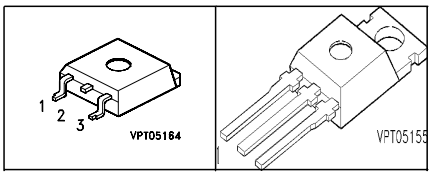
Cool MOS™ Power Transistor

V_{DS}	600	V
$R_{DS(on)}$	3	Ω
I_D	1.8	A

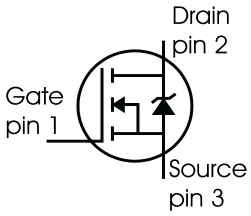
Feature

- New revolutionary high voltage technology
- Ultra low gate charge
- Periodic avalanche rated
- Extreme d*v*/d*t* rated
- Ultra low effective capacitances
- Improved noise immunity

P-TO263-3-2 P-TO220-3-1



Type	Package	Ordering Code	Marking
SPP02N60S5	P-TO220-3-1	Q67040-S4181	02N60S5
SPB02N60S5	P-TO263-3-2	Q67040-S4212	02N60S5



Maximum Ratings, at T_C = 25°C, unless otherwise specified

Parameter	Symbol	Value	Unit
Continuous drain current	I_D		A
T_C = 25 °C		1.8	
T_C = 100 °C		1.1	
Pulsed drain current, t_p limited by T_{jmax}	$I_{D\ puls}$	3.2	
Avalanche energy, single pulse	E_{AS}	50	mJ
I_D=-A, V_{DD}=50V			
Avalanche energy, repetitive t_{AR} limited by T_{jmax} [1)]	E_{AR}	0.07	
I_D=1.8A, V_{DD}=50V			
Avalanche current, repetitive t_{AR} limited by T_{jmax}	I_{AR}	1.8	A
Reverse diode d*v*/d*t*	d*v*/d*t*	6	V/ns
I_S=1.8A, $V_{DS} < V_{DD}$, d*i*/d*t*=100A/µs, T_{jmax}=150°C			
Gate source voltage	V_{GS}	±20	V
Power dissipation, T_C = 25°C	P_{tot}	25	W
Operating and storage temperature	T_j , T_{stg}	-55... +150	°C

Thermal Characteristics

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Characteristics					
Thermal resistance, junction - case	R_{thJC}	-	-	5	K/W
Thermal resistance, junction - ambient, leaded	R_{thJA}	-	-	62	
SMD version, device on PCB:	R_{thJA}				
@ min. footprint		-	-	62	
@ 6 cm^2 cooling area [2)]		-	35	-	
Linear derating factor		-	0.2	-	W/K
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

Static Characteristics					
Drain-source breakdown voltage V_{GS}=0V, I_D=0.25mA	$V_{(BR)DSS}$	600	-	-	V
Drain-source avalanche breakdown voltage V_{GS}=0V, I_D=1.8A	$V_{(BR)DS}$	-	700	-	
Gate threshold voltage, V_{GS} = V_{DS} I_D=80µA	$V_{GS(th)}$	3.5	4.5	5.5	
Zero gate voltage drain current	I_{DSS}				µA
V_{DS} = 600 V, V_{GS} = 0 V, T_j = 25 °C		-	0.5	1	
V_{DS} = 600 V, V_{GS} = 0 V, T_j = 150 °C		-	-	50	
Gate-source leakage current V_{GS}=20V, V_{DS}=0V	I_{GSS}	-	-	100	nA
Drain-source on-state resistance V_{GS}=10V, I_D=1.1A, T_j=25°C	$R_{DS(on)}$	-	2.7	3	Ω

[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.

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

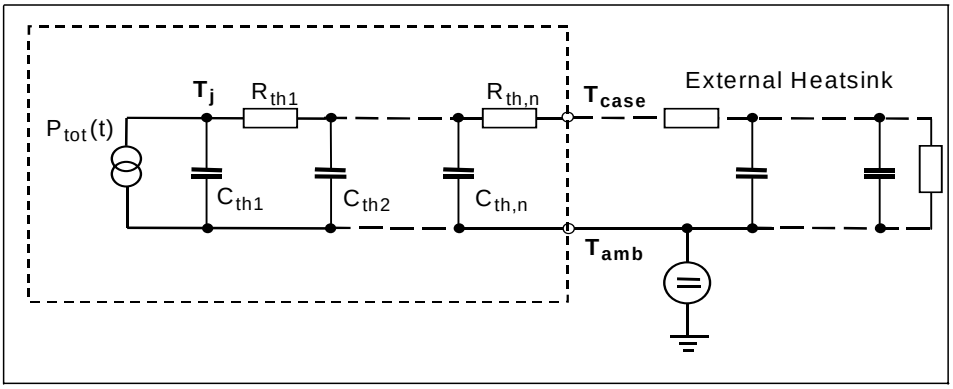
Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Characteristics						
Transconductance	g_{fs}	$V_{DS}\geq 2*I_D*R_{DS(on)max}$, I_D=1.1A	-	1.4	-	S
Input capacitance	C_{iss}	V_{GS}=0V, V_{DS}=25V, f=1MHz	-	240	-	pF
Output capacitance	C_{oss}		-	77	-	
Reverse transfer capacitance	C_{rss}		-	4.4	-	
Turn-on delay time	$t_{d(on)}$	V_{DD}=350V, V_{GS}=0/10V, I_D=1.8A, R_G=50Ω	-	35	-	ns
Rise time	t_r		-	35	-	
Turn-off delay time	$t_{d(off)}$		-	35	42	
Fall time	t_f		-	20	30	
Gate Charge Characteristics						
Gate to source charge	Q_{gs}	V_{DD}=350V, I_D=1.8A	-	2.3	-	nC
Gate to drain charge	Q_{gd}		-	4.5	-	
Gate charge total	Q_g	V_{DD}=350V, I_D=1.8A, V_{GS}=0 to 10V	-	7.3	9.5	
Gate plateau voltage	$V_{(plateau)}$	V_{DD}=350V, I_D=1.8A	-	8	-	V

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

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Characteristics						
Inverse diode continuous forward current	I_S	T_C=25°C	-	-	1.8	A
Inverse diode direct current, pulsed	I_{SM}		-	-	3.2	
Inverse diode forward voltage	V_{SD}	V_{GS}=0V, I_F=I_S	-	1	1.2	V
Reverse recovery time	t_{rr}	V_R=350V, I_F=I_S,	-	860	1460	ns
Reverse recovery charge	Q_{rr}	di_F/dt=100A/µs	-	1.6	-	µC

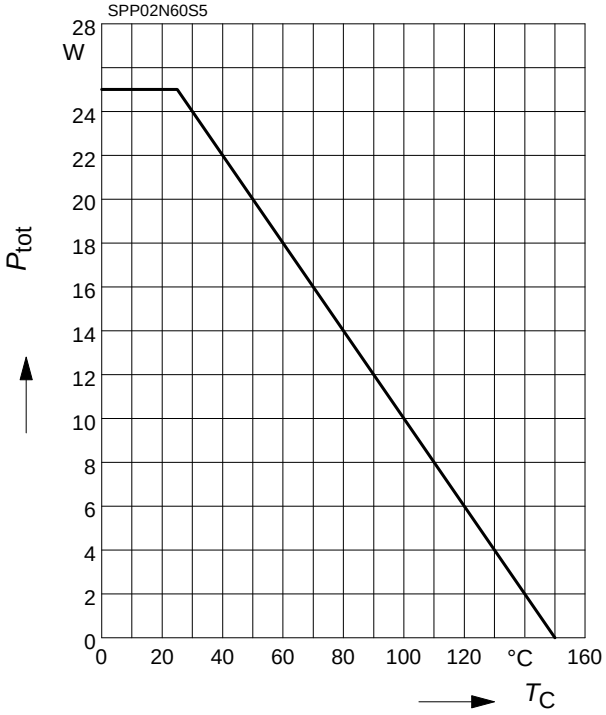
Typical Transient Thermal Characteristics

Symbol	Value	Unit	Symbol	Value	Unit
	typ.			typ.	
Thermal resistance			Thermal capacitance		
R_{th1}	0.101	K/W	C_{th1}	0.00003158	Ws/K
R_{th2}	0.207		C_{th2}	0.0001104	
R_{th3}	0.311		C_{th3}	0.0002001	
R_{th4}	0.583		C_{th4}	0.0004898	
R_{th5}	0.501		C_{th5}	0.00274	
R_{th6}	0.135		C_{th6}	0.035	



1 Power dissipation

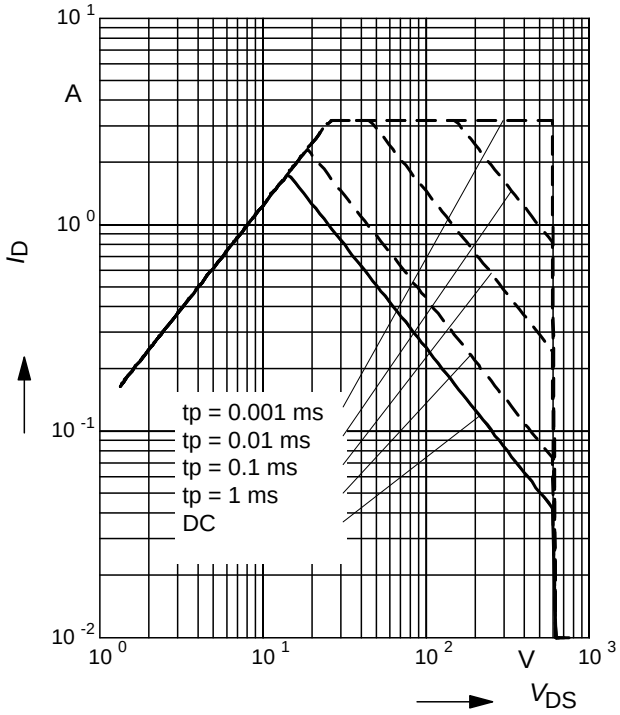
$P_{tot} = f(T_C)$



2 Safe operating area

$I_D = f(V_{DS})$

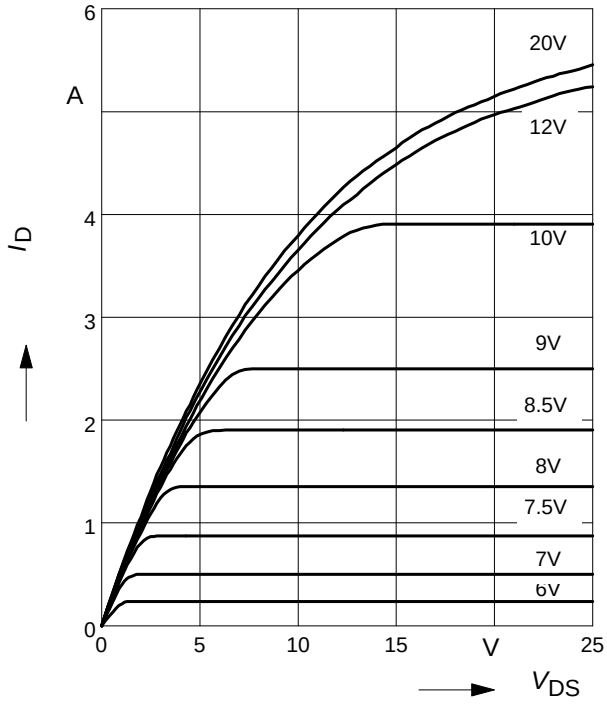
parameter : $D = 0$, T_C=25°C



3 Typ. output characteristic

$I_D = f(V_{DS})$; T_j=25°C

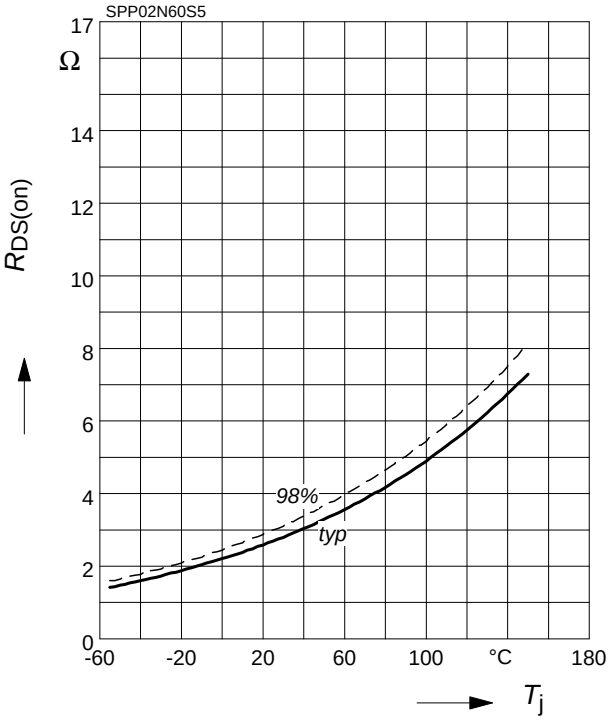
parameter: t_p = 10 µs, V_{GS}



4 Drain-source on-state resistance

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

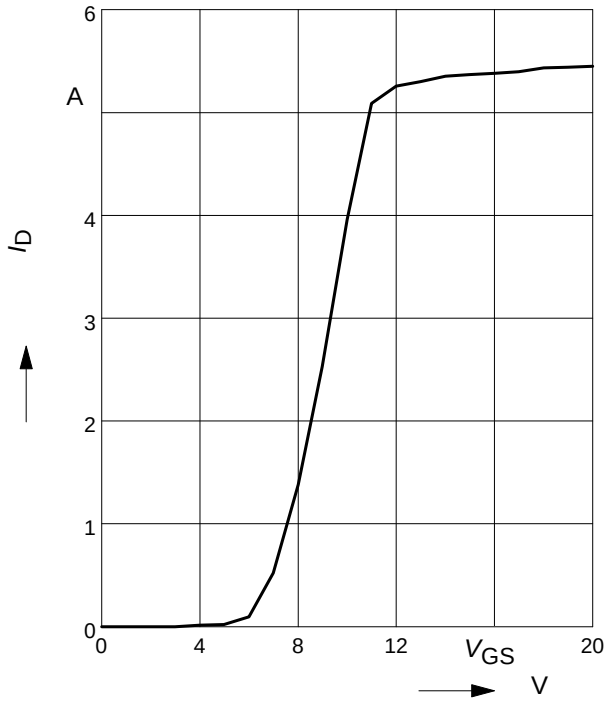
parameter : I_D = 1.1 A, V_{GS} = 10 V



5 Typ. transfer characteristics

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

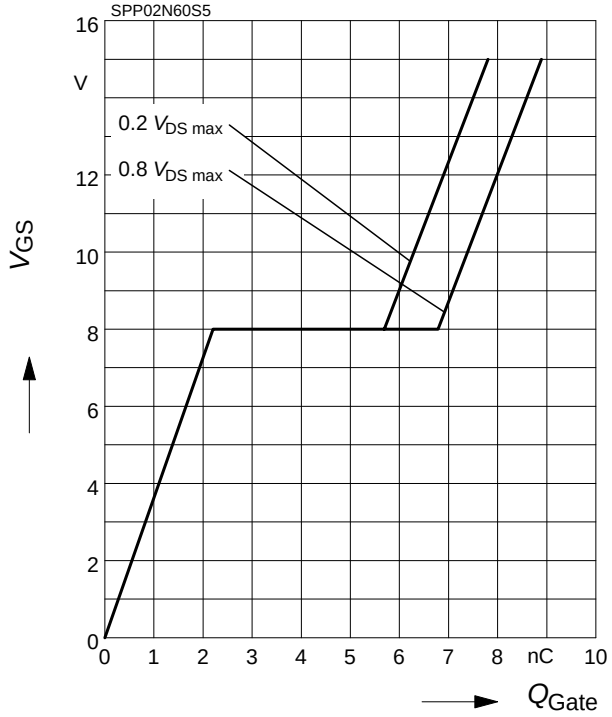
parameter: t_p = 10 µs



6 Typ. gate charge

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

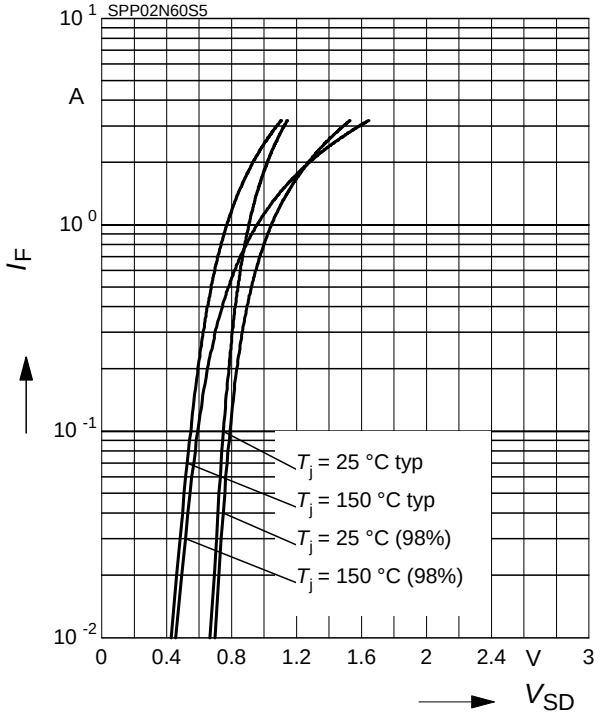
parameter: I_D = 1.8 A pulsed



7 Forward characteristics of body diode

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

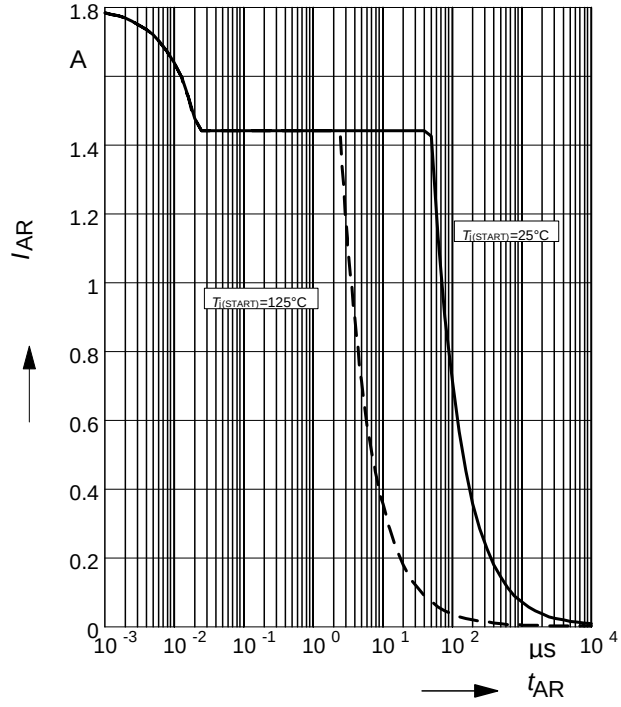
parameter: T_j , tp = 10 µs



8 Avalanche SOA

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

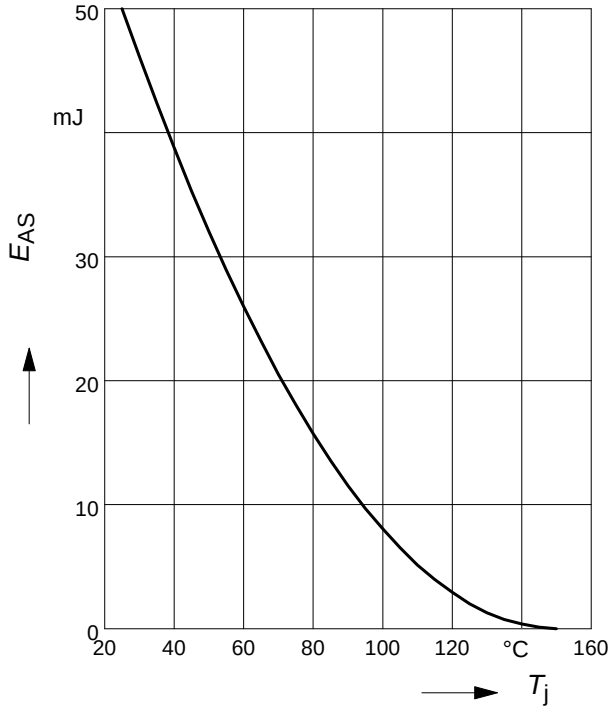
par.: $T_j \leq$ 150 °C



9 Avalanche energy

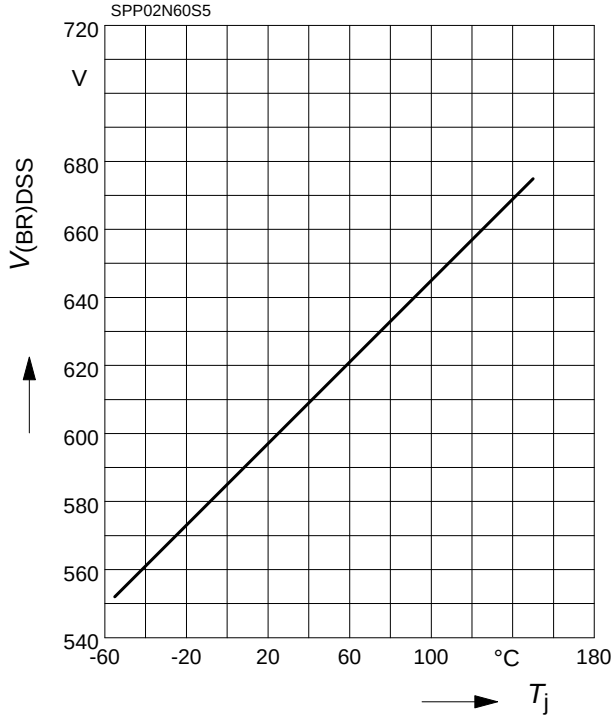
$E_{AS} = f(T_j)$

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



10 Drain-source breakdown voltage

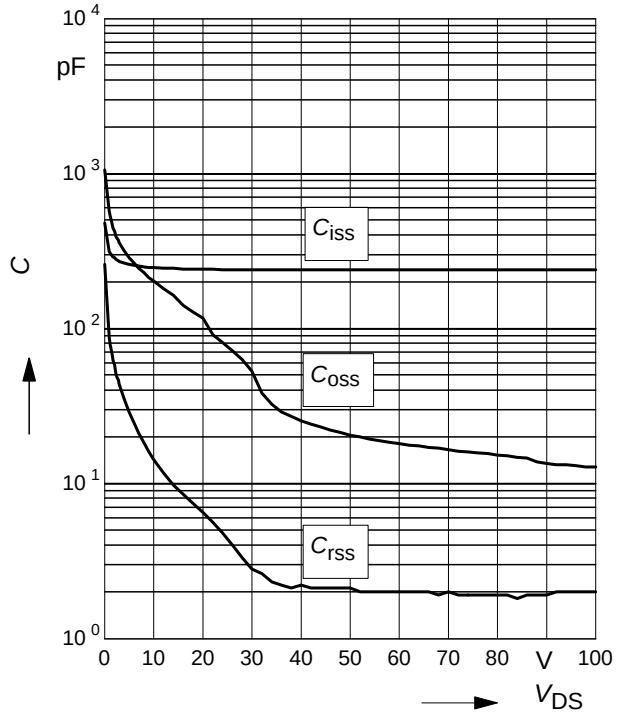
$V_{(BR)DSS} = f(T_j)$



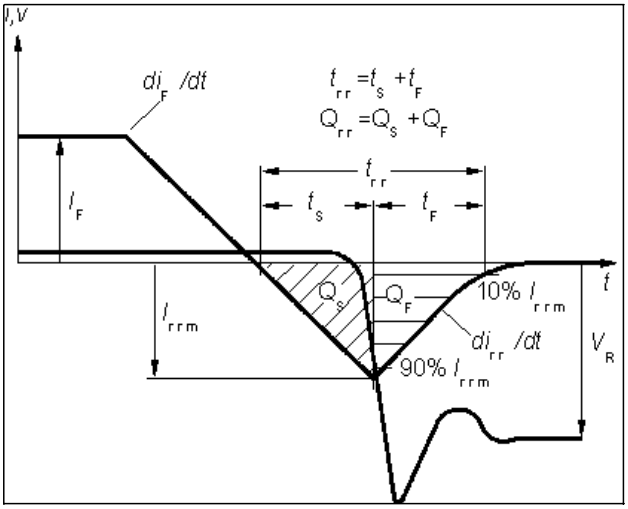
11 Typ. capacitances

$C = f(V_{DS})$

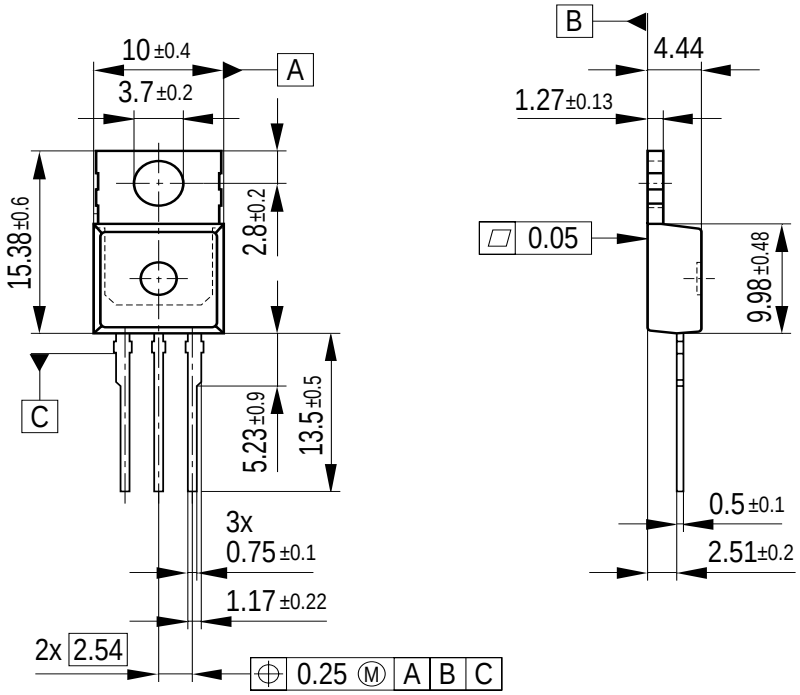
parameter: V_{GS}=0V, f=1 MHz



Definition of diodes switching characteristics

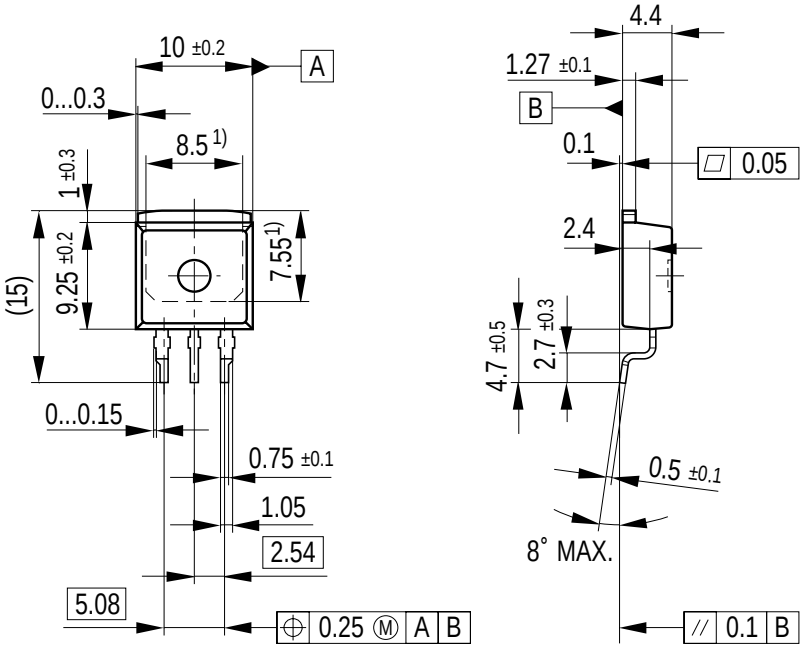


P-TO-220-3-1



All metal surfaces tin plated, except area of cut.
Metal surface min. x=7.25, y=12.3

P-TO-263-3-1 (D^2-PAK)



1) Typical

All metal surfaces: tin plated, except area of cut.
Metal surface min. x=7.25, y=6.9

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