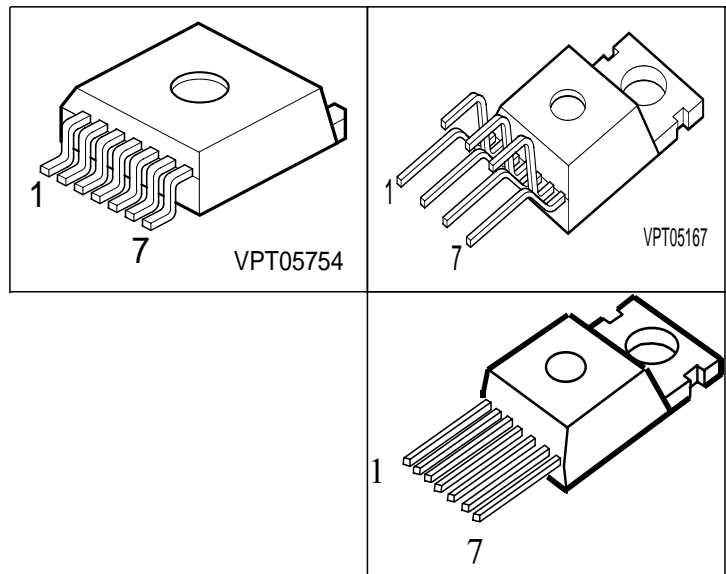# BTS 282 Z

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

- High current pinning

Type	V_{DS}	$R_{DS(on)}$	Package	Ordering Code
BTS 282 Z	49 V	6.5 mΩ	P-TO220-7-3	Q67060-S6004-A2
			P-TO220-7-180	Q67060-S6005-A2
			P-TO220-7-230	Q67060-S6007
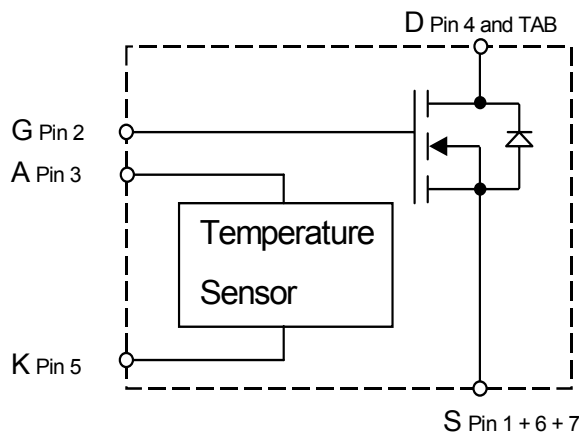
Pin	Symbol	Function
1	S	Source
2	G	Gate
3	A	Anode Temperature Sensor
4	D	Drain
5	K	Cathode Temperature Sensor
6	S	Source
7	S	Source

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Maximum Ratings

Parameter	Symbol	Value	Unit
Drain source voltage	V_{DS}	49	V
Drain-gate voltage, R_{GS} = 20 kΩ	V_{DGR}	49	
Gate source voltage	V_{GS}	±20	
Nominal load current (ISO 10483) V_{GS} = 4.5 V, $V_{DS} \le$ 0.5 V, T_C = 85 °C V_{GS} = 10 V, $V_{DS} \le$ 0.5 V, T_C = 85 °C	$I_{D(ISO)}$	 36 52	A
Continuous drain current [1] T_C = 100 °C, V_{GS} = 4.5V	I_D	80	
Pulsed drain current	$I_{D\ puls}$	320	
Avalanche energy, single pulse I_D = 36 A, R_{GS} = 25 Ω	E_{AS}	2	J
Power dissipation T_C = 25 °C	P_{tot}	300	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

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Thermal Characteristics

Parameter	Symbol	Values			Unit
		min.	typ.	max.	

Characteristics

Parameter	Symbol	min.	typ.	max.	Unit
junction - case:	R_{thJC}	-	-	0.5	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	Symbol	Values			Unit
at T_j = 25°C, unless otherwise specified		min.	typ.	max.	

Static Characteristics

Parameter	Symbol	min.	typ.	max.	Unit
Drain-source breakdown voltage V_{GS} = 0 V, I_D = 0.25 mA	$V_{(BR)DSS}$	49	-	-	V
Gate threshold voltage, V_{GS} = V_{DS} I_D = 240 µA	$V_{GS(th)}$	1.2	1.6	2	
Zero gate voltage drain current	I_{DSS}				µA
V_{DS} = 45 V, V_{GS} = 0 V, T_j = -40 °C		-	-	0.1	
V_{DS} = 45 V, V_{GS} = 0 V, T_j = 25 °C		-	0.1	1	
V_{DS} = 45 V, V_{GS} = 0 V, T_j = 150 °C		-	-	100	
Gate-source leakage current	I_{GSS}				nA
V_{GS} = 20 V, V_{DS} = 0 V, T_j = 25 °C		-	10	100	
V_{GS} = 20 V, V_{DS} = 0 V, T_j = 150 °C		-	20	100	
Drain-Source on-state resistance	$R_{DS(on)}$				mΩ
V_{GS} = 4.5 V, I_D = 36 A		-	8.2	9.5	
V_{GS} = 10 V, I_D = 36 A		-	5.8	6.5	

[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.

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Electrical Characteristics

Parameter	Symbol	Values			Unit
at T_j = 25°C, unless otherwise specified		min.	typ.	max.	
Dynamic Characteristics					
Forward transconductance $V_{DS}>2*I_D*R_{DS(on)max}$, I_D = 80 A	g_{fs}	30	70	-	S
Input capacitance V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz	C_{iss}	-	3850	4800	pF
Output capacitance V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz	C_{oss}	-	1090	1357	
Reverse transfer capacitance V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz	C_{rss}	-	570	715	
Turn-on delay time V_{DD} = 30 V, V_{GS} = 4.5 V, I_D = 80 A, R_G = 1.3 Ω	$t_{d(on)}$	-	30	45	ns
Rise time V_{DD} = 30 V, V_{GS} = 4.5 V, I_D = 80 A, R_G = 1.3 Ω	t_r	-	37	56	
Turn-off delay time V_{DD} = 30 V, V_{GS} = 4.5 V, I_D = 80 A, R_G = 1.3 Ω	$t_{d(off)}$	-	70	105	
Fall time V_{DD} = 30 V, V_{GS} = 4.5 V, I_D = 80 A, R_G = 1.3 Ω	t_f	-	36	55	
Gate Charge Characteristics					
Gate charge at threshold V_{DD} = 40 V, ID $\geq$0,1 A , V_{GS} = 0 to 1 V	$Q_{g(th)}$	-	3.8	5.7	nC
Gate charge at 5.0 V V_{DD} = 40 V, I_D = 80 A, V_{GS} = 0 to 5 V	$Q_{g(5)}$	-	92	138	
Gate charge total V_{DD} = 40 V, I_D = 80 A, V_{GS} = 0 to 10 V	$Q_{g(total)}$	-	155	232	
Gate plateau voltage V_{DD} = 40 V, I_D = 80 A	$V_{(plateau)}$	-	3.4	-	V

Electrical Characteristics

Parameter	Symbol	Values			Unit
at T_j = 25°C, unless otherwise specified		min.	typ.	max.	
Reverse Diode					
Inverse diode continuous forward current T_C = 25 °C	I_S	80	-	-	A
Inverse diode direct current,pulsed T_C = 25 °C	I_{FM}	320	-	-	
Inverse diode forward voltage V_{GS} = 0 V, I_F = 95 A	V_{SD}	-	1.25	1.6	V
Reverse recovery time V_R = 30 V, I_F=I_S, di_F/dt = 100 A/µs	t_{rr}	-	105	157	ns
Reverse recovery charge V_R = 30 V, I_F=I_S, di_F/dt = 100 A/µs	Q_{rr}	-	0.31	0.47	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	

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Electrical Characteristics

Parameter	Symbol	Values			Unit
at T_j = 25°C, unless otherwise specified		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

Parameter	Symbol	Values			Unit
Holding current, $V_{AK(off)}$ = 5V	$I_{AK(hold)}$				mA
T_j = 25 °C		0.05	-	0.5	
T_j = 150 °C		0.05	-	0.3	
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:
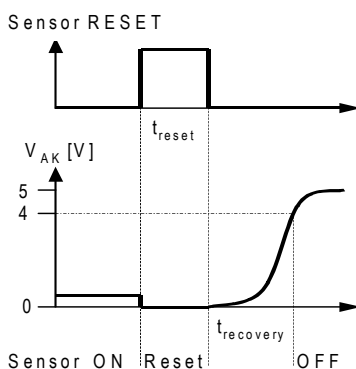
[1]See diagram Sensor recovery behaviour

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

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1 Maximum allowable power dissipation

P_{tot} = f(T_C)
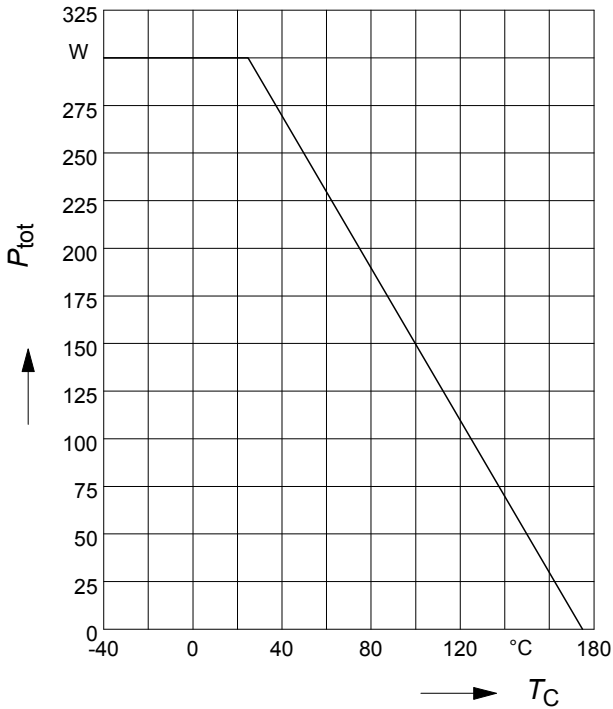
2 Drain current

I_D = f(T_C); $V_{GS} \geq 4.5$V
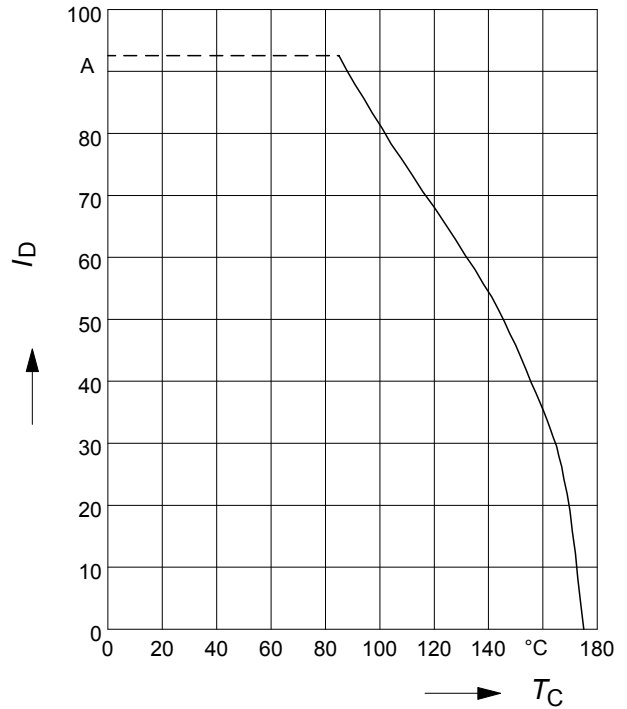
3 Typ. transient thermal impedance
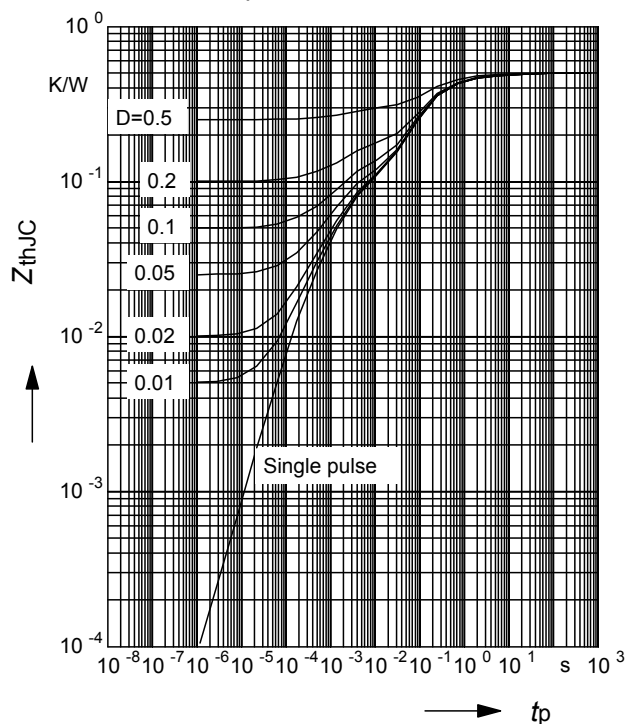
Z_{thJA}=f(t_p) @ 6 cm² cooling area
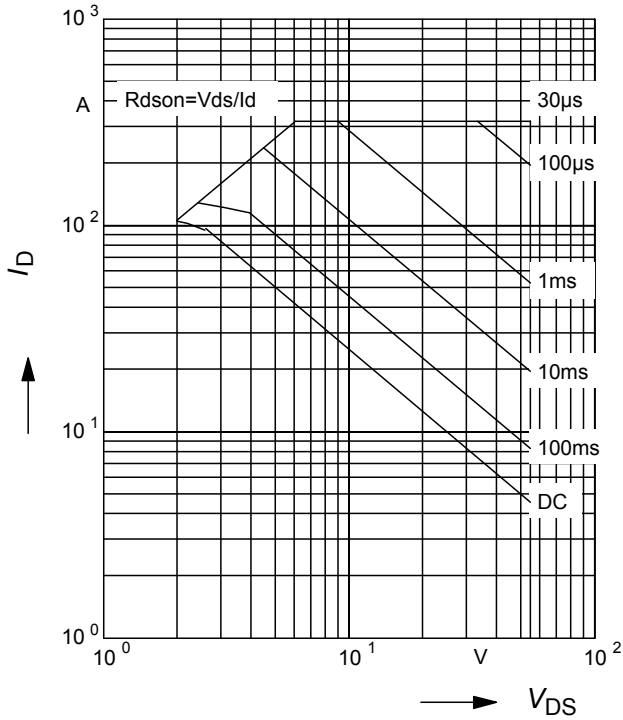
Parameter: $D = t_p/T$
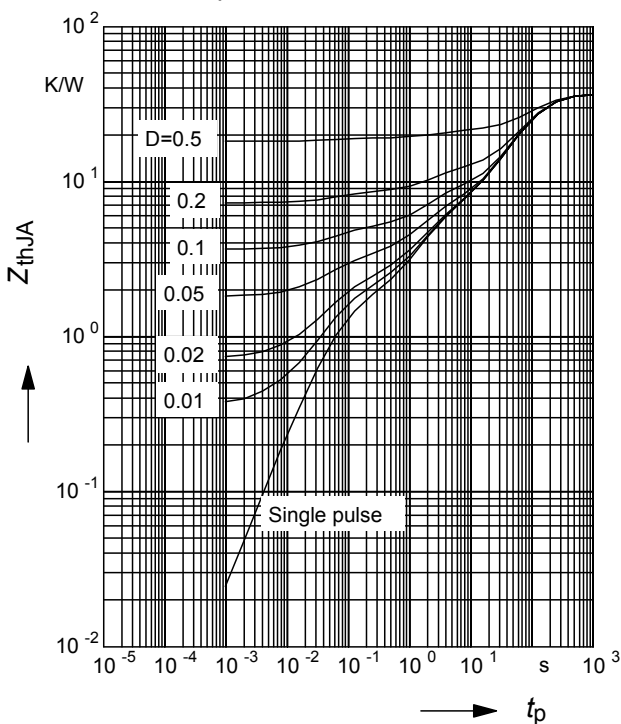
4 Transient thermal impedance

Z_{thJC} = f (t_p)

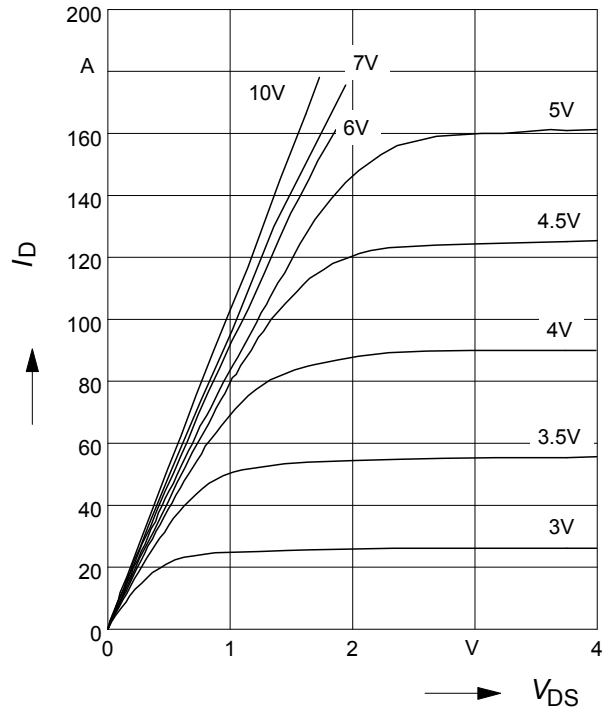parameter : $D = t_p/T$

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5 Safe operating area

I_D=f(V_{DS}); D=0.01; T_C=25°C; V_{GS}=4.5V

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=36A; V_{GS} = 4.5V
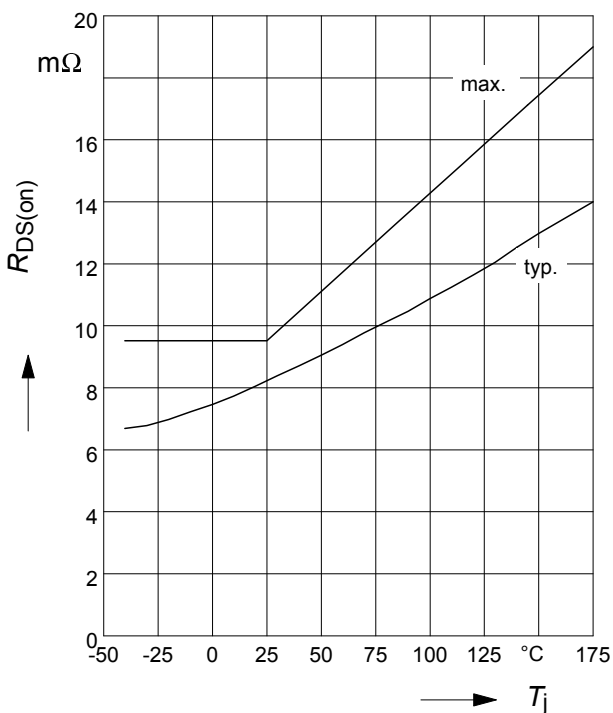
8 On-state resistance

R_{ON} = f(T_j); I_D=36A; V_{GS} = 10V

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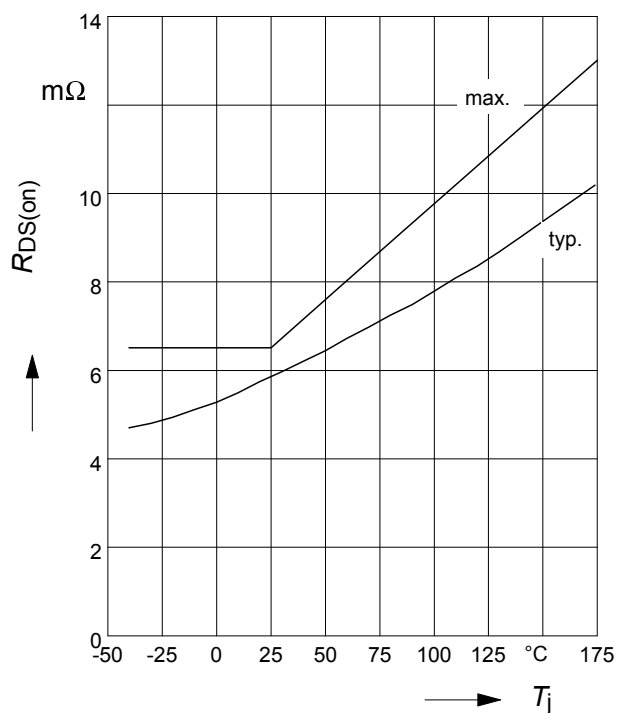
9 Typ. transfer characteristics

I_D = f(V_{GS}); V_{DS} = 12V; T_j = 25°C
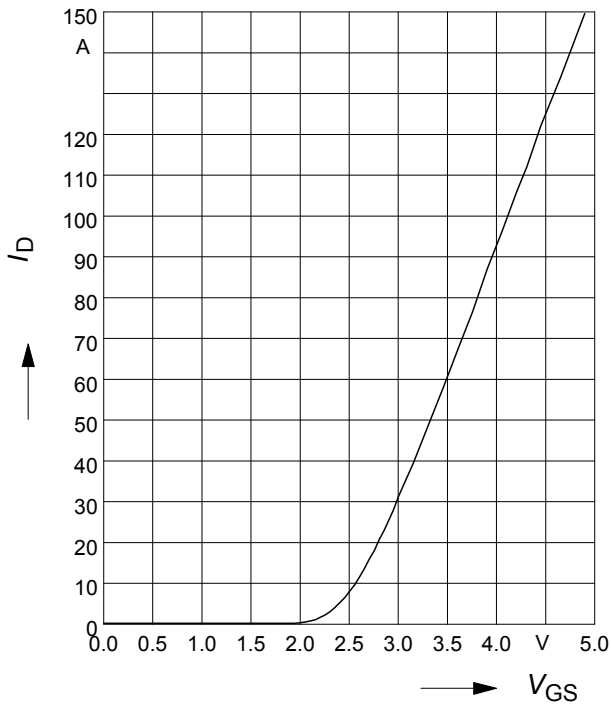
10 Typ. input threshold voltage

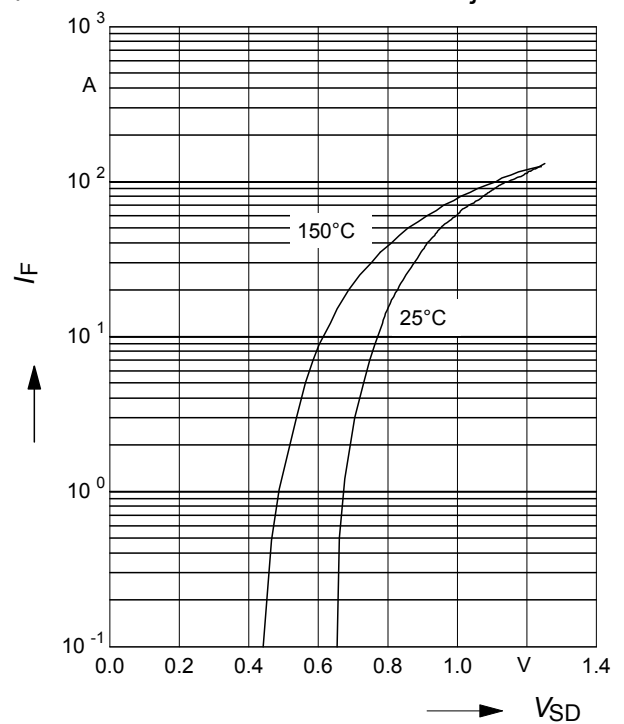$V_{GS(th)}$ = f(T_j); V_{DS}=V_{GS}

Parameter: I_D
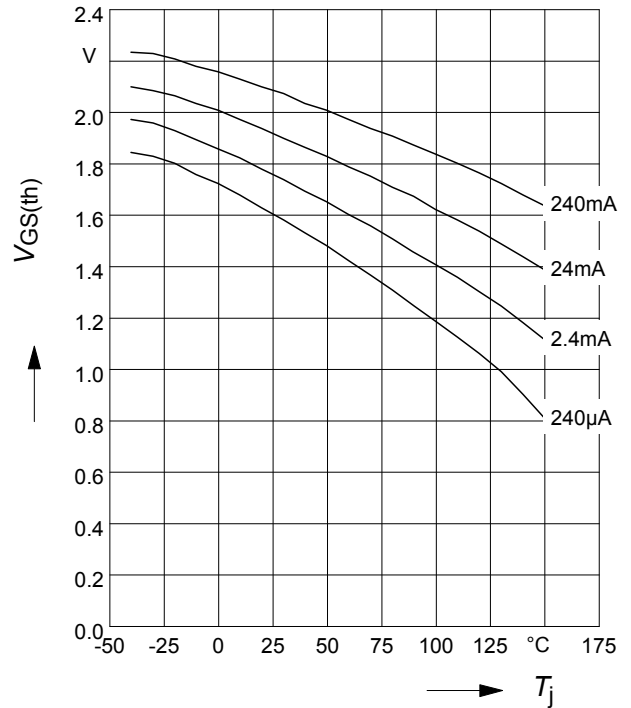
11 Typ. capacitances

C = f(V_{DS}); V_{GS}=0 V, f=1 MHz
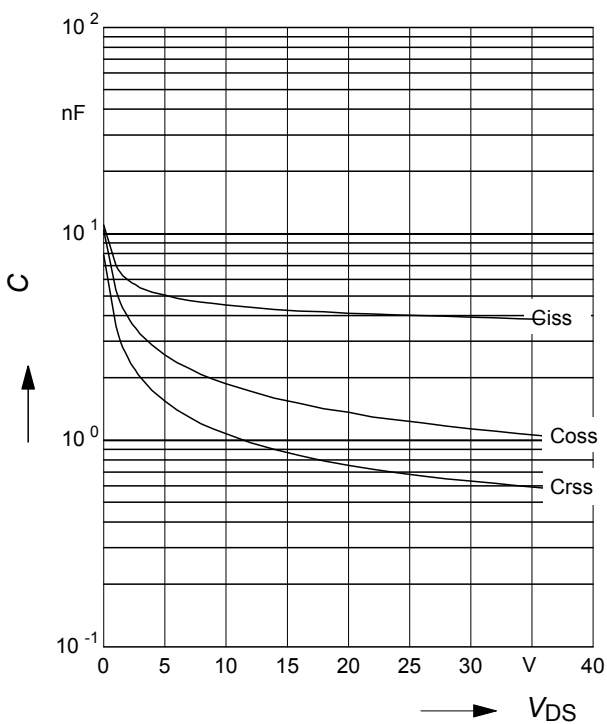
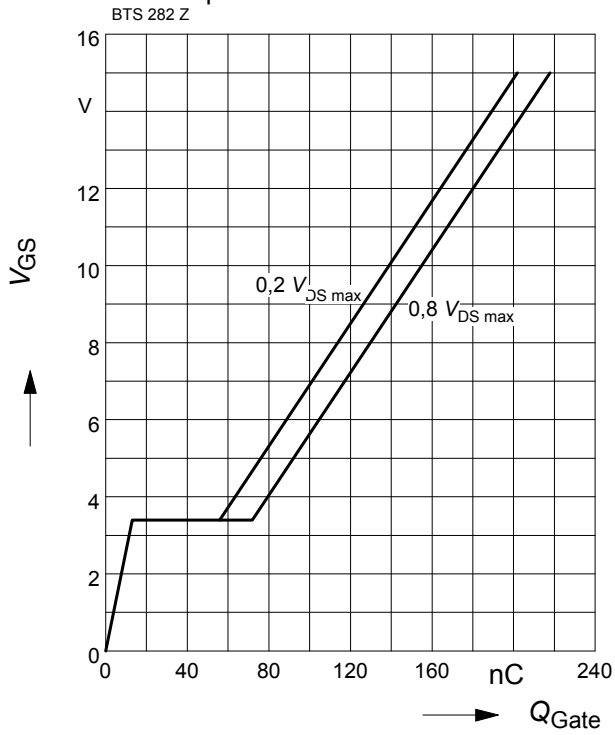## 12 Typ. reverse diode forward charcteristics I_F = f(V_{SD})

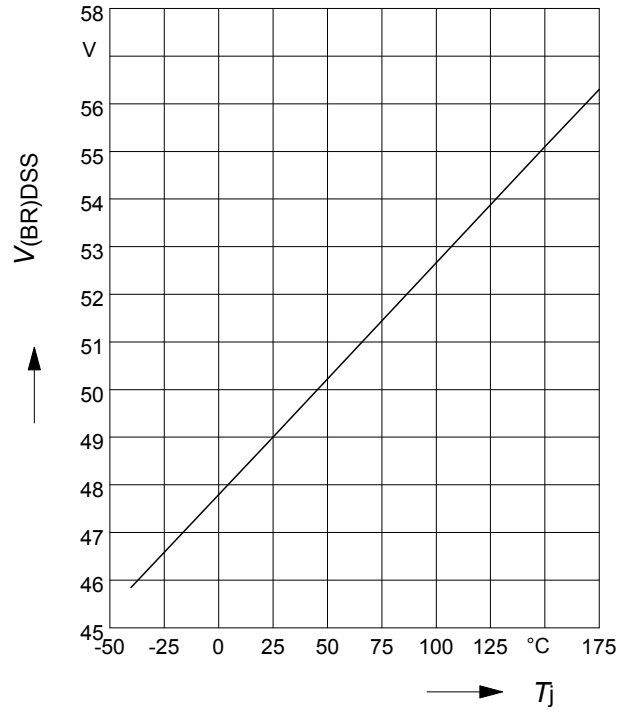t_p = 80µs (spread); Parameter: T_j

13 Typ. gate charge

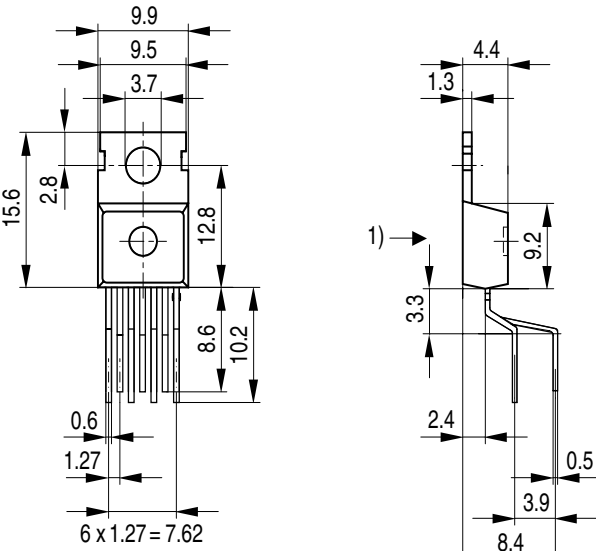**V_{GS} = f(Q_{Gate})**

Parameter: $I_{D\ puls}$ = 80 A

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14 Drain-source break down voltage
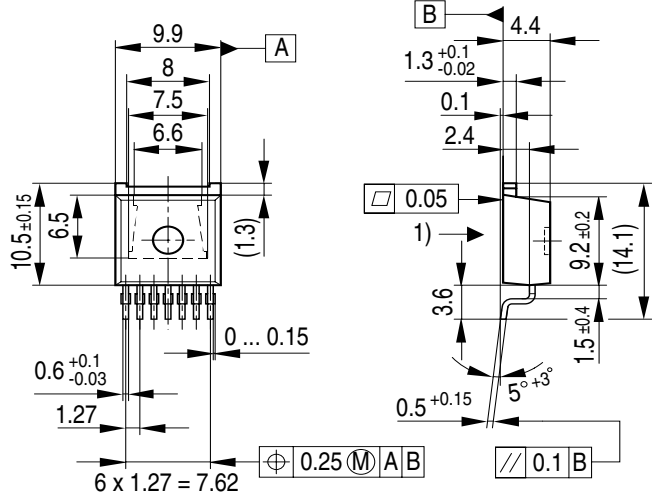
$V_{(BR)DSS}$ = f(T_j)

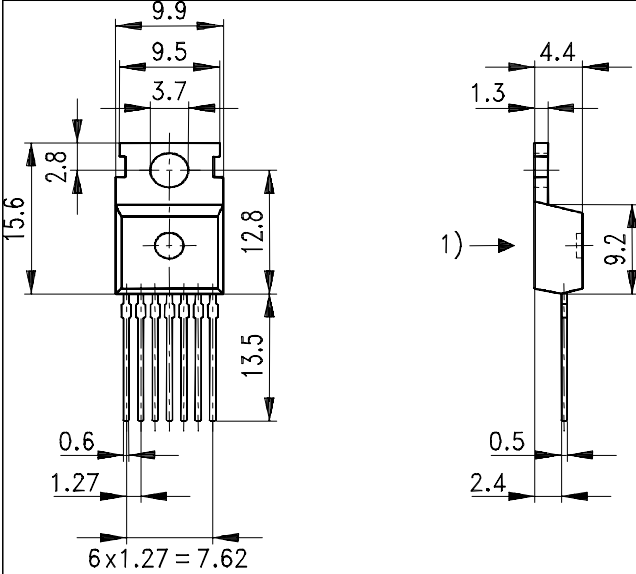| Package	Ordering Code	Package	Ordering Code
P-TO220-7-3	Q67060-S6004-A2	P-TO220-7-180	Q67060-S6005-A2

1) shear and punch direction no burrs this surface

GPT05167

1) Shear and punch direction no burrs this surface

- - - Back side, heatsink contour

All metal surfaces tin plated, except area of cut

Package	Ordering Code
P-TO220-7-230	Q67060-S6007

1) Shear and punch direction no burrs this surface

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