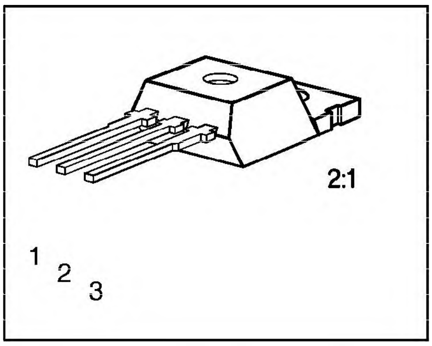
SIEMENS

TEMPFET® BTS 130

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



Pin	1	2	3
	G	D	S

Refer to circuit design hints (see chapter Technical information)

Type	V_{DS}	I_D	$R_{DS(on)}$	Package	Ordering Code
BTS 130	50 V	27 A	0.05 Ω	TO-220AB	C67078-A5001-A3

Maximum Ratings

Parameter	Symbol	Values	Unit
Drain-source voltage	V_{DS}	50	V
Drain-gate voltage, R_{GS} = 20 kΩ	V_{DGR}	50	
Gate-source peak voltage, aperiodic	V_{gs}	± 20	
Continuous drain current, T_C = 25 °C	I_D	27	A
ISO drain current T_C = 85 °C, V_{GS} = 10 V, V_{DS} = 0.5 V	$I_{D\text{-}ISO}$	7.5	
Pulsed drain current, T_C = 25 °C	$I_{D\ puls}$	108	
Short circuit current, T_j = – 55 ... + 150 °C	I_{SC}	80	
Short circuit dissipation, T_j = – 55 ... + 150 °C	P_{SCmax}	1200	W
Power dissipation	P_{tot}	75	
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	 $R_{th\ JC}$ $R_{th\ JA}$	 ≤ 1.67 ≤ 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	$V_{(BR)DSS}$	50	–	–	V
Gate threshold voltage V_{GS} = V_{DS}, I_D = 1 mA	$V_{GS(th)}$	2.5	3.0	3.5	
Zero gate voltage drain current V_{GS} = 0 V, V_{DS} = 50 V	I_{DSS}				µA
T_j = 25 °C		–	1	10	
T_j = 125 °C		–	100	300	
Gate-source leakage current V_{GS} = 20 V, V_{DS} = 0	I_{GSS}				
T_j = 25 °C		–	10	100	nA
T_j = 150 °C		–	2	4	µA
Drain-source on-state resistance V_{GS} = 10 V, I_D =17 A	$R_{DS(on)}$	–	0.04	0.05	Ω
Dynamic Characteristics					
Forward transconductance $V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$, I_D = 17 A	g_{fs}	8.0	13.0	18.0	S
Input capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{iss}	700	940	1250	pF
Output capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{oss}	–	500	750	
Reverse transfer capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{rss}	–	180	270	
Turn-on time t_{on}, ($t_{on} = t_{d(on)} + t_r$) V_{CC} = 30 V, V_{GS} = 10 V, I_D = 3 A, R_{GS} = 50 Ω	$t_{d(on)}$	–	25	40	ns
	t_r	–	60	90	
Turn-off time t_{off}, ($t_{off} = t_{d(off)} + t_f$) V_{CC} = 30 V, V_{GS} = 10 V, I_D = 3 A, R_{GS} = 50 Ω	$t_{d(off)}$	–	100	130	
	t_f	–	75	95	

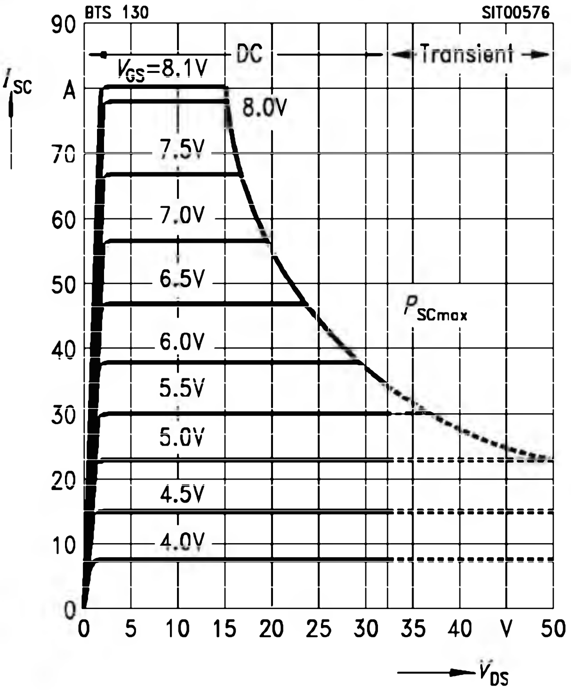
Electrical Characteristics (cont'd)
at T_j = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Reverse Diode					
Continous source current	I_S	–	–	27	A
Pulsed source current	I_{SM}	–	–	108	
Diode forward on-voltage I_F = 54 A, V_{GS} = 0	V_{SD}	–	1.5	2.0	V
Reverse recovery time I_F = I_S, di_F/dt = 100 A/µs, V_R = 30 V	t_{rr}	–	150	–	ns
Reverse recovery charge I_F = I_S, di_F/dt = 100 A/µs, V_R = 30 V	Q_{rr}	–	1.0	–	µC
Temperature Sensor					
Forward voltage $I_{TS(on)}$ = 10 mA, T_j = – 55 ... + 150 °C	$V_{TS(on)}$	–	1.4	1.5	V
Sensor override, $t_p \leq$ 100 µs T_j = – 55 ... + 160 °C		–	–	10	
Forward current T_j = – 55 ... + 150 °C	$I_{TS(on)}$	–	–	10	mA
Sensor override, $t_p \leq$ 100 µs T_j = – 55 ... + 160 °C		–	–	600	
Holding current, $V_{TS(off)}$ = 5 V, T_j = 25 °C	I_H	0.05	0.1	0.5	
T_j = 150 °C		0.05	0.2	0.3	
Switching temperature V_{TS} = 5 V	$T_{TS(on)}$	150	–	–	°C
Turn-off time V_{TS} = 5 V, $I_{TS(on)}$ = 2 mA	t_{off}	0.5	–	2.5	µs

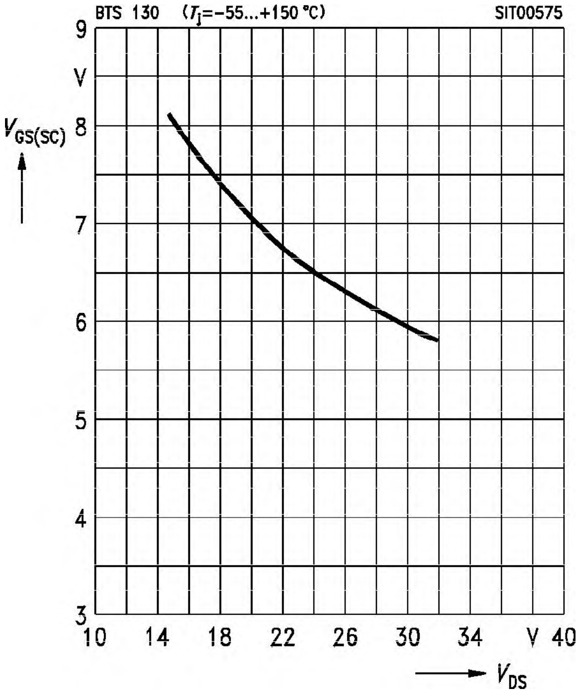
Examples for short-circuit protection
at T_j = – 55 ... + 150 °C, unless otherwise specified.

Parameter	Symbol	Examples			Unit
		1	2	–	
Drain-source voltage	V_{DS}	15	30	–	V
Gate-source voltage	V_{GS}	8.1	5.9	–	
Short-circuit current	I_{SC}	≤ 80	≤ 37	–	A
Short-circuit dissipation	P_{SC}	1200	1100	–	W
Response time T_j = 25 °C, before short circuit	$t_{SC(off)}$	25	25	–	ms

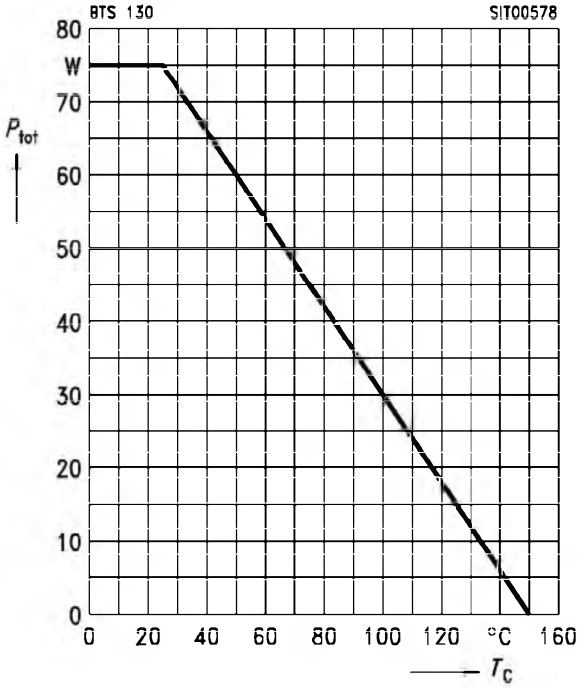
Short-circuit protection $I_{SC} = f(V_{DS})$
Parameter: V_{GS}
Diagram to determine I_{SC} for T_j = –55 ... + 150 °C



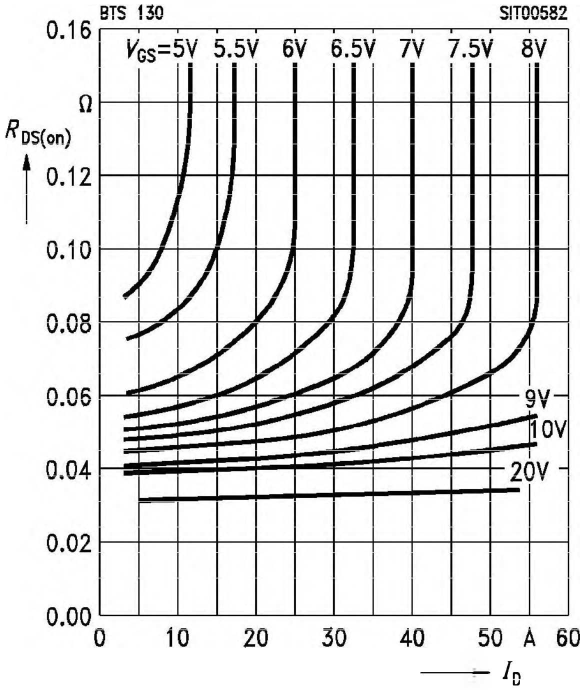
Max. gate voltage $V_{GS(SC)} = f(V_{DS})$
Parameter: T_j = – 55 ... + 150 °C



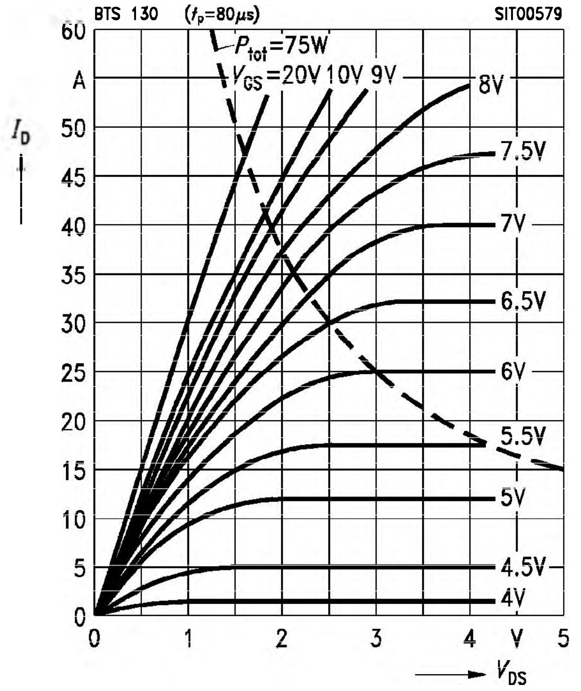
Max. power dissipation $P_{tot} = f(T_C)$



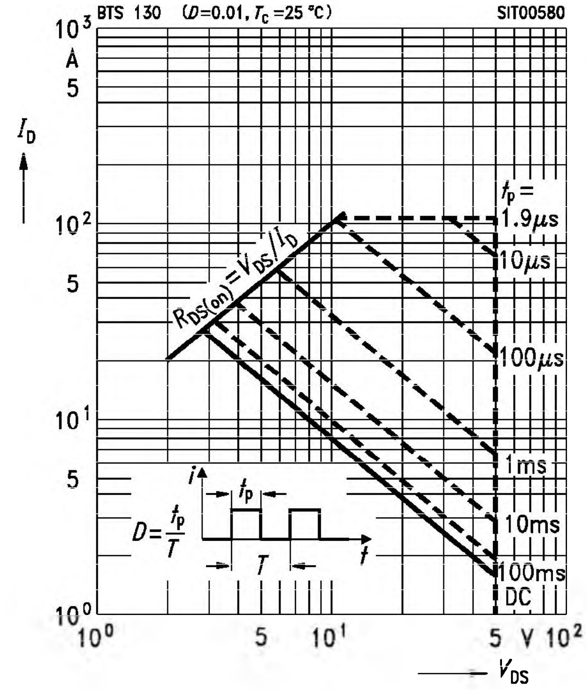
Typ. drain-source on-state resistance
$R_{DS(on)} = f(I_D)$
Parameter: V_{GS}



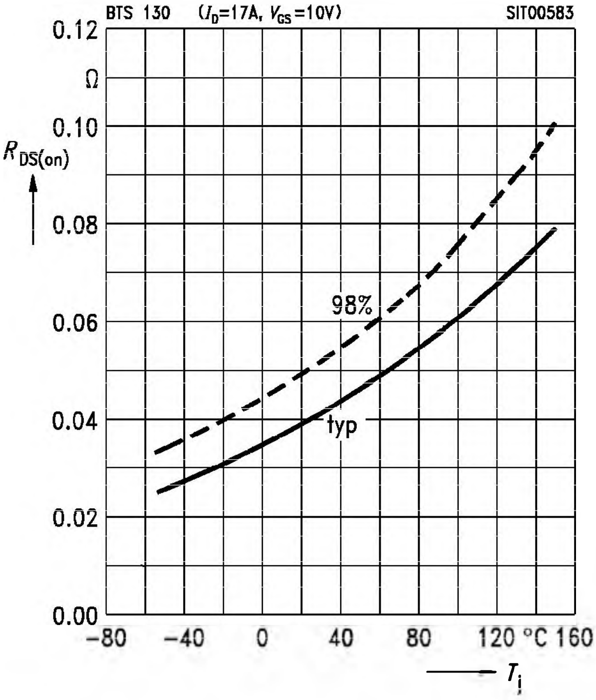
Typical output characteristics $I_D = f(V_{DS})$
Parameter: t_p = 80 µs



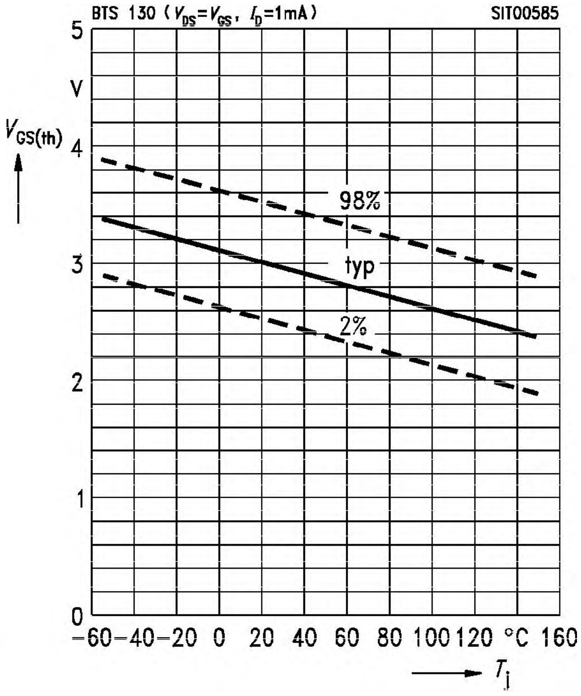
Safe operating area $I_D = f(V_{DS})$
Parameter: D = 0.01, T_C = 25 °C



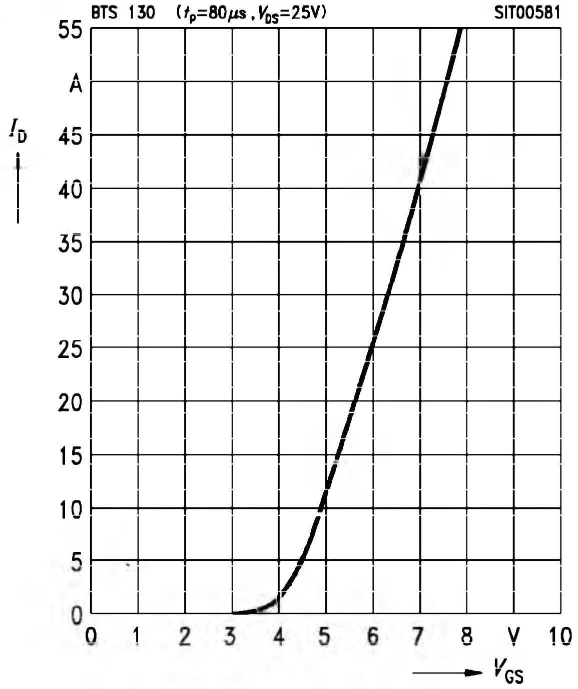
Drain-source on-state resistance
$R_{DS(on)} = f(T_j)$
Parameter: I_D = 17 A, V_{GS} = 10 V (spread)



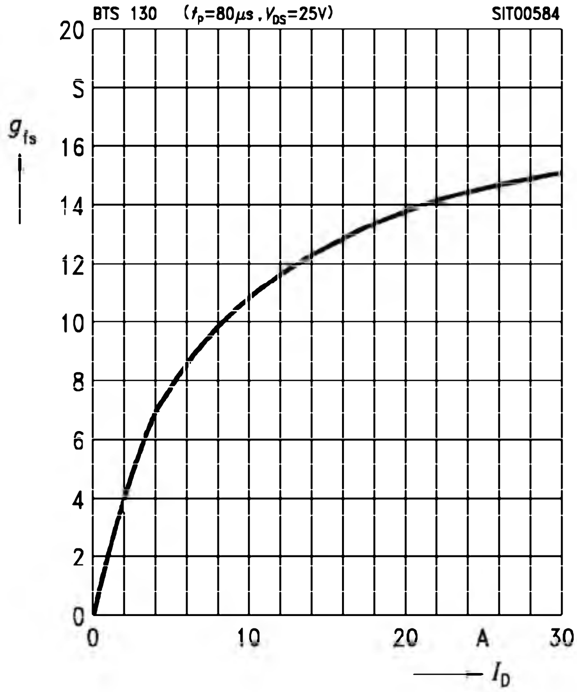
Gate threshold voltage $V_{GS(th)} = f(T_j)$
Parameter: V_{DS} = V_{GS}, I_D = 1 mA



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

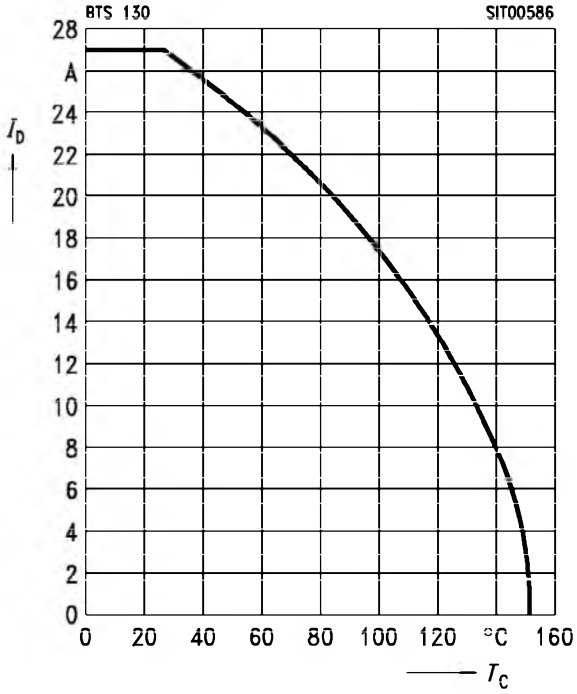


Typ. transconductance $g_{fs} = f(I_D)$
Parameter: t_p = 80 µs, V_{DS} = 25 V



Continous drain current $I_D = f(T_C)$

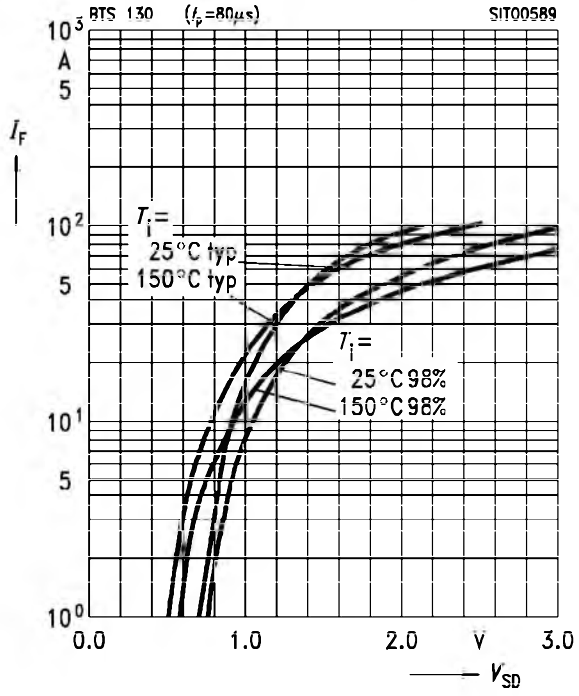
Parameter: $V_{GS} \geq 10$ V



Forward characteristics of reverse diode

$I_F = f(V_{SD})$

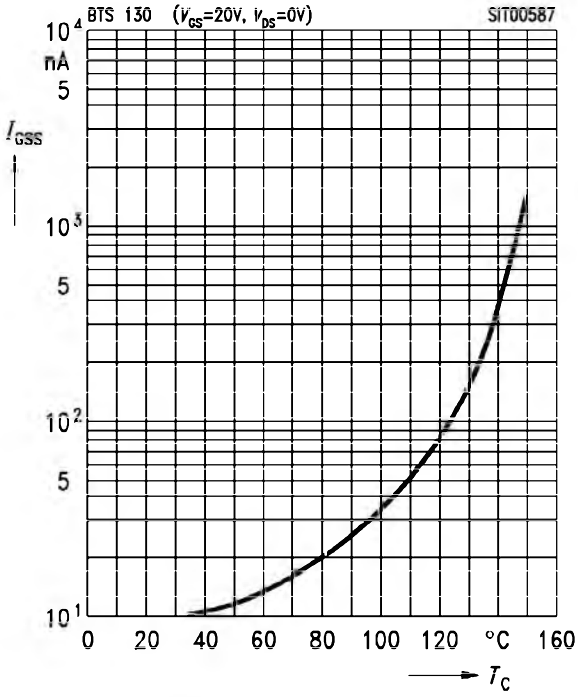
Parameter: T_j, t_p = 80 µs (spread)



Typ. gate-source leakage current

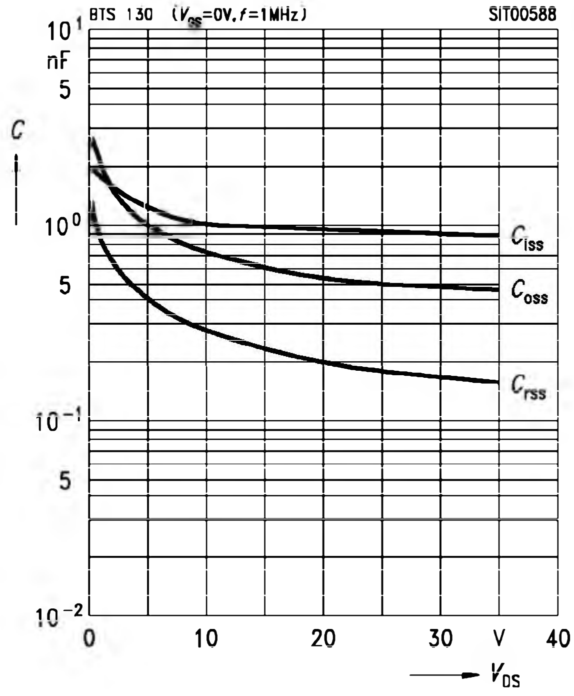
$I_{GSS} = f(T_C)$

Parameter: V_{GS} = 20 V, V_{DS} = 0

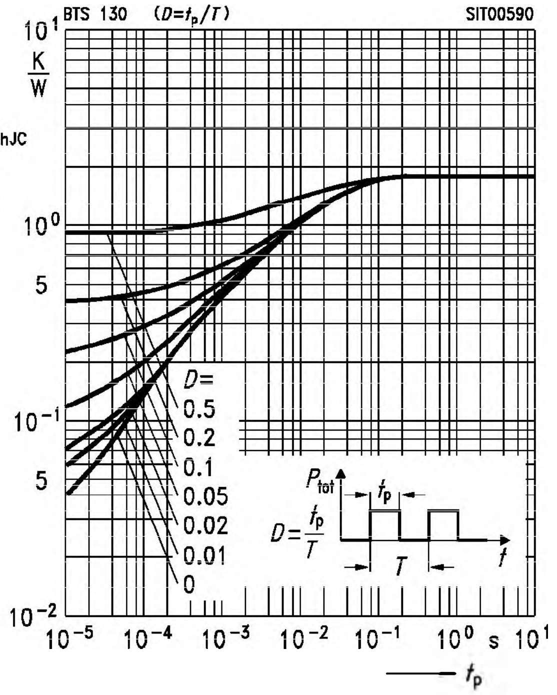


Typ. capacitances $C = f(V_{DS})$

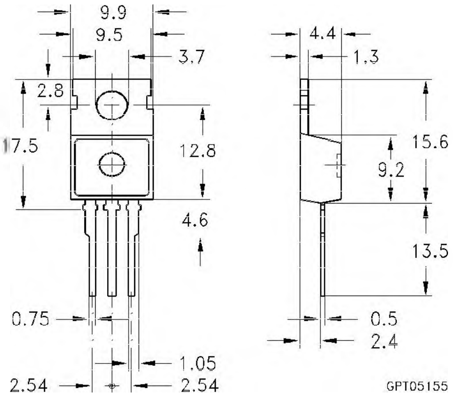
Parameter: V_{GS} = 0, f = 1 MHz



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



TO 220 AB **Ordering Code**
Standard C67078-A5001-A3



TO 220 AB **Ordering Code**
SMD version E3045 C67078-A5001-A9