} / (I_{\text{REF}} - I_{\text{FB}})$	$A_{\text{HYST}}$	0.8	0.95	1.1	–	$-20\text{ }\mu\text{A} < I_{\text{HYST}} < -10\text{ }\mu\text{A}$ ; $10\text{ }\mu\text{A} < I_{\text{HYST}} < 20\text{ }\mu\text{A}$ ; $I_{\text{REF}} = 250\text{ }\mu\text{A}$ $V_{\text{HYST}} = V_S / 2$
Current Offset	$I_{\text{HYSTIO}}$	–2	0.35	3	$\mu\text{A}$	$I_{\text{REF}} = I_{\text{FB}} = 250\text{ }\mu\text{A}$ $V_{\text{HYST}} = V_S / 2$
Threshold voltage High	$V_{\text{HYH}} / V_S$	–	52	–	%	–
Deadband voltage High	$V_{\text{DBH}} / V_S$	–	50.4	–	%	–
Deadband voltage Low	$V_{\text{DBL}} / V_S$	–	49.6	–	%	–
Threshold voltage Low	$V_{\text{HYL}} / V_S$	–	48	–	%	–
Hysteresis Window	$V_{\text{HYW}} / V_S$	3	4	5	%	$(V_{\text{HYH}} - V_{\text{HYL}}) / V_S$
Deadband Window	$V_{\text{DBW}} / V_S$	0.4	0.8	1.2	%	$(V_{\text{DBH}} - V_{\text{DBL}}) / V_S$



### Electrical Characteristics (cont'd)

$8\text{ V} < V_S < 18\text{ V}$ ;  $I_{\text{OUT}1-2} = 0\text{ A}$ ;  $-40\text{ }^{\circ}\text{C} < T_j < 150\text{ }^{\circ}\text{C}$

(unless otherwise specified)

Parameter	Symbol	Limit Values			Unit	Test Condition
		min.	typ.	max.		

### Input RANGE

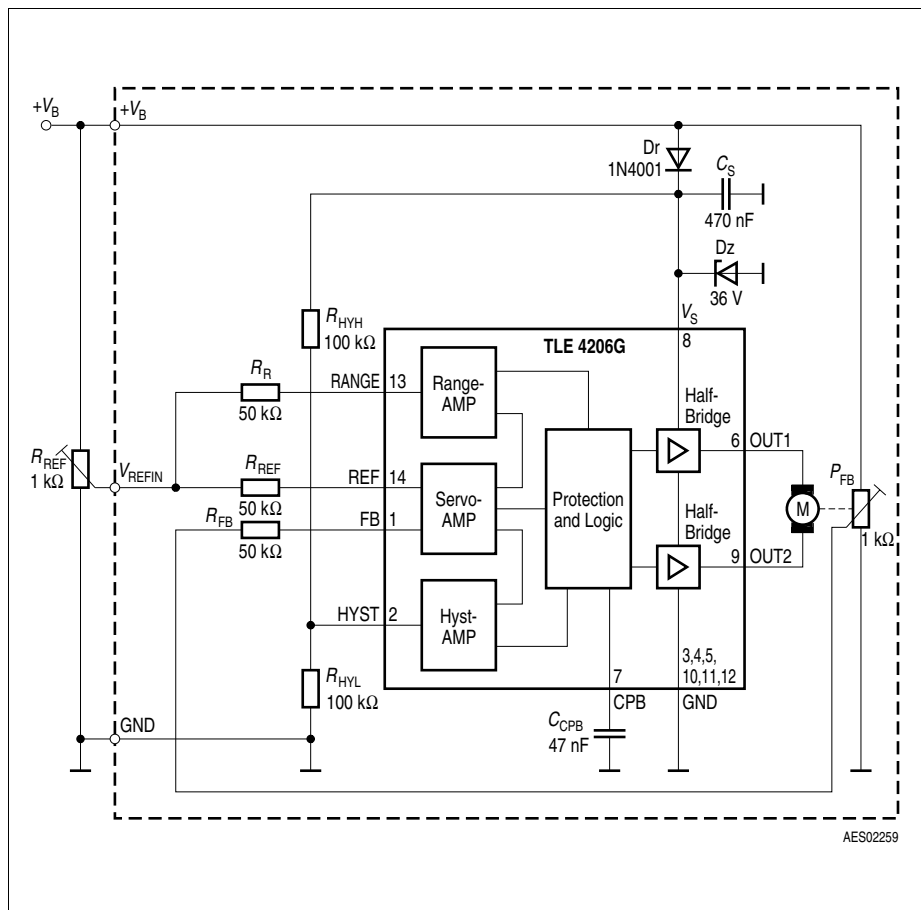
Input current	$I_{\text{RANGE}}$	- 1	-	1	$\mu\text{A}$	$0\text{ V} < V_{\text{RANGE}} < V_S$
Switch-OFF voltage High	$V_{\text{OFFH}}$	- 25	0	100	mV	refer to $V_S$
Switch-OFF voltage Low	$V_{\text{OFFL}}$	300	400	500	mV	refer to GND

### Input CPB (Current Peak Blanking)

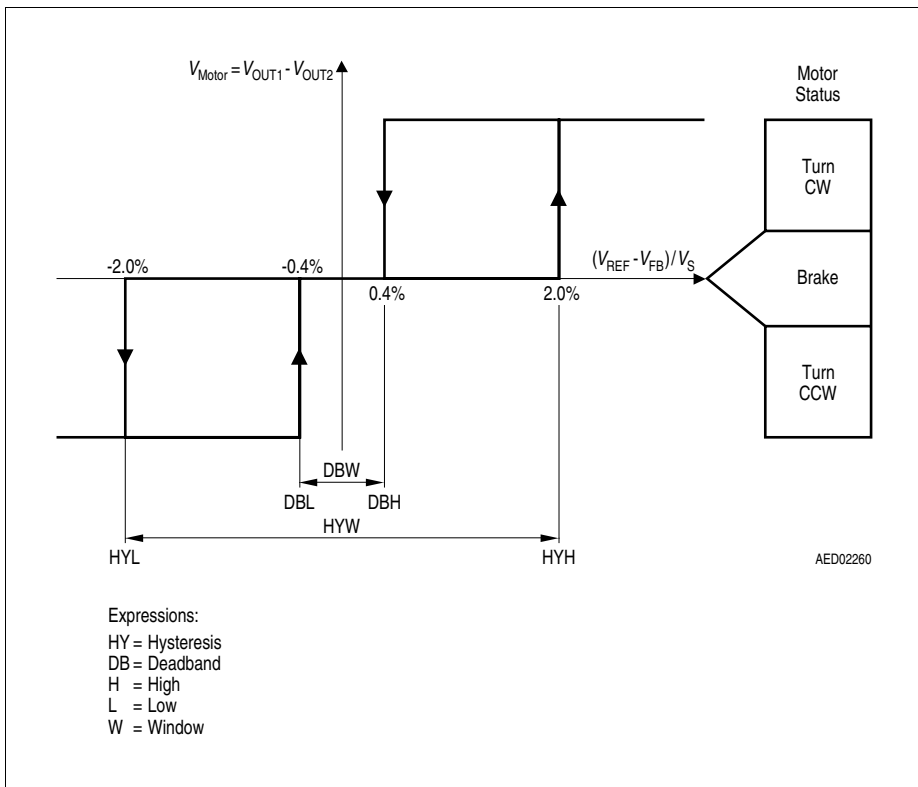
Charge current	$I_{\text{CPBCH}}$	-	6.5	-	$\mu\text{A}$	$V_{\text{HYL}} > V_{\text{HYST}}$ ; $V_{\text{CPB}} = 0\text{ V}$
Low voltage	$V_{\text{CPBL}}$	-	20	100	mV	$V_{\text{HYL}} < V_{\text{HYST}}$ $< V_{\text{HYH}}$
High voltage threshold	$V_{\text{CPBH}}$	5	5.7	6.5	V	$V_{\text{HYL}} > V_{\text{HYST}}$
Clamp voltage	$V_{\text{CPBC}}$	-	6.2	-	V	$V_{\text{HYL}} > V_{\text{HYST}}$
Blanking time	$t_{\text{CPB}}$	-	40	-	ms	$C_{\text{CPB}} = 47\text{ nF}$

### Thermal Shutdown

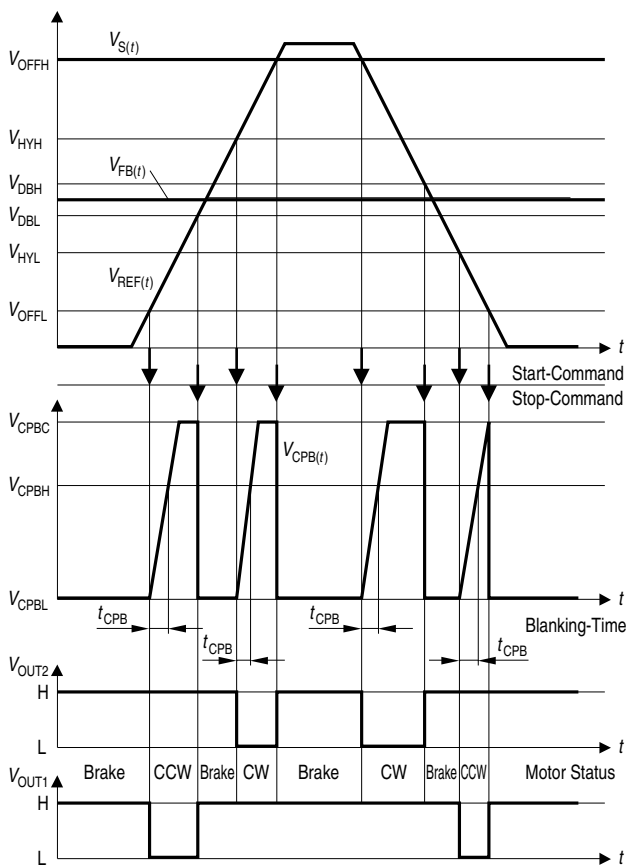
Thermal shutdown junction temperature	$T_{\text{JSD}}$	150	175	200	$^{\circ}\text{C}$	-
Thermal switch-on junction temperature	$T_{\text{JSO}}$	120	-	170	$^{\circ}\text{C}$	-
Temperature hysteresis	$\Delta T$	-	30	-	K	-



### Figure 3 Application Circuit



**Figure 4 Hysteresis, Phaselag and Deadband-Definitions**



Testconditions:  $V_S = V_B$ ; no revers polarity voltage diode  
 $R_{HYH} = R_{HYL} = 100 \text{ k}\Omega$ ;  
 $R_{REF} = R_{FB} = 50 \text{ k}\Omega$

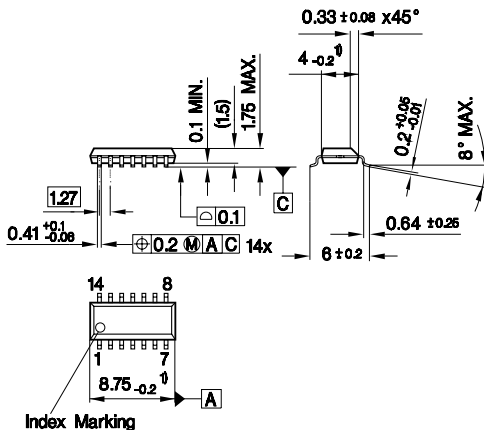
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**Figure 5 Timing and Phaselag**

## Package Outlines

### PG-DSO-14-22

(Plastic Green - Dual Small Outline Package)



1) Does not include plastic or metal protrusion of 0.15 max. per side

### Green Product (RoHS compliant)

To meet the world-wide customer requirements for environmentally friendly products and to be compliant with government regulations the device is available as a green product. Green products are RoHS-Compliant (i.e Pb-free finish on leads and suitable for Pb-free soldering according to IPC/JEDEC J-STD-020).

You can find all of our packages, sorts of packing and others in our Infineon Internet Page "Products": <http://www.infineon.com/products>.

SMD = Surface Mounted Device

Dimensions in mm

## Revision History

Version	Date	Changes
Rev. 1.1	2007-08-10	<p>RoHS-compliant version of the TLE 4206</p> <ul style="list-style-type: none"> <li>• All pages: Infineon logo updated</li> <li>• Page 1: <ul style="list-style-type: none"> <li>“AEC qualified” and “RoHS” logo added, “Green Product (RoHS compliant)” and “AEC qualified” statement added to feature list, package names changed to RoHS compliant versions, package pictures updated, ordering codes removed</li> </ul> </li> <li>• Page 13: <ul style="list-style-type: none"> <li>Package names changed to RoHS compliant versions, “Green Product” description added</li> </ul> </li> </ul>
Rev. 1.2	2008-02-04	<ul style="list-style-type: none"> <li>• Revision History added</li> <li>• Legal Disclaimer added</li> <li>• Page1: Update Package Picture</li> <li>• Editorial change: deleted "fully" (The term "fully protected" often leads to misunderstandings as it is unclear with respect to which parameters).</li> </ul>

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