



**THE DATASHEET OF
SPB42N03S2L-13 G**

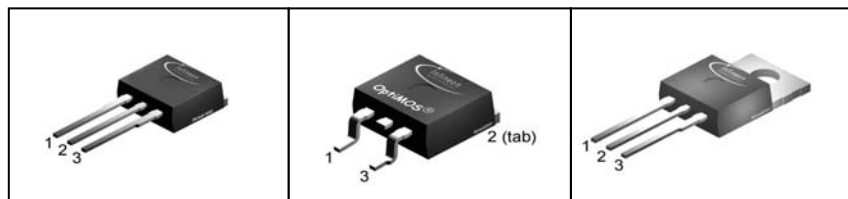


OptiMOS® Power-Transistor
Features

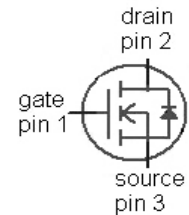
- N-channel
- Enhancement mode
- Logic level
- Excellent gate charge x $R_{DS(on)}$ product (FOM)
- Superior thermal resistance
- 175 °C operating temperature
- Avalanche rated
- dv/dt rated

Product Summary

| | | |
|------------------|------|------------|
| V_{DS} | 30 | V |
| $R_{DS(on),max}$ | 12.9 | m Ω |
| I_D | 42 | A |

P-TO262-3-1
P-TO263-3-2
P-TO220-3-1


| Type | Package | Ordering Code | Marking |
|----------------|-------------|---------------|---------|
| SPP42N03S2L-13 | P-TO220-3-1 | Q67042-S4034 | 2N03L13 |
| SPB42N03S2L-13 | P-TO263-3-2 | Q67042-S4035 | 2N03L13 |
| SPI42N03S2L-13 | P-TO262-3-1 | Q67042-S4104 | 2N03L13 |


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

| Parameter | Symbol | Conditions | Value | Unit |
|--|-------------------|---|-------------|-------------------|
| Continuous drain current ¹⁾ | I_D | $T_C=25\text{ °C}$ | 42 | A |
| | | $T_C=100\text{ °C}$ | 42 | |
| Pulsed drain current | $I_{D,pulse}$ | $T_C=25\text{ °C}$ | 248 | |
| Avalanche energy, single pulse | E_{AS} | $I_D=42\text{ A}$, $R_{GS}=25\text{ }\Omega$ | 110 | mJ |
| Repetitive avalanche energy | E_{AR} | limited by T_{jmax} ²⁾ | 8 | mJ |
| Reverse diode dv/dt | dv/dt | $I_D=42\text{ A}$, $V_{DS}=24\text{ V}$, $di/dt=200\text{ A}/\mu\text{s}$, $T_{j,max}=175\text{ °C}$ | 6 | kV/ μs |
| Gate source voltage | V_{GS} | | ± 20 | V |
| Power dissipation | P_{tot} | $T_C=25\text{ °C}$ | 83 | 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} | | - | 1.2 | 1.8 | K/W |
| SMD version, device on PCB | R_{thJA} | minimal footprint | - | - | 62 | |
| | | 6 cm ² cooling area ³⁾ | - | - | 40 | |

Electrical characteristics, at $T_j=25\text{ }^\circ\text{C}$, unless otherwise specified
Static characteristics

| | | | | | | |
|--|---------------|--|-----|------|------|---------------|
| Drain-source breakdown voltage | $V_{(BR)DSS}$ | $V_{GS}=0\text{ V}, I_D=1\text{ mA}$ | 30 | - | - | V |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=37\text{ }\mu\text{A}$ | 1.2 | 1.6 | 2 | |
| Zero gate voltage drain current | I_{DSS} | $V_{DS}=30\text{ V}, V_{GS}=0\text{ V}, T_j=25\text{ }^\circ\text{C}$ | - | 0.01 | 1 | μA |
| | | $V_{DS}=30\text{ V}, V_{GS}=0\text{ V}, T_j=125\text{ }^\circ\text{C}$ | - | 10 | 100 | |
| Gate-source leakage current | I_{GSS} | $V_{GS}=20\text{ V}, V_{DS}=0\text{ V}$ | - | 1 | 100 | nA |
| Drain-source on-state resistance ⁴⁾ | $R_{DS(on)}$ | $V_{GS}=4.5\text{ V}, I_D=21\text{ A}$ | - | 14.9 | 19.9 | m Ω |
| | | $V_{GS}=4.5\text{ V}, I_D=21\text{ A},$ SMD version | - | 14.5 | 19.6 | |
| | | $V_{GS}=10\text{ V}, I_D=21\text{ A}$ | - | 10.3 | 12.9 | |
| | | $V_{GS}=10\text{ V}, I_D=21\text{ A},$ SMD version | - | 9.9 | 12.6 | |
| Gate resistance | R_G | | - | 1 | - | Ω |
| Transconductance | g_{fs} | $ V_{DS} >2 I_D R_{DS(on)max},$ $I_D=42\text{ A}$ | 21 | 42 | - | S |

¹⁾ Current is limited by bondwire; with an $R_{thJC}=1.8\text{ K/W}$ the chip is able to carry 64 A at 25°C, for detailed information see app.-note ANPS071E at www.infineon.com/optimos.

²⁾ Defined by design. Not subject to production test.

³⁾ 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.

⁴⁾ Diagrams are related to straight lead versions.

| Parameter | Symbol | Conditions | Values | | | Unit |
|-----------|--------|------------|--------|------|------|------|
| | | | min. | typ. | max. | |

Dynamic characteristics

| | | | | | | |
|------------------------------|--------------|---|---|------|------|----|
| Input capacitance | C_{iss} | $V_{GS}=0\text{ V}, V_{DS}=25\text{ V},$ $f=1\text{ MHz}$ | - | 850 | 1130 | pF |
| Output capacitance | C_{oss} | | - | 330 | 440 | |
| Reverse transfer capacitance | C_{rss} | | - | 90 | 130 | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD}=15\text{ V}, V_{GS}=10\text{ V},$ $I_D=21\text{ A}, R_G=7.8\ \Omega$ | - | 6.5 | 9.8 | ns |
| Rise time | t_r | | - | 12 | 18 | |
| Turn-off delay time | $t_{d(off)}$ | | - | 24 | 36 | |
| Fall time | t_f | | - | 14.5 | 21.8 | |

Gate Charge Characteristics

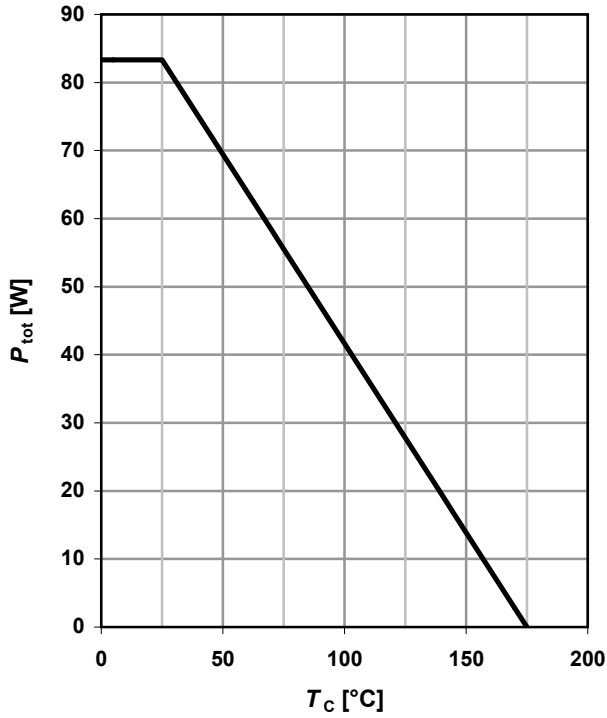
| | | | | | | |
|-----------------------|---------------|--|---|------|------|----|
| Gate to source charge | Q_{gs} | $V_{DD}=24\text{ V}, I_D=21\text{ A},$ $V_{GS}=0\text{ to }10\text{ V}$ | - | 2.7 | 3.6 | nC |
| Gate to drain charge | Q_{gd} | | - | 7.9 | 11.9 | |
| Gate charge total | Q_g | | - | 22.9 | 30.5 | |
| Gate plateau voltage | $V_{plateau}$ | | - | 3.5 | - | V |

Reverse Diode

| | | | | | | |
|----------------------------------|---------------|---|---|------|------|----|
| Diode continuous forward current | I_S | $T_C=25\text{ }^\circ\text{C}$ | - | - | 42 | A |
| Diode pulse current | $I_{S,pulse}$ | | - | - | 248 | |
| Diode forward voltage | V_{SD} | $V_{GS}=0\text{ V}, I_F=42\text{ A},$ $T_J=25\text{ }^\circ\text{C}$ | - | 0.95 | 1.25 | V |
| Reverse recovery time | t_{rr} | $V_R=15\text{ V}, I_F=I_S,$ $dI_F/dt=100\text{ A}/\mu\text{s}$ | - | 24 | 31 | ns |
| Reverse recovery charge | Q_{rr} | | - | 18 | 23 | |

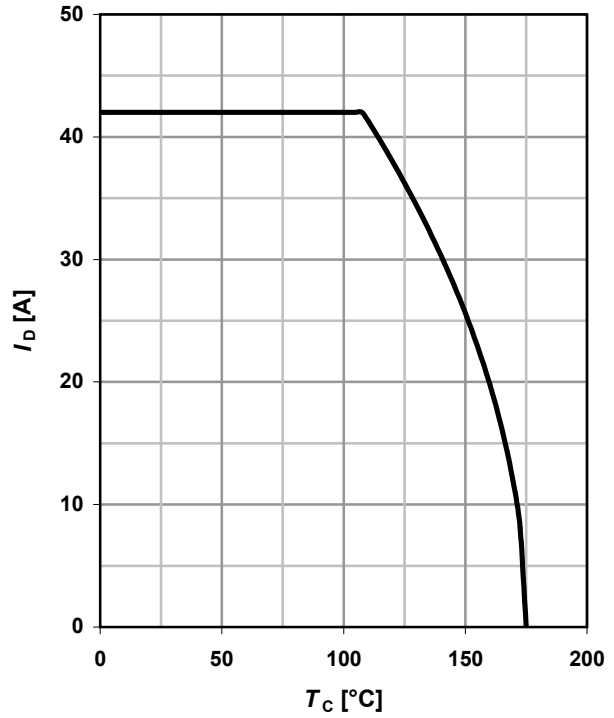
1 Power dissipation

$P_{tot}=f(T_C)$



2 Drain current

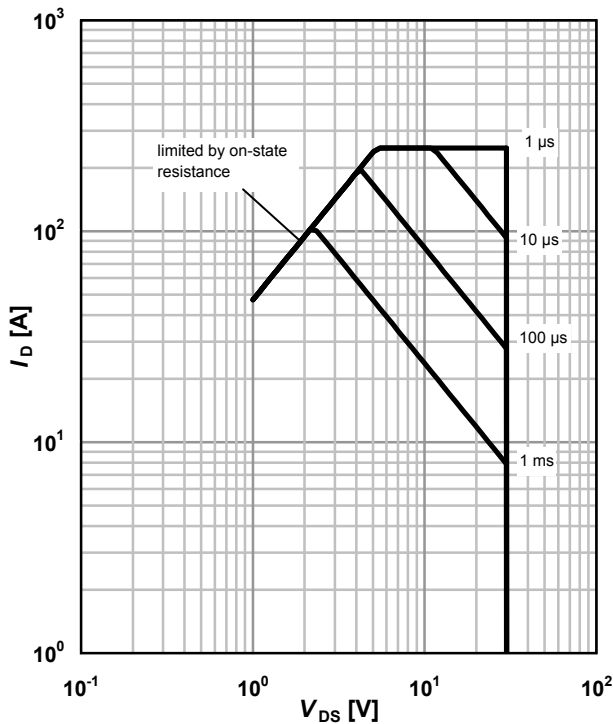
$I_D=f(T_C); V_{GS} \geq 10\text{ V}$



3 Safe operating area

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

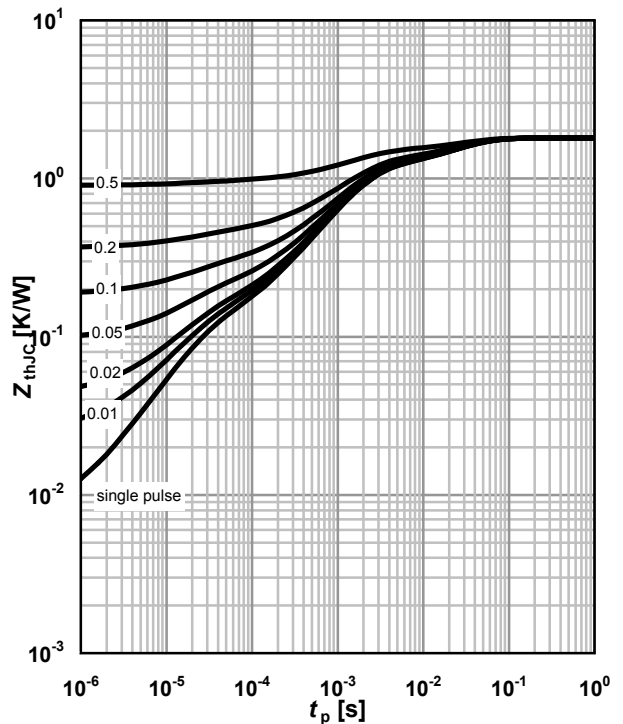
parameter: t_p



4 Max. transient thermal impedance

$Z_{thJC}=f(t_p)$

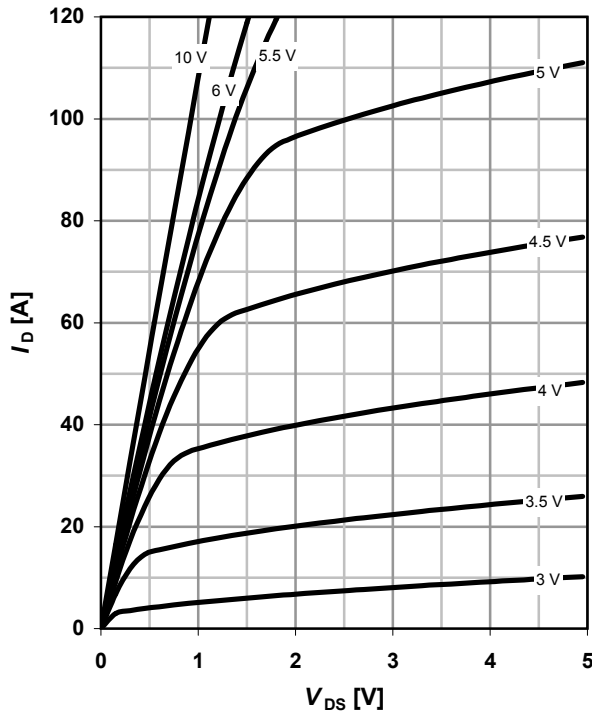
parameter: $D=t_p/T$



5 Typ. output characteristics

$I_D = f(V_{DS}); T_j = 25\text{ °C}$

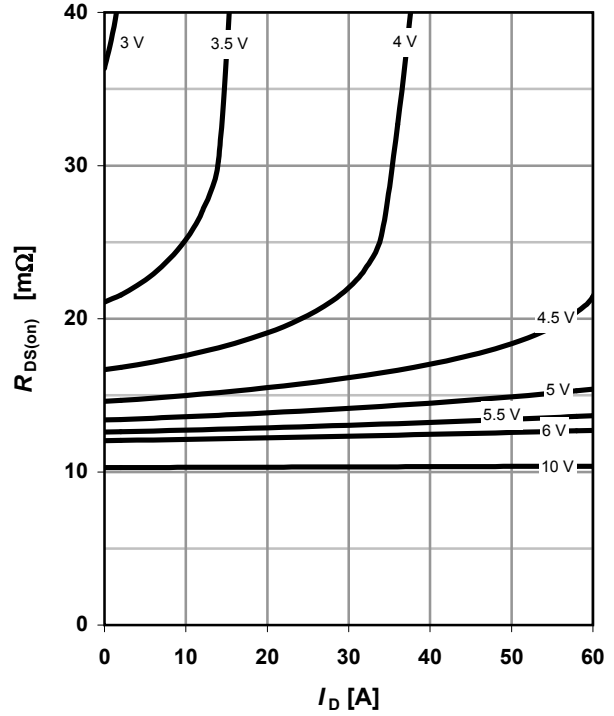
parameter: V_{GS}



6 Typ. drain-source on resistance

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

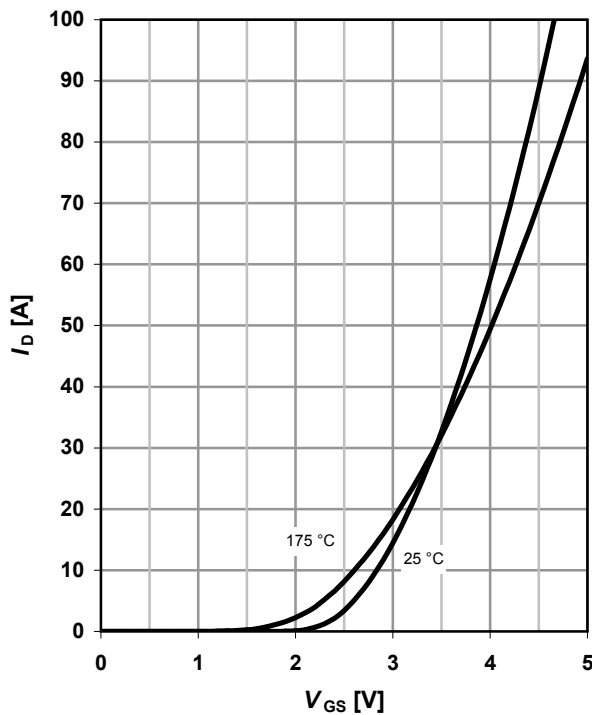
parameter: V_{GS}



7 Typ. transfer characteristics

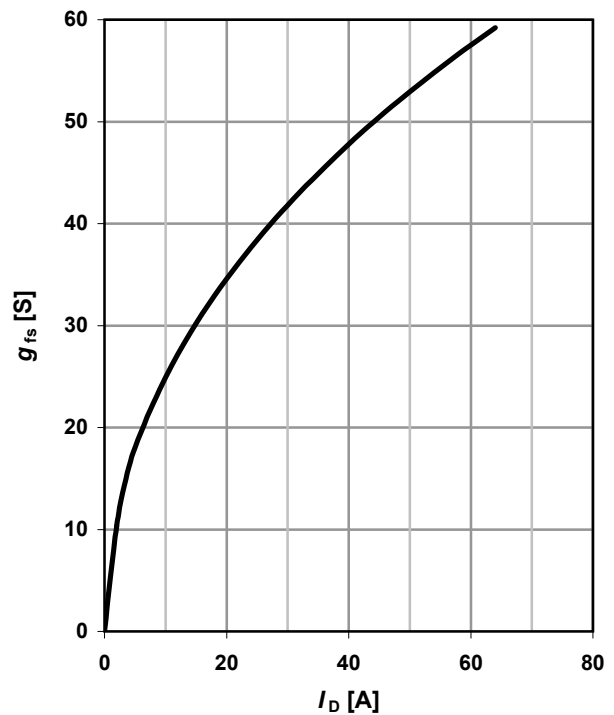
$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}$

parameter: T_j



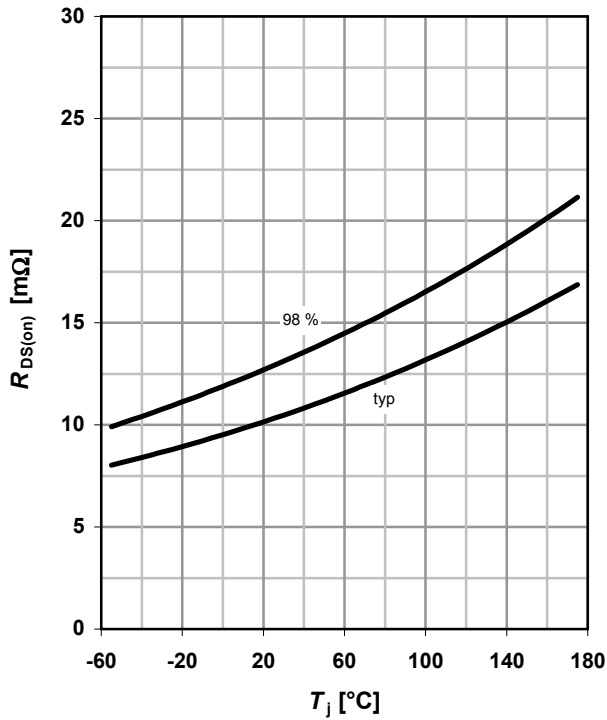
8 Typ. forward transconductance

$g_{fs} = f(I_D); T_j = 25\text{ °C}$



9 Drain-source on-state resistance

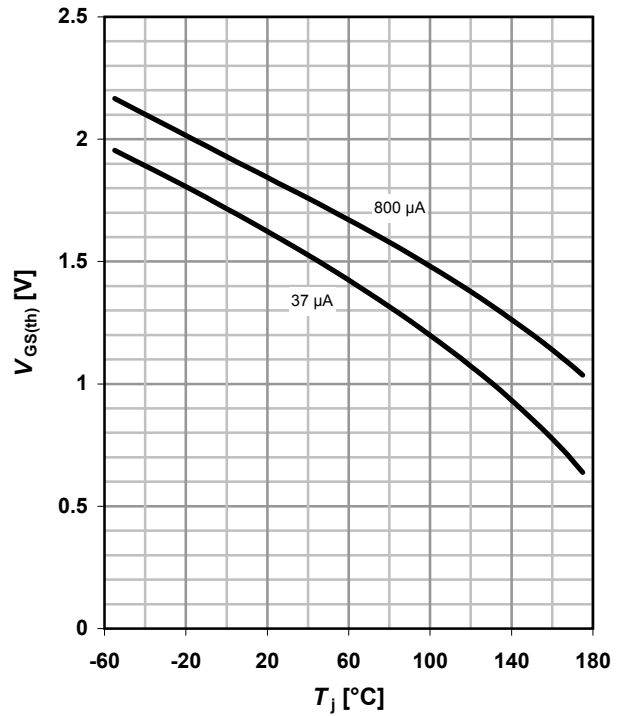
$R_{DS(on)}=f(T_j); I_D=21\text{ A}; V_{GS}=10\text{ V}$



10 Typ. gate threshold voltage

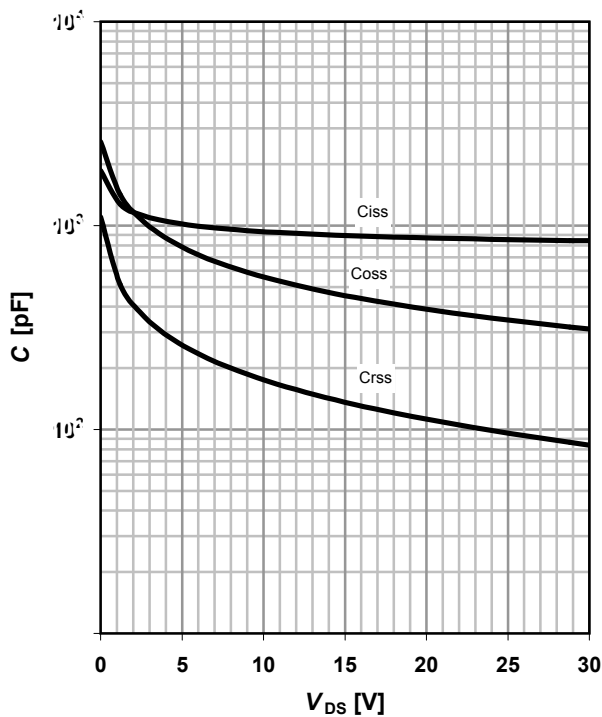
$V_{GS(th)}=f(T_j); V_{GS}=V_{DS}$

parameter: I_D



11 Typ. capacitances

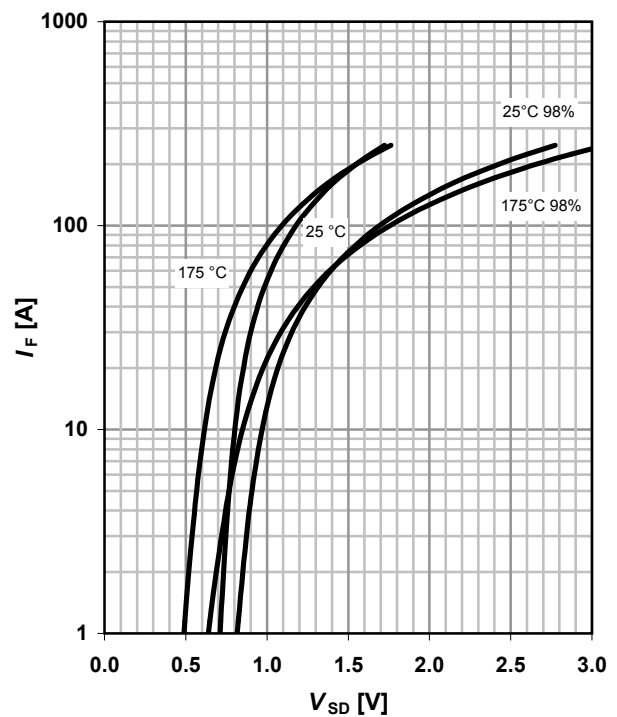
$C=f(V_{DS}); V_{GS}=0\text{ V}; f=1\text{ MHz}$



12 Forward characteristics of reverse diode

$I_F=f(V_{SD})$

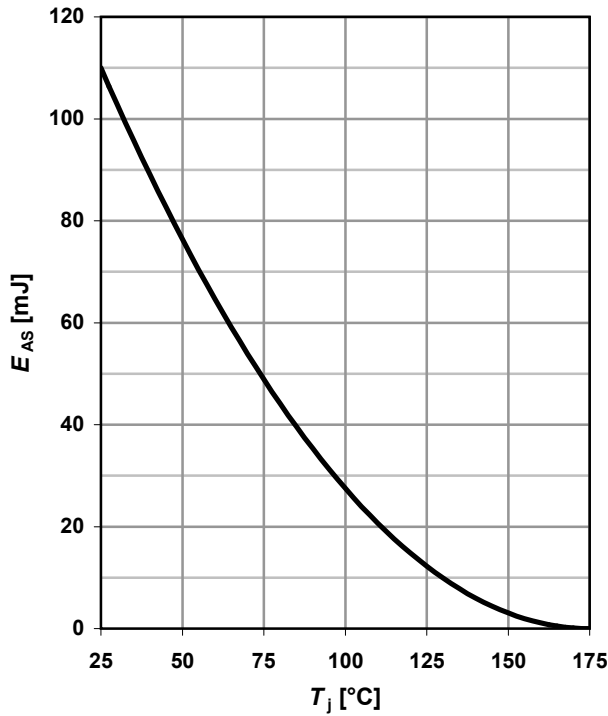
parameter: T_j



13 Avalanche characteristics

$E_{AS} = f(T_j)$

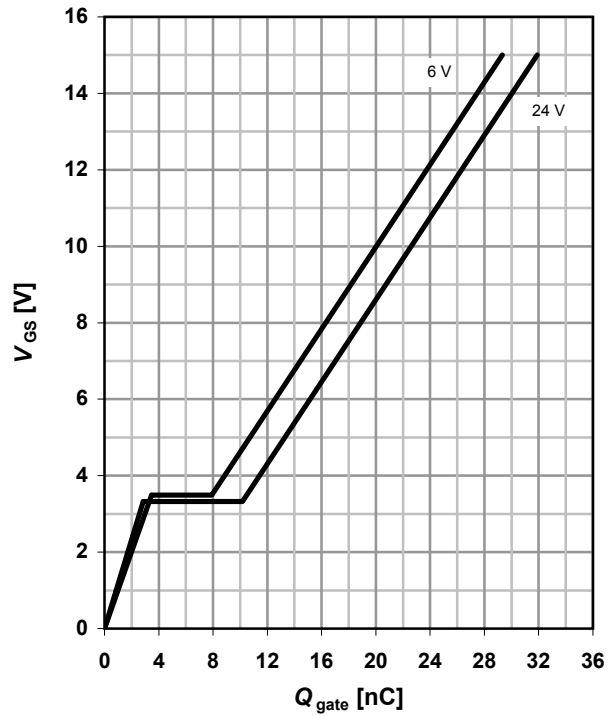
parameter: $I_D = 42A$, $V_{DD} = 25V$, $R_{GS} = 25\Omega$



14 Typ. gate charge

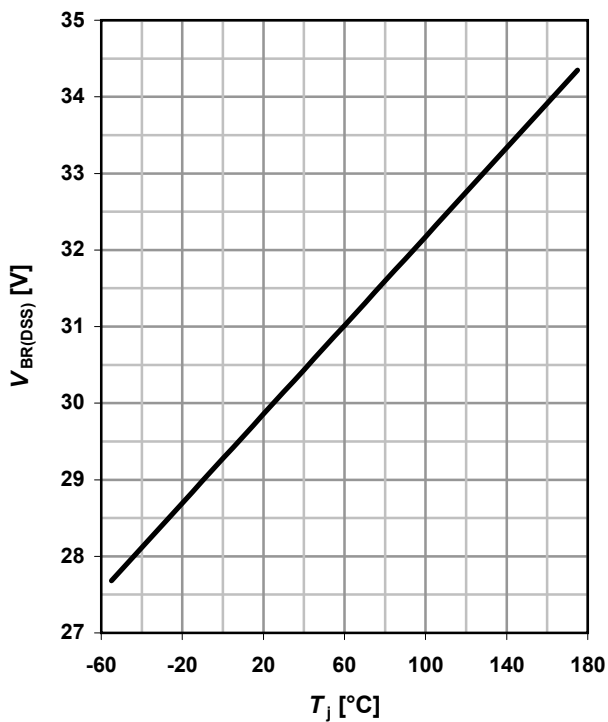
$V_{GS} = f(Q_{gate}); I_D = 21A$ pulsed

parameter: V_{DD}

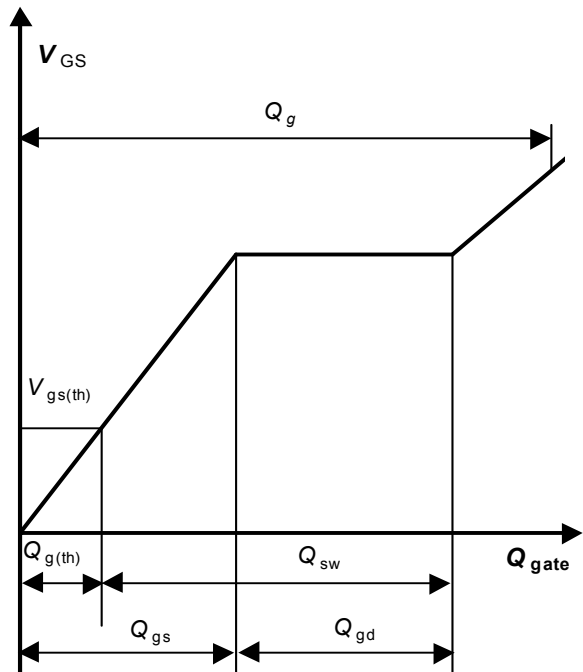


15 Drain-source breakdown voltage

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

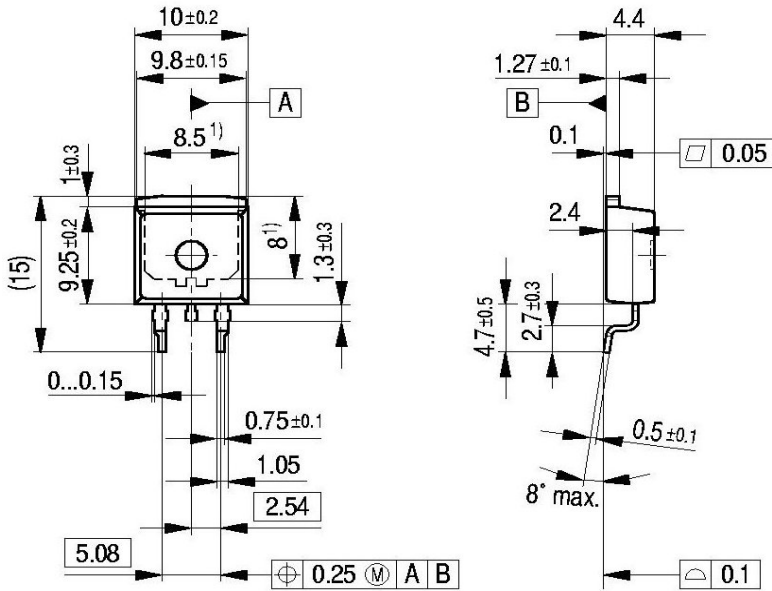


16 Gate charge waveforms

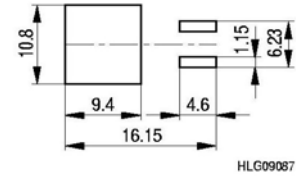


Package Outline

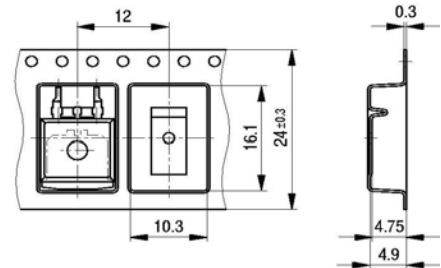
P-TO263-3-2: Outline



Footprint



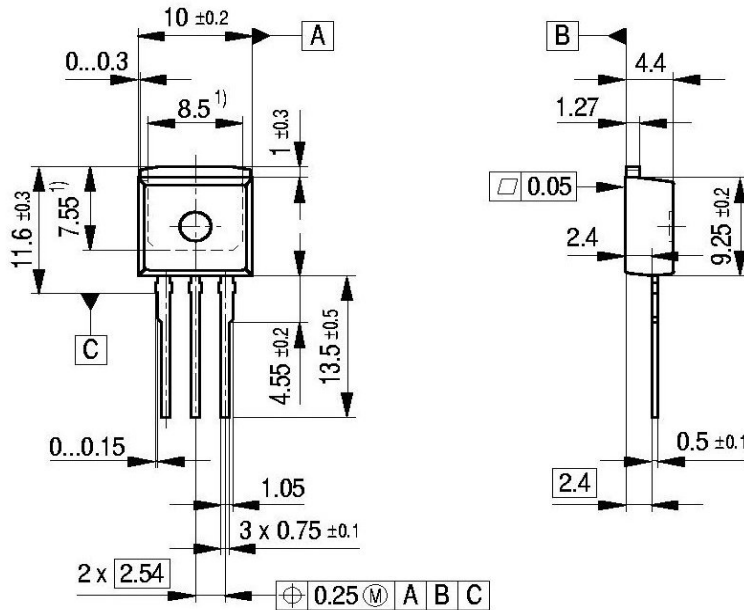
Packaging



1) Typical
All metal surfaces tin plated, except area of cut.

GPT09085

P-TO262-3-1: Outline

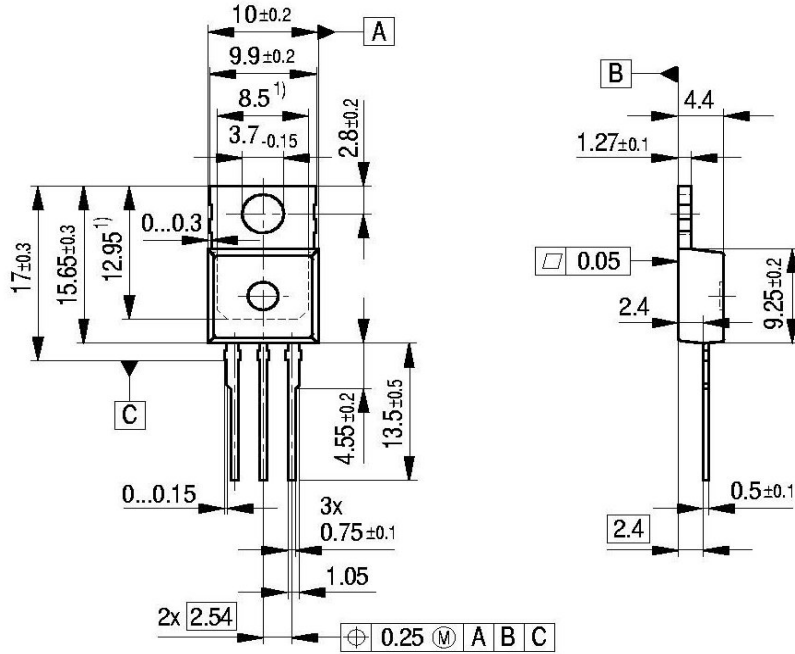


1) Typical
Metal surface min. X = 7.25, Y = 6.9
All metal surfaces tin plated, except area of cut.

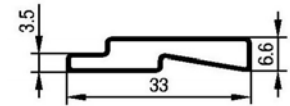
Dimensions in mm

Package Outline

P-TO220-3-1: Outline



Packaging



¹⁾ Typical

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

Dimensions in mm

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Further information

Please note that the part number is BSPP42N03S2L-13, BSPB42N03S2L-13 and BSPI42N03S2L-13, for simplicity the device is referred to by the term SPP42N03S2L-13, SPB42N03S2L-13, SPI42N03S2L-13 throughout this documentation.

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