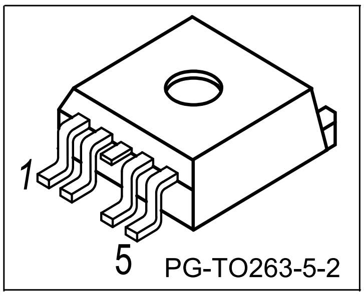
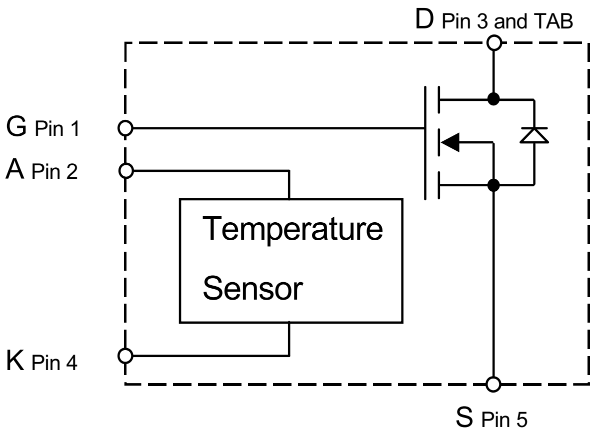
Speed TEMPFET®

- N-Channel
- Enhancement mode
- Logic Level Input
- Analog driving possible
- Fast switching up to 1 MHz
- Potential-free temperature sensor with thyristor characteristics
- Overtemperature protection
- Avalanche rated
- Green Product (RoHS Compliant)
- AEC Qualified



Type	V_{DS}	$R_{DS(on)}$	Package	
BTS247Z E3062A	55 V	18 mΩ	PG-TO263-5-2	



Pin	Symbol	Function
1	G	Gate
2	A	Anode Temperature Sensor
3	D	Drain
4	K	Cathode Temperature Sensor
5	S	Source

Maximum Ratings

Parameter	Symbol	Value	Unit
Drain source voltage	V_{DS}	55	V
Drain-gate voltage, R_{GS} = 20 kΩ	V_{DGR}	55	
Gate source voltage	V_{GS}	±20	
Nominal load current (ISO 10483) V_{GS} = 4.5 V, $V_{DS} \leq 0.5$ V, T_C = 85 °C V_{GS} = 10 V, $V_{DS} \leq 0.5$ V, T_C = 85 °C	$I_{D(ISO)}$	 12 19	A
Continuous drain current [1)] T_C = 100 °C, V_{GS} = 4.5V	I_D	33	
Pulsed drain current	$I_{D\ puls}$	180	
Avalanche energy, single pulse I_D = 12 A, R_{GS} = 25 Ω	E_{AS}	1.3	J
Power dissipation T_C = 25 °C	P_{tot}	120	W
Operating temperature [2)]	T_j	-40 ...+175	°C
Peak temperature (single event)	T_{jpeak}	200	
Storage temperature	T_{stg}	-55 ... +150	
DIN humidity category, DIN 40 040		E	
IEC climatic category; DIN IEC 68-1		40/150/56	

[1]current limited by bond wire

[2]Note: Thermal trip temperature of temperature sensor is below 175°C

Thermal Characteristics

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Characteristics					
junction - case:	R_{thJC}	-	-	1.25	K/W
Thermal resistance @ min. footprint	$R_{th(JA)}$	-	-	62	
Thermal resistance @ 6 cm^2 cooling area [1)]	$R_{th(JA)}$	-	33	40	

Electrical Characteristics

Parameter at T_j = 25°C, unless otherwise specified	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Drain-source breakdown voltage V_{GS} = 0 V, I_D = 0.25 mA	$V_{(BR)DSS}$	55	-	-	V
Gate threshold voltage, V_{GS} = V_{DS} I_D = 90 µA I_D = 250 µA	$V_{GS(th)}$	 1.2 -	 1.6 1.65	 2 -	
Zero gate voltage drain current V_{DS} = 50 V, V_{GS} = 0 V, T_j = -40 °C V_{DS} = 50 V, V_{GS} = 0 V, T_j = 25 °C V_{DS} = 50 V, V_{GS} = 0 V, T_j = 150 °C	I_{DSS}	 - - -	 - 0.1 -	 0.1 1 100	µA
Gate-source leakage current V_{GS} = 20 V, V_{DS} = 0 V, T_j = 25 °C V_{GS} = 20 V, V_{DS} = 0 V, T_j = 150 °C	I_{GSS}	 - -	 10 20	 100 100	nA
Drain-Source on-state resistance V_{GS} = 4.5 V, I_D = 12 A V_{GS} = 10 V, I_D = 12 A	$R_{DS(on)}$	 - -	 22 15	 28 18	mΩ

[1] 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.**	
Dynamic Characteristics					
Forward transconductance V_{DS}>2*I_D*$R_{DS(on)max}$, I_D = 33 A	g_{fs}	10	-	-	S
Input capacitance V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz	C_{iss}	-	1380	1730	pF
Output capacitance V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz	C_{oss}	-	410	515	
Reverse transfer capacitance V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz	C_{rss}	-	230	290	
Turn-on delay time V_{DD} = 30 V, V_{GS} = 4.5 V, I_D = 45 A, R_G = 3.6 Ω	$t_{d(on)}$	-	15	25	ns
Rise time V_{DD} = 30 V, V_{GS} = 4.5 V, I_D = 45 A, R_G = 3.6 Ω	t_r	-	30	45	
Turn-off delay time V_{DD} = 30 V, V_{GS} = 4.5 V, I_D = 45 A, R_G = 3.6 Ω	$t_{d(off)}$	-	30	45	
Fall time V_{DD} = 30 V, V_{GS} = 4.5 V, I_D = 45 A, R_G = 3.6 Ω	t_f	-	20	30	

Gate Charge Characteristics

Gate charge at threshold V_{DD} = 40 V, I_D = 0.1 A, V_{GS} = 0 to 1 V	$Q_{g(th)}$	-	2	3	nC
Gate charge at 5.0 V V_{DD} = 40 V, I_D = 45 A, V_{GS} = 0 to 5 V	$Q_{g(5)}$	-	35	55	
Gate charge total V_{DD} = 40 V, I_D = 45 A, V_{GS} = 0 to 10 V	$Q_{g(total)}$	-	60	90	
Gate plateau voltage V_{DD} = 40 V, I_D = 45 A	$V_{(plateau)}$	-	4.5	-	V

Electrical Characteristics

Parameter at T_j = 25°C, unless otherwise specified	Symbol	Values			Unit
		min.	typ.	max.	
Reverse Diode					
Inverse diode continuous forward current T_C = 25 °C	I_S	33	-	-	A
Inverse diode direct current,pulsed T_C = 25 °C	I_{FM}	180	-	-	
Inverse diode forward voltage V_{GS} = 0 V, I_F = 90 A	V_{SD}	-	1.1	1.7	V
Reverse recovery time V_R = 30 V, I_F=I_S, di_F/dt = 100 A/µs	t_{rr}	-	75	115	ns
Reverse recovery charge V_R = 30 V, I_F=I_S, di_F/dt = 100 A/µs	Q_{rr}	-	0.15	0.25	µC

Sensor Characteristics

For temperature sensing, i.e. temperature protection, please consider application note "Temperature sense concept - Speed TEMPFET".

For short circuit protection please consider application note "Short circuit behaviour of the Speed TEMPFET family".

All application notes are available at **http://www.infineon.com/tempfet/**

Forward voltage $I_{AK(on)}$ = 5 mA, T_j = -40...+150 °C $I_{AK(on)}$ = 1.5 mA, T_j = 150 °C	$V_{AK(on)}$	 - -	 1.3 -	 1.4 0.9	V
Sensor override t_P = 100 µs, T_j = -40...+150 °C		-	-	10	
Forward current T_j = -40...+150 °C	$I_{AK(on)}$	-	-	5	mA
Sensor override t_P = 100 µs, T_j = -40...+150 °C		-	-	600	

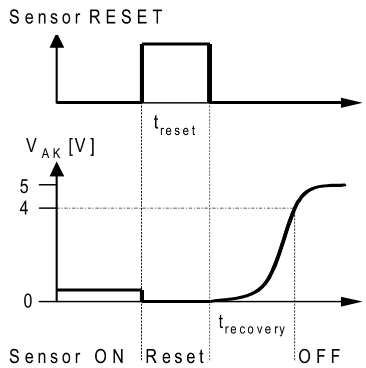
Electrical Characteristics

Parameter at T_j = 25°C, unless otherwise specified	Symbol	Values			Unit
		min.	typ.	max.	
Sensor Characteristics					
Temperature sensor leakage current T_j = 150 °C	$I_{AK(off)}$	-	-	4	µA
Min. reset pulse duration [1)] T_j = -40...+150 °C, $I_{AK(on)}$ = 0.3 mA, $V_{AK(Reset)}$<0.5V	t_{reset}	100	-	-	µs
V_{AK} Recovery time[1)2)] T_j = -40...+150 °C, $I_{AK(on)}$ = 0.3 mA	$t_{recovery}$	-	-	150	

Characteristics

Holding current, $V_{AK(off)}$ = 5V T_j = 25 °C T_j = 150 °C	$I_{AK(hold)}$	 0.05 0.05	 - -	 0.5 0.3	mA
Thermal trip temperature V_{TS} = 5V	$T_{TS(on)}$	150	160	170	°C
Turn-off time (Pin G+A and K+S connected) V_{TS} = 5V, $I_{TS(on)}$ = 2 mA	t_{off}	0.5	-	2.5	µs
Reset voltage T_j = -40...+150°C	$V_{AK(reset)}$	0.5	-	-	V

Sensor recovery behaviour:

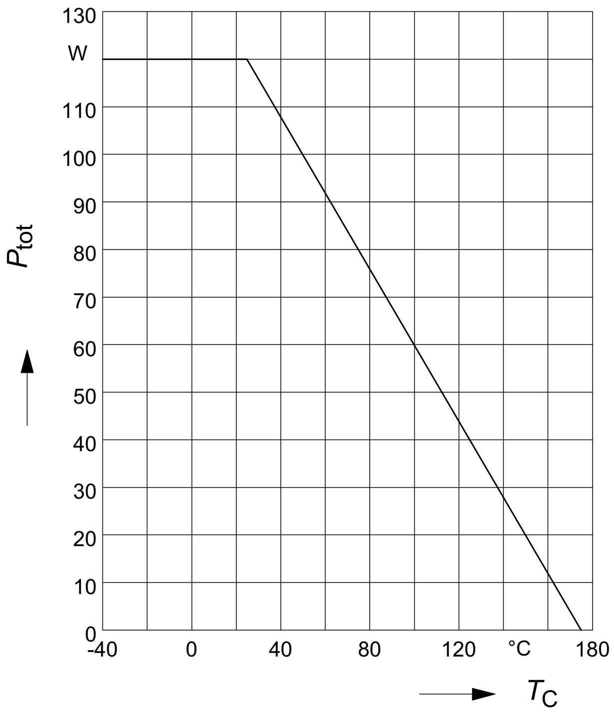


[1]See diagram Sensor recovery behaviour

[2]Time after reset pulse until V_{AK} reaches 4V again

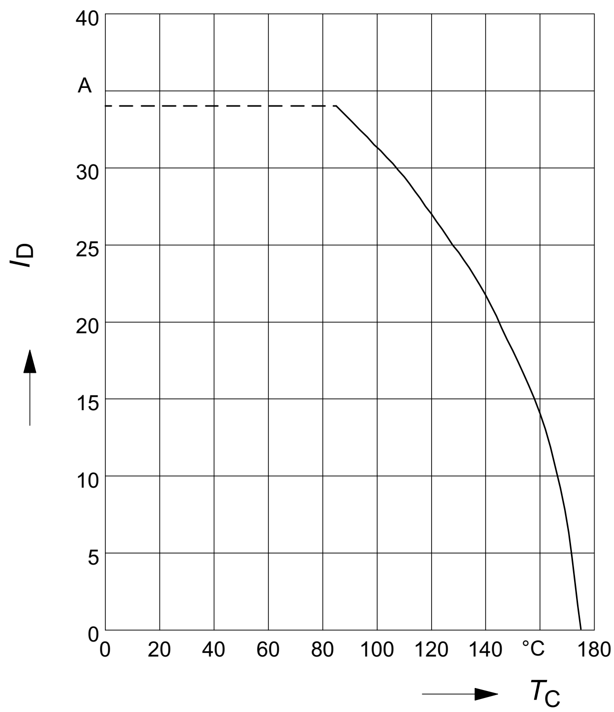
1 Maximum allowable power dissipation

$P_{tot} = f(T_C)$



2 Drain current

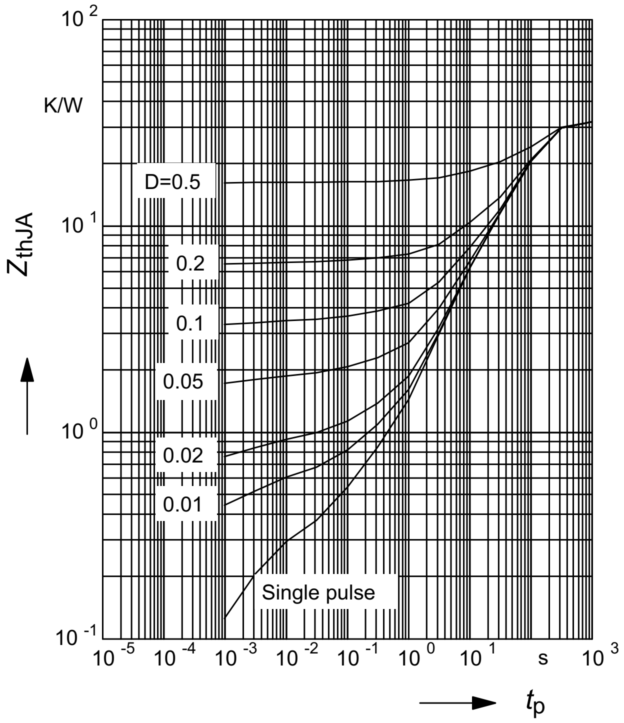
$I_D = f(T_C)$; $V_{GS} \geq 4.5V$



3 Typ. transient thermal impedance

$Z_{thJA}=f(t_p)$ @ 6 cm² cooling area

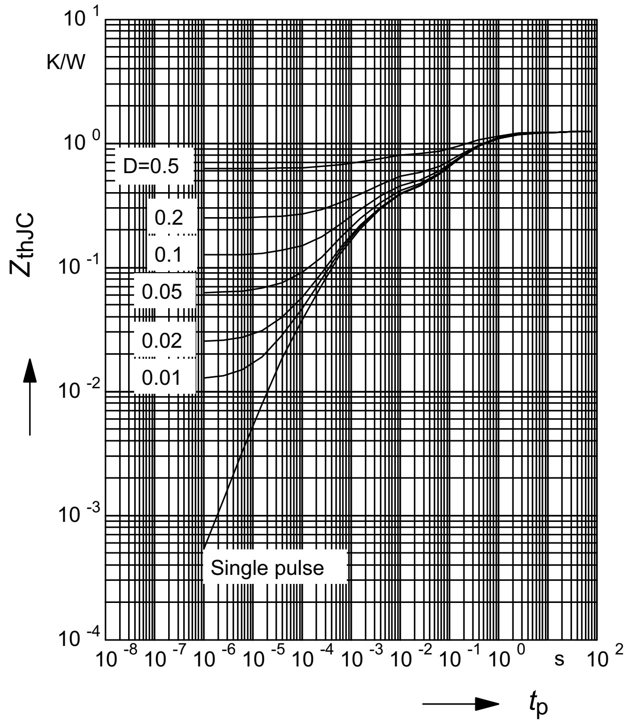
Parameter: $D=t_p/T$



4 Transient thermal impedance

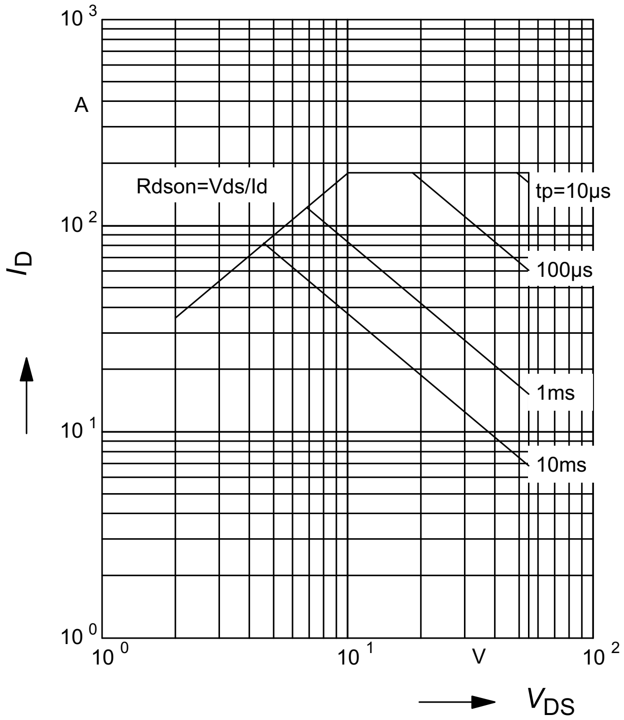
$Z_{thJC} = f(t_p)$

parameter : $D = t_p/T$



5 Safe operating area

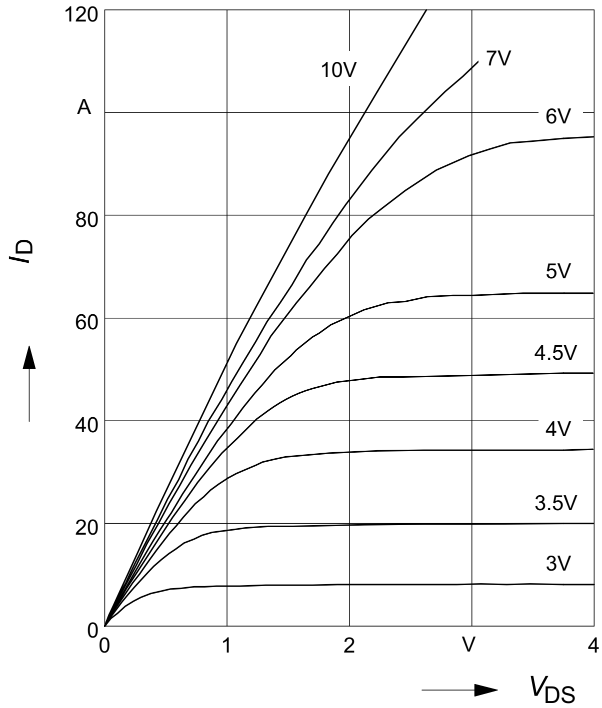
I_D=f(V_{DS}); D=0.01; T_C=25°C



6 Typ. output characteristic

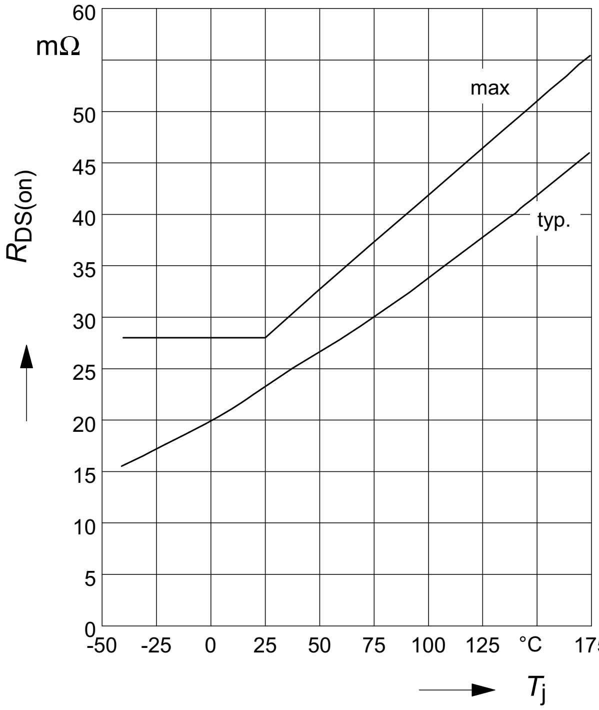
I_D = f(V_{DS}); T_j=25°C

Parameter: V_{GS}



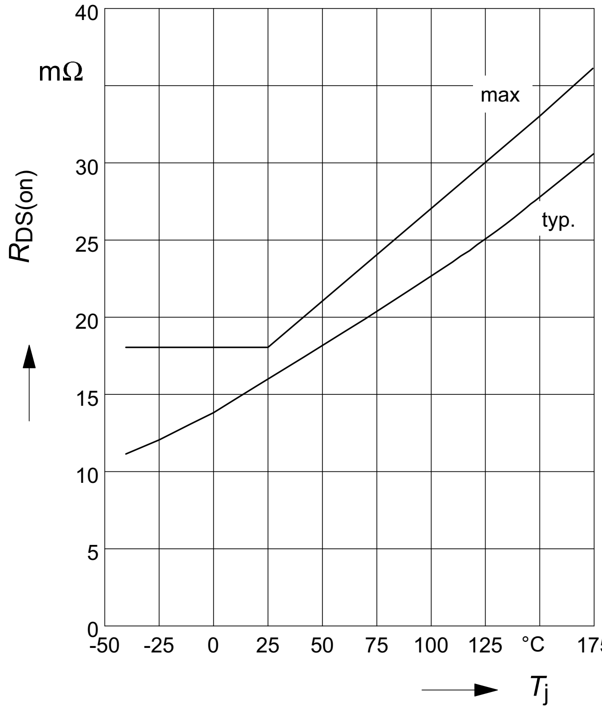
7 On-state resistance

R_{ON} = f(T_j); I_D=12A; V_{GS} = 4.5V



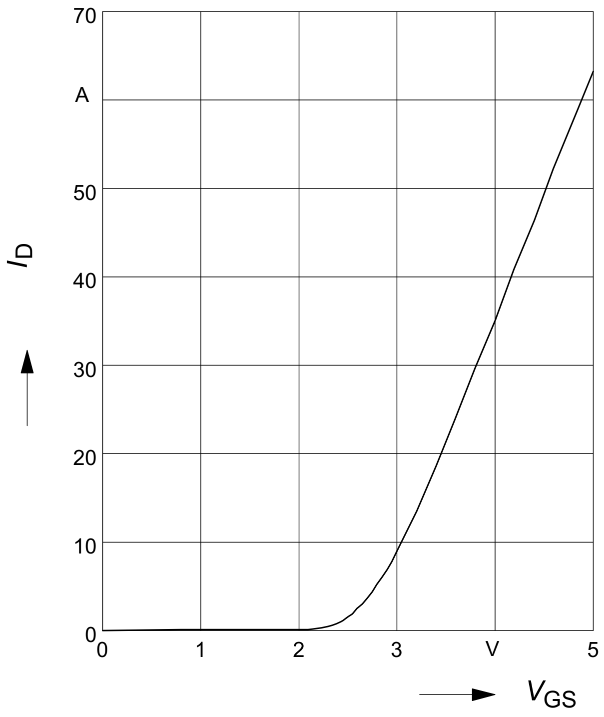
8 On-state resistance

R_{ON} = f(T_j); I_D=12A; V_{GS} = 10V



9 Typ. transfer characteristics

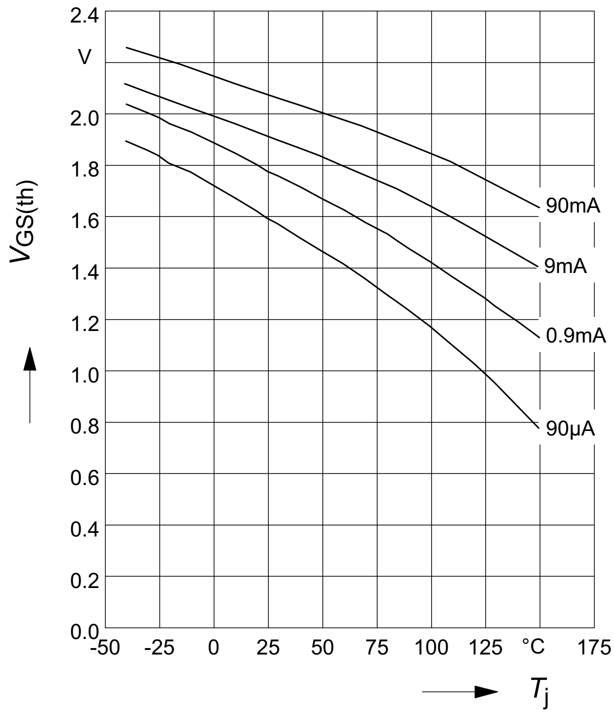
I_D = f(V_{GS}); V_{DS} = 12V; T_j = 25°C



10 Typ. input threshold voltage

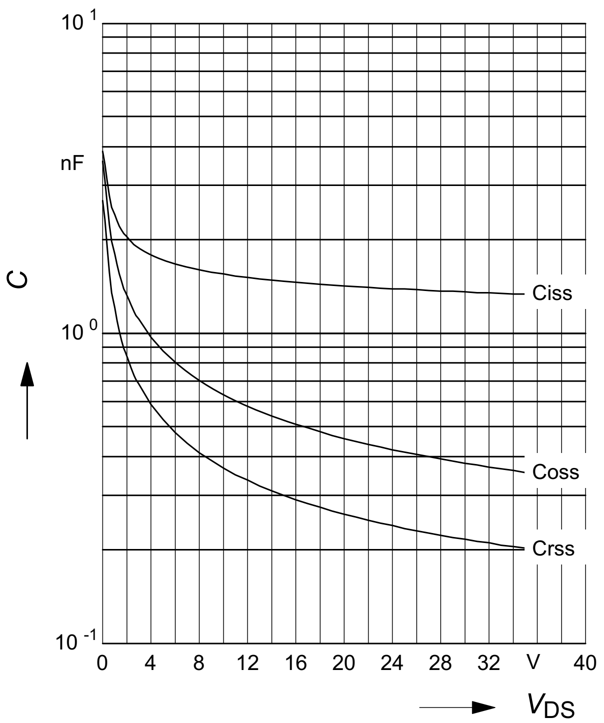
$V_{GS(th)}$ = f(T_j); V_{DS}=V_{GS}

Parameter: I_D



11 Typ. capacitances

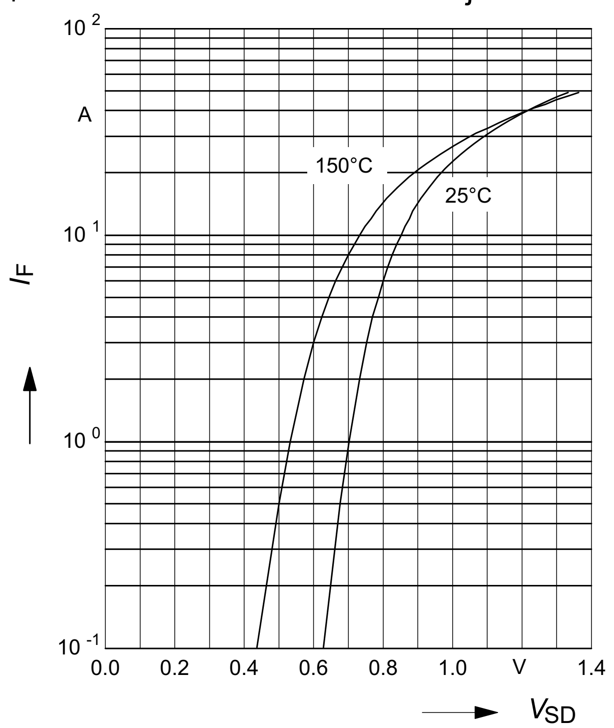
C = f(V_{DS}); V_{GS}=0 V, f=1 MHz



12 Typ. forward charcteristics of

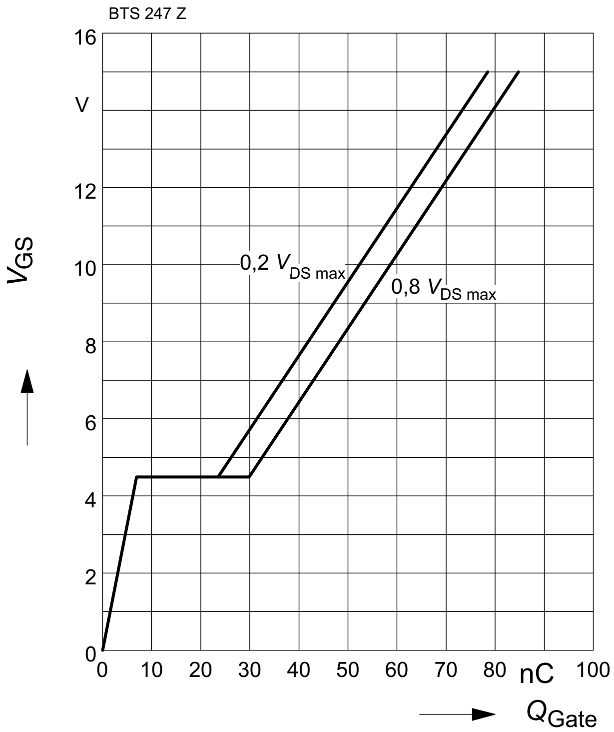
reverse diode I_F = f(V_{SD})

t_p = 80µs (spread); Parameter: T_j



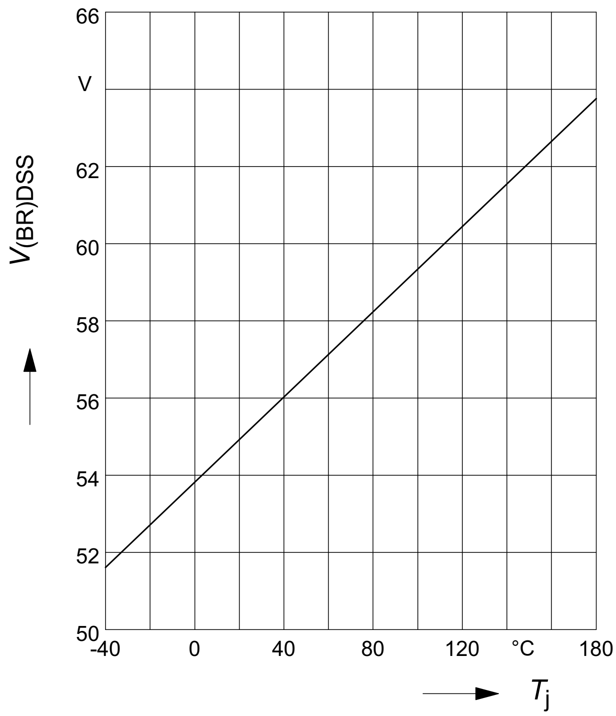
13 Typ. gate charge

$V_{GS} = f(Q_{Gate})$; $I_{D\ puls} = 45$ A



14 Drain-source break down voltage

$V_{(BR)DSS} = f(T_j)$



1 Package Outlines

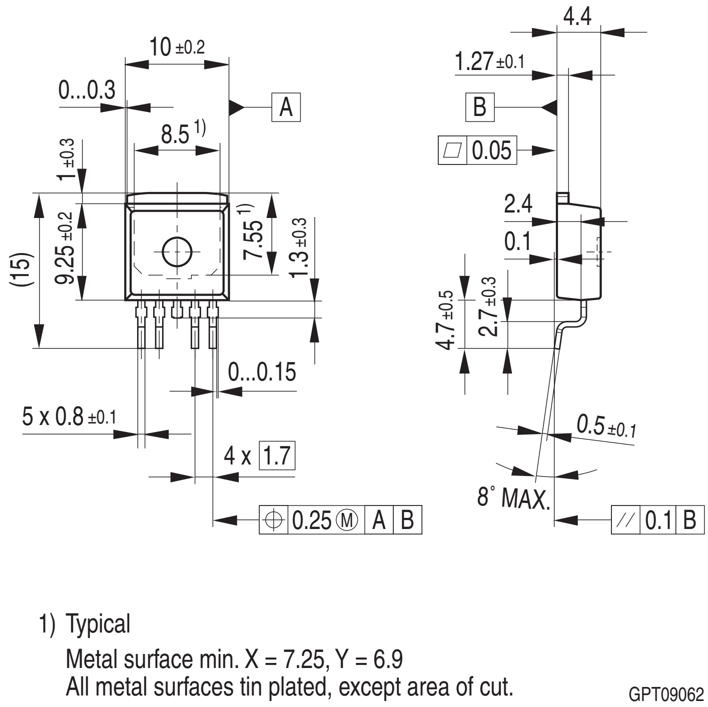


Figure 1 PG-TO263-5-2

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).

For further information on alternative packages, please visit our website:
http://www.infineon.com/packages.

Dimensions in mm

2 Revision History

Revision	Date	Changes
1.4	2013-07-26	page 1, 11: updated package name and package drawing: PG-TO220-5-62 to PG-TO263-5-2 (SMD) page 1, 11/12: removed packages: PG-TO220-5-3 (THD, staggered leads) and PG-TO220-5-43 (THD, straight leads); page 1: added sales name; page 8: updated description figure 5
1.3	2009-12-04	updated package drawing of PG-TO220-5-62
1.2	2009-07-31	removed 100ms and DC line in SOA diagram
1.1	2008-11-10	all pages: added new Infineon logo Initial version of RoHS-compliant derivate of the BTS247Z Page 1 and 12: added RoHS compliance statement and Green product feature Page 1, 11 and 12: Package changed to RoHS compliant version page 13: added Revision history page 14: update of disclaimer

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