Features

- N channel
- Enhancement mode
- Temperature sensor with thyristor characteristic
- The drain pin is electrically shorted to the tab
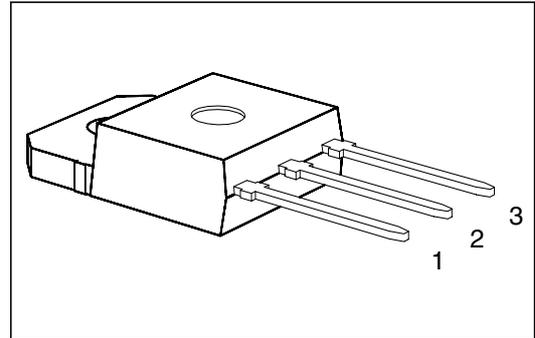
Pin	1	2	3
	G	D	S

Type	V_{DS}	I_D	$R_{DS(on)}$	Package	Ordering Code
BTS 240A	50 V	58 A	0.018 Ω	TO-218AA	C67078-A5100-A3

Maximum Ratings

Parameter	Symbol	Values	Unit
Drain-source voltage	V_{DS}	50	V
Drain-gate voltage, $R_{GS} = 20\ k\Omega$	V_{DGR}	50	
Gate-source voltage	V_{GS}	± 20	
Continuous drain current, $T_C = 73\ °C$	I_D	58	A
ISO drain current $T_C = 85\ °C, V_{GS} = 10\ V, V_{DS} = 0.5\ V$	$I_{D\text{-}ISO}$	21.0	
Pulsed drain current,　　　$T_C = 25\ °C$	$I_{D\ puls}$	232	
Short circuit current,　　　$T_j = -55 ... + 150\ °C$	I_{SC}	147	
Short circuit dissipation,　$T_j = -55 ... + 150\ °C$	P_{SCmax}	2200	W
Power dissipation	P_{tot}	170	
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	$R_{th\ JC}$ $R_{th\ JA}$	≤ 0.74 ≤ 45	K/W

Electrical Characteristics

at $T_j = 25\ °C$, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	

Static Characteristics

Parameter	Symbol	min.	typ.	max.	Unit
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
$T_j = 25\ °C$		–	0.1	1.0	
$T_j = 125\ °C$		–	10	100	
Gate-source leakage current $V_{GS} = 20$ V, $V_{DS} = 0$	I_{GSS}				
$T_j = 25\ °C$		–	10	100	nA
$T_j = 150\ °C$		–	2.0	4.0	µA
Drain-source on-state resistance $V_{GS} = 10$ V, $I_D = 47$ A	$R_{DS(on)}$	–	0.012	0.018	Ω

Dynamic Characteristics

Parameter	Symbol	min.	typ.	max.	Unit
Forward transconductance $V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$, $I_D = 47$ A	g_{fs}	20.0	43.0	–	S
Input capacitance $V_{GS} = 0$, $V_{DS} = 25$ V, $f = 1$ MHz	C_{iss}	–	2.9	4.3	nF
Output capacitance $V_{GS} = 0$, $V_{DS} = 25$ V, $f = 1$ MHz	C_{oss}	–	1.4	2.1	
Reverse transfer capacitance $V_{GS} = 0$, $V_{DS} = 25$ V, $f = 1$ MHz	C_{rss}	–	0.5	0.8	
Turn-on time t_{on}, ($t_{on} = t_{d(on)} + t_r$) $V_{CC} = 30$ V, $V_{GS} = 10$ V, $I_D = 3$ A, $R_{GS} = 50\ \Omega$	$t_{d(on)}$	–	50	75	ns
	t_r	–	150	230	
Turn-off time t_{off}, ($t_{off} = t_{d(off)} + t_f$) $V_{CC} = 30$ V, $V_{GS} = 10$ V, $I_D = 3$ A, $R_{GS} = 50\ \Omega$	$t_{d(off)}$	–	350	560	
	t_f	–	250	330	

Electrical Characteristics (cont'd)

at $T_j = 25\,°C$, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	**typ.**	**max.**	

Reverse Diode

Parameter	Symbol	min.	typ.	max.	Unit
Continuous source current	I_S	–	–	58	A
Pulsed source current	I_{SM}	–	–	232	
Diode forward on-voltage $I_F = 116\,A$, $V_{GS} = 0$	V_{SD}	–	1.6	2.0	V
Reverse recovery time $I_F = I_S$, $di_F/dt = 100\,A/\mu s$, $V_R = 30\,V$	t_{rr}	–	100	–	ns
Reverse recovery charge $I_F = I_S$, $di_F/dt = 100\,A/\mu s$, $V_R = 30\,V$	Q_{rr}	–	0.3	–	µC

Temperature Sensor

Parameter	Symbol	min.	typ.	max.	Unit
Forward voltage $I_{TS(on)} = 10\,mA$, $T_j = -55 \dots +150\,°C$ Sensor override, $t_p \le 100\,\mu s$ $T_j = -55 \dots +160\,°C$	$V_{TS(on)}$	0.7 –	1.4 –	1.5 10	V
Forward current $T_j = -55 \dots +150\,°C$ Sensor override, $t_p \le 100\,\mu s$ $T_j = -55 \dots +160\,°C$	$I_{TS(on)}$	– –	– –	10 600	mA
Holding current, $V_{TS(off)} = 5\,V$, $T_j = 25\,°C$ $T_j = 150\,°C$	I_H	0.05 0.05	0.1 0.2	0.5 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}	6.4	5.1	–	
Short-circuit current	I_{SC}	< 147	< 67	–	A
Short-circuit dissipation	P_{SC}	< 2200	< 2000	–	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 $T_j = -55 ... +150°C$
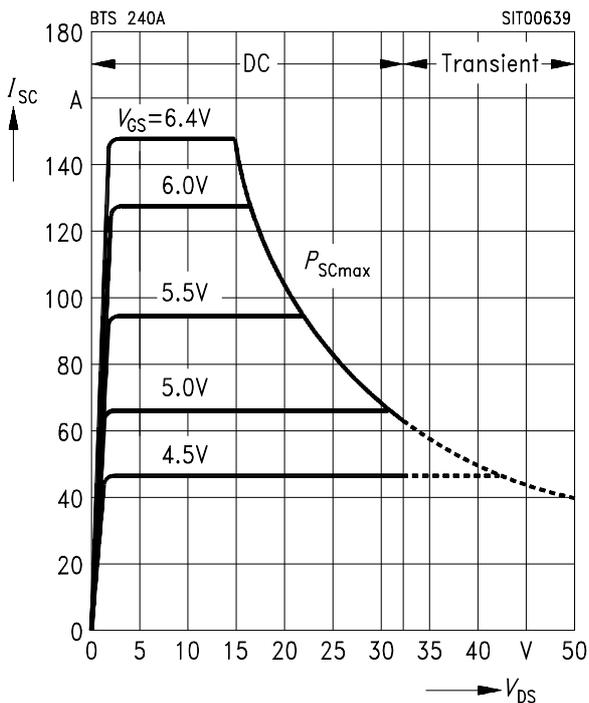
Max. gate voltage $V_{GS(SC)} = f(V_{DS})$
Parameter: $T_j = -55 ... +150 °C$
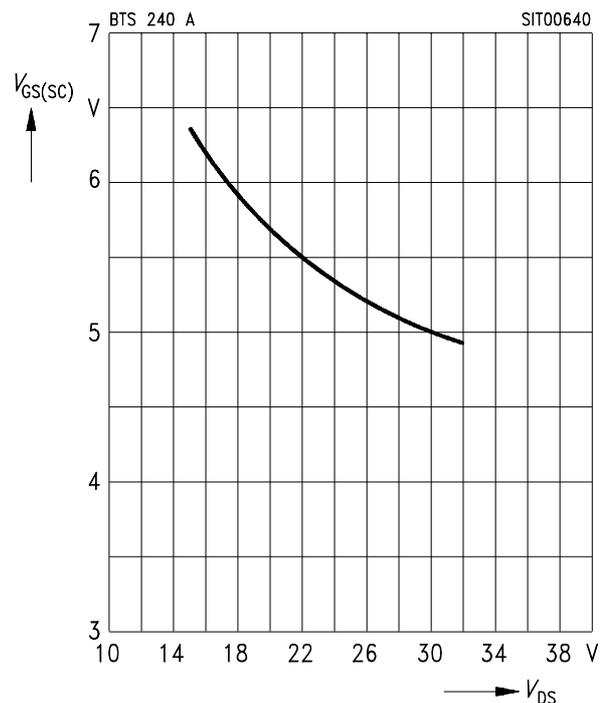
Max. power dissipation $P_{tot} = f(T_C)$
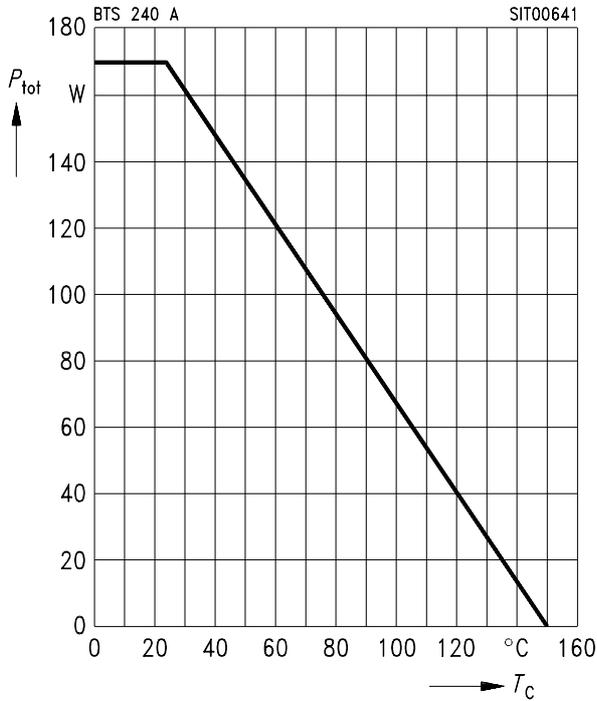
Typ. drain-source on-state resistance
$R_{DS(on)} = f(I_D)$
Parameter: V_{GS}
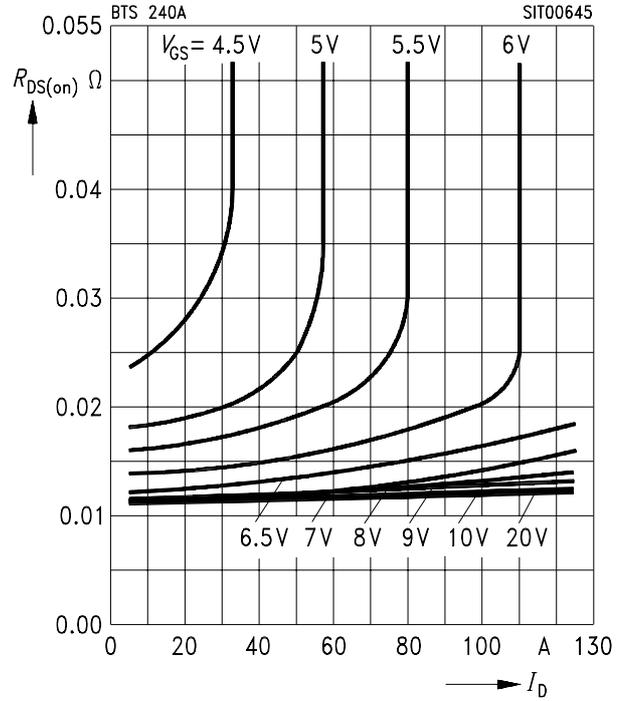
Typical output characteristics $I_D = f(V_{DS})$
Parameter: $t_p = 80\ \mu s$
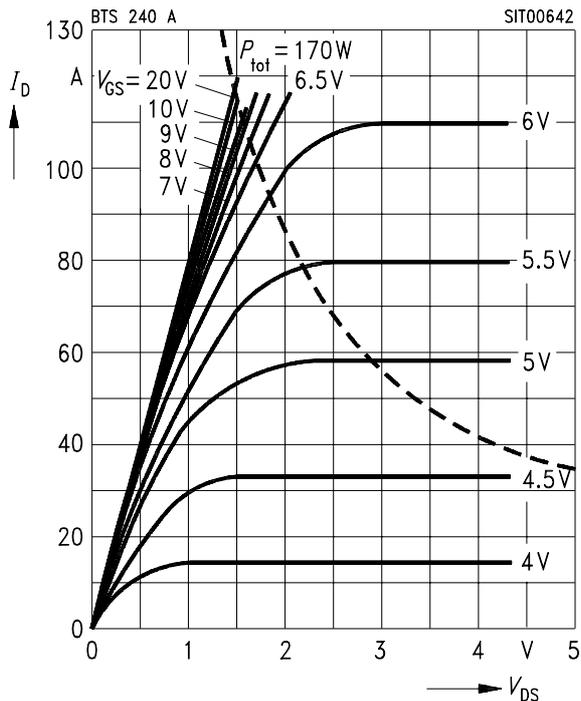
Safe operating area $I_D = f(V_{DS})$
Parameter: $D = 0.01$, $T_C = 25\ °C$

04.97
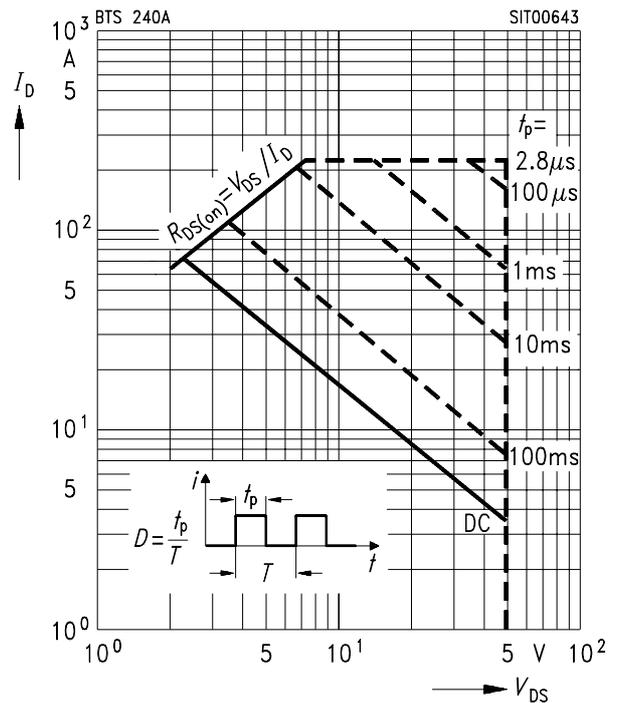
Drain-source on-state resistance

$R_{DS(on)} = f(T_j)$

Parameter: $I_D = 47$ A, $V_{GS} = 10$ V (spread)
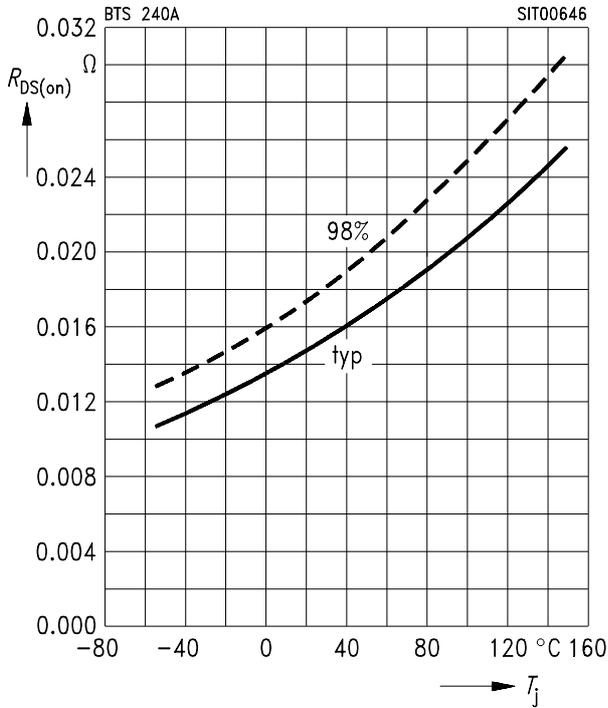
Gate threshold voltage $V_{GS(th)} = f(T_j)$

Parameter: $V_{DS} = V_{GS}$, $I_D = 1$ mA
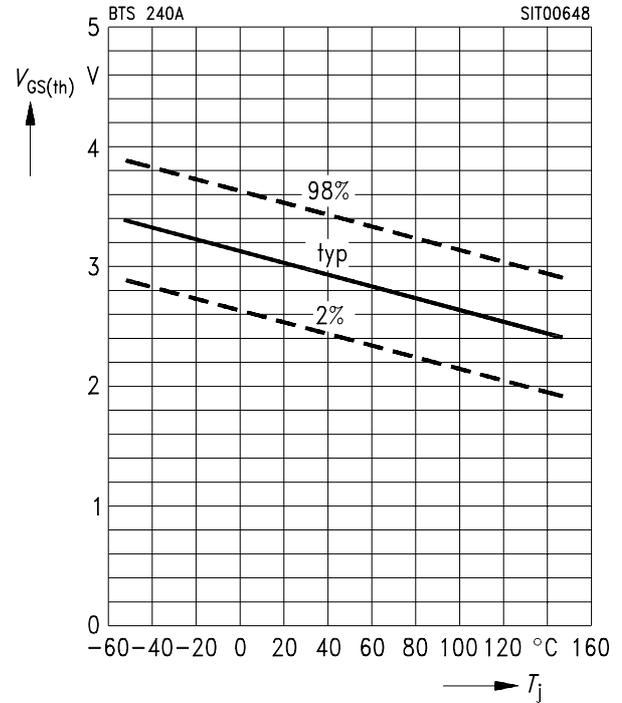
Typ. transfer characteristic

$I_D = f(V_{GS})$

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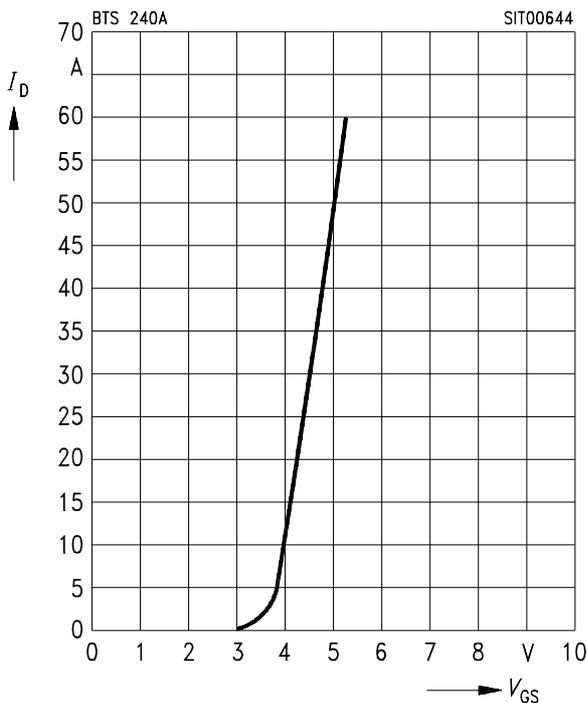
Typ. transconductance $g_{fs} = f(I_D)$

Parameter: $t_p = 80$ µs, $V_{DS} = 25$ V
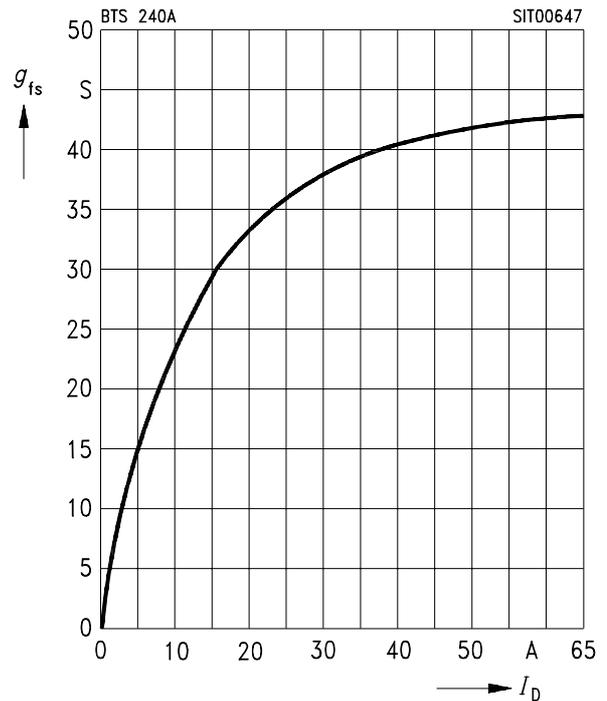
Continuous drain current $I_D = f(T_C)$
Parameter: $V_{GS} \geq 10$ V
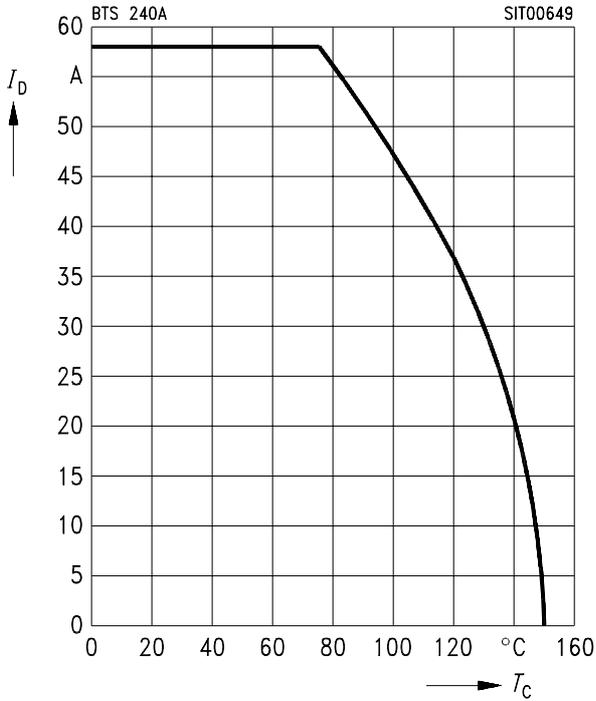
Forward characteristics of reverse diode
$I_F = f(V_{SD})$
Parameter: T_j, $t_p = 80$ µs (spread)
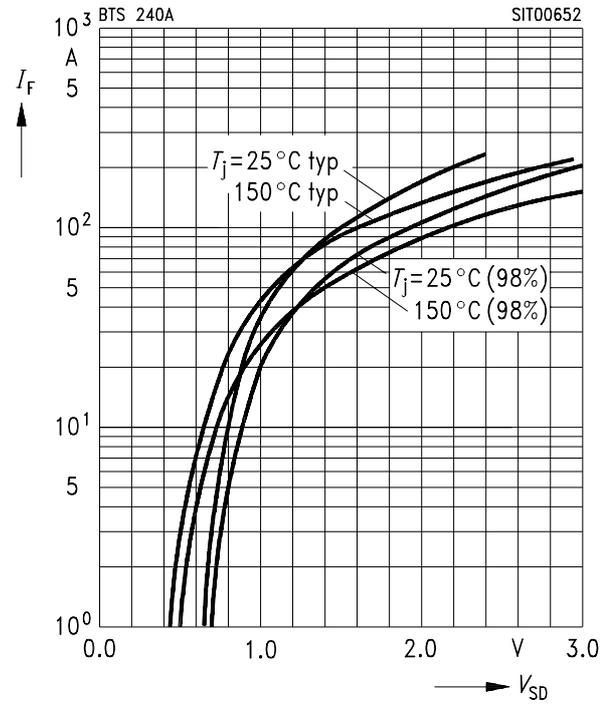
Typ. gate-source leakage current
$I_{GSS} = f(T_C)$
Parameter: $V_{GS} = 20$ V, $V_{DS} = 0$
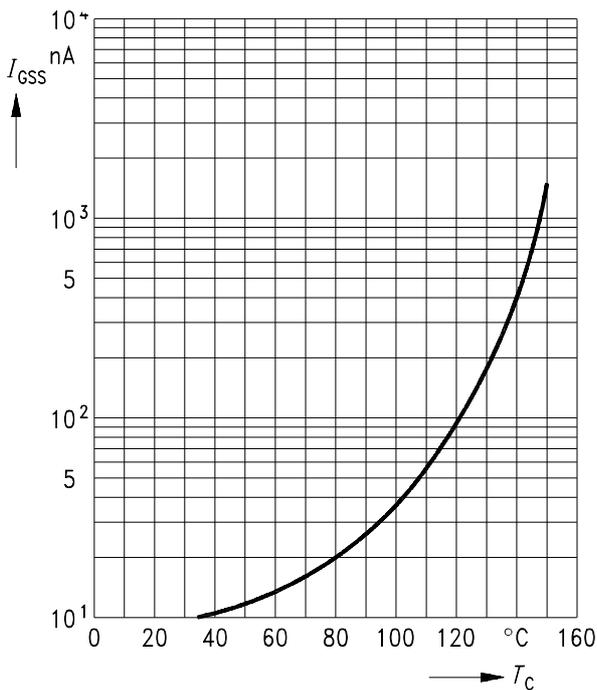
**Typ. capacitances** $C = f(V_{DS})$
Parameter: $V_{GS} = 0$, $f = 1$ MHz
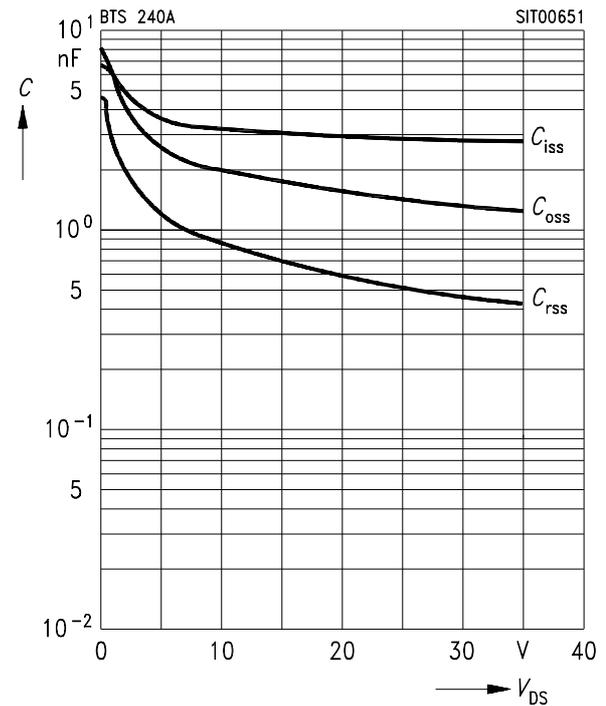
Transient thermal impedance $Z_{thJC} = f(t_p)$

Parameter: $D = t_p/T$
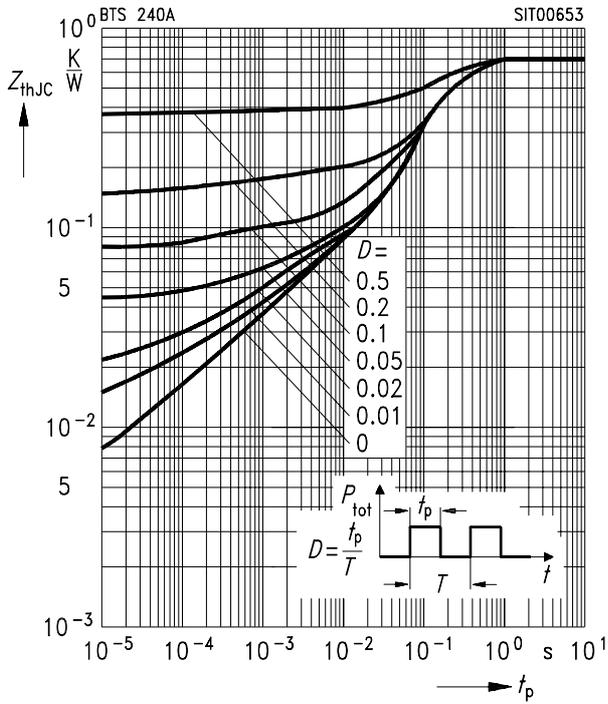
TO-218 AA   **Ordering Code**
Standard   C67078-S5100-A3
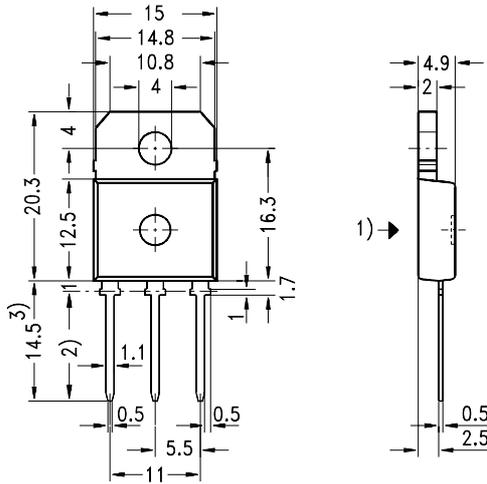
1) punch direction, burr max. 0.04
2) dip tinning
3) max. 15.5 by dip tinning press burr max. 0.05

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