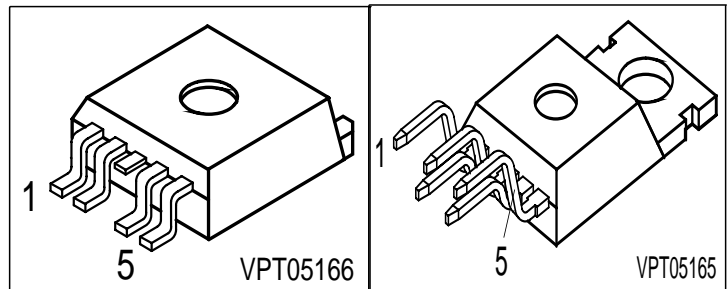
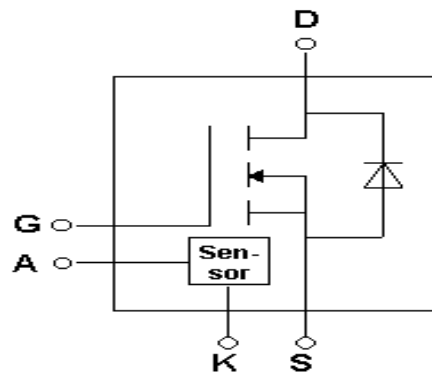


Speed TEMPFET®

- 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 244 Z	55 V	13 mΩ	TO-220 AB	-	Q67060-S6000
			TO-220-5 SMD		Q67060-S6003



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 $T_j = 25^\circ\text{C}$ unless otherwise specified

Parameter	Symbol	Value	Unit
Drain source voltage	V_{DS}	55	V
Drain-gate voltage, $R_{GS} = 20\text{ k}\Omega$	V_{DGR}	55	
Gate source voltage	V_{GS}	± 14	
Nominal load current (ISO 10483) $V_{GS} = 4.5\text{ V}$, $V_{DS} \leq 0.5\text{ V}$, $T_C = 85^\circ\text{C}$ $V_{GS} = 10\text{ V}$, $V_{DS} \leq 0.5\text{ V}$, $T_C = 85^\circ\text{C}$	$I_{D(ISO)}$	19 26	A
Continuous drain current ¹⁾ $T_C = 100^\circ\text{C}$, $V_{GS} = 4.5\text{V}$	I_D	35	
Pulsed drain current	$I_{D\text{ puls}}$	188	
Avalanche energy, single pulse $I_D = 19\text{ A}$, $R_{GS} = 25\ \Omega$	E_{AS}	1.65	J
Power dissipation $T_C = 25^\circ\text{C}$	P_{tot}	170	W
Operating temperature ²⁾	T_j	-40 ... +175	$^\circ\text{C}$
Storage temperature	T_{stg}	-55 ... +150	
DIN humidity category, DIN 40 040		E	
IEC climatic category; DIN IEC 68-1		40/150/56	

¹current limited by bond wire

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

Electrical Characteristics

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

Thermal Characteristics

junction - case:	R_{thJC}	-	-	0.88	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 $V_{GS} = 0\text{ V}$, $I_D = 0.25\text{ mA}$	$V_{(BR)DSS}$	55	-	-	V
Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D = 130\ \mu\text{A}$ $I_D = 250\ \mu\text{A}$	$V_{GS(th)}$	1.2 -	1.6 1.65	2 -	
Zero gate voltage drain current $V_{DS} = 50\text{ V}$, $V_{GS} = 0\text{ V}$, $T_j = -40\ ^\circ\text{C}$ $V_{DS} = 50\text{ V}$, $V_{GS} = 0\text{ V}$, $T_j = 25\ ^\circ\text{C}$ $V_{DS} = 50\text{ V}$, $V_{GS} = 0\text{ V}$, $T_j = 150\ ^\circ\text{C}$	I_{DSS}	- - -	- 0.1 -	0.1 1 100	μA
Gate-source leakage current $V_{GS} = 20\text{ V}$, $V_{DS} = 0\text{ V}$, $T_j = 25\ ^\circ\text{C}$ $V_{GS} = 20\text{ V}$, $V_{DS} = 0\text{ V}$, $T_j = 150\ ^\circ\text{C}$	I_{GSS}	- -	10 20	100 100	nA
Drain-Source on-state resistance $V_{GS} = 4.5\text{ V}$, $I_D = 19\text{ A}$ $V_{GS} = 10\text{ V}$, $I_D = 19\text{ A}$	$R_{DS(on)}$	- -	16 11.5	18 13	m Ω

¹ Device on 50mm*50mm*1.5mm epoxy PCB FR4 with 6cm² (one layer, 70 μm thick) copper area for drain connection. PCB mounted vertical without blown air.

Electrical Characteristics

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

Dynamic Characteristics

Forward transconductance $V_{DS} > 2 \cdot I_D \cdot R_{DS(on)max}$, $I_D = 35\text{ A}$	g_{fs}	25	-	-	S
Input capacitance $V_{GS} = 0\text{ V}$, $V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$	C_{iss}	-	2130	2660	pF
Output capacitance $V_{GS} = 0\text{ V}$, $V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$	C_{oss}	-	600	750	
Reverse transfer capacitance $V_{GS} = 0\text{ V}$, $V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$	C_{rss}	-	320	400	
Turn-on delay time $V_{DD} = 30\text{ V}$, $V_{GS} = 4.5\text{ V}$, $I_D = 47\text{ A}$, $R_G = 2.2\ \Omega$	$t_{d(on)}$	-	15	25	ns
Rise time $V_{DD} = 30\text{ V}$, $V_{GS} = 4.5\text{ V}$, $I_D = 47\text{ A}$, $R_G = 2.2\ \Omega$	t_r	-	70	105	
Turn-off delay time $V_{DD} = 30\text{ V}$, $V_{GS} = 4.5\text{ V}$, $I_D = 47\text{ A}$, $R_G = 2.2\ \Omega$	$t_{d(off)}$	-	40	60	
Fall time $V_{DD} = 30\text{ V}$, $V_{GS} = 4.5\text{ V}$, $I_D = 47\text{ A}$, $R_G = 2.2\ \Omega$	t_f	-	25	40	

Gate Charge Characteristics

Gate charge at threshold $V_{DD} = 40\text{ V}$, $I_D = 0.1\text{ A}$, $V_{GS} = 0\text{ to }1\text{ V}$	$Q_{g(th)}$	-	2.5	3.8	nC
Gate charge at 5.0 V $V_{DD} = 40\text{ V}$, $I_D = 47\text{ A}$, $V_{GS} = 0\text{ to }5\text{ V}$	$Q_{g(5)}$	-	50	75	
Gate charge total $V_{DD} = 40\text{ V}$, $I_D = 47\text{ A}$, $V_{GS} = 0\text{ to }10\text{ V}$	$Q_{g(total)}$	-	85	130	
Gate plateau voltage $V_{DD} = 40\text{ V}$, $I_D = 47\text{ A}$	$V_{(plateau)}$	-	4.5	-	V

Electrical Characteristics

Parameter at $T_j = 25^\circ\text{C}$, unless otherwise specified	Symbol	Values			Unit
		min.	typ.	max.	
Reverse Diode					
Inverse diode continuous forward current $T_C = 25^\circ\text{C}$	I_S	35	-	-	A
Inverse diode direct current, pulsed $T_C = 25^\circ\text{C}$	I_{FM}	188	-	-	
Inverse diode forward voltage $V_{GS} = 0\text{ V}$, $I_F = 94\text{ A}$	V_{SD}	-	1.25	1.8	V
Reverse recovery time $V_R = 30\text{ V}$, $I_F = I_S$, $di_F/dt = 100\text{ A}/\mu\text{s}$	t_{rr}	-	110	165	ns
Reverse recovery charge $V_R = 30\text{ V}$, $I_F = I_S$, $di_F/dt = 100\text{ A}/\mu\text{s}$	Q_{rr}	-	0.23	0.35	nC

Sensor Characteristics

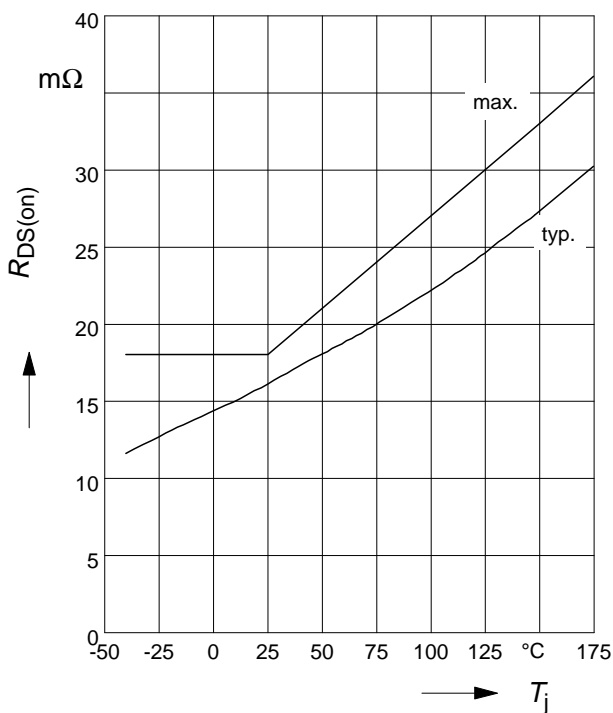
Forward voltage $I_{AK(on)} = 5\text{ mA}$, $T_j = -40\dots+150^\circ\text{C}$	$V_{AK(on)}$	-	1.3	1.4	V
Sensor override $t_P = 100\ \mu\text{s}$, $T_j = -40\dots+150^\circ\text{C}$		-	-	10	
Forward current $T_j = -40\dots+150^\circ\text{C}$	$I_{AK(on)}$	-	-	5	mA
Sensor override $t_P = 100\ \mu\text{s}$, $T_j = -40\dots+150^\circ\text{C}$		-	-	600	
Temperature sensor leakage current $T_j = 150^\circ\text{C}$	$I_{AK(off)}$	-	-	4	μA

Electrical Characteristics

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Characteristics					
Holding current, $V_{AK(off)} = 5V$ $T_j = 25\text{ }^\circ\text{C}$ $T_j = 150\text{ }^\circ\text{C}$	$I_{AK(hold)}$	0.05 0.05	- -	0.5 0.3	mA
Thermal trip temperature $V_{TS} = 5V$	$T_{TS(on)}$	150	160	170	$^\circ\text{C}$
Turn-off time $V_{TS} = 5V, I_{TS(on)} = 2\text{ mA}$	t_{off}	0.5	-	2.5	μs
Reset voltage $T_j = -40\dots+150\text{ }^\circ\text{C}$	$V_{AK(reset)}$	0.5	-	-	V

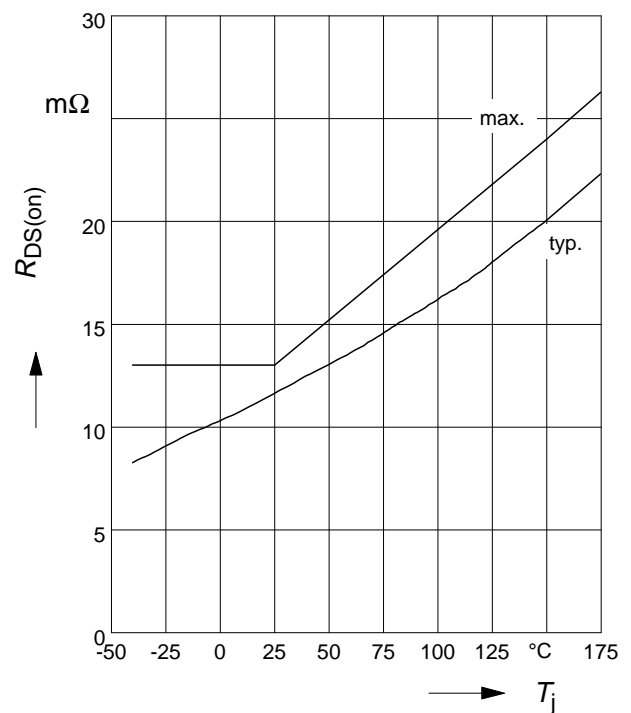
On-state resistance

$$R_{ON} = f(T_j); I_D=19A; V_{GS} = 4.5V$$



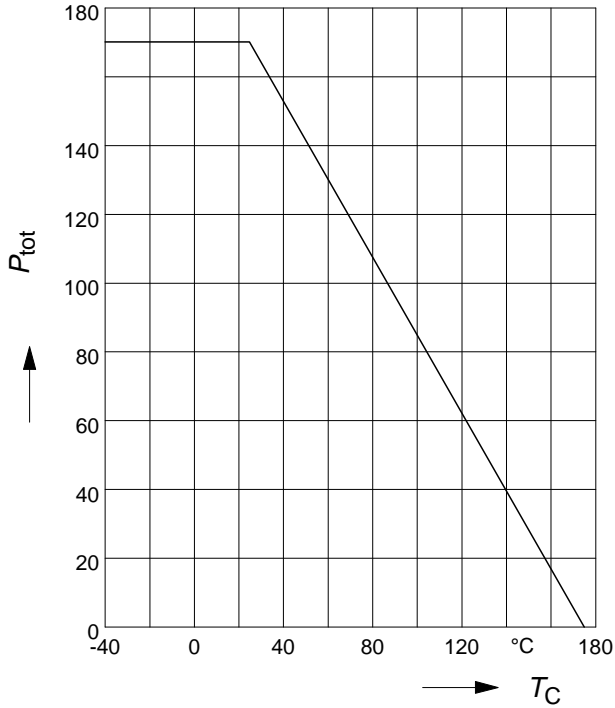
On-state resistance

$$R_{ON} = f(T_j); I_D=19A; V_{GS} = 10V$$



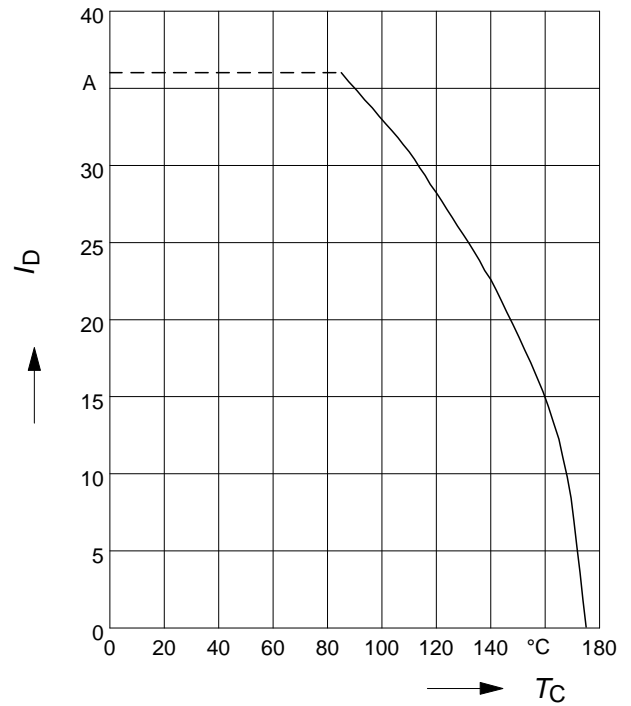
Maximum allowable power dissipation

$$P_{\text{tot}} = f(T_C)$$



Drain current

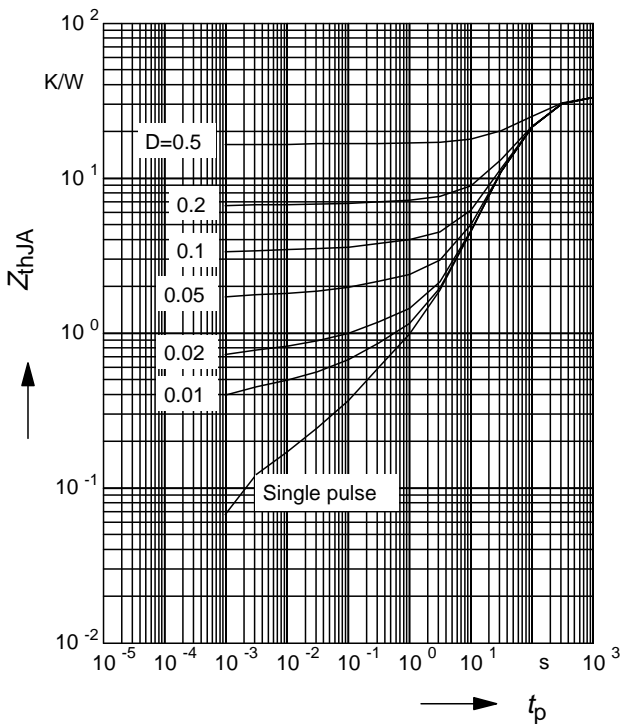
$$I_D = f(T_C); V_{GS} \geq 4.5V$$



Typ. transient thermal impedance

$$Z_{\text{thJA}} = f(t_p) \text{ @ } 6 \text{ cm}^2 \text{ cooling area}$$

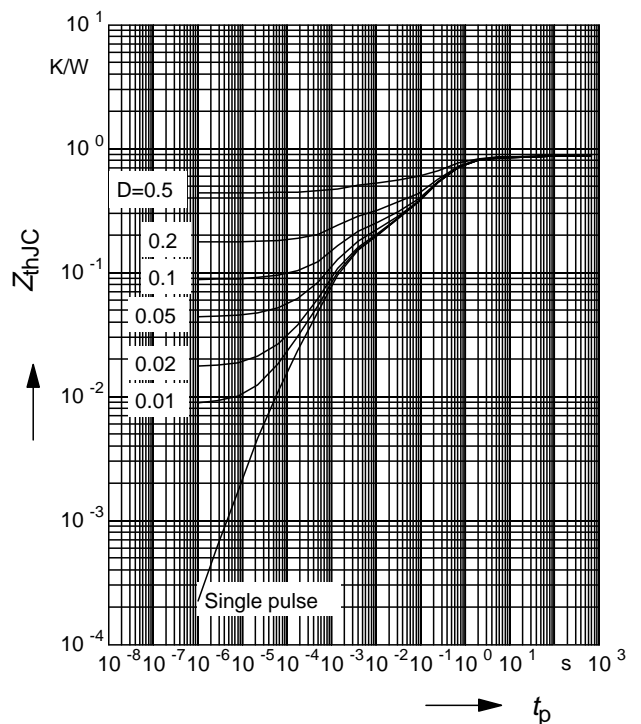
Parameter: $D = t_p / T$



Transient thermal impedance

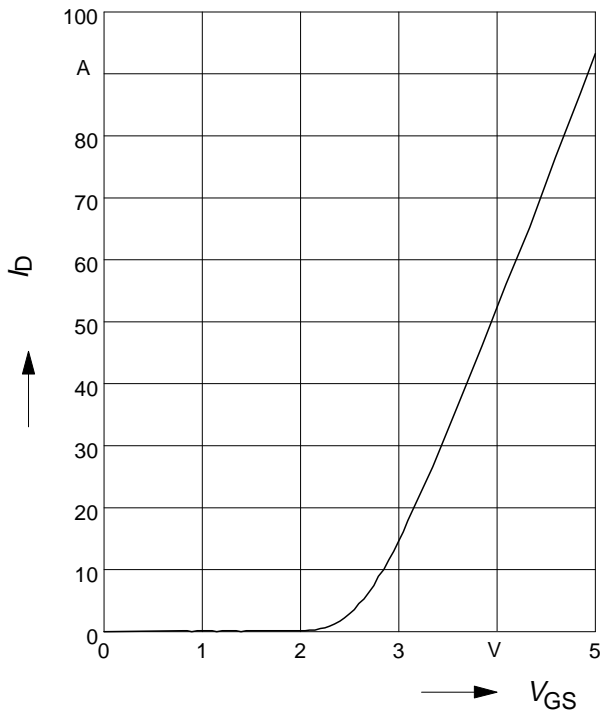
$$Z_{\text{thJC}} = f(t_p)$$

Parameter: $D = t_p / T$



Typ. transfer characteristics

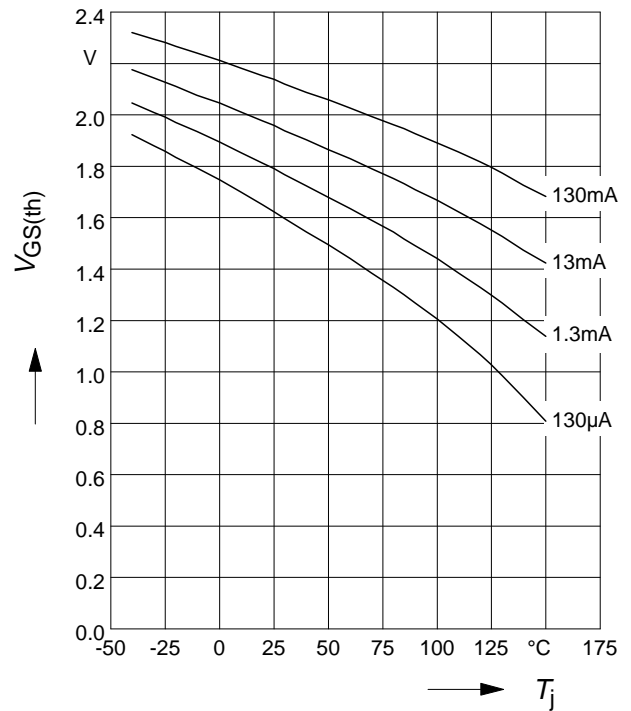
$$I_D = f(V_{GS}); V_{DS} = 12V; T_j = 25^\circ C$$



Typ. input threshold voltage

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

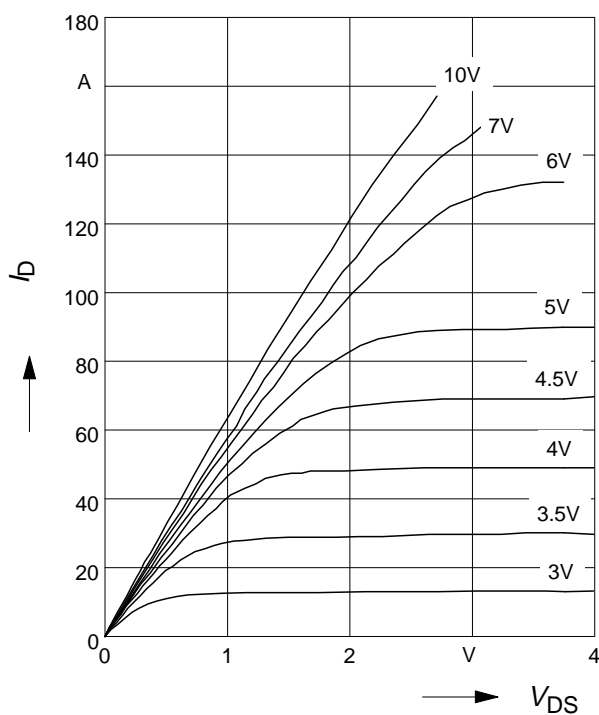
Parameter: I_D



Typ. output characteristic

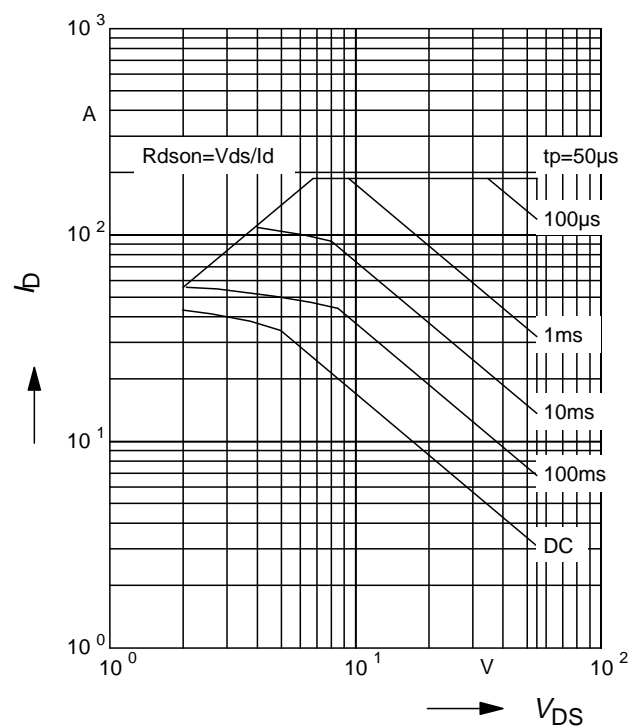
$$I_D = f(V_{DS}); T_j = 25^\circ C$$

Parameter: V_{GS}



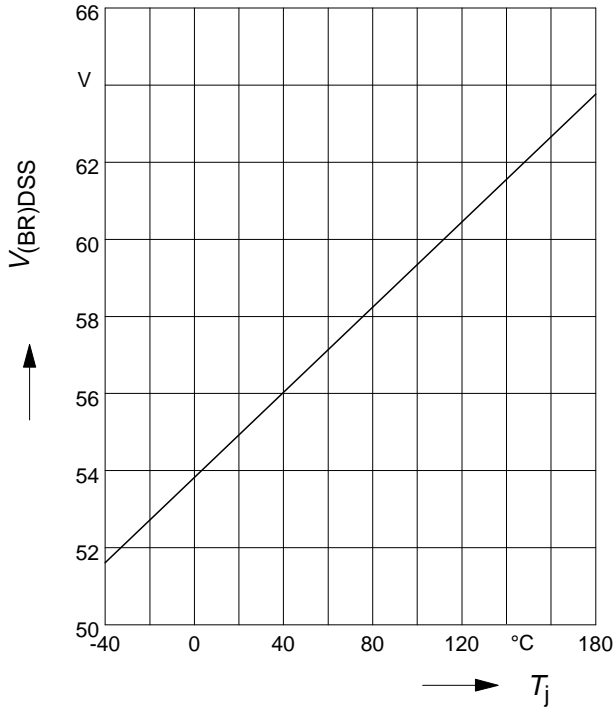
Safe operating area

$$I_D = f(V_{DS}); D = 0.01; T_C = 25^\circ C; V_{GS} = 4.5V$$



Drain-source break down voltage

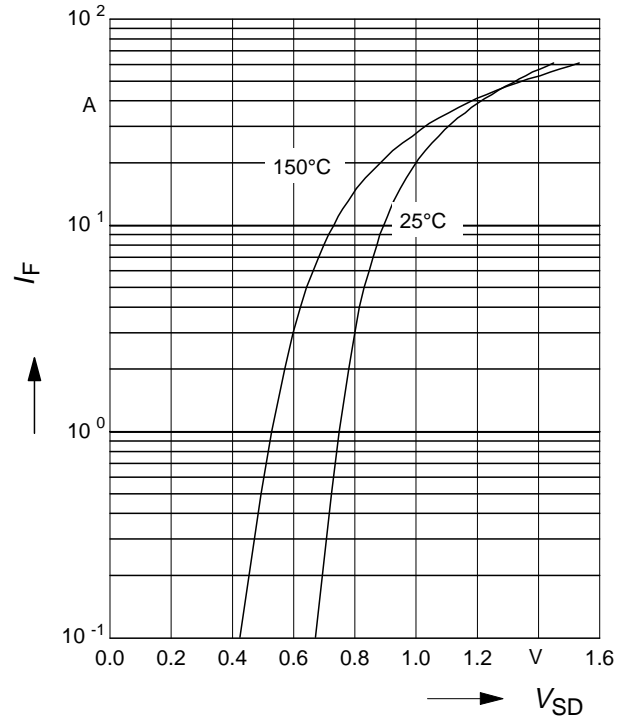
$$V_{(BR)DSS} = f(T_j)$$



Forward characteristics of reverse diode

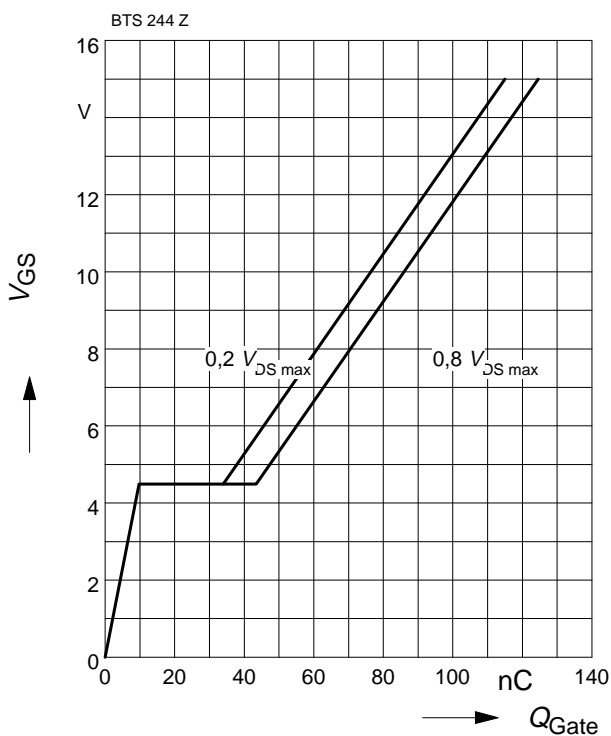
$$I_F = f(V_{SD}); t_p = 80\mu s \text{ (spread)}$$

Parameter: T_j



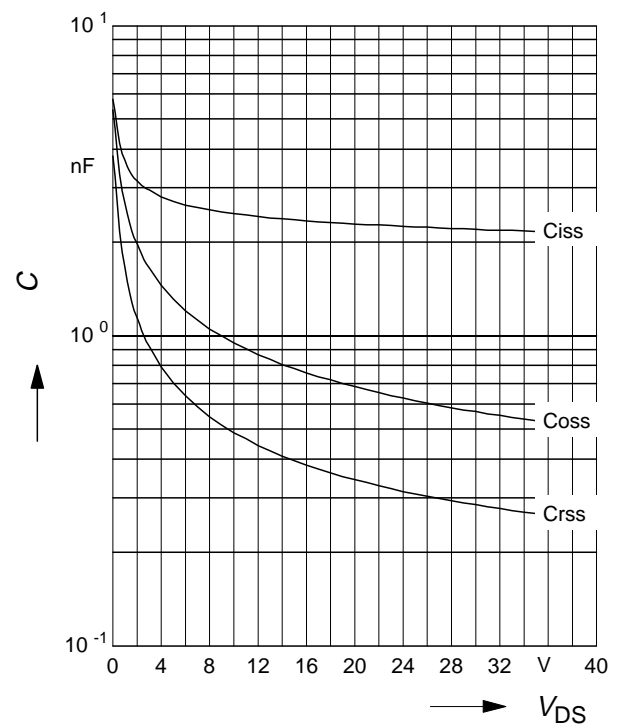
Typ. gate charge

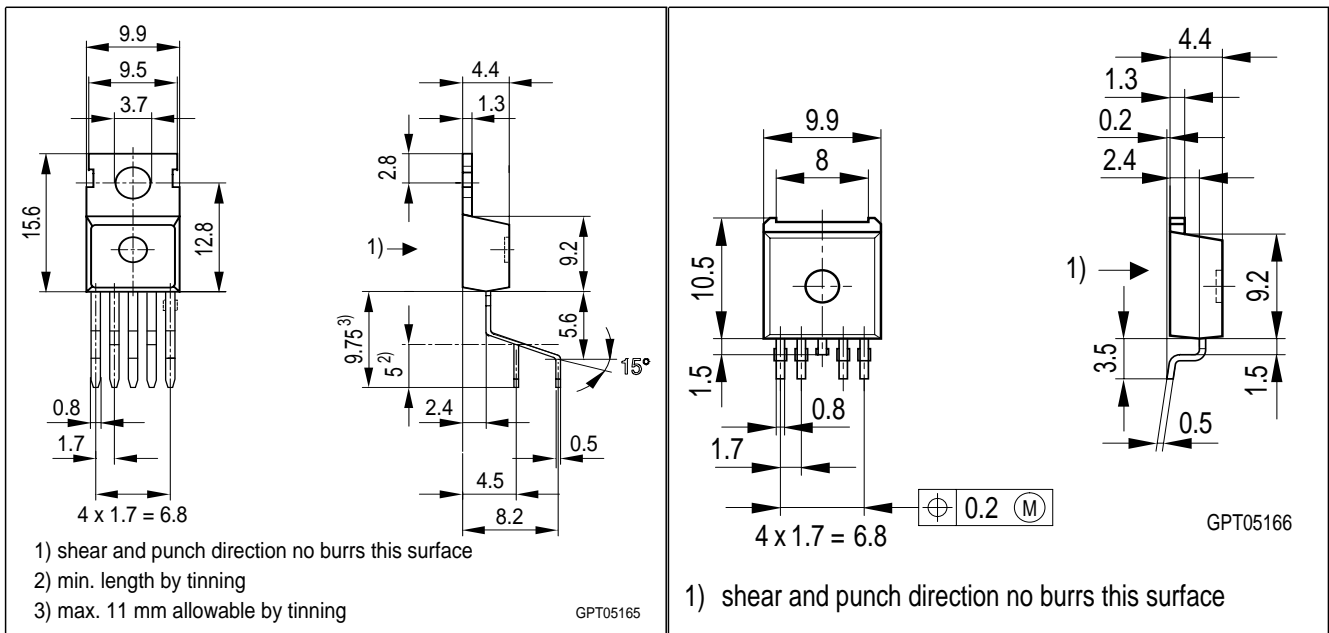
$$V_{GS} = f(Q_{Gate}); I_{D \text{ puls}} = 47A$$



Typ. capacitances

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





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