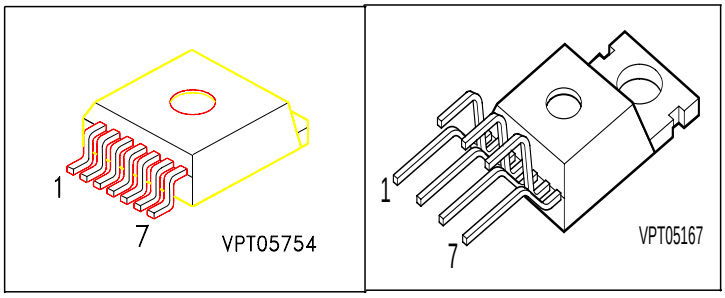
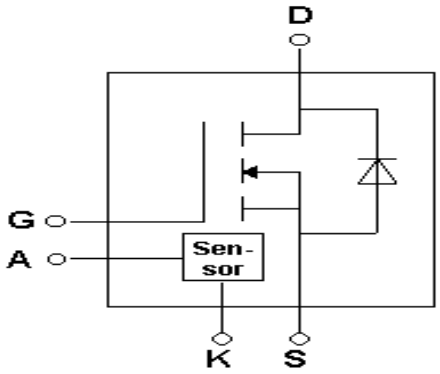
Speed TEMPFET®

- 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	Marking	Ordering Code
BTS 282 Z	49 V	6.5 mΩ	P-TO220-7-3	-	Q67060-S6004-A2
			P-TO220-7-180		Q67060-S6005-A2



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

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

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}	±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	$I_{D(ISO)}$	 36 51	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}	250	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}	-	-	0.6	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	$V_{(BR)DSS}$	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	$R_{DS(on)}$	-	8.2	9.5	mΩ
V_{GS} = 4.5 V, I_D = 36 A		-	5.8	6.5	
V_{GS} = 10 V, I_D = 36 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 = 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 ≥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

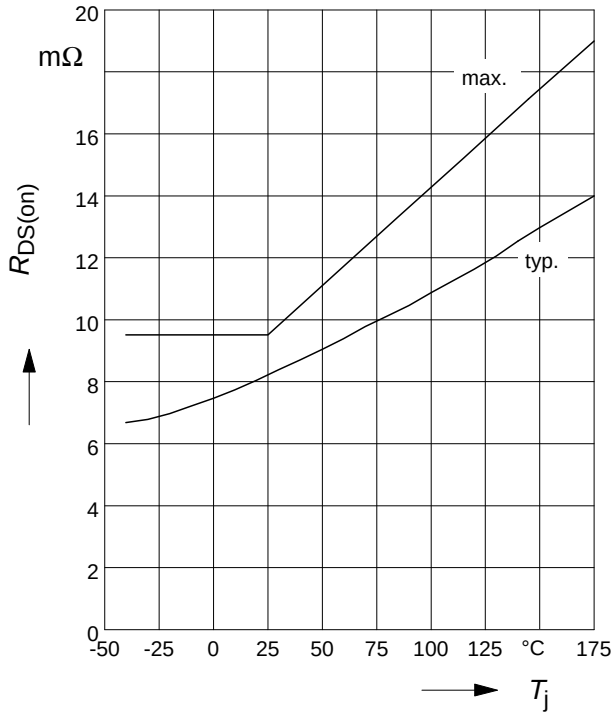
Parameter at T_j = 25°C, unless otherwise specified	Symbol	Values			Unit
		min.	typ.	max.	
Reverse Diode					
Inverse diode continuous forward current T_C = 25 °C	I_S	80	-	-	A
Inverse diode direct current,pulsed T_C = 25 °C	I_{FM}	320	-	-	
Inverse diode forward voltage V_{GS} = 0 V, I_F = 95 A	V_{SD}	-	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					
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					

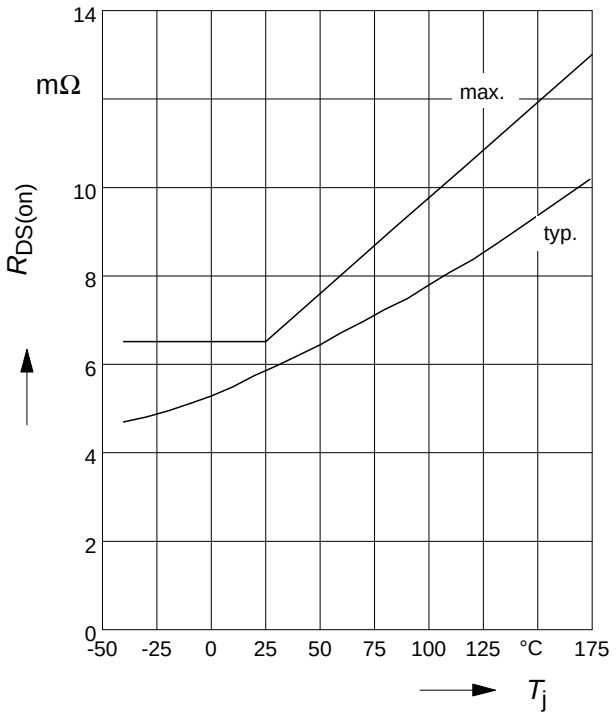
On-state resistance

R_{ON} = f(T_j); I_D=36A; V_{GS} = 4.5V



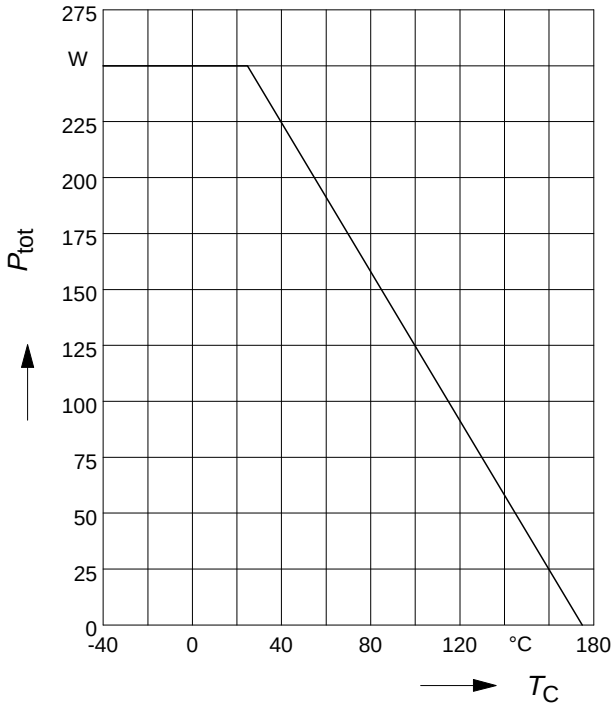
On-state resistance

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



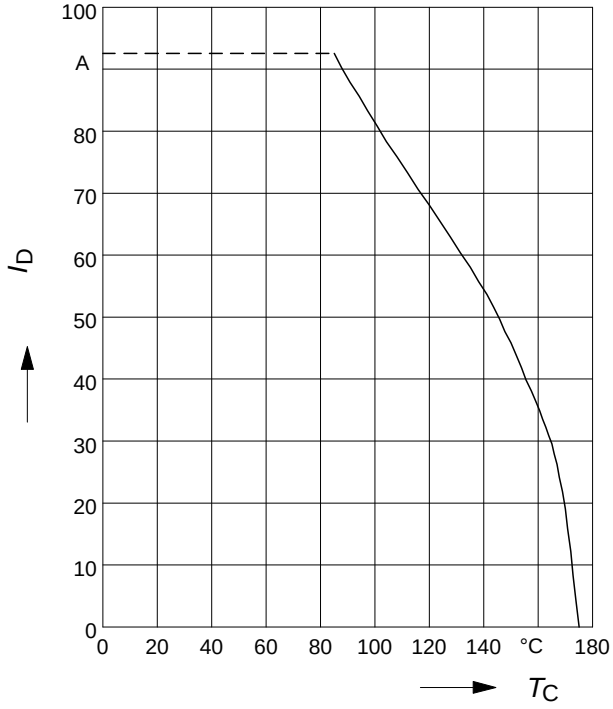
Maximum allowable power dissipation

$P_{tot} = f(T_C)$



Drain current

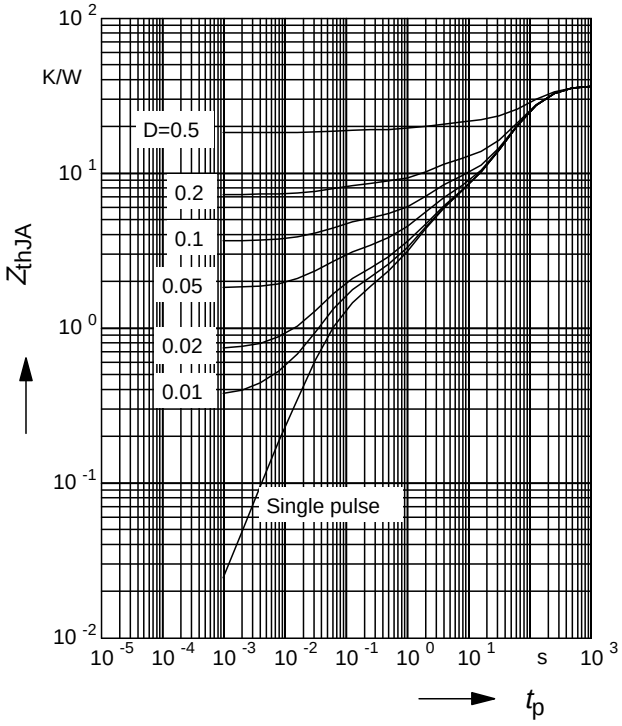
$I_D = f(T_C)$; $V_{GS} \geq 4.5V$



Typ. transient thermal impedance

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

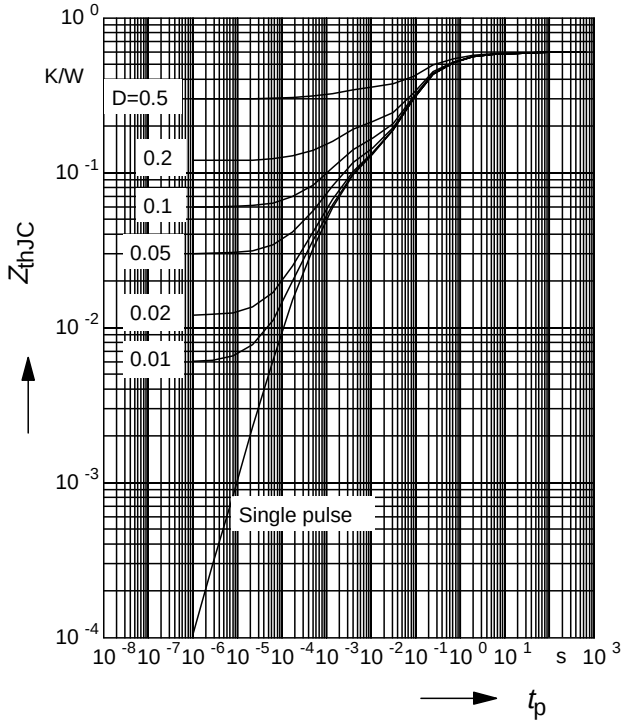
Parameter: $D=t_p/T$



Transient thermal impedance

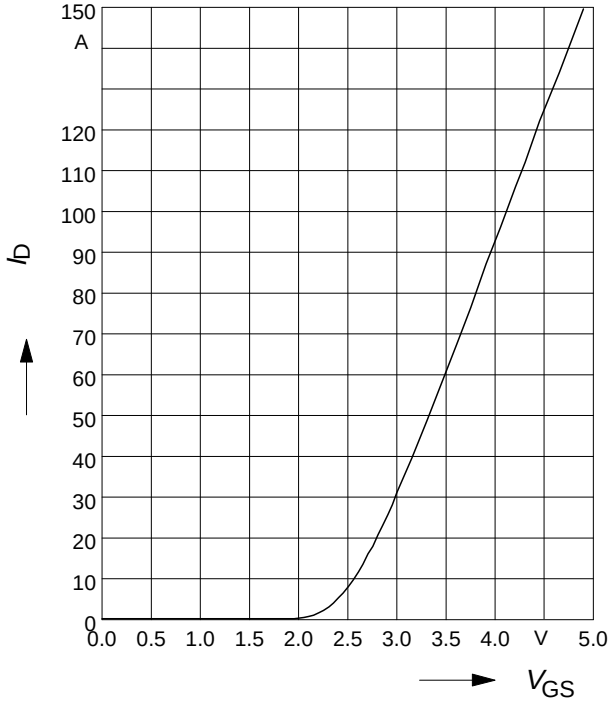
$Z_{thJC} = f(t_P)$

Parameter: $D=t_P/T$



Typ. transfer characteristics

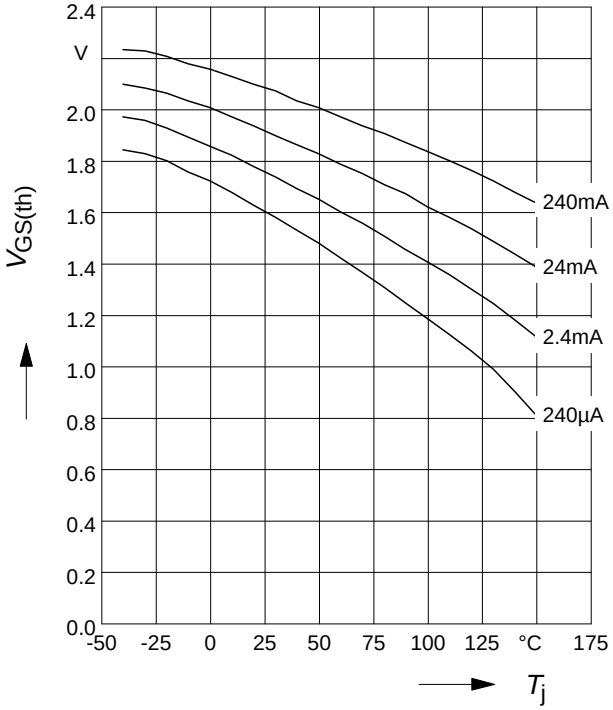
I_D = f(V_{GS}); V_{DS} = 12V; T_j = 25°C



Typ. input threshold voltage

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

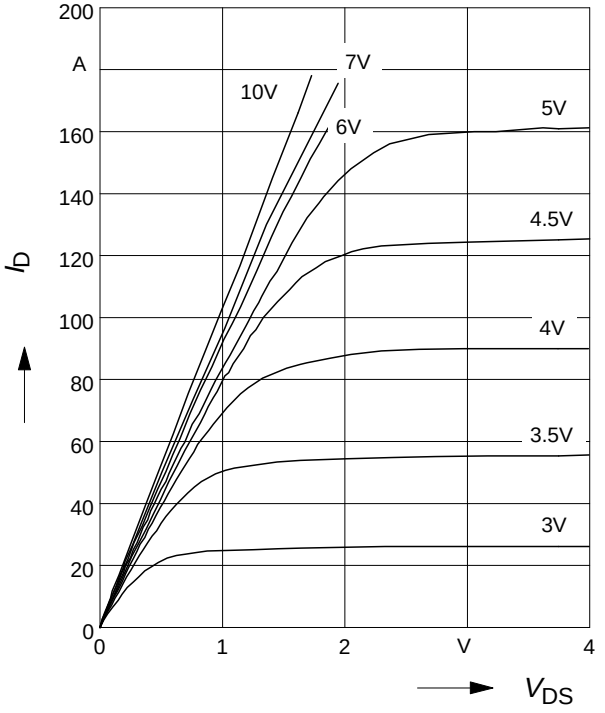
Parameter: I_D



Typ. output characteristic

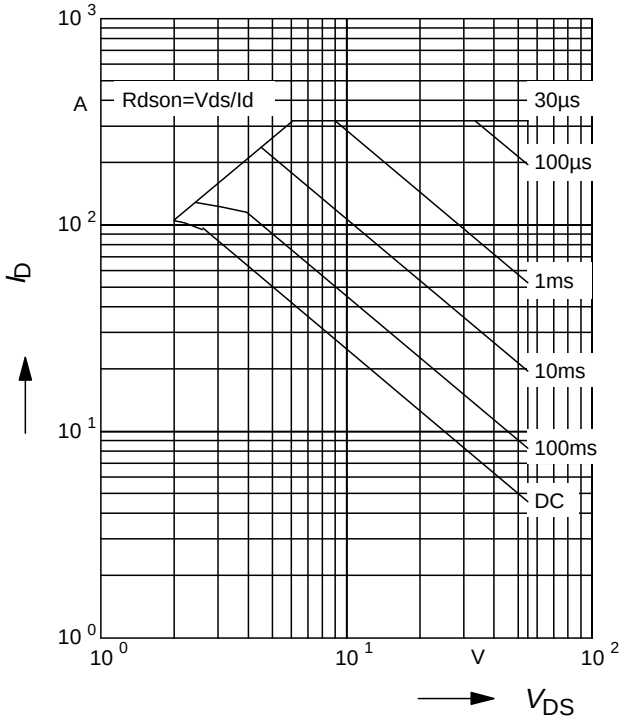
I_D = f(V_{DS}); T_j=25°C

Parameter: V_{GS}



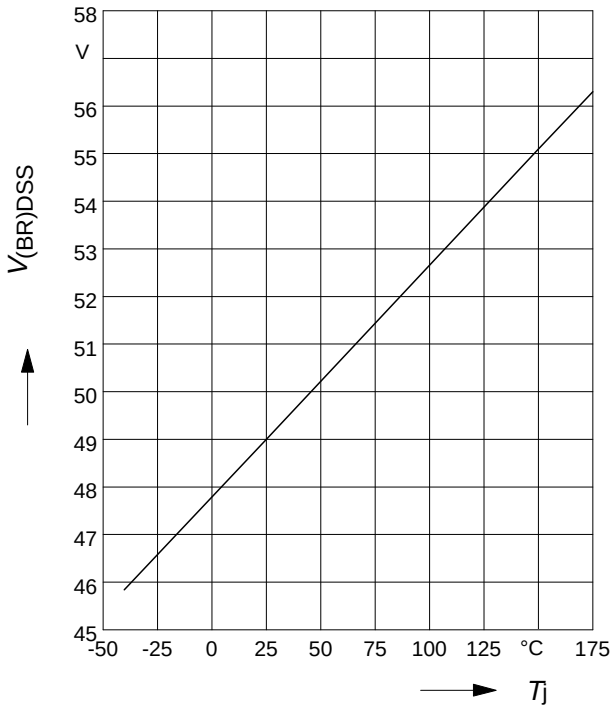
Safe operating area

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



Drain-source break down voltage

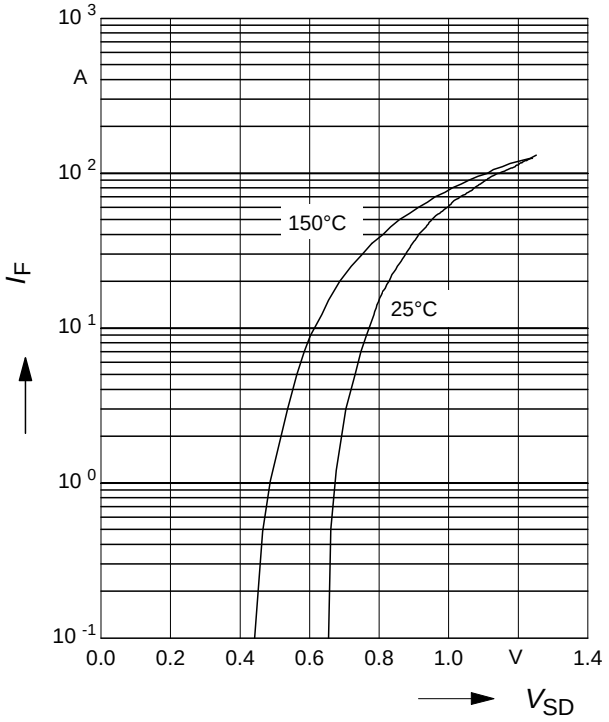
$V_{(BR)DSS} = f(T_j)$;



Typ. reverse diode forward charcteristics

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

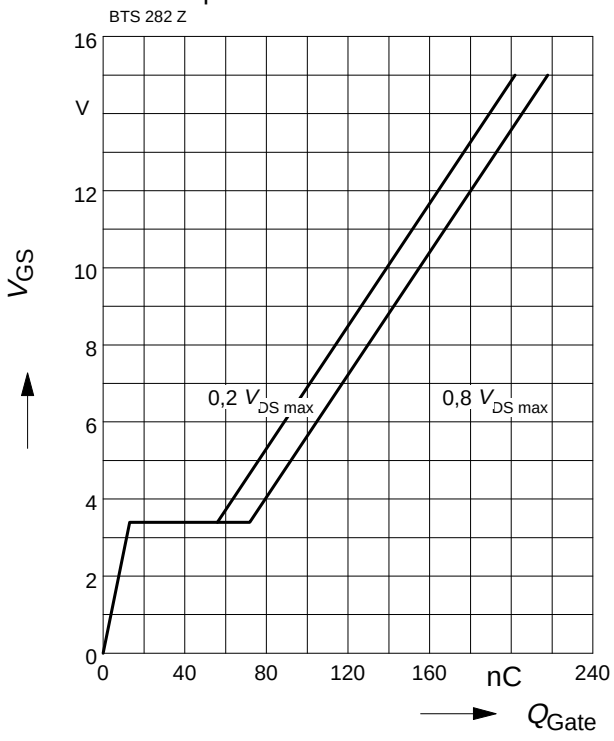
Parameter: T_j



Typ. gate charge

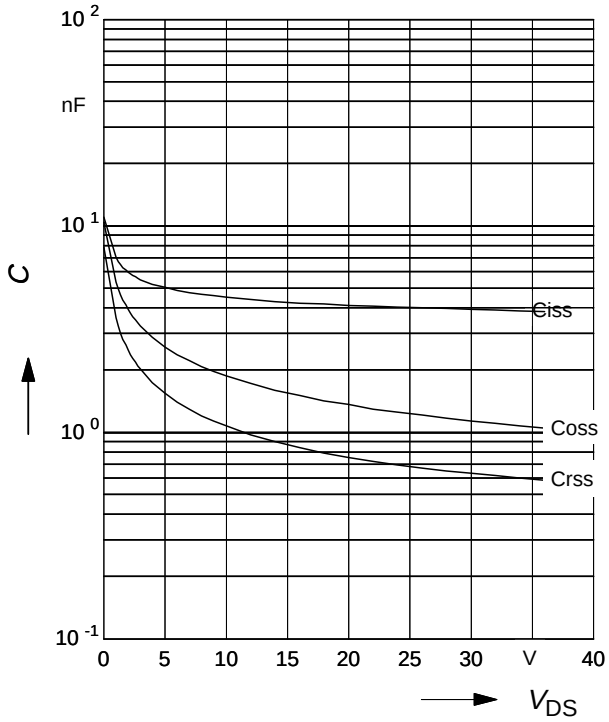
$V_{GS} = f(Q_{Gate})$

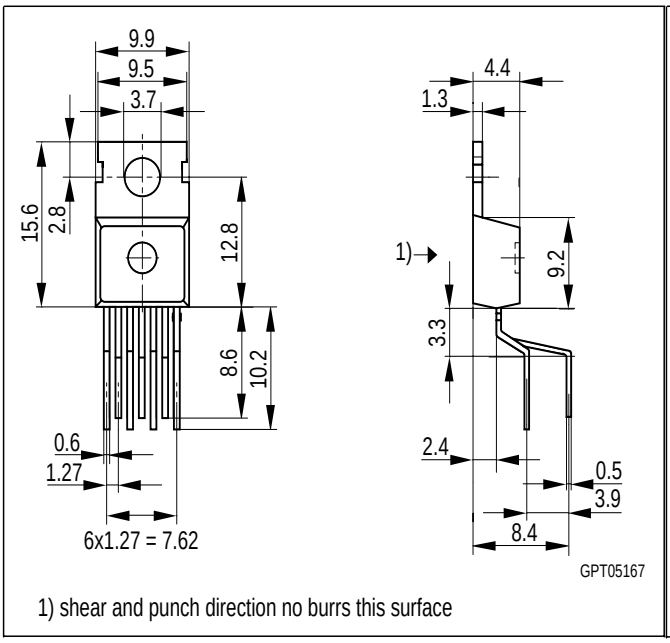
Parameter: $I_{D\ puls}$ = 80 A

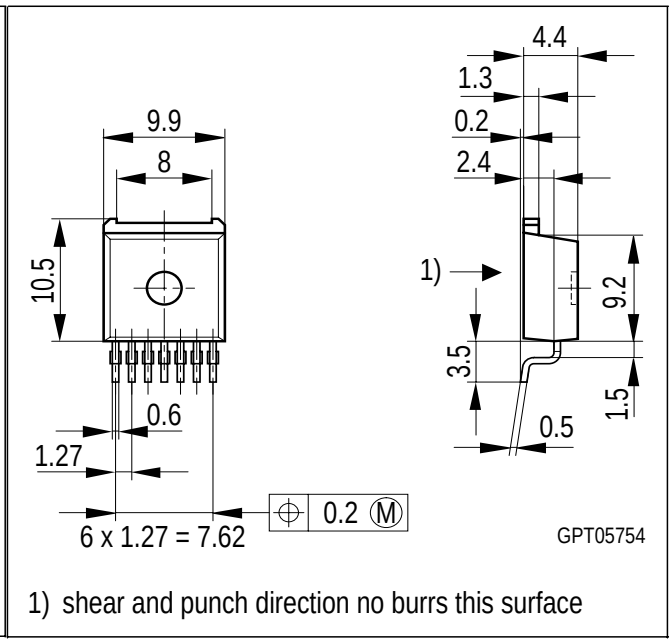


Typ. capacitances

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







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