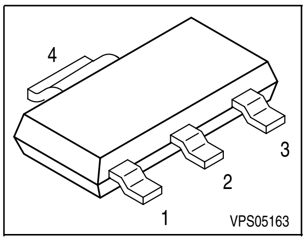
Features

- Logic Level Input
- Input Protection (ESD)
- Thermal shutdown
- Green product (RoHS compliant)
- Overload protection
- Short circuit protection
- Overvoltage protection
- Current limitation
- Analog driving possible

Product Summary

Drain source voltage	V_{DS}	42	V
On-state resistance	$R_{DS(on)}$	200	mΩ
Nominal load current	$I_{D(Nom)}$	1.4	A
Clamping energy	E_{AS}	150	mJ

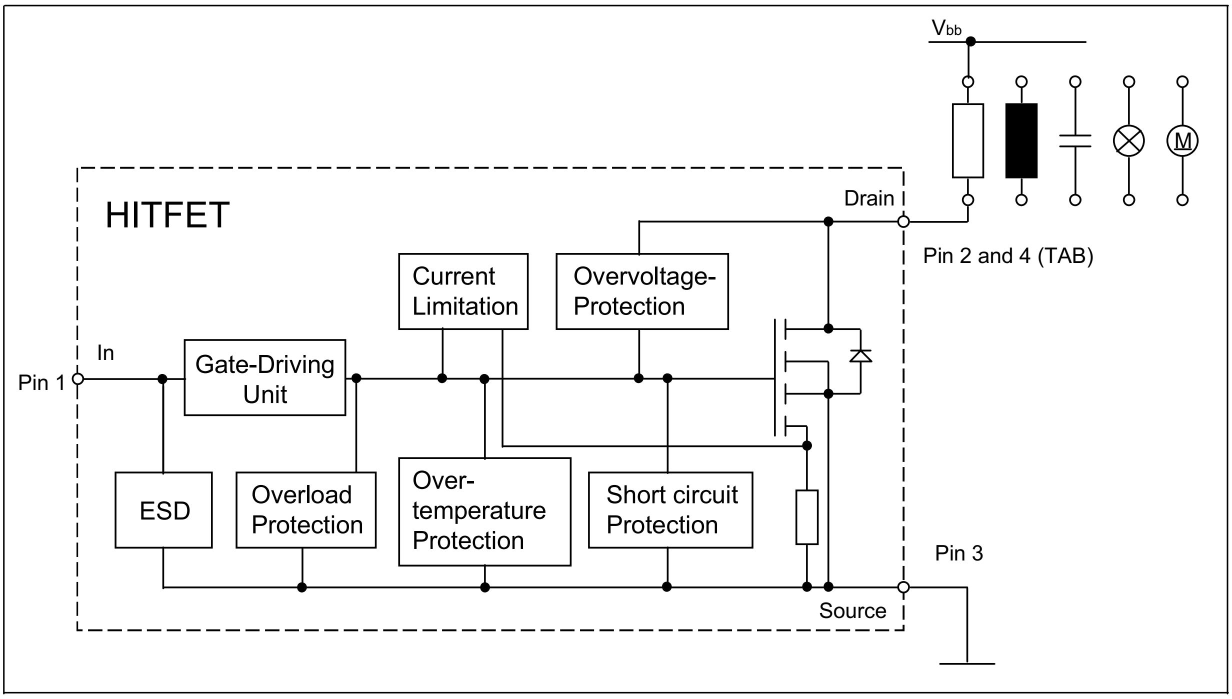


Application

- All kinds of resistive, inductive and capacitive loads in switching or linear applications
- µC compatible power switch for 12 V DC applications
- Replaces electromechanical relays and discrete circuits

General Description

N channel vertical power FET in Smart SIPMOS® technology. Fully protected by embedded protection functions.



Maximum Ratings at T_j = 25°C, unless otherwise specified

Parameter	Symbol	Value	Unit
Drain source voltage	V_{DS}	42	V
Drain source voltage for short circuit protection T_j = -40...150°C	$V_{DS(SC)}$	18	
Continuous input current -0.2V ≤ V_{IN} ≤ 10V V_{IN} < -0.2V or V_{IN} > 10V	I_{IN}	 no limit | I_{IN} | ≤ 2	mA
Operating temperature	T_j	-40 ...+150	°C
Storage temperature	T_{stg}	-55 ... +150	
Power dissipation T_C = 85 °C	P_{tot}	3.8	W
Unclamped single pulse inductive energy [1)]	E_{AS}	150	mJ
Load dump protection $V_{LoadDump}$[2)] = V_A + V_S V_{IN} = 0 and 10 V, t_d = 400 ms, R_I = 2 Ω, R_L = 9 Ω, V_A = 13.5 V	V_{LD}	50	V
Electro**s**tatic **d**ischarge voltage (Human Body Model) according to MIL STD 883D, method 3015.7 and EOS/ESD assn. standard S5.1 - 1993	V_{ESD}	2	kV

Thermal resistance

junction - ambient: @ min. footprint @ 6 cm^2 cooling area [3)]	R_{thJA}	 125 72	K/W
junction-soldering point:	R_{thJS}	17	K/W

[1] Not tested, specified by design.

[2] $V_{Loaddump}$ is setup without the DUT connected to the generator per ISO 7637-1 and DIN 40839

[3] Device on 50mm*50mm*1.5mm epoxy PCB FR4 with 6cm^2 (one layer, 70µm thick) copper area for drain connection. PCB mounted vertical without blown air.

Electrical Characteristics

Parameter at T_j = 25°C, unless otherwise specified	Symbol	Values			Unit
		min.	typ.	max.	
Characteristics					
Drain source clamp voltage T_j = - 40 ...+ 150, I_D = 10 mA	$V_{DS(AZ)}$	42	-	55	V
Off-state drain current T_j = -40 ... +150°C V_{DS} = 32 V, V_{IN} = 0 V	I_{DSS}	-	1.5	10	µA
Input threshold voltage I_D = 0.3 mA, T_j = 25 °C I_D = 0.3 mA, T_j = 150 °C	$V_{IN(th)}$	 1.3 0.8	 1.7 -	 2.2 -	V
On state input current	$I_{IN(on)}$	-	10	30	µA
On-state resistance V_{IN} = 5 V, I_D = 1.4 A, T_j = 25 °C V_{IN} = 5 V, I_D = 1.4 A, T_j = 150 °C	$R_{DS(on)}$	 - -	 190 350	 240 480	mΩ
On-state resistance V_{IN} = 10 V, I_D = 1.4 A, T_j = 25 °C V_{IN} = 10 V, I_D = 1.4 A, T_j = 150 °C	$R_{DS(on)}$	 - -	 150 280	 200 400	
Nominal load current V_{DS} = 0.5 V, T_j < 150°C, V_{IN} = 10 V, T_A = 85 °C	$I_{D(Nom)}$	 1.4	 -	 -	A
Current limit (active if V_{DS}>2.5 V)[1)] V_{IN} = 10 V, V_{DS} = 12 V, t_m = 200 µs	$I_{D(lim)}$	5	7.5	10	

[1]Device switched on into existing short circuit (see diagram Determination of $I_{D(lim)}$). If the device is in on condit
and a short circuit occurs, these values might be exceeded for max. 50 µs.

Electrical Characteristics

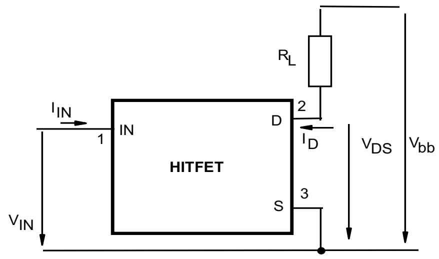
Parameter at T_j = 25°C, unless otherwise specified	**Symbol**	**Values**			**Unit**
		min.	**typ.**	**max.**	
Dynamic Characteristics					
Turn-on time V_{IN} to 90% I_D: R_L = 4.7 Ω, V_{IN} = 0 to 10 V, V_{bb} = 12 V	t_{on}	-	45	100	µs
Turn-off time V_{IN} to 10% I_D: R_L = 4.7 Ω, V_{IN} = 10 to 0 V, V_{bb} = 12 V	t_{off}	-	60	100	
Slew rate on 70 to 50% V_{bb}: R_L = 4.7 Ω, V_{IN} = 0 to 10 V, V_{bb} = 12 V	$-dV_{DS}/dt_{on}$	-	0.4	1.5	V/µs
Slew rate off 50 to 70% V_{bb}: R_L = 4.7 Ω, V_{IN} = 10 to 0 V, V_{bb} = 12 V	dV_{DS}/dt_{off}	-	0.6	1.5	
Protection Functions[1)]					
Thermal overload trip temperature	T_{jt}	150	175	-	°C
Input current protection mode	$I_{IN(Prot)}$	25	50	300	µA
Input current protection mode T_j = 150 °C	$I_{IN(Prot)}$	-	40	300	
Unclamped single pulse inductive energy [2)] I_D = 1.4 A, T_j = 25 °C, V_{bb} = 12 V	E_{AS}	150	-	-	mJ
Inverse Diode					
Inverse diode forward voltage I_F = 7 A, t_m = 250 µs, V_{IN} = 0 V, t_P = 300 µs	V_{SD}	-	1	-	V

[1] Integrated protection functions are designed to prevent IC destruction under fault conditions described in the data sheet. Fault conditions are considered as "outside" normal operating range. Protection functions are not designed for continuous repetitive operation.

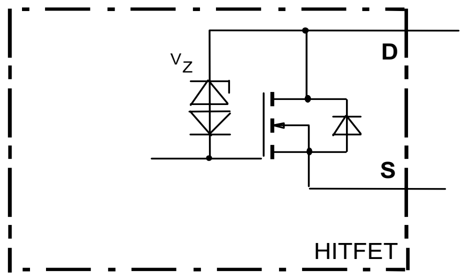
[2] Not tested, specified by design.

Block diagram

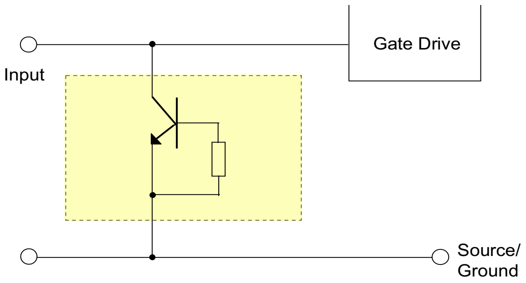
Terms



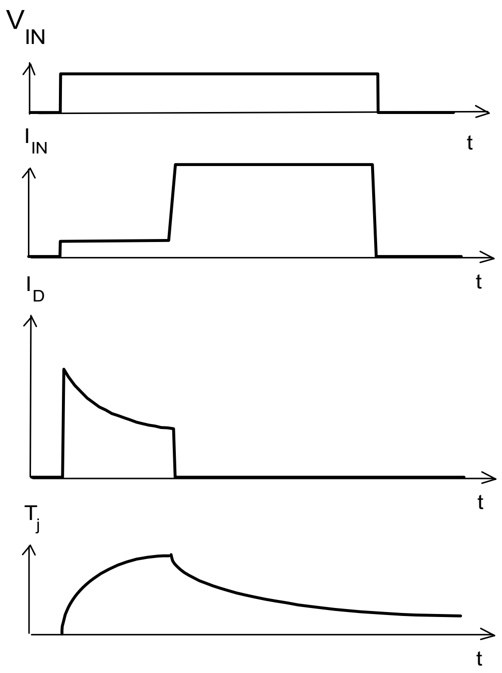
Inductive and overvoltage output clamp



Input circuit (ESD protection)



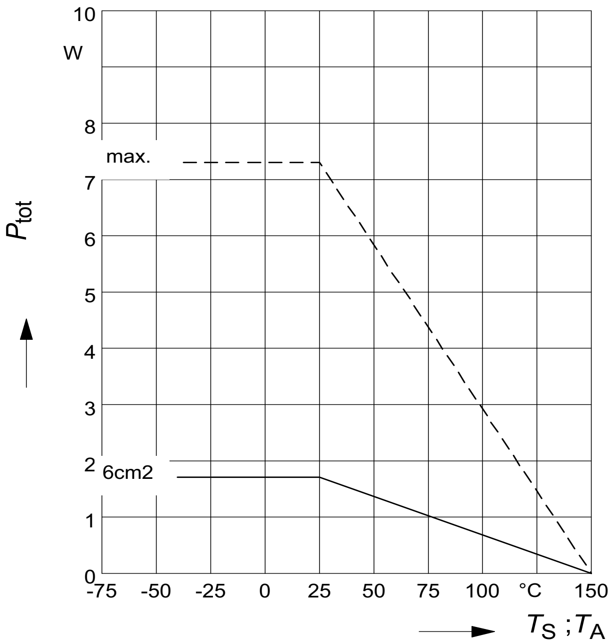
Short circuit behaviour



1 Maximum allowable power dissipation

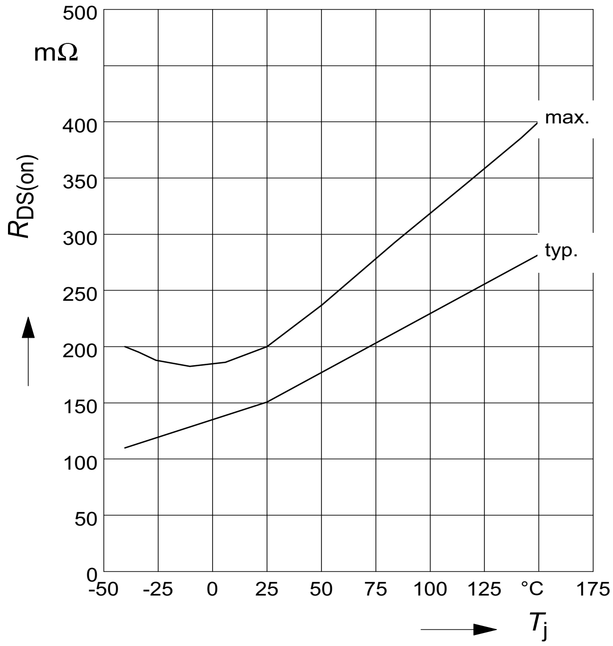
P_{tot} = f(T_S) resp.

P_{tot} = f(T_A) @ R_{thJA}=72 K/W



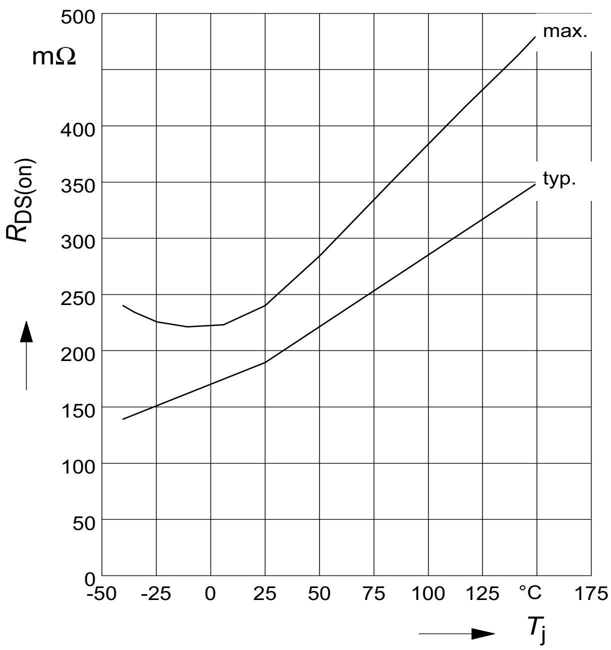
2 On-state resistance

R_{ON} = f(T_j); I_D=1.4A; V_{IN}=10V



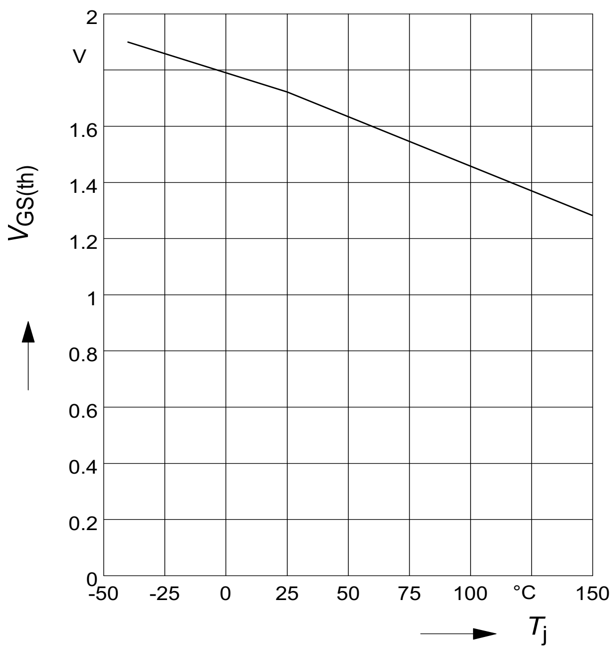
3 On-state resistance

R_{ON} = f(T_j); I_D= 1.4A; V_{IN}=5V



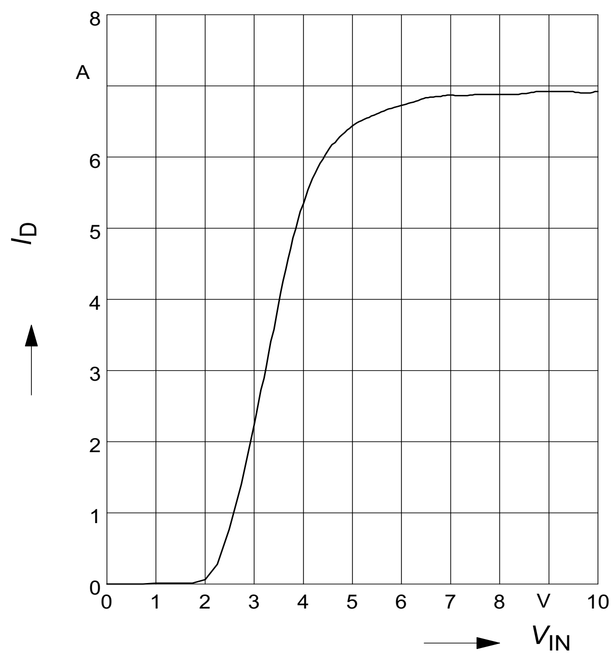
4 Typ. input threshold voltage

$V_{IN(th)}$ = f(T_j); I_D = 0.15 mA; V_{DS} = 12V



5 Typ. transfer characteristics

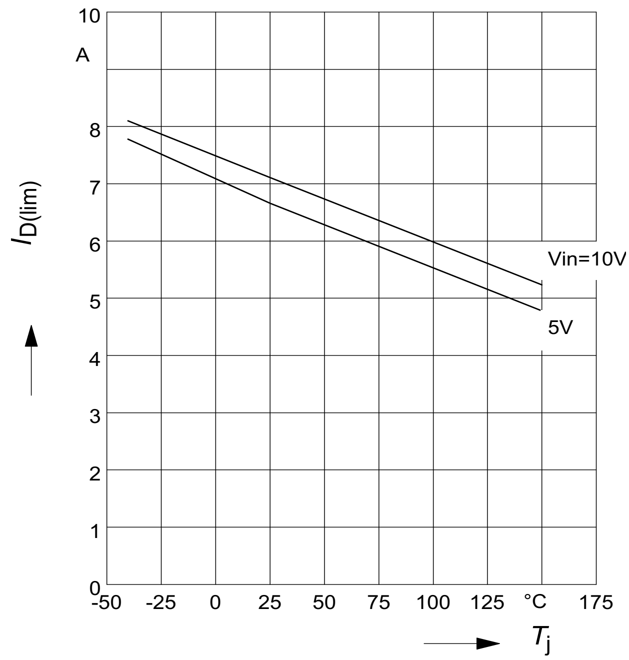
$I_D=f(V_{IN})$; V_{DS}=12V; T_{Jstart}=25°C



6 Typ. short circuit current

$I_{D(lim)}$ = f(Tj); V_{DS}=12V

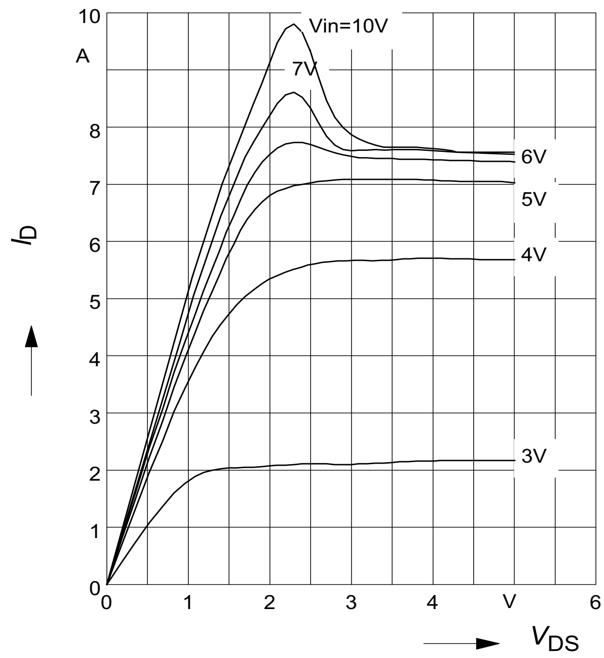
Parameter: V_{IN}



7 Typ. output characteristics

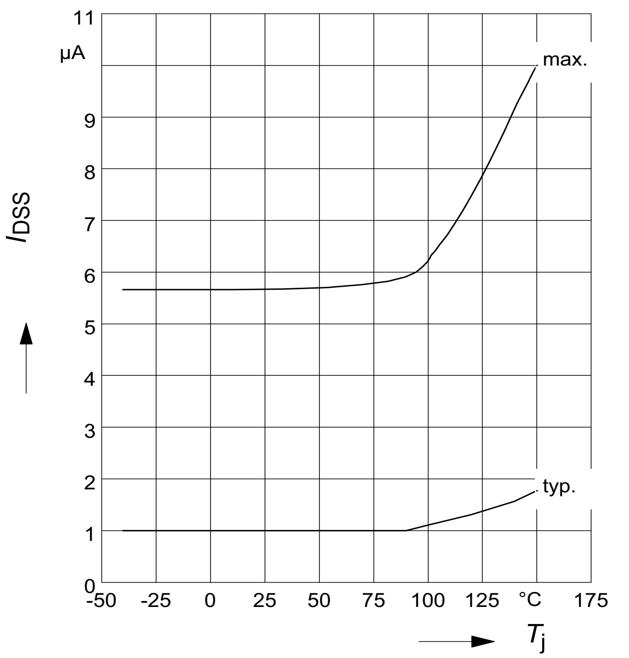
$I_D=f(V_{DS})$; T_{Jstart}=25°C

Parameter: V_{IN}



8 Typ. off-state drain current

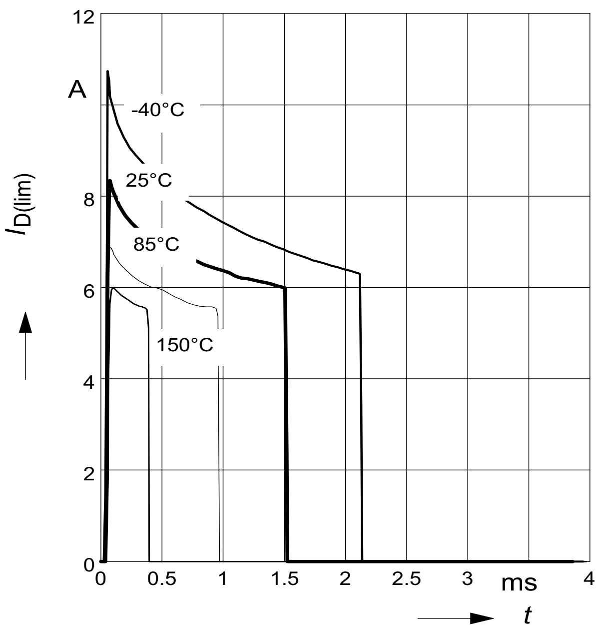
I_{DSS} = f(T_j)



9 Typ. overload current

$I_{D(lim)}$ = f(t), V_{bb}=12 V, no heatsink

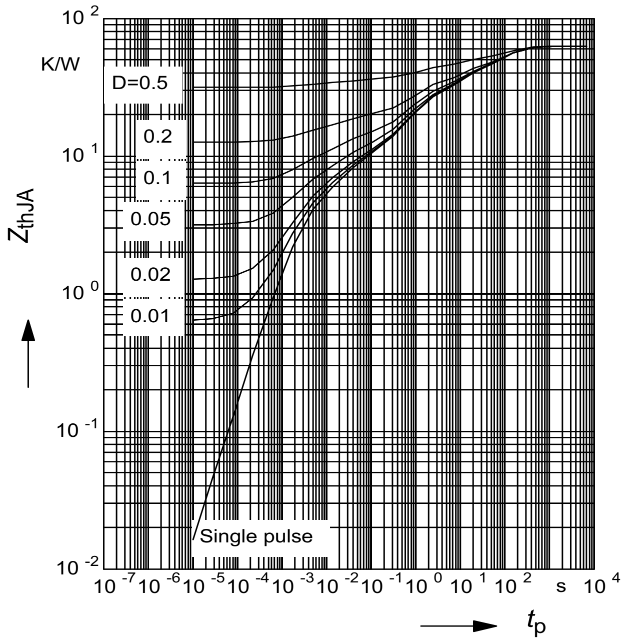
Parameter: T_{jstart}



10 Typ. transient thermal impedance

Z_{thJA}=f(t_p) @ 6 cm² cooling area

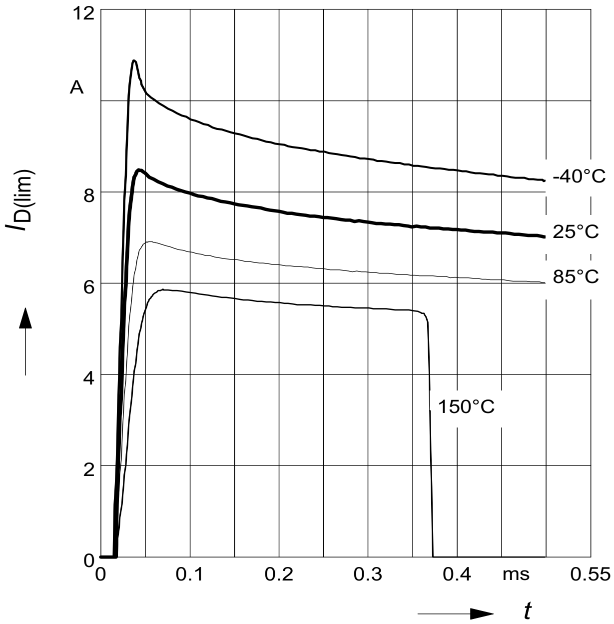
Parameter: $D=t_p/T$



11 Determination of $I_{D(lim)}$

$I_{D(lim)}$ = f(t); t_m = 200µs

Parameter: T_{Jstart}



1 Package Outlines

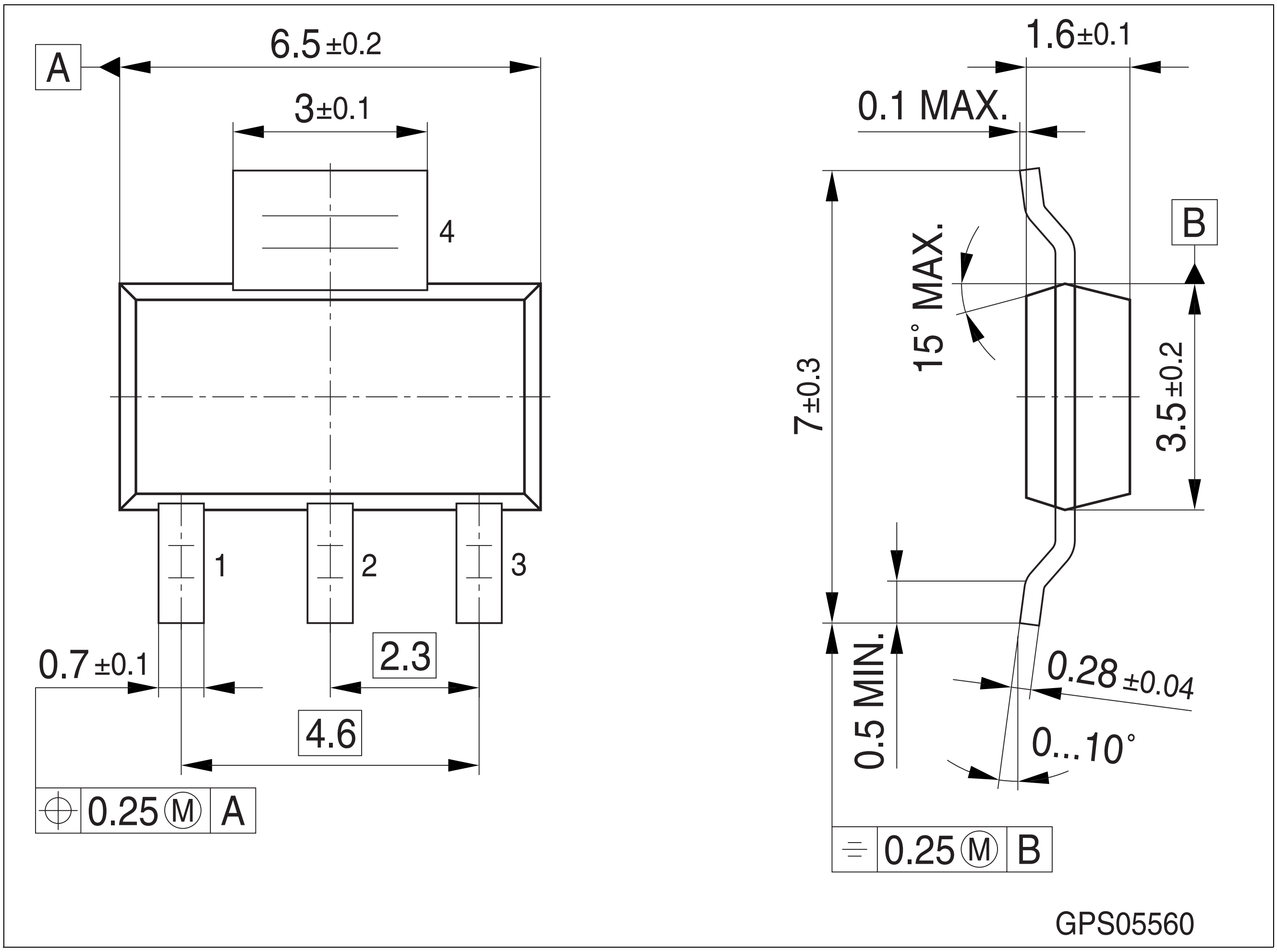


Figure 1 **PG-SOT223-4** (Plastic Green Small Outline Transistor Package)

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).

Please specify the package needed (e.g. green package) when placing an order

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

Dimensions in mm

2 Revision History

Version	Date	Changes
Rev. 1.3	2008-04-14	Package information updated to SOT223-4
Rev. 1.2	2007-03-28	released automotive green version Package parameter (humidity and climatic) removed in Maximum ratings AEC icon added RoHS icon added Green product (RoHS-compliant) added to the feature list Package information updated to green Green explanation added
Rev. 1.1	2004-02-02	released production version

Edition 2008-04-14

Published by
Infineon Technologies AG
81726 Munich, Germany

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