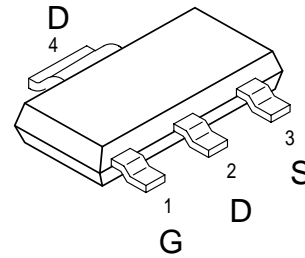


**Description**

- P-Channel
- Enhancement mode
- Avalanche rated
- Logic Level
- dv/dt rated
- Pb-free lead plating; RoHS compliant



**Features**

$V_{DS} (V) = -60V$   
 $I_D = -1.17A (V_{GS} = -10V)$   
 $R_{DS(ON)} < 60m\Omega (V_{GS} = -10V)$   
 $R_{DS(ON)} < 95m\Omega (V_{GS} = -4.5V)$

**Maximum Ratings, at  $T_j = 25\text{ }^\circ\text{C}$ , unless otherwise specified**

Parameter	Symbol	Value	Unit
Continuous drain current $T_A = 25\text{ }^\circ\text{C}$ $T_A = 70\text{ }^\circ\text{C}$	$I_D$	-1.17 -0.94	A
Pulsed drain current $T_A = 25\text{ }^\circ\text{C}$	$I_{D\text{ puls}}$	-4.68	
Avalanche energy, single pulse $I_D = -1.17\text{ A}$ , $V_{DD} = -25\text{ V}$ , $R_{GS} = 25\text{ }\Omega$	$E_{AS}$	24	mJ
Avalanche energy, periodic limited by $T_{jmax}$	$E_{AR}$	0.18	
Reverse diode dv/dt $I_S = -1.17\text{ A}$ , $V_{DS} = -48\text{ V}$ , $di/dt = 200\text{ A}/\mu\text{s}$ , $T_{jmax} = 150\text{ }^\circ\text{C}$	dv/dt	6	kV/ $\mu\text{s}$
Gate source voltage	$V_{GS}$	$\pm 20$	V
Power dissipation $T_A = 25\text{ }^\circ\text{C}$	$P_{tot}$	1.8	W
Operating and storage temperature	$T_j, T_{stg}$	-55...+150	$^\circ\text{C}$
IEC climatic category; DIN IEC 68-1		55/150/56	
ESD Class; JESD22-A114-HBM		Class 0	

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>Characteristics</b>					
Thermal resistance, junction - soldering point (Pin 4)	$R_{thJS}$			25	K/W
SMD version, device on PCB: @ min. footprint @ 6 cm <sup>2</sup> cooling area <sup>1)</sup>	$R_{thJA}$			115 70	K/W
<b>Electrical Characteristics</b> , at $T_j = 25\text{ }^\circ\text{C}$ , unless otherwise specified					
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>Static Characteristics</b>					
Drain- source breakdown voltage $V_{GS} = 0\text{ V}$ , $I_D = -250\text{ }\mu\text{A}$	$V_{(BR)DSS}$	-60			V
Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D = -160\text{ }\mu\text{A}$	$V_{GS(th)}$	-1	-1.5	-2	
Zero gate voltage drain current $V_{DS} = -60\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_j = 25\text{ }^\circ\text{C}$ $V_{DS} = -60\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_j = 125\text{ }^\circ\text{C}$	$I_{DSS}$		-0.1 -10	-1 -100	$\mu\text{A}$
Gate-source leakage current $V_{GS} = -20\text{ V}$ , $V_{DS} = 0\text{ V}$	$I_{GSS}$		-10	-100	nA
Drain-Source on-state resistance $V_{GS} = -4.5\text{ V}$ , $I_D = -0.89\text{ A}$	$R_{DS(on)}$			60	m $\Omega$
Drain-Source on-state resistance $V_{GS} = -10\text{ V}$ , $I_D = -1.17\text{ A}$	$R_{DS(on)}$			95	m $\Omega$

Device on 40mm\*40mm\*1.5mm epoxy PCB FR4 with 6cm<sup>2</sup> (one layer, 70  $\mu\text{m}$  thick) copper area for drain connection.

PCB is vertical without blown air.

**Electrical Characteristics, at  $T_j = 25\text{ }^\circ\text{C}$ , unless otherwise specified**

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>Dynamic Characteristics</b>					
Transconductance $V_{DS} \leq 2 \cdot I_D \cdot R_{DS(on)max}$ , $I_D = -0.89\text{ A}$	$g_{fs}$	0.7	1.4		S
Input capacitance $V_{GS} = 0\text{ V}$ , $V_{DS} = -25\text{ V}$ , $f = 1\text{ MHz}$	$C_{iss}$		130	160	pF
Output capacitance $V_{GS} = 0\text{ V}$ , $V_{DS} = -25\text{ V}$ , $f = 1\text{ MHz}$	$C_{oss}$		40	50	
Reverse transfer capacitance $V_{GS} = 0\text{ V}$ , $V_{DS} = -25\text{ V}$ , $f = 1\text{ MHz}$	$C_{rss}$		17	21	
Turn-on delay time $V_{DD} = -30\text{ V}$ , $V_{GS} = -4.5\text{ V}$ , $I_D = -0.89\text{ A}$ , $R_G = 18\Omega$	$t_{d(on)}$		24	36	ns
Rise time $V_{DD} = -30\text{ V}$ , $V_{GS} = -4.5\text{ V}$ , $I_D = -0.89\text{ A}$ , $R_G = 18\Omega$	$t_r$		9	14	
Turn-off delay time $V_{DD} = -30\text{ V}$ , $V_{GS} = -4.5\text{ V}$ , $I_D = -0.89\text{ A}$ , $R_G = 18\Omega$	$t_{d(off)}$		32	48	
Fall time $V_{DD} = -30\text{ V}$ , $V_{GS} = -4.5\text{ V}$ , $I_D = -0.89\text{ A}$ , $R_G = 18\Omega$	$t_f$		19	28	

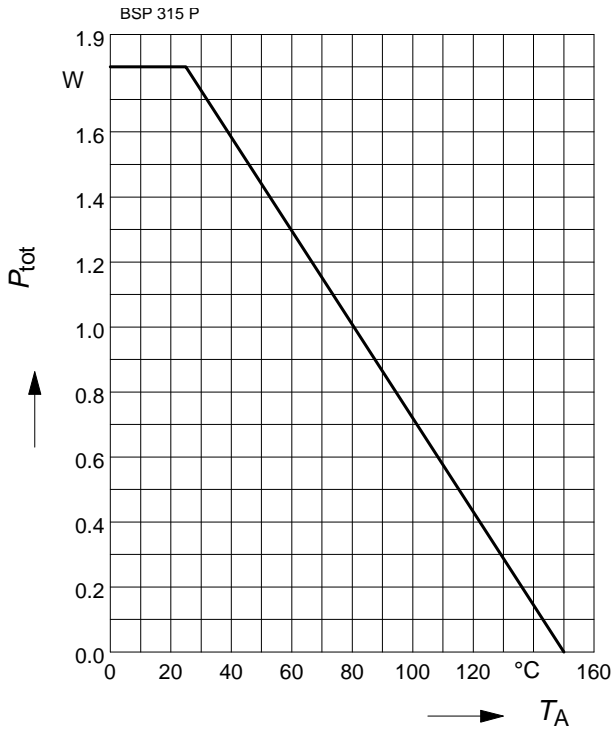
**Electrical Characteristics, at  $T_j = 25\text{ }^\circ\text{C}$ , unless otherwise specified**

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>Dynamic Characteristics</b>					
Gate to source charge $V_{DD} = -48\text{ V}, I_D = -1.17\text{ A}$	$Q_{gs}$		0.7	1.1	nC
Gate to drain charge $V_{DD} = -48\text{ V}, I_D = -1.17\text{ A}$	$Q_{gd}$		1.8	2.6	
Gate charge total $V_{DD} = -48\text{ V}, I_D = -1.17\text{ A}, V_{GS} = 0\text{ to }-10\text{ V}$	$Q_g$		5.2	7.8	
Gate plateau voltage $V_{DD} = -48\text{ V}, I_D = -1.17\text{ A}$	$V_{(plateau)}$		-3.14		V

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>Reverse Diode</b>					
Inverse diode continuous forward current $T_A = 25\text{ }^\circ\text{C}$	$I_S$			-1.17	A
Inverse diode direct current,pulsed $T_A = 25\text{ }^\circ\text{C}$	$I_{SM}$			-4.68	
Inverse diode forward voltage $V_{GS} = 0\text{ V}, I_F = -1.17\text{ A}$	$V_{SD}$		-0.97	-1.3	V
Reverse recovery time $V_R = -30\text{ V}, I_F = I_S, di_F/dt = 100\text{ A}/\mu\text{s}$	$t_{rr}$		30.5	46	ns
Reverse recovery charge $V_R = -30\text{ V}, I_F = I_S, di_F/dt = 100\text{ A}/\mu\text{s}$	$Q_{rr}$		36	54	$\mu\text{C}$

**Power Dissipation**

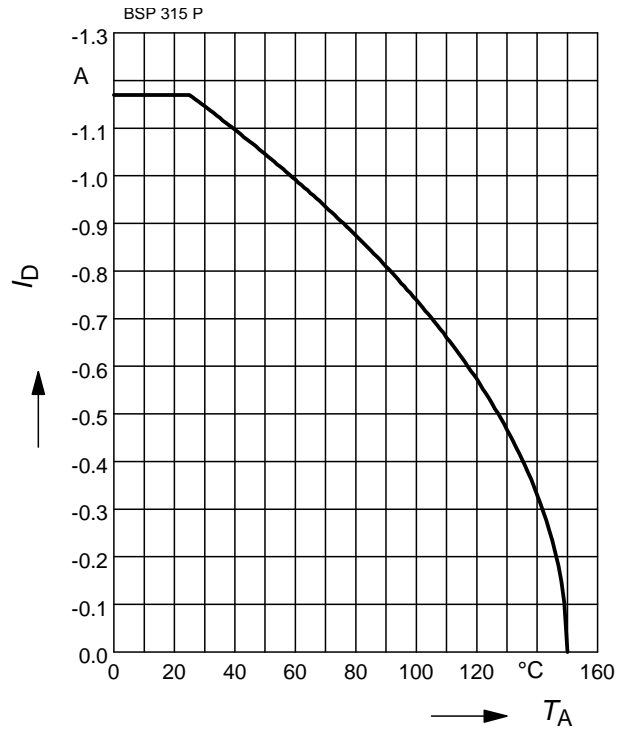
$P_{tot} = f(T_A)$



**Drain current**

$I_D = f(T_A)$

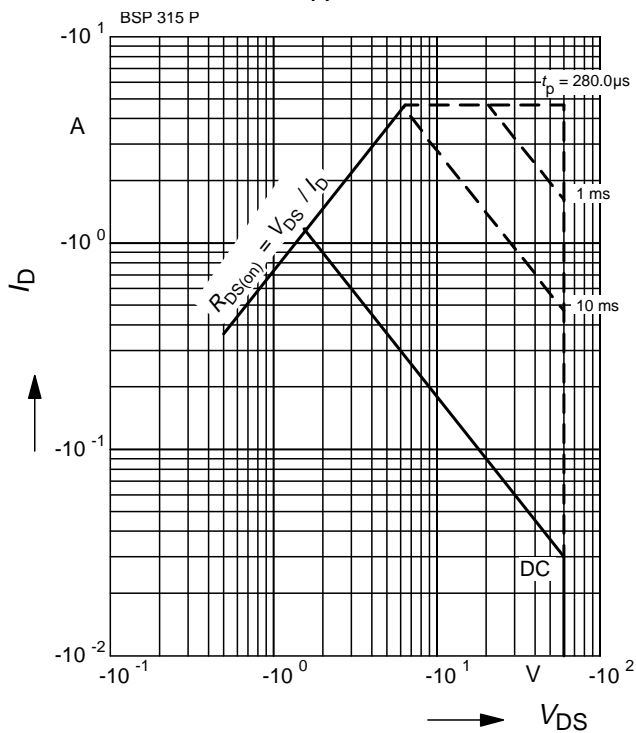
parameter :  $V_{GS} \geq -10V$



**Safe operating area**

$I_D = f(V_{DS})$

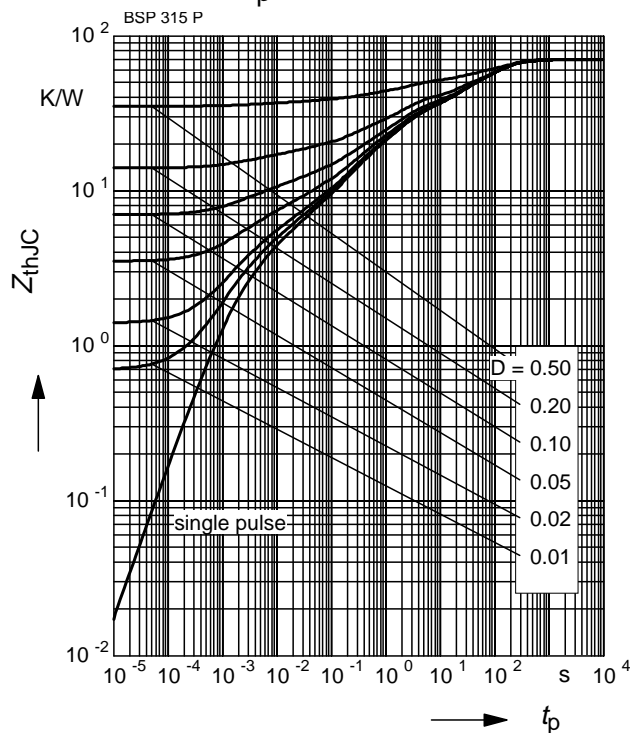
parameter :  $D = 0, T_A = 25\text{ °C}$



**Transient thermal impedance**

$Z_{thJC} = f(t_p)$

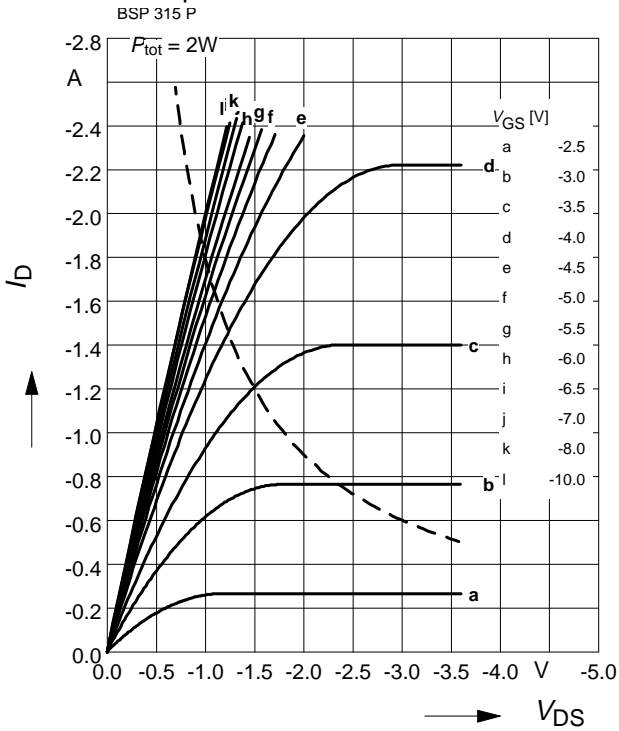
parameter :  $D = t_p/T$



**Typ. output characteristics**

$I_D = f(V_{DS})$

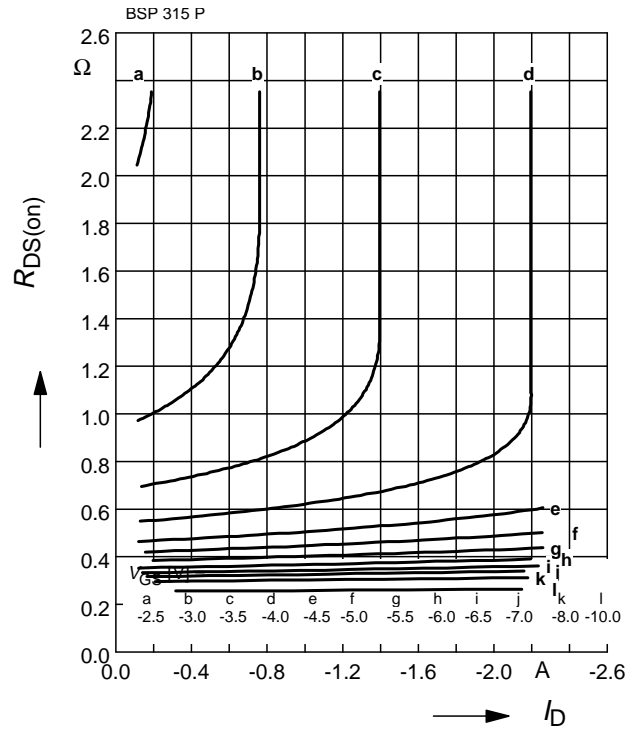
parameter:  $t_p = 80 \mu s$



**Typ. drain-source-on-resistance**

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

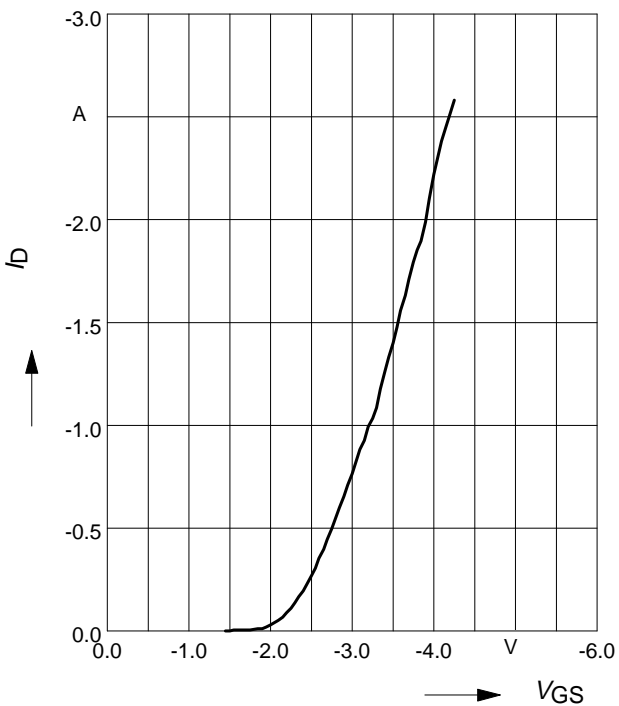
parameter:  $V_{GS}$



**Typ. transfer characteristics  $I_D = f(V_{GS})$**

$V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$

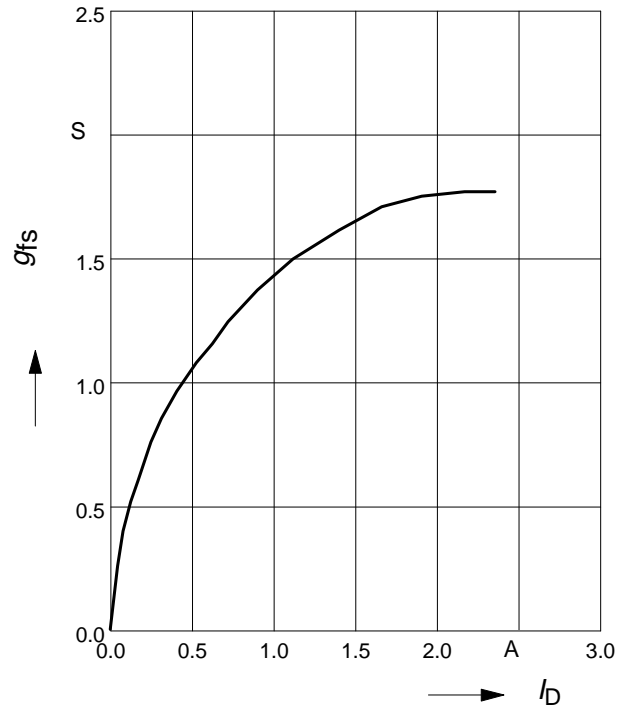
parameter:  $t_p = 80 \mu s$



**Typ. forward transconductance**

$g_{fs} = f(I_D); T_j = 25^\circ C$

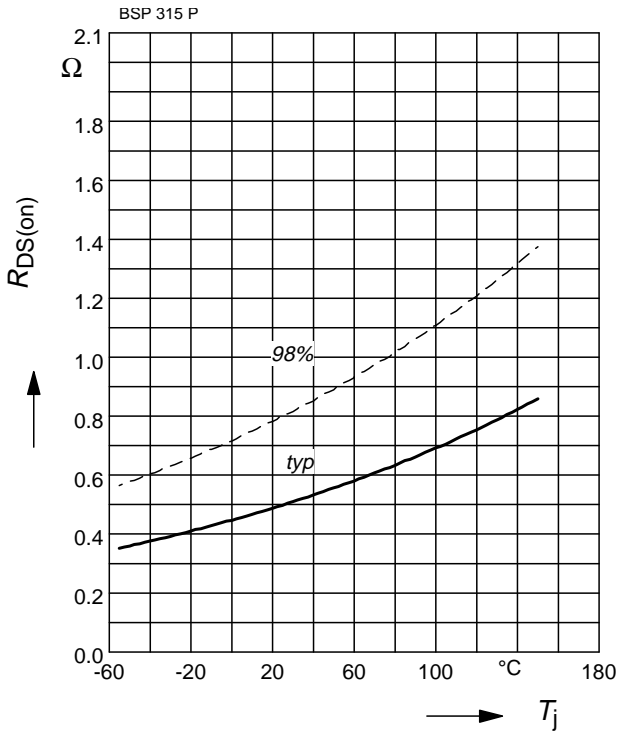
parameter:  $g_{fs}$



**Drain-source on-resistance**

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

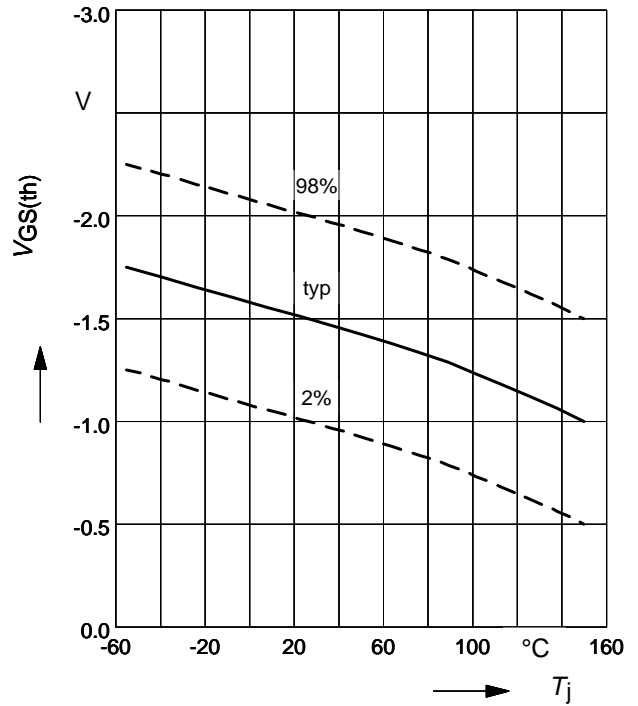
parameter:  $I_D = -1.17\text{ A}$ ,  $V_{GS} = -10\text{ V}$



**Gate threshold voltage**

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

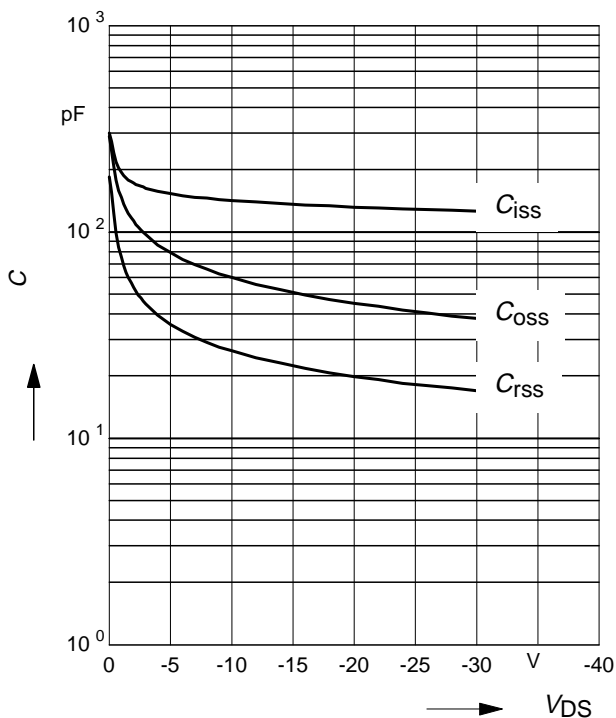
parameter:  $V_{GS} = V_{DS}$ ,  $I_D = -160\ \mu\text{A}$



**Typ. capacitances**

$C = f(V_{DS})$

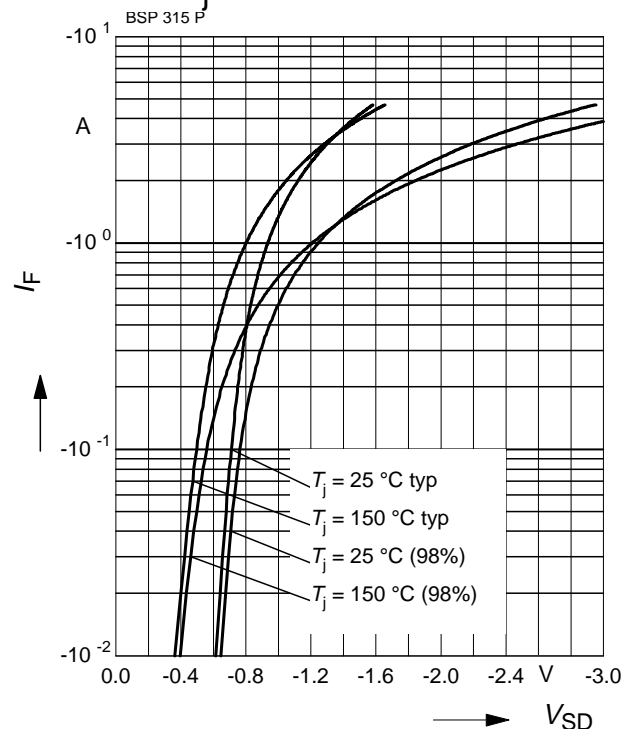
Parameter:  $V_{GS} = 0\text{ V}$ ,  $f = 1\text{ MHz}$



**Forward characteristics of reverse diode**

$I_F = f(V_{SD})$

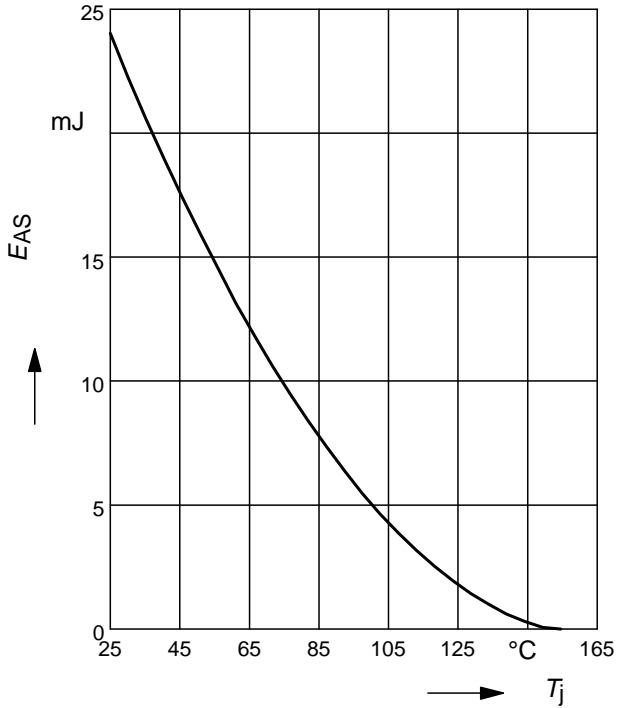
parameter:  $T_j$ ,  $t_p = 80\ \mu\text{s}$



**Avalanche Energy  $E_{AS} = f(T_j)$**

parameter:  $I_D = -1.17\text{ A}$  ,  $V_{DD} = -25\text{ V}$

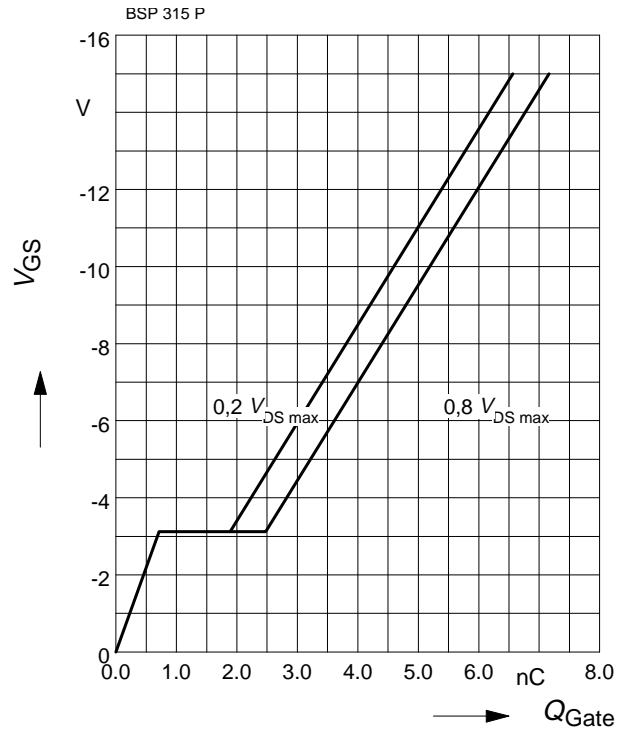
$R_{GS} = 25\ \Omega$



**Typ. gate charge**

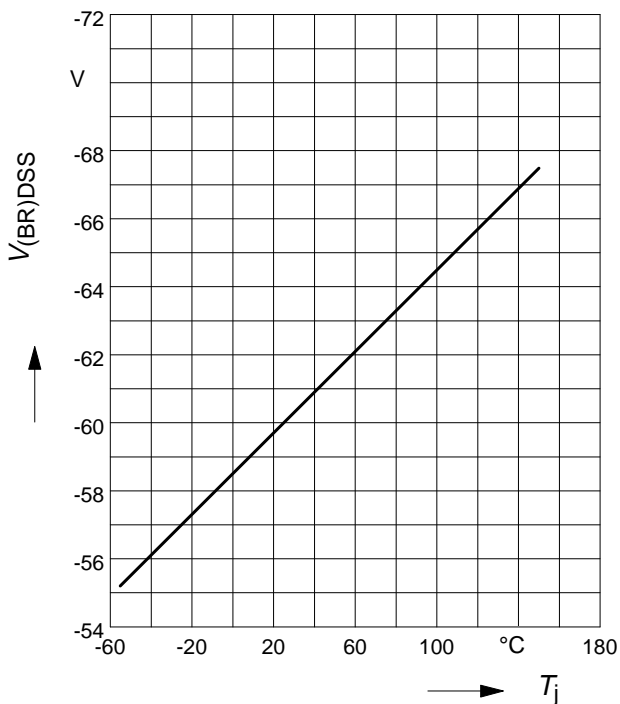
$V_{GS} = f(Q_{Gate})$

parameter:  $I_D = -1.17\text{ A}$  pulsed



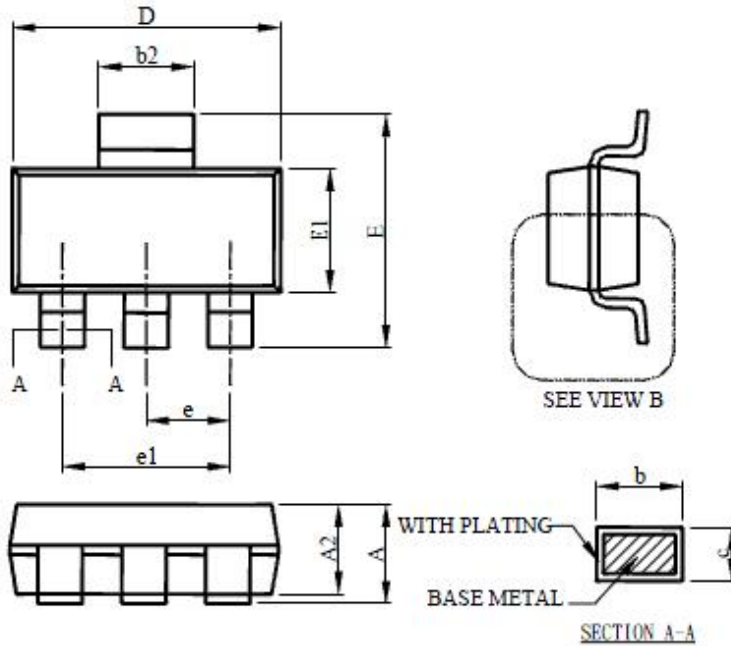
**Drain-source breakdown voltage**

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

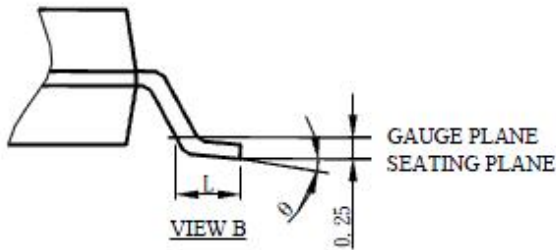




Package Mechanical Data SOT-223



SYMBOL	SOT-223	
	MILLIMETERS	
	MIN.	MAX.
A		1.80
A1	0.02	0.10
A2	1.55	1.65
b	0.68	0.84
b2	2.90	3.10
c	0.23	0.33
D	6.30	6.70
E	6.70	7.30
E1	3.30	3.70
e	2.30 BSC	
e1	4.60 BSC	
L	0.90	
θ	0°	8°



Note:

1. Refer to JEDEC TO-261AA.
2. Dimension D and E1 are determined at the outermost extremes of the plastic body exclusive of mold flash, tie bar burrs, gate burrs, and interlead flash, but including any mismatch between the top and bottom of the plastic body.
3. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

**Marking**



**Ordering information**

Order code	Package	Baseqty	Deliverymode
UMW BSP315P	SOT-223	2500	Tape and reel

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[PJMF280N60E1\\_T0\\_00201](#) [PJMF600N65E1\\_T0\\_00201](#) [PJMF900N65E1\\_T0\\_00201](#)