

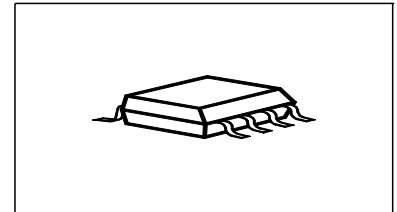


### Features

- Logic Level Input
- Input Protection (ESD)
- Thermal shutdown with auto restart
- 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	m $\Omega$
Nominal load current	$I_{D(Nom)}$	1.3	A
Clamping energy	$E_{AS}$	150	mJ

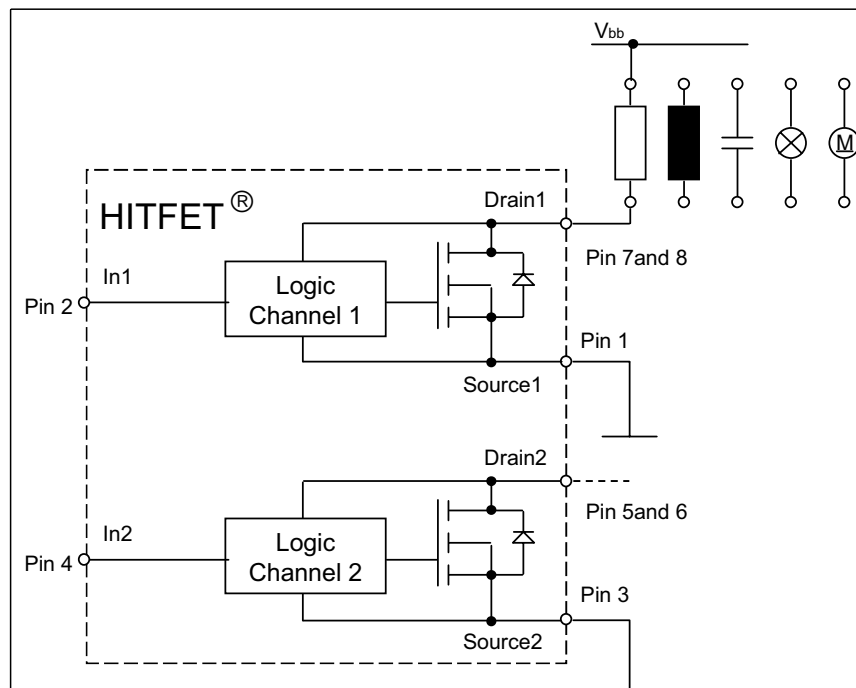


### Application

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

### General Description

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

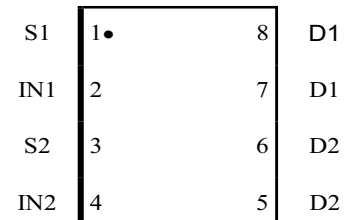


Complete product spectrum and additional information <http://www.infineon.com/hitfet>

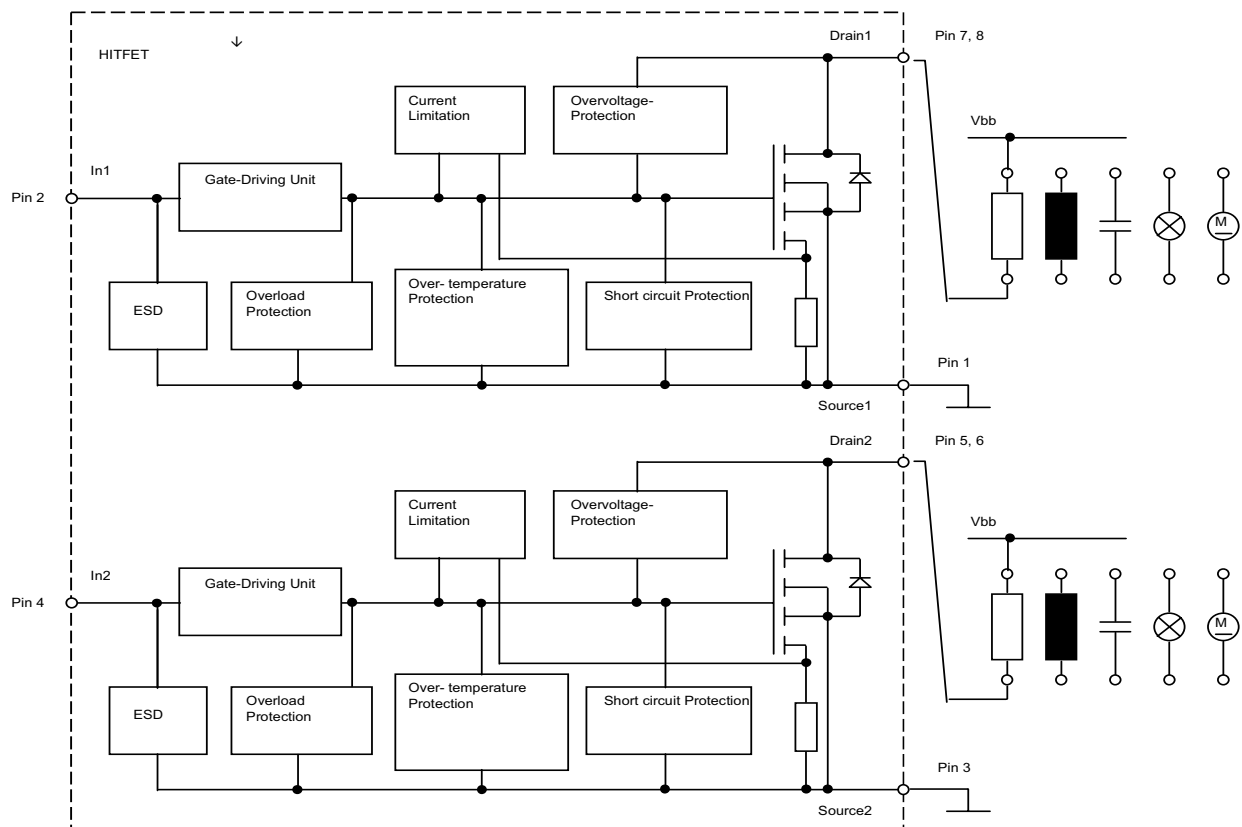
Pin Description

Pin	Symbol	Function
1	S1	Source Channel 1
2	IN1	Input Channel 1
3	S2	Source Channel 2
4	IN2	Input Channel 2
5	D2	Drain Channel 2
6	D2	Drain Channel 2
7	D1	Drain Channel 1
8	D1	Drain Channel 1

Pin Configuration (Top view)



PG-DSO-8-25



**Maximum Ratings at  $T_j = 25^\circ\text{C}$ , unless otherwise specified**

Parameter	Symbol	Value	Unit
Drain source voltage	$V_{DS}$	42	V
Drain source voltage for short circuit protection <sup>1)</sup> $T_j = -40\dots150^\circ\text{C}$	$V_{DS(SC)}$	18	
Continuous input current <sup>1)</sup> $-0.2\text{V} \leq V_{IN} \leq 10\text{V}$ $V_{IN} < -0.2\text{V}$ or $V_{IN} > 10\text{V}$	$I_{IN}$	no limit $ I_{IN}  \leq 2$	mA
Operating temperature	$T_j$	-40 ... +150	$^\circ\text{C}$
Storage temperature	$T_{stg}$	-55 ... +150	
Power dissipation <sup>2)5)</sup> $T_A = 85^\circ\text{C}$	$P_{tot}$	0.8	W
Unclamped single pulse inductive energy <sup>1)</sup> each channel	$E_{AS}$	150	mJ
Load dump protection $V_{LoadDump}^{1)3)} = V_A + V_S$ $V_{IN} = 0$ and $10\text{V}$ , $t_d = 400\text{ms}$ , $R_I = 2\ \Omega$ , $R_L = 9\ \Omega$ , $V_A = 13.5\text{V}$	$V_{LD}$	50	V
<b>Electrostatic discharge voltage<sup>1)</sup></b> (Human Body Model) according to Jedec norm EIA/JESD22-A114-B, Section 4	$V_{ESD}$	2	kV

**Thermal resistance**

junction - ambient: per channel @ $6\text{cm}^2$ cooling area <sup>2)</sup>	$R_{thJA}$		K/W
one channel on		100	
both channels on		160	

<sup>1)</sup>not subject to production test, specified by design

<sup>2)</sup> Device on  $50\text{mm} \times 50\text{mm} \times 1.5\text{mm}$  epoxy PCB FR4 with  $6\text{cm}^2$  (one layer,  $70\mu\text{m}$  thick) copper area for drain connection. PCB mounted vertical without blown air.

<sup>3)</sup> $V_{Loaddump}$  is setup without the DUT connected to the generator per ISO 7637-1 and DIN 40839

<sup>5)</sup> not subject to production test, calculated by  $R_{THJA}$  and  $R_{ds(on)}$

**Electrical Characteristics**

Parameter at $T_j = 25^\circ\text{C}$ , unless otherwise specified	Symbol	Values			Unit
		min.	typ.	max.	
<b>Characteristics</b>					
Drain source clamp voltage $T_j = -40 \dots +150$ , $I_D = 10 \text{ mA}$	$V_{DS(AZ)}$	42	-	55	V
Off-state drain current $T_j = -40 \dots +150^\circ\text{C}$ $V_{DS} = 32 \text{ V}$ , $V_{IN} = 0 \text{ V}$	$I_{DSS}$	-	1.5	10	$\mu\text{A}$
Input threshold voltage $I_D = 0.3 \text{ mA}$ , $T_j = 25^\circ\text{C}$ $I_D = 0.3 \text{ mA}$ , $T_j = 150^\circ\text{C}$	$V_{IN(th)}$	1.3 0.8	1.7 -	2.2 -	V
On state input current	$I_{IN(on)}$	-	10	30	$\mu\text{A}$
On-state resistance $V_{IN} = 5 \text{ V}$ , $I_D = 1.4 \text{ A}$ , $T_j = 25^\circ\text{C}$ $V_{IN} = 5 \text{ V}$ , $I_D = 1.4 \text{ A}$ , $T_j = 150^\circ\text{C}$	$R_{DS(on)}$	- -	190 350	240 480	$\text{m}\Omega$
On-state resistance $V_{IN} = 10 \text{ V}$ , $I_D = 1.4 \text{ A}$ , $T_j = 25^\circ\text{C}$ $V_{IN} = 10 \text{ V}$ , $I_D = 1.4 \text{ A}$ , $T_j = 150^\circ\text{C}$	$R_{DS(on)}$	- -	150 280	200 400	$\text{m}\Omega$
Nominal load current per channel <sup>5)</sup> $V_{DS} = 0.5 \text{ V}$ , $T_j < 150^\circ\text{C}$ , $V_{IN} = 10 \text{ V}$ , $T_A = 85^\circ\text{C}$ , one channel on both channels on	$I_{D(Nom)}$	1.3 1	1.65 1.3	- -	A
Current limit (active if $V_{DS} > 2.5 \text{ V}$ ) <sup>2)</sup> $V_{IN} = 10 \text{ V}$ , $V_{DS} = 12 \text{ V}$ , $t_m = 200 \mu\text{s}$	$I_{D(lim)}$	5	7.5	10	

<sup>1)</sup>not subject to production test, specified by design

<sup>2)</sup>Device switched on into existing short circuit (see diagram Determination of  $I_{D(lim)}$ ). If the device is in on conc and a short circuit occurs, these values might be exceeded for max. 50  $\mu\text{s}$ .

<sup>5)</sup> not subject to production test, calculated by  $R_{THJA}$  and  $R_{ds(on)}$

**Electrical Characteristics**

Parameter at $T_j = 25^\circ\text{C}$ , unless otherwise specified	Symbol	Values			Unit
		min.	typ.	max.	

**Dynamic Characteristics**

Turn-on time $V_{IN}$ to 90% $I_D$ : $R_L = 4.7 \Omega$ , $V_{IN} = 0$ to 10 V, $V_{bb} = 12$ V	$t_{on}$	-	45	100	$\mu\text{s}$
Turn-off time $V_{IN}$ to 10% $I_D$ : $R_L = 4.7 \Omega$ , $V_{IN} = 10$ to 0 V, $V_{bb} = 12$ V	$t_{off}$	-	60	100	$\mu\text{s}$
Slew rate on 70 to 50% $V_{bb}$ : $R_L = 4.7 \Omega$ , $V_{IN} = 0$ to 10 V, $V_{bb} = 12$ V	$-dV_{DS}/dt_{on}$	-	0.4	1.5	V/ $\mu\text{s}$
Slew rate off 50 to 70% $V_{bb}$ : $R_L = 4.7 \Omega$ , $V_{IN} = 10$ to 0 V, $V_{bb} = 12$ V	$dV_{DS}/dt_{off}$	-	0.6	1.5	V/ $\mu\text{s}$

**Protection Functions<sup>1)</sup>**

Thermal overload trip temperature	$T_{jt}$	150	175	-	$^\circ\text{C}$
Thermal hysteresis <sup>2)</sup>	$\Delta T_{jt}$	-	10	-	K
Input current protection mode	$I_{IN(Prot)}$	25	50	300	$\mu\text{A}$
Input current protection mode $T_j = 150^\circ\text{C}$	$I_{IN(Prot)}$	-	40	300	$\mu\text{A}$
Unclamped single pulse inductive energy <sup>2)</sup> each channel $I_D = 0.9$ A, $T_j = 25^\circ\text{C}$ , $V_{bb} = 12$ V	$E_{AS}$	150	-	-	mJ

**Inverse Diode**

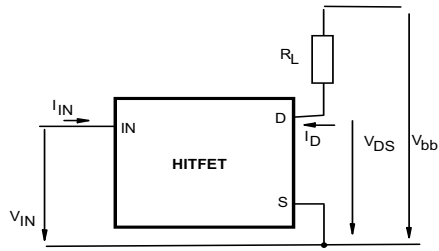
Inverse diode forward voltage $I_F = 7$ A, $t_m = 250 \mu\text{s}$ , $V_{IN} = 0$ V, $t_P = 300 \mu\text{s}$	$V_{SD}$	-	1	-	V
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<sup>1)</sup>Integrated protection functions are designed to prevent IC destruction under fault conditions described in the data sheet. Fault conditions are considered as "outside" normal operating range. Protection functions are not designed for continuous repetitive operation.

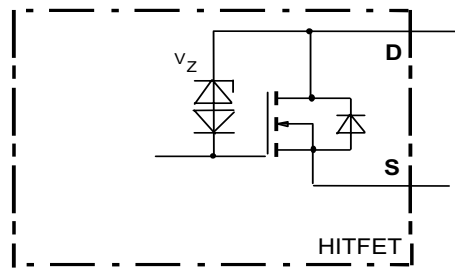
<sup>2)</sup>not subject to production test, specified by design

## Block diagram

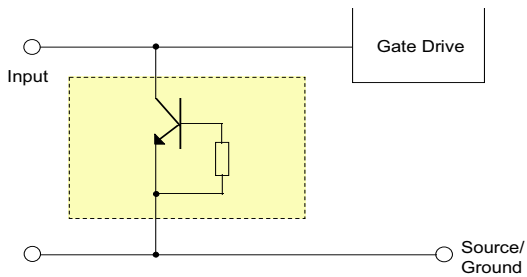
### Terms



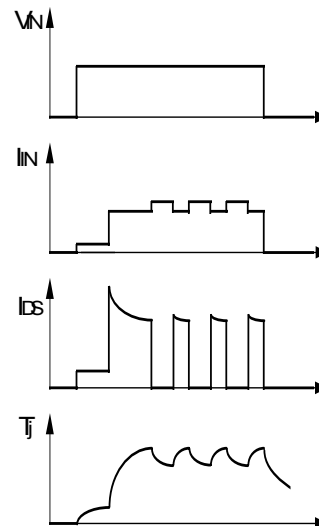
### Inductive and overvoltage output clamp



### Input circuit (ESD protection)

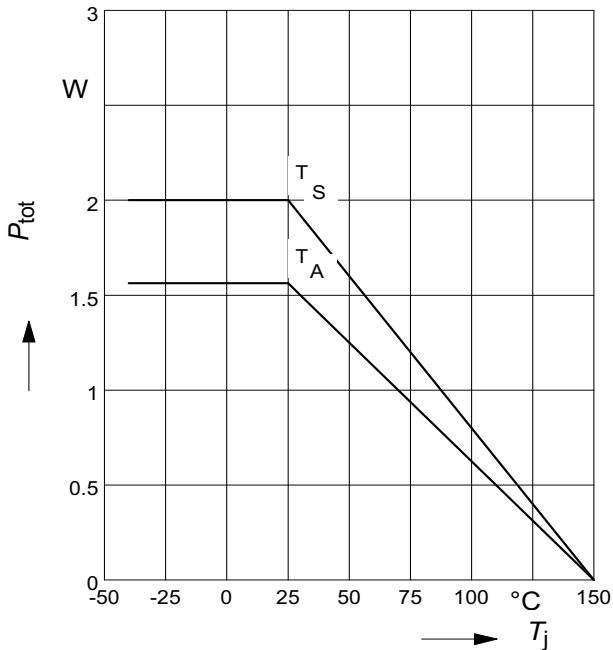


### Short circuit behaviour



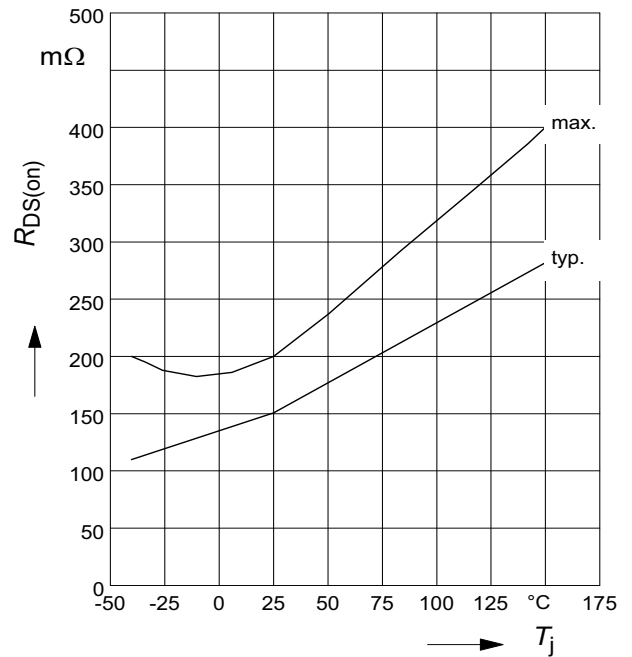
**1 Overall maximum allowable power dissipation;  $P_{tot} = f(T_S)$  resp.**

$P_{tot} = f(T_A) @ R_{thJA}=80 \text{ K/W}$



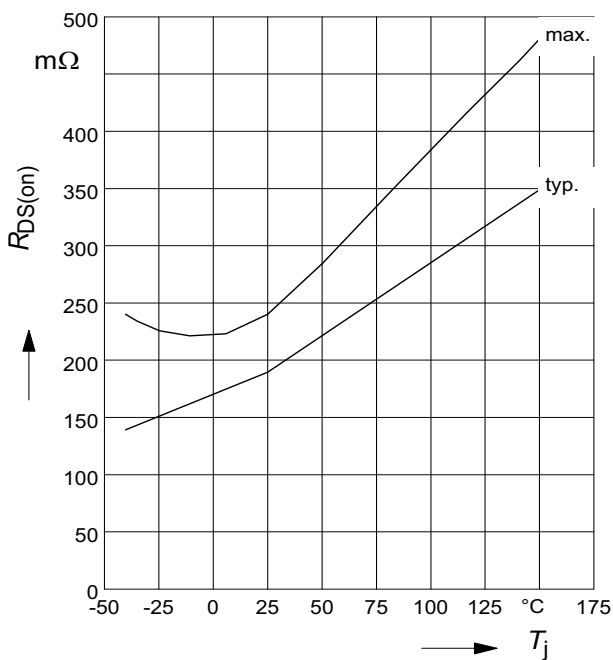
**2 On-state resistance**

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



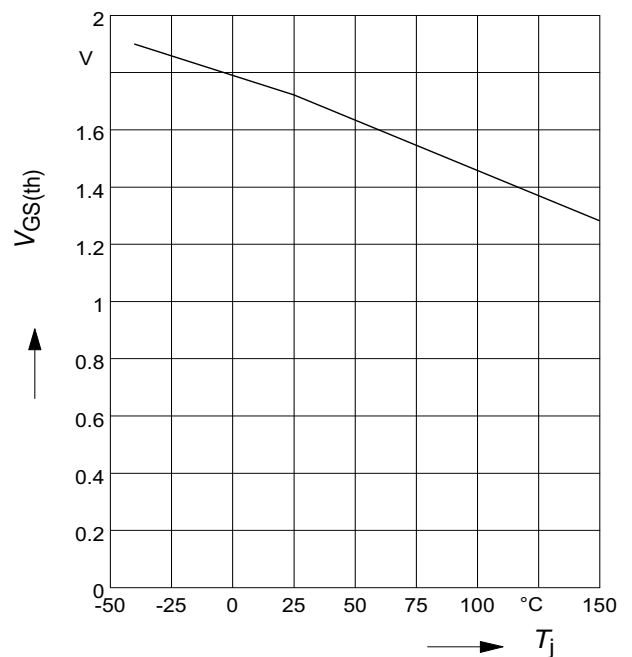
**3 On-state resistance**

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



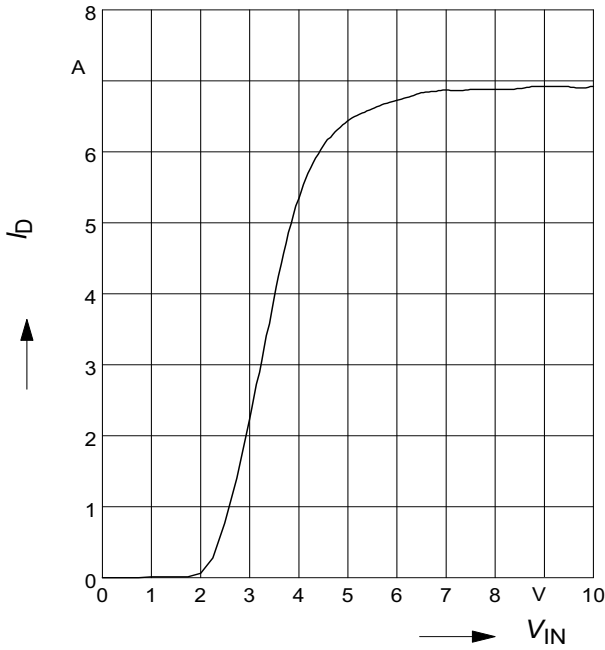
**4 Typ. input threshold voltage**

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



**5 Typ. transfer characteristics**

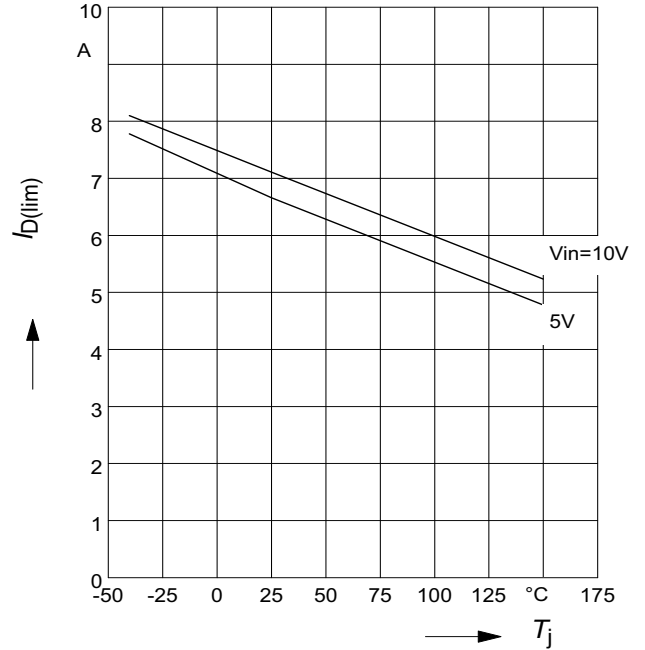
$I_D = f(V_{IN}); V_{DS} = 12V; T_{Jstart} = 25^\circ C$



**6 Typ. short circuit current**

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

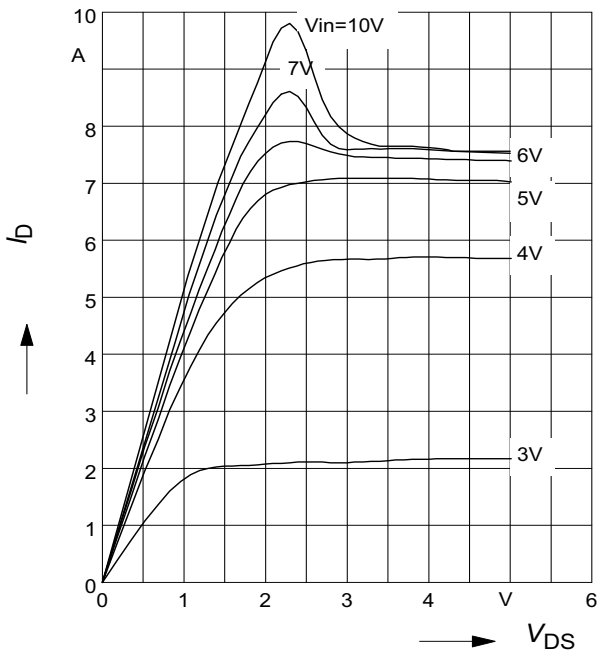
Parameter:  $V_{IN}$



**7 Typ. output characteristics**

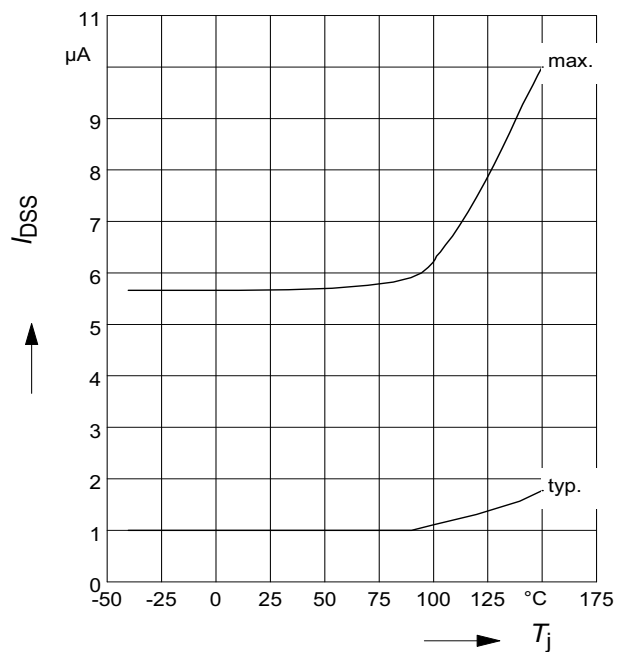
$I_D = f(V_{DS}); T_{Jstart} = 25^\circ C$

Parameter:  $V_{IN}$



**8 Typ. off-state drain current**

$I_{DSS} = f(T_j)$

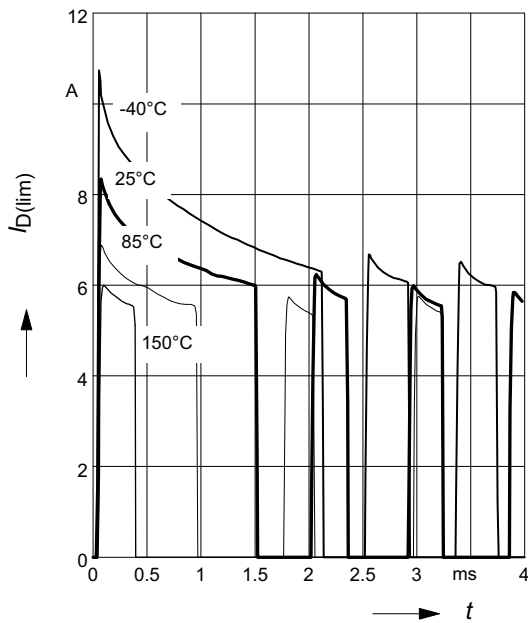




**9 Typ. overload current**

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

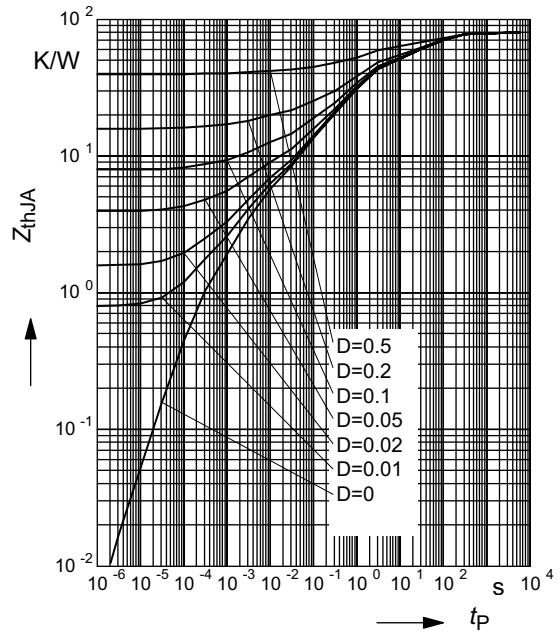
Parameter:  $T_{jstart}$



**10 Typ. transient thermal impedance**

$Z_{thJA} = f(t_p)$  @ 6 cm<sup>2</sup> cooling area

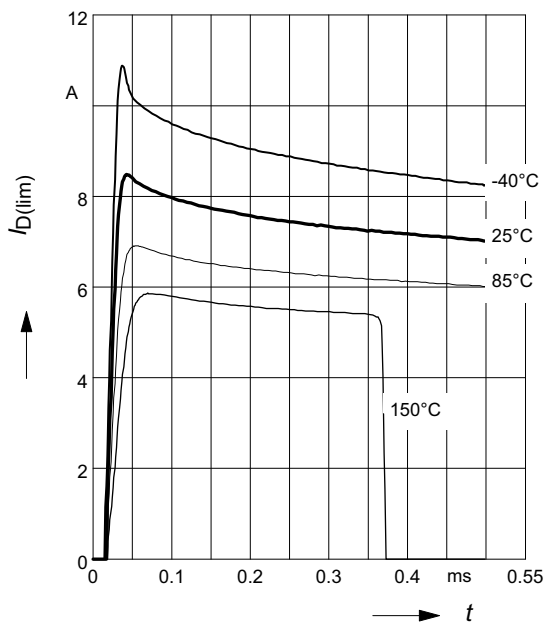
Parameter:  $D = t_p / T$ ; one channel on



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

$I_{D(lim)} = f(t)$ ;  $t_m = 200\mu\text{s}$

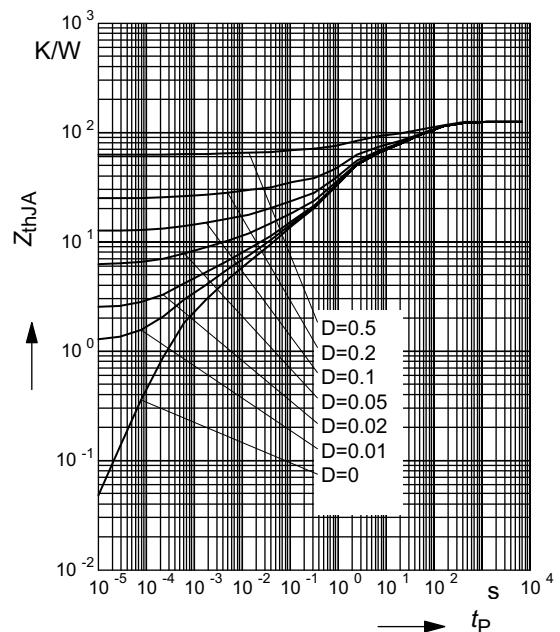
Parameter:  $T_{jstart}$



**12 Typ. transient thermal impedance**

$Z_{thJA} = f(t_p)$  @ 6 cm<sup>2</sup> cooling area

Parameter:  $D = t_p / T$ ; both channels on



# 1 Package Outlines

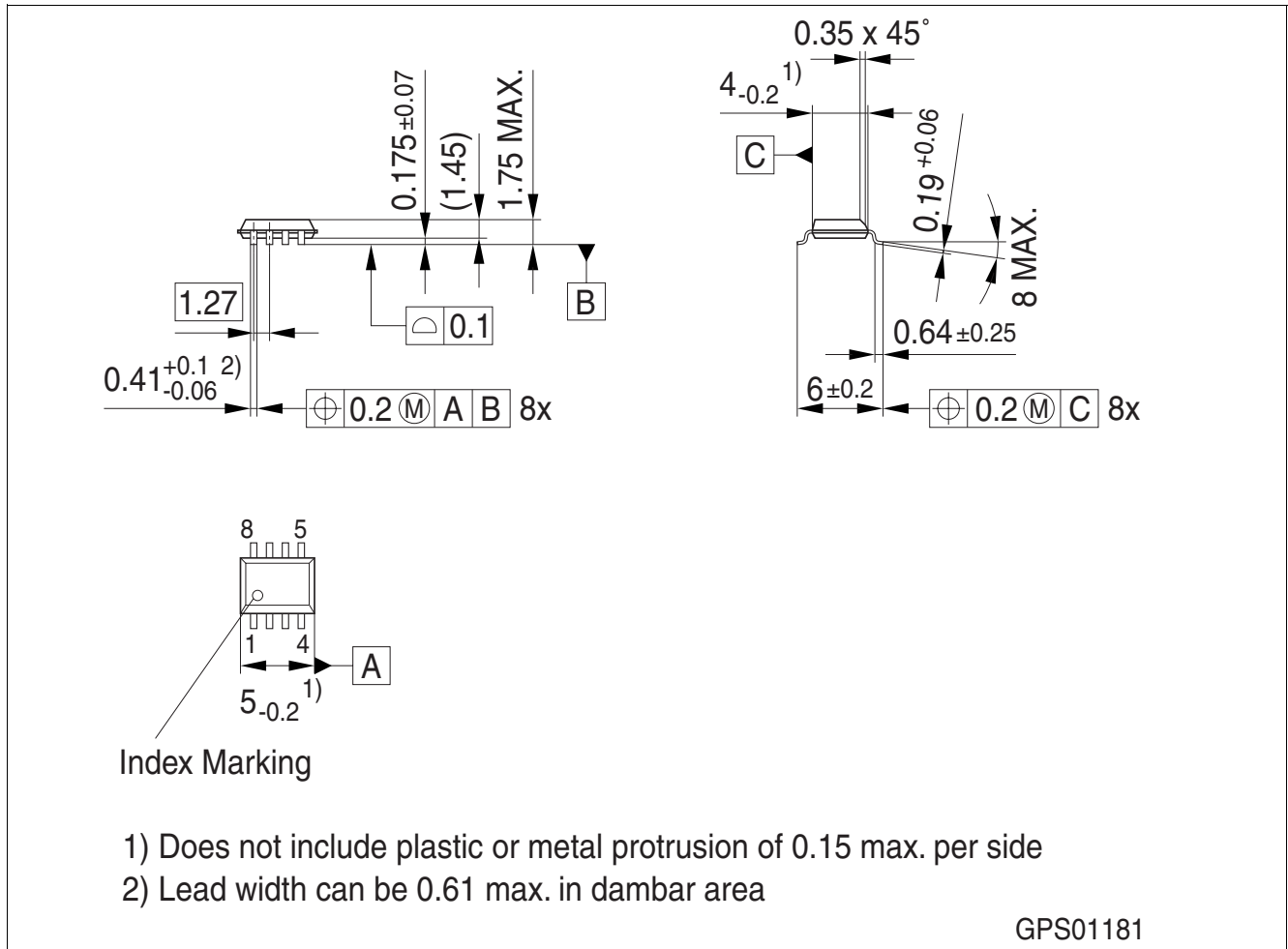


Figure 1 PG-DSO8-25 (Plastic Green Dual Small Outline Package)

### 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

## 2 Revision History

Version	Date	Changes
Rev. 1.3	2007-11-06	updated package drawing of green package
Rev. 1.2	2007-06-18	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 package naming Green explanation added
Rev. 1.1	2004-03-05	released production version

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