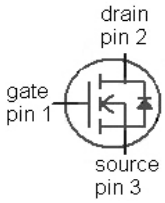
OptiMOS®3 Power-Transistor

Features

- Fast switching MOSFET for SMPS
- Optimized technology for DC/DC converters
- Qualified according to JEDEC[1] for target applications
- N-channel, logic level
- Excellent gate charge x $R_{DS(on)}$ product (FOM)
- Very low on-resistance $R_{DS(on)}$
- 100% Avalanche tested
- Pb-free plating; RoHS compliant

Product Summary

V_{DS}	40	V
$R_{DS(on),max}$	10.5	mΩ
I_D	40	A



Type	IPD105N04L G
	
Package	PG-TO252-3
Marking	105N04L

Maximum ratings, at T_j=25 °C, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	I_D	V_{GS}=10 V, T_C=25 °C	40	A
		V_{GS}=10 V, T_C=100 °C	34	
		V_{GS}=4.5 V, T_C=25 °C	40	
		V_{GS}=4.5 V, T_C=100 °C	29	
Pulsed drain current[2]	$I_{D,pulse}$	T_C=25 °C	280	
Avalanche current, single pulse[3]	I_{AS}	T_C=25 °C	40	
Avalanche energy, single pulse	E_{AS}	I_D=40 A, R_{GS}=25 Ω	10	mJ
Gate source voltage	V_{GS}		±20	V

[1] J-STD20 and JESD22

Maximum ratings, at T_j=25 °C, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
Power dissipation	P_{tot}	T_C=25 °C	42	W
Operating and storage temperature	T_j, T_{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_{thJC}		-	-	3.6	K/W
SMD version, device on PCB	R_{thJA}	minimal footprint	-	-	75	
		6 cm² cooling area[4)]	-	-	50	

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	40	-	-	V
Gate threshold voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=14 µA	1.2	-	2	
Zero gate voltage drain current	I_{DSS}	V_{DS}=40 V, V_{GS}=0 V, T_j=25 °C	-	0.1	1	µA
		V_{DS}=40 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=25 A	-	12.0	15	mΩ
		V_{GS}=10 V, I_D=40 A	-	8.8	10.5	
Gate resistance	R_G		-	1.1	-	Ω
Transconductance	g_{fs}	$\|V_{DS}\|>2\|I_D\|R_{DS(on)max}$, I_D=40 A	31	62	-	S

[2)] See figure 3 for more detailed information

[3)] See figure 13 for more detailed information

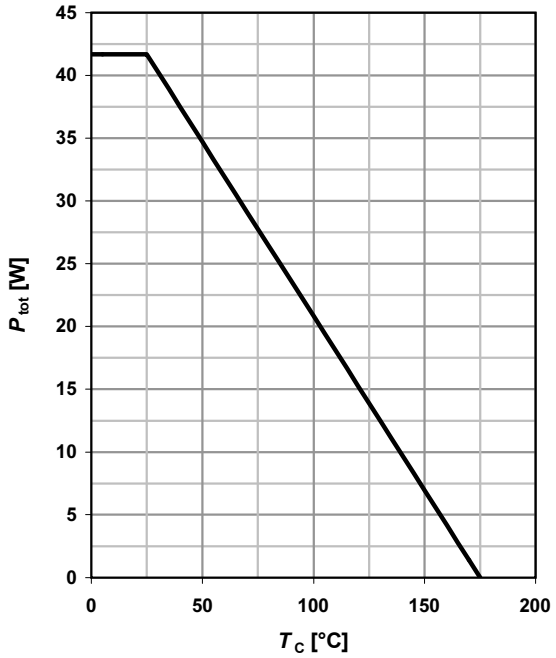
[4)] Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm2 (one layer, 70 µm thick) copper area for drain connection. PCB is vertical in still air.

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Dynamic characteristics						
Input capacitance	C_{iss}	V_{GS}=0 V, V_{DS}=20 V, f=1 MHz	-	1400	1900	pF
Output capacitance	C_{oss}		-	330	440	
Reverse transfer capacitance	C_{rss}		-	16	-	
Turn-on delay time	$t_{d(on)}$	V_{DD}=20 V, V_{GS}=10 V, I_D=30 A, R_G=1.6 Ω	-	3.7	-	ns
Rise time	t_r		-	2.4	-	
Turn-off delay time	$t_{d(off)}$		-	16	-	
Fall time	t_f		-	2.8	-	
Gate Charge Characteristics[5)]						
Gate to source charge	Q_{gs}	V_{DD}=20 V, I_D=30 A, V_{GS}=0 to 10 V	-	4.8	-	nC
Gate charge at threshold	$Q_{g(th)}$		-	2.2	-	
Gate to drain charge	Q_{gd}		-	1.9	-	
Switching charge	Q_{sw}		-	4.6	-	
Gate charge total	Q_g		-	18	23	
Gate plateau voltage	$V_{plateau}$		-	3.5	-	V
Gate charge total	Q_g	V_{DD}=20 V, I_D=30 A, V_{GS}=0 to 4.5 V	-	8	11	nC
Gate charge total, sync. FET	$Q_{g(sync)}$	V_{DS}=0.1 V, V_{GS}=0 to 10 V	-	16.4	-	
Output charge	Q_{oss}	V_{DD}=20 V, V_{GS}=0 V	-	13	-	
Reverse Diode						
Diode continuous forward current	I_S	T_C=25 °C	-	-	35	A
Diode pulse current	$I_{S,pulse}$		-	-	280	
Diode forward voltage	V_{SD}	V_{GS}=0 V, I_F=40 A, T_j=25 °C	-	0.94	1.2	V
Reverse recovery charge	Q_{rr}	V_R=20 V, I_F=I_S, di_F/dt=400 A/µs	-	16	-	nC

[5)] See figure 16 for gate charge parameter definition

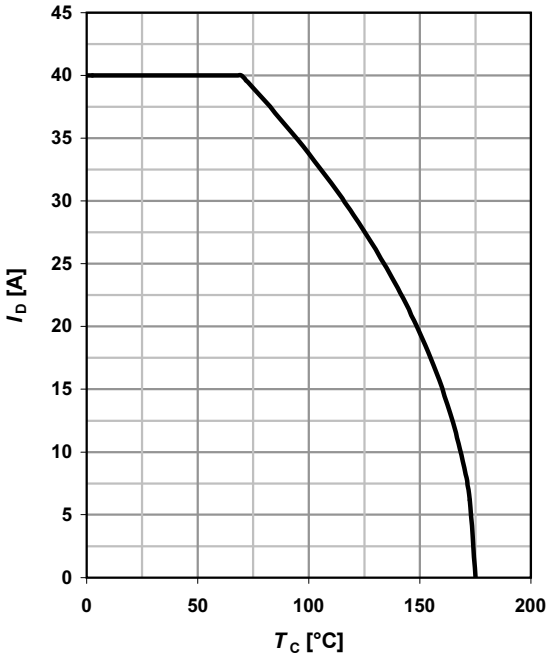
1 Power dissipation

$P_{tot}=f(T_C)$



2 Drain current

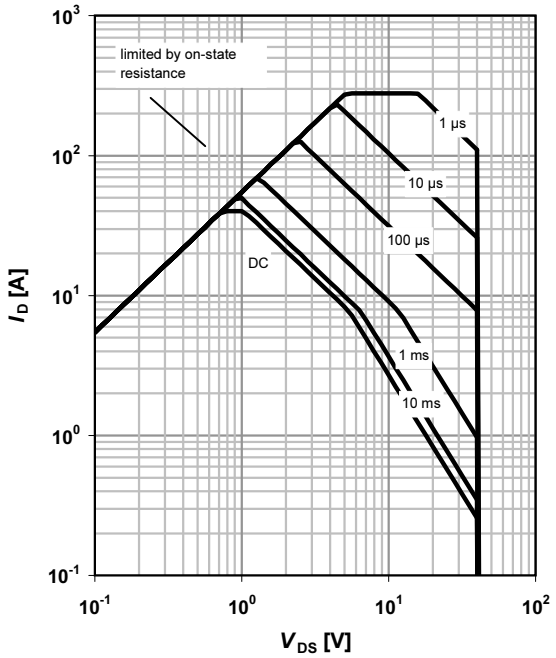
$I_D=f(T_C)$; $V_{GS}\geq 10$ V



3 Safe operating area

$I_D=f(V_{DS})$; $T_C=25$ °C; $D=0$

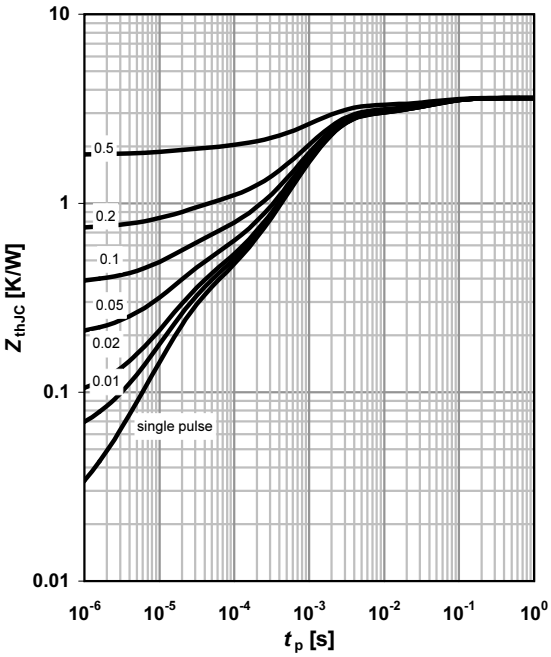
parameter: t_p



4 Max. transient thermal impedance

$Z_{thJC}=f(t_p)$

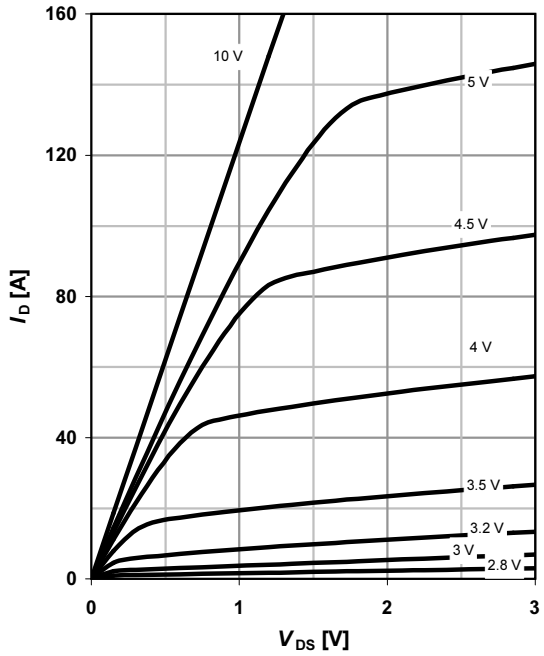
parameter: $D=t_p/T$



5 Typ. output characteristics

$I_D=f(V_{DS})$; T_j=25 °C

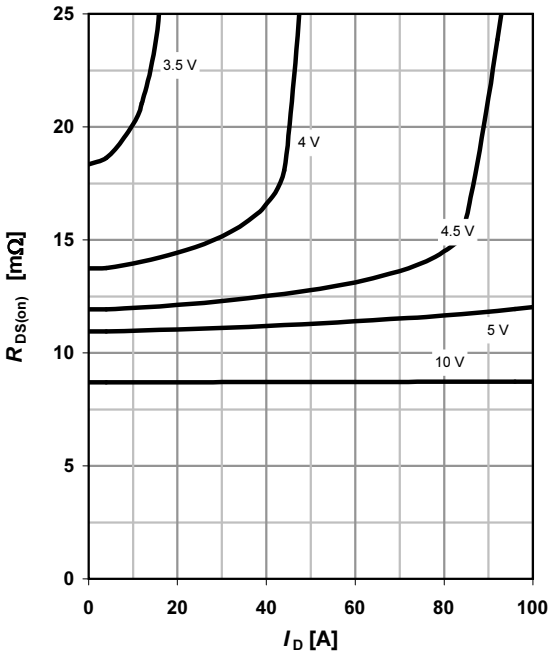
parameter: V_{GS}



6 Typ. drain-source on resistance

$R_{DS(on)}=f(I_D)$; T_j=25 °C

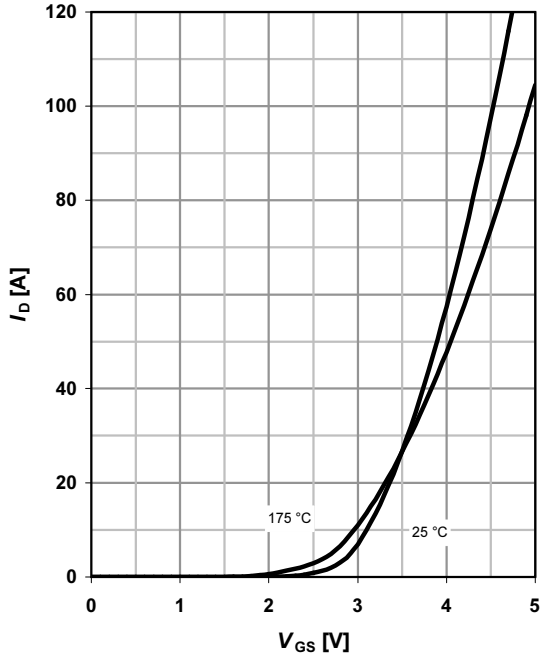
parameter: V_{GS}



7 Typ. transfer characteristics

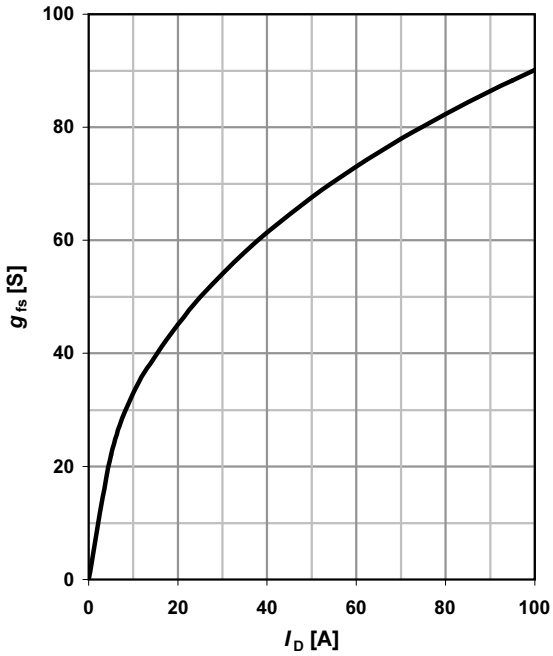
$I_D=f(V_{GS})$; $|V_{DS}|>2|I_D|R_{DS(on)max}$

parameter: T_j



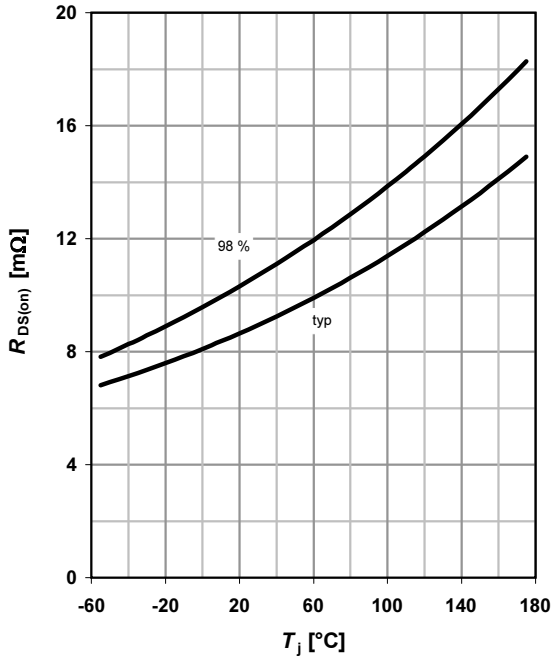
8 Typ. forward transconductance

$g_{fs}=f(I_D)$; T_j=25 °C



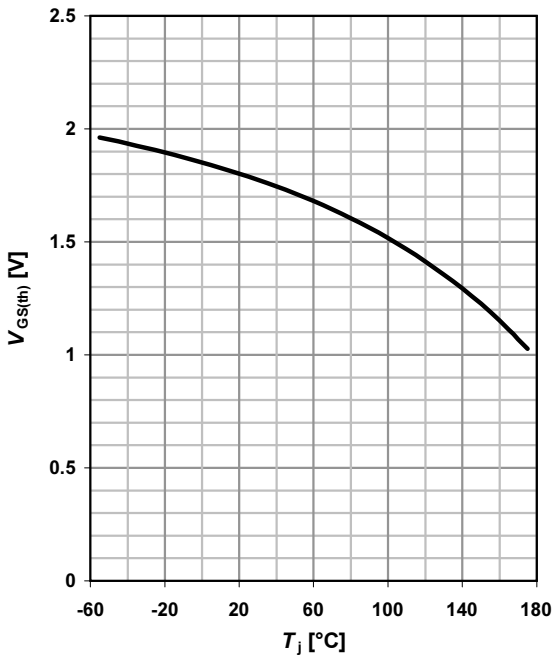
9 Drain-source on-state resistance

$R_{DS(on)}$=f(T_j); I_D=40 A; V_{GS}=10 V



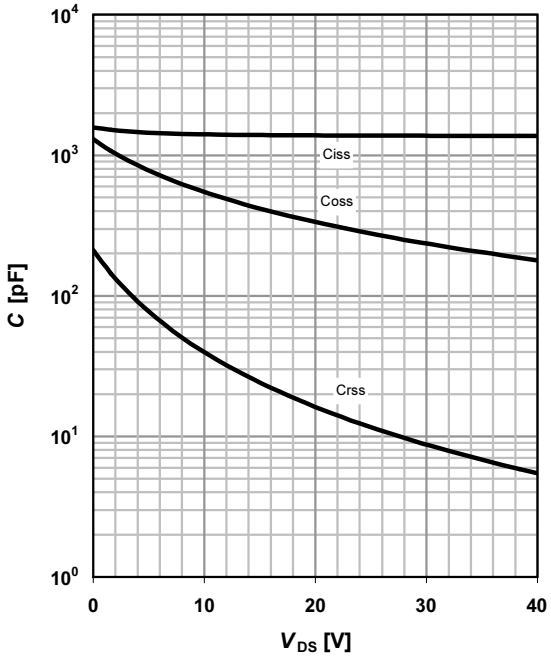
10 Typ. gate threshold voltage

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



11 Typ. capacitances

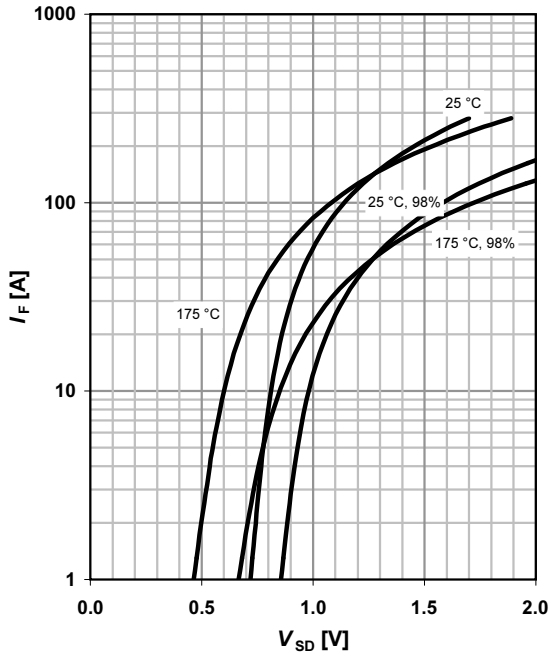
C=f(V_{DS}); V_{GS}=0 V; f=1 MHz



12 Forward characteristics of reverse diode

I_F=f(V_{SD})

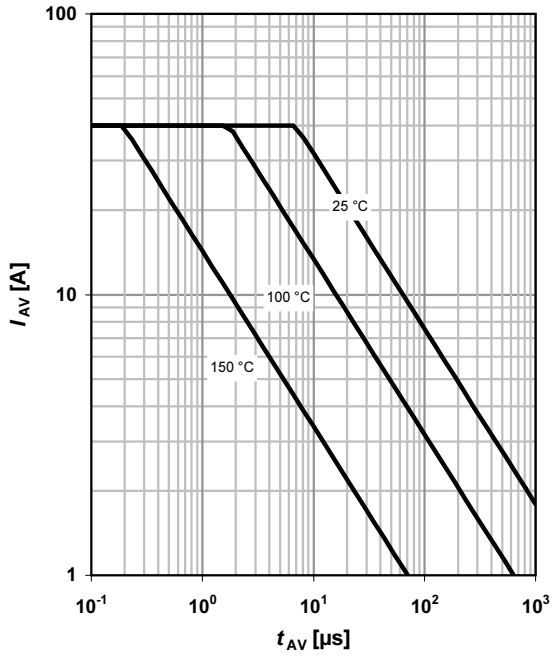
parameter: T_j



13 Avalanche characteristics

I_{AS}=f(t_{AV}); R_{GS}=25 Ω

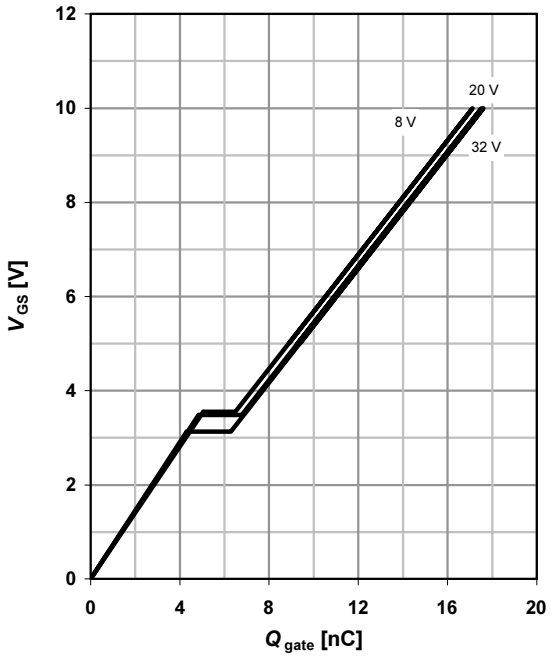
parameter: $T_{j(start)}$



14 Typ. gate charge

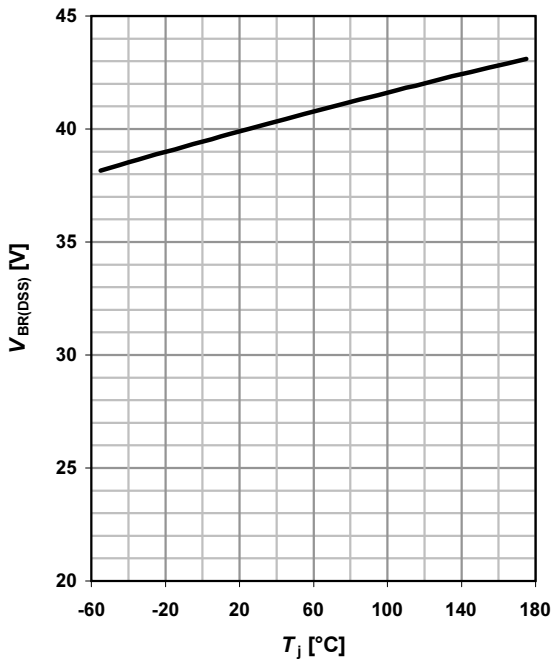
V_{GS}=f(Q_{gate}); I_D=30 A pulsed

parameter: V_{DD}

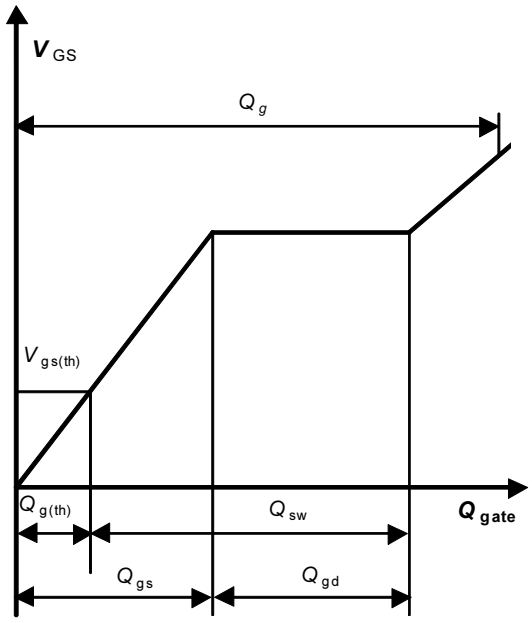


15 Drain-source breakdown voltage

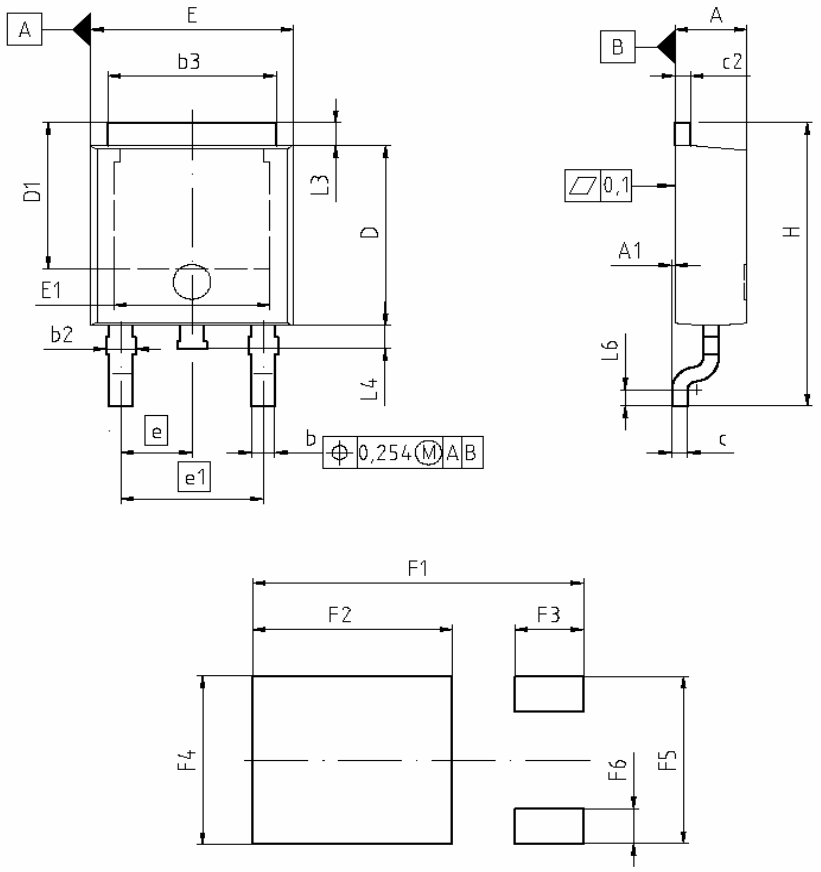
$V_{BR(DSS)}$=f(T_j); I_D=1 mA



16 Gate charge waveforms



Package Outline **PG-TO252-3**



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.16	2.41	0.085	0.095
A1	0.00	0.15	0.000	0.006
b	0.64	0.89	0.025	0.035
b2	0.65	1.15	0.026	0.045
b3	5.00	5.50	0.197	0.217
c	0.46	0.60	0.018	0.024
c2	0.46	0.98	0.018	0.039
D	5.97	6.22	0.235	0.245
D1	5.02	5.84	0.198	0.230
E	6.40	6.73	0.252	0.265
E1	4.70	5.21	0.185	0.205
e	2.29		0.090	
e1	4.57		0.180	
N	3		3	
H	9.40	10.48	0.370	0.413
L3	0.90	1.25	0.035	0.049
L4	0.58	1.00	0.023	0.039
L6	0.51	0.69	0.020	0.027
F1	10.50	10.70	0.413	0.421
F2	6.30	6.50	0.248	0.256
F3	2.10	2.30	0.083	0.091
F4	5.70	5.90	0.224	0.232
F5	5.66	5.86	0.223	0.231
F6	1.10	1.30	0.043	0.051

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