

OptiMOS[®]-P Small-Signal-Transistor
Features

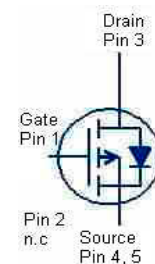
- P-Channel
- Enhancement mode
- Logic level
- 175°C operating temperature
- Avalanche rated
- dv/dt rated
- High current rating
- available with Pb-free lead-plating, RoHS compliant

Product Summary

V_{DS}	-30	V
$R_{DS(on),max}$	7	mΩ
I_D	-50	A

P-TO252-5-3


Type	Package	Ordering Code	Marking
SPD50P03L	P-TO252-5-3	Q67042-S4076	50P03L
SPD50P03L	PG-TO252-5-3	SP000086729	50P03L ⁰⁾


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

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	I_D	$T_C=25\text{ °C}^{1)}$	-50	A
		$T_C=100\text{ °C}^{1)}$	-50	
Pulsed drain current	$I_{D,pulse}$	$T_C=25\text{ °C}$	-200	
Avalanche energy, single pulse	E_{AS}	$I_D=-50\text{ A}$, $R_{GS}=25\text{ Ω}$	256	mJ
Reverse diode dv/dt	dv/dt	$I_D=-50\text{ A}$, $V_{DS}=24\text{ V}$, $di/dt=-200\text{ A/μs}$, $T_{j,max}=175\text{ °C}$	-6	kV/μs
Gate source voltage	V_{GS}		±20	V
Power dissipation	P_{tot}	$T_C=25\text{ °C}$	150	W
Operating and storage temperature	T_j , T_{stg}		-55...+175	°C
IEC climatic category; DIN IEC 68-1			55/175/56	

⁰⁾ the lead-free type is indicated by a 'G' marking on the package next to the datecode

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

Thermal characteristics

Thermal resistance, junction - case	R_{thJC}		-	-	1	K/W
Thermal resistance, junction - ambient	R_{thJA}	minimal footprint	-	-	75	
		6 cm ² cooling area ²⁾	-	-	50	

Electrical characteristics, at $T_j=25\text{ }^\circ\text{C}$, unless otherwise specified
Static characteristics

Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS}=0\text{ V}, I_D=-250\text{ }\mu\text{A}$	-30	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\text{ }\mu\text{A}$	-1	-1.5	-2	
Zero gate voltage drain current	I_{DSS}	$V_{DS}=-30\text{ V}, V_{GS}=0\text{ V}, T_j=25\text{ }^\circ\text{C}$	-	-0.1	-1	μA
		$V_{DS}=-30\text{ V}, V_{GS}=0\text{ V}, T_j=175\text{ }^\circ\text{C}$	-	-10	-100	
Gate-source leakage current	I_{GSS}	$V_{GS}=-20\text{ V}, V_{DS}=0\text{ V}$	-	-10	-100	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=-4.5\text{ V}, I_D=-30\text{ A}$	-	8.5	12.5	m Ω
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=-10\text{ V}, I_D=-50\text{ A}$	-	5.7	7.0	
Transconductance	g_{fs}	$ V_{DS} >2 I_D R_{DS(on)max}, I_D=-50\text{ A}$	47	94	-	S

¹⁾ Current is limited by bondwire; with an $R_{thJC}=1\text{ K/W}$ the chip is able to carry 123 A.

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.

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

Dynamic characteristics

Input capacitance	C_{iss}	$V_{GS}=0\text{ V}$, $V_{DS}=-25\text{ V}$, $f=1\text{ MHz}$	-	4590	6880	pF
Output capacitance	C_{oss}		-	1220	1830	
Reverse transfer capacitance	C_{rss}		-	1000	1500	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=-15\text{ V}$, $V_{GS}=-10\text{ V}$, $I_D=-1\text{ A}$, $R_G=6\ \Omega$	-	14.8	22	ns
Rise time	t_r		-	21.7	32	
Turn-off delay time	$t_{d(off)}$		-	139	208	
Fall time	t_f		-	104	156	

Gate Charge Characteristics³⁾

Gate to source charge	Q_{gs}	$V_{DD}=-24\text{ V}$, $I_D=-50\text{ A}$	-	-14	-19	nC
Gate to drain charge	Q_{gd}		-	-35	-53	
Gate charge total	Q_g	$V_{DD}=-24\text{ V}$, $I_D=-50\text{ A}$, $V_{GS}=0\text{ to }-10\text{ V}$	-	-95	-126	
Gate plateau voltage	$V_{plateau}$	$V_{DD}=-24\text{ V}$, $I_D=-50\text{ A}$	-	-3.0	-	V

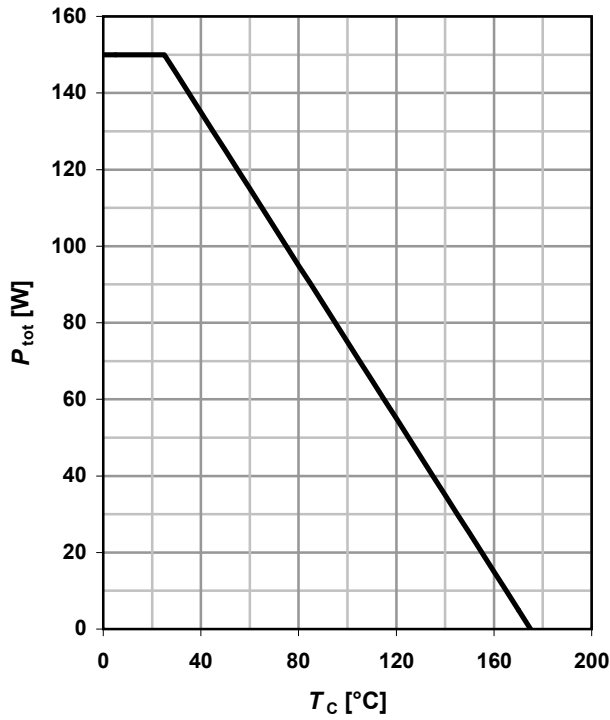
Reverse Diode

Diode continuous forward current	I_S	$T_C=25\text{ }^\circ\text{C}$	-	-	-50	A
Diode pulse current	$I_{S,pulse}$		-	-	-200	
Diode forward voltage	V_{SD}	$V_{GS}=0\text{ V}$, $I_F=50\text{ A}$, $T_J=25\text{ }^\circ\text{C}$	-	-1	-1.65	V
Reverse recovery time	t_{rr}	$V_R=-15\text{ V}$, $I_F= I_S $, $di_F/dt=100\text{ A}/\mu\text{s}$	-	38	47	ns
Reverse recovery charge	Q_{rr}		-	46	57	

³⁾ See figure 16 for gate charge parameter definition

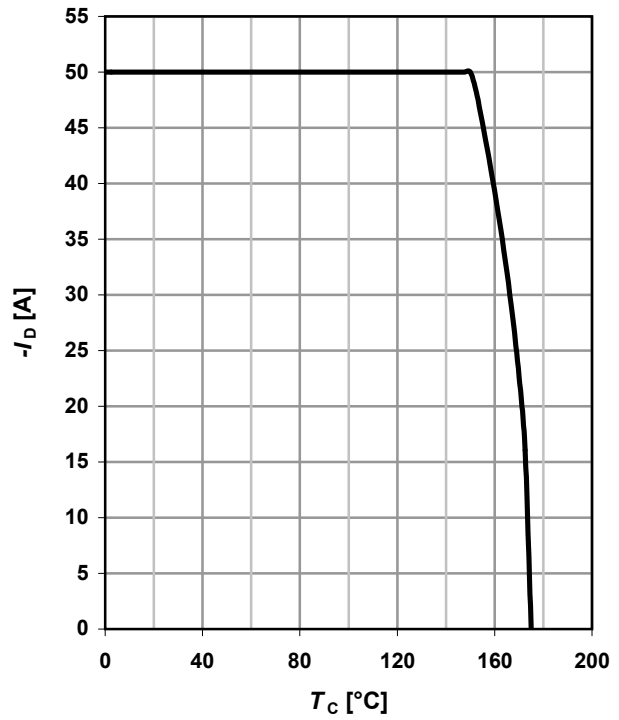
1 Power dissipation

$P_{tot}=f(T_C)$



2 Drain current

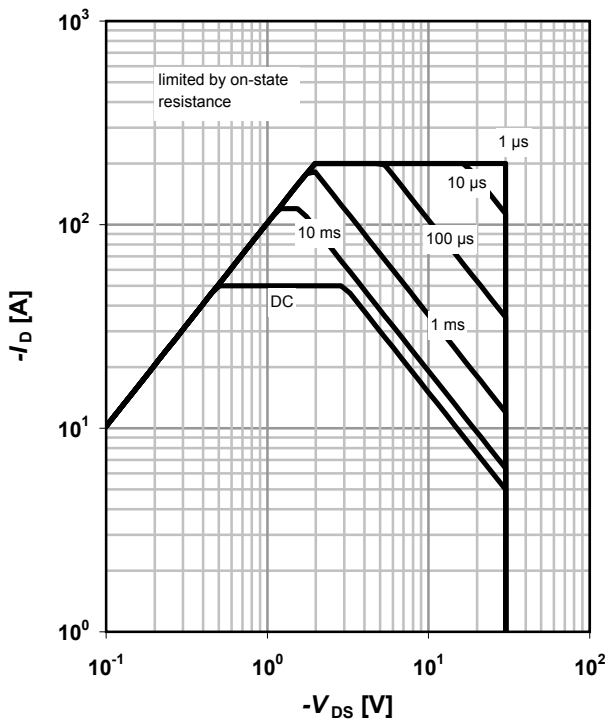
$I_D=f(T_C); |V_{GS}|\geq 10\text{ V}$



3 Safe operating area

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

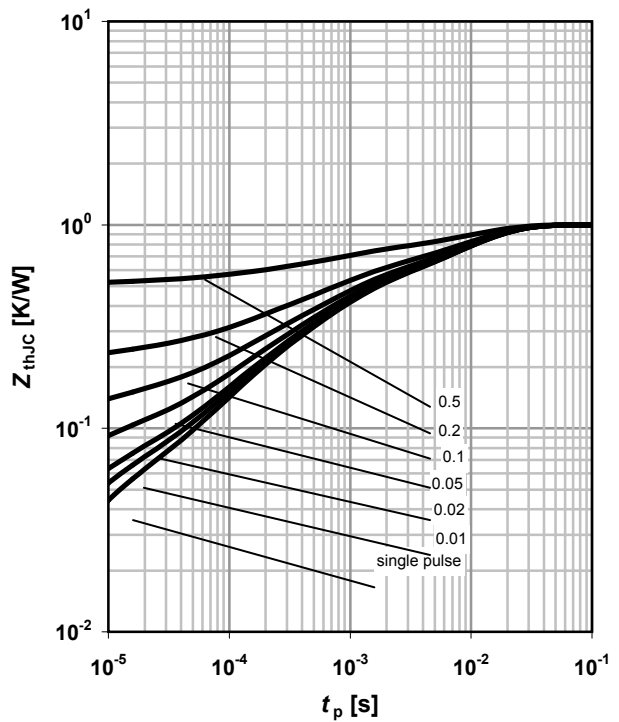
parameter: t_p



4 Max. transient thermal impedance

$Z_{thJC}=f(t_p)$

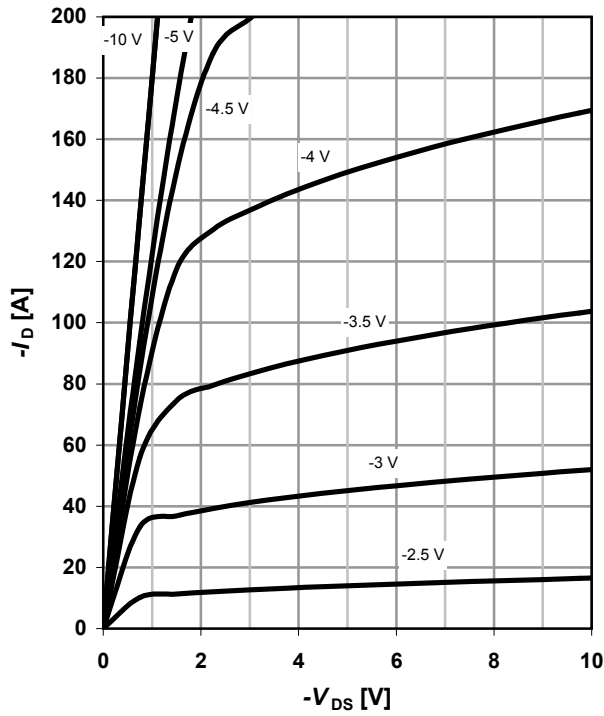
parameter: $D=t_p/T$



5 Typ. output characteristics

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

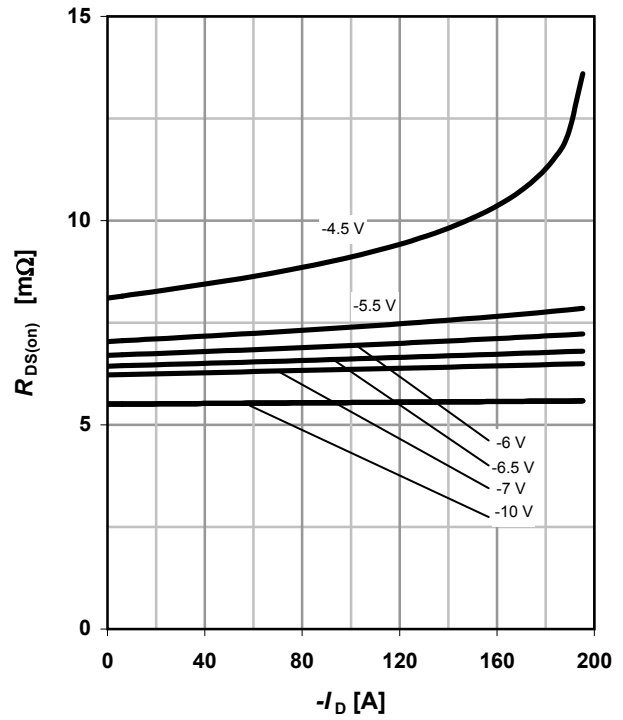
parameter: V_{GS}



6 Typ. drain-source on resistance

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

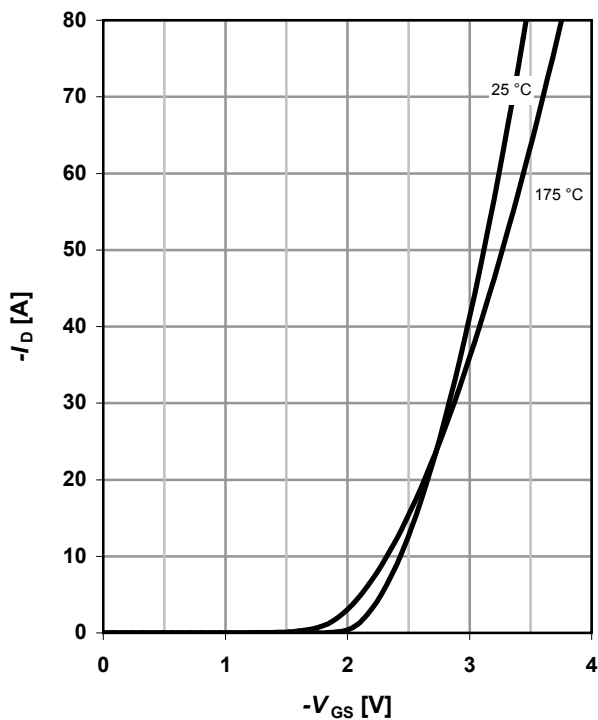
parameter: V_{GS}



7 Typ. transfer characteristics

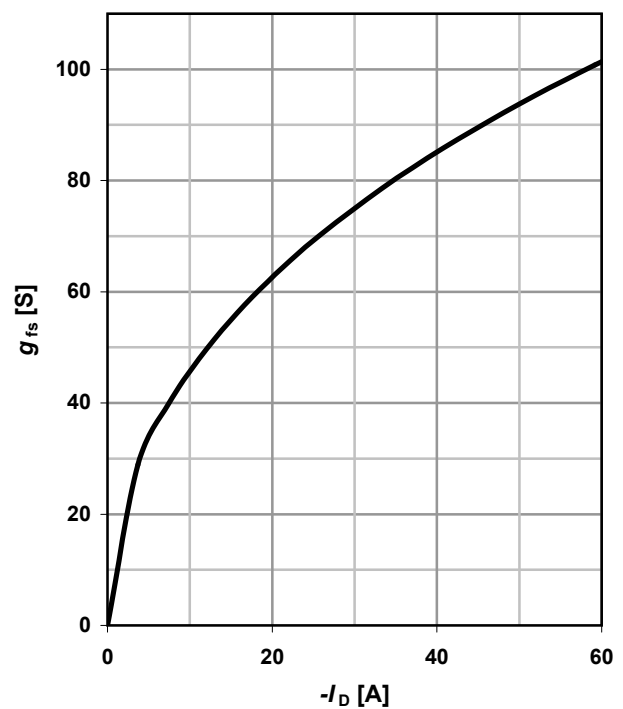
$I_D=f(V_{GS}); |V_{DS}|>2|I_D|R_{DS(on)max}$

parameter: T_j



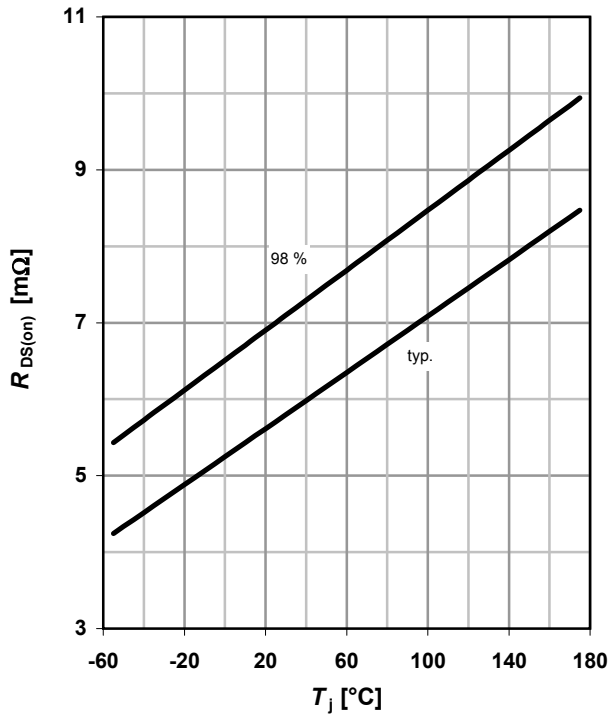
8 Typ. forward transconductance

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



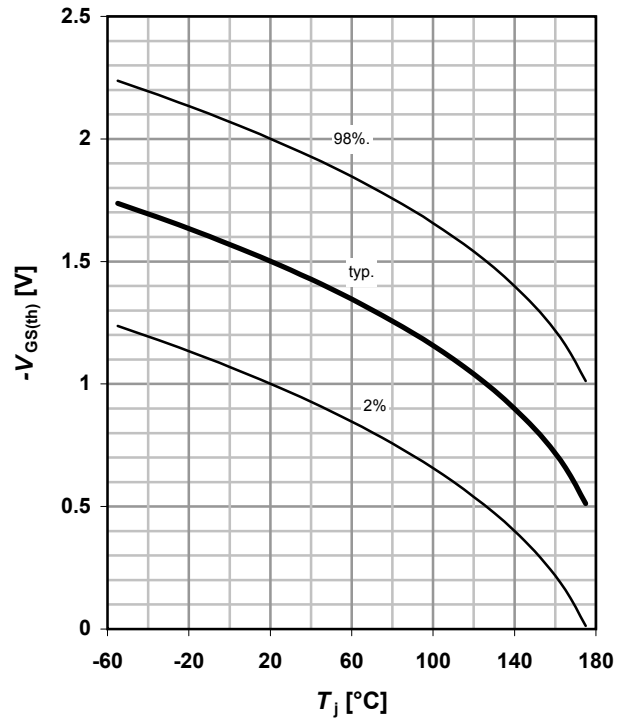
9 Drain-source on-state resistance

$R_{DS(on)}=f(T_j); I_D=-50\text{ A}; V_{GS}=-10\text{ V}$



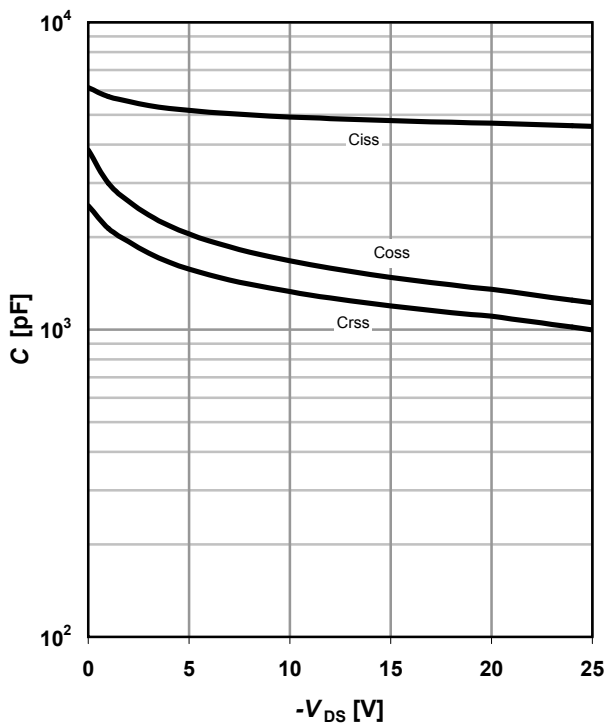
10 Typ. gate threshold voltage

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



11 Typ. capacitances

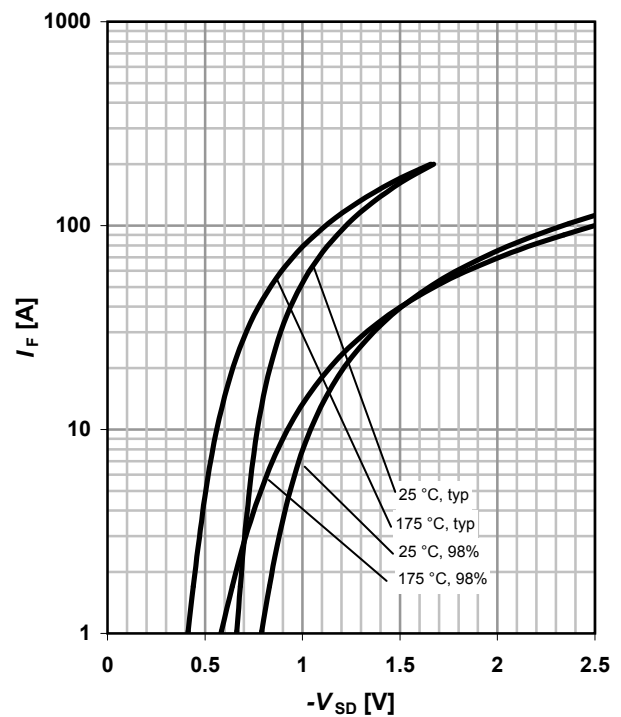
$C=f(V_{DS}); V_{GS}=0\text{ V}; f=1\text{ MHz}$



12 Forward characteristics of reverse diode

$I_F=f(V_{SD})$

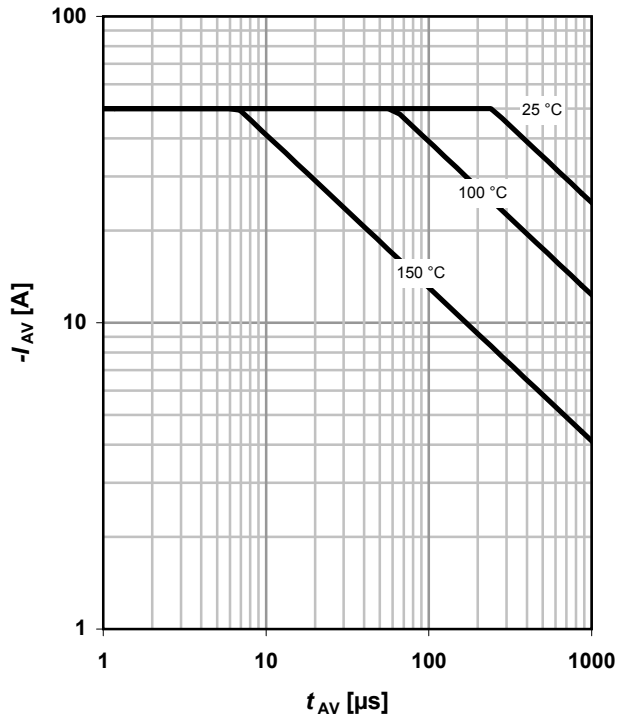
parameter: T_j



13 Avalanche characteristics

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

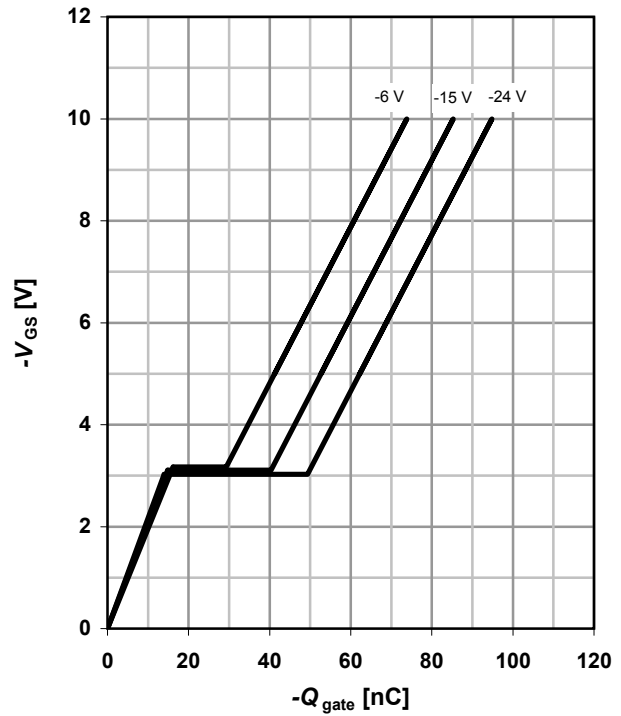
parameter: $T_{j(\text{start})}$



14 Typ. gate charge

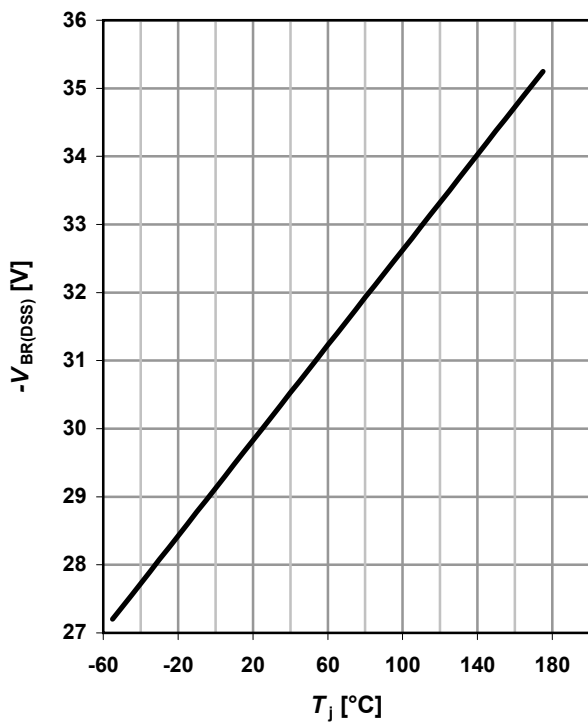
$V_{GS}=f(Q_{\text{gate}}); I_D=-50 \text{ A pulsed}$

parameter: V_{DD}

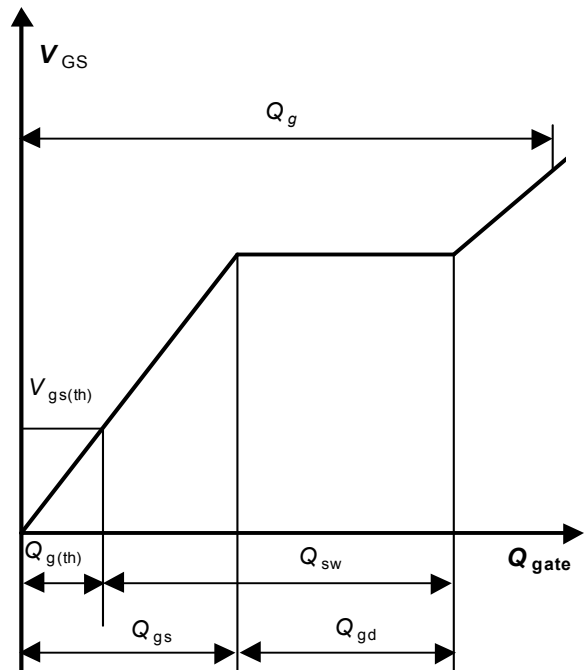


15 Drain-source breakdown voltage

$V_{BR(DSS)}=f(T_j); I_D=-250 \mu\text{A}$

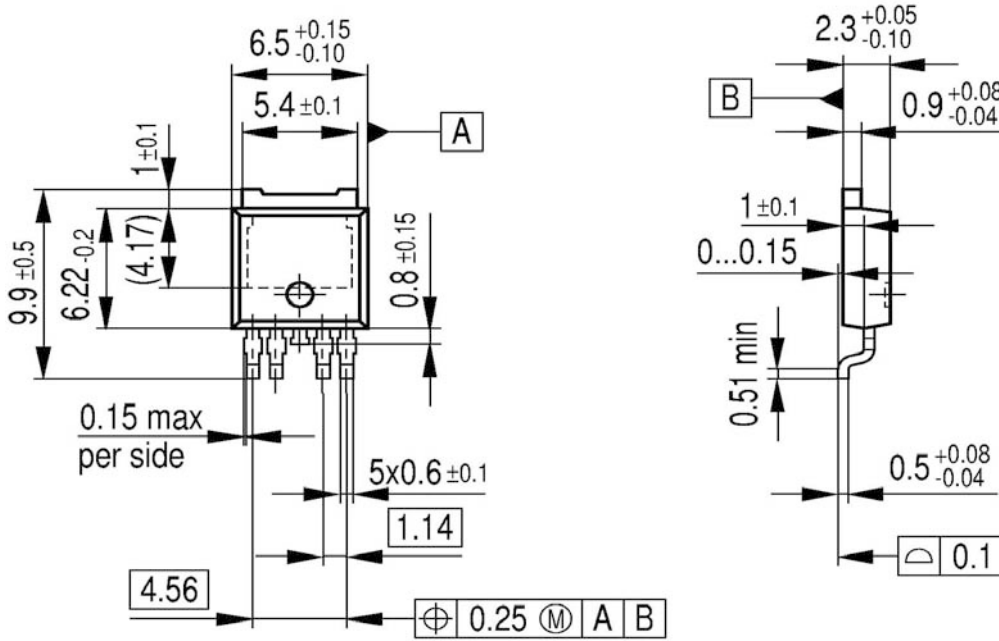


16 Gate charge waveforms

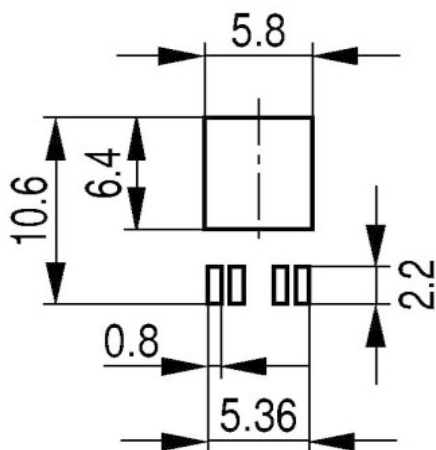


Package Outline

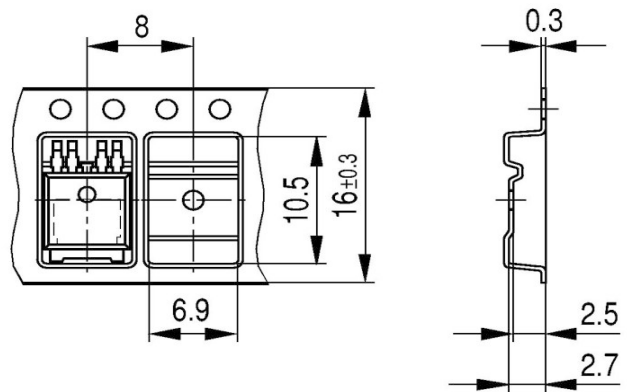
P-TO252-5-3: Outline



Footprint



Packaging Tape



Dimensions in mm

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