

OptiMOS®3 M-Series Power-MOSFET
Features

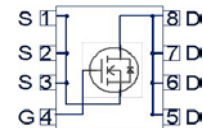
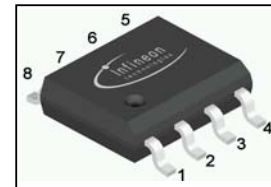
- Optimized for 5V driver application (Notebook, VGA, POL)
- Low FOM_{SW} for High Frequency SMPS
- 100% Avalanche tested
- N-channel
- Very low on-resistance $R_{DS(on)}$ @ $V_{GS}=4.5\text{ V}$
- Excellent gate charge x $R_{DS(on)}$ product (FOM)
- Qualified for consumer level application
- Pb-free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



Type	Package	Marking
BSO033N03MS G	PG-DSO-8	033N03MS

Product Summary

V_{DS}		30	V
$R_{DS(on),max}$	$V_{GS}=10\text{ V}$	3.3	mΩ
	$V_{GS}=4.5\text{ V}$	3.8	
I_D		22	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	$V_{GS}=10\text{ V}, T_A=25\text{ °C}$	22	17	A
		$V_{GS}=10\text{ V}, T_A=90\text{ °C}$	15	12.1	
		$V_{GS}=4.5\text{ V}, T_A=25\text{ °C}$	21	16	
		$V_{GS}=4.5\text{ V}, T_A=90\text{ °C}$	14.3	11.3	
Pulsed drain current ²⁾	$I_{D,pulse}$	$T_A=25\text{ °C}$	154		
Avalanche current, single pulse ³⁾	I_{AS}	$T_A=25\text{ °C}$	22		
Avalanche energy, single pulse	E_{AS}	$I_D=22\text{ A}, R_{GS}=25\text{ Ω}$	150		mJ
Gate source voltage	V_{GS}		±16		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	
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, $I_D=21$ A	-	3.0	3.8	m Ω
		$V_{GS}=10$ V, $I_D=22$ A	-	2.8	3.3	
Gate resistance	R_G		0.9	1.9	3.3	Ω
Transconductance	g_{fs}	$ V_{DS} > 2 I_D R_{DS(on)max}$, $I_D=22$ A	46	93	-	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}	$V_{GS}=0\text{ V}, V_{DS}=15\text{ V},$ $f=1\text{ MHz}$	-	7200	9600	pF
Output capacitance	C_{oss}		-	1900	2500	
Reverse transfer capacitance	C_{rss}		-	150	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=15\text{ V}, V_{GS}=4.5\text{ V},$ $I_D=22\text{ A}, R_G=1.6\ \Omega$	-	27	-	ns
Rise time	t_r		-	12.8	-	
Turn-off delay time	$t_{d(off)}$		-	38	-	
Fall time	t_f		-	14	-	

Gate Charge Characteristics⁴⁾

Gate to source charge	Q_{gs}	$V_{DD}=15\text{ V}, I_D=22\text{ A},$ $V_{GS}=0\text{ to }4.5\text{ V}$	-	19	-	nC
Gate charge at threshold	$Q_{g(th)}$		-	11	-	
Gate to drain charge	Q_{gd}		-	9.6	-	
Switching charge	Q_{sw}		-	17	-	
Gate charge total	Q_g		-	45	60	
Gate plateau voltage	$V_{plateau}$		-	2.6	-	
Gate charge total	Q_g	$V_{DD}=15\text{ V}, I_D=22\text{ A},$ $V_{GS}=0\text{ to }10\text{ V}$	-	93	124	nC
Gate charge total, sync. FET	$Q_{g(sync)}$	$V_{DS}=0.1\text{ V},$ $V_{GS}=0\text{ to }4.5\text{ V}$	-	39	52	
Output charge	Q_{oss}	$V_{DD}=15\text{ V}, V_{GS}=0\text{ V}$	-	51	68	

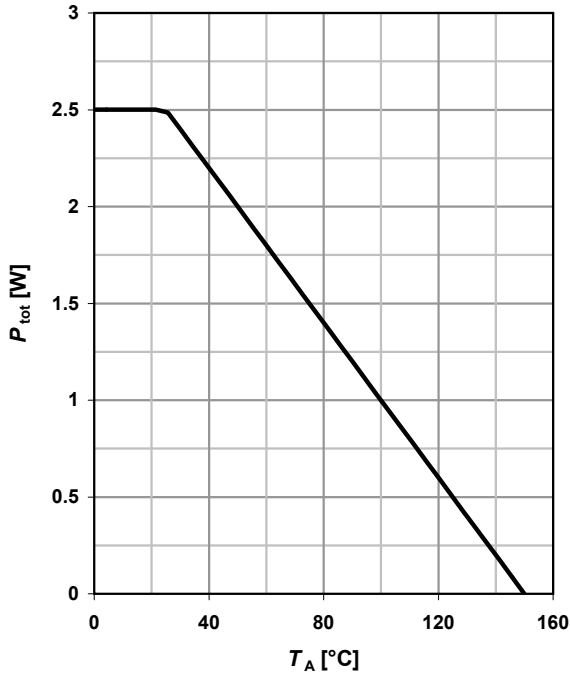
Reverse Diode

Diode continuous forward current	I_S	$T_A=25\text{ }^\circ\text{C}$	-	-	3.6	A
Diode pulse current	$I_{S,pulse}$		-	-	154	
Diode forward voltage	V_{SD}	$V_{GS}=0\text{ V}, I_F=22\text{ A},$ $T_j=25\text{ }^\circ\text{C}$	-	0.82	1	V
Reverse recovery charge	Q_{rr}	$V_R=15\text{ V}, I_F=I_S,$ $di_F/dt=400\text{ A}/\mu\text{s}$	-	-	20	nC

⁴⁾ See figure 16 for gate charge parameter definition

1 Power dissipation

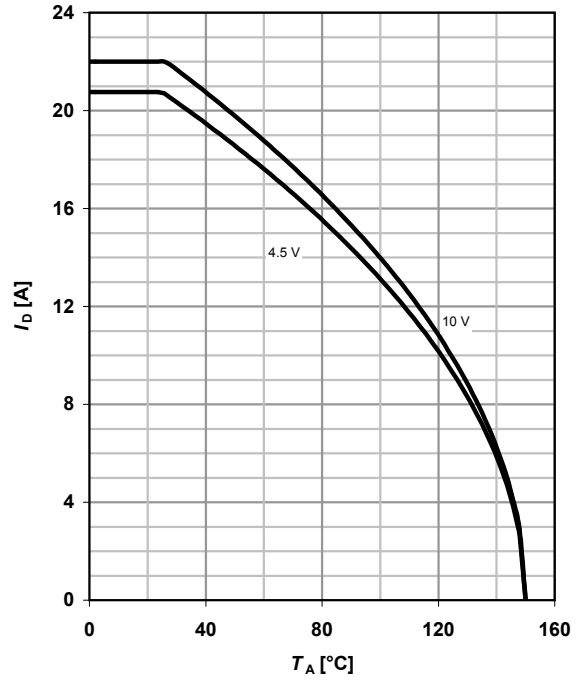
$$P_{tot} = f(T_A); t_p \leq 10 \text{ s}$$



2 Drain current

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

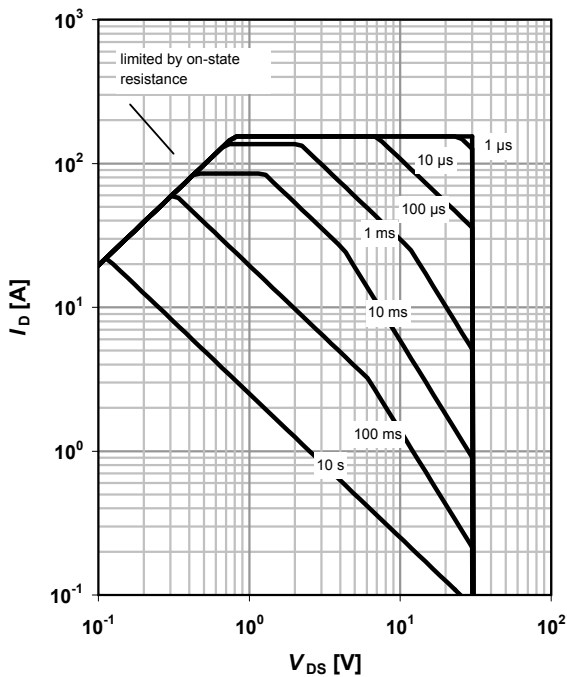
parameter: V_{GS}



3 Safe operating area

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

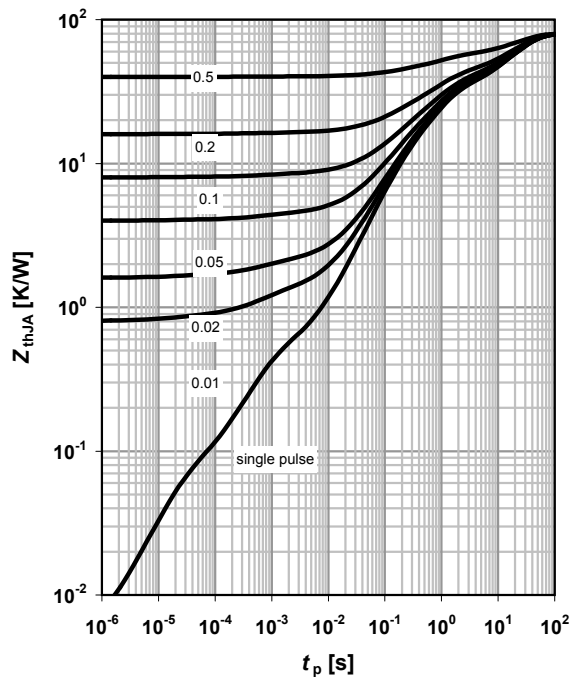
parameter: t_p



4 Max. transient thermal impedance

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

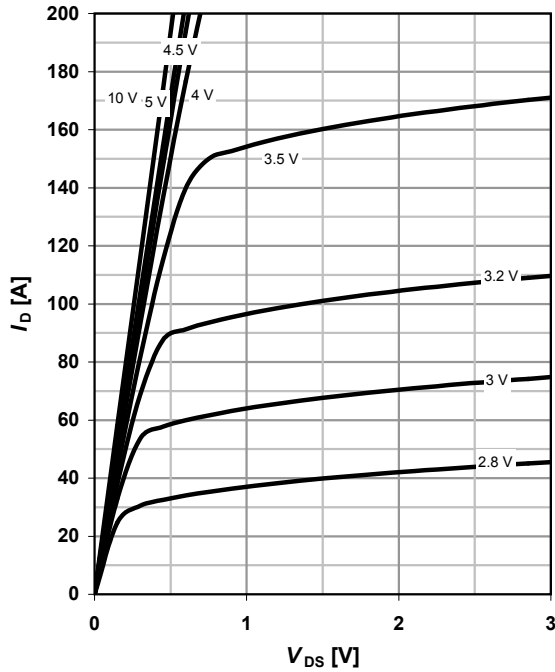
parameter: $D = t_p / T$



5 Typ. output characteristics

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

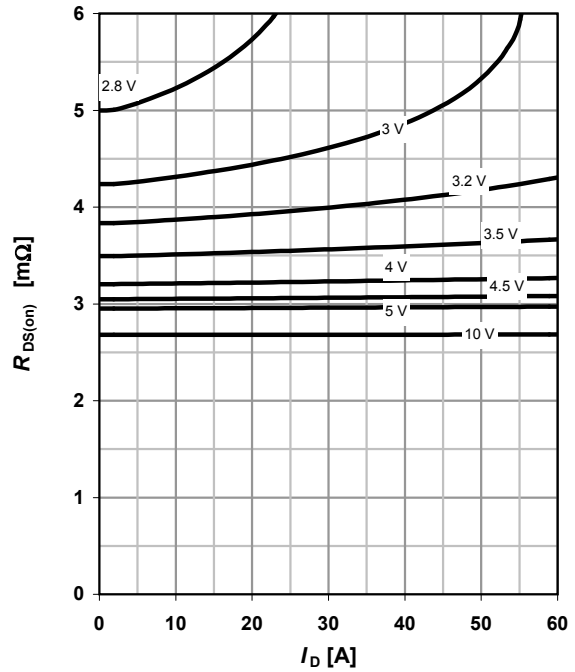
parameter: V_{GS}



6 Typ. drain-source on resistance

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

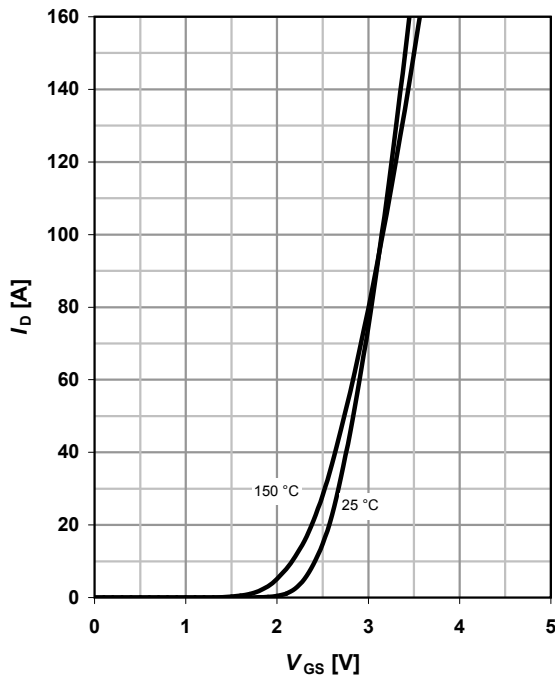
parameter: V_{GS}



7 Typ. transfer characteristics

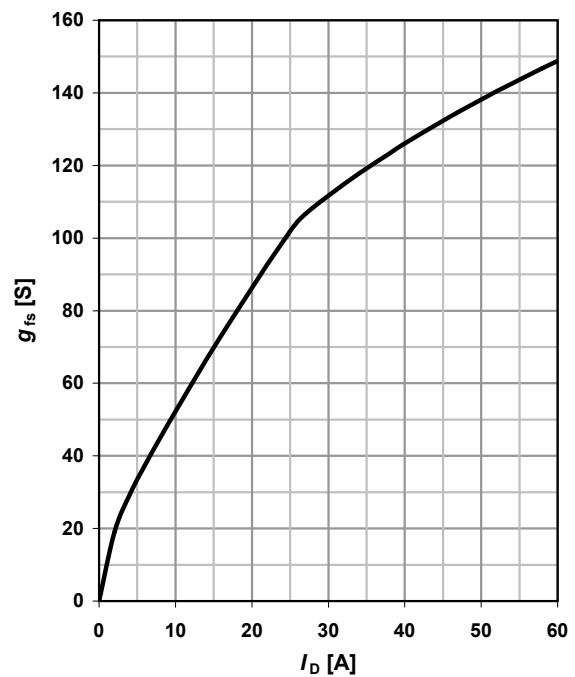
$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}$

parameter: T_j



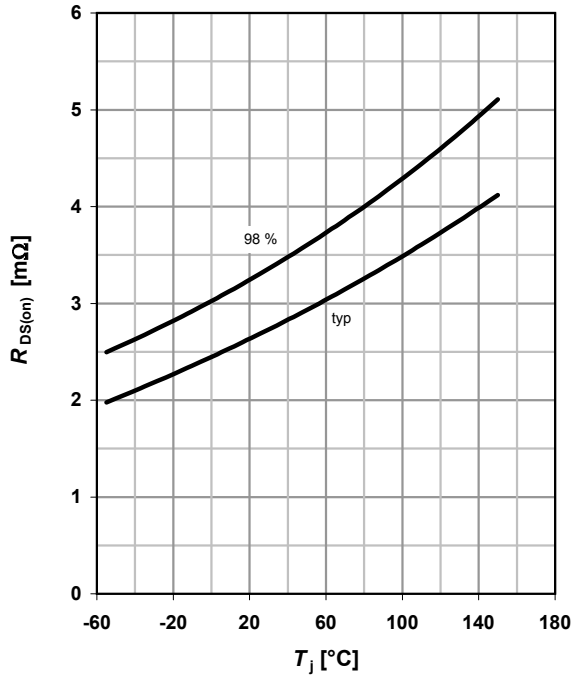
8 Typ. forward transconductance

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



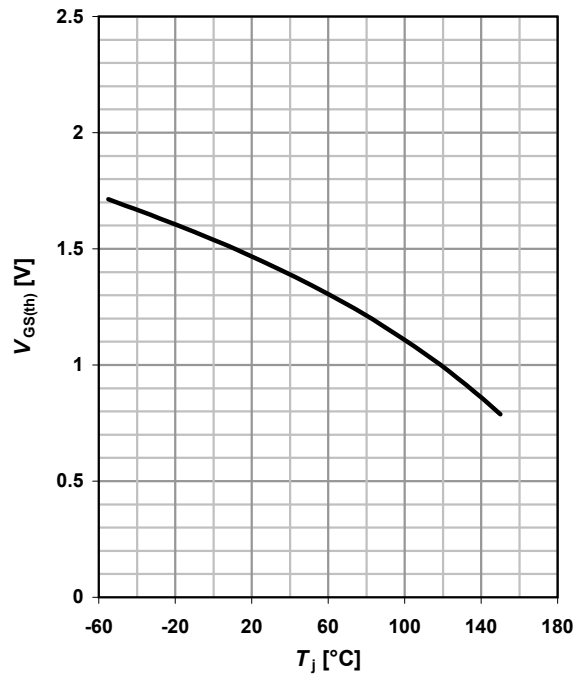
9 Drain-source on-state resistance

$R_{DS(on)} = f(T_j); I_D = 22 \text{ A}; V_{GS} = 10 \text{ V}$



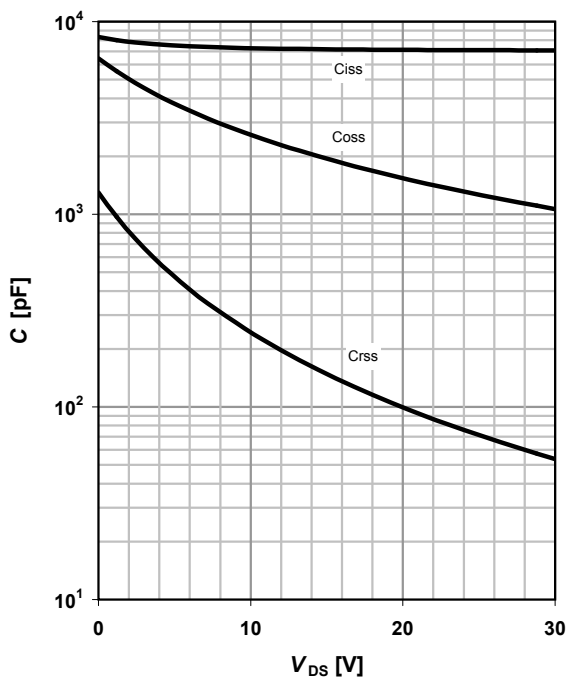
10 Typ. gate threshold voltage

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



11 Typ. capacitances

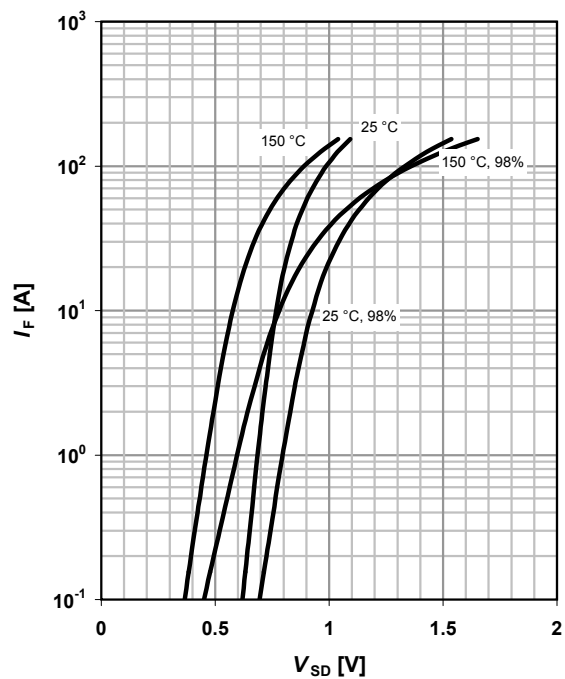
$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$



12 Forward characteristics of reverse diode

$I_F = f(V_{SD})$

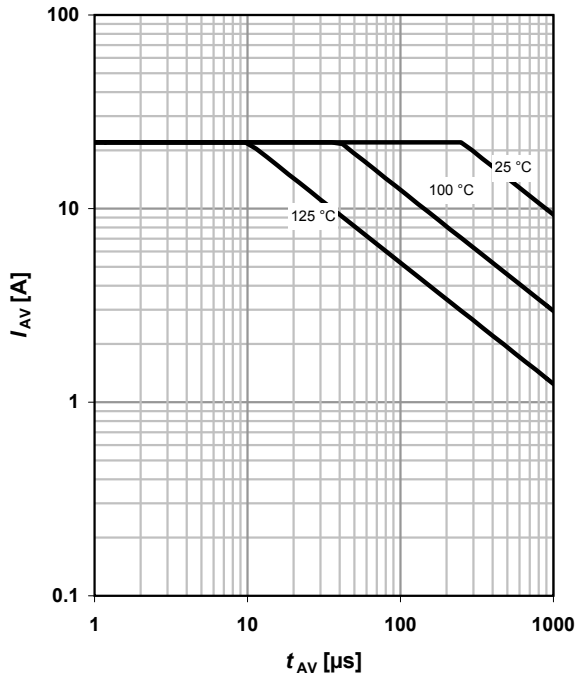
parameter: T_j



13 Avalanche characteristics

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

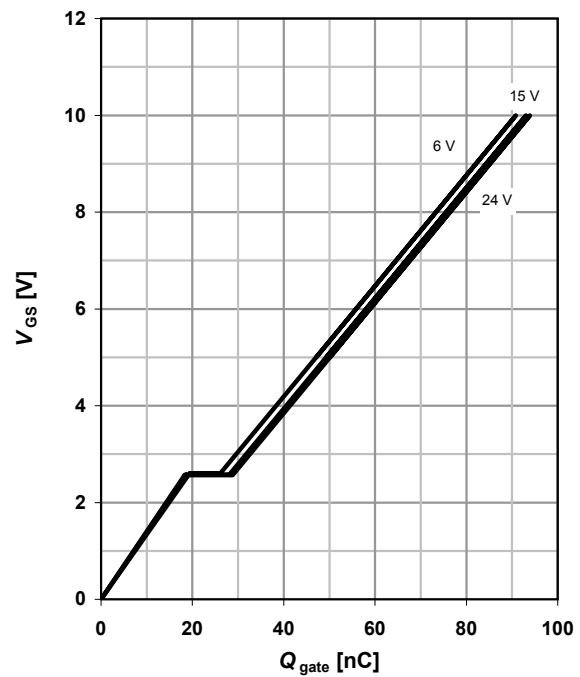
parameter: $T_{j(start)}$



14 Typ. gate charge

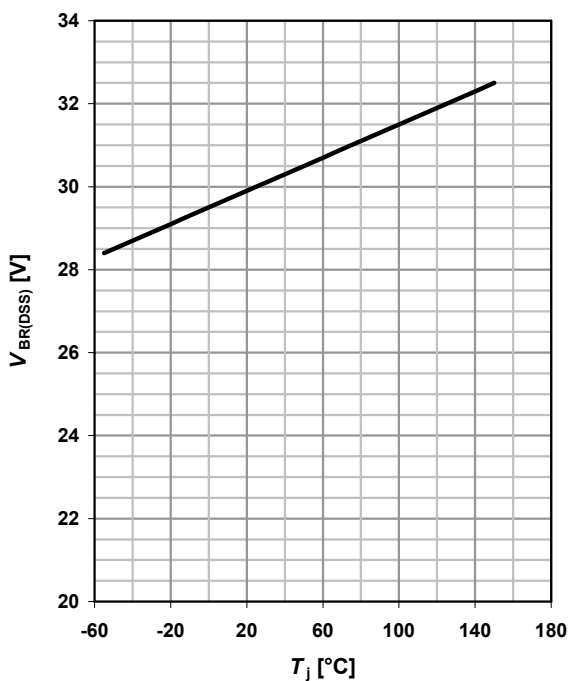
$V_{GS}=f(Q_{gate}); I_D=22 \text{ A pulsed}$

parameter: V_{DD}

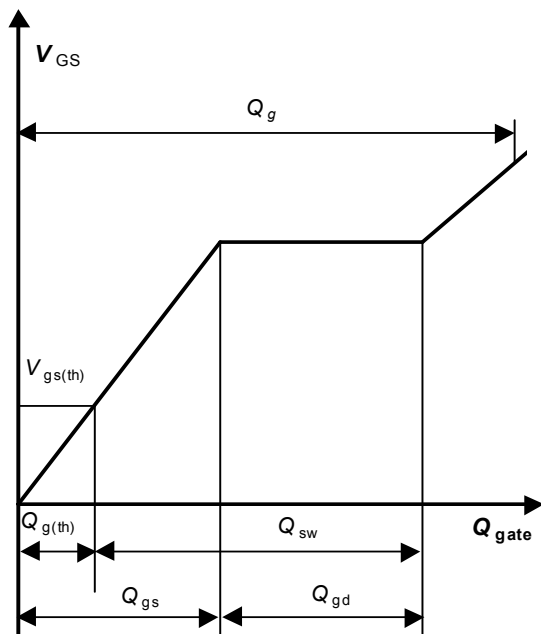


15 Drain-source breakdown voltage

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



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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