MOSFET

OptiMOS™ Power-Transistor, 60 V

Features

- Optimized for high performance SMPS, e.g. sync. rec.
- 175 °C rated
- 100% avalanche tested
- Superior thermal resistance
- N-channel
- 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}	60	V
$R_{DS(on),max}$	2.8	mΩ
I_D	137	A
Q_{oss}	43	nC
Q_G(0..10V)	37	nC

Type / Ordering Code	Package	Marking	Related Links
BSC028N06NST	PG-TDSON-8	028N06NT	-

[1] J-STD20 and JESD22

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1 Maximum ratings

at T_A=25 °C, unless otherwise specified

Table 2 Maximum ratings

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Continuous drain current[1]	I_D	- - -	- - -	137 97 24	A	V_{GS}=10 V, T_C=25 °C V_{GS}=10 V, T_C=100 °C V_{GS}=10 V, T_A=25 °C, R_{thJA} =50K/W[2]
Pulsed drain current[3]	$I_{D,pulse}$	-	-	548	A	T_C=25 °C
Avalanche energy, single pulse[4]	E_{AS}	-	-	100	mJ	I_D=50 A, R_{GS}=25 Ω
Gate source voltage	V_{GS}	-20	-	20	V	-
Power dissipation	P_{tot}	- -	- -	100 3.0	W	T_C=25 °C T_A=25 °C, R_{thJA}=50 K/W[3]
Operating and storage temperature	T_j, T_{stg}	-55	-	175	°C	-

2 Thermal characteristics

Table 3 Thermal characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Thermal resistance, junction - case, bottom	R_{thJC}	-	0.9	1.5	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] Rating refers to the product only with datasheet specified absolute maximum values, maintaining case temperature at 25°C. For higher case temperature please refer to Diagram 2. De-rating will be required based on the actual environmental conditions.
[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] See Diagram 3 for more detailed information
[4] See Diagram 13 for more detailed information

3 Electrical characteristics

at T_j=25 °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 V, I_D=1 mA
Gate threshold voltage	$V_{GS(th)}$	2.1	2.8	3.3	V	V_{DS}=V_{GS}, I_D=50 µA
Zero gate voltage drain current	I_{DSS}	- -	0.5 10	1 100	µA	V_{DS}=60 V, V_{GS}=0 V, T_j=25 °C V_{DS}=60 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	$R_{DS(on)}$	- -	2.3 3.4	2.8 4.2	mΩ	V_{GS}=10 V, I_D=50 A V_{GS}=6 V, I_D=12.5 A
Gate resistance[1)]	R_G	-	1.3	1.95	Ω	-
Transconductance	g_{fs}	50	100	-	S	$\|V_{DS}\|>2\|I_D\|R_{DS(on)max}$, I_D=50 A

Table 5 Dynamic characteristics[1)]

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance	C_{iss}	2025	2700	3375	pF	V_{GS}=0 V, V_{DS}=30 V, f=1 MHz
Output capacitance	C_{oss}	495	660	825	pF	V_{GS}=0 V, V_{DS}=30 V, f=1 MHz
Reverse transfer capacitance	C_{rss}	8.5	28	56	pF	V_{GS}=0 V, V_{DS}=30 V, f=1 MHz
Turn-on delay time	$t_{d(on)}$	-	11	22	ns	V_{DD}=30 V, V_{GS}=10 V, I_D=50 A, $R_{G,ext}$=3 Ω
Rise time	t_r	-	38	57	ns	V_{DD}=30 V, V_{GS}=10 V, I_D=50 A, $R_{G,ext}$=3 Ω
Turn-off delay time	$t_{d(off)}$	-	19	38	ns	V_{DD}=30 V, V_{GS}=10 V, I_D=50 A, $R_{G,ext}$=3 Ω
Fall time	t_f	-	8	16	ns	V_{DD}=30 V, V_{GS}=10 V, I_D=50 A, $R_{G,ext}$=3 Ω

Table 6 Gate charge characteristics[2)]

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	9	12	16.5	nC	V_{DD}=30 V, I_D=50 A, V_{GS}=0 to 10 V
Gate charge at threshold	$Q_{g(th)}$	6	8	11	nC	V_{DD}=30 V, I_D=50 A, V_{GS}=0 to 10 V
Gate to drain charge	Q_{gd}	5	7	10.3	nC	V_{DD}=30 V, I_D=50 A, V_{GS}=0 to 10 V
Switching charge	Q_{sw}	8	12	17	nC	V_{DD}=30 V, I_D=50 A, V_{GS}=0 to 10 V
Gate charge total	Q_g	31	37	49	nC	V_{DD}=30 V, I_D=50 A, V_{GS}=0 to 10 V
Gate plateau voltage	$V_{plateau}$	4.0	4.6	5.2	V	V_{DD}=30 V, I_D=50 A, V_{GS}=0 to 10 V
Gate charge total, sync. FET	$Q_{g(sync)}$	27	33	43	nC	V_{DS}=0.1 V, V_{GS}=0 to 10 V
Output charge	Q_{oss}	32	43	54	nC	V_{DD}=30 V, V_{GS}=0 V

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

Table 7 Reverse diode

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode continuous forward current	I_S	-	-	100	A	T_C=25 °C
Diode pulse current	$I_{S,pulse}$	-	-	400	A	T_C=25 °C
Diode forward voltage	V_{SD}	-	0.9	1.2	V	V_{GS}=0 V, I_F=50 A, T_j=25 °C
Reverse recovery time[1)]	t_{rr}	14	35	56	ns	V_R=30 V, I_F=50 A, di_F/dt=100 A/µs
Reverse recovery charge[1)]	Q_{rr}	14	29	58	nC	V_R=30 V, I_F=50 A, di_F/dt=100 A/µs

[1)] Defined by design. Not subject to production test

4 Electrical characteristics diagrams

Diagram 1: Power dissipation

P_{tot}=f(T_C)

Diagram 2: Drain current

I_D=f(T_C); V_{GS}≥10 V

Diagram 3: Safe operating area

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

Diagram 4: Max. transient thermal impedance

Z_{thJC}=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=50 A; V_{GS}=10 V

Diagram 10: Typ. gate threshold voltage

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

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=50 A pulsed; parameter: V_{DD}

Diagram 15: Drain-source breakdown voltage

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

Diagram Gate charge waveforms

5 Package Outlines

1) EXCLUDING MOLD FLASH
2) REMOVAL ON MOLD GATE
INTRUSION 0.1 MM
PROTRUSION 0.1 MM
LEAD LENGTH UP TO ANTI FLASH LINE
ALL METAL SURFACES ARE PLATED, EXCEPT AREA OF CUT

DIMENSION	MILLIMETERS	
	MIN.	MAX.
A	0.90	1.20
A1	0.15	0.35
b	0.34	0.54
D	4.80	5.35
D1	3.90	4.40
D2	0.03	0.23
E	5.70	6.10
E1	5.90	6.42
E2	3.88	4.31
e	1.27	
L	0.45	0.71
M	0.45	0.69

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Figure 1 Outline PG-TDSON-8, dimensions in mm

Figure 2 Outline Boardpads (TDSON-8), dimensions in mm

Dimension in mm

Figure 3 Outline Tape (TDSON-8)

Revision History

BSC028N06NST

Revision: 2020-09-21, Rev. 2.4

Previous Revision

Revision	Date	Subjects (major changes since last revision)
2.0	2017-03-02	Release of final version
2.1	2017-10-19	Update footnotes
2.2	2019-01-22	Update "Marking"
2.3	2020-02-04	Update package drawings
2.4	2020-09-21	Update current rating

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