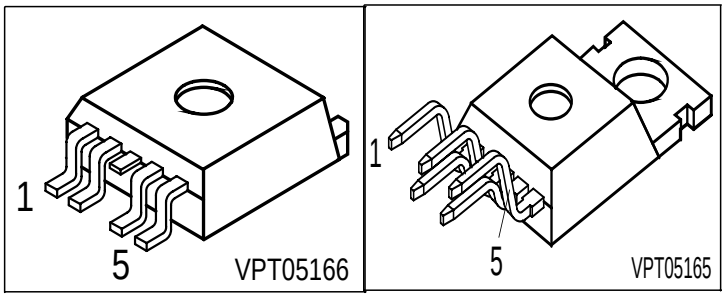
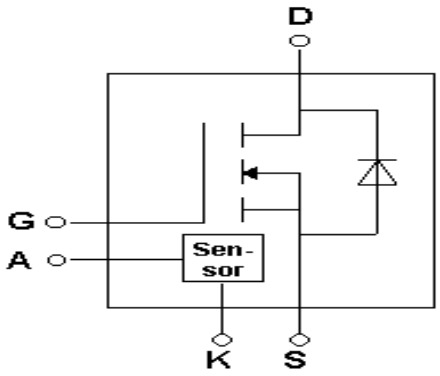
Speed TEMPFET®

- 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



Type	V_{DS}	$R_{DS(on)}$	Package	Marking	Ordering Code
BTS 247 Z	55 V	18 mΩ	TO-220 AB	-	Q67060-S6001
			TO-220-5 SMD		Q67060-S6002



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

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

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}	±14	
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
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

Electrical Characteristics

Parameter at T_j = 25°C, unless otherwise specified	Symbol	Values			Unit
		min.	typ.	max.	
Thermal 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	-	
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}	$V_{GS(th)}$				
I_D = 90 µA		1.2	1.6	2	
I_D = 250 µA		-	1.65	-	
Zero gate voltage drain current	I_{DSS}				µA
V_{DS} = 50 V, V_{GS} = 0 V, T_j = -40 °C		-	-	0.1	
V_{DS} = 50 V, V_{GS} = 0 V, T_j = 25 °C		-	0.1	1	
V_{DS} = 50 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	$R_{DS(on)}$	-	22	28	mΩ
V_{GS} = 4.5 V, I_D = 12 A		-	15	18	
V_{GS} = 10 V, I_D = 12 A					

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

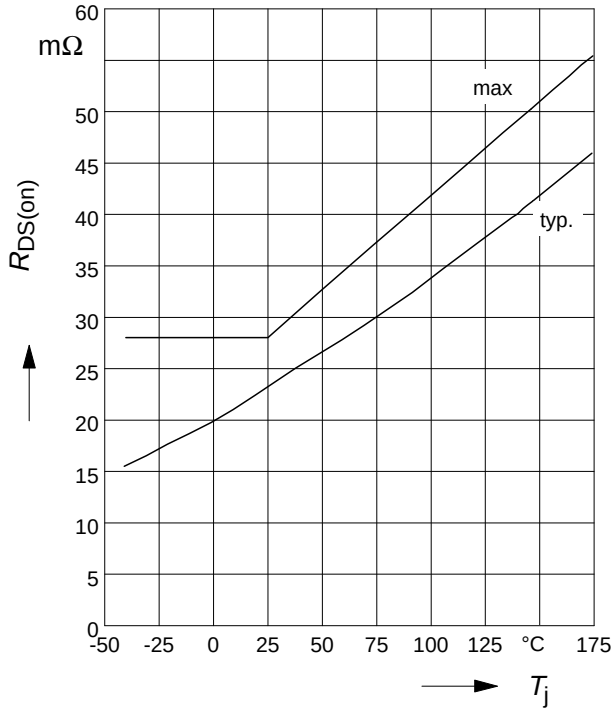
Parameter at T_j = 25°C, unless otherwise specified	Symbol	Values			Unit
		min.	typ.	max.	
Reverse Diode					
Inverse diode continuous forward current T_C = 25 °C	I_S	33	-	-	A
Inverse diode direct current,pulsed T_C = 25 °C	I_{FM}	180	-	-	
Inverse diode forward voltage V_{GS} = 0 V, I_F = 90 A	V_{SD}	-	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	nC
Sensor Characteristics					
Forward voltage $I_{AK(on)}$ = 5 mA, T_j = -40...+150 °C	$V_{AK(on)}$	-	1.3	1.4	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	
Temperature sensor leakage current T_j = 150 °C	$I_{AK(off)}$	-	-	4	µA

Electrical Characteristics

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Characteristics					
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	$T_{TS(on)}$	150	160	170	°C
V_{TS} = 5V					
Turn-off time	t_{off}	0.5	-	2.5	µs
V_{TS} = 5V, $I_{TS(on)}$ = 2 mA					
Reset voltage	$V_{AK(reset)}$	0.5	-	-	V
T_j = -40...+150°C					

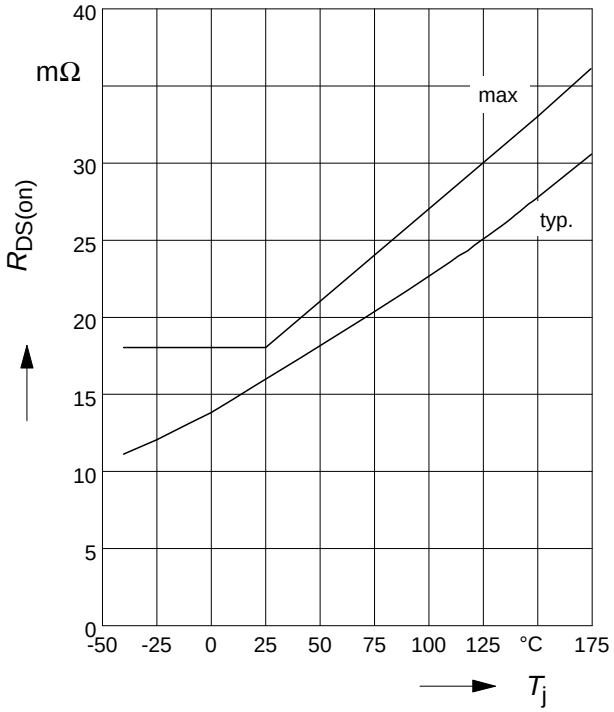
On-state resistance

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



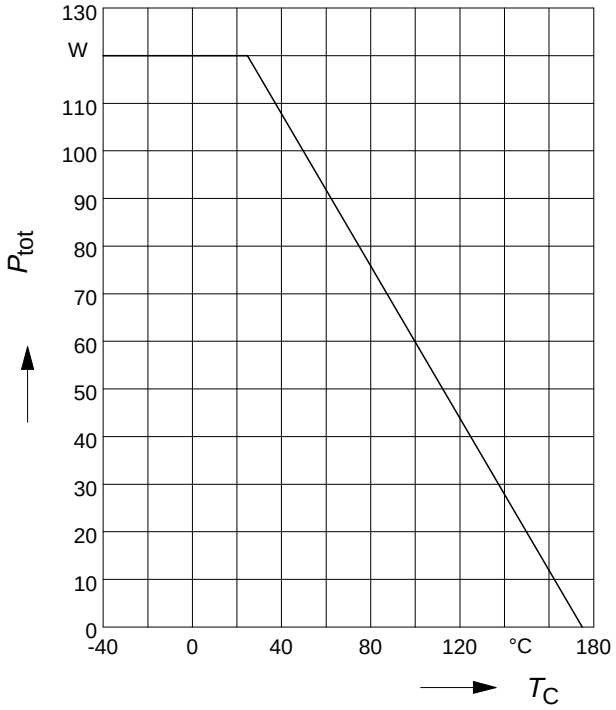
On-state resistance

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



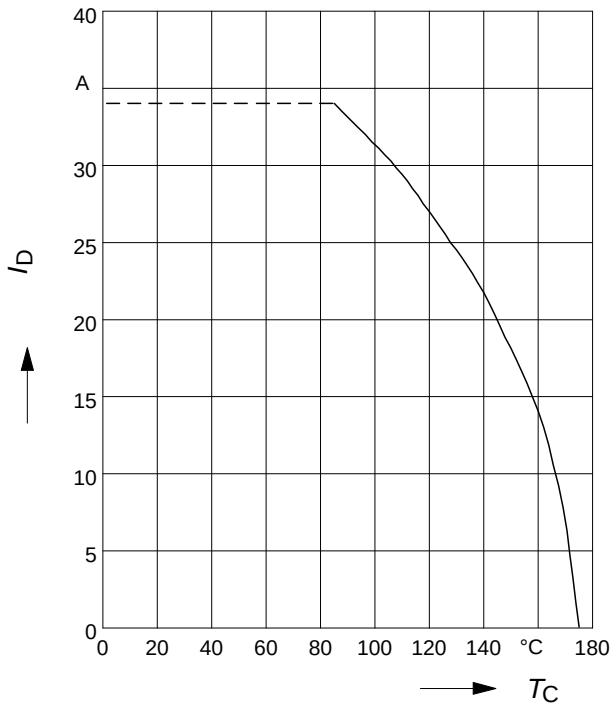
Maximum allowable power dissipation

$P_{tot} = f(T_C)$



Drain current

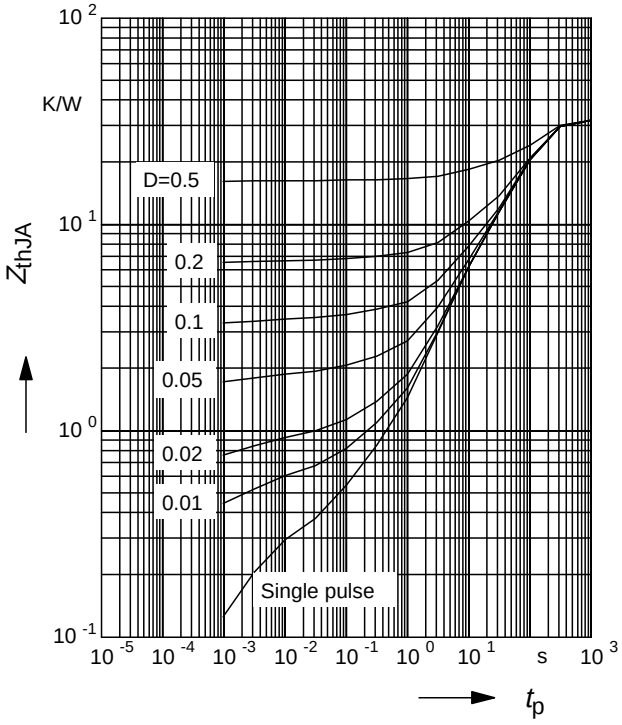
$I_D = f(T_C)$; $V_{GS} \geq 4.5V$



Typ. transient thermal impedance

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

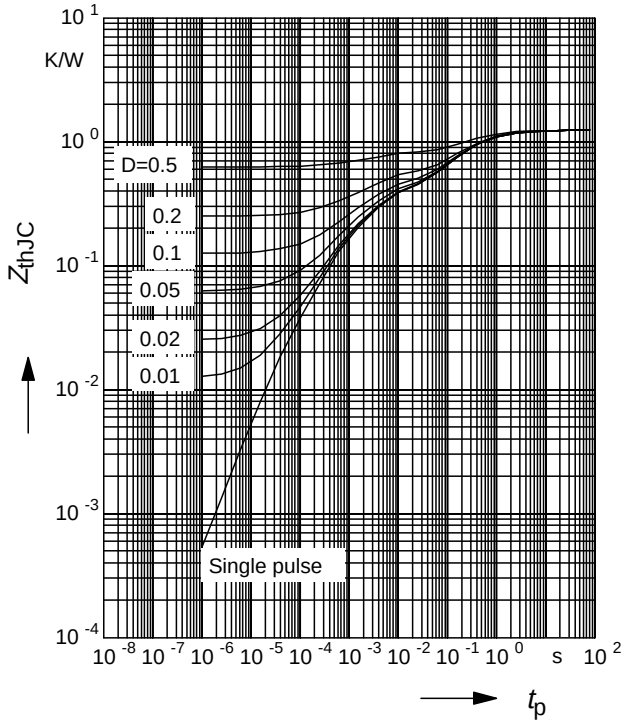
Parameter: $D=t_p/T$



Transient thermal impedance

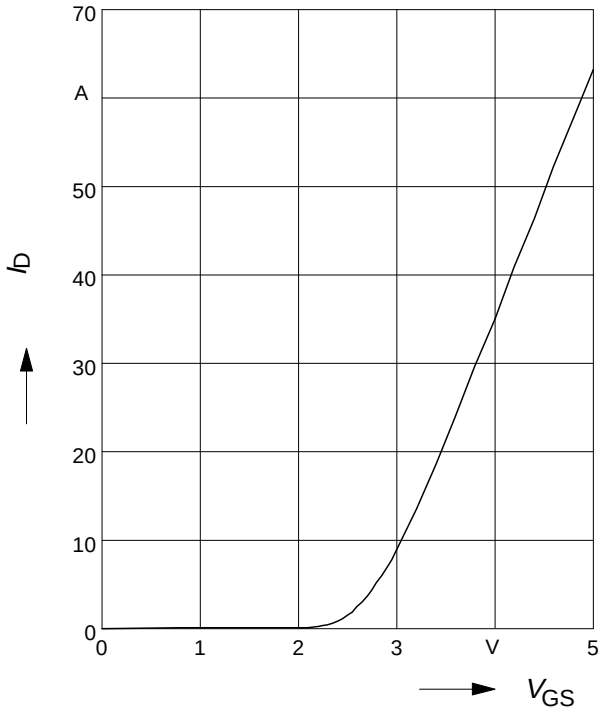
$Z_{thJC} = f(t_P)$

Parameter: $D=t_P/T$



Typ. transfer characteristics

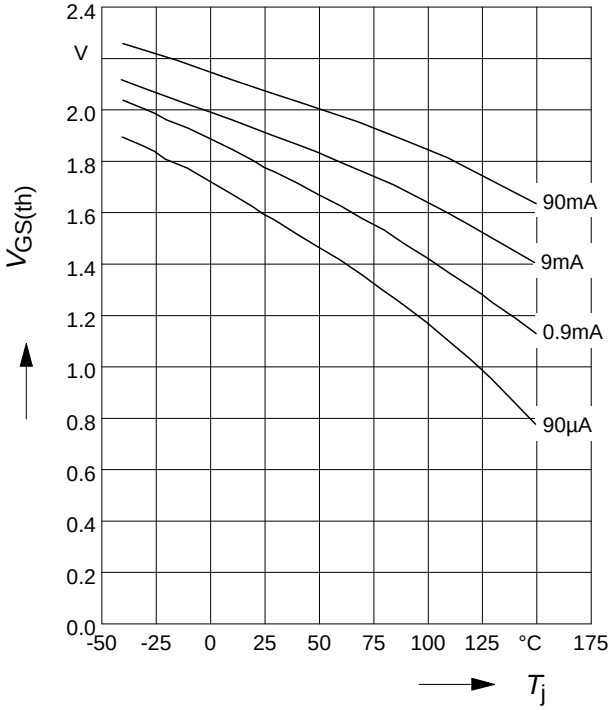
I_D = f(V_{GS}); V_{DS} = 12V; T_j = 25°C



Typ. input threshold voltage

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

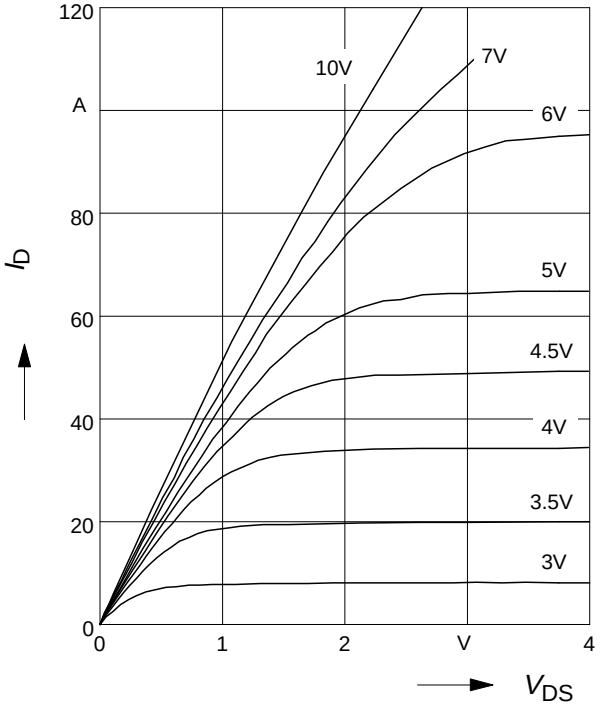
Parameter: I_D



Typ. output characteristic

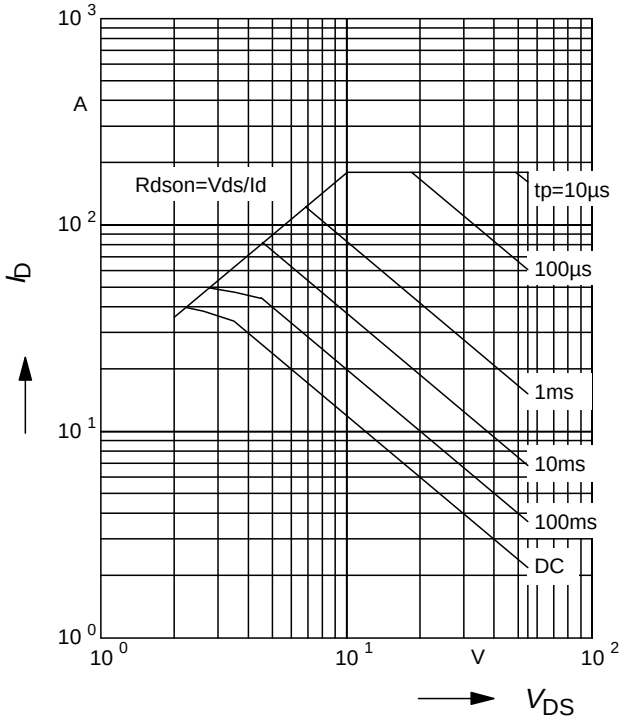
I_D = f(V_{DS}); T_j=25°C

Parameter: V_{GS}



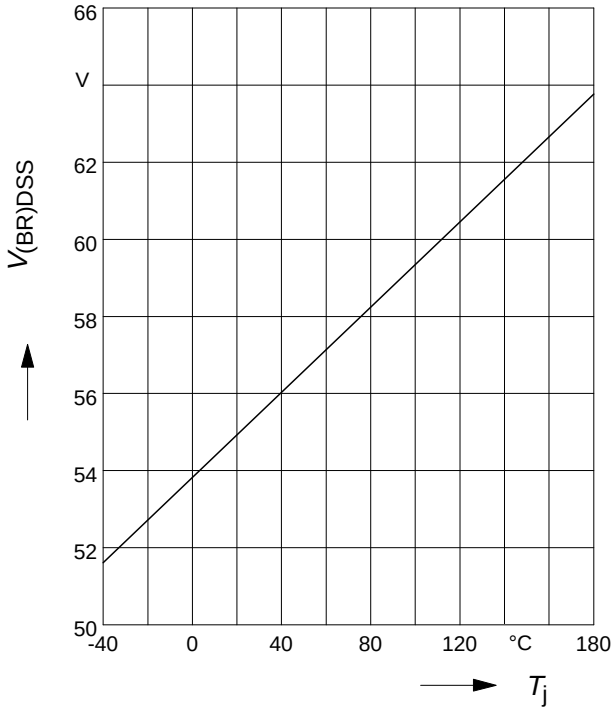
Safe operating area

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



Drain-source break down voltage

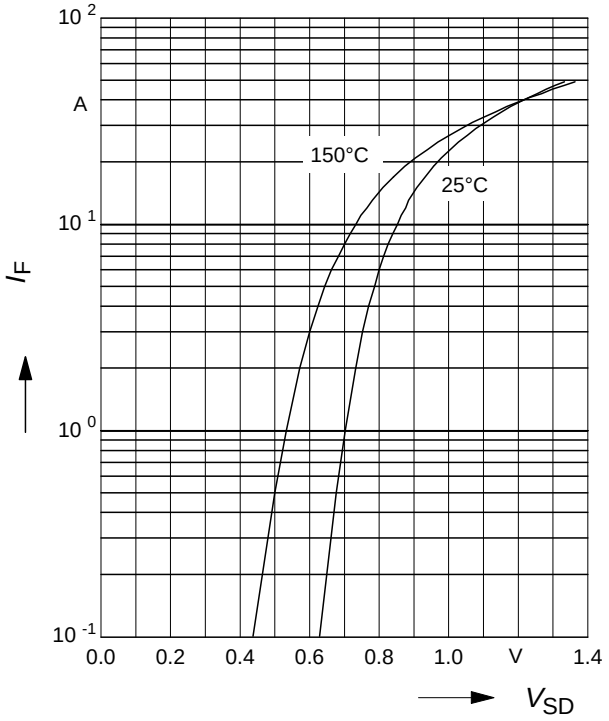
$V_{(BR)DSS} = f(T_j)$



Forward charcteristics of reverse diode

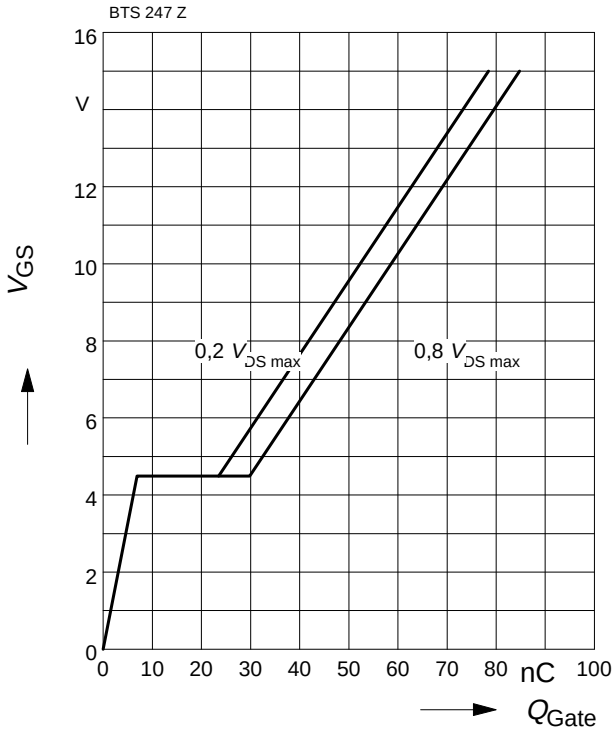
$I_F = f(V_{SD})$; t_p = 80µs (spread)

Parameter: T_j



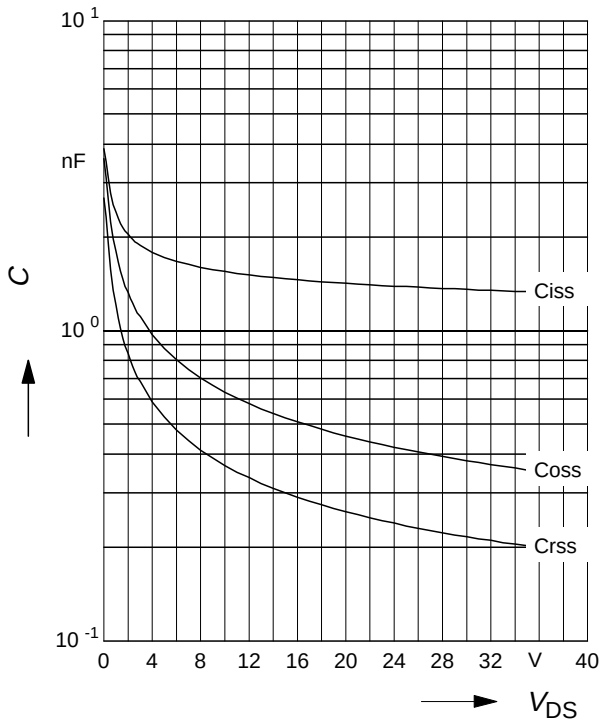
Typ. gate charge

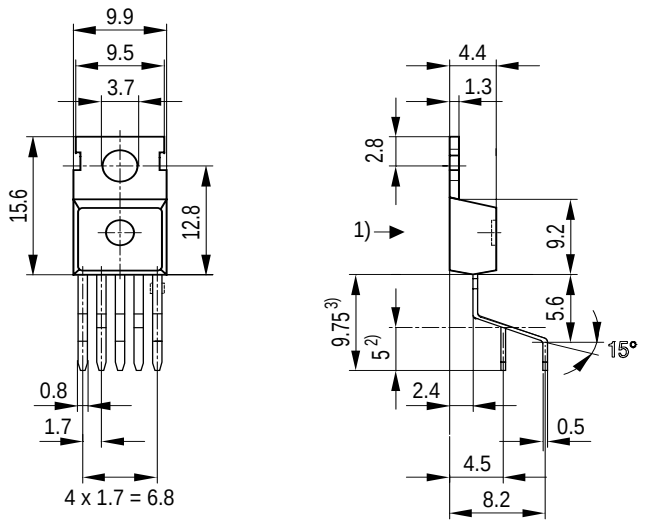
$V_{GS} = f(Q_{Gate})$; $I_{D\ puls}$ = 45 A



Typ. capacitances

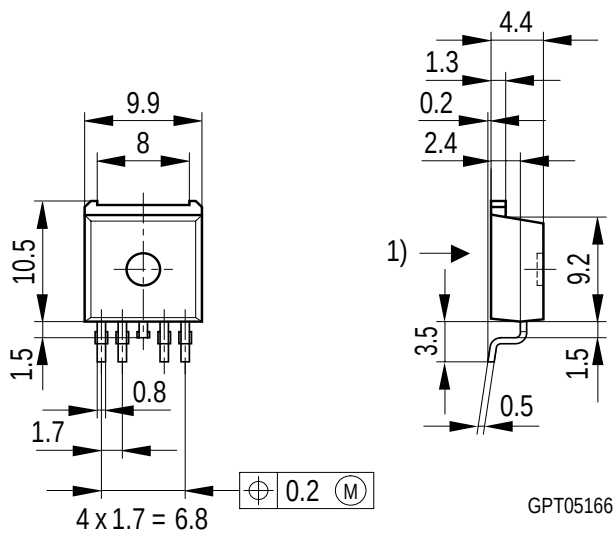
$C = f(V_{DS})$; V_{GS}=0 V, f=1 MHz





1) shear and punch direction no burrs this surface
2) min. length by tinning
3) max. 11 mm allowable by tinning

GPT05165



1) shear and punch direction no burrs this surface

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