

MOSFET  
Small Signal MOSFET, -60 V

Features

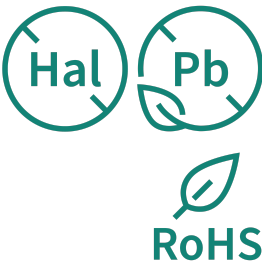
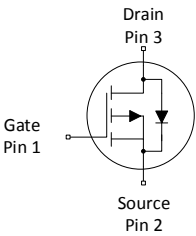
- P-channel
- Very low on-resistance  $R_{DS(on)}$
- Superior thermal resistance
- 100% avalanche tested
- Pb-free lead plating; RoHS compliant
- Halogen-free according to IEC61249-2-21
- Logic level

Product validation

Fully qualified according to JEDEC for Industrial Applications

Table 1 Key performance parameters

Parameter	Value	Unit
$V_{DS}$	-60	V
$R_{DS(on),max}$	5500	mΩ
$I_D$	-0.29	A
$Q_{oss}$	-0.21	nC
$Q_G$	-0.29	nC



Part number	Package	Marking	Related links
BSS84I	PG-SOT23-3	BI	-



Table of contents

Description ..... 1

Maximum ratings ..... 3

Thermal characteristics ..... 3

Electrical characteristics ..... 4

Electrical characteristics diagrams ..... 6

Package outlines ..... 10

Revision history ..... 11

Trademarks ..... 12

Disclaimer ..... 12

## 1 Maximum ratings

at  $T_A=25\text{ °C}$ , unless otherwise specified

**Table 2 Maximum ratings**

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Continuous drain current <sup>1)</sup>	$I_D$	-	-	-0.29	A	$V_{GS}=-10\text{ V}$ , $T_C=25\text{ °C}$
				-0.19		$V_{GS}=-10\text{ V}$ , $T_C=100\text{ °C}$
				-0.17		$V_{GS}=-4.5\text{ V}$ , $T_C=100\text{ °C}$
				-0.18		$V_{GS}=-10\text{ V}$ , $T_A=25\text{ °C}$ , $R_{thJA}=350\text{ °C/W}$ <sup>2)</sup>
Pulsed drain current <sup>3)</sup>	$I_{D,pulse}$	-	-	-1.16	A	$T_C=25\text{ °C}$
Avalanche energy, single pulse <sup>4)</sup>	$E_{AS}$	-	-	4	mJ	$I_D=-0.18\text{ A}$ , $R_{GS}=25\text{ }\Omega$
Gate source voltage	$V_{GS}$	-20	-	20	V	-
Power dissipation	$P_{tot}$	-	-	0.96	W	$T_C=25\text{ °C}$
				0.4		$T_A=25\text{ °C}$ , $R_{thJA}=350\text{ °C/W}$ <sup>2)</sup>
Operating and storage temperature	$T_j, T_{stg}$	-55	-	150	°C	-

<sup>1)</sup> Rating refers to the product only with datasheet specified absolute maximum values, maintaining case temperature as specified. For other case temperatures please refer to Diagram 2. De-rating will be required based on the actual environmental conditions.

<sup>2)</sup> Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm<sup>2</sup> (one layer, 70 µm thick) copper area for drain connection. PCB is vertical in still air.

<sup>3)</sup> See Diagram 3 for more detailed information

<sup>4)</sup> See Diagram 13 for more detailed information

## 2 Thermal characteristics

**Table 3 Thermal characteristics**

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Thermal resistance, junction - case	$R_{thJC}$	-	-	130	°C/W	-
Thermal resistance, junction - ambient, minimal footprint	$R_{thJA}$			350		

### 3 Electrical characteristics

at  $T_j=25\text{ °C}$ , unless otherwise specified

**Table 4 Static characteristics**

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$V_{(BR)DSS}$	-60	-	-	V	$V_{GS}=0\text{ V}$ , $I_D=-250\text{ }\mu\text{A}$
Gate threshold voltage	$V_{GS(th)}$	-1.0	-1.5	-2.0	V	$V_{DS}=V_{GS}$ , $I_D=-11\text{ }\mu\text{A}$
Zero gate voltage drain current	$I_{DSS}$	-	-0.1	-1	$\mu\text{A}$	$V_{DS}=-60\text{ V}$ , $V_{GS}=0\text{ V}$ , $T_j=25\text{ °C}$
			-10	-100		$V_{DS}=-60\text{ V}$ , $V_{GS}=0\text{ V}$ , $T_j=125\text{ °C}$
Gate-source leakage current	$I_{GSS}$	-	-10	-100	nA	$V_{GS}=-20\text{ V}$ , $V_{DS}=0\text{ V}$
Drain-source on-state resistance	$R_{DS(on)}$	-	4344.4	5500	m $\Omega$	$V_{GS}=-10\text{ V}$ , $I_D=-0.18\text{ A}$
			5240.4	7000		$V_{GS}=-4.5\text{ V}$ , $I_D=-0.16\text{ A}$
Gate resistance	$R_G$	-	45	-	$\Omega$	-
Transconductance	$g_{fs}$	-	0.28	-	S	$ V_{DS} \geq 2 I_D R_{DS(on)max}$ , $I_D=-0.18\text{ A}$

**Table 5 Dynamic characteristics**

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Input capacitance <sup>5)</sup>	$C_{iss}$	-	18	23	pF	$V_{GS}=0\text{ V}$ , $V_{DS}=-30\text{ V}$ , $f=1\text{ MHz}$
Output capacitance <sup>5)</sup>	$C_{oss}$		3.4	4.4		
Reverse transfer capacitance <sup>5)</sup>	$C_{rss}$		1.2	2.1		
Turn-on delay time	$t_{d(on)}$	-	3.0	-	ns	$V_{DD}=-30\text{ V}$ , $V_{GS}=-10\text{ V}$ , $I_D=-0.18\text{ A}$ , $R_{G,ext}=6\text{ }\Omega$
Rise time	$t_r$		3.1			
Turn-off delay time	$t_{d(off)}$		6.8			
Fall time	$t_f$		48.7			

<sup>5)</sup> Defined by design. Not subject to production test.

**Table 6 Gate charge characteristics** <sup>6)</sup>

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Gate to source charge	$Q_{gs}$	-	-0.06	-	nC	$V_{DD} = -30\text{ V}$ , $I_D = -0.18\text{ A}$ , $V_{GS} = 0\text{ to } -4.5\text{ V}$
Gate charge at threshold	$Q_{g(th)}$		-0.03	-	nC	
Gate to drain charge <sup>7)</sup>	$Q_{gd}$		-0.17	-0.26	nC	
Switching charge	$Q_{sw}$		-0.21	-	nC	
Gate charge total <sup>7)</sup>	$Q_g$		-0.29	-0.36	nC	
Gate plateau voltage	$V_{plateau}$		-3.5	-	V	
Gate charge total <sup>7)</sup>	$Q_g$	-	-0.59	-0.78	nC	$V_{DD} = -30\text{ V}$ , $I_D = -0.18\text{ A}$ , $V_{GS} = 0\text{ to } -10\text{ V}$
Output charge <sup>7)</sup>	$Q_{oss}$	-	-0.21	-0.28	nC	$V_{DS} = -30\text{ V}$ , $V_{GS} = 0\text{ V}$

<sup>6)</sup> See "Gate charge waveforms" for parameter definition

<sup>7)</sup> Defined by design. Not subject to production test.

**Table 7 Reverse diode**

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Diode continuous forward current	$I_S$	-	-	-0.29	A	$T_C = 25\text{ °C}$
Diode pulse current	$I_{S,pulse}$			-1.16		
Diode forward voltage	$V_{SD}$	-	-0.86	-1.2	V	$V_{GS} = 0\text{ V}$ , $I_F = -0.18\text{ A}$ , $T_J = 25\text{ °C}$
Reverse recovery time <sup>8)</sup>	$t_{rr}$	-	10.5	21.0	ns	$V_R = -30\text{ V}$ , $I_F = -0.18\text{ A}$ , $di_F/dt = -100\text{ A}/\mu\text{s}$
Reverse recovery charge <sup>8)</sup>	$Q_{rr}$		4.5	9.0	nC	

<sup>8)</sup> Defined by design. Not subject to production test.

## 4 Electrical characteristics diagrams

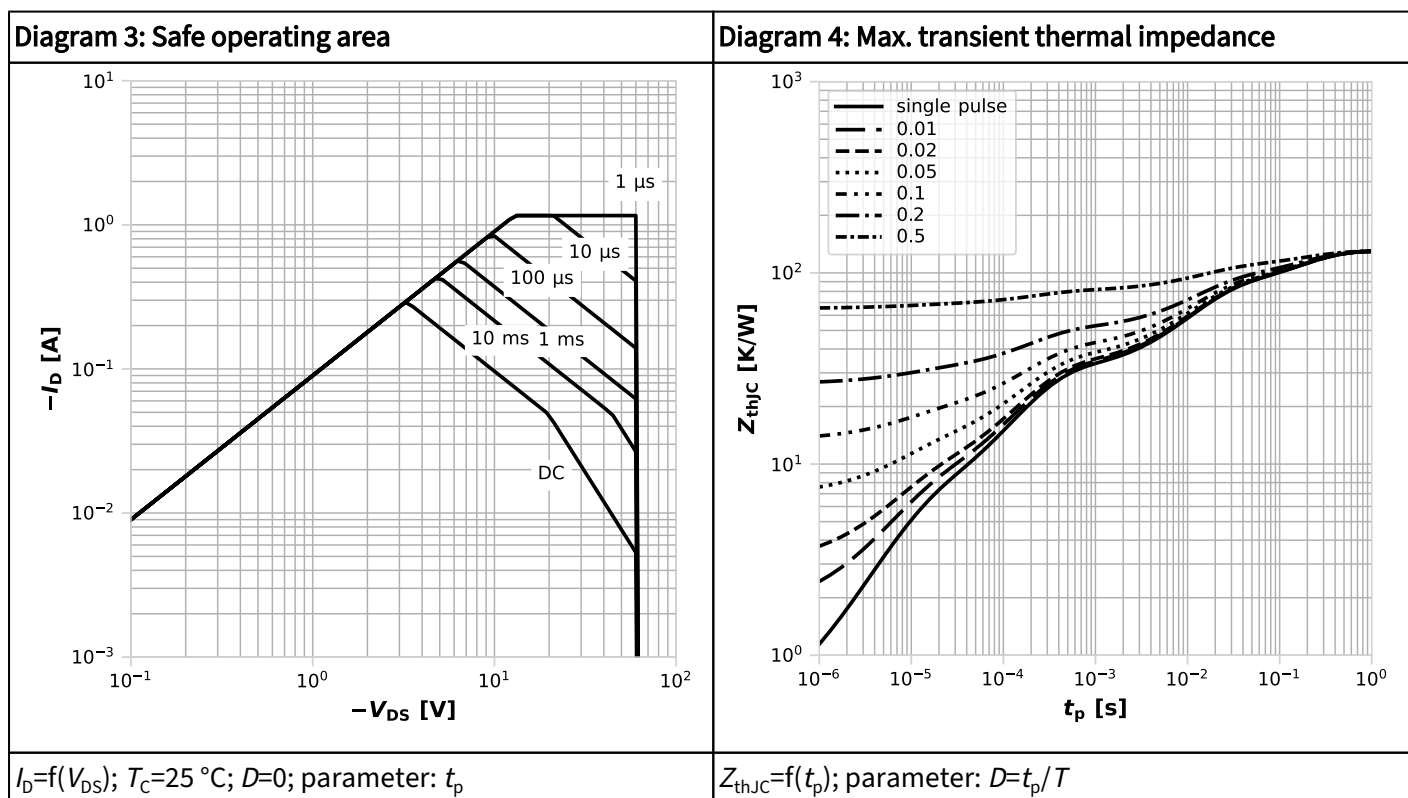
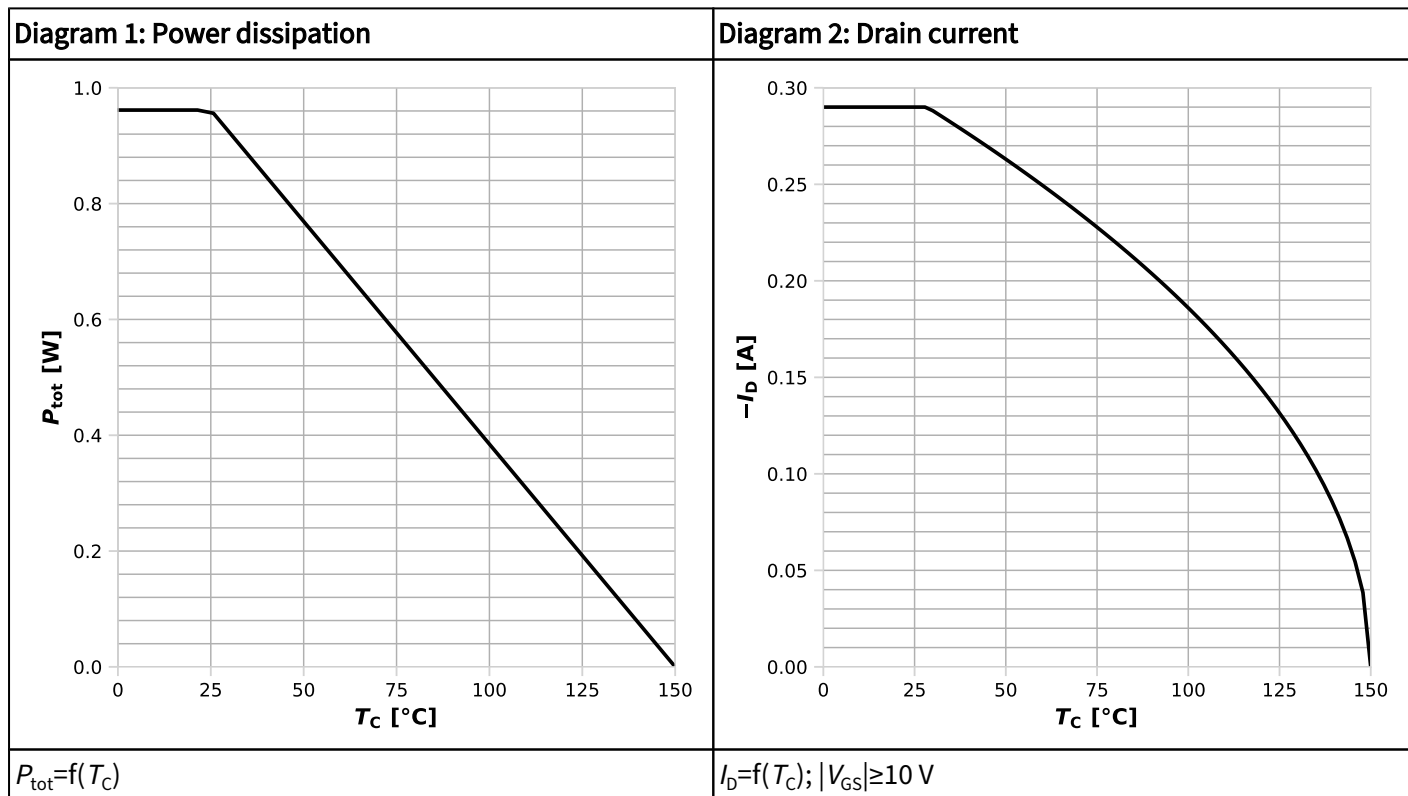
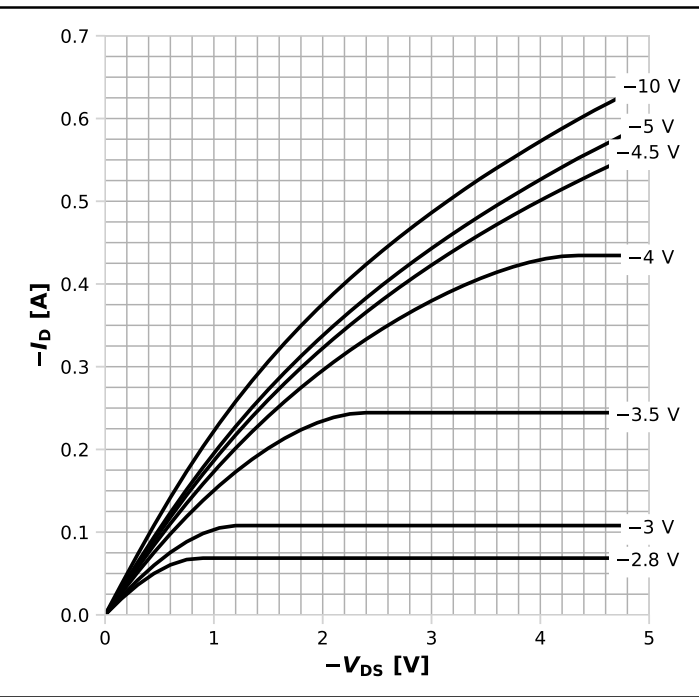
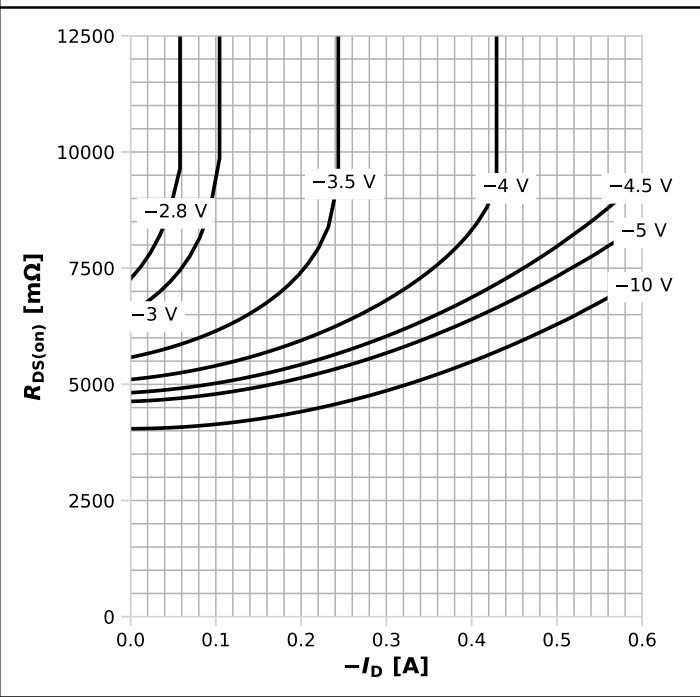


Diagram 5: Typ. output characteristics



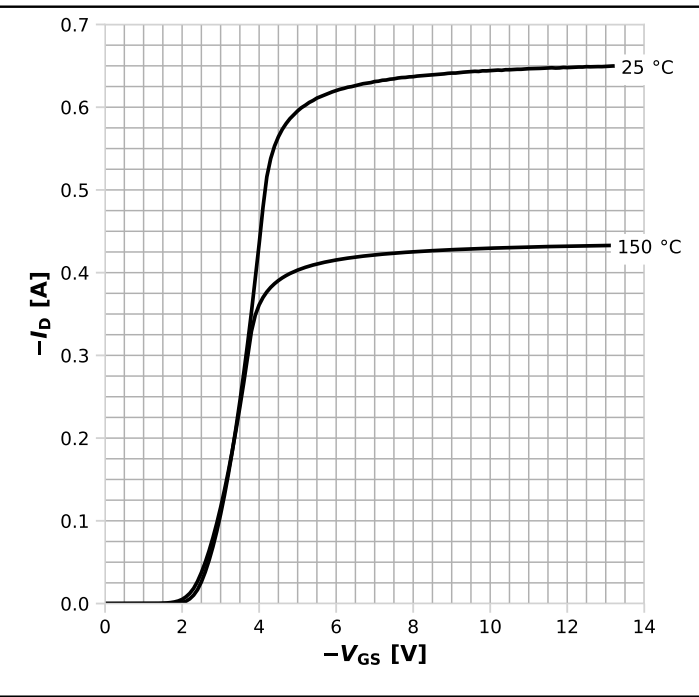
$I_D = f(V_{DS})$ ,  $T_j = 25^\circ\text{C}$ ; parameter:  $V_{GS}$

Diagram 6: Typ. drain-source on resistance



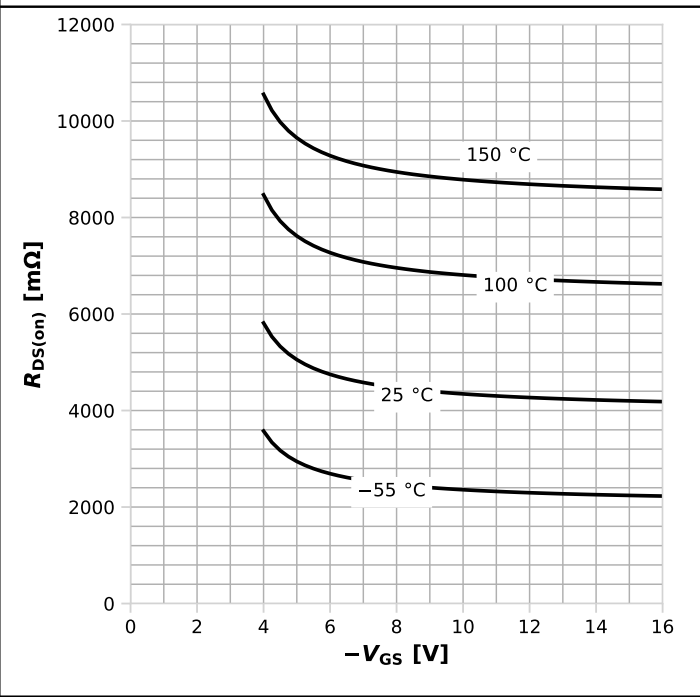
$R_{DS(on)} = f(I_D)$ ,  $T_j = 25^\circ\text{C}$ ; parameter:  $V_{GS}$

Diagram 7: Typ. transfer characteristics



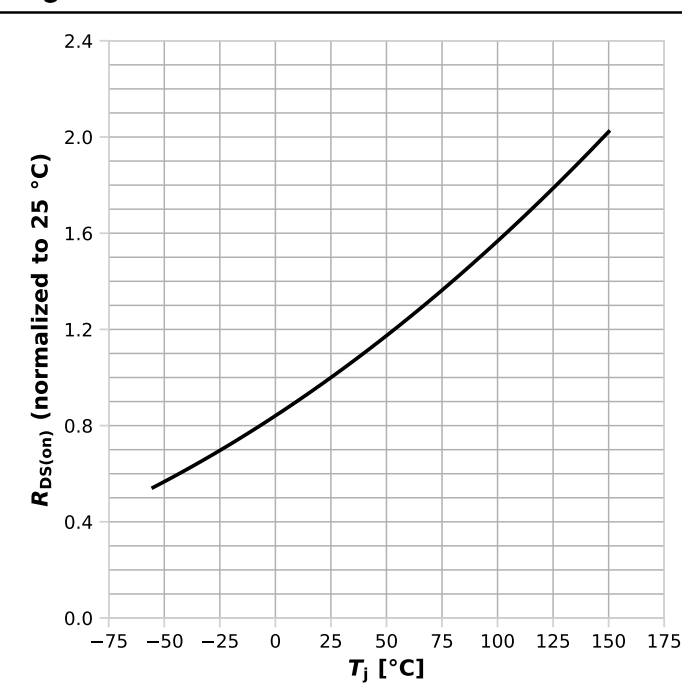
$I_D = f(V_{GS})$ ,  $|V_{DS}| > 2|I_D|R_{DS(on)max}$ ; parameter:  $T_j$

Diagram 8: Typ. drain-source on resistance



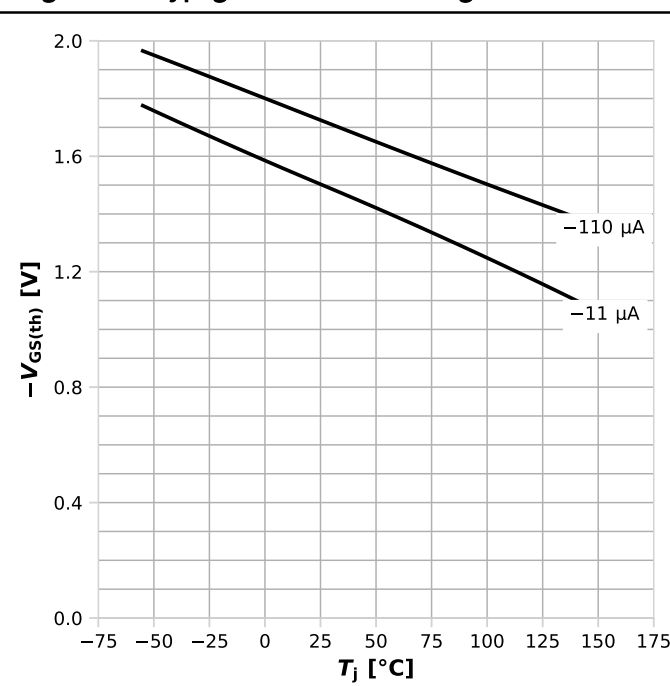
$R_{DS(on)} = f(V_{GS})$ ,  $I_D = -0.18\text{ A}$ ; parameter:  $T_j$

Diagram 9: Normalized drain-source on resistance



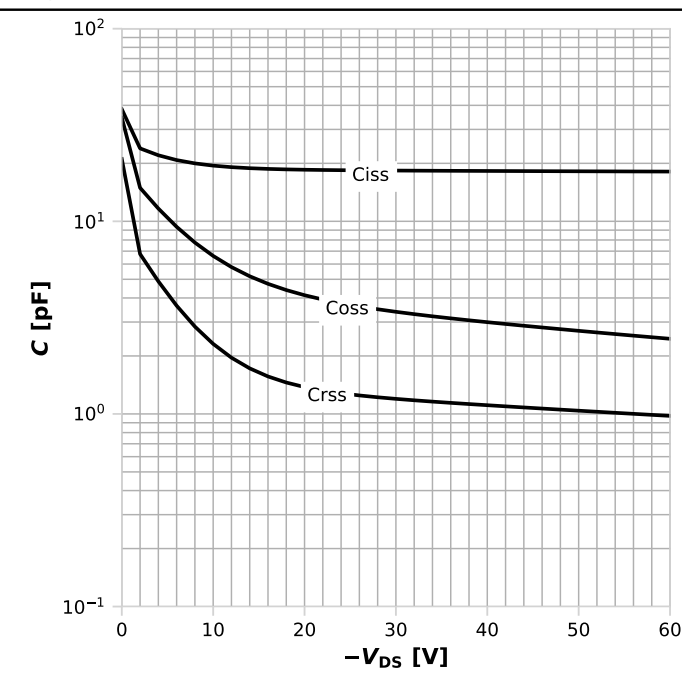
$R_{DS(on)} = f(T_j)$ ,  $I_D = -0.18$  A,  $V_{GS} = -10$  V

Diagram 10: Typ. gate threshold voltage



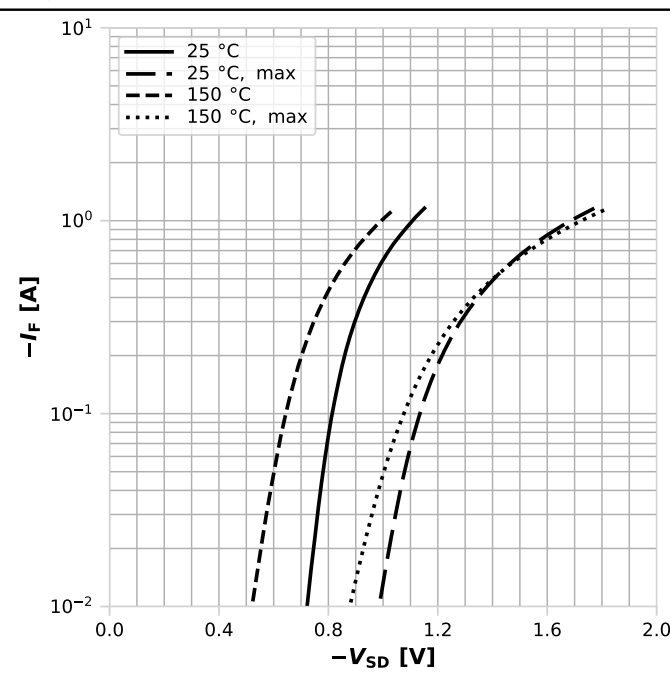
$V_{GS(th)} = f(T_j)$ ,  $V_{GS} = V_{DS}$ ; parameter:  $I_D$

Diagram 11: Typ. capacitances



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

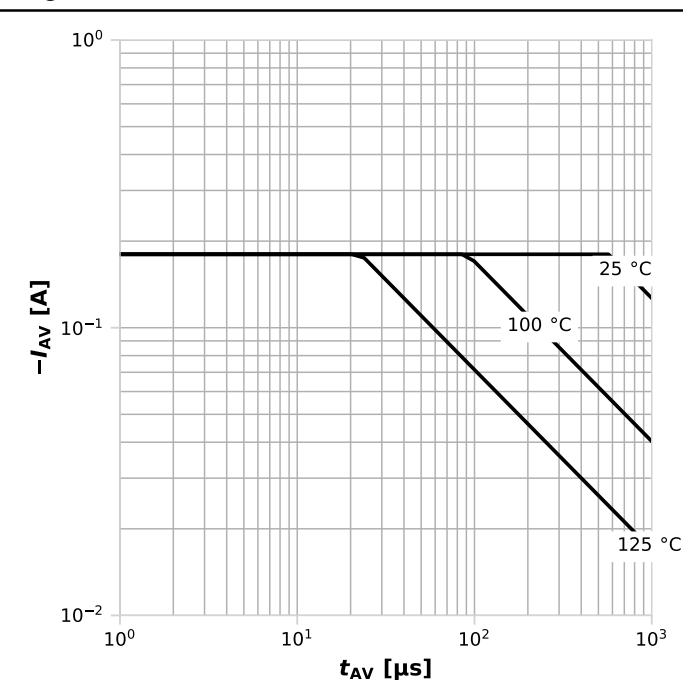
Diagram 12: Forward characteristics of reverse diode



$I_F = f(V_{SD})$ ; parameter:  $T_j$

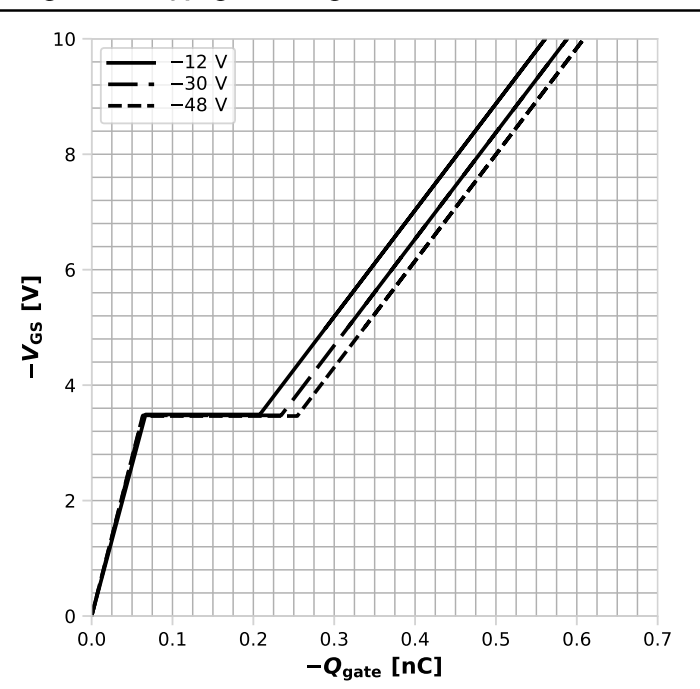


Diagram 13: Avalanche characteristics



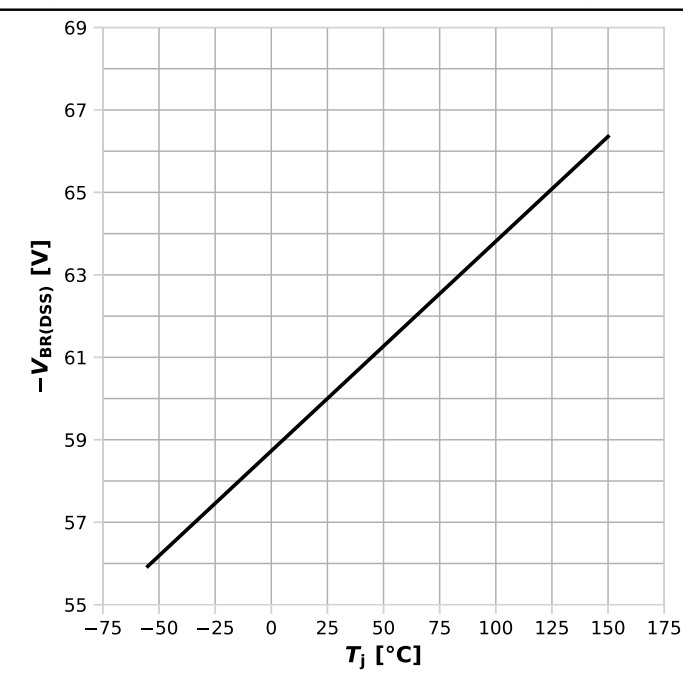
$I_{AS}=f(t_{AV})$ ;  $R_{GS}=25\ \Omega$ ; parameter:  $T_{j,start}$

Diagram 14: Typ. gate charge



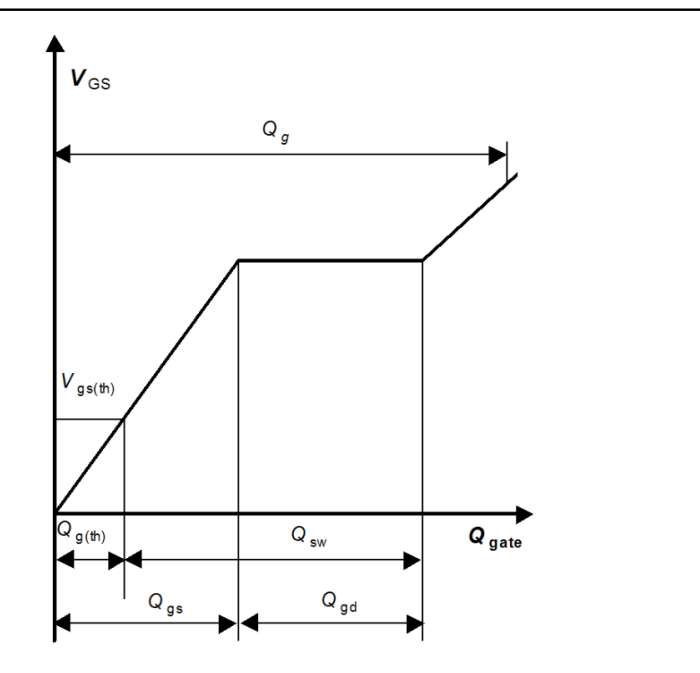
$V_{GS}=f(Q_{gate})$ ,  $I_D=-0.18$  A pulsed,  $T_j=25\ ^\circ\text{C}$ ; parameter:  $V_{DD}$

Diagram 15: Min. drain-source breakdown voltage



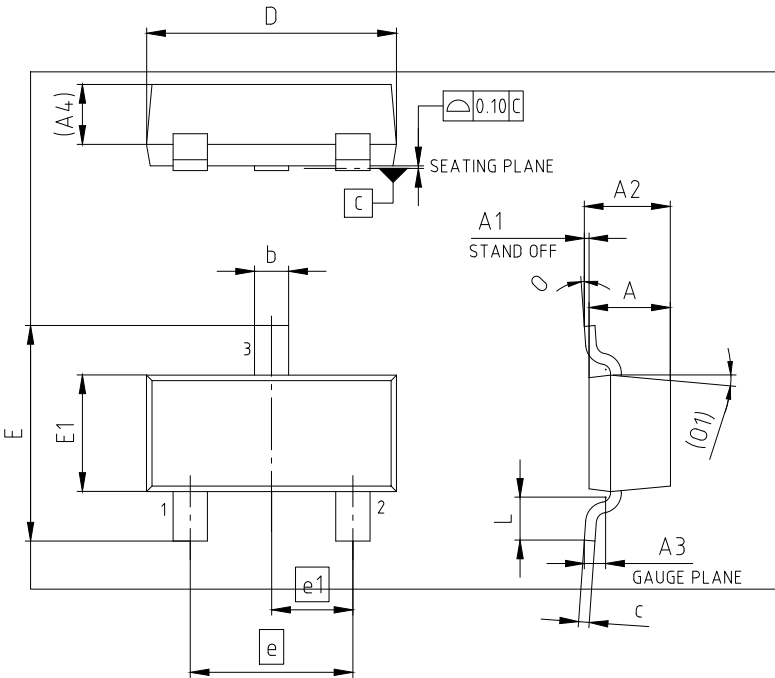
$V_{BR(DSS)}=f(T_j)$ ;  $I_D=-250\ \mu\text{A}$

Gate charge waveforms



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5 Package outlines



PACKAGE - GROUP NUMBER: PG-SOT23-3-U03					
DIMENSIONS	MILLIMETERS		DIMENSIONS	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
A	0.88	1.02	e	1.90	
A1	0.01	0.10	e1	0.95	
A2	0.89	1.12	L	0.40	0.60
A3	0.15	0.35	N	3	
A4	0.70		O	3°	8°
b	0.32	0.47	O1	6°	8°
c	0.08	0.18			
D	2.80	3.04			
E	2.40	2.64			
E1	1.32	1.40			

NOTE: ALL DIMENSIONS DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.

Figure 1 Outline PG-SOT23-3mm

## Revision history

BSS84I

### Revision 2025-02-16, Rev. 2.0

Previous revisions

Revision	Date	Subjects (major changes since last revision)
2.0	2025-02-16	Release of final datasheet

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