



Intrinsicly Safe Power Protection Module

1 Features

- Limits the voltage and/or current to a specified value (intrinsicly safe barrier)
- 0.8 to 3.3 A over-current protection (OCP) limit*
- 4.8 to 16 V operating voltage range
- 4.3 to 4.8 V under-voltage lockout (UVLO)
- Optional over-voltage (crowbar) protection*
- 5.7 to 12.6 V tripping voltage*
- Less than 20 µJ output transient energy before activation
- Low self-resistance in normal operation (max. 1Ω)
- Low self-capacitance (max. 10.31µF)
- Auto-retry function
- Reverse mode: power source connected to output (reverse current is not limited)
- Switch function: output can be turned off (DISABLE pin)
- No voltage increasing circuitry inside the module
- IEC and ATEX certified component: Zone 1 and Zone 2, Zone 21 and Zone 22
- Package dimensions (W x L x H): 20 mm x 28 mm x 5 mm
- RoHS Compliant, Pb free

*Depends on the selected part number

2 Certifications

2.1 IECEx Certification

(IEC 60079-0, 60079-11)

IECEx BKI 20.0003U

- Ex ib IIC Gb
- Ex ib IIIC Db

2.2 ATEX Certification

(ATEX Directive 2014/34/EU)

BKI20ATEX0014U

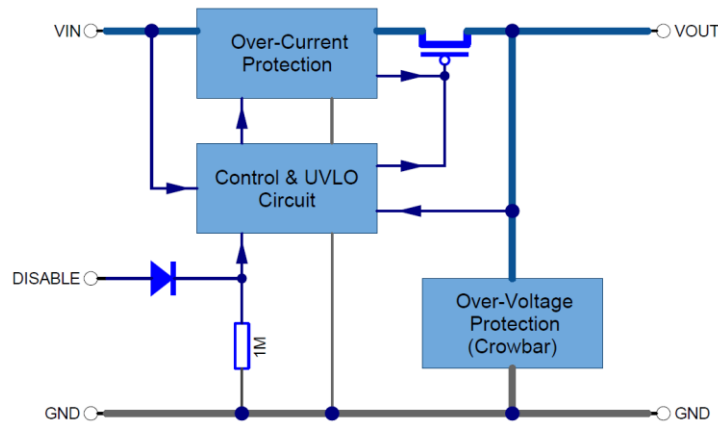
- II 2G Ex ib IIC Gb
- II 2D Ex ib IIIC Db

3 Part Numbers:

A.PPEX X - XX - X A X [- XX V X]

- X – Generation (0-9 A-Z)
- XX – Revision (00-99)
- X A X – Current limit value (0A7 / 1A0 / 1A2 / 1A5 / 1A8 / 2A0 / 2A4 / 2A7 / 3A0 / 3A3)
- XX V X – Tripping voltage [optional] (05V7 / 06V2 / 06V8 / 07V4 / 08V1 / 08V8 / 09V7 / 10V6 / 11V6 / 12V6)

4 Block Diagram



5 Electrical Characteristics

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|--|-----------------|------------------------|------|------|-------|------|
| Operating temperature range | T_A | | -40 | - | +105 | °C |
| Abs. maximum input voltage range | V_{IN_MAX} | | -0.6 | - | 25 | V |
| Operating input voltage range ¹ | V_{IN} | | 4.8 | - | 16 | V |
| UVLO ON (V_{OUT} is switched OFF) | V_{UVLO_ON} | | - | 4.3 | - | V |
| UVLO OFF (V_{OUT} is switched ON) | V_{UVLO_OFF} | | - | 4.8 | - | V |
| UVLO OFF, reverse mode | V_{UVLO_OFR} | | - | 5 | - | V |
| Nominal current limit value ² | I_L | | 0.8 | - | 3 | A |
| Nominal tripping voltage ² | V_T | | 5.7 | - | 12.6 | V |
| Series resistance in normal operation ² | R_S | | 0.4 | - | 1 | Ω |
| Maximum voltage range on DISABLE | V_{DIS_MAX} | | -0.6 | - | 25 | V |
| DISABLE input threshold voltage (when HIGH, V_{OUT} is switched OFF) | V_{DIS} | | 1.5 | - | 2.5 | V |
| Maximum output transient energy ³ | W_{TR} | $V_{IN} = 16\text{ V}$ | - | - | 20 | μJ |
| Transient duration | t_{TR} | | - | 100 | - | ns |
| Constant current duration | t_{CC} | | 3 | - | 5 | ms |
| Auto-retry interval | t_{RETRY} | | 350 | - | 500 | ms |
| Total internal capacitance | C_{TOT} | | - | - | 10.31 | μF |

All values are defined on 25 °C ambient temperature unless other conditions are specified.

¹ Less than 20 μJ output transient energy is not guaranteed, if input voltage exceeds 16V.

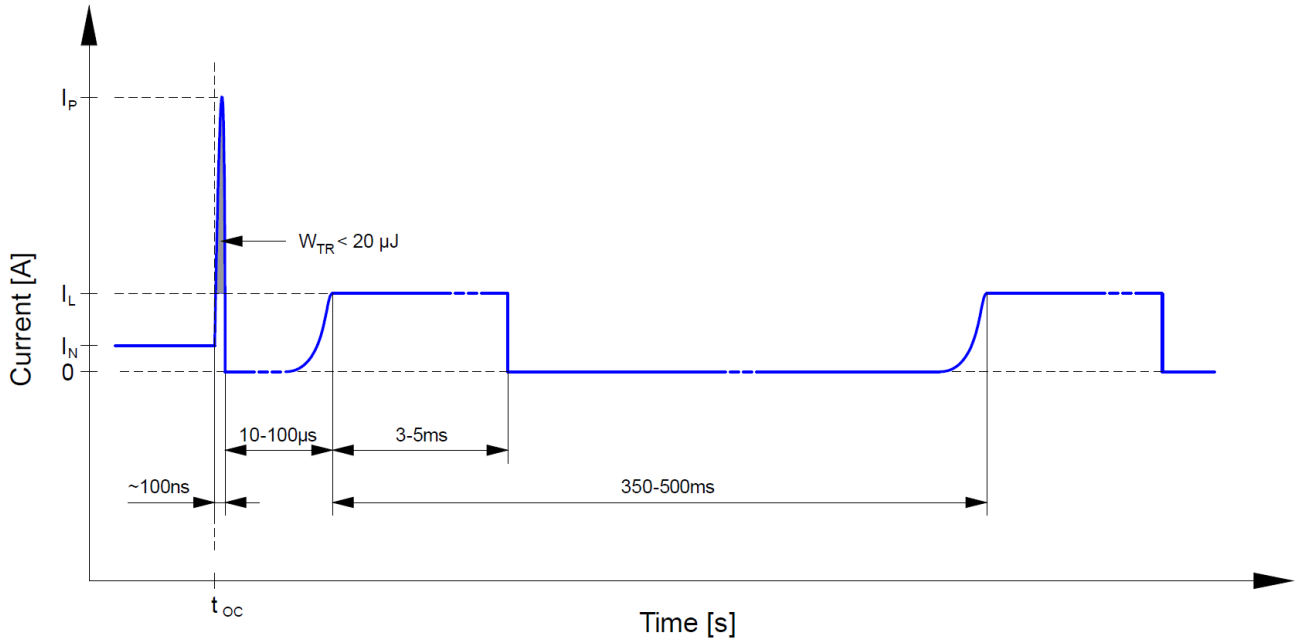
² Value depends on part number.

³ Assessed according to IEC 60079-11 Annex E. At input voltages lower than 16V, the maximum transient energy is lower.

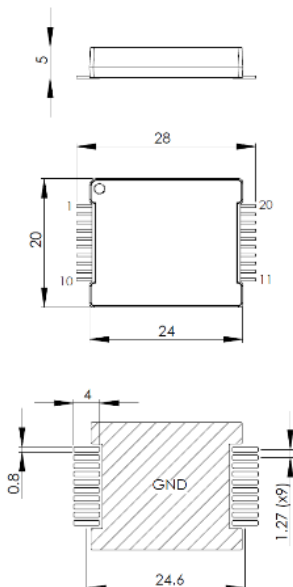
Maximum Power Dissipation

| Variant Tag | 3A3 | 3A0 | 2A7 | 2A4 | 2A0 | 1A8 | 1A5 | 1A2 | 1A0 | 0A7 |
|-------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Total resistance [mΩ] | 255 | 272 | 292 | 322 | 372 | 402 | 472 | 572 | 672 | 892 |
| Maximum Power Dissipation [W] | 2.7 | 2.4 | 2.2 | 1.9 | 1.5 | 1.3 | 1.1 | 0.8 | 0.7 | 0.5 |

6 Current Limit Timing Diagram



7 Mechanical Dimensions, Footprint:



8 Pinout:

| | | | |
|----|---------|------|----|
| 3 | VIN | VOUT | 18 |
| 4 | VIN | VOUT | 17 |
| 5 | VIN | VOUT | 16 |
| 6 | VIN | VOUT | 15 |
| 7 | VIN | VOUT | 14 |
| 10 | DISABLE | | |
| | | GND | 20 |
| 1 | GND | GND | 19 |
| 2 | GND | GND | 13 |
| 8 | GND | GND | 12 |
| 9 | GND | GND | 11 |

9 Intrinsic Safety:

9.1 Schedule of Limitations

- PCB outermost layer under the component must be GND (see [Footprint](#))
- This module must be encapsulated according to IEC 60079-11
- In the application of this module, keep required separation distances to the module according to IEC 60079-11
- Enclosure of the equipment in which the module is to be used must be at least IP2x
- It is not allowed to attempt to repair or disassemble the module
- The input voltage must not exceed 16V for the output to be intrinsicly safe
- This module is ensuring a limited current on its output, and in specific variants it will also limit the voltage on its output. However, for application of the module, further consideration is required to ensure that the combination of voltages, currents and components (e.g. capacitors, inductors) that are to be connected to the output of the module, will maintain the safety of the equipment (e.g. via Annex A of IEC 60079-11 or spark assessment).

9.2 Markings:

ADOTT Solutions

A.PPEX X - X X - X A X - X X V X

IECEX: BKI 20.0003U

Ex ib IIC Gb

Ex ib IIIC Db

ATEX: BKI20ATEX0014U

⊕ II 2G **Ex ib IIC Gb**

⊕ II 2D **Ex ib IIIC Db**

Top side



Bottom side



9.3 Intrinsicly Safe Outputs According to Table A.1 of IEC 60079-11:2012

| | 0A7 | 1A0 | 1A2 | 1A5 | 1A8 | 2A0 | 2A4 | 2A7 | 3A0 | 3A3 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 05V7 | • | • | • | • | • | • | • | • | • | • |
| 06V2 | • | • | • | • | • | • | • | • | • | • |
| 06V8 | • | • | • | • | • | • | • | • | • | • |
| 07V4 | • | • | • | • | • | • | • | • | • | • |
| 08V1 | • | • | • | • | • | • | • | • | • | • |
| 08V8 | • | • | • | • | • | • | • | • | • | • |
| 09V7 | • | • | • | • | • | • | • | • | • | • |
| 10V6 | • | • | • | • | • | • | • | • | • | • |
| 11V6 | • | • | • | • | • | • | • | • | • | • |
| 12V6 | • | • | • | • | • | • | • | - | - | - |