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Infineon Technologies
SPB17N80C3

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Infineon technologies

*Final data*

**SPP17N80C3, SPB17N80C3**
**SPA17N80C3**

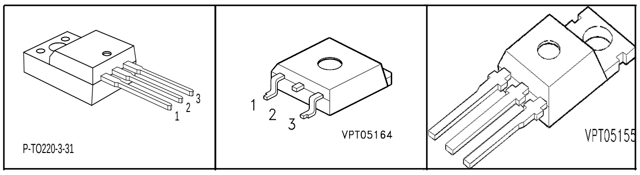
## Cool MOS™ Power Transistor

| | | |
|---|---|---|
| $V_{DS}$ | 800 | V |
| $R_{DS(on)}$ | 0.29 | Ω |
| $I_D$ | 17 | A |

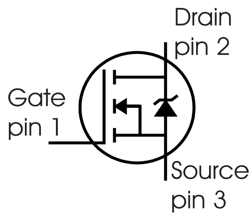
### Feature

- New revolutionary high voltage technology
- Worldwide best $R_{DS(on)}$ in TO 220
- Ultra low gate charge
- Periodic avalanche rated
- Extreme d*v*/d*t* rated
- Ultra low effective capacitances
- Improved transconductance
- P-TO-220-3-31: Fully isolated package (2500 VAC; 1 minute)

P-TO220-3-31 P-TO263-3-2 P-TO220-3-1




| Type | Package | Ordering Code | Marking |
|---|---|---|---|
| SPP17N80C3 | P-TO220-3-1 | Q67040-S4353 | 17N80C3 |
| SPB17N80C3 | P-TO263-3-2 | Q67040-S4354 | 17N80C3 |
| SPA17N80C3 | P-TO220-3-31 | Q67040-S4441 | 17N80C3 |




### Maximum Ratings

| Parameter | Symbol | Value | | Unit |
|---|---|---|---|---|
| | | SPP_B | SPA | |
| Continuous drain current<br>$T_C$ = 25 °C<br>$T_C$ = 100 °C | $I_D$ | <br>17<br>11 | <br>17 1)<br>11 1) | A |
| Pulsed drain current, $t_p$ limited by $T_{jmax}$ | $I_{D\ puls}$ | 51 | 51 | A |
| Avalanche energy, single pulse<br>$I_D$=3.4A, $V_{DD}$=50V | $E_{AS}$ | 670 | 670 | mJ |
| Avalanche energy, repetitive $t_{AR}$ limited by $T_{jmax}$ 2)<br>$I_D$=17A, $V_{DD}$=50V | $E_{AR}$ | 0.5 | 0.5 | |
| Avalanche current, repetitive $t_{AR}$ limited by $T_{jmax}$ | $I_{AR}$ | 17 | 17 | A |
| Gate source voltage | $V_{GS}$ | ±20 | ±20 | V |
| Gate source voltage AC (f >1Hz) | $V_{GS}$ | ±30 | ±30 | |
| Power dissipation, $T_C$ = 25°C | $P_{tot}$ | 208 | 42 | W |
| Operating and storage temperature | $T_j$ , $T_{stg}$ | -55...+150 | | °C |

**Maximum Ratings**

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Drain Source voltage slope<br>$V_{DS}$ = 640 V, $I_D$ = 17 A, $T_j$ = 125 °C | d$v$/d$t$ | 50 | V/ns |

**Thermal Characteristics**

| Parameter | Symbol | Values | | | Unit |
|---|---|---|---|---|---|
| | | min. | typ. | max. | |
| Thermal resistance, junction - case | $R_{thJC}$ | - | - | 0.6 | K/W |
| Thermal resistance, junction - case, FullPAK | $R_{thJC\_FP}$ | - | - | 3.6 | |
| Thermal resistance, junction - ambient, leaded | $R_{thJA}$ | - | - | 62 | |
| Thermal resistance, junction - ambient, FullPAK | $R_{thJA\_FP}$ | - | - | 80 | |
| SMD version, device on PCB: | $R_{thJA}$ | | | | |
| @ min. footprint | | - | - | 62 | |
| @ 6 cm$^2$ cooling area [3)] | | - | 35 | - | |
| Soldering temperature,<br>1.6 mm (0.063 in.) from case for 10s [4)] | $T_{sold}$ | - | - | 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 | 800 | - | - | V |
| Drain-Source avalanche breakdown voltage | $V_{(BR)DS}$ | $V_{GS}$=0V, $I_D$=17A | - | 870 | - | |
| Gate threshold voltage | $V_{GS(th)}$ | $I_D$=1000µA, $V_{GS}$=$V_{DS}$ | 2.1 | 3 | 3.9 | |
| Zero gate voltage drain current | $I_{DSS}$ | $V_{DS}$=800V, $V_{GS}$=0V, | | | | µA |
| | | $T_j$=25°C | - | 0.5 | 25 | |
| | | $T_j$=150°C | - | - | 250 | |
| Gate-source leakage current | $I_{GSS}$ | $V_{GS}$=20V, $V_{DS}$=0V | - | - | 100 | nA |
| Drain-source on-state resistance | $R_{DS(on)}$ | $V_{GS}$=10V, $I_D$=11A | | | | Ω |
| | | $T_j$=25°C | - | 0.25 | 0.29 | |
| | | $T_j$=150°C | - | 0.78 | - | |
| Gate input resistance | $R_G$ | $f$=1MHz, open drain | - | 0.7 | - | |

**Electrical Characteristics**

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | min. | typ. | max. | |
| Transconductance | $g_{fs}$ | $V_{DS}\geq2*I_D*R_{DS(on)max}$, $I_D$=11A | - | 15 | - | S |
| Input capacitance | $C_{iss}$ | $V_{GS}$=0V, $V_{DS}$=25V, $f$=1MHz | - | 2320 | - | pF |
| Output capacitance | $C_{oss}$ | | - | 1250 | - | |
| Reverse transfer capacitance | $C_{rss}$ | | - | 60 | - | |
| Effective output capacitance,[5] energy related | $C_{o(er)}$ | $V_{GS}$=0V, $V_{DS}$=0V to 480V | - | 59 | - | |
| Effective output capacitance,[6] time related | $C_{o(tr)}$ | | - | 124 | - | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD}$=400V, $V_{GS}$=0/10V, $I_D$=17A, $R_G$=4.7Ω, $T_j$=125°C | - | 25 | - | ns |
| Rise time | $t_r$ | | - | 15 | - | |
| Turn-off delay time | $t_{d(off)}$ | | - | 72 | 82 | |
| Fall time | $t_f$ | | - | 6 | 9 | |

**Gate Charge Characteristics**

| Parameter | Symbol | Conditions | min. | typ. | max. | Unit |
|---|---|---|---|---|---|---|
| Gate to source charge | $Q_{gs}$ | $V_{DD}$=640V, $I_D$=17A | - | 12 | - | nC |
| Gate to drain charge | $Q_{gd}$ | | - | 46 | - | |
| Gate charge total | $Q_g$ | $V_{DD}$=640V, $I_D$=17A, $V_{GS}$=0 to 10V | - | 91 | 177 | |
| Gate plateau voltage | $V_{(plateau)}$ | $V_{DD}$=640V, $I_D$=17A | - | 6 | - | V |

[1]Limited only by maximum temperature

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

[3]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.

[4]Soldering temperature for TO-263: 220°C, reflow

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

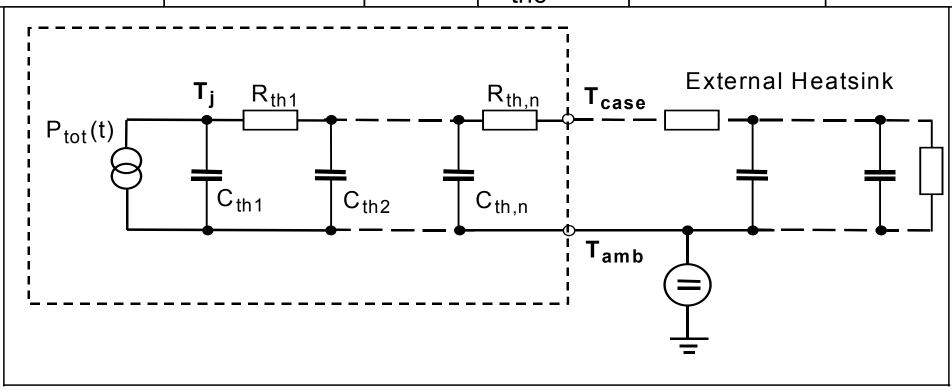
[6]$C_{o(tr)}$ is a fixed capacitance that gives the same charging time as $C_{oss}$ while $V_{DS}$ is rising from 0 to 80% $V_{DSS}$.

## Electrical Characteristics

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | min. | typ. | max. | |
| Inverse diode continuous forward current | $I_S$ | $T_C$=25°C | - | - | 17 | A |
| Inverse diode direct current, pulsed | $I_{SM}$ | | - | - | 51 | |
| Inverse diode forward voltage | $V_{SD}$ | $V_{GS}$=0V, $I_F$=$I_S$ | - | 1 | 1.2 | V |
| Reverse recovery time | $t_{rr}$ | $V_R$=400V, $I_F$=$I_S$ , $di_F/dt$=100A/µs | - | 550 | - | ns |
| Reverse recovery charge | $Q_{rr}$ | | - | 15 | - | µC |
| Peak reverse recovery current | $I_{rrm}$ | | - | 51 | - | A |
| Peak rate of fall of reverse recovery current | $di_{rr}/dt$ | $T_j$=25°C | - | 1200 | - | A/µs |

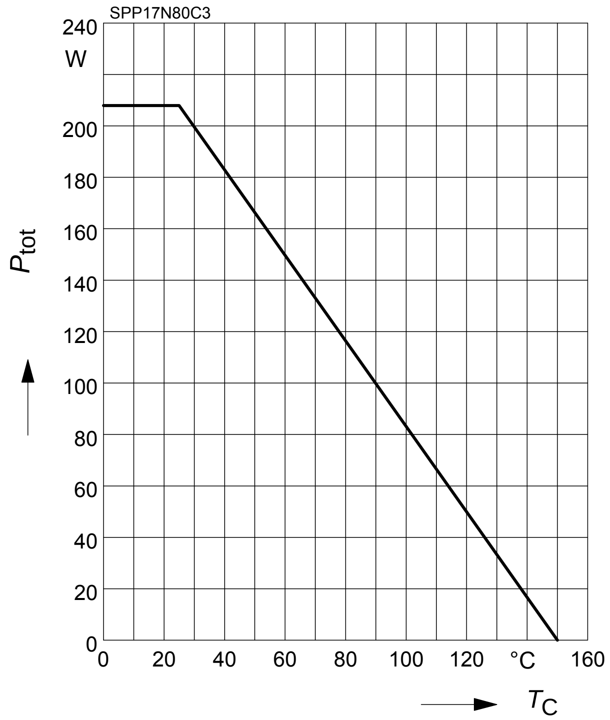
## Typical Transient Thermal Characteristics

| Symbol | Value | | Unit | Symbol | Value | | Unit |
|---|---|---|---|---|---|---|---|
| | SPP_B | SPA | | | SPP_B | SPA | |
| $R_{th1}$ | 0.00812 | 0.00812 | K/W | $C_{th1}$ | 0.0003562 | 0.0003562 | Ws/K |
| $R_{th2}$ | 0.016 | 0.016 | | $C_{th2}$ | 0.001337 | 0.001337 | |
| $R_{th3}$ | 0.031 | 0.031 | | $C_{th3}$ | 0.001831 | 0.001831 | |
| $R_{th4}$ | 0.114 | 0.16 | | $C_{th4}$ | 0.005033 | 0.005033 | |
| $R_{th5}$ | 0.135 | 0.324 | | $C_{th5}$ | 0.012 | 0.008657 | |
| $R_{th6}$ | 0.059 | 2.522 | | $C_{th6}$ | 0.092 | 0.412 | |



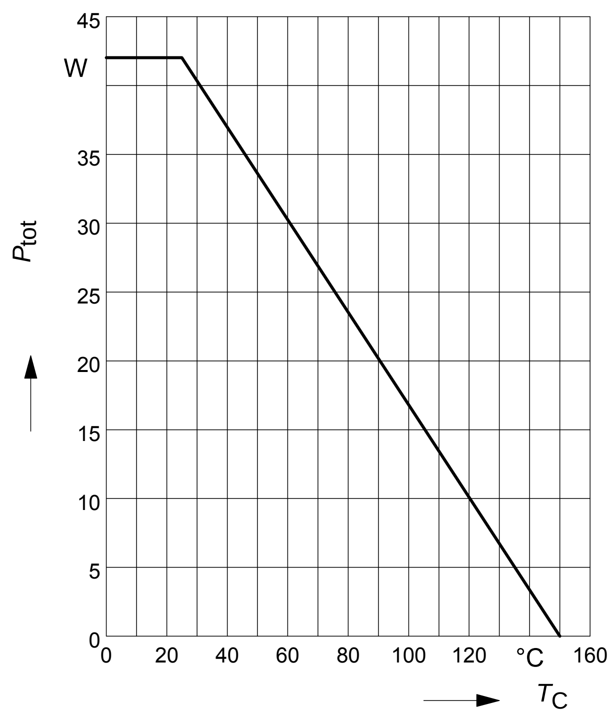
## 1 Power dissipation

$P_{tot} = f(T_C)$




## 2 Power dissipation FullPAK

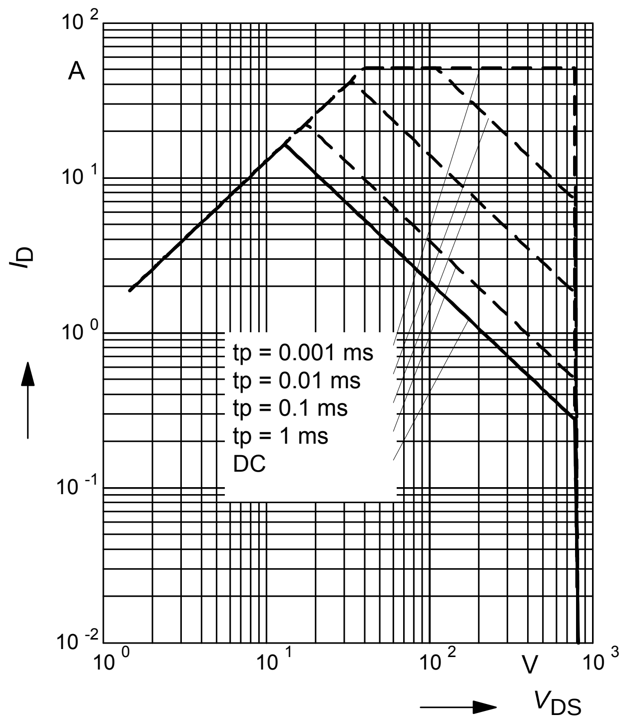
$P_{tot} = f(T_C)$




## 3 Safe operating area

$I_D = f(V_{DS})$

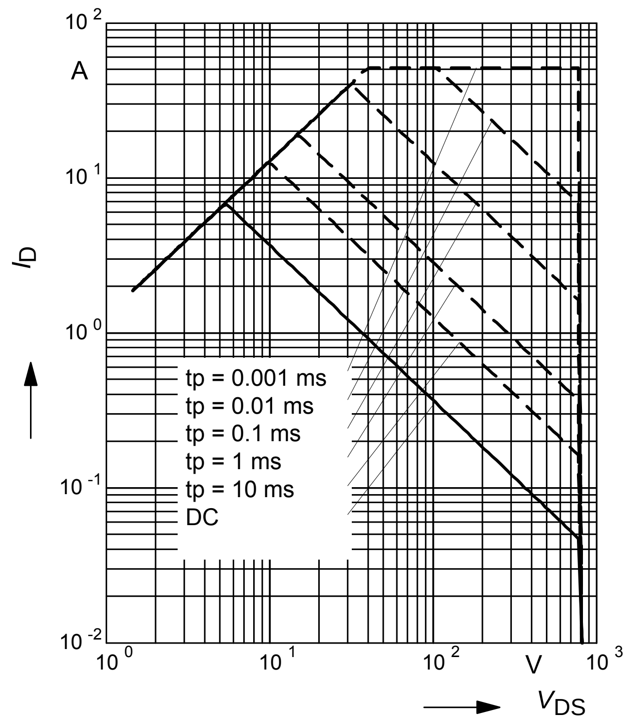
parameter : $D = 0$ , $T_C$=25°C




## 4 Safe operating area FullPAK

$I_D = f(V_{DS})$

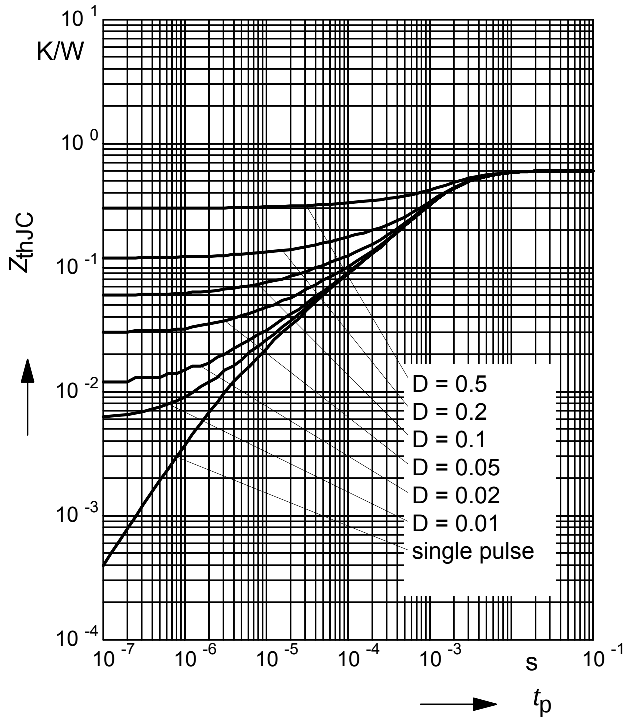
parameter: $D = 0$, $T_C$ = 25°C



## 5 Transient thermal impedance

$Z_{thJC} = f(t_p)$

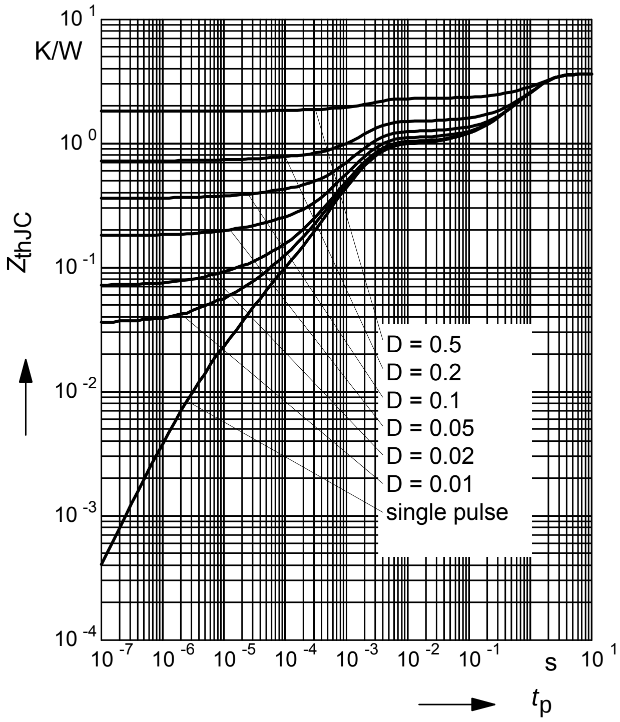
parameter: $D = t_p/T$




## 6 Transient thermal impedance FullPAK

$Z_{thJC} = f(t_p)$

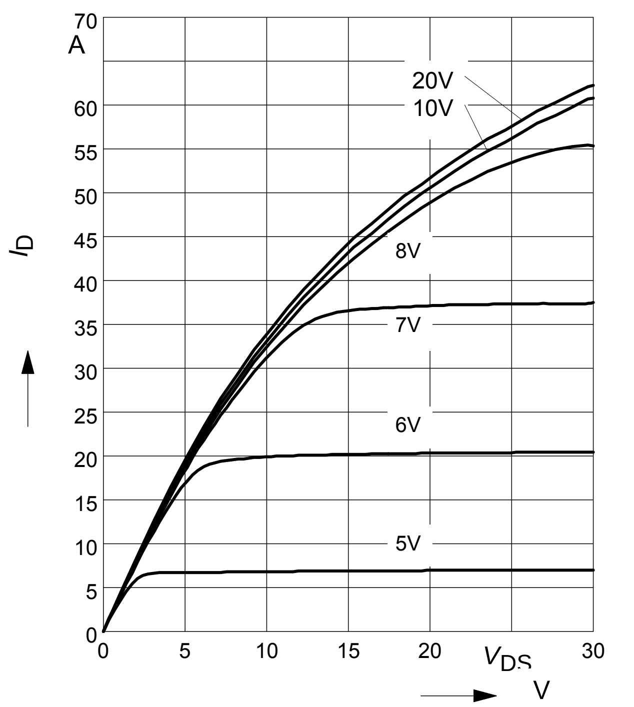
parameter: $D = t_p/t$




## 7 Typ. output characteristic

$I_D = f(V_{DS})$; $T_j$=25°C

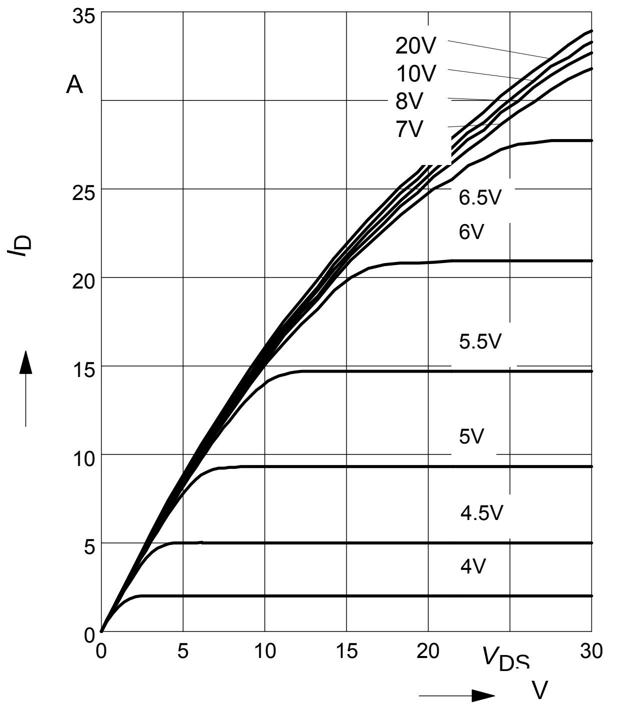
parameter: $t_p$ = 10 µs, $V_{GS}$




## 8 Typ. output characteristic

$I_D = f(V_{DS})$; $T_j$=150°C

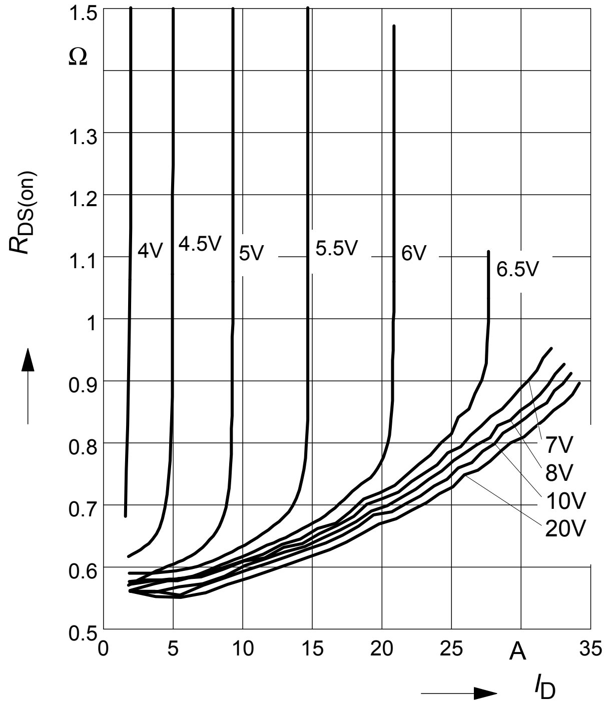
parameter: $t_p$ = 10 µs, $V_{GS}$



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

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

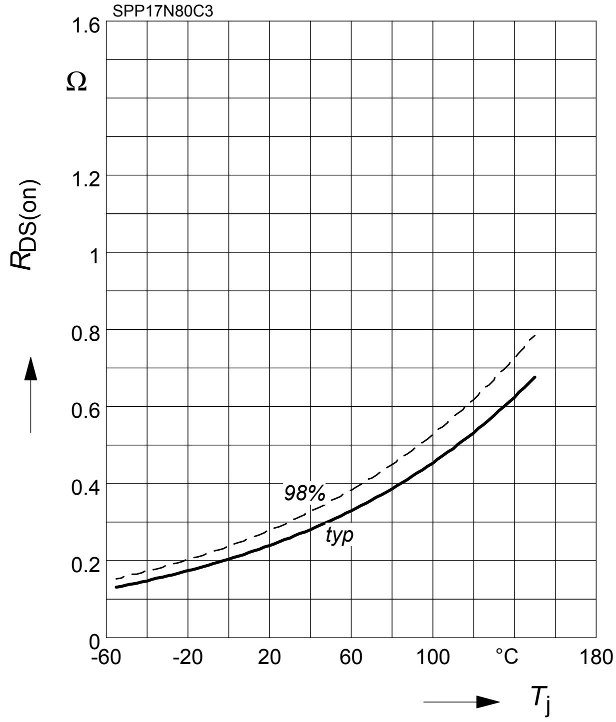
parameter: $T_j$=150°C, $V_{GS}$




**10 Drain-source on-state resistance**

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

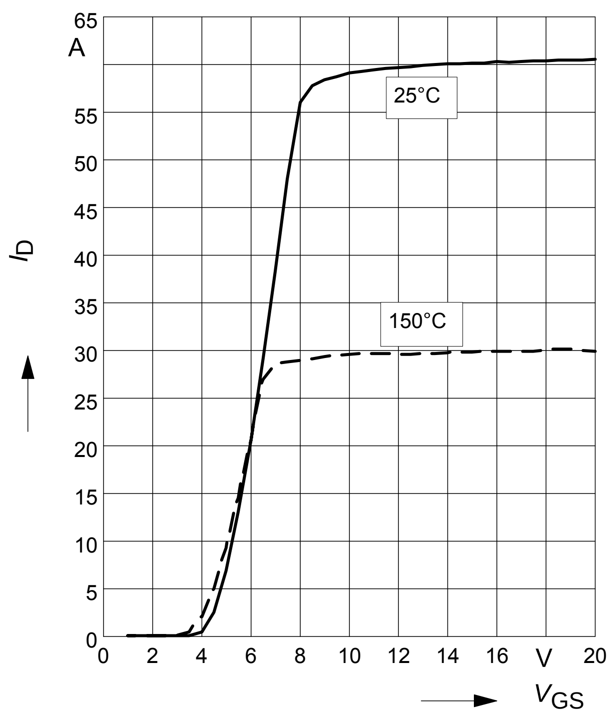
parameter : $I_D$ = 11 A, $V_{GS}$ = 10 V




**11 Typ. transfer characteristics**

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

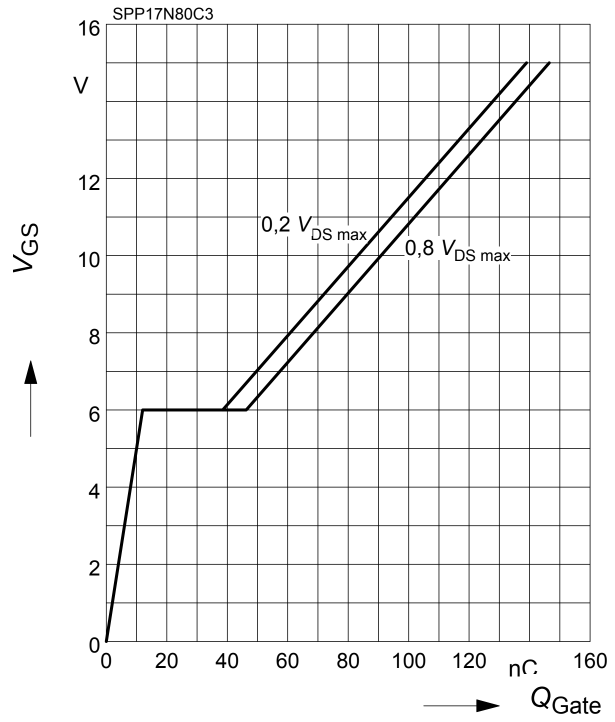
parameter: $t_p$ = 10 µs




**12 Typ. gate charge**

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

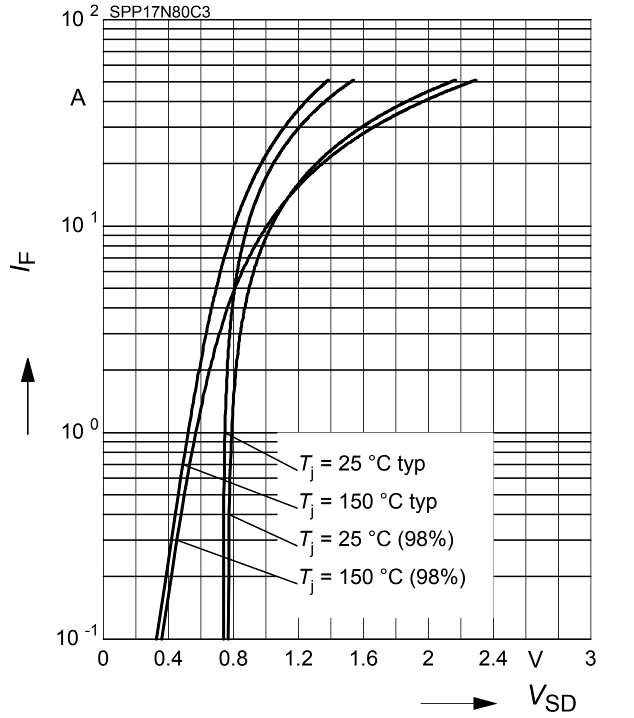
parameter: $I_D$ = 17 A pulsed



## 13 Forward characteristics of body diode

$I_F = f(V_{SD})$

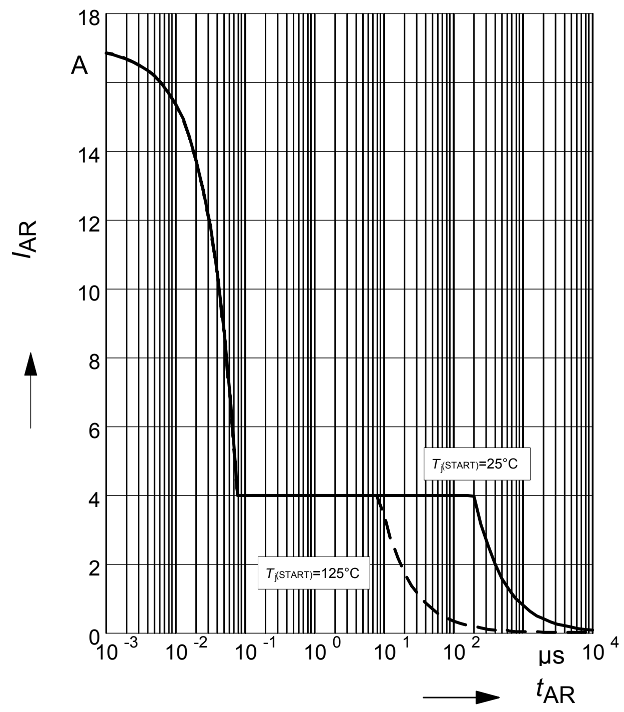
parameter: $T_j$, $t_p$ = 10 µs




## 14 Avalanche SOA

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

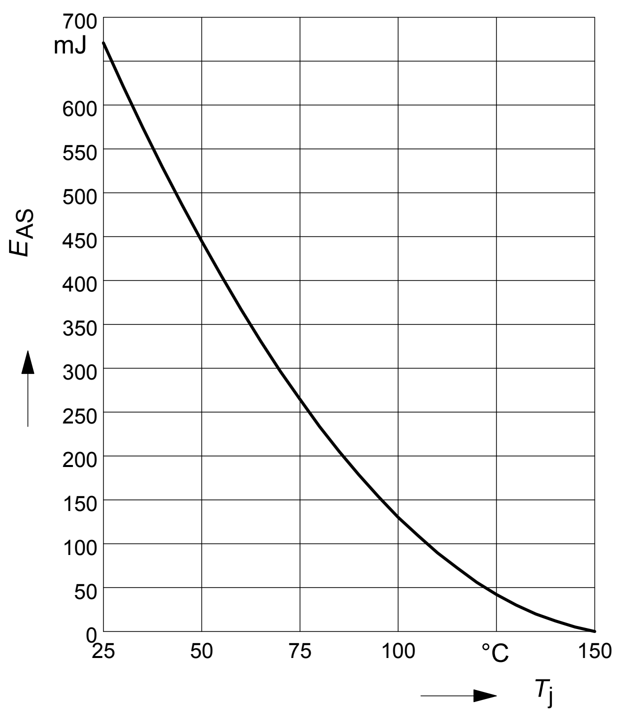
par.: $T_j \leq$ 150 °C




## 15 Avalanche energy

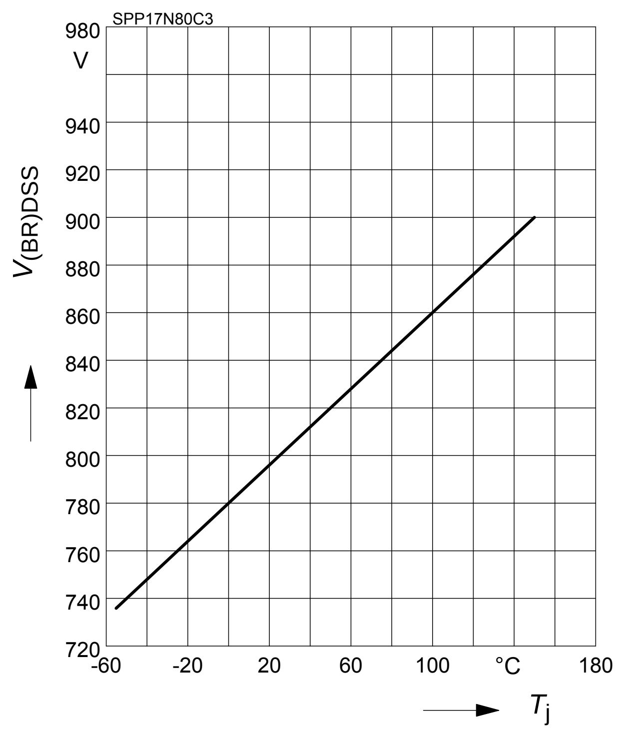
$E_{AS} = f(T_j)$

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




## 16 Drain-source breakdown voltage

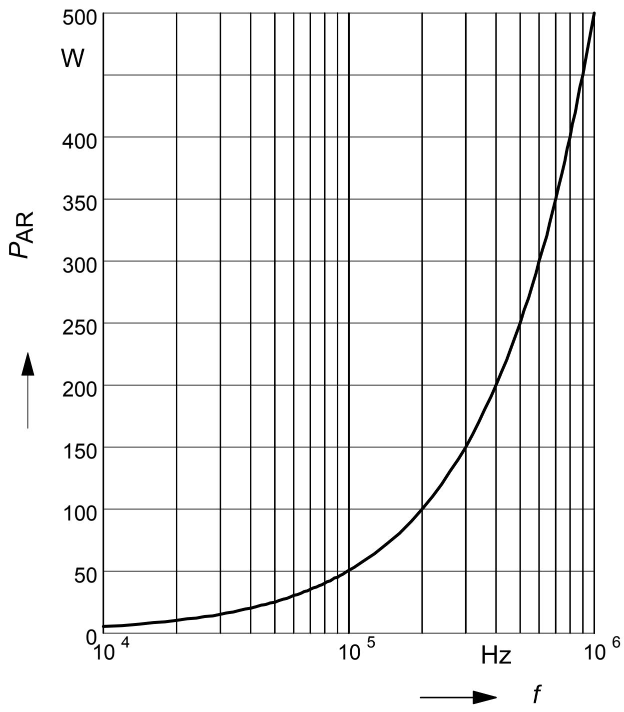
$V_{(BR)DSS} = f(T_j)$



## 17 Avalanche power losses

$P_{AR} = f(f)$

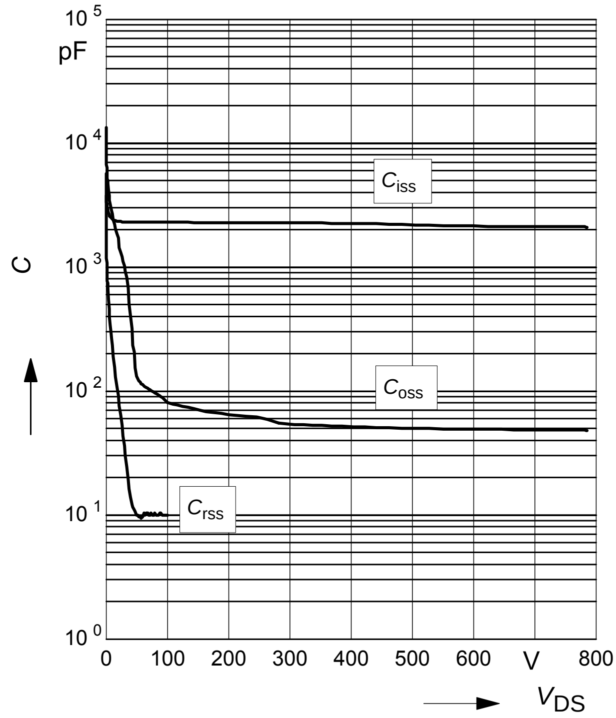
parameter: $E_{AR}$=0.5mJ




## 18 Typ. capacitances

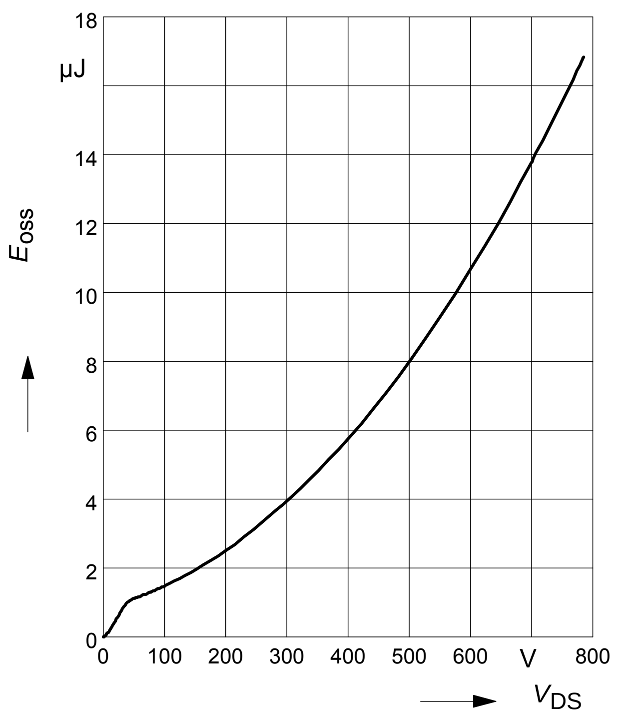
$C = f(V_{DS})$

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

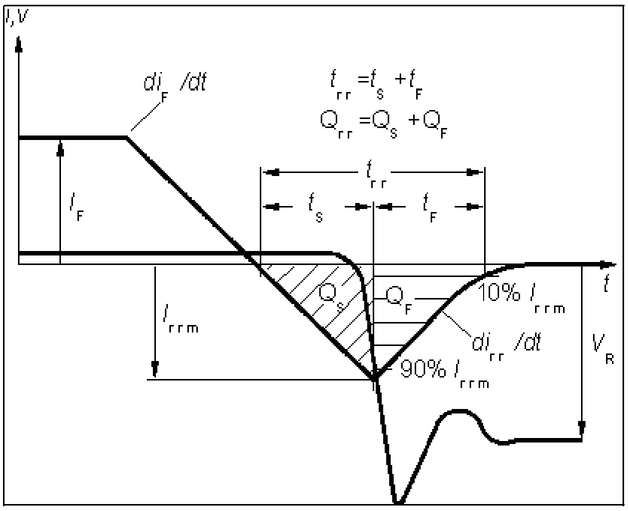



## 19 Typ. $C_{oss}$ stored energy

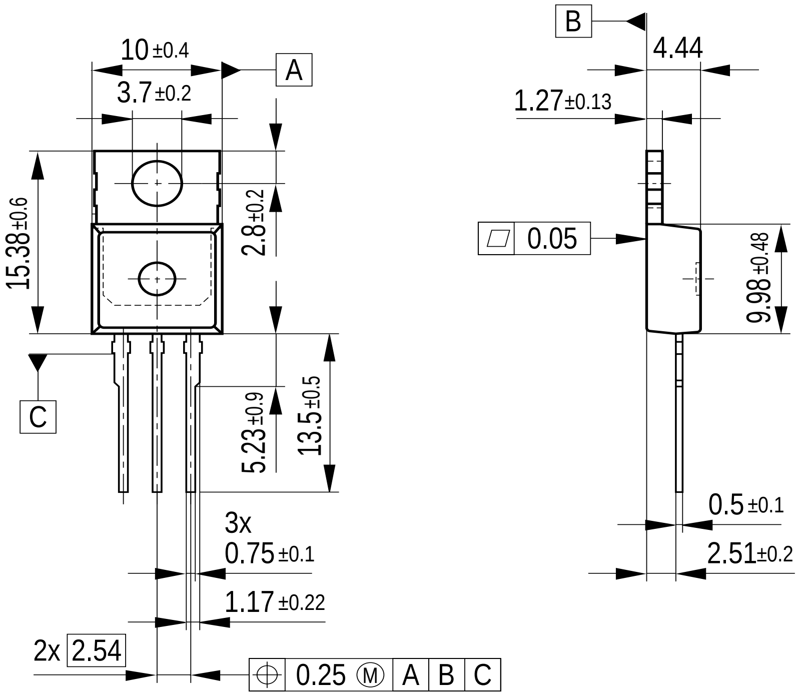
$E_{oss}=f(V_{DS})$



Definition of diodes switching characteristics

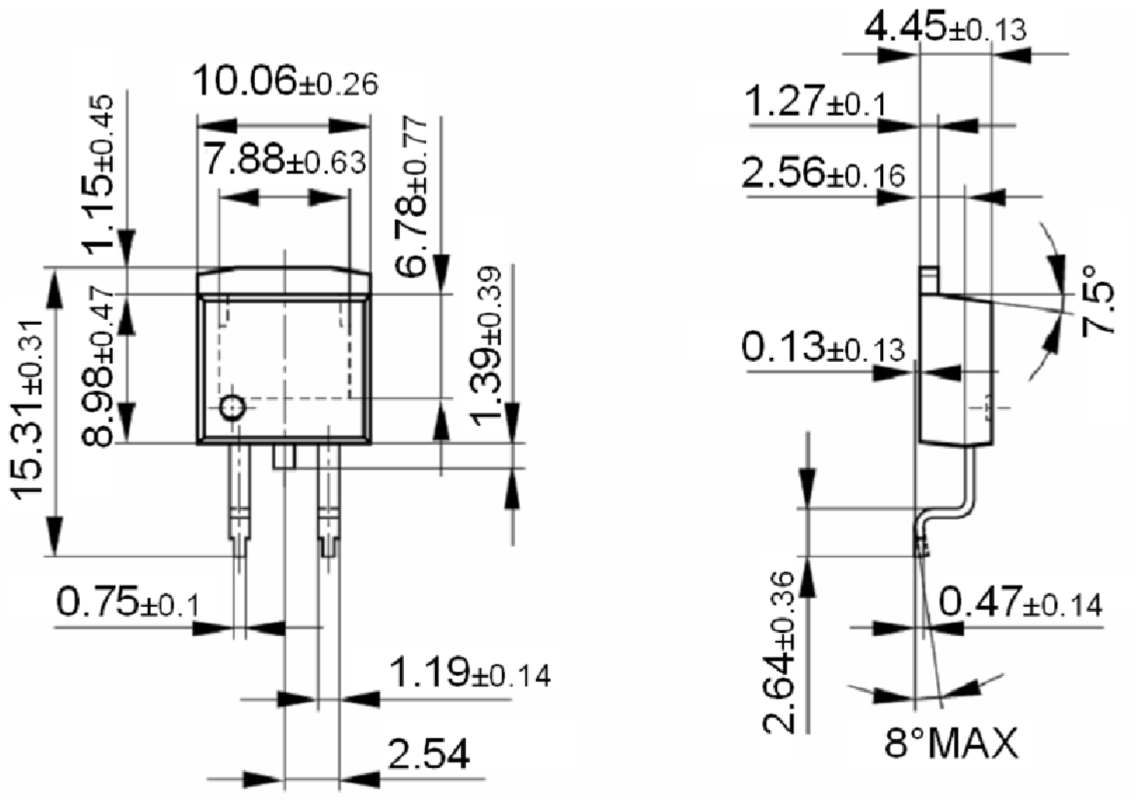


P-TO-220-3-1

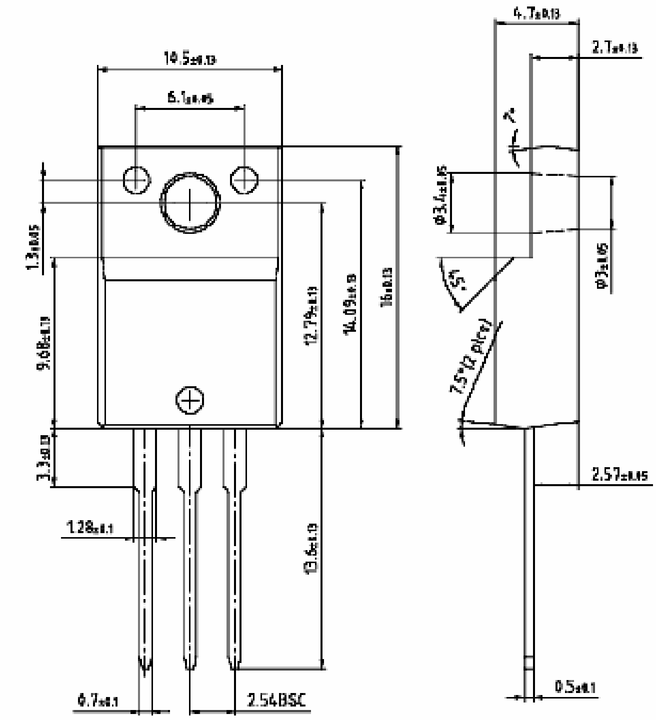



All metal surfaces tin plated, except area of cut.
Metal surface min. x=7.25, y=12.3

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



P-TO-220-3-31 (FullPAK)




Please refer to mounting instructions (application note AN-TO220-3-31-01)

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