SPD04N60C3 Datasheet

https://www.DiGi-Electronics.com

DiGi Electronics Part Number	SPD04N60C3-DG
Manufacturer	Infineon Technologies
Manufacturer Product Number	SPD04N60C3
Description	MOSFET N-CH 600V 4.5A TO252-3
Detailed Description	N-Channel 600 V 4.5A (Tc) 50W (Tc) Surface Mount PG-TO252-3

Tel: +00 852-30501935

RFQ Email: Info@DiGi-Electronics.com

Purchase and inquiry

Manufacturer Product Number:	Manufacturer:
SPD04N60C3	Infineon Technologies
Series:	Product Status:
CoolMOS™	Obsolete
FET Type:	Technology:
N-Channel	MOSFET (Metal Oxide)
Drain to Source Voltage (Vdss):	Current - Continuous Drain (Id) @ 25°C:
600 V	4.5A (Tc)
Drive Voltage (Max Rds On, Min Rds On):	Rds On (Max) @ Id, Vgs:
10V	950mOhm @ 2.8A, 10V
Vgs(th) (Max) @ Id:	Gate Charge (Qg) (Max) @ Vgs:
3.9V @ 200µA	25 nC @ 10 V
Vgs (Max):	Input Capacitance (Ciss) (Max) @ Vds:
±20V	490 pF @ 25 V
FET Feature:	Power Dissipation (Max):
-	50W (Tc)
Operating Temperature:	Mounting Type:
-55°C ~ 150°C (TJ)	Surface Mount
Supplier Device Package:	Package / Case:
PG-TO252-3	TO-252-3, DPAK (2 Leads + Tab), SC-63
Base Product Number:	
SPD04N	

Environmental & Export classification

Moisture Sensitivity Level (MSL):	REACH Status:
1 (Unlimited)	REACH Unaffected
ECCN:	HTSUS:
EAR99	8541.29.0095

SPD04N60C3
SPU04N60C3

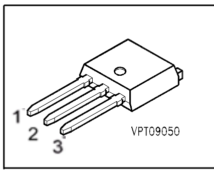
Cool MOS™ Power Transistor

V_{DS} @ T_{jmax}	650	V
$R_{DS(on)}$	0.95	Ω
I_D	4.5	A

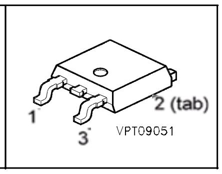
Feature

- New revolutionary high voltage technology
- Ultra low gate charge
- Periodic avalanche rated
- Extreme d*v*/d*t* rated
- High peak current capability
- Improved transconductance
- Pb-free lead plating; RoHS compliant; available in Halogen free mold compound[a)]
- Qualified according to JEDEC[0)] for target applications

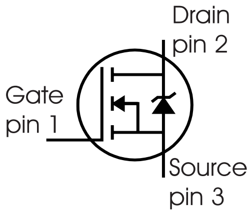
PG-TO251



PG-TO252



Type	Package	Marking
SPD04N60C3	PG-TO252	04N60C3
SPU04N60C3	PG-TO251	04N60C3



Maximum Ratings

Parameter	Symbol	Value	Unit
Continuous drain current	I_D		A
T_C = 25 °C		4.5	
T_C = 100 °C		2.8	
Pulsed drain current, t_p limited by T_{jmax}	$I_{D\ puls}$	13.5	
Avalanche energy, single pulse I_D = 3.4 A, V_{DD} = 50 V	E_{AS}	130	mJ
Avalanche energy, repetitive t_{AR} limited by T_{jmax}[1)] I_D = 4.5 A, V_{DD} = 50 V	E_{AR}	0.4	
Avalanche current, repetitive t_{AR} limited by T_{jmax}	I_{AR}	4.5	A
Gate source voltage static	V_{GS}	±20	V
Gate source voltage AC (f >1Hz)	V_{GS}	±30	
Power dissipation, T_C = 25°C	P_{tot}	50	W
Operating and storage temperature	T_j , T_{stg}	-55... +150	°C
Reverse diode dv/dt [5)]	dv/dt	15	V/ns

a) except PG-TO251, non-Halogen free (SPD04N60C3BT); Halogen free (SPD04N60C3AT)

Maximum Ratings

Parameter	**Symbol**	**Value**	**Unit**
Drain Source voltage slope V_{DS} = 480 V, I_D = 4.5 A, T_j = 125 °C	dv/dt	50	V/ns

Thermal Characteristics

Parameter	**Symbol**	**Values**			**Unit**
		min.	**typ.**	**max.**	
Thermal resistance, junction - case	R_{thJC}	-	-	2.5	K/W
Thermal resistance, junction - ambient, leaded	R_{thJA}	-	-	75	
SMD version, device on PCB: @ min. footprint @ 6 cm^2 cooling area 2)	R_{thJA}	 - -	 - -	 75 50	
Soldering temperature, *) 1.6 mm (0.063 in.) from case for 10s	T_{sold}	-	-	260	°C

Electrical Characteristics, at T_j=25°C unless otherwise specified

Parameter	**Symbol**	**Conditions**	**Values**			**Unit**
			min.	**typ.**	**max.**	
Drain-source breakdown voltage	$V_{(BR)DSS}$	V_{GS}=0V, I_D=0.25mA	600	-	-	V
Drain-Source avalanche breakdown voltage	$V_{(BR)DS}$	V_{GS}=0V, I_D=4.5A	-	700	-	
Gate threshold voltage	$V_{GS(th)}$	I_D=200µA, V_{GS}=V_{DS}	2.1	3	3.9	
Zero gate voltage drain current	I_{DSS}	V_{DS}=600V, V_{GS}=0V, T_j=25°C, T_j=150°C	 - -	 0.5 -	 1 50	µA
Gate-source leakage current	I_{GSS}	V_{GS}=30V, V_{DS}=0V	-	-	100	nA
Drain-source on-state resistance	$R_{DS(on)}$	V_{GS}=10V, I_D=2.8A, T_j=25°C T_j=150°C	 - -	 0.85 2.3	 0.95 -	Ω
Gate input resistance	R_G	f=1MHz, open Drain	-	0.95	-	

*) TO252: reflow soldering, MSL1; TO251: wavesoldering

SPD04N60C3
SPU04N60C3

Electrical Characteristics , at T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Transconductance	g_{fs}	V_{DS}≥2*I_D*$R_{DS(on)max}$, I_D=2.8A	-	4.4	-	S
Input capacitance	C_{iss}	V_{GS}=0V, V_{DS}=25V, f=1MHz	-	490	-	pF
Output capacitance	C_{oss}		-	160	-	
Reverse transfer capacitance	C_{rss}		-	15	-	
Effective output capacitance,[3] energy related	$C_{o(er)}$	V_{GS}=0V, V_{DS}=0V to 480V	-	20	-	pF
Effective output capacitance,[4] time related	$C_{o(tr)}$		-	35	-	
Turn-on delay time	$t_{d(on)}$	V_{DD}=380V, V_{GS}=0/10V, I_D=4.5A, R_G=18Ω	-	6	-	ns
Rise time	t_r		-	2.5	-	
Turn-off delay time	$t_{d(off)}$		-	58.5	80	
Fall time	t_f		-	9.5	14	

Gate Charge Characteristics

Parameter	Symbol	Conditions	min.	typ.	max.	Unit
Gate to source charge	Q_{gs}	V_{DD}=480V, I_D=4.5A	-	2.2	-	nC
Gate to drain charge	Q_{gd}		-	8.8	-	
Gate charge total	Q_g	V_{DD}=480V, I_D=4.5A, V_{GS}=0 to 10V	-	19	25	
Gate plateau voltage	$V_{(plateau)}$	V_{DD}=480V, I_D=4.5A	-	5	-	V

[0]J-STD20 and JESD22

[1]Repetitve avalanche causes additional power losses that can be calculated as $P_{AV}=E_{AR}*f$.

[2]Device on 40mm*40mm*1.5mm epoxy PCB FR4 with 6cm² (one layer, 70 µm thick) copper area for drain connection. PCB is vertical without blown air.

[3]$C_{o(er)}$ is a fixed capacitance that gives the same stored energy as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS}.

[4]$C_{o(tr)}$ is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS}.

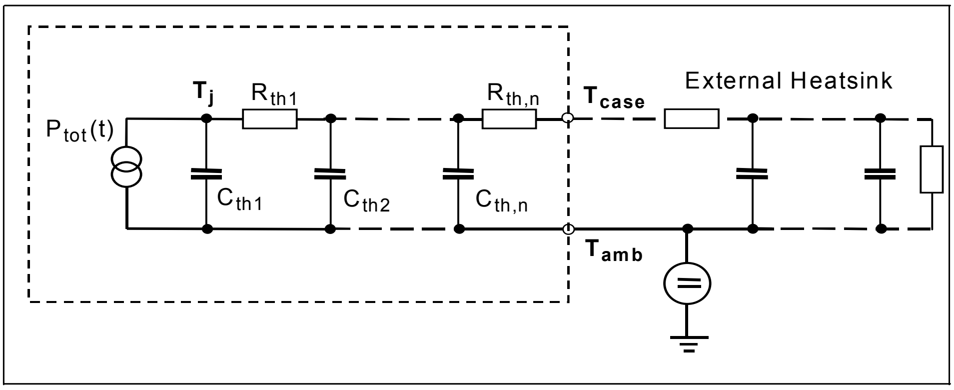
[5]I_{SD}<=I_D, di/dt<=400A/us, V_{DClink}=400V, V_{peak}<$V_{BR, DSS}$, T_j<$T_{j,max}$.
Identical low-side and high-side switch.

Electrical Characteristics, at T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Inverse diode continuous forward current	I_S	T_C=25°C	-	-	4.5	A
Inverse diode direct current, pulsed	I_{SM}		-	-	13.5	
Inverse diode forward voltage	V_{SD}	V_{GS}=0V, I_F=I_S	-	1	1.2	V
Reverse recovery time	t_{rr}	V_R=480V, I_F=I_S , di_F/dt=100A/µs	-	300	500	ns
Reverse recovery charge	Q_{rr}		-	2.6	-	µC
Peak reverse recovery current	I_{rrm}		-	18	-	A
Peak rate of fall of reverse recovery current	di_{rr}/dt		-	-	900	A/µs

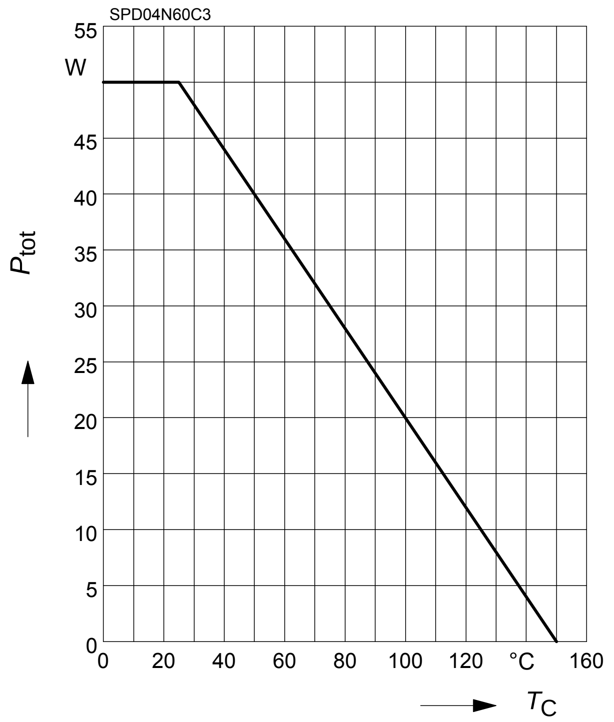
Typical Transient Thermal Characteristics

Symbol	Value	Unit	Symbol	Value	Unit
	typ.			typ.	
Thermal resistance			Thermal capacitance		
R_{th1}	0.039	K/W	C_{th1}	0.00007347	Ws/K
R_{th2}	0.074		C_{th2}	0.0002831	
R_{th3}	0.132		C_{th3}	0.0004062	
R_{th4}	0.555		C_{th4}	0.001215	
R_{th5}	0.529		C_{th5}	0.00276	
R_{th6}	0.169		C_{th6}	0.029	



1 Power dissipation

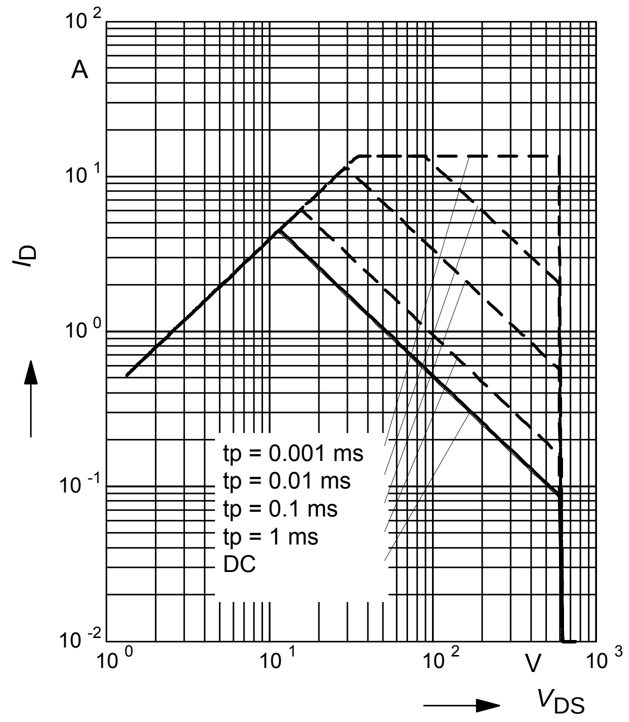
$P_{tot} = f(T_C)$



2 Safe operating area

$I_D = f(V_{DS})$

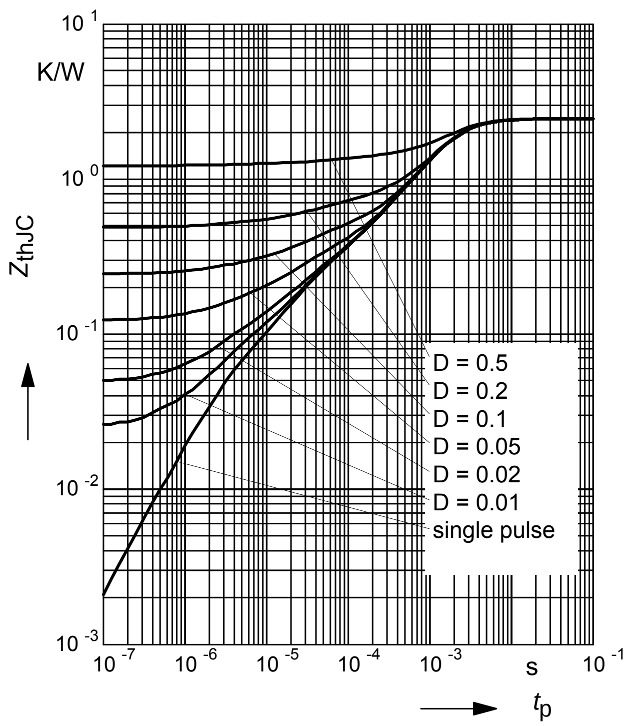
parameter : $D = 0$, T_C=25°C



3 Transient thermal impedance

$Z_{thJC} = f(t_p)$

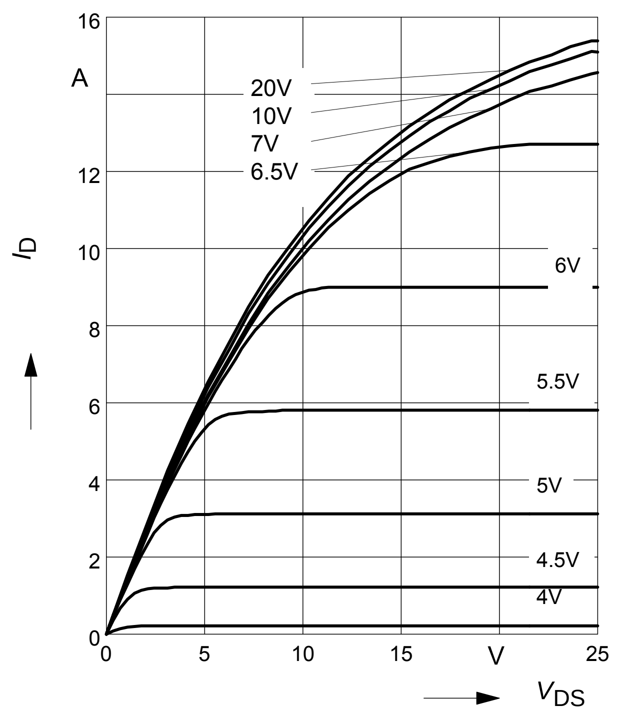
parameter: $D = t_p/T$



4 Typ. output characteristic

$I_D = f(V_{DS})$; T_j=25°C

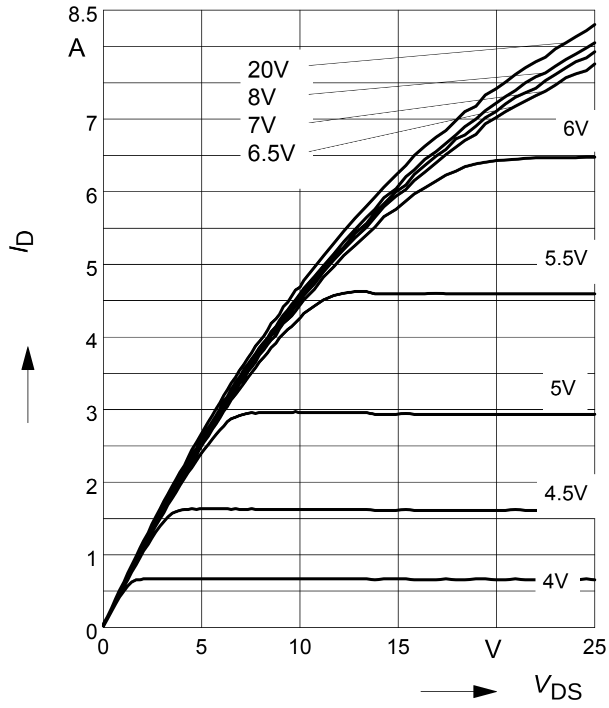
parameter: t_p = 10 µs, V_{GS}



5 Typ. output characteristic

$I_D = f(V_{DS})$; T_j=150°C

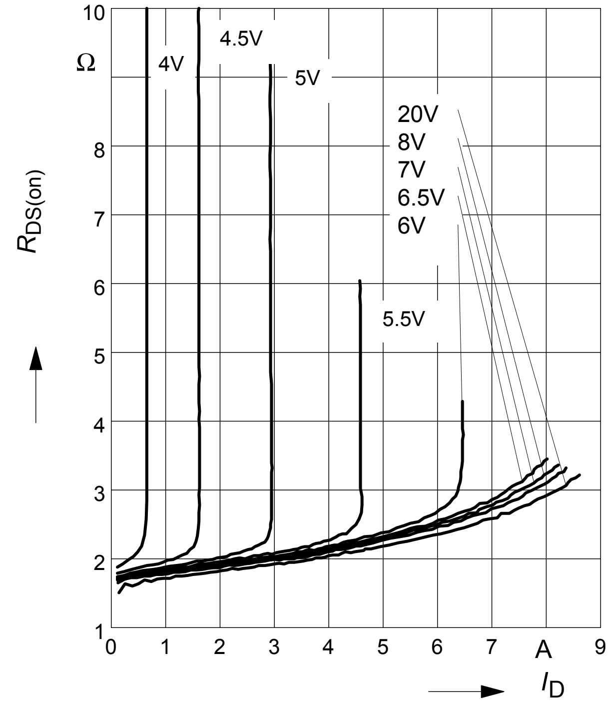
parameter: t_p = 10 µs, V_{GS}



6 Typ. drain-source on resistance

$R_{DS(on)}=f(I_D)$

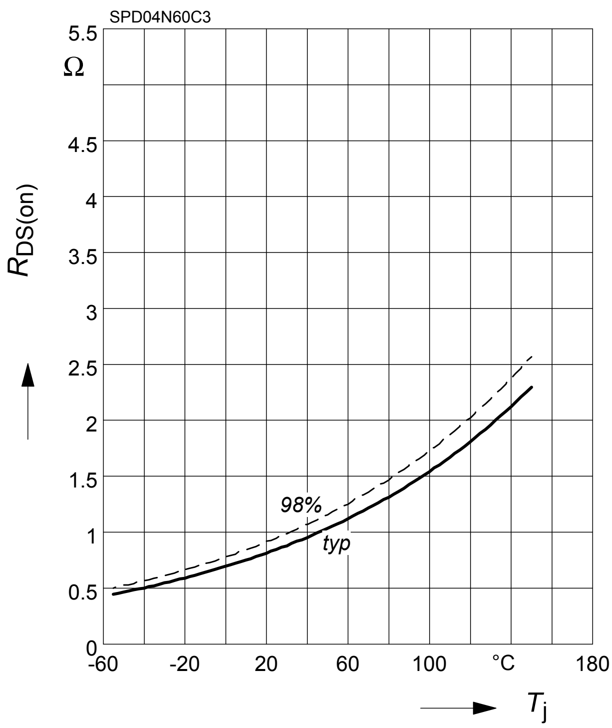
parameter: T_j=150°C, V_{GS}



7 Drain-source on-state resistance

$R_{DS(on)} = f(T_j)$

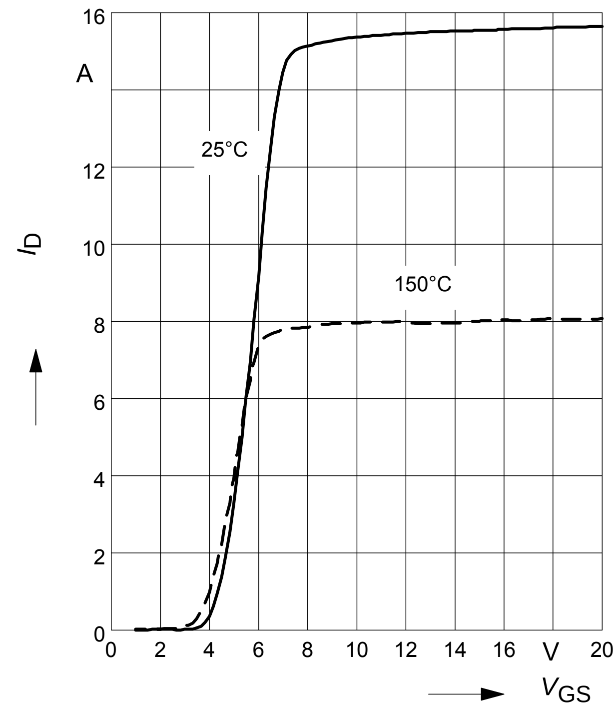
parameter : I_D = 2.8 A, V_{GS} = 10 V



8 Typ. transfer characteristics

$I_D= f(V_{GS})$; $V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$

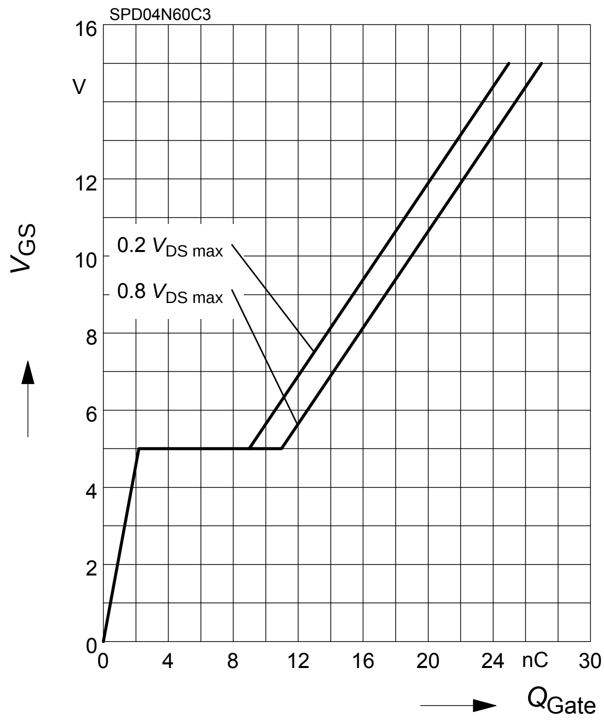
parameter: t_p = 10 µs



9 Typ. gate charge

$V_{GS} = f\ (Q_{Gate})$

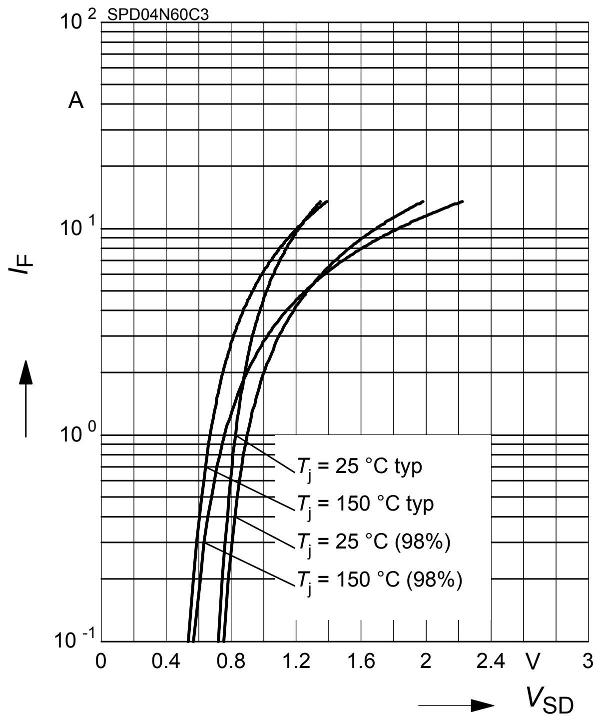
parameter: I_D = 4.5 A pulsed



10 Forward characteristics of body diode

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

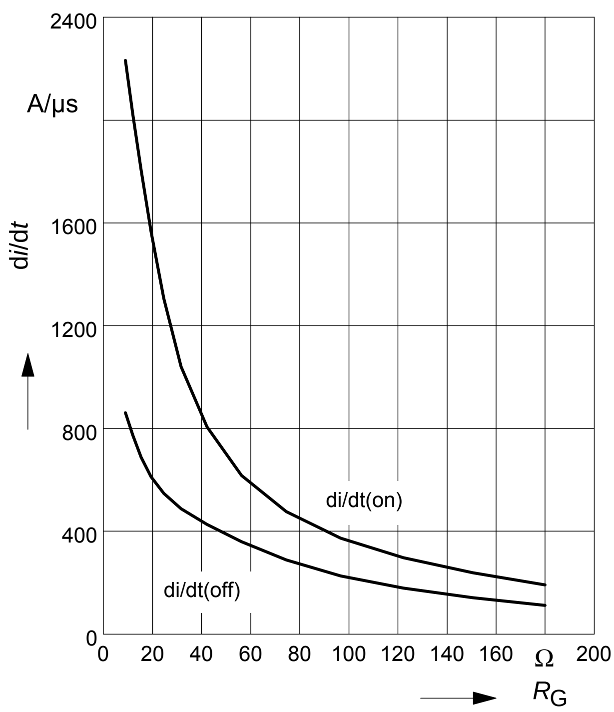
parameter: T_j , tp = 10 µs



11 Typ. drain current slope

di/dt = f(R_G), inductive load, T_j = 125°C

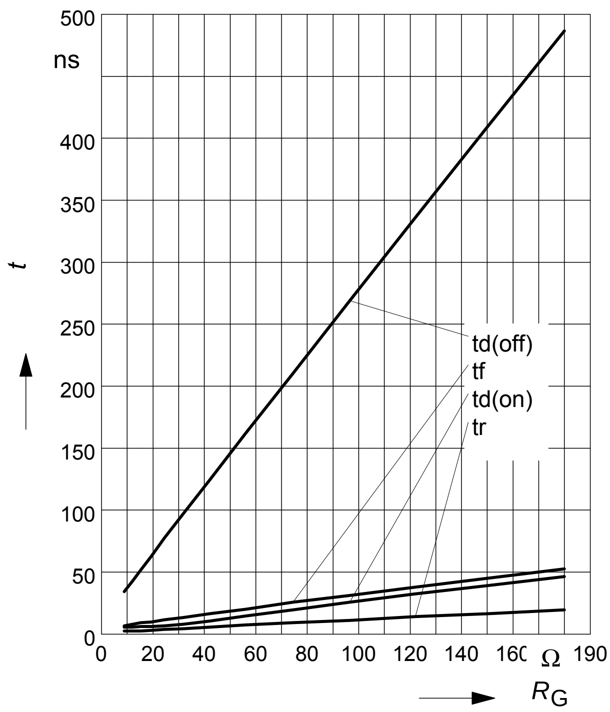
par.: V_{DS}=380V, V_{GS}=0/+13V, I_D=4.5A



12 Typ. switching time

$t = f\,(R_G)$, inductive load, T_j=125°C

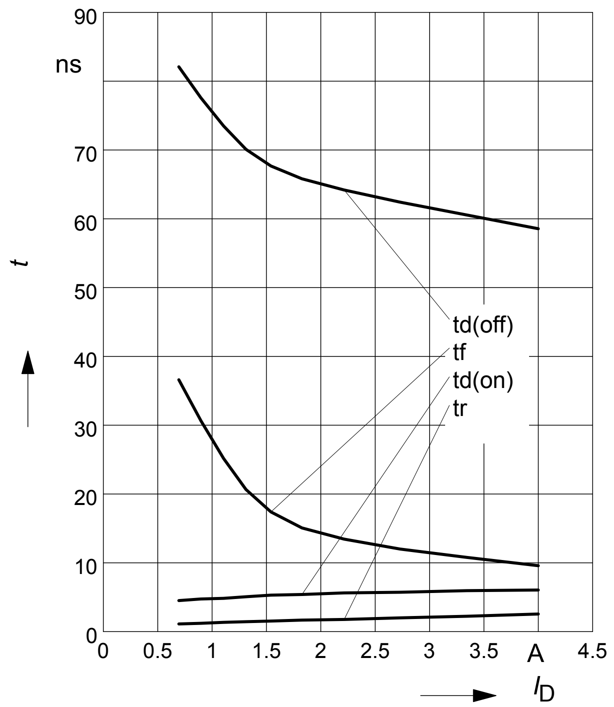
par.: V_{DS}=380V, V_{GS}=0/+13V, I_D=4.5 A



13 Typ. switching time

$t = f(I_D)$, inductive load, T_j=125°C

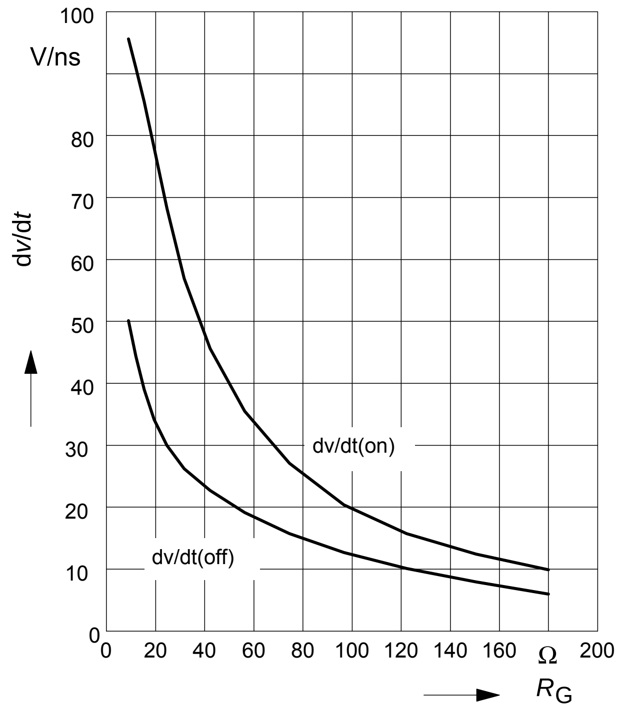
par.: V_{DS}=380V, V_{GS}=0/+13V, R_G=18Ω



14 Typ. drain source voltage slope

$dv/dt = f(R_G)$, inductive load, T_j = 125°C

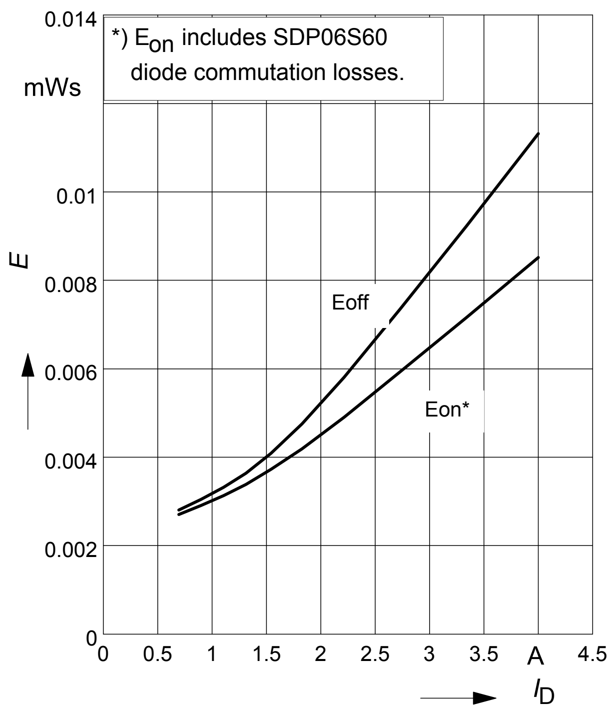
par.: V_{DS}=380V, V_{GS}=0/+13V, I_D=4.5A



15 Typ. switching losses

$E = f(I_D)$, inductive load, T_j=125°C

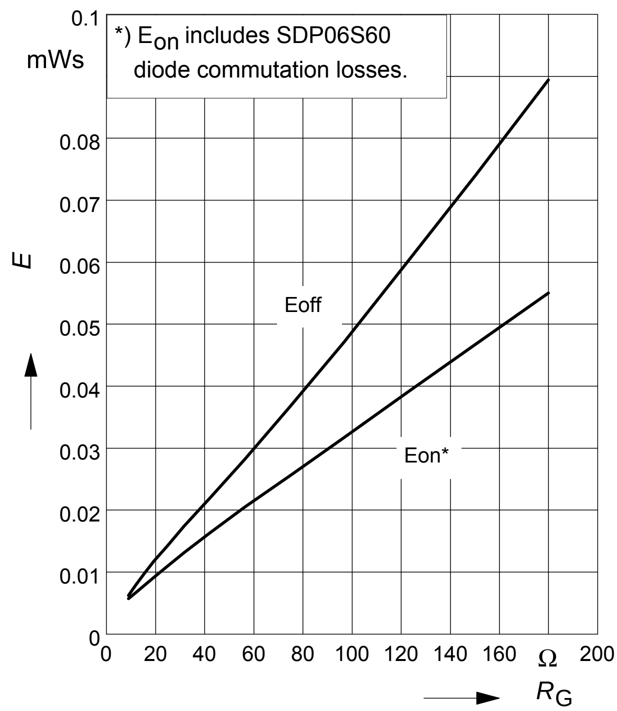
par.: V_{DS}=380V, V_{GS}=0/+13V, R_G=18Ω



16 Typ. switching losses

$E = f(R_G)$, inductive load, T_j=125°C

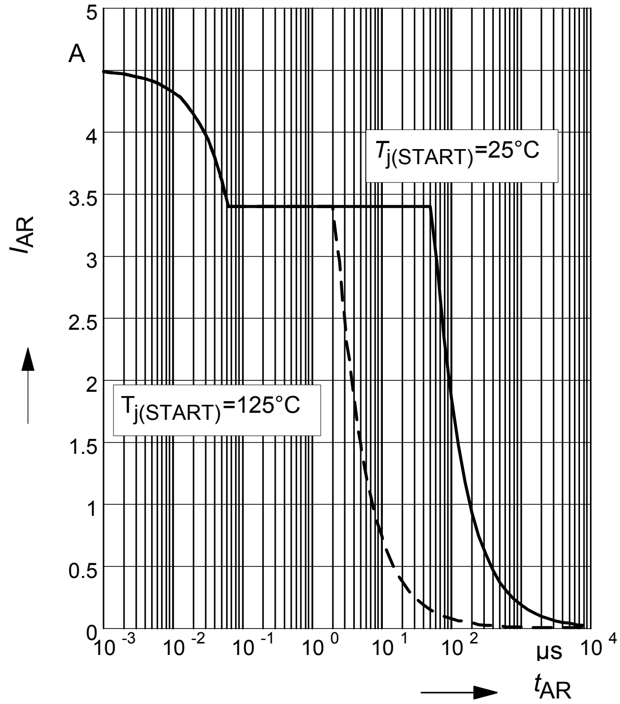
par.: V_{DS}=380V, V_{GS}=0/+13V, I_D=4.5A



17 Avalanche SOA

$I_{AR} = f(t_{AR})$

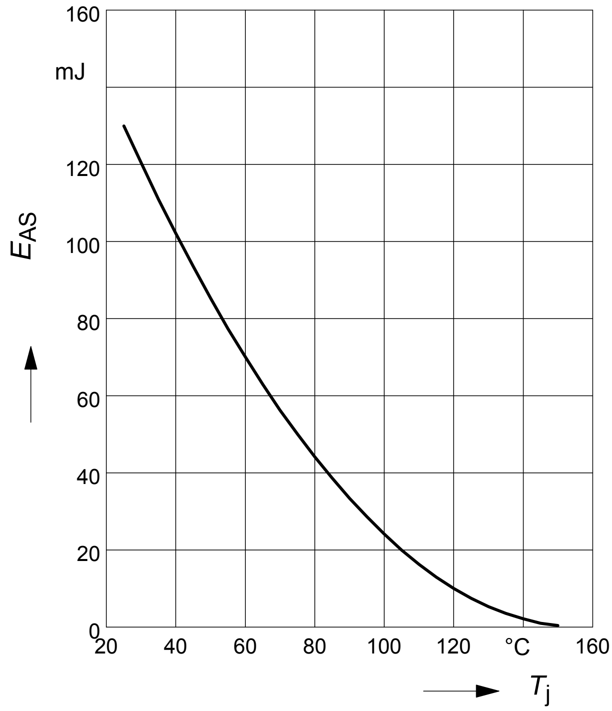
par.: $T_j \leq 150$ °C



18 Avalanche energy

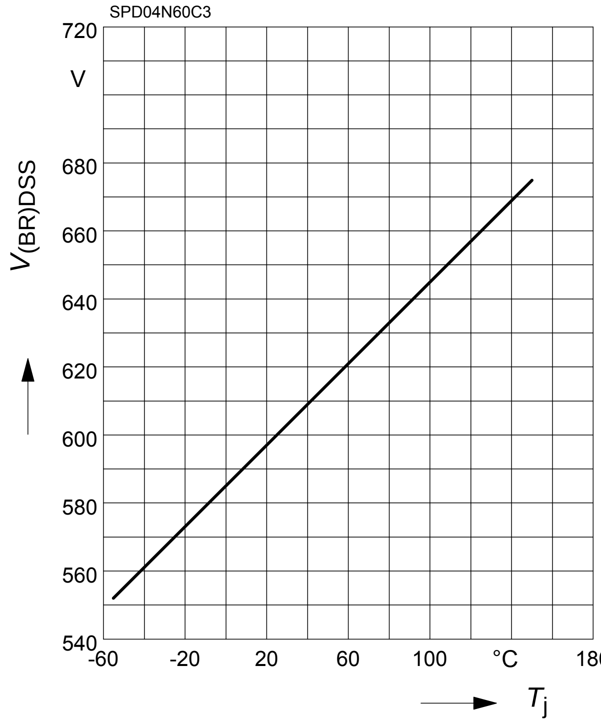
$E_{AS} = f(T_j)$

par.: I_D = 3.4 A, V_{DD} = 50 V



19 Drain-source breakdown voltage

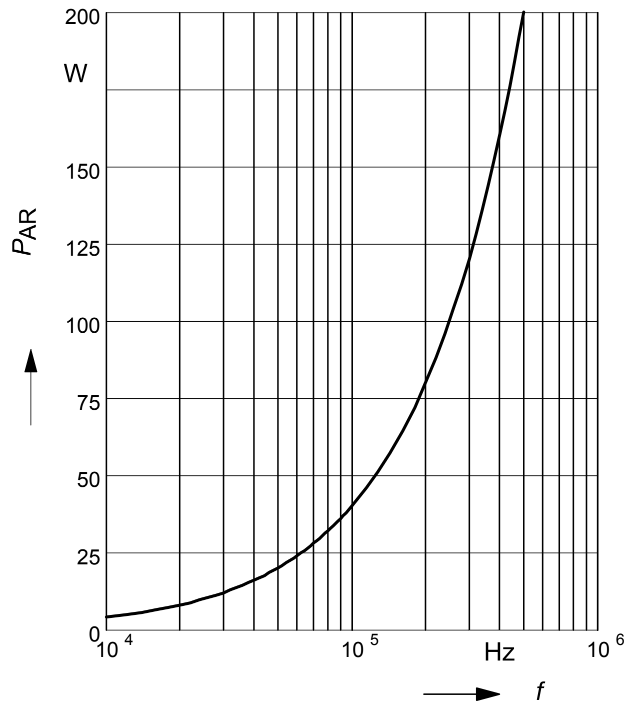
$V_{(BR)DSS} = f(T_j)$



20 Avalanche power losses

$P_{AR} = f(f)$

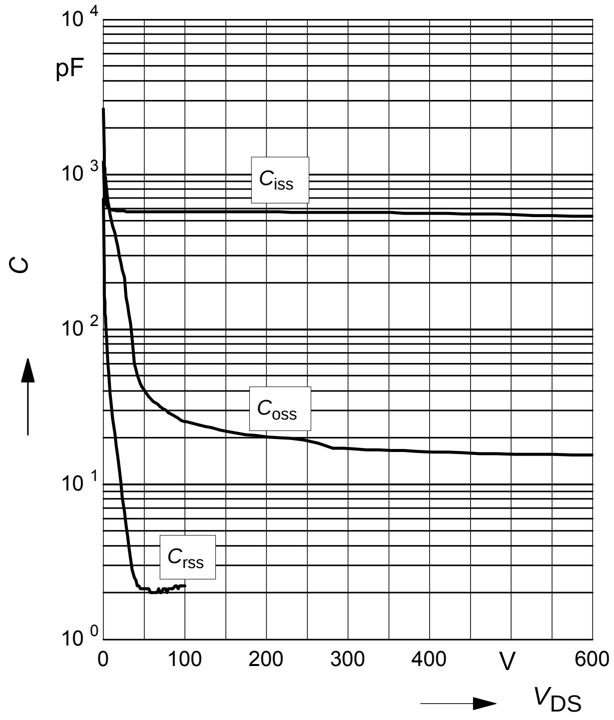
parameter: E_{AR}=0.4mJ



21 Typ. capacitances

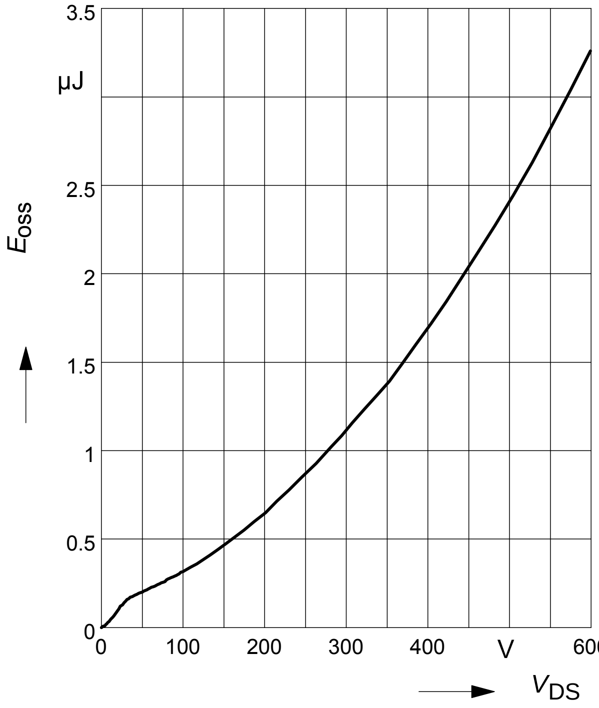
$C = f(V_{DS})$

parameter: V_{GS}=0V, f=1 MHz

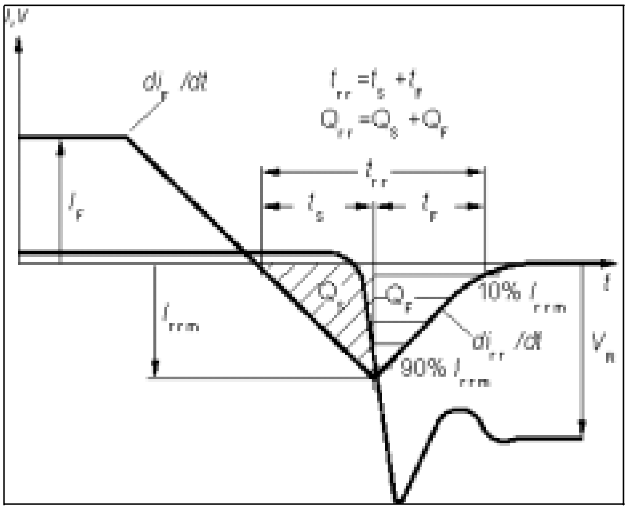


22 Typ. C_{oss} stored energy

$E_{oss}=f(V_{DS})$



Definition of diodes switching characteristics



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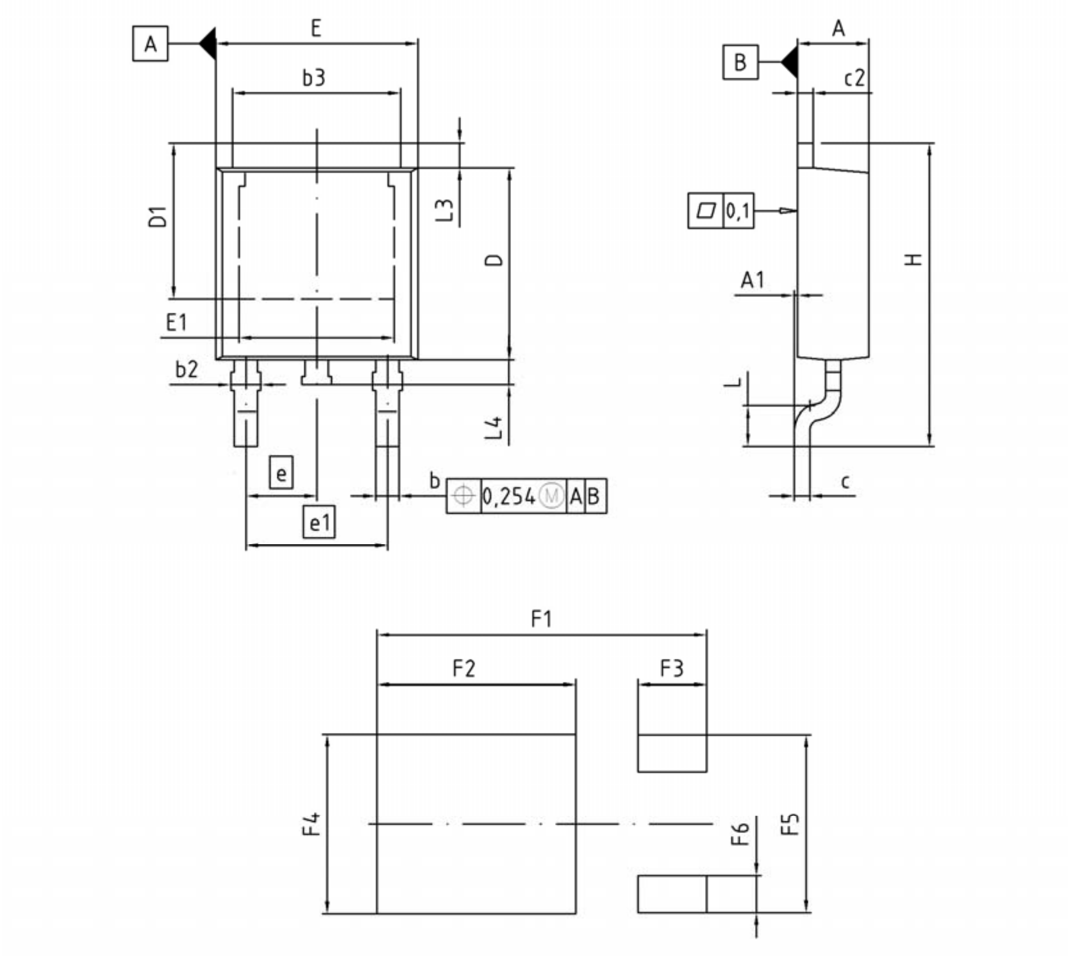

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.16	2.41	0.085	0.095
A1	0.00	0.15	0.000	0.006
b	0.64	0.89	0.025	0.035
b2	0.65	1.15	0.026	0.045
b3	5.00	5.50	0.197	0.217
c	0.46	0.60	0.018	0.024
c2	0.46	0.98	0.018	0.039
D	5.97	6.22	0.235	0.245
D1	5.02	5.84	0.198	0.230
E	6.40	6.73	0.252	0.265
E1	4.70	5.21	0.185	0.205
e	2.29		0.090	
e1	4.57		0.180	
N	3		3	
H	9.40	10.48	0.370	0.413
L	1.18	1.70	0.046	0.067
L3	0.90	1.25	0.035	0.049
L4	0.51	1.00	0.020	0.039
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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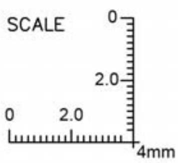
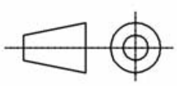


EUROPEAN PROJECTION



ISSUE DATE
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REVISION
03

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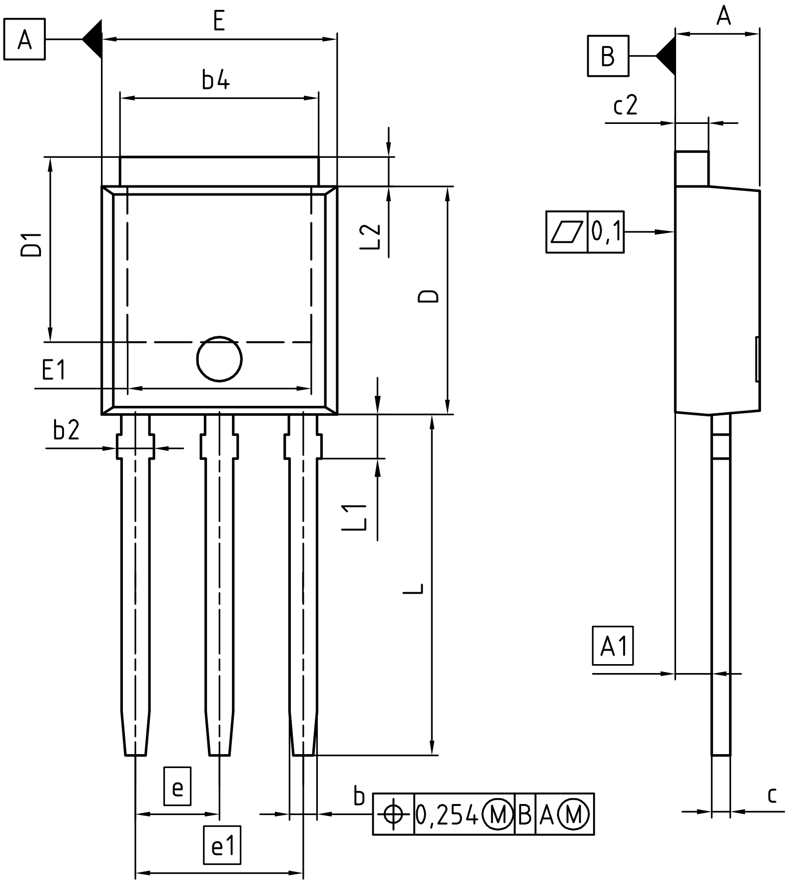
PG-TO251-3



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.16	2.41	0.085	0.095
A1	0.90	1.14	0.035	0.045
b	0.64	0.89	0.025	0.035
b2	0.65	1.15	0.026	0.045
b4	4.95	5.50	0.195	0.217
c	0.46	0.60	0.018	0.024
c2	0.46	0.89	0.018	0.035
D	5.97	6.22	0.235	0.245
D1	5.04	5.77	0.198	0.227
E	6.35	6.73	0.250	0.265
E1	4.70	5.21	0.185	0.205
e	2.29		0.090	
e1	4.57		0.180	
N	3		3	
L	8.89	9.65	0.350	0.380
L1	1.90	2.29	0.075	0.090
L2	0.89	1.37	0.035	0.054

DOCUMENT NO.
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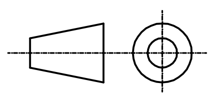
SCALE

EUROPEAN PROJECTION



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REVISION
03

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