



**THE DATASHEET OF
BSO104N03S**



OptiMOS™ 2 Power-Transistor
Features

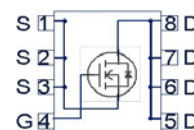
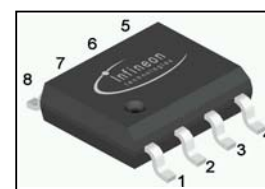
- Fast switching MOSFET for SMPS
- Optimized technology for notebook DC/DC converters
- Qualified according to JEDEC¹⁾ for target applications
- N-channel
- Logic level
- Excellent gate charge x $R_{DS(on)}$ product (FOM)
- Very low on-resistance $R_{DS(on)}$
- Superior thermal resistance
- Avalanche rated
- Pb-free plating; RoHS compliant
- Halogen-free according to IEC61249-2-21



Type	Package	Marking
BSO104N03S	PG-DSO-8	104N3S

Product Summary

V_{DS}	30	V
$R_{DS(on),max}$	9.7	m Ω
I_D	13	A

PG-DSO-8

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

Parameter	Symbol	Conditions	Value		Unit
			10 secs	steady state	
Continuous drain current	I_D	$T_A=25\text{ }^\circ\text{C}^{2)}$	13	10	A
		$T_A=70\text{ }^\circ\text{C}^{2)}$	10	8	
Pulsed drain current	$I_{D,pulse}$	$T_A=25\text{ }^\circ\text{C}^{3)}$	52		
Avalanche energy, single pulse	E_{AS}	$I_D=13\text{ A}, R_{GS}=25\text{ }\Omega$	73		mJ
Reverse diode dv/dt	dv/dt	$I_D=13\text{ A}, V_{DS}=20\text{ V},$ $di/dt=200\text{ A}/\mu\text{s},$ $T_{j,max}=150\text{ }^\circ\text{C}$	6		kV/ μs
Gate source voltage	V_{GS}		± 20		V
Power dissipation	P_{tot}	$T_A=25\text{ }^\circ\text{C}^{2)}$	2.5	1.56	W
Operating and storage temperature	T_j, T_{stg}		-55 ... 150		$^\circ\text{C}$
IEC climatic category; DIN IEC 68-1			55/150/56		

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

Thermal characteristics

Thermal resistance, junction - soldering point	R_{thJS}		-	-	35	K/W
Thermal resistance, junction - ambient	R_{thJA}	minimal footprint, $t_p \leq 10$ s	-	-	110	
		minimal footprint, steady state	-	-	150	
		6 cm ² cooling area ²⁾ , $t_p \leq 10$ s	-	-	50	
		6 cm ² cooling area ²⁾ , steady state	-	-	80	

Electrical characteristics, at $T_j=25$ °C, unless otherwise specified
Static characteristics

Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS}=0$ V, $I_D=1$ mA	30	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}$, $I_D=30$ μ A	1.2	1.6	2	
Zero gate voltage drain current	I_{DSS}	$V_{DS}=30$ V, $V_{GS}=0$ V, $T_j=25$ °C	-	0.1	1	μ A
		$V_{DS}=30$ V, $V_{GS}=0$ V, $T_j=125$ °C	-	10	100	
Gate-source leakage current	I_{GSS}	$V_{GS}=20$ V, $V_{DS}=0$ V	-	10	100	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=4.5$ V, $I_D=11$ A	-	10.9	13.6	m Ω
		$V_{GS}=10$ V, $I_D=13$ A	-	8.1	9.7	
Gate resistance	R_G		-	1	-	Ω
Transconductance	g_{fs}	$ V_{DS} > 2 I_D R_{DS(on)max}$, $I_D=13$ A	18	36	-	S

¹⁾J-STD20 and JESD22

²⁾ Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm² (one layer, 70 μ m thick) copper area for drain connection. PCB is vertical in still air.

³⁾ See figure 3

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

Dynamic characteristics

Input capacitance	C_{iss}	$V_{GS}=0\text{ V}, V_{DS}=15\text{ V},$ $f=1\text{ MHz}$	-	1600	2130	pF
Output capacitance	C_{oss}		-	570	760	
Reverse transfer capacitance	C_{rss}		-	75	110	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=15\text{ V}, V_{GS}=10\text{ V},$ $I_D=6.5\text{ A}, R_G=2.7\ \Omega$	-	5.0	7.5	ns
Rise time	t_r		-	4.2	6.3	
Turn-off delay time	$t_{d(off)}$		-	21	31	
Fall time	t_f		-	3.2	4.8	

Gate Charge Characteristics⁴⁾

Gate to source charge	Q_{gs}	$V_{DD}=15\text{ V}, I_D=6.5\text{ A},$ $V_{GS}=0\text{ to }5\text{ V}$	-	4.5	5.9	nC
Gate charge at threshold	$Q_{g(th)}$		-	2.6	3.4	
Gate to drain charge	Q_{gd}		-	3.0	4.6	
Switching charge	Q_{sw}		-	5.0	7.1	
Gate charge total	Q_g		-	12	16	
Gate plateau voltage	$V_{plateau}$		-	2.8	-	
Gate charge total, sync. FET	$Q_{g(sync)}$	$V_{DS}=0.1\text{ V},$ $V_{GS}=0\text{ to }5\text{ V}$	-	11	14	nC
Output charge	Q_{oss}	$V_{DD}=15\text{ V}, V_{GS}=0\text{ V}$	-	14	18	

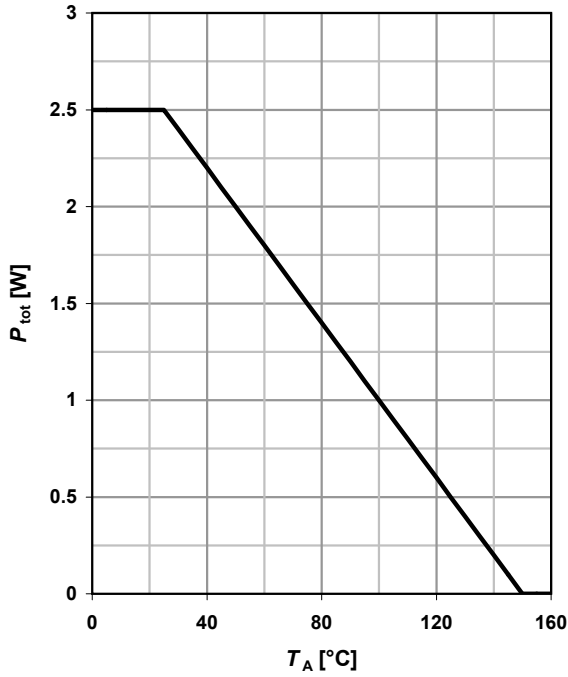
Reverse Diode

Diode continuous forward current	I_S	$T_A=25\text{ }^\circ\text{C}$	-	-	2.5	A
Diode pulse current	$I_{S,pulse}$		-	-	52	
Diode forward voltage	V_{SD}	$V_{GS}=0\text{ V}, I_F=2.5\text{ A},$ $T_j=25\text{ }^\circ\text{C}$	-	0.74	1	V
Reverse recovery charge	Q_{rr}	$V_R=12\text{ V}, I_F=I_S,$ $di_F/dt=400\text{ A}/\mu\text{s}$	-	-	10	nC

⁴⁾ See figure 16 for gate charge parameter definition

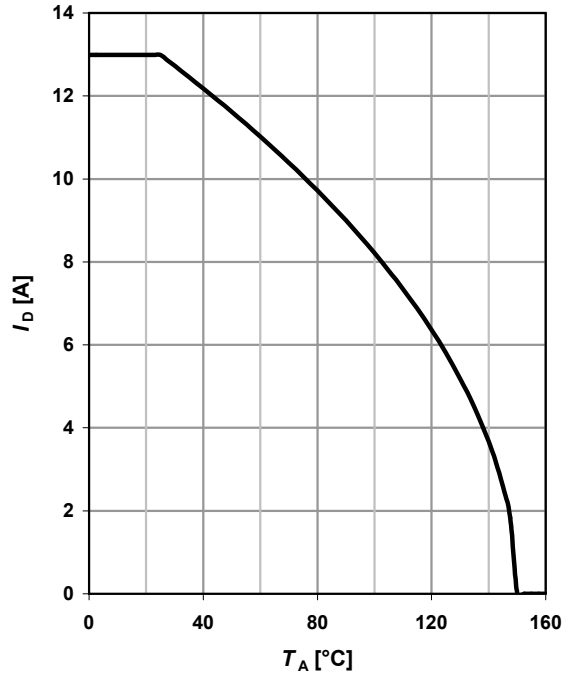
1 Power dissipation

$P_{tot}=f(T_A); t_p \leq 10 \text{ s}$



2 Drain current

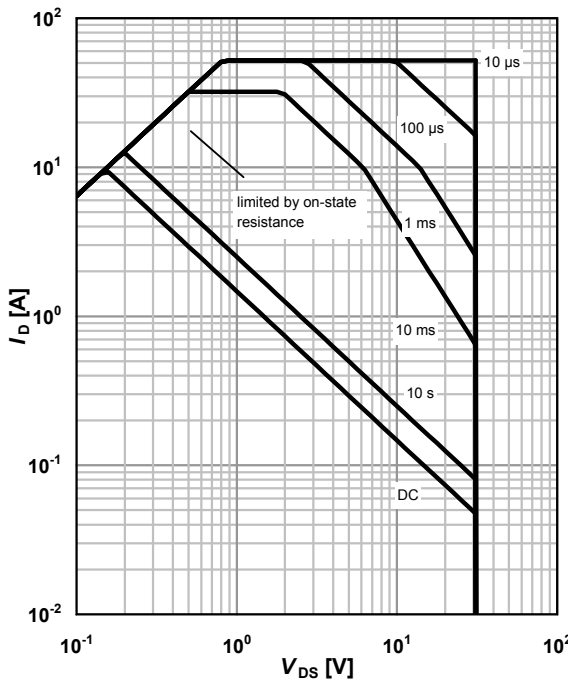
$I_D=f(T_A); V_{GS} \geq 10 \text{ V}; t_p \leq 10 \text{ s}$



3 Safe operating area

$I_D=f(V_{DS}); T_A=25 \text{ °C}^1; D=0$

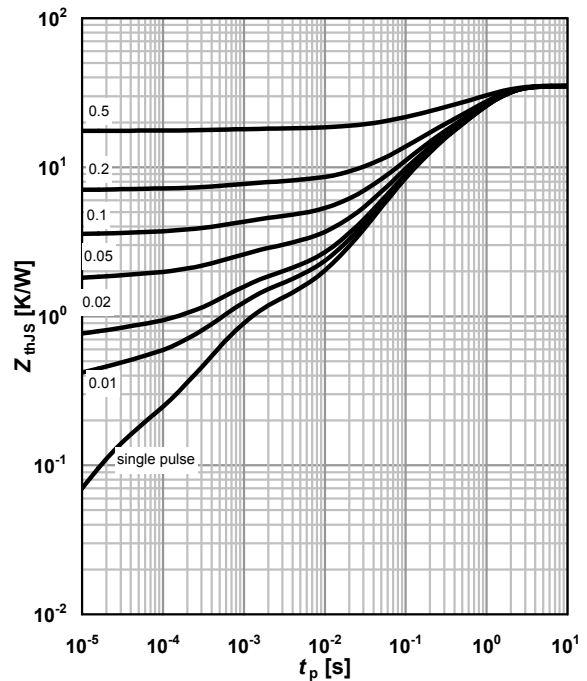
parameter: t_p



4 Max. transient thermal impedance

$Z_{thJS}=f(t_p)$

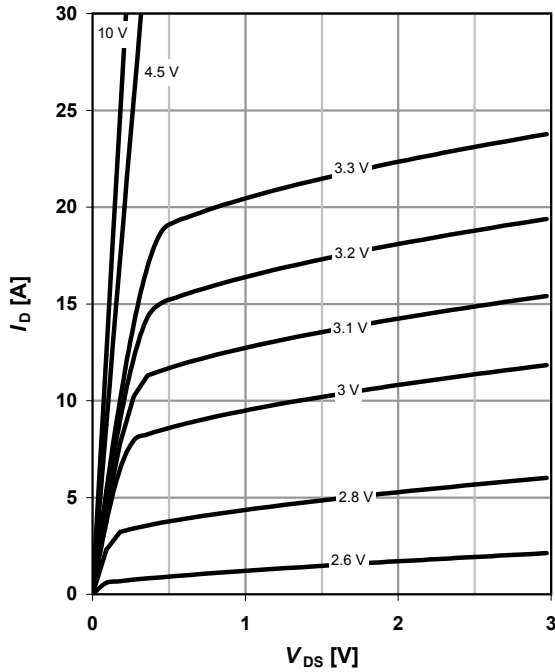
parameter: $D=t_p/T$



5 Typ. output characteristics

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

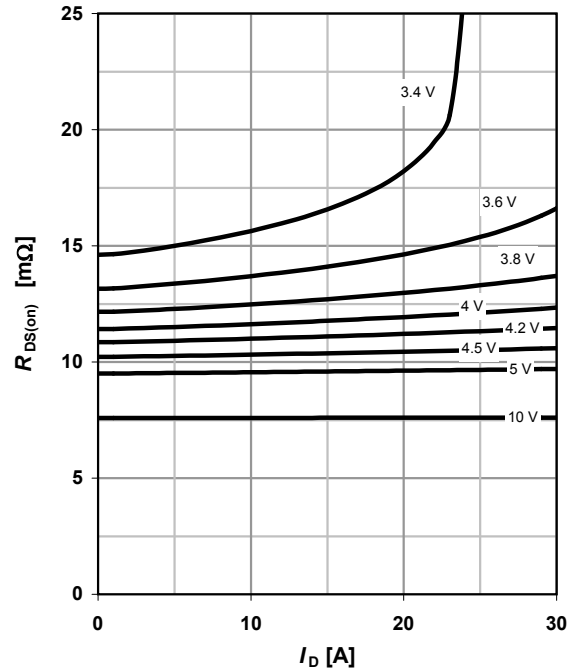
parameter: V_{GS}



6 Typ. drain-source on resistance

$R_{DS(on)} = f(I_D); T_j = 25\text{ }^\circ\text{C}$

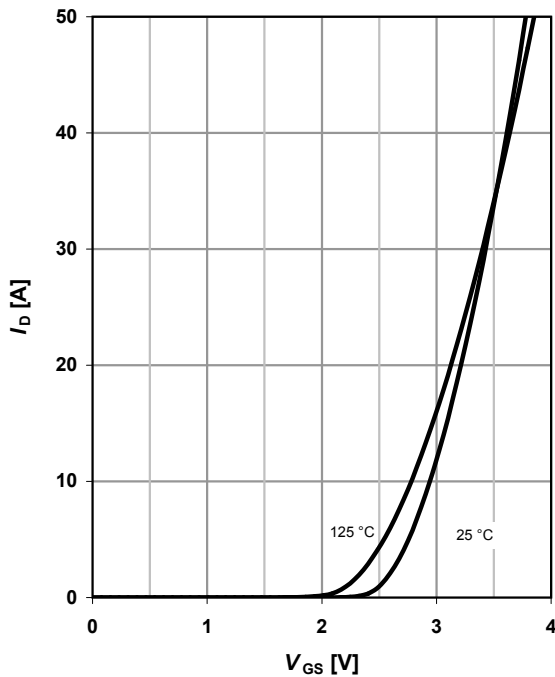
parameter: V_{GS}



7 Typ. transfer characteristics

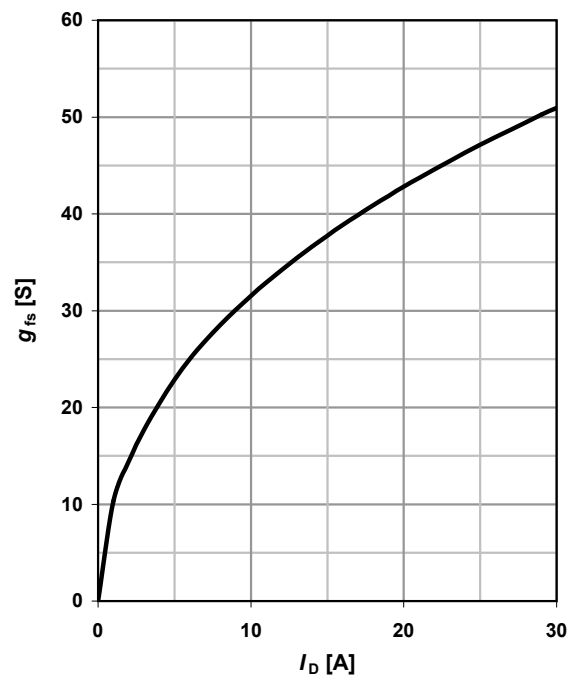
$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}$

parameter: T_j



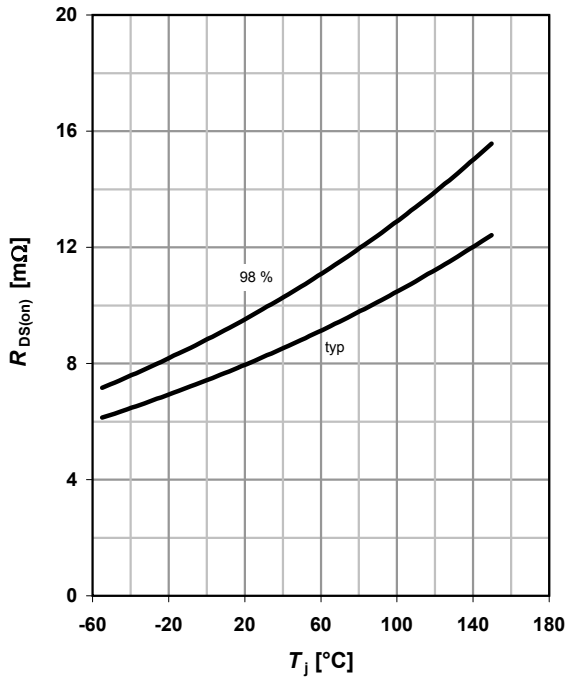
8 Typ. forward transconductance

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



9 Drain-source on-state resistance

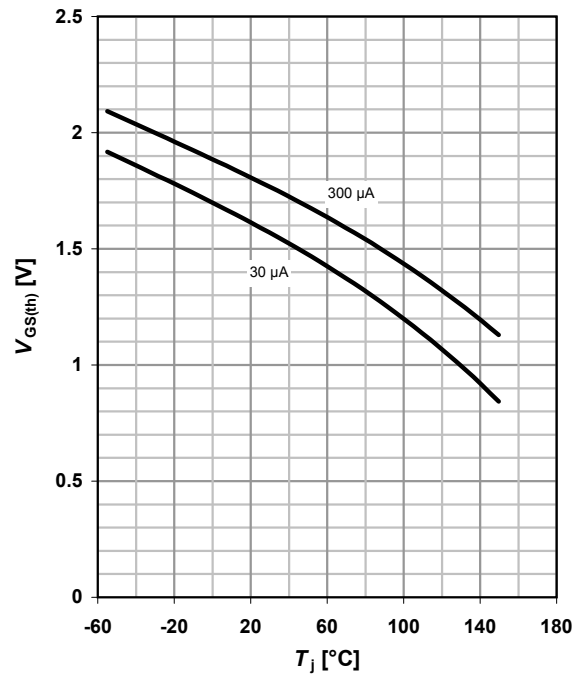
$R_{DS(on)} = f(T_j); I_D = 13 \text{ A}; V_{GS} = 10 \text{ V}$



10 Typ. gate threshold voltage

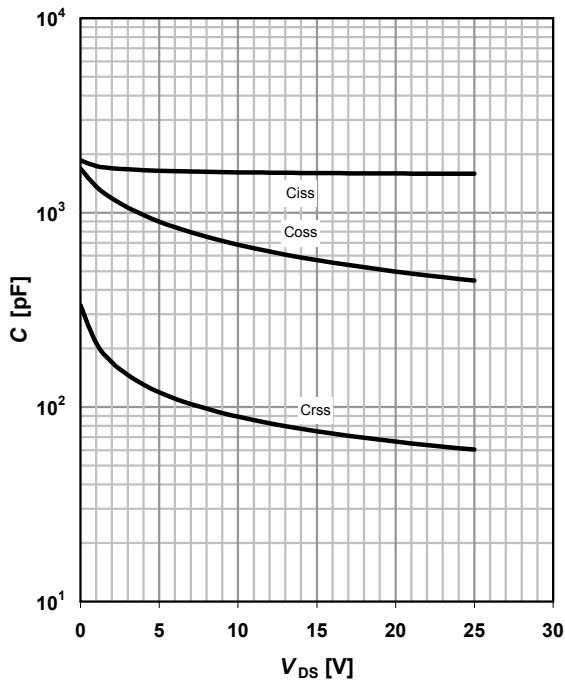
$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}$

parameter: I_D



11 Typ. capacitances

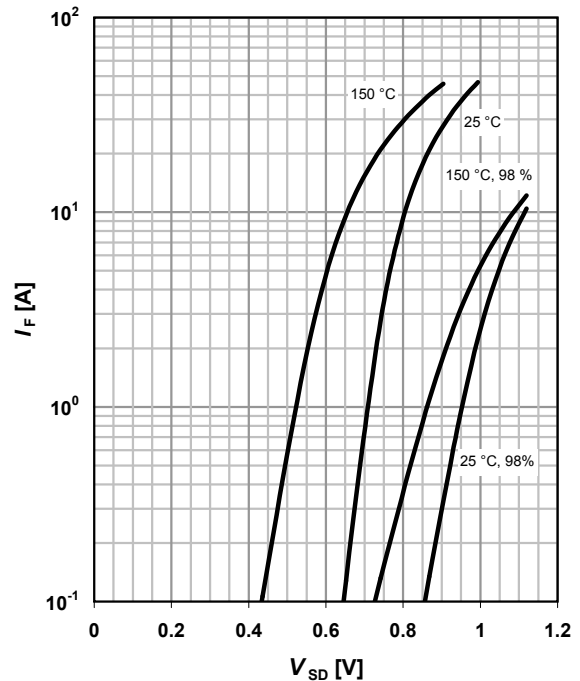
$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$



12 Forward characteristics of reverse diode

$I_F = f(V_{SD})$

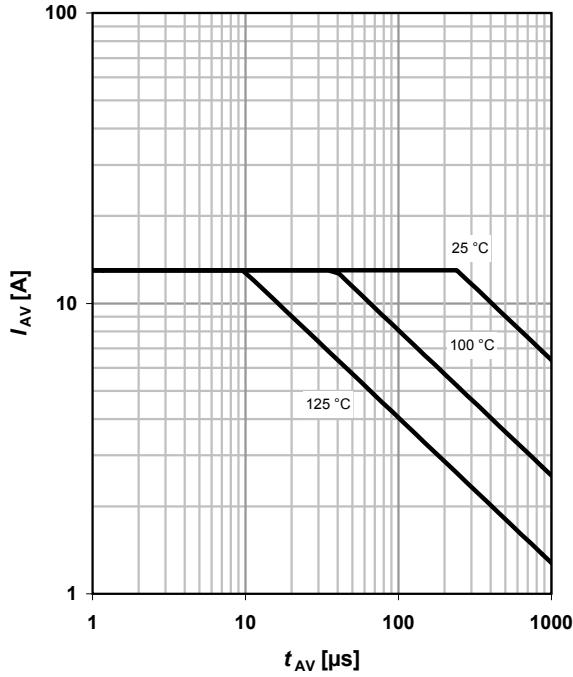
parameter: T_j



13 Avalanche characteristics

$I_{AS}=f(t_{AV}); R_{GS}=25 \Omega$

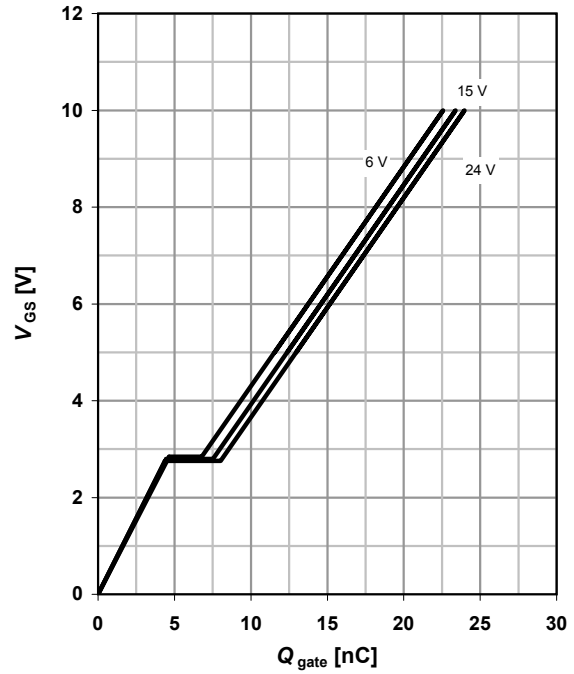
parameter: $T_{j(start)}$



14 Typ. gate charge

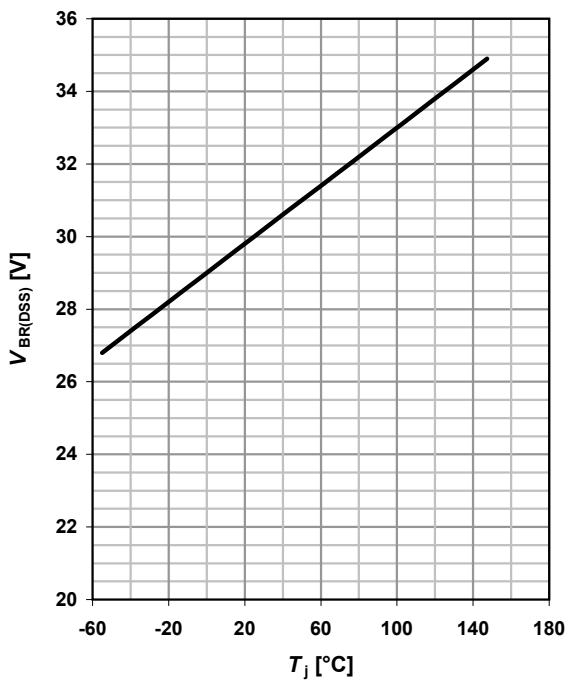
$V_{GS}=f(Q_{gate}); I_D=6.5 \text{ A pulsed}$

parameter: V_{DD}



15 Drain-source breakdown voltage

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

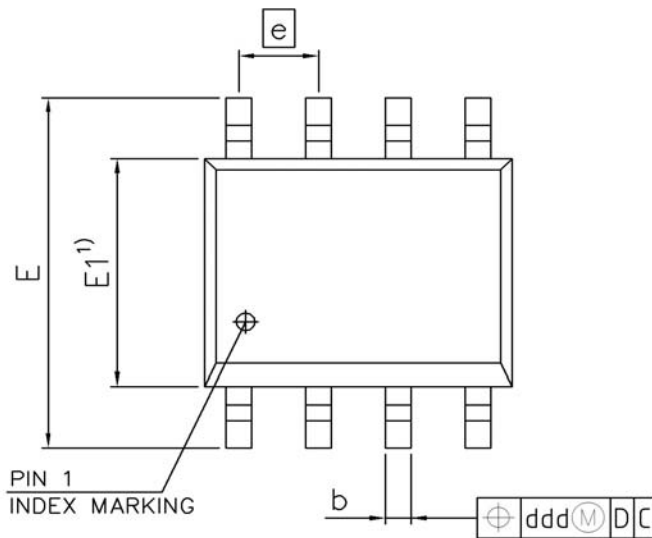
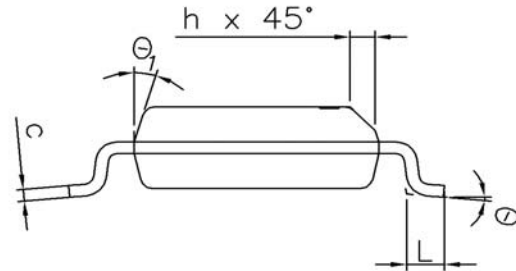
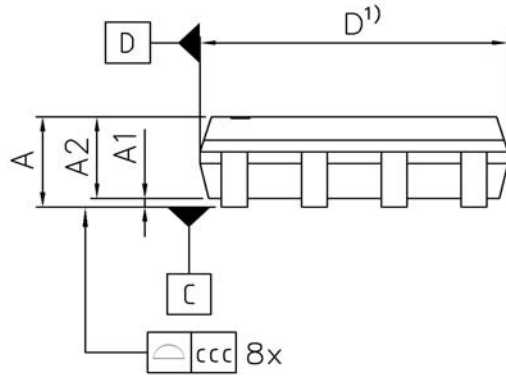


16 Gate charge waveforms

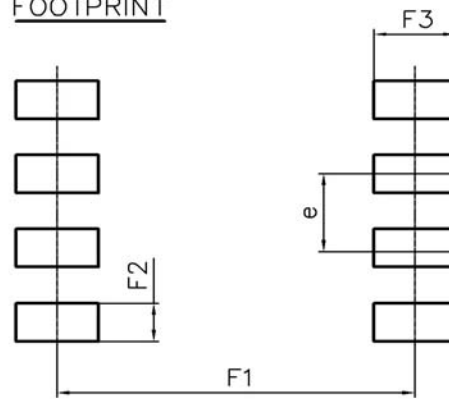


Package Outline

PG-DSO-8



FOOTPRINT



1) DOES NOT INCLUDE MOLD FLASH OR PROTRUSIONS.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	-	1.75	-	0.069
A1	0.10	-	0.004	-
A2	1.25	1.65	0.049	0.065
b	0.35	0.51	0.014	0.020
c	0.17	0.25	0.007	0.010
D	4.80	5.00	0.189	0.197
E	5.80	6.20	0.228	0.244
E1	3.80	4.00	0.150	0.157
e	1.27		0.050	
N	8		8	
L	0.39	0.89	0.015	0.035
h	0.23	0.50	0.009	0.020
θ	0°	8°	0°	8°
θ ₁	-	19°	-	19°
ccc	0.10		0.004	
ddd	0.25		0.010	
F1	5.59	5.79	0.220	0.228
F2	0.55	0.75	0.022	0.030
F3	1.21	1.41	0.048	0.056

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