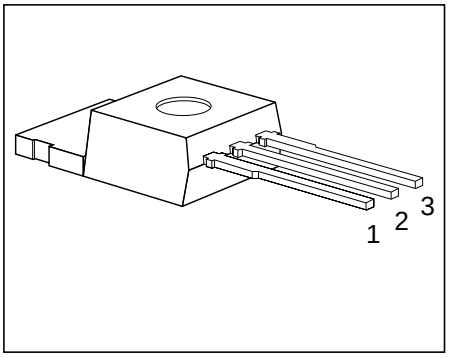
SIEMENS

TEMPFET® **BTS 113A**

Features

- N channel
- Logic level
- Enhancement mode
- Temperature sensor with thyristor characteristic
- The drain pin is electrically shorted to the tab



Pin	1	2	3
	G	D	S

Type	V_{DS}	I_D	$R_{DS(on)}$	Package	Ordering Code
BTS 113A	60 V	11.5 A	0.17 Ω	TO-220AB	C67078-S5015-A2

Maximum Ratings

Parameter	Symbol	Values	Unit
Drain-source voltage	V_{DS}	60	V
Drain-gate voltage, R_{GS} = 20 kΩ	V_{DGR}	60	
Gate-source voltage	V_{GS}	± 10	
Continuous drain current, T_C = 25 °C	I_D	11.5	A
ISO drain current T_C = 85 ˚C, V_{GS} = 10 V, V_{DS} = 0.5 V	$I_{D\text{-}ISO}$	2.2	
Pulsed drain current, T_C = 25 °C	$I_{D\ puls}$	46	
Short circuit current, T_j = – 55 ... + 150 °C	I_{SC}	27	
Short circuit dissipation, T_j = – 55 ... + 150 °C	P_{SCmax}	400	W
Power dissipation	P_{tot}	40	
Operating and storage temperature range	T_j, T_{stg}	– 55 ... + 150	°C
DIN humidity category, DIN 40 040	–	E	–
IEC climatic category, DIN IEC 68-1	–	55/150/56	
Thermal resistance Chip-case Chip-ambient	 $R_{th\ JC}$ $R_{th\ JA}$	 ≤ 3.1 ≤ 75	K/W

Electrical Characteristics

at T_j = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Drain-source breakdown voltage V_{GS} = 0, I_D = 0.25 mA	$V_{(BR)DSS}$	60	–	–	V
Gate threshold voltage V_{GS} = V_{DS}, I_D = 1 mA	$V_{GS(th)}$	1.6	2.0	2.5	
Zero gate voltage drain current V_{GS} = 0 V, V_{DS} = 60 V T_j = 25 °C T_j = 125 °C	I_{DSS}	 – –	 0.1 10	 1.0 100	µA
Gate-source leakage current V_{GS} = ± 20 V, V_{DS} = 0 T_j = 25 °C T_j = 150 °C	I_{GSS}	 – –	 10 2	 100 4	 nA µA
Drain-source on-state resistance V_{GS} = 4.5 V, I_D = 5.8 A	$R_{DS(on)}$	–	0.14	0.17	Ω
Dynamic Characteristics					
Forward transconductance $V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$, I_D = 5.8 A	g_{fs}	4.5	7.5	–	S
Input capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{iss}	–	420	560	pF
Output capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{oss}	–	160	250	
Reverse transfer capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{rss}	–	60	110	
Turn-on time t_{on}, (t_{on} = $t_{d(on)}$ + t_r) V_{CC} = 30 V, V_{GS} = 5.0 V, I_D = 3.0 A, R_{GS} = 50 Ω	$t_{d(on)}$	–	15	25	ns
	t_r	–	55	80	
Turn-off time t_{off}, (t_{off} = $t_{d(off)}$ + t_f) V_{CC} = 30 V, V_{GS} = 5.0 V, I_D = 3.0 A, R_{GS} = 50 Ω	$t_{d(off)}$	–	45	60	
	t_f	–	40	55	

Electrical Characteristics (cont'd)
at T_j = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Reverse Diode					
Continuous source current	I_S	–	–	11.5	A
Pulsed source current	I_{SM}	–	–	46	
Diode forward on-voltage I_F = 28 A, V_{GS} = 0	V_{SD}	– 	1.5 	1.8 	V
Reverse recovery time $I_F = I_S$, di_F/dt = 100 A/µs, V_R = 30 V	t_{rr}	– 	60 	– 	ns
Reverse recovery charge $I_F = I_S$, di_F/dt = 100 A/µs, V_R = 30 V	Q_{rr}	– 	0.10 	– 	µC
Temperature Sensor					
Forward voltage $I_{TS(on)}$ = 5 mA, T_j = – 55 ... + 150 °C Sensor override, $t_p \leq$ 100 µs T_j = – 55 ... + 160 °C	$V_{TS(on)}$	 – –	 1.4 –	 1.5 10	V
Forward current T_j = – 55 ... + 150 °C Sensor override, $t_p \leq$ 100 µs T_j = – 55 ... + 160 °C	$I_{TS(on)}$	 – –	 – –	 5 600	mA
Holding current, $V_{TS(off)}$ = 5.0 V, T_j = 25 °C T_j = 150 °C	I_H	0.05 0.05	0.3 0.2	0.5 0.3	
Switching temperature V_{TS} = 5.0 V	$T_{TS(on)}$	 150	 –	 –	°C
Turn-off time V_{TS} = 5.0 V, $I_{TS(on)}$ = 2 mA	t_{off}	 0.5	 –	 2.5	µs

Examples for short-circuit protection

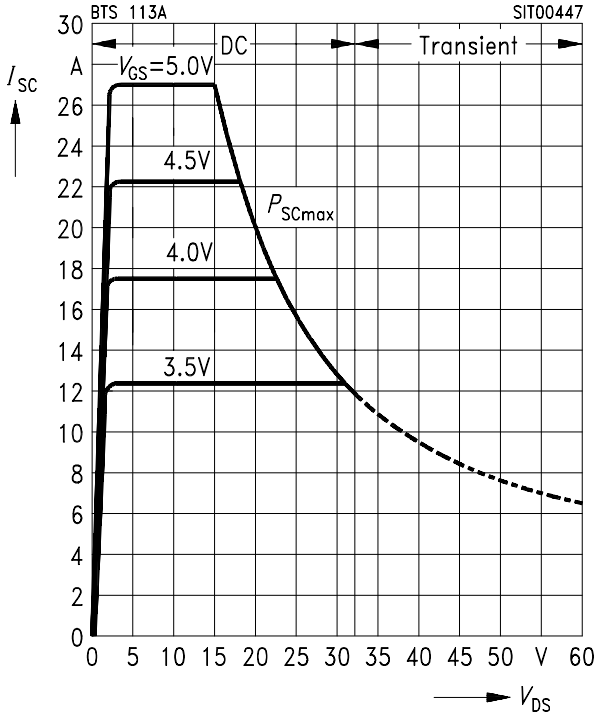
at T_j = – 55 ... + 150 °C, unless otherwise specified.

Parameter	Symbol	Examples			Unit
		1	2	–	
Drain-source voltage	V_{DS}	15	30	–	V
Gate-source voltage	V_{GS}	5.0	3.5	–	
Short-circuit current	I_{SC}	27	12.6	–	A
Short-circuit dissipation	P_{SC}	400	380	–	W
Response time T_j = 25 °C, before short circuit	$t_{SC(off)}$	20	20	–	ms

Short-circuit protection $I_{SC} = f(V_{DS})$

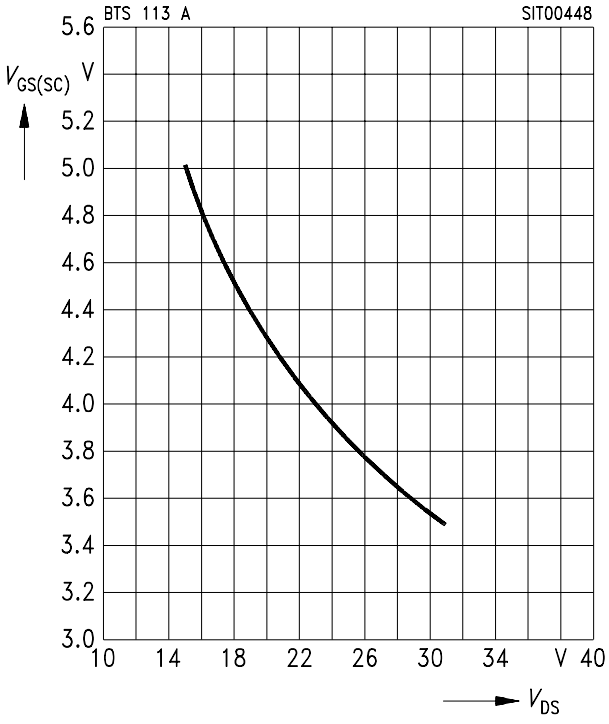
Parameter: V_{GS}

Diagram to determine I_{SC} for T_j = – 55 ... + 150 °C

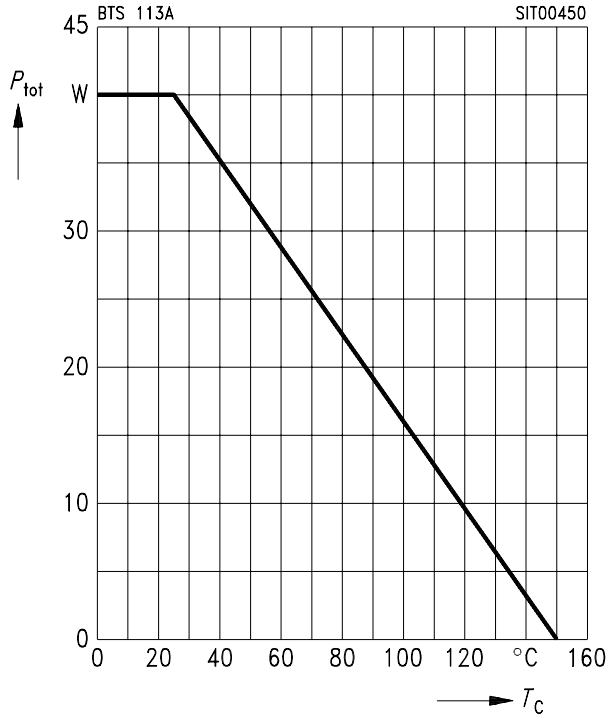


Max. gate voltage $V_{GS(SC)} = f(V_{DS})$

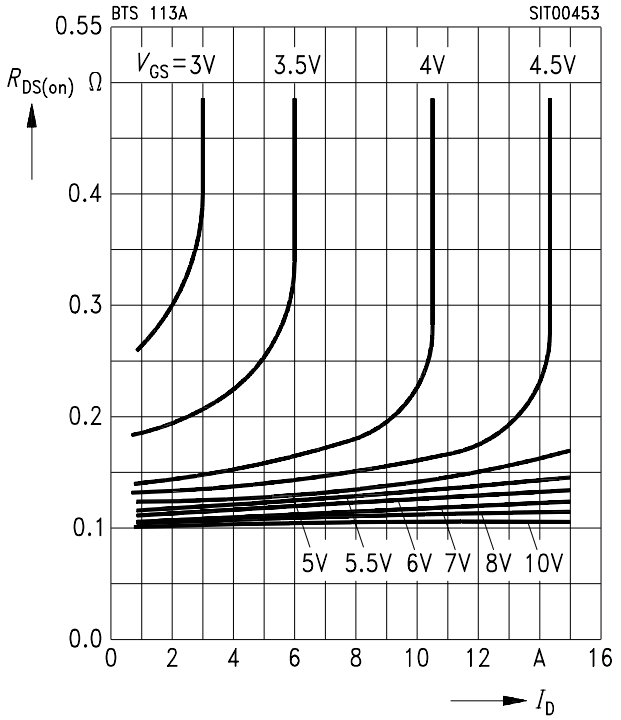
Parameter: T_j = – 55 ... + 150 °C



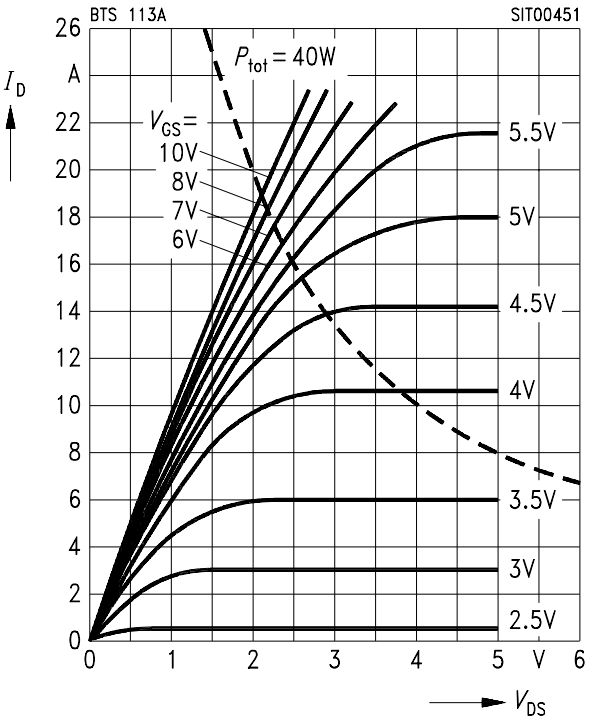
Max. power dissipation $P_{tot} = f(T_C)$



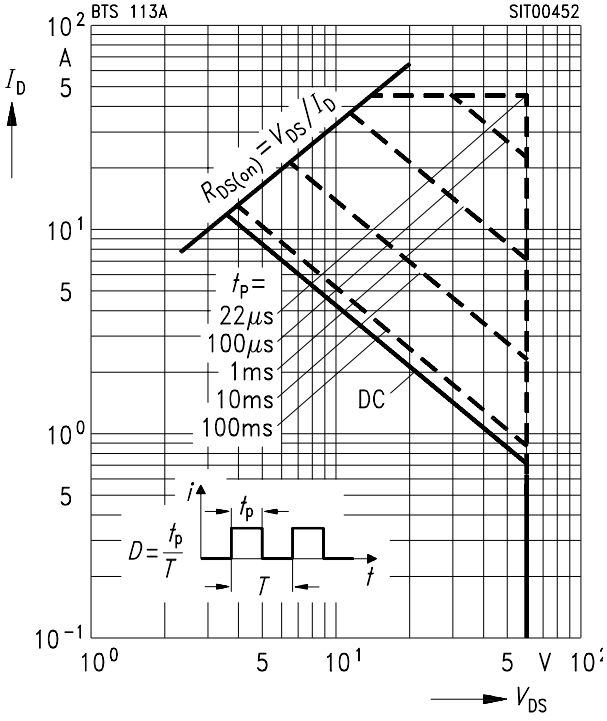
Typ. drain-source on-state resistance
$R_{DS(on)} = f(I_D)$
Parameter: V_{GS}



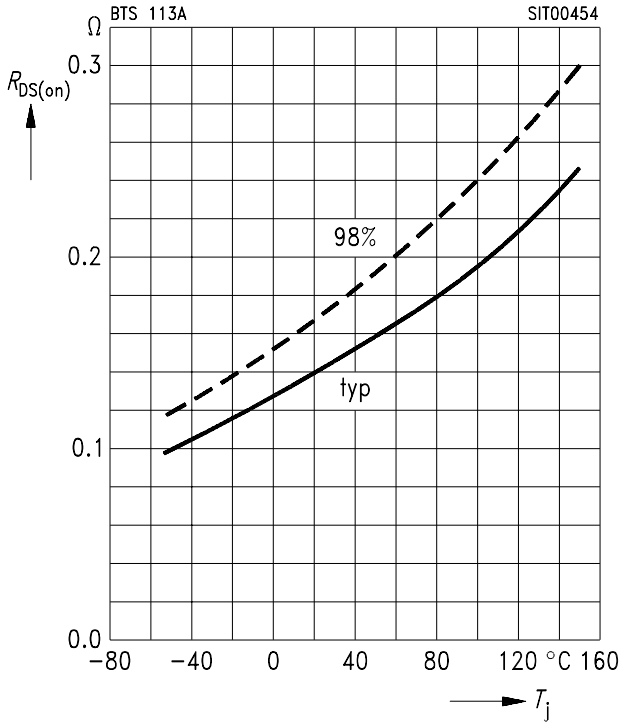
Typical output characteristics $I_D = f(V_{DS})$
Parameter: t_p 80 = µs



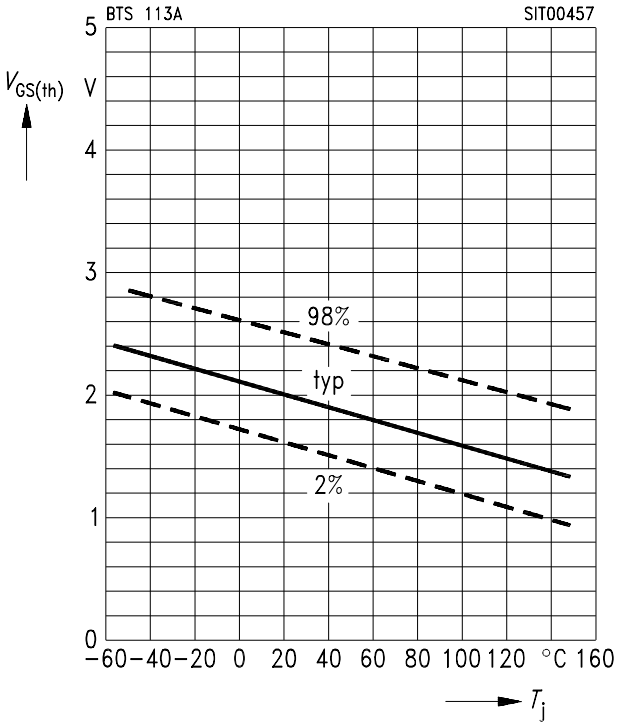
Safe operating area $I_D = f(V_{DS})$
Parameter: D = 0.01, T_C = 25 °C



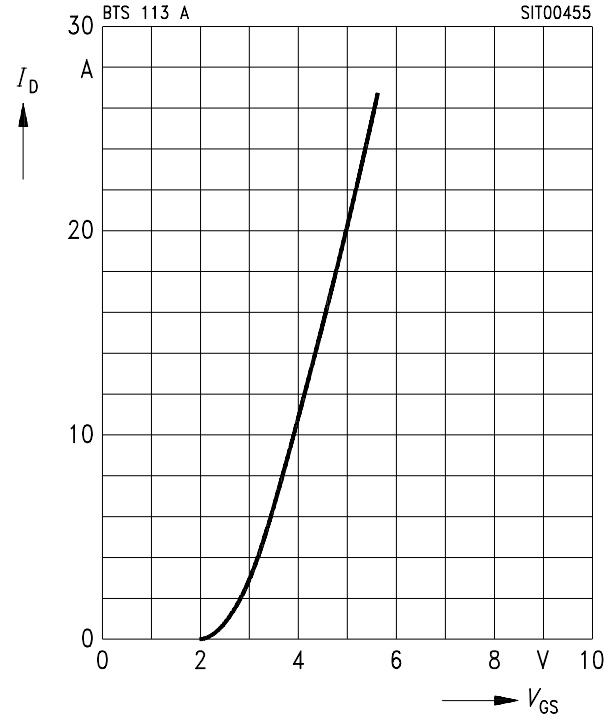
Drain-source on-state resistance
$R_{DS(on)} = f(T_j)$
Parameter: $I_D = -5$ A, $V_{GS} = 4.5$ V



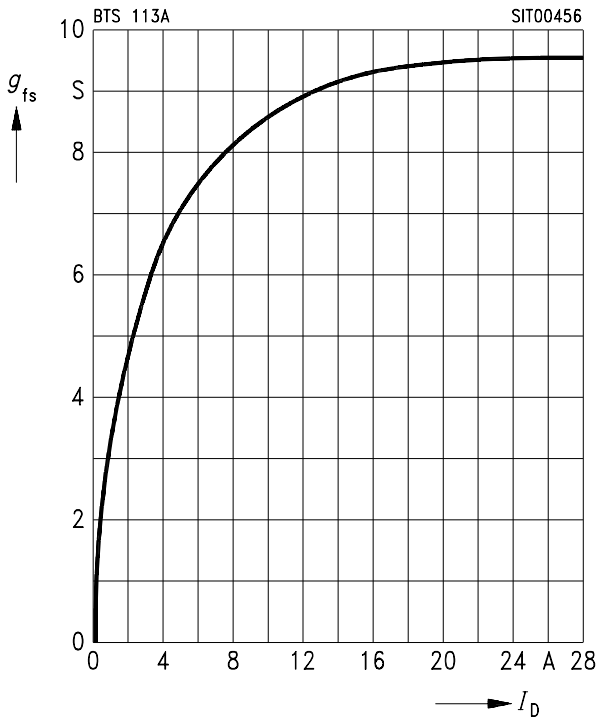
Gate threshold voltage $V_{GS(th)} = f(T_j)$
Parameter: $V_{DS} = V_{GS}$, $I_D = -1$ mA



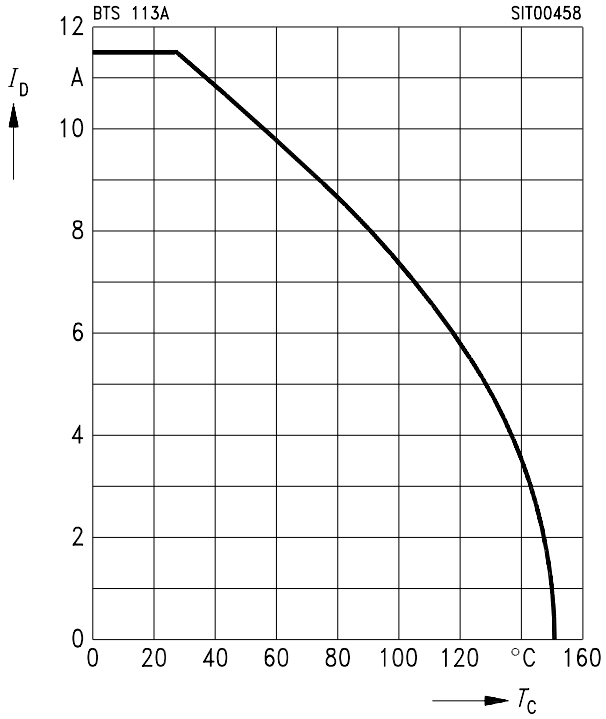
Typ. transfer characteristic
$I_D = f(V_{GS})$
Parameter: $t_p = 80$ µs, $V_{DS} = -25$ V



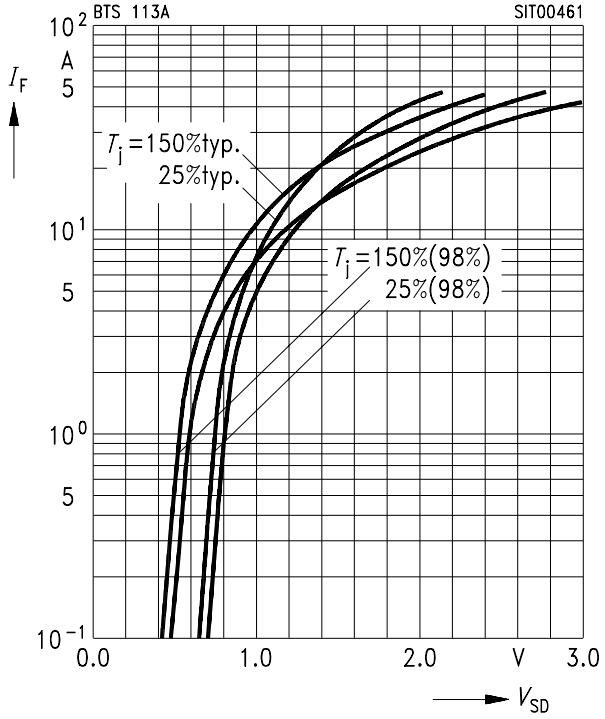
Typ. transconductance $g_{fs} = f(I_D)$
Parameter: $t_p = 80$ µs, $V_{DS} = -25$ V



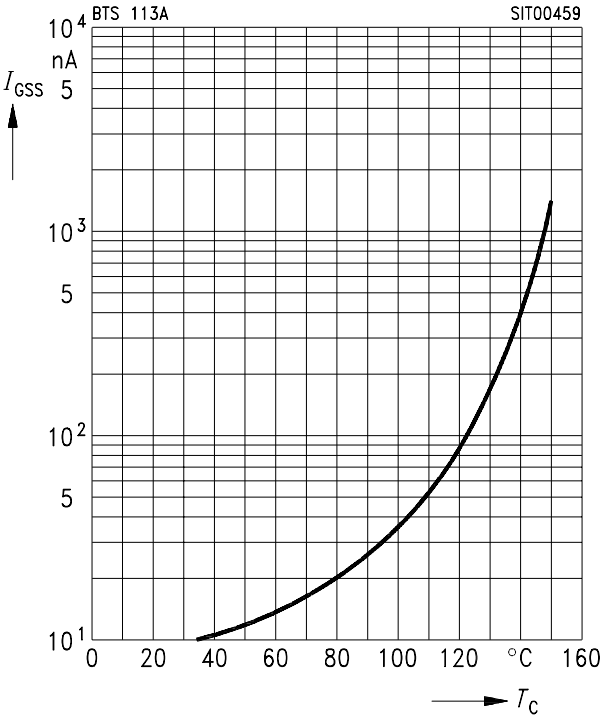
Continuous drain current $I_D = f(T_C)$
Parameter: $V_{GS} \geq 4.5$ V



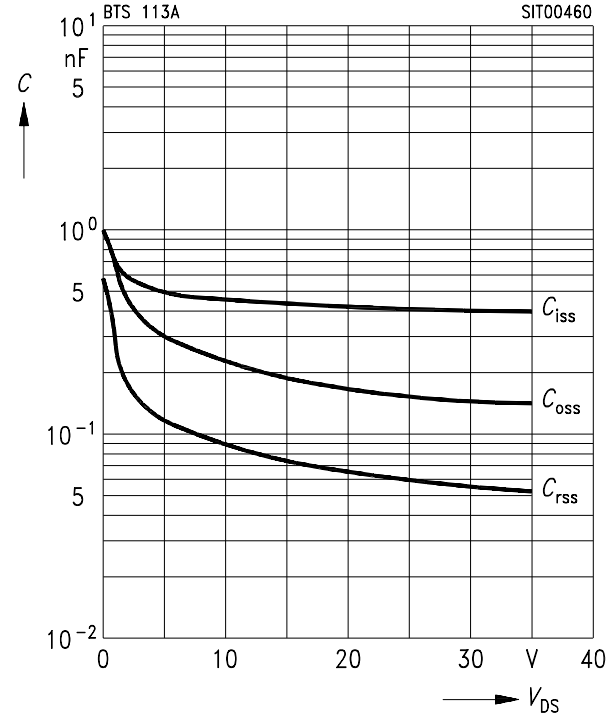
Forward characteristics of reverse diode
$I_F = f(V_{SD})$
Parameter: T_j, t_p = 80 µs



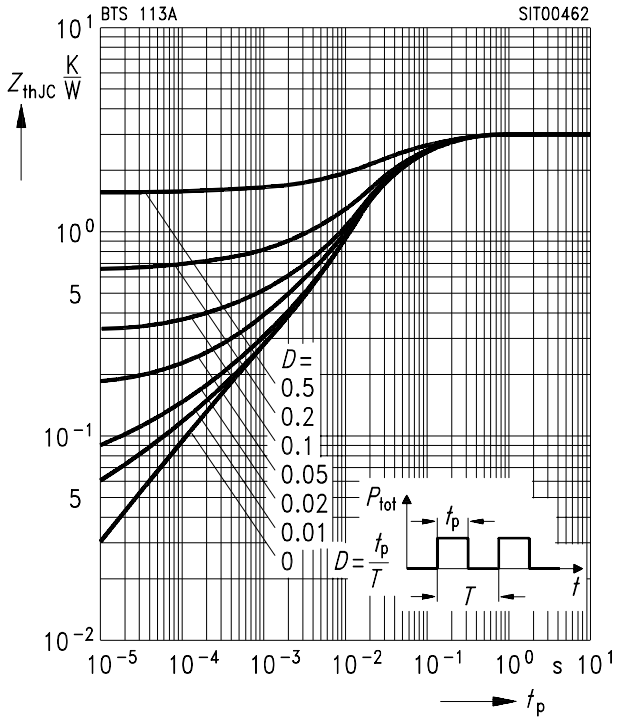
Typ. gate-source leakage current
$I_{GSS} = f(T_C)$
Parameter: V_{GS} = 10 V, V_{DS} = 0



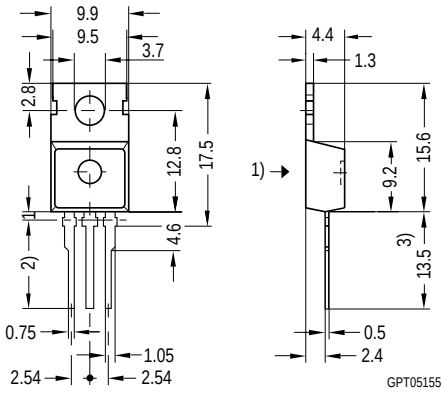
Typ. capacitances $C = f(V_{DS})$
Parameter: V_{GS} = 0, f = 1 MHz



Transient thermal impedance $Z_{thJC} = f(t_p)$
Parameter: $D = t_p/T$

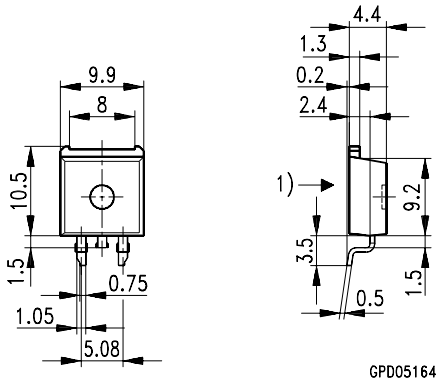


TO 220 AB **Ordering Code**
Standard C67078-S5015-A3



1) punch direction, burr max. 0.04
2) dip tinning
3) max. 14.5 by dip tinning press burr max. 0.05

TO 220 AB **Ordering Code**
SMD Version E 3045 A C67078-S5015-A4
(Tape & reel)



1) shear and punch direction no burrs this surface