MOSFET

OptiMOS™ Power-MOSFET, 30 V

Powerstage 5x6

Features

- Dual N-channel OptiMOS™ MOSFET
- Optimized for clean switching
- 100% avalanche tested
- Superior thermal resistance
- Optimized for wireless charger
- Qualified according to JEDEC[1] for target applications
- Pb-free lead plating; RoHS compliant
- Halogen-free according to IEC61249-2-21

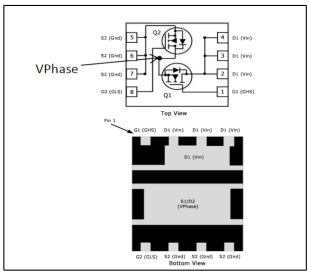


Table 1 Key Performance Parameters

Parameter	Value	Unit
V_{DS}	30	V
$R_{DS(on),max}$	5	mΩ
I_D	17	A
Q_{OSS}	8.6	nC
Q_G(0V..4.5V)	6.7	nC

Type / Ordering Code	Package	Marking	Related Links
BSC0993ND	PG-TISON-8	0993ND	-

[1] J-STD20 and JESD22

Table of Contents

1 Maximum ratings

at T_A=25 °C, unless otherwise specified, one transistor active

Table 2 Maximum ratings

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Continuous drain current	I_D	- -	- -	17 10	A	V_{GS}=10 V, T_A=25 °C V_{GS}=10 V, T_A=100 °C
Pulsed drain current[1]	$I_{D,pulse}$	-	-	68	A	T_A=25 °C
Avalanche energy, single pulse	E_{AS}	-	-	14	mJ	I_D=20 A, R_{GS}=25 Ω
Gate source voltage	V_{GS}	-20	-	20	V	-
Power dissipation	P_{tot}	-	-	2.5	W	T_A=25 °C, R_{thJA}=50 K/W[1]
Operating and storage temperature	T_j, T_{stg}	-55	-	150	°C	IEC climatic category; DIN IEC 68-1: 55/150/56

2 Thermal characteristics

Table 3 Thermal characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Thermal resistance, junction - case, bottom	R_{thJC}	-	-	4.2	K/W	-
Thermal resistance, junction - case, top	R_{thJC}	-	-	20	K/W	-
Device on PCB, 6 cm^2 cooling area[2]	R_{thJA}	-	-	50	K/W	-

[1] See Diagram 3 for more detailed information.
[2] Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm2 (one layer, 70 µm thick) copper area for drain connection. PCB is vertical in still air.

3 Electrical characteristics

Table 4 Static characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$V_{(BR)DSS}$	30	-	-	V	V_{GS}=0 V, I_D=1 mA
Gate threshold voltage	$V_{GS(th)}$	1.2	-	2.0	V	V_{DS}=V_{GS}, I_D=250 µA
Zero gate voltage drain current	I_{DSS}	- -	0.1 10	1 100	µA	V_{DS}=30 V, V_{GS}=0 V, T_j=25 °C V_{DS}=30 V, V_{GS}=0 V, T_j=125 °C
Gate-source leakage current	I_{GSS}	-	10	100	nA	V_{GS}=20 V, V_{DS}=0 V
Drain-source on-state resistance	$R_{DS(on)}$	- -	5.6 4.2	7 5	mΩ	V_{GS}=4.5 V, I_D=7 A V_{GS}=10 V, I_D=7 A
Gate resistance[1)]	R_G	1.3	2.6	5.2	Ω	-
Transconductance	g_{fs}	24	48	-	S	|V_{DS}|>2|I_D|$R_{DS(on)max}$, I_D=11 A

Table 5 Dynamic characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance[1)]	C_{iss}	-	870	1200	pF	V_{GS}=0 V, V_{DS}=15 V, f=1 MHz
Output capacitance[1)]	C_{oss}	-	330	440	pF	V_{GS}=0 V, V_{DS}=15 V, f=1 MHz
Reverse transfer capacitance	C_{rss}	-	49	-	pF	V_{GS}=0 V, V_{DS}=15 V, f=1 MHz
Turn-on delay time	$t_{d(on)}$	-	3.6	-	ns	V_{DD}=15 V, V_{GS}=10 V, I_D=7 A, $R_{G,ext}$=1.6 Ω
Rise time	t_r	-	3.8	-	ns	V_{DD}=15 V, V_{GS}=10 V, I_D=7 A, $R_{G,ext}$=1.6 Ω
Turn-off delay time	$t_{d(off)}$	-	17	-	ns	V_{DD}=15 V, V_{GS}=10 V, I_D=7 A, $R_{G,ext}$=1.6 Ω
Fall time	t_f	-	3.0	-	ns	V_{DD}=15 V, V_{GS}=10 V, I_D=7 A, $R_{G,ext}$=1.6 Ω

Table 6 Gate charge characteristics[2)]

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	2.1	-	nC	V_{DD}=15 V, I_D=7 A, V_{GS}=0 to 4.5 V
Gate charge at threshold	$Q_{g(th)}$	-	1.4	-	nC	V_{DD}=15 V, I_D=7 A, V_{GS}=0 to 4.5 V
Gate to drain charge	Q_{gd}	-	2.0	-	nC	V_{DD}=15 V, I_D=7 A, V_{GS}=0 to 4.5 V
Switching charge	Q_{sw}	-	2.7	-	nC	V_{DD}=15 V, I_D=7 A, V_{GS}=0 to 4.5 V
Gate charge total	Q_g	-	6.7	-	nC	V_{DD}=15 V, I_D=7 A, V_{GS}=0 to 4.5 V
Gate plateau voltage	$V_{plateau}$	-	2.4	-	V	V_{DD}=15 V, I_D=7 A, V_{GS}=0 to 4.5 V
Gate charge total[1)]	Q_g	-	13	18	nC	V_{DD}=15 V, I_D=7 A, V_{GS}=0 to 10 V
Gate charge total, sync. FET	$Q_{g(sync)}$	-	5.4	-	nC	V_{DS}=0.1 V, V_{GS}=0 to 4.5 V
Output charge[1)]	Q_{oss}	-	8.6	11	nC	V_{DD}=15 V, V_{GS}=0 V

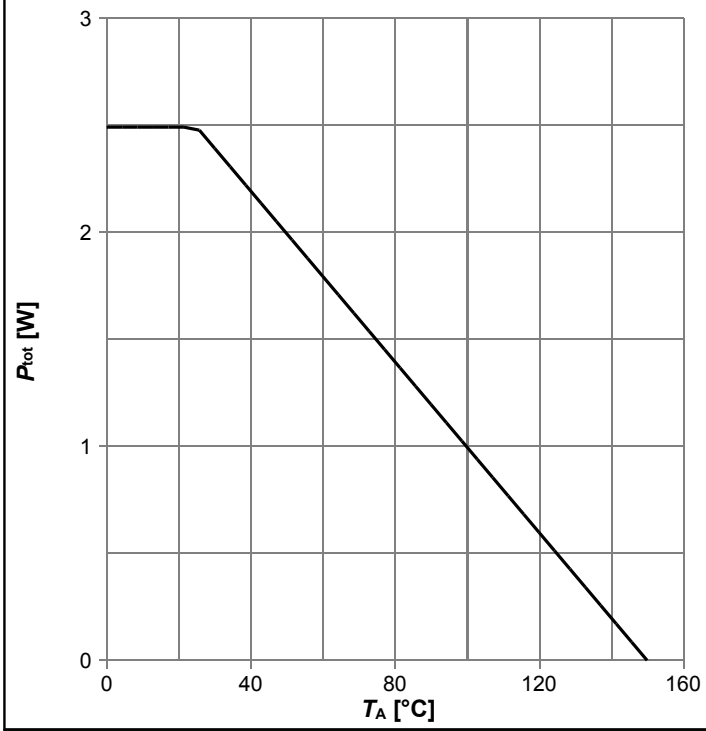
[1)] Defined by design. Not subject to production test
[2)] See ″Gate charge waveforms″ for parameter definition

Table 7 Reverse diode

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode continuous forward current	I_S	-	-	2.5	A	T_A=25 °C
Diode pulse current	$I_{S,pulse}$	-	-	68	A	T_A=25 °C
Diode forward voltage	V_{SD}	-	0.76	1.1	V	V_{GS}=0 V, I_F=2.5 A, T_j=25 °C
Reverse recovery charge	Q_{rr}	-	5	-	nC	V_R=15 V, I_F=I_S, di_F/dt=400 A/µs

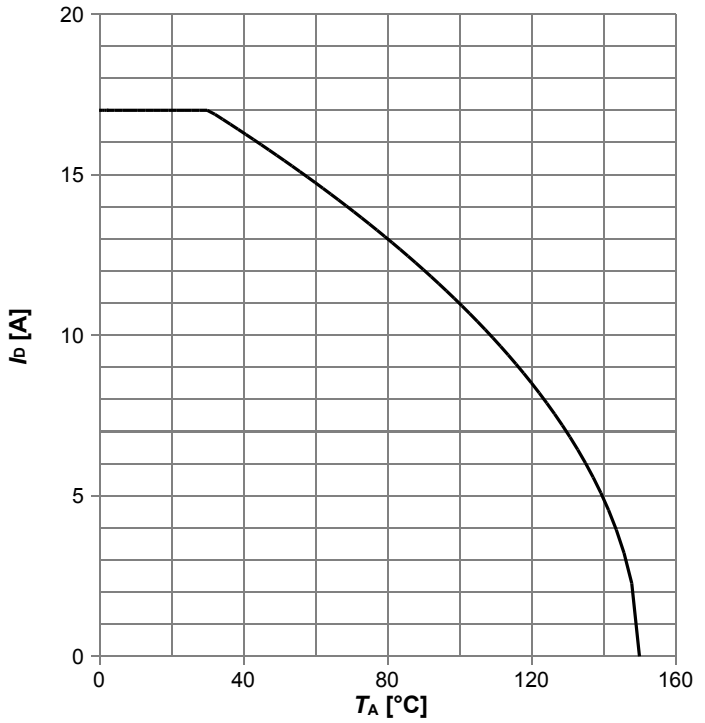
4 Electrical characteristics diagrams

Diagram 1: Power dissipation



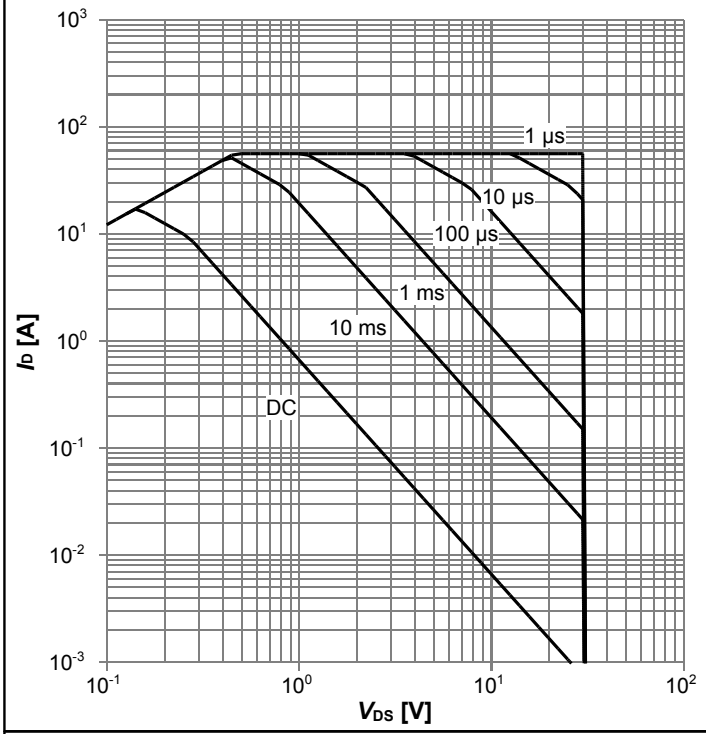
$P_{tot}=f(T_A)$

Diagram 2: Drain current



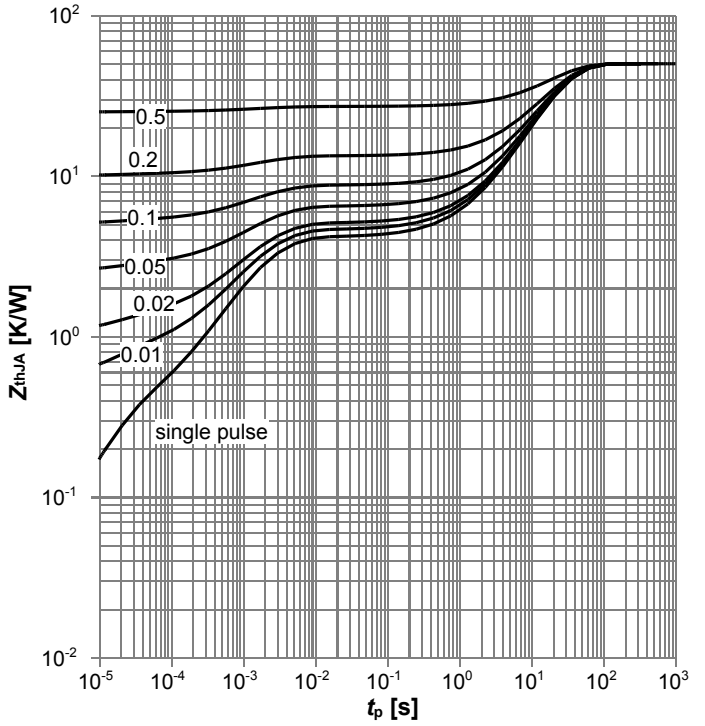
$I_D=f(T_A)$; $V_{GS}\geq 10$ V

Diagram 3: Safe operating area



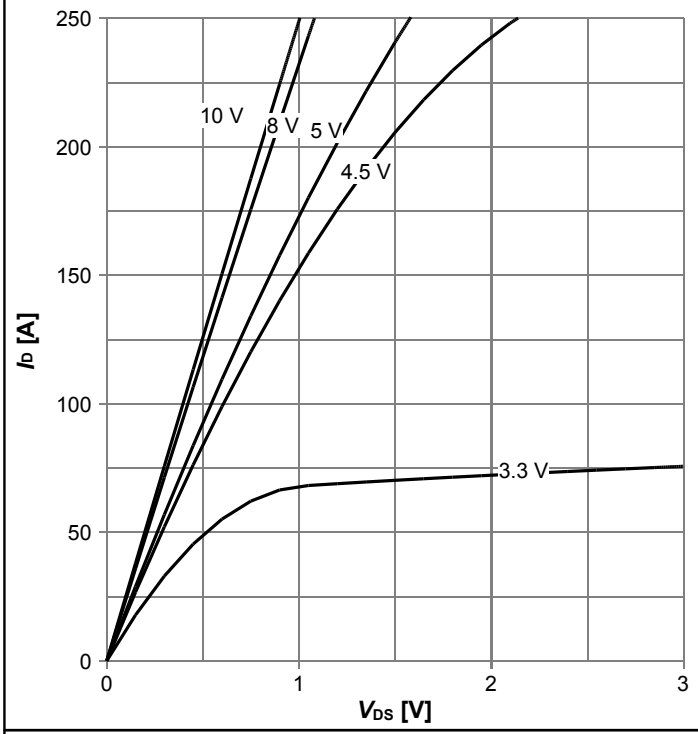
$I_D=f(V_{DS})$; $T_A=25$ °C; $D=0$; parameter: t_p

Diagram 4: Max. transient thermal impedance



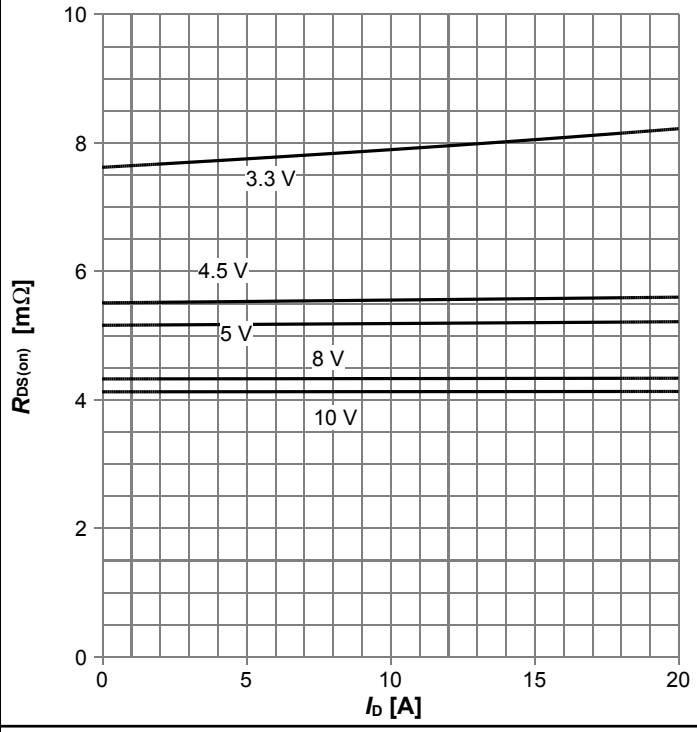
$Z_{thJA}=f(t_p)$; parameter: $D=t_p/T$

Diagram 5: Typ. output characteristics



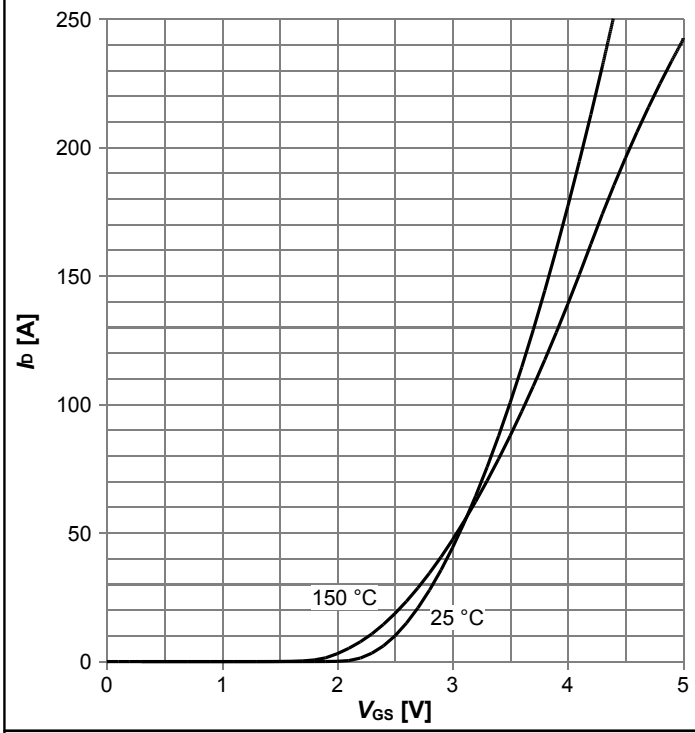
$I_D=f(V_{DS})$; $T_j=25$ °C; parameter: V_{GS}

Diagram 6: Typ. drain-source on resistance



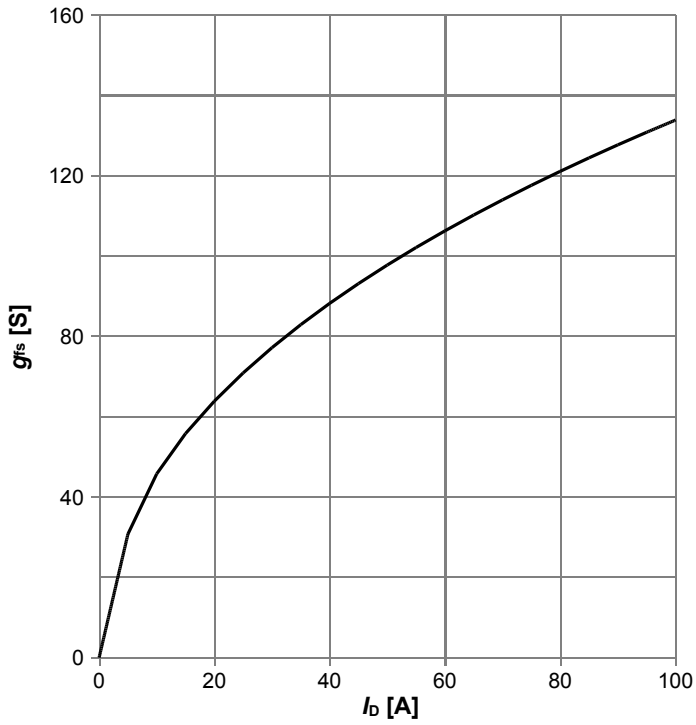
$R_{DS(on)}=f(I_D)$; $T_j=25$ °C; parameter: V_{GS}

Diagram 7: Typ. transfer characteristics



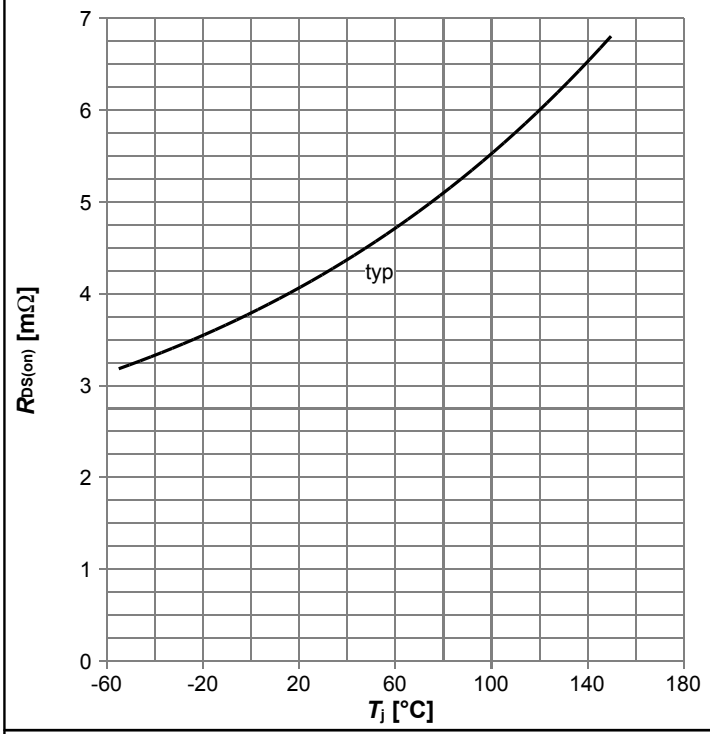
$I_D=f(V_{GS})$; $|V_{DS}|>2|I_D|R_{DS(on)max}$; parameter: T_j

Diagram 8: Typ. forward transconductance



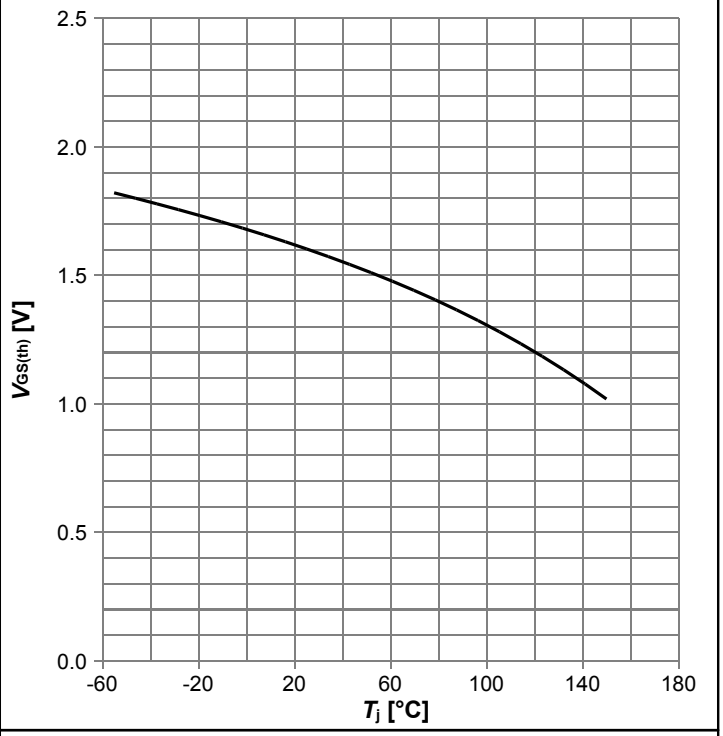
$g_{fs}=f(I_D)$; $T_j=25$ °C

Diagram 9: Drain-source on-state resistance



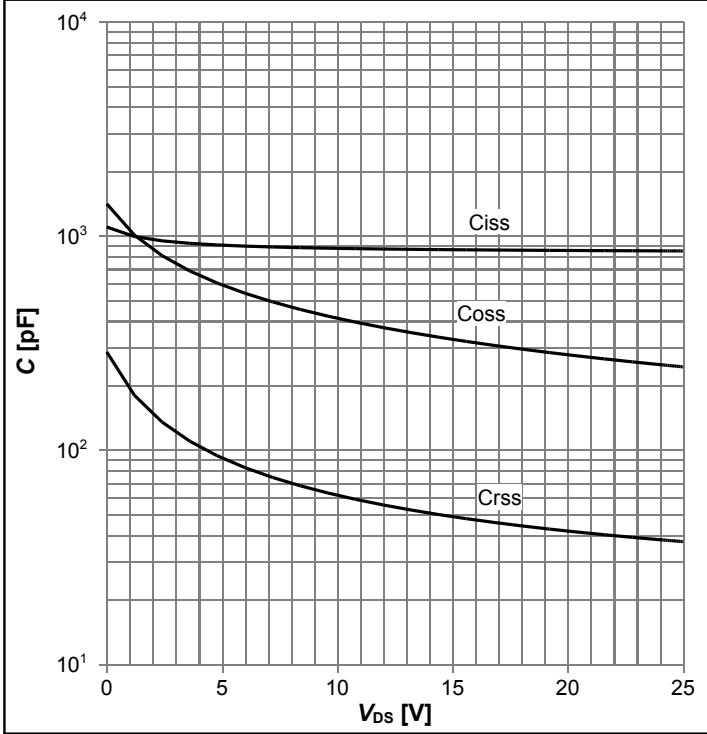
$R_{DS(on)}$=f(T_j); I_D=7 A; V_{GS}=10 V

Diagram 10: Typ. gate threshold voltage



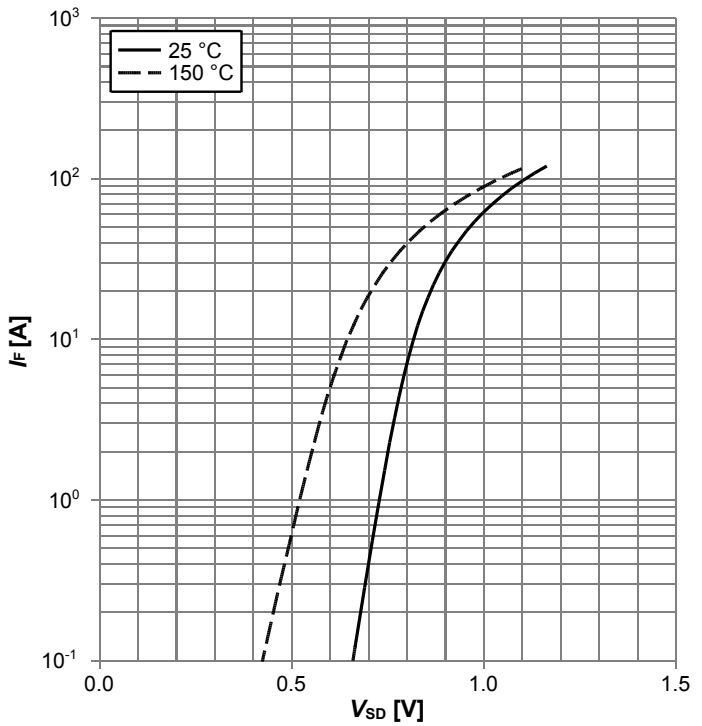
$V_{GS(th)}$=f(T_j); V_{GS}=V_{DS}; I_D=250 µA

Diagram 11: Typ. capacitances



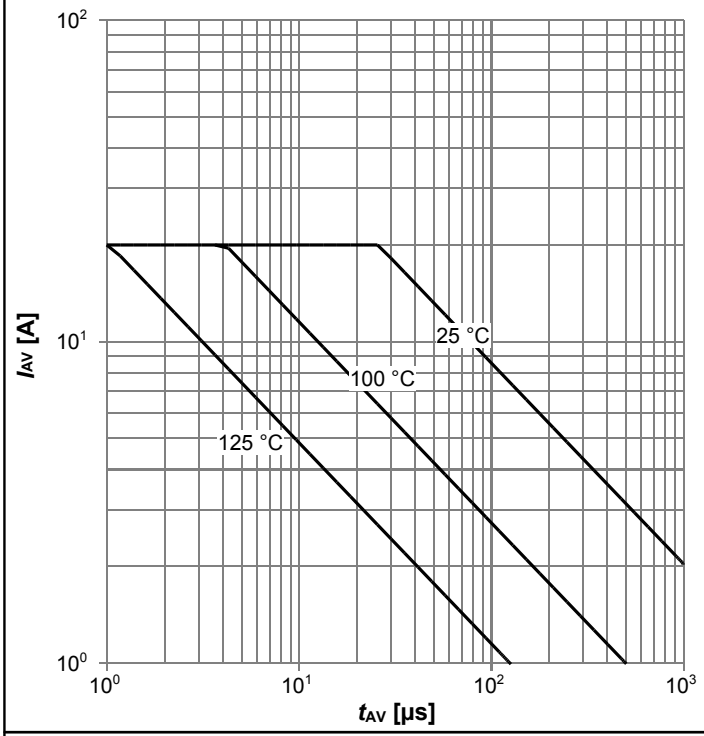
C=f(V_{DS}); V_{GS}=0 V; f=1 MHz

Diagram 12: Forward characteristics of reverse diode



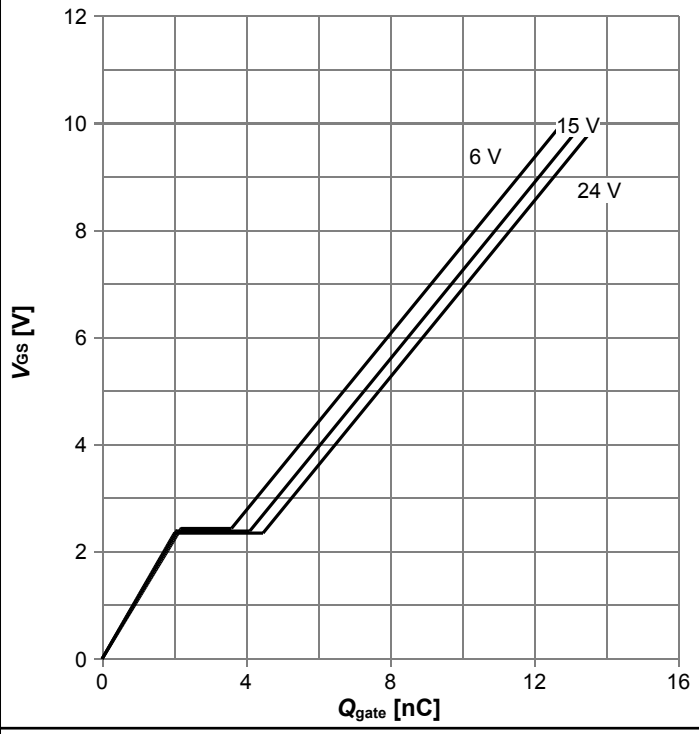
I_F=f(V_{SD}); parameter: T_j

Diagram 13: Avalanche characteristics



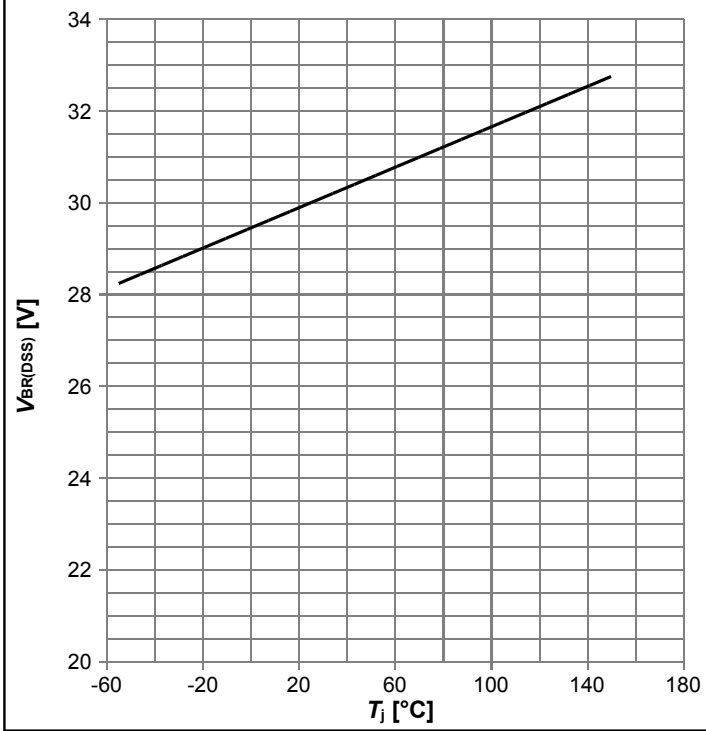
I_{AS}=f(t_{AV}); R_{GS}=25 Ω; parameter: $T_{j(start)}$

Diagram 14: Typ. gate charge



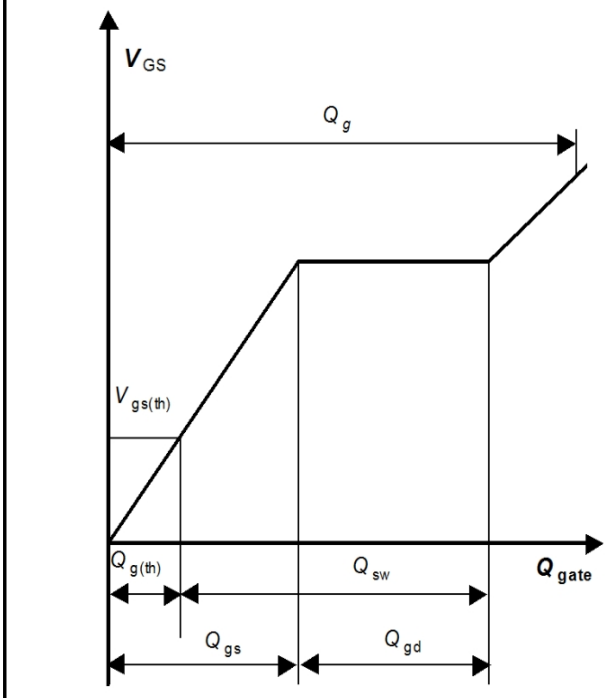
V_{GS}=f(Q_{gate}); I_D=7 A pulsed; parameter: V_{DD}

Diagram 15: Drain-source breakdown voltage

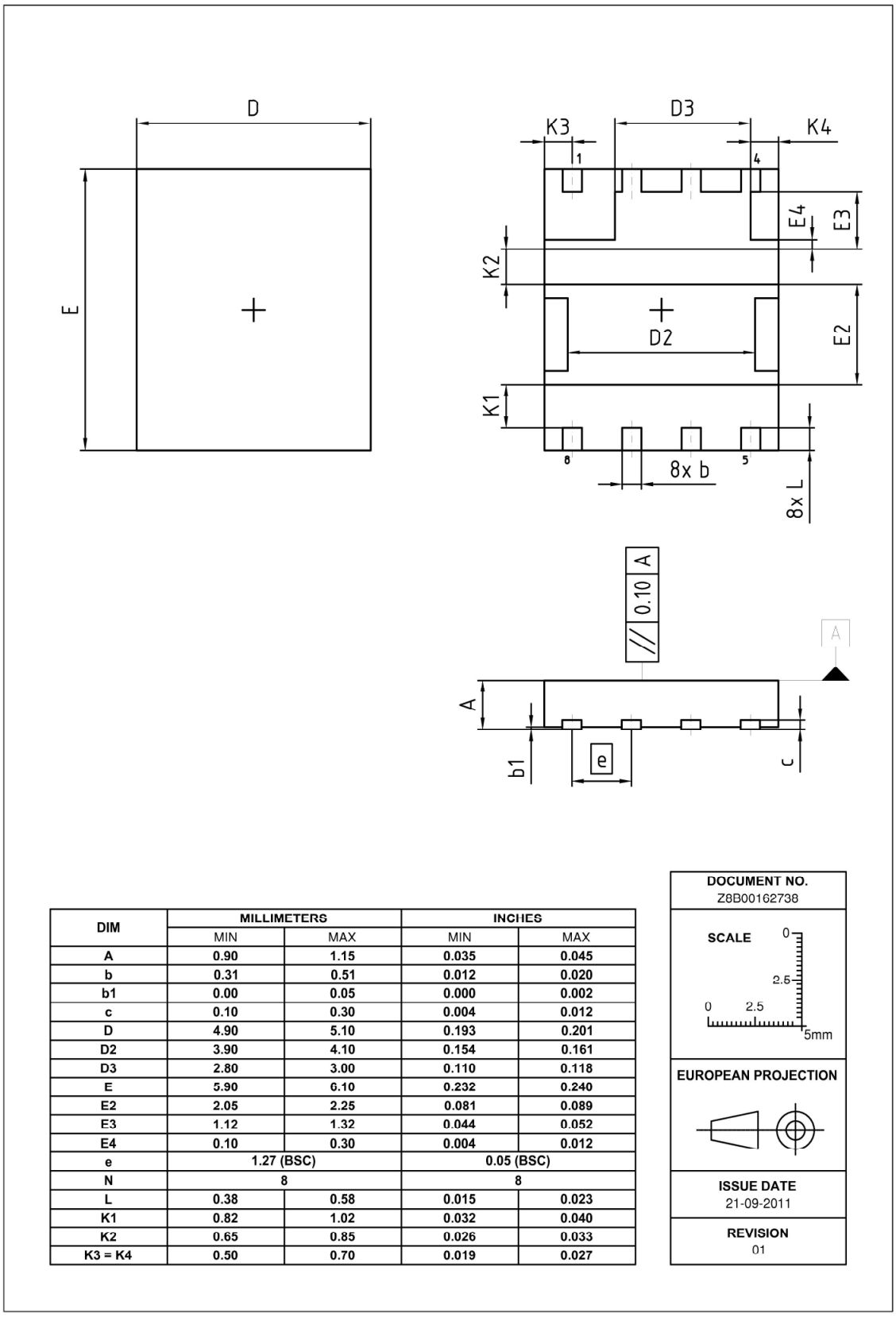


$V_{BR(DSS)}$=f(T_j); I_D=1 mA

Gate charge waveforms



5 Package Outlines



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.90	1.15	0.035	0.045
b	0.31	0.51	0.012	0.020
b1	0.00	0.05	0.000	0.002
c	0.10	0.30	0.004	0.012
D	4.90	5.10	0.193	0.201
D2	3.90	4.10	0.154	0.161
D3	2.80	3.00	0.110	0.118
E	5.90	6.10	0.232	0.240
E2	2.05	2.25	0.081	0.089
E3	1.12	1.32	0.044	0.052
E4	0.10	0.30	0.004	0.012
e	1.27 (BSC)		0.05 (BSC)	
N	8		8	
L	0.38	0.58	0.015	0.023
K1	0.82	1.02	0.032	0.040
K2	0.65	0.85	0.026	0.033
K3 = K4	0.50	0.70	0.019	0.027

DOCUMENT NO.
Z8B00162738

SCALE 0 2.5 5mm

EUROPEAN PROJECTION

ISSUE DATE
21-09-2011

REVISION
01

Figure 1 Outline PG-TISON-8, dimensions in mm/inches

Revision History

BSC0993ND

Revision: 2016-07-11, Rev. 2.0

Previous Revision

Revision	Date	Subjects (major changes since last revision)
2.0	2016-07-11	Release of final version

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