

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

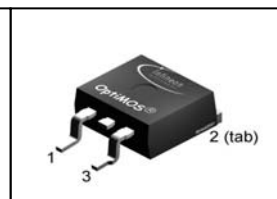
Product Summary

V_{DS}	30	V
$R_{DS(on),max}$	12.9	mΩ
I_D	42	A

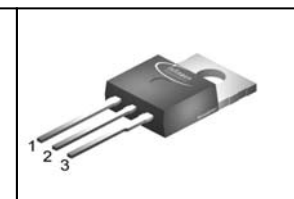
P-TO262-3-1



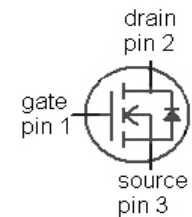
P-TO263-3-2



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}	$I_D=42\text{ A}$, $R_{GS}=25\text{ Ω}$	110	mJ
Repetitive avalanche energy	E_{AR}	limited by T_{jmax} ²⁾	8	mJ
Reverse diode dv/dt	dv/dt	$I_D=42\text{ A}$, $V_{DS}=24\text{ V}$, $di/dt=200\text{ A/μs}$, $T_{j,max}=175\text{ °C}$	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 $T_j=25\text{ °C}$, 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}	$V_{DS}=30\text{ V}, V_{GS}=0\text{ V}, T_j=25\text{ °C}$	-	0.01	1	μA
		$V_{DS}=30\text{ V}, V_{GS}=0\text{ V}, T_j=125\text{ °C}$	-	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

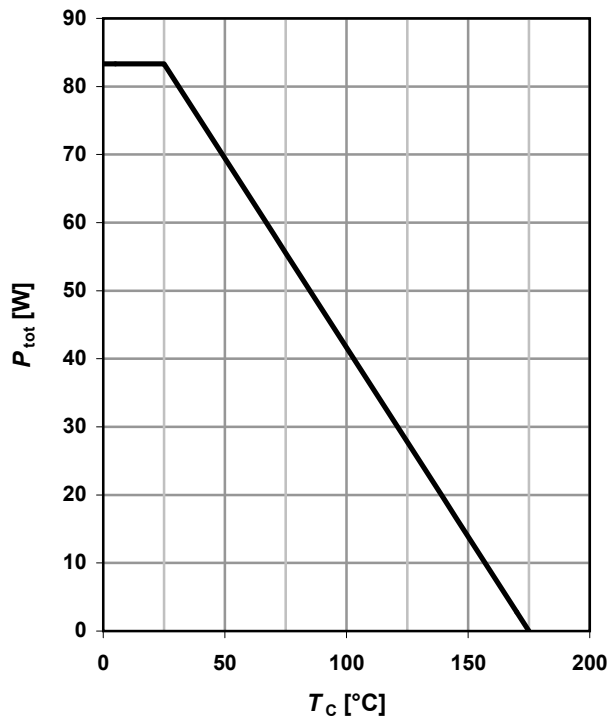
Gate to source charge	Q_{gs}	$V_{DD}=24\text{ V}, I_D=21\text{ A},$ $V_{GS}=0\text{ to }10\text{ V}$	-	2.7	3.6	nC
Gate to drain charge	Q_{gd}		-	7.9	11.9	
Gate charge total	Q_g		-	22.9	30.5	
Gate plateau voltage	$V_{plateau}$		-	3.5	-	V

Reverse Diode

Diode continuous forward current	I_S	$T_C=25\text{ °C}$	-	-	42	A
Diode pulse current	$I_{S,pulse}$		-	-	248	
Diode forward voltage	V_{SD}	$V_{GS}=0\text{ V}, I_F=42\text{ A},$ $T_J=25\text{ °C}$	-	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	

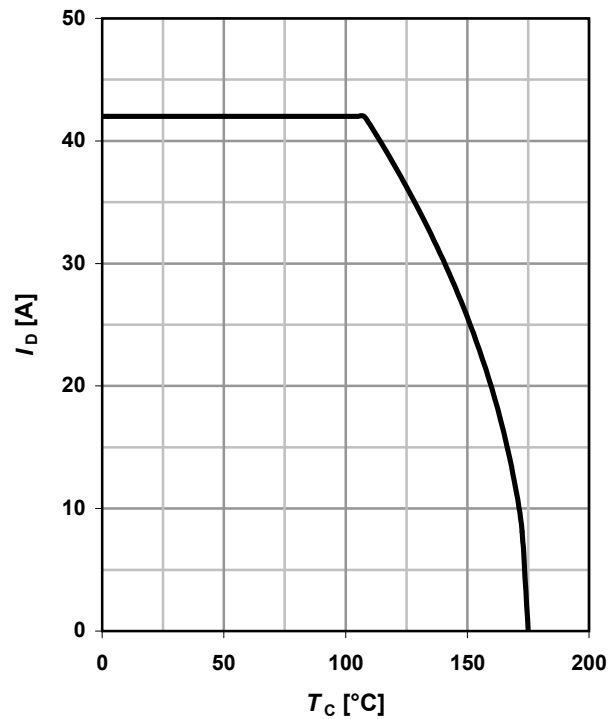
1 Power dissipation

$$P_{\text{tot}} = f(T_C)$$



2 Drain current

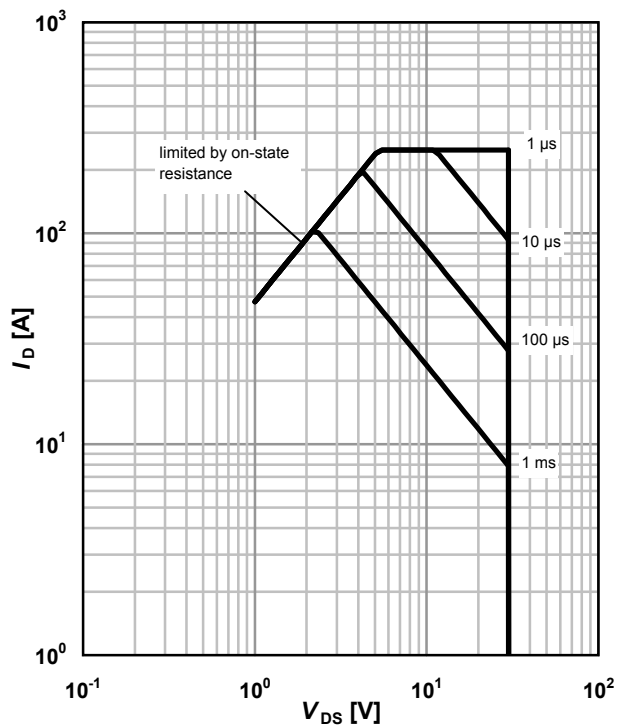
$$I_D = f(T_C); V_{GS} \geq 10 \text{ V}$$



3 Safe operating area

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

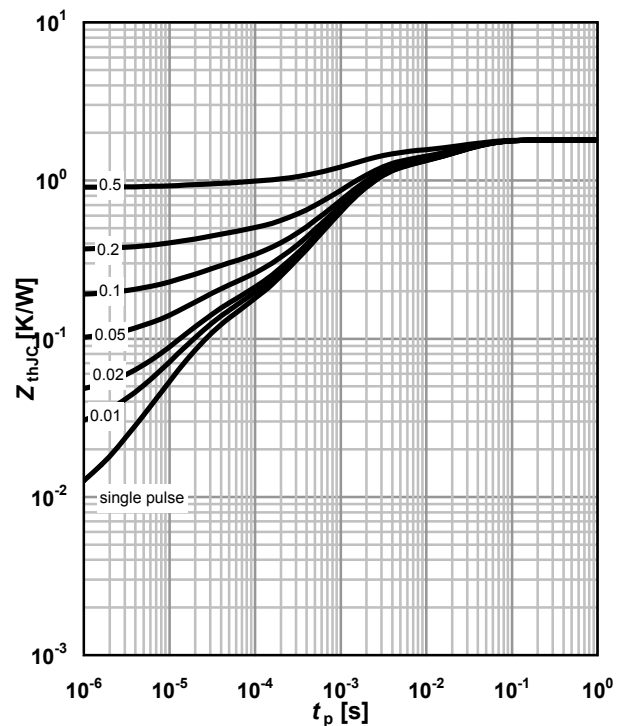
parameter: t_p



4 Max. transient thermal impedance

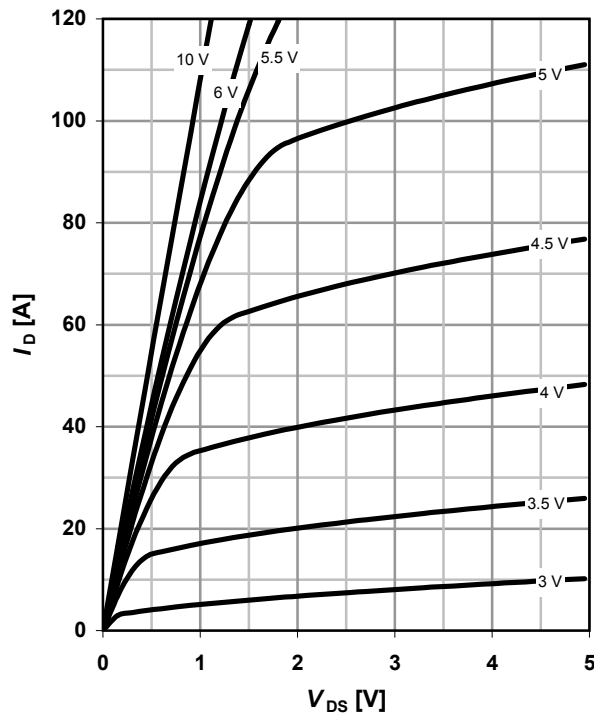
$$Z_{\text{thJC}} = f(t_p)$$

parameter: $D = t_p / T$



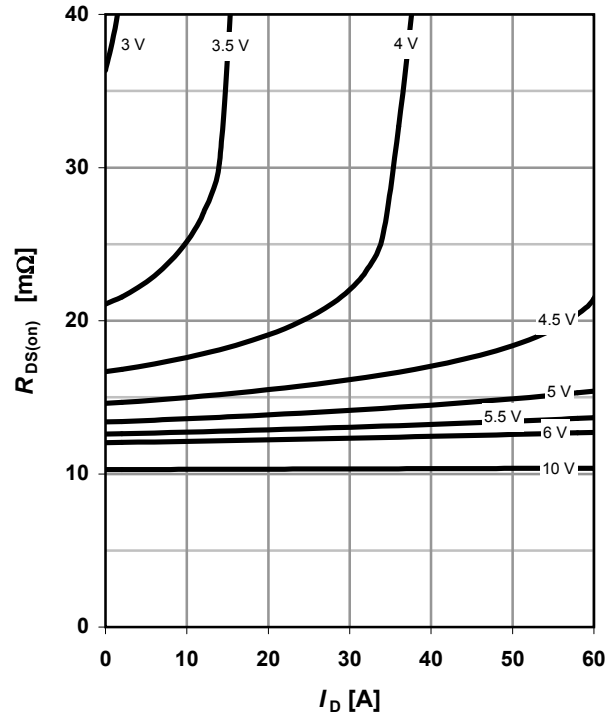
5 Typ. output characteristics

 $I_D = f(V_{DS}); T_j = 25^\circ\text{C}$

parameter: V_{GS}


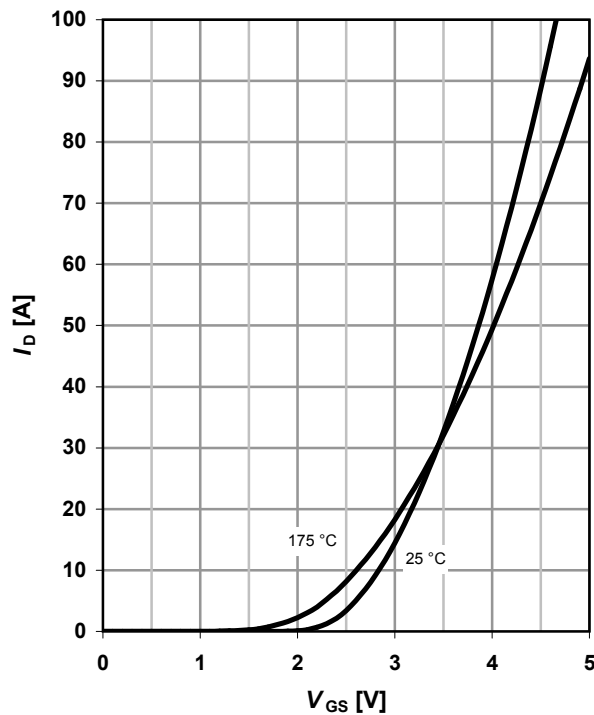
6 Typ. drain-source on resistance

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

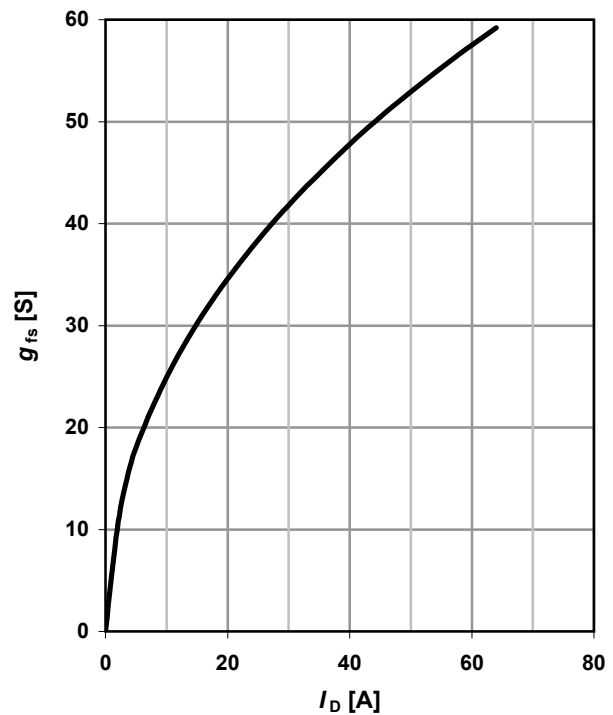
parameter: V_{GS}


7 Typ. transfer characteristics

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

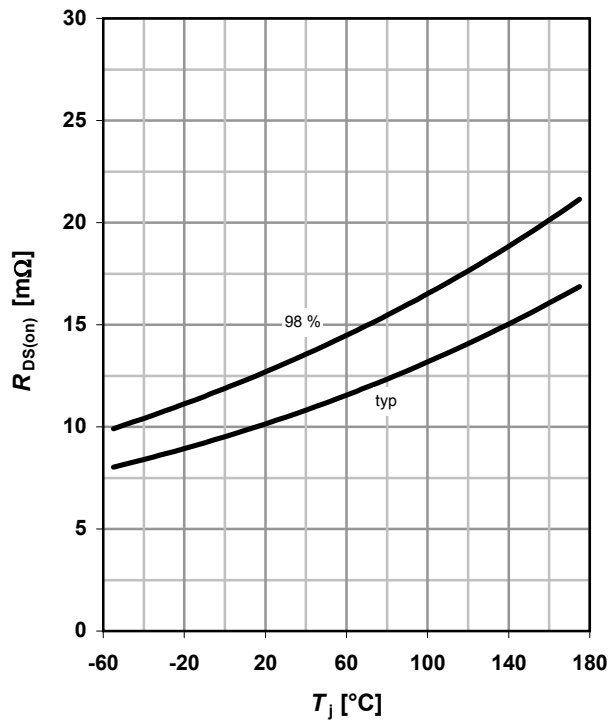
parameter: T_j


8 Typ. forward transconductance

 $g_{fs} = f(I_D); T_j = 25^\circ\text{C}$


9 Drain-source on-state resistance

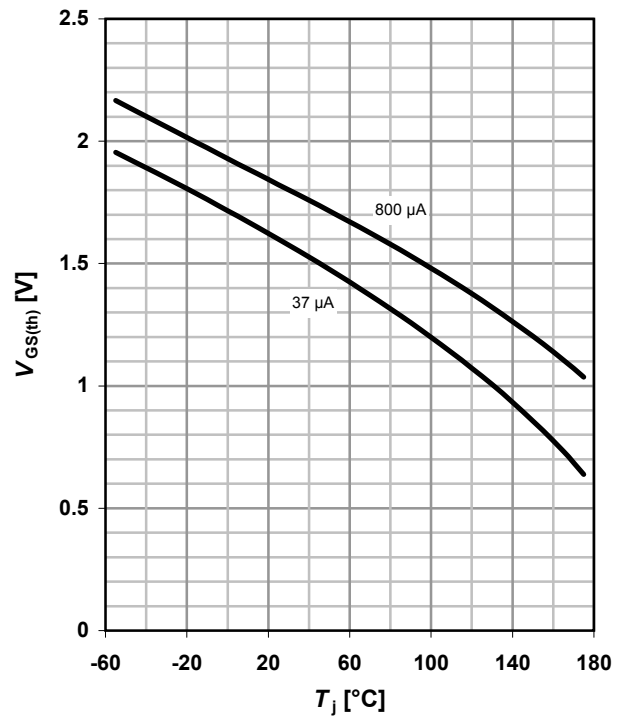
$$R_{DS(on)} = f(T_j); I_D = 21 \text{ A}; V_{GS} = 10 \text{ V}$$



10 Typ. gate threshold voltage

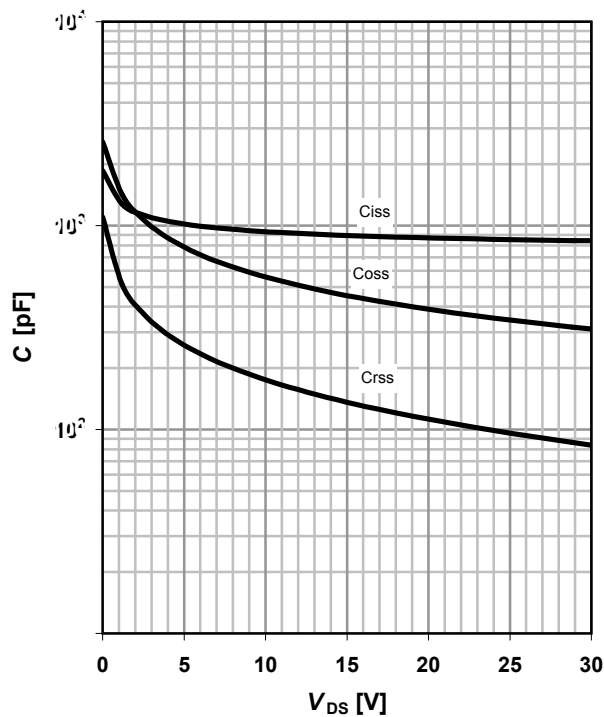
$$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}$$

parameter: I_D



11 Typ. capacitances

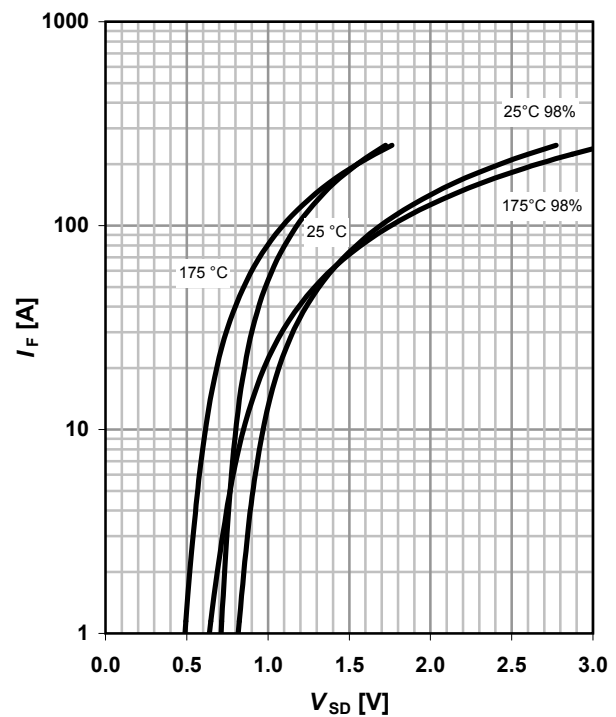
$$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$$



12 Forward characteristics of reverse diode

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

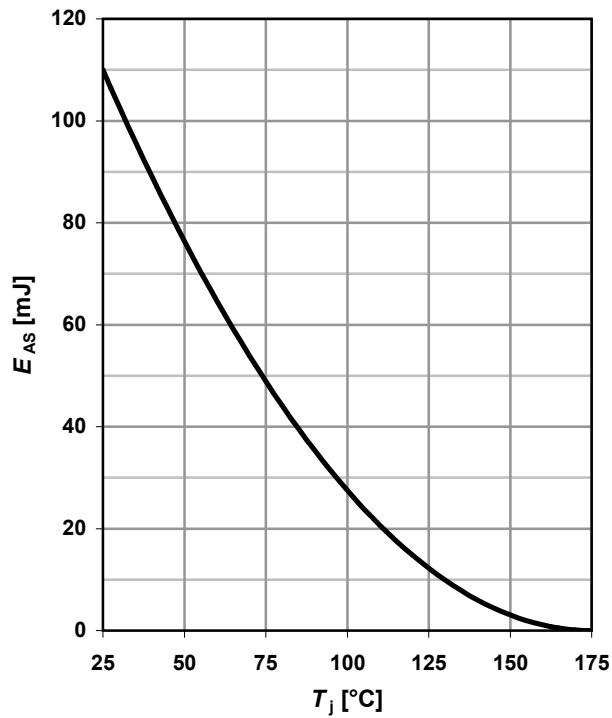
parameter: T_j



13 Avalanche characteristics

$$E_{AS}=f(T_j)$$

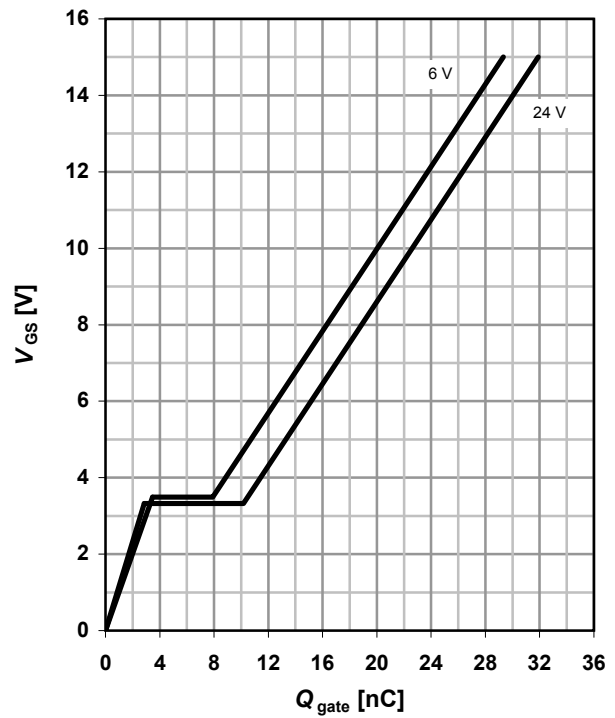
parameter: $I_D=42\text{A}$, $V_{DD}=25\text{V}$, $R_{GS}=25\Omega$



14 Typ. gate charge

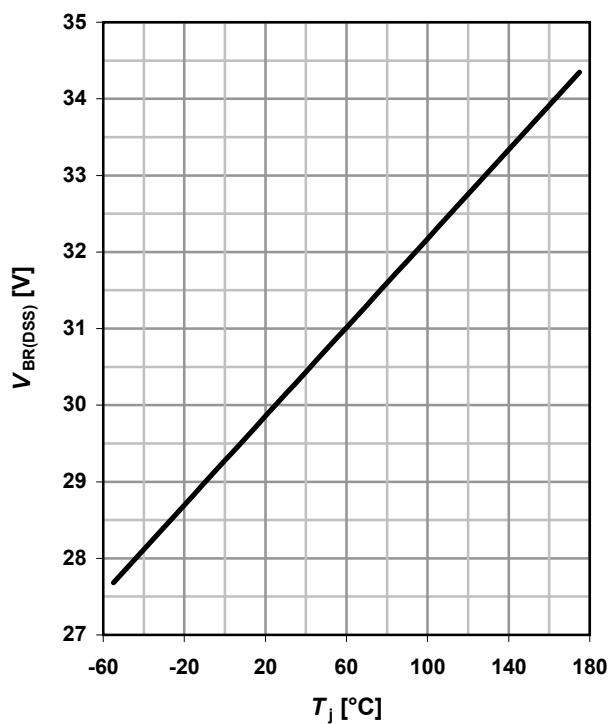
$$V_{GS}=f(Q_{gate}); I_D=21\text{ A pulsed}$$

parameter: V_{DD}

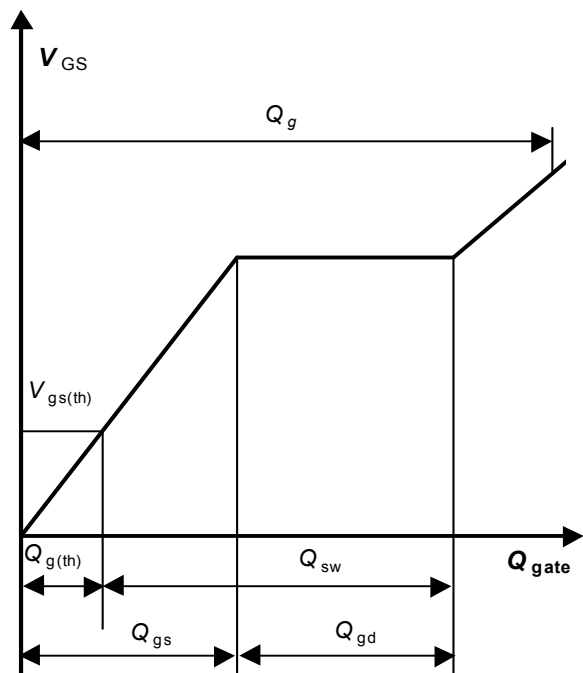


15 Drain-source breakdown voltage

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

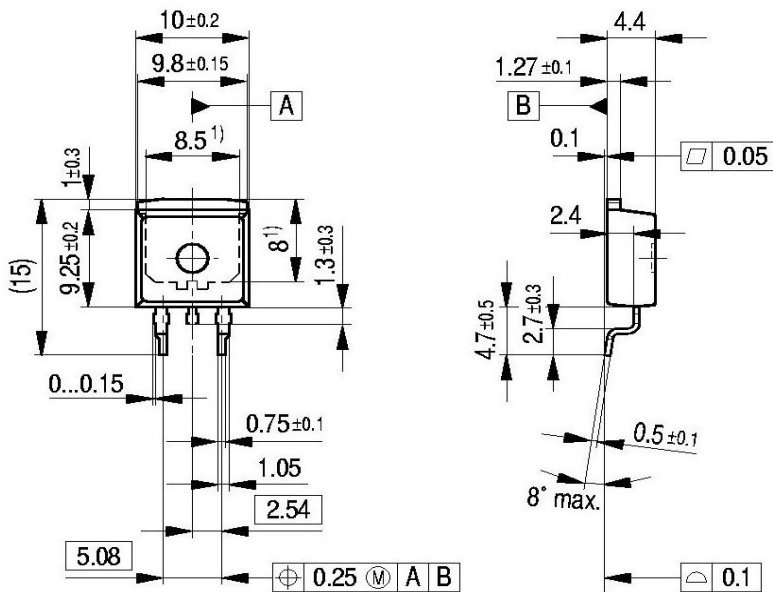


16 Gate charge waveforms



Package Outline

P-TO263-3-2: Outline

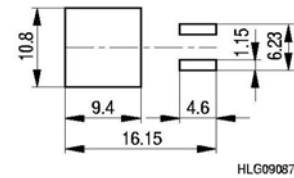


¹⁾ Typical

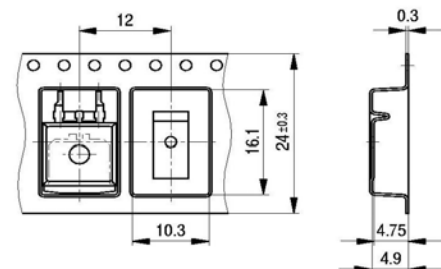
All metal surfaces tin plated, except area of cut.

GPT09085

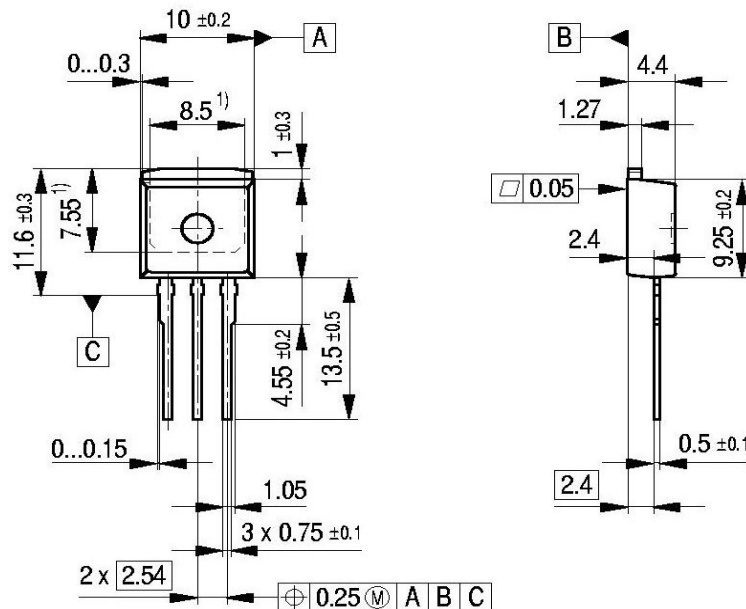
Footprint



Packaging



P-TO262-3-1: Outline



¹⁾ Typical

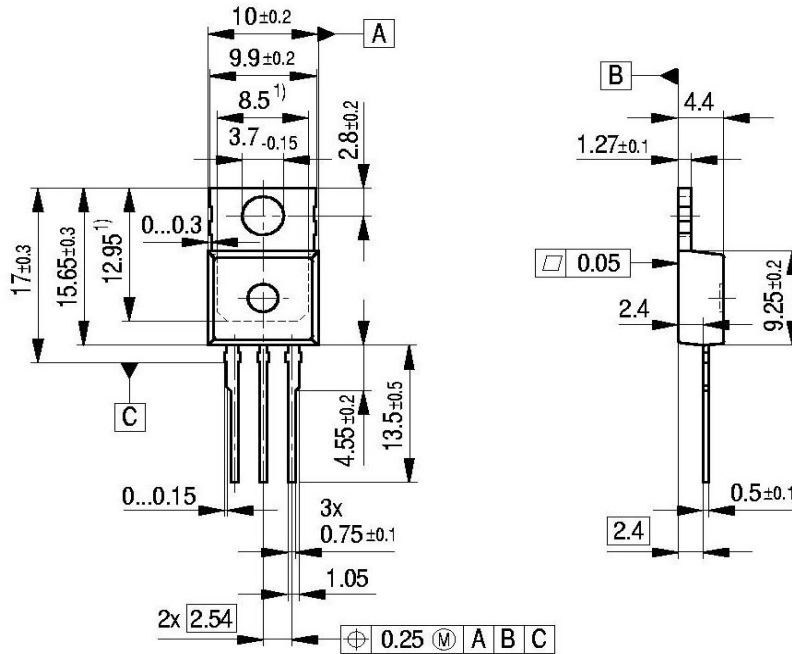
Metal surface min. X = 7.25, Y = 6.9

All metal surfaces tin plated, except area of cut.

Dimensions in mm

Package Outline

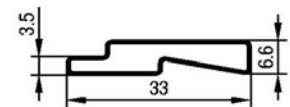
P-TO220-3-1: Outline



¹⁾ Typical

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

Packaging



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.