

OptiMOS™ 3 M-Series Power-MOSFET
Features

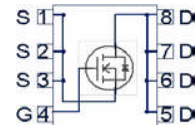
- Optimized for 5V driver application (Notebook, VGA, POL)
- Low FOM_{SW} for High Frequency SMPS
- 100% Avalanche tested
- N-channel
- Very low on-resistance $R_{DS(on)}$ @ $V_{GS}=4.5\text{ V}$
- Excellent gate charge x $R_{DS(on)}$ product (FOM)
- Qualified for consumer level application
- Pb-free plating; RoHS compliant
- Halogen-free according to IEC61249-2-21



Type	Package	Marking
BSO220N03MS G	PG-DSO-8	220N03MS

Product Summary

V_{DS}		30	V
$R_{DS(on),max}$	$V_{GS}=10\text{ V}$	22	mΩ
	$V_{GS}=4.5\text{ V}$	27	
I_D		8.6	A

PG-DSO-8

Maximum ratings, at $T_J=25\text{ °C}$, unless otherwise specified

Parameter	Symbol	Conditions	Value		Unit
			10 secs	steady state	
Continuous drain current ¹⁾	I_D	$V_{GS}=10\text{ V}, T_A=25\text{ °C}$	8.6	7.0	A
		$V_{GS}=10\text{ V}, T_A=90\text{ °C}$	5.9	4.7	
		$V_{GS}=4.5\text{ V}, T_A=25\text{ °C}$	7.7	6.1	
		$V_{GS}=4.5\text{ V}, T_A=90\text{ °C}$	5.4	4.2	
Pulsed drain current ²⁾	$I_{D,pulse}$	$T_A=25\text{ °C}$	60		
Avalanche current, single pulse ³⁾	I_{AS}	$T_A=25\text{ °C}$	8.6		
Avalanche energy, single pulse	E_{AS}	$I_D=8.6\text{ A}, R_{GS}=25\text{ }\Omega$	8		mJ
Gate source voltage	V_{GS}		±20		V
Power dissipation ¹⁾	P_{tot}	$T_A=25\text{ °C}$	2.5	1.56	W
Operating and storage temperature	T_j, T_{stg}		-55 ... 150		°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 ¹⁾ , $t_p \leq 10$ s	-	-	50	
		6 cm ² cooling area ¹⁾ , 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	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250$ μ A	1	-	2.1	
Zero gate voltage drain current	I_{DSS}	$V_{DS} = 30$ V, $V_{GS} = 0$ V, $T_j = 25$ °C	-	0.1	10	μ A
		$V_{DS} = 30$ V, $V_{GS} = 0$ V, $T_j = 125$ °C	-	10	100	
Gate-source leakage current	I_{GSS}	$V_{GS} = 16$ V, $V_{DS} = 0$ V	-	10	100	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS} = 4.5$ V, $I_D = 7.7$ A	-	21.6	27	m Ω
		$V_{GS} = 10$ V, $I_D = 8.6$ A	-	18.3	22	
Gate resistance	R_G		0.6	1.3	2.3	Ω
Transconductance	g_{fs}	$ V_{DS} > 2 I_D R_{DS(on)max}$, $I_D = 8.6$ A	9.5	19	-	S

¹⁾ 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.

²⁾ See figure 3 for more detailed information

³⁾ See figure 13 for more detailed information

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

Dynamic characteristics

Input capacitance	C_{iss}	$V_{GS}=0\text{ V}, V_{DS}=15\text{ V},$ $f=1\text{ MHz}$	-	600	800	pF
Output capacitance	C_{oss}		-	230	310	
Reverse transfer capacitance	C_{rss}		-	12	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=15\text{ V}, V_{GS}=4.5\text{ V},$ $I_D=8.6\text{ A}, R_G=1.6\text{ }\Omega$	-	5.7	-	ns
Rise time	t_r		-	2.8	-	
Turn-off delay time	$t_{d(off)}$		-	6.2	-	
Fall time	t_f		-	3.4	-	

Gate Charge Characteristics⁴⁾

Gate to source charge	Q_{gs}	$V_{DD}=15\text{ V}, I_D=8.6\text{ A},$ $V_{GS}=0\text{ to }4.5\text{ V}$	-	1.8	-	nC
Gate charge at threshold	$Q_{g(th)}$		-	1.0	-	
Gate to drain charge	Q_{gd}		-	0.9	-	
Switching charge	Q_{sw}		-	1.7	-	
Gate charge total	Q_g		-	3.8	5.0	
Gate plateau voltage	$V_{plateau}$		-	3.0	-	
Gate charge total	Q_g	$V_{DD}=15\text{ V}, I_D=8.6\text{ A},$ $V_{GS}=0\text{ to }10\text{ V}$	-	8	10.4	nC
Gate charge total, sync. FET	$Q_{g(sync)}$	$V_{DS}=0.1\text{ V},$ $V_{GS}=0\text{ to }4.5\text{ V}$	-	3.3	4.4	
Output charge	Q_{oss}	$V_{DD}=15\text{ V}, V_{GS}=0\text{ V}$	-	6.1	8.1	

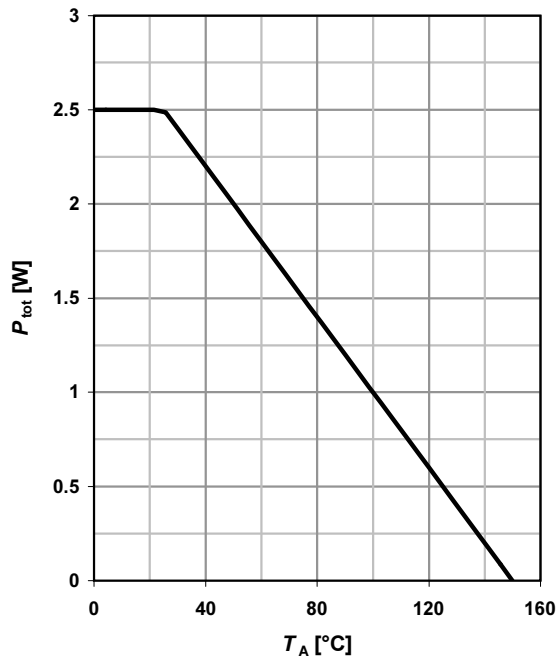
Reverse Diode

Diode continuous forward current	I_S	$T_A=25\text{ }^\circ\text{C}$	-	-	3	A
Diode pulse current	$I_{S,pulse}$		-	-	60	
Diode forward voltage	V_{SD}	$V_{GS}=0\text{ V}, I_F=8.6\text{ A},$ $T_j=25\text{ }^\circ\text{C}$	-	0.88	1.1	V
Reverse recovery charge	Q_{rr}	$V_R=15\text{ V}, I_F=I_S,$ $di_F/dt=400\text{ A}/\mu\text{s}$	-	-	8	nC

⁴⁾ See figure 16 for gate charge parameter definition

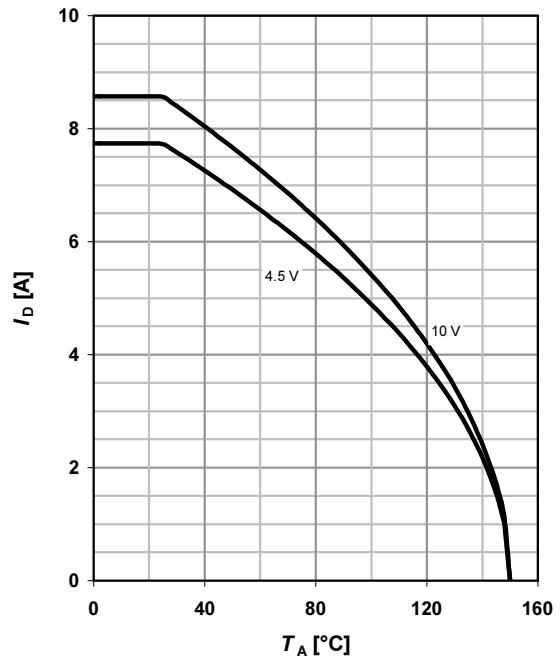
1 Power dissipation

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



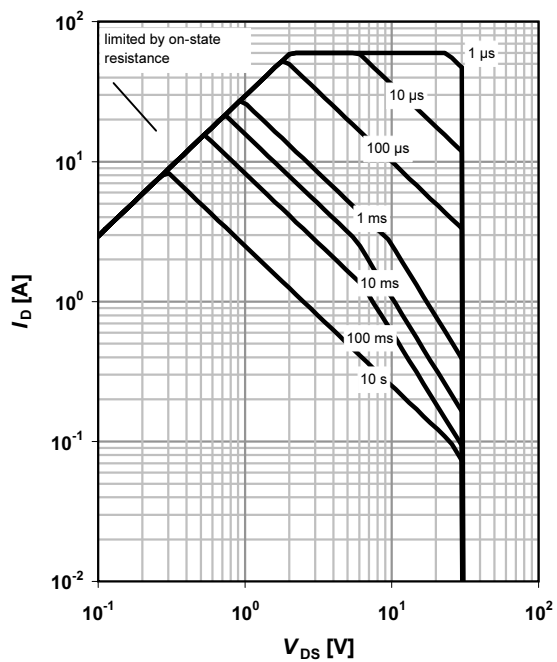
2 Drain current

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

parameter: V_{GS}


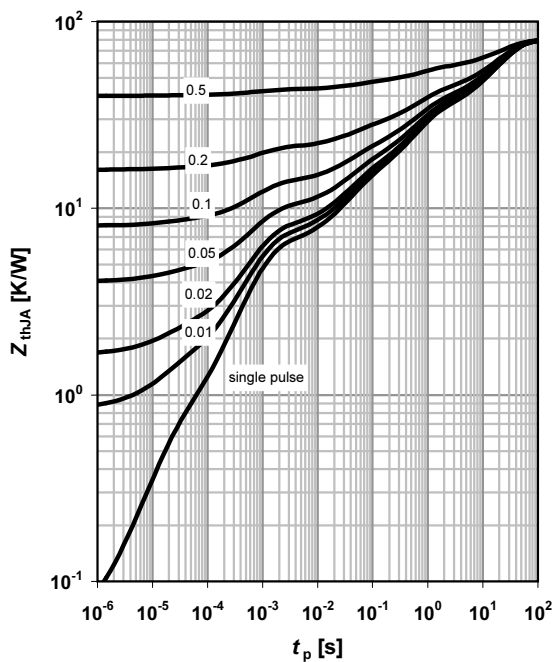
3 Safe operating area

$$I_D = f(V_{DS}); T_A = 25 \text{ °C}^2; D = 0$$

parameter: t_p


4 Max. transient thermal impedance

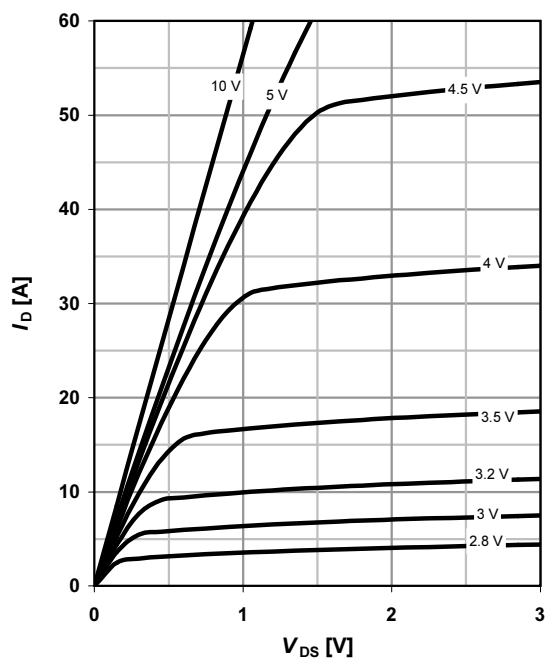
$$Z_{thJA} = f(t_p)^2$$

parameter: $D = t_p/T$


5 Typ. output characteristics

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

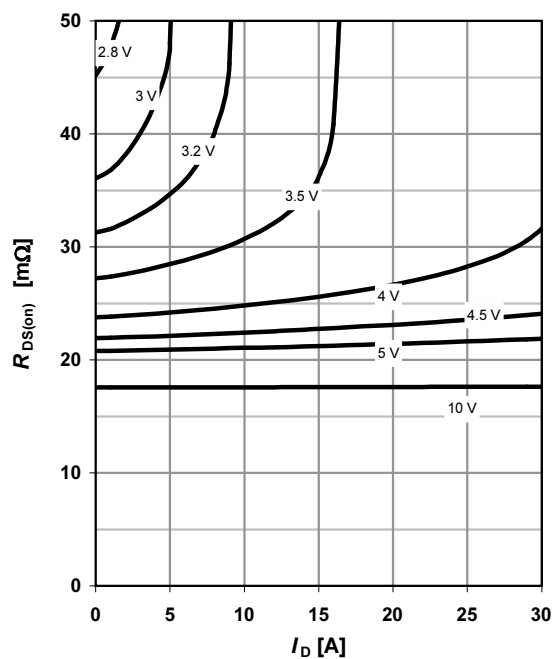
parameter: V_{GS}



6 Typ. drain-source on resistance

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

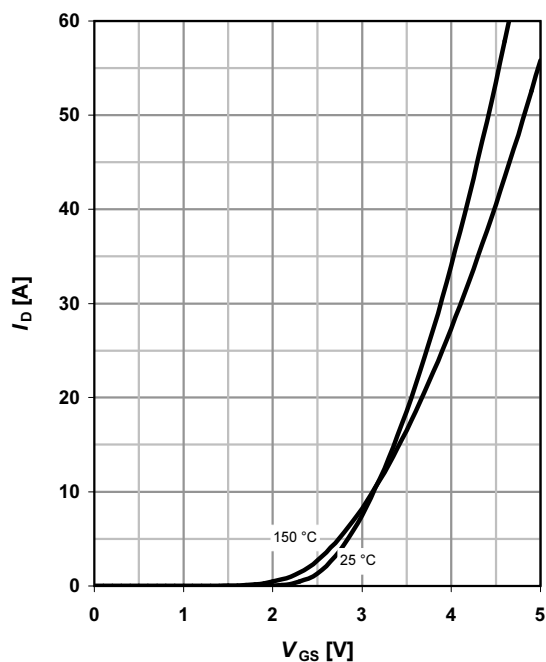
parameter: V_{GS}



7 Typ. transfer characteristics

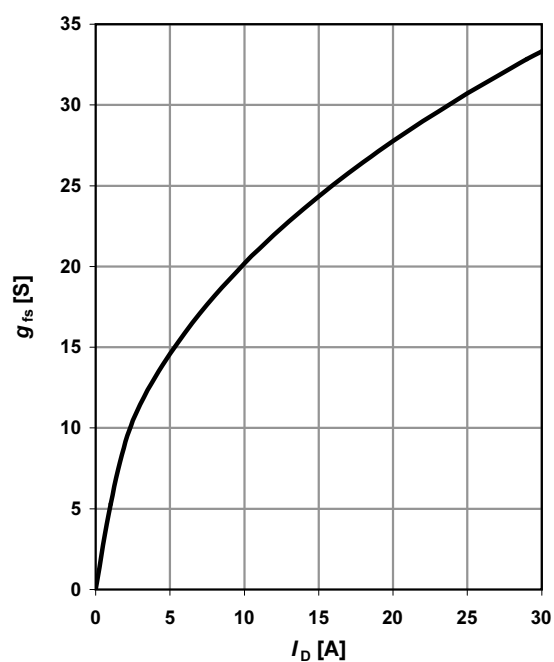
$$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}$$

parameter: T_J



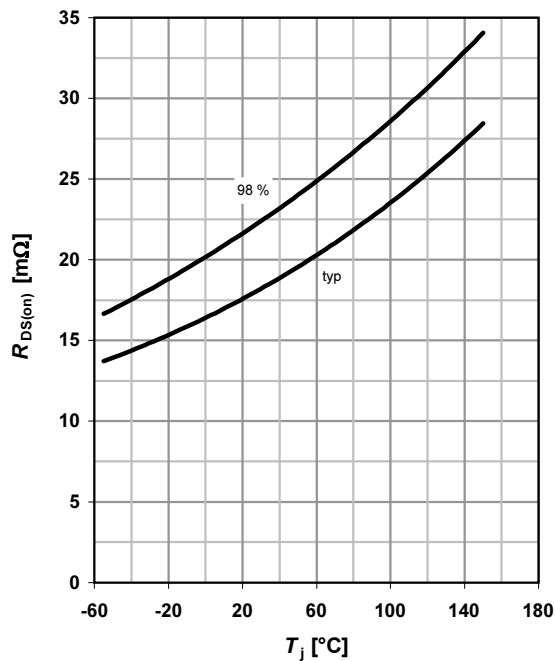
8 Typ. forward transconductance

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



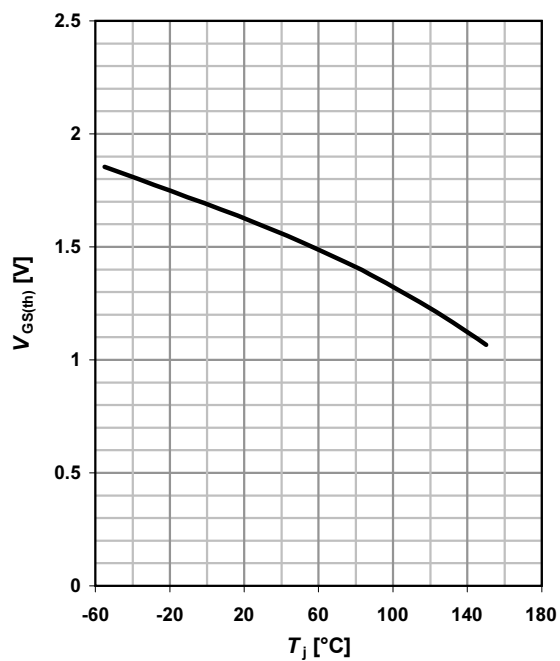
9 Drain-source on-state resistance

$$R_{DS(on)} = f(T_j); I_D = 8.6 \text{ A}; V_{GS} = 10 \text{ V}$$



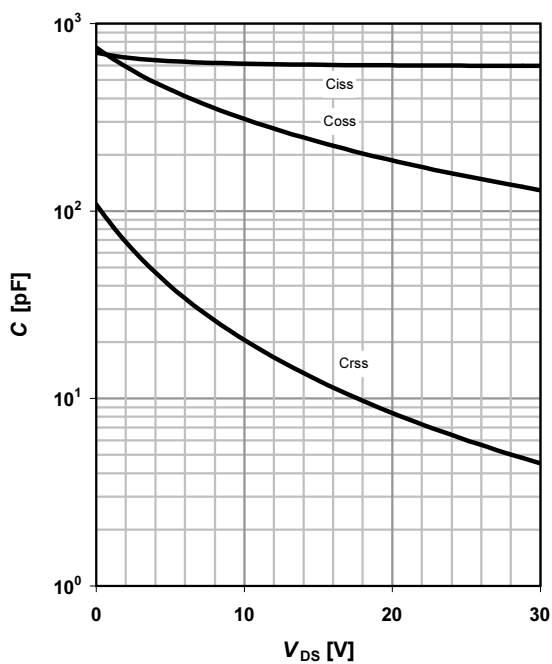
10 Typ. gate threshold voltage

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



11 Typ. capacitances

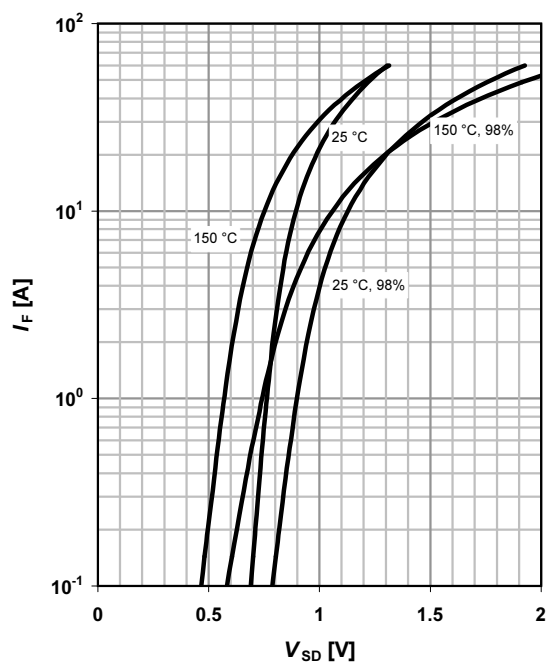
$$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$$



12 Forward characteristics of reverse diode

$$I_F = f(V_{SD})$$

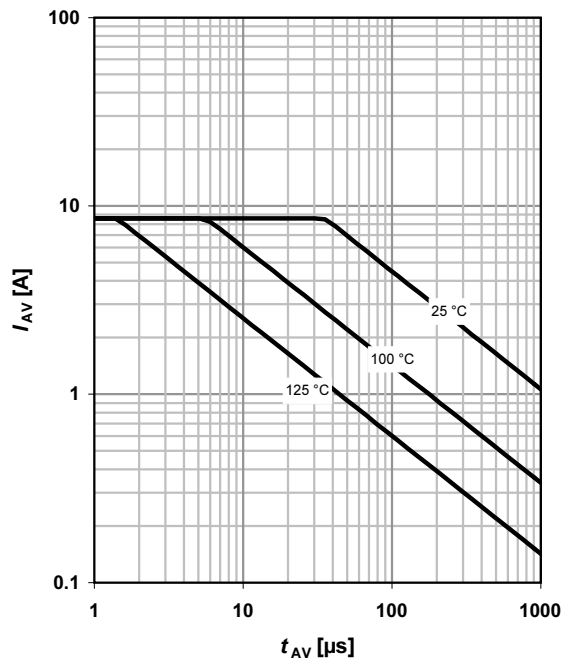
parameter: T_j



13 Avalanche characteristics

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

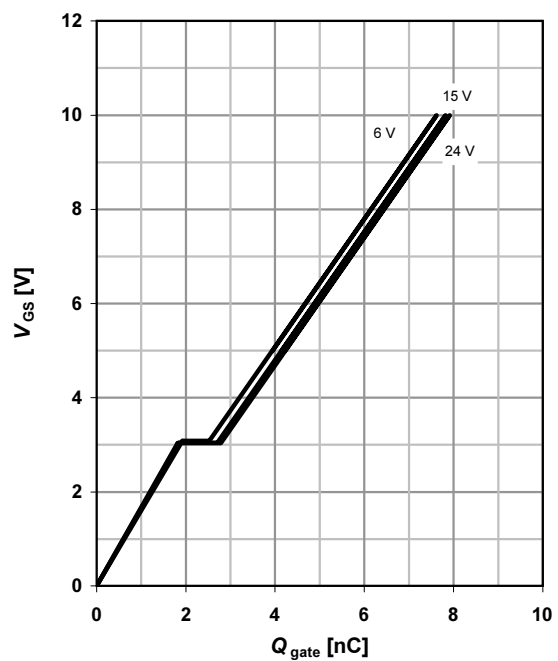
parameter: $T_{j(\text{start})}$



14 Typ. gate charge

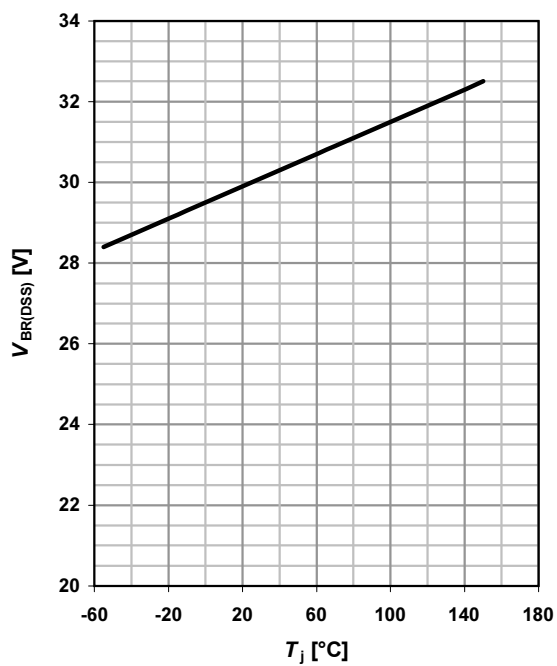
$$V_{GS}=f(Q_{\text{gate}}); I_D=8.6\ \text{A pulsed}$$

parameter: V_{DD}

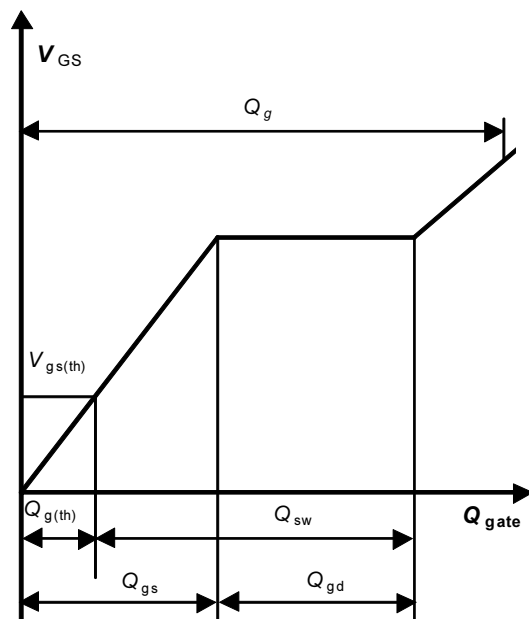


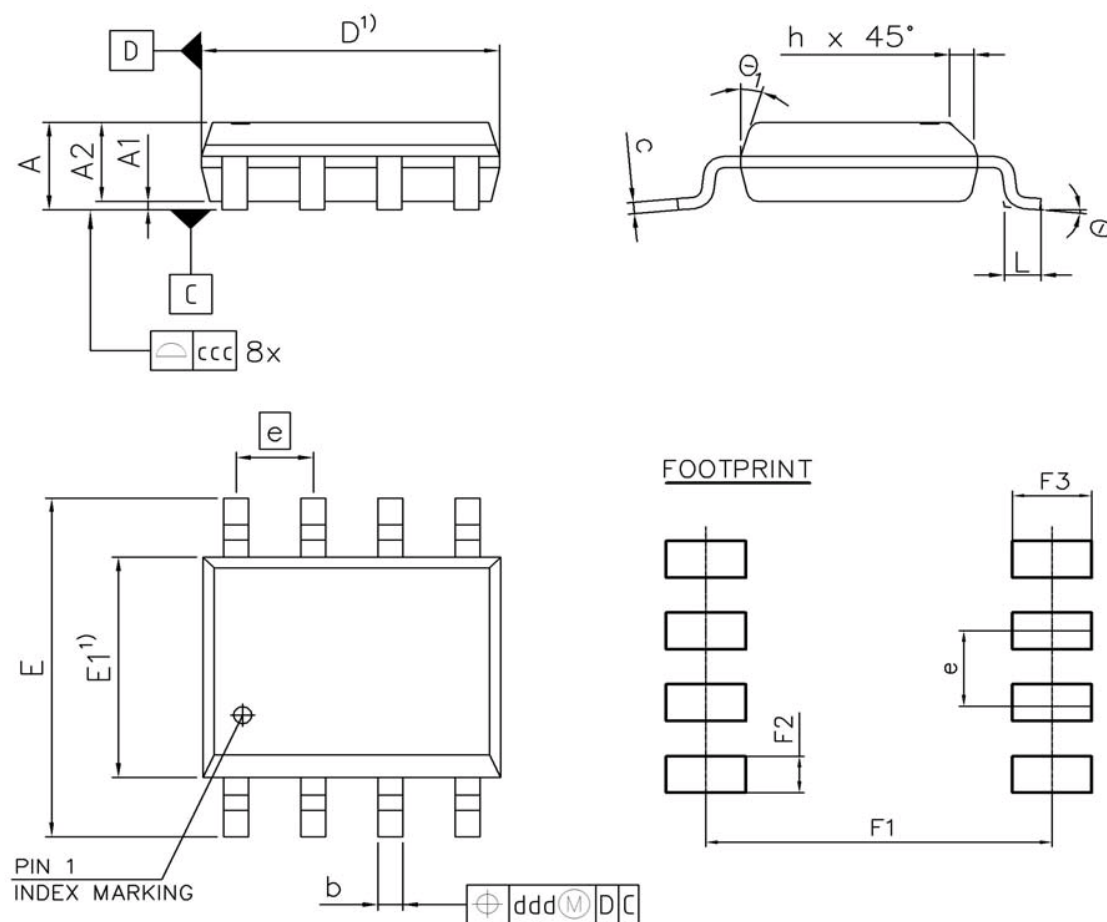
15 Drain-source breakdown voltage

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



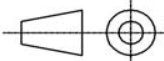
16 Gate charge waveforms



Package Outline
PG-DSO-8: Outline


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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