

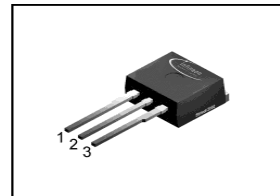
## OptiMOS™ Power-Transistor

### Features

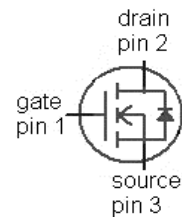
- Optimized for high performance SMPS, e.g. sync. rec.
- 100% avalanche tested
- Superior thermal resistance
- N-channel
- Qualified according to JEDEC<sup>1)</sup> for target applications
- Pb-free lead plating; RoHS compliant
- Halogen-free according to IEC61249-2-21

### Product Summary

$V_{DS}$	60	V
$R_{DS(on),max}$	2.0	m $\Omega$
$I_D$	120	A
$Q_{OSS}$	119	nC
$Q_G(0V..10V)$	106	nC


**PG-TO262-3**


Type	Package	Marking
IPI020N06N	PG-TO262-3	020N06N



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

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	$I_D$	$V_{GS}=10\text{ V}, T_C=25\text{ °C}$	120	A
		$V_{GS}=10\text{ V}, T_C=100\text{ °C}$	120	
		$V_{GS}=10\text{ V}, T_C=25\text{ °C}, R_{thJA}=50\text{K/W}^{2)}$	29	
Pulsed drain current <sup>3)</sup>	$I_{D,pulse}$	$T_C=25\text{ °C}$	480	
Avalanche energy, single pulse <sup>4)</sup>	$E_{AS}$	$I_D=100\text{ A}, R_{GS}=25\text{ }\Omega$	420	mJ
Gate source voltage	$V_{GS}$		$\pm 20$	V

<sup>1)</sup> J-STD20 and JESD22

<sup>2)</sup> Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm<sup>2</sup> (one layer, 70  $\mu\text{m}$  thick) copper area for drain connection. PCB is vertical in still air.

<sup>3)</sup> See figure 3 for more detailed information

<sup>4)</sup> See figure 13 for more detailed information

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

Parameter	Symbol	Conditions	Value	Unit
Power dissipation	$P_{\text{tot}}$	$T_C=25\text{ °C}$	214	W
		$T_A=25\text{ °C}$ , $R_{\text{thJA}}=50\text{ K/W}^{(2)}$	3.0	
Operating and storage temperature	$T_j, T_{\text{stg}}$		-55 ... 175	°C
IEC climatic category; DIN IEC 68-1			55/175/56	

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

**Thermal characteristics**

Thermal resistance, junction - case	$R_{\text{thJC}}$	bottom	-	-	0.7	K/W
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**Electrical characteristics**, at  $T_j=25\text{ °C}$ , unless otherwise specified

**Static characteristics**

Drain-source breakdown voltage	$V_{(\text{BR})\text{DSS}}$	$V_{\text{GS}}=0\text{ V}, I_{\text{D}}=1\text{ mA}$	60	-	-	V
Gate threshold voltage	$V_{\text{GS(th)}}$	$V_{\text{DS}}=V_{\text{GS}}, I_{\text{D}}=143\text{ }\mu\text{A}$	-	2.8	-	
Zero gate voltage drain current	$I_{\text{DSS}}$	$V_{\text{DS}}=60\text{ V}, V_{\text{GS}}=0\text{ V},$ $T_j=25\text{ °C}$	-	0.5	1	$\mu\text{A}$
		$V_{\text{DS}}=60\text{ V}, V_{\text{GS}}=0\text{ V},$ $T_j=125\text{ °C}$	-	10	100	
Gate-source leakage current	$I_{\text{GSS}}$	$V_{\text{GS}}=20\text{ V}, V_{\text{DS}}=0\text{ V}$	-	10	100	nA
Drain-source on-state resistance	$R_{\text{DS(on)}}$	$V_{\text{GS}}=10\text{ V}, I_{\text{D}}=100\text{ A}$	-	1.8	2	m $\Omega$
		$V_{\text{GS}}=6\text{ V}, I_{\text{D}}=25\text{ A}$	-	3.6	-	
Gate resistance	$R_{\text{G}}$		-	1.6	-	$\Omega$
Transconductance	$g_{\text{fs}}$	$ V_{\text{DS}} >2 I_{\text{D}} R_{\text{DS(on)max}},$ $I_{\text{D}}=100\text{ A}$	100	210	-	S

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

**Dynamic characteristics**

Input capacitance	$C_{iss}$	$V_{GS}=0\text{ V}, V_{DS}=30\text{ V}, f=1\text{ MHz}$	-	7800	-	pF
Output capacitance	$C_{oss}$		-	1800	-	
Reverse transfer capacitance	$C_{rss}$		-	69	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=30\text{ V}, V_{GS}=10\text{ V}, I_D=100\text{ A}, R_G=3\ \Omega$	-	24	-	ns
Rise time	$t_r$		-	45	-	
Turn-off delay time	$t_{d(off)}$		-	51	-	
Fall time	$t_f$		-	19	-	

**Gate Charge Characteristics<sup>5)</sup>**

Gate to source charge	$Q_{gs}$	$V_{DD}=30\text{ V}, I_D=100\text{ A}, V_{GS}=0\text{ to }10\text{ V}$	-	35	-	nC
Gate charge at threshold	$Q_{g(th)}$		-	22	-	
Gate to drain charge	$Q_{gd}$		-	19	-	
Switching charge	$Q_{sw}$		-	33	-	
Gate charge total	$Q_g$		-	106	-	
Gate plateau voltage	$V_{plateau}$		-	4.5	-	V
Gate charge total, sync. FET	$Q_{g(sync)}$	$V_{DS}=0.1\text{ V}, V_{GS}=0\text{ to }10\text{ V}$	-	94	-	nC
Output charge	$Q_{oss}$	$V_{DD}=30\text{ V}, V_{GS}=0\text{ V}$	-	119	-	

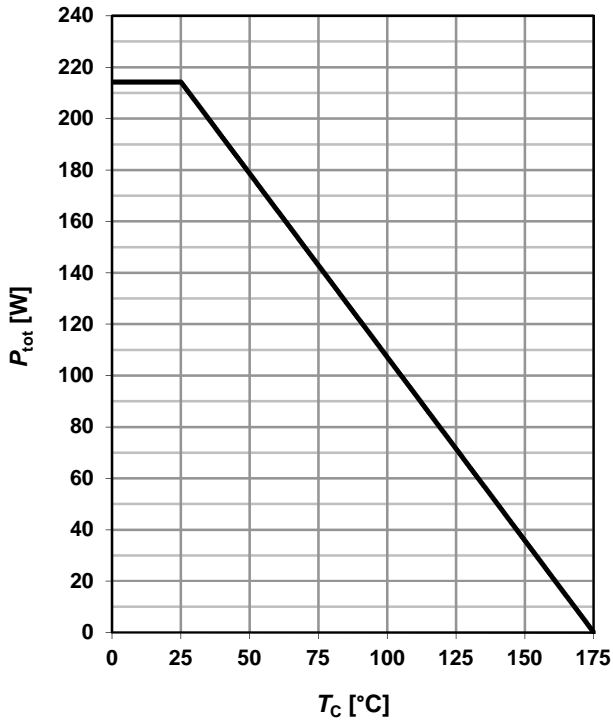
**Reverse Diode**

Diode continuous forward current	$I_S$	$T_C=25\text{ }^\circ\text{C}$	-	-	120	A
Diode pulse current	$I_{S,pulse}$		-	-	480	
Diode forward voltage	$V_{SD}$	$V_{GS}=0\text{ V}, I_F=100\text{ A}, T_j=25\text{ }^\circ\text{C}$	-	0.9	1.2	V
Reverse recovery time	$t_{rr}$	$V_R=30\text{ V}, I_F=100\text{ A}, di_F/dt=100\text{ A}/\mu\text{s}$	-	76	-	ns
Reverse recovery charge	$Q_{rr}$		-	97	-	nC

<sup>5)</sup> See figure 16 for gate charge parameter definition

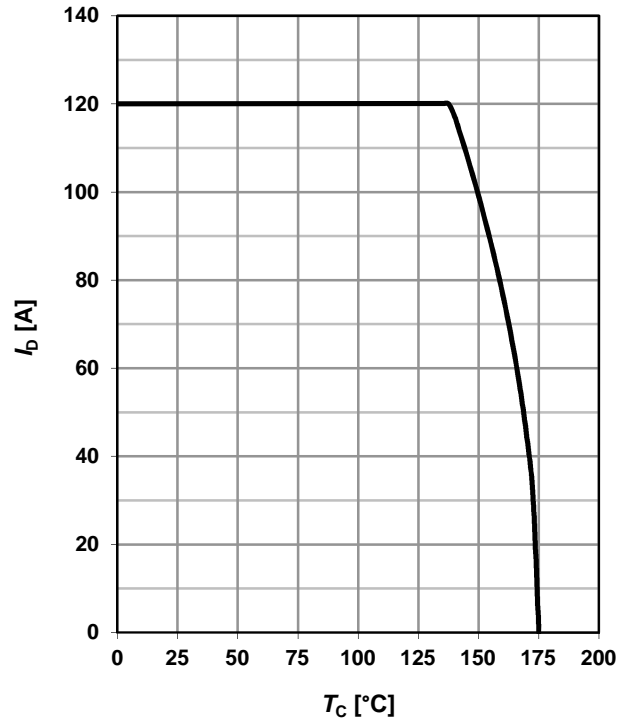
### 1 Power dissipation

$$P_{tot}=f(T_C)$$



### 2 Drain current

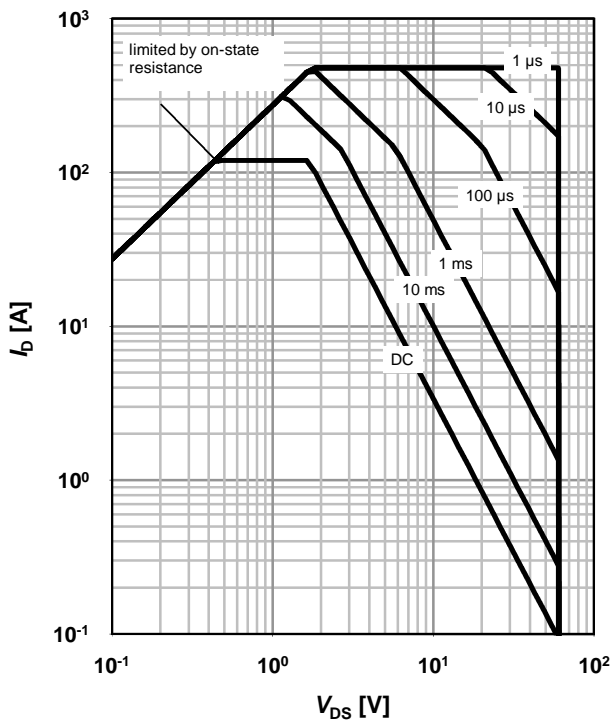
$$I_D=f(T_C); V_{GS} \geq 10 \text{ V}$$



### 3 Safe operating area

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

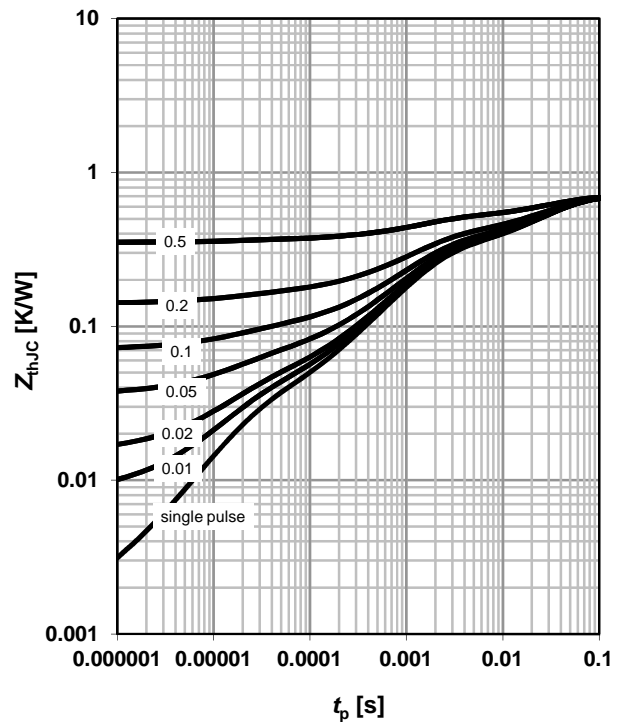
parameter:  $t_p$



### 4 Max. transient thermal impedance

$$Z_{thJC}=f(t_p)$$

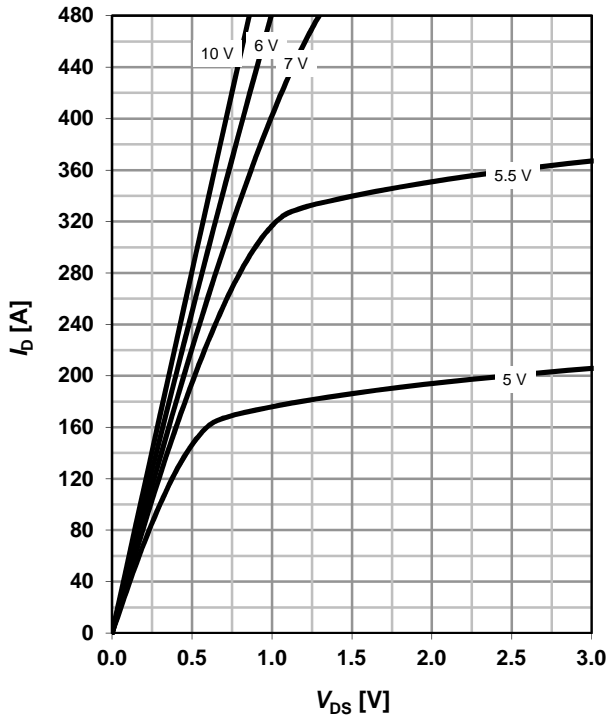
parameter:  $D=t_p/T$



**5 Typ. output characteristics**

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

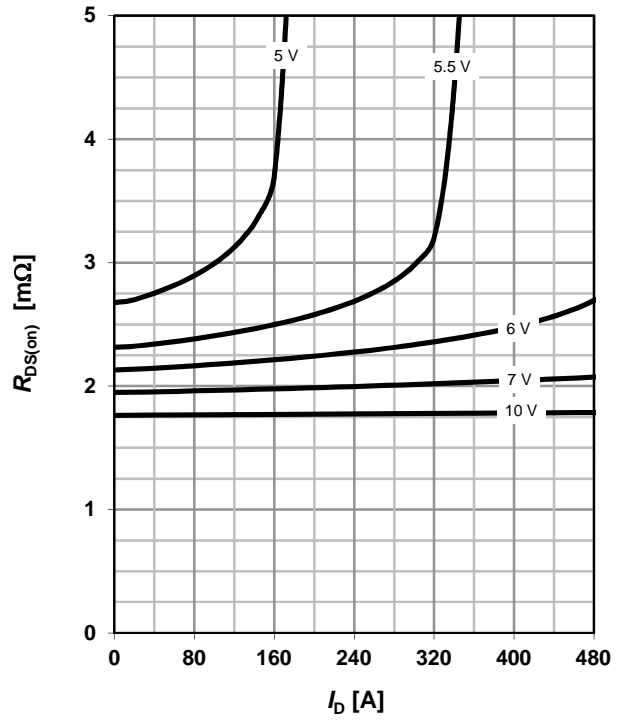
parameter:  $V_{GS}$



**6 Typ. drain-source on resistance**

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

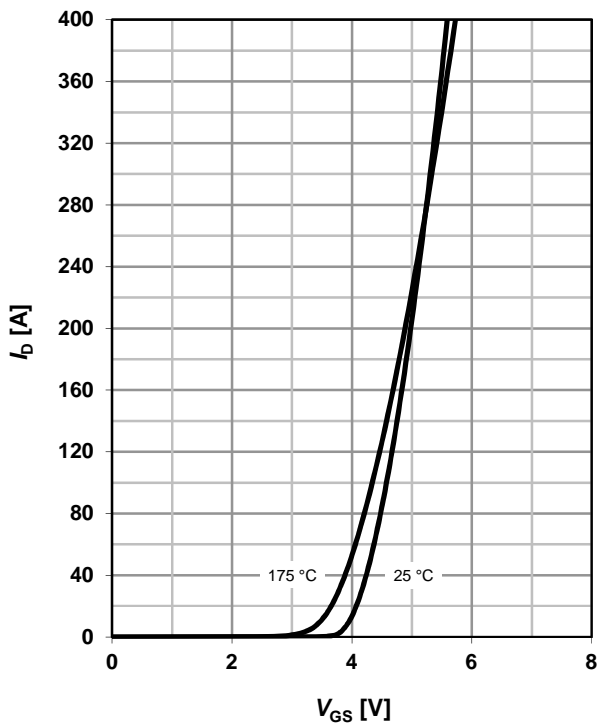
parameter:  $V_{GS}$



**7 Typ. transfer characteristics**

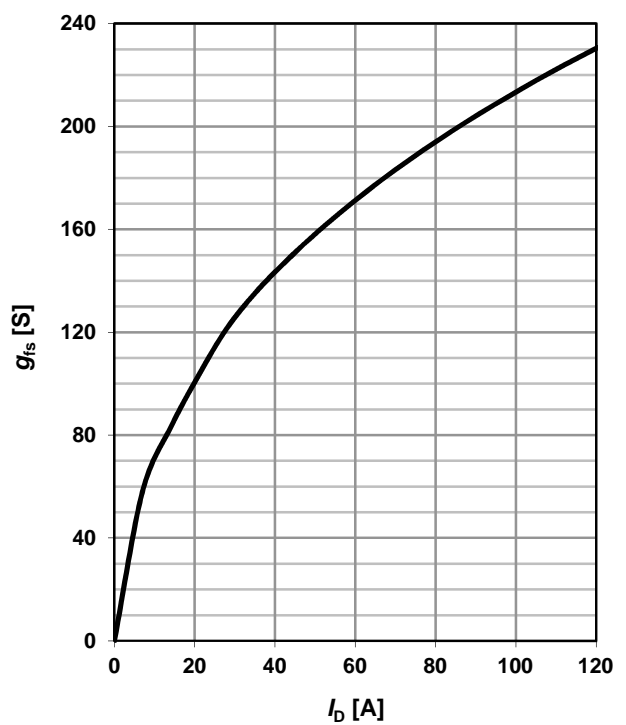
$I_D=f(V_{GS}); |V_{DS}|>2|I_D|R_{DS(on)max}$

parameter:  $T_j$



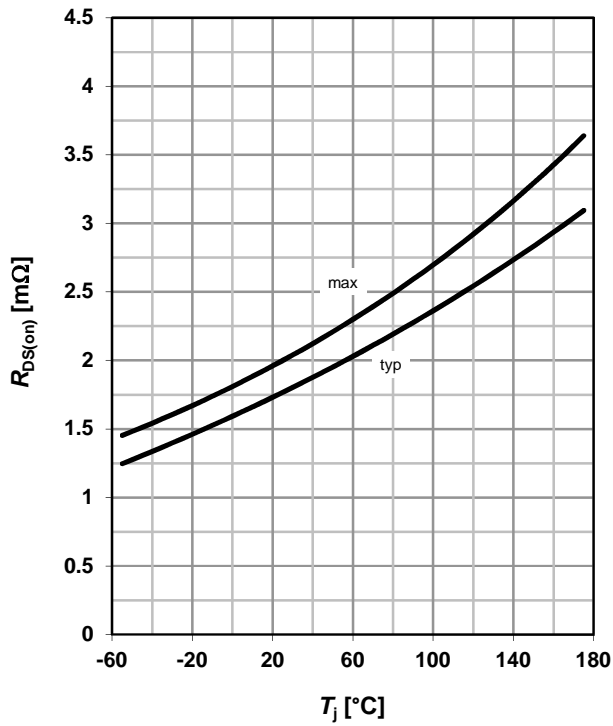
**8 Typ. forward transconductance**

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



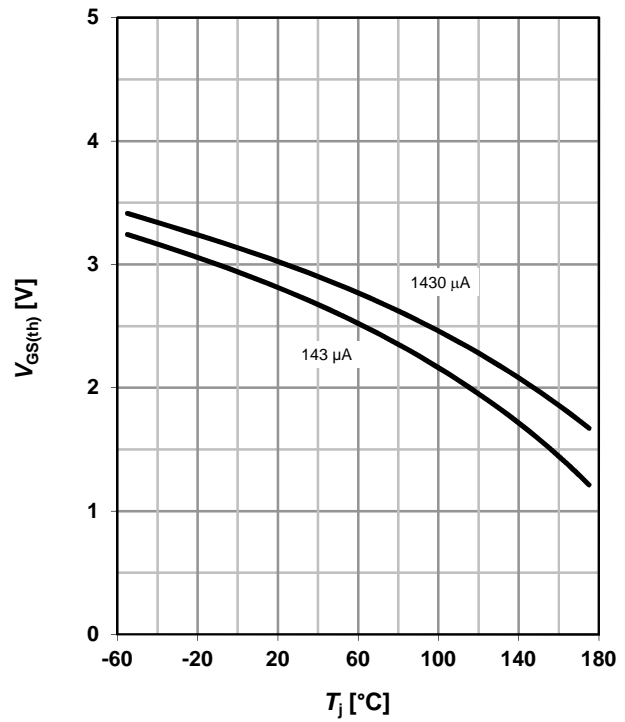
**9 Drain-source on-state resistance**

$R_{DS(on)}=f(T_j); I_D=100\text{ A}; V_{GS}=10\text{ V}$



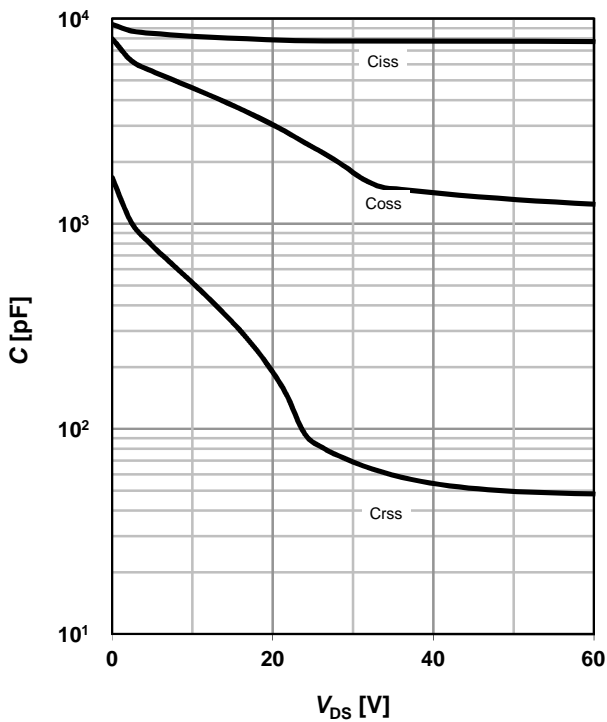
**10 Typ. gate threshold voltage**

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



**11 Typ. capacitances**

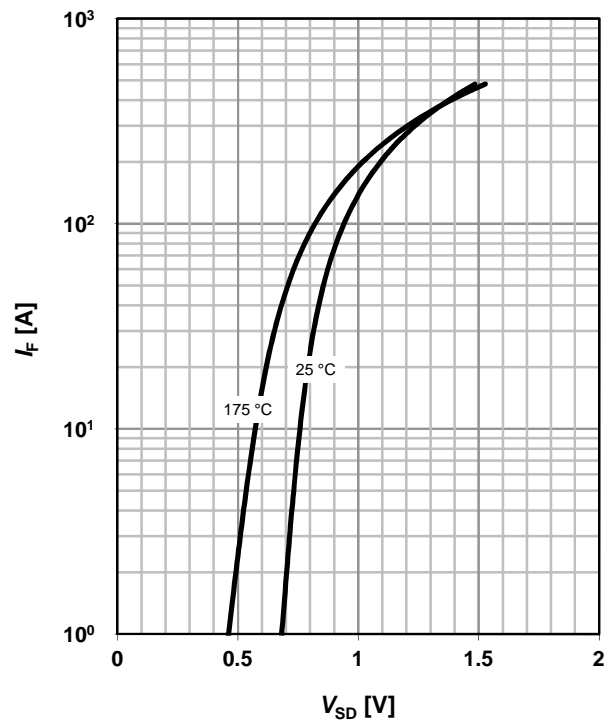
$C=f(V_{DS}); V_{GS}=0\text{ V}; f=1\text{ MHz}$



**12 Forward characteristics of reverse diode**

$I_F=f(V_{SD})$

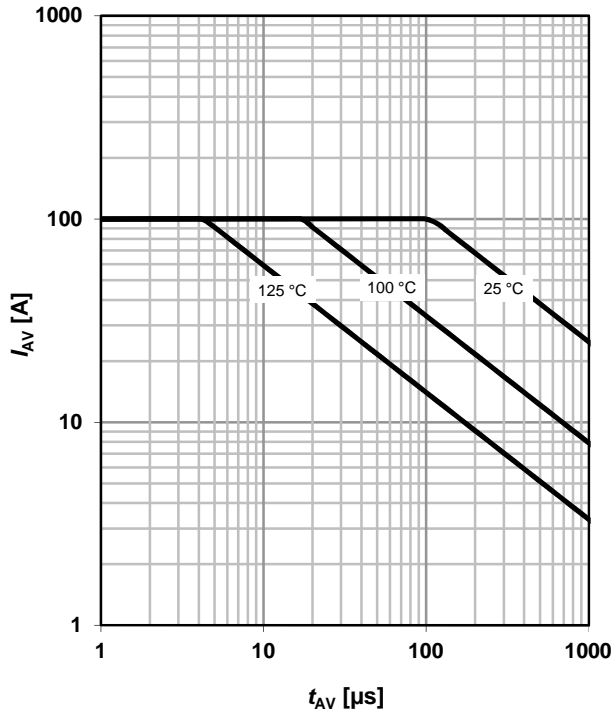
parameter:  $T_j$



**13 Avalanche characteristics**

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

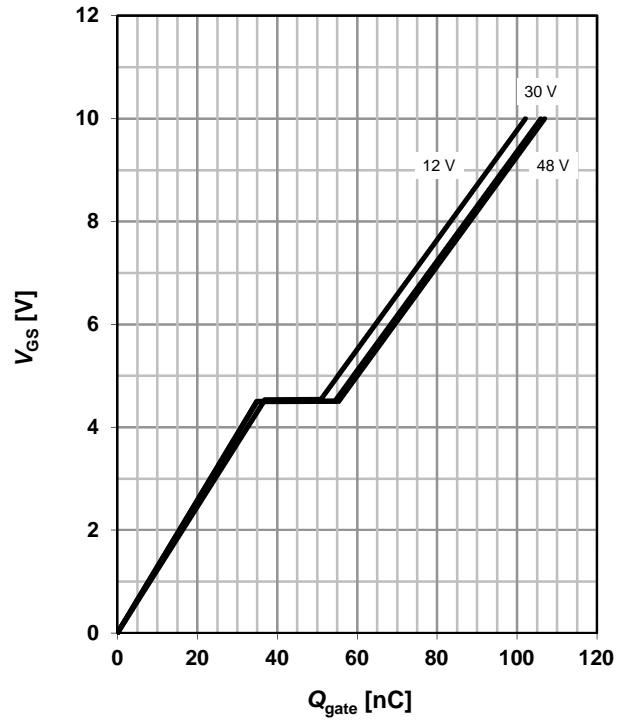
parameter:  $T_{j(\text{start})}$



**14 Typ. gate charge**

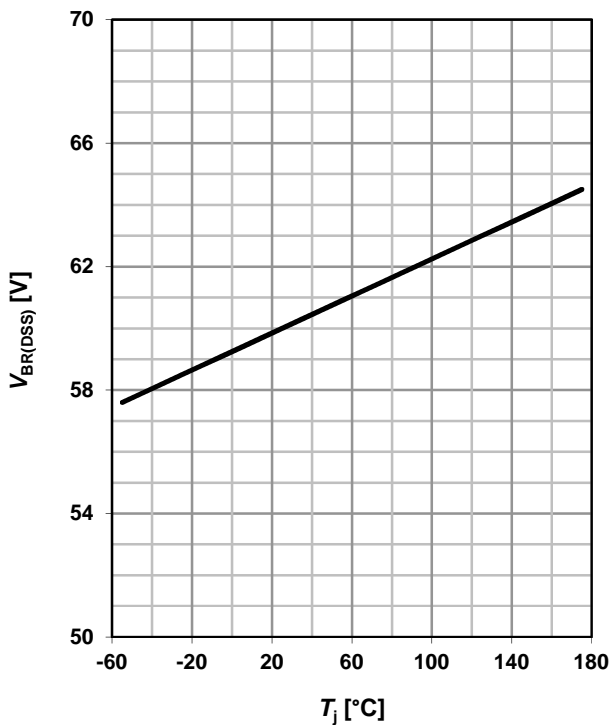
$V_{GS}=f(Q_{\text{gate}}); I_D=100 \text{ A pulsed}$

parameter:  $V_{DD}$

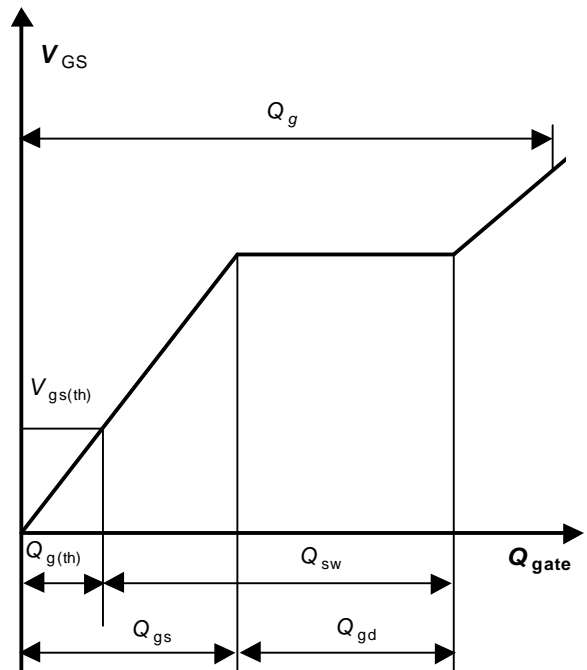


**15 Drain-source breakdown voltage**

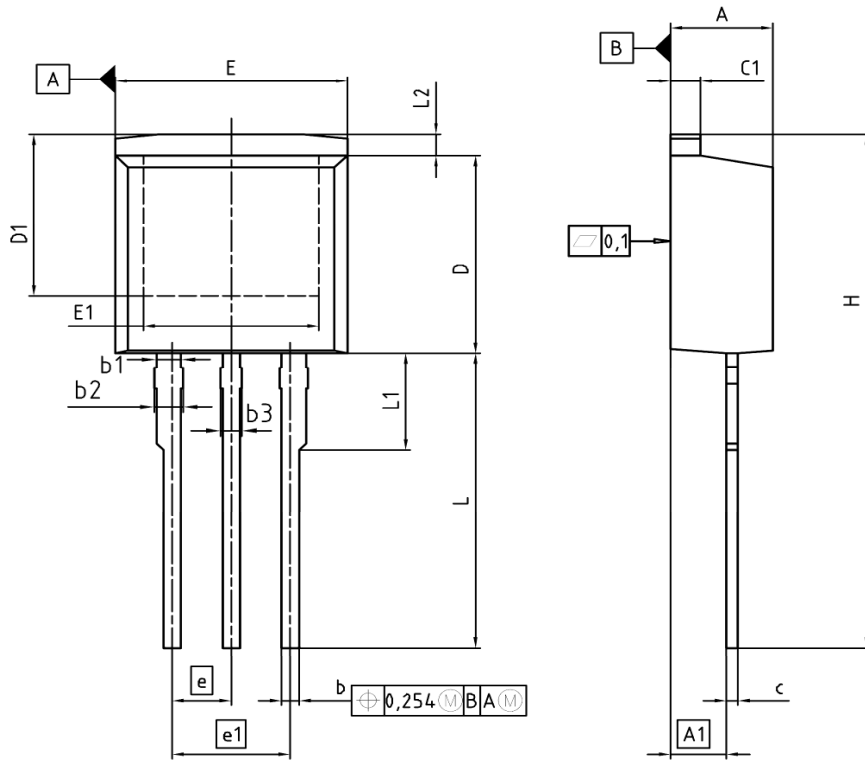
$V_{BR(DSS)}=f(T_j); I_D=1 \text{ mA}$



**16 Gate charge waveforms**



T0262-3-1 / T0262-3-21



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.300	4.572	0.169	0.180
A1	2.150	2.718	0.085	0.107
b	0.650	0.864	0.026	0.034
b1	0.950	1.093	0.037	0.043
b2	0.950	1.400	0.037	0.055
b3	0.650	1.118	0.026	0.044
c	0.330	0.600	0.013	0.024
c1	1.170	1.400	0.046	0.055
D	8.509	9.450	0.335	0.372
D1	6.900	-	0.272	-
E	9.700	10.363	0.382	0.408
E1	6.500	8.600	0.256	0.339
e	2.540		0.100	
e1	5.080		0.200	
N	3		3	
L	13.000	14.000	0.512	0.551
L1	-	4.800	-	0.189
L2	-	1.727	-	0.068

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