

**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

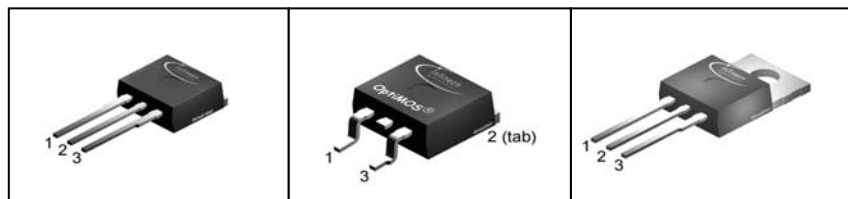
**Product Summary**

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

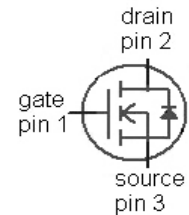
P-TO262-3-1

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 <sup>1)</sup>	$I_D$	$T_C=25\text{ °C}$	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 $T_{jmax}$ <sup>2)</sup>	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 <sup>2</sup> cooling area <sup>3)</sup>	-	-	40	

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**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	$\mu\text{A}$
		$V_{DS}=30\text{ V}, V_{GS}=0\text{ V}, T_j=125\text{ }^\circ\text{C}$	-	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 <sup>4)</sup>	$R_{DS(on)}$	$V_{GS}=4.5\text{ V}, I_D=21\text{ A}$	-	14.9	19.9	m $\Omega$
		$V_{GS}=4.5\text{ V}, I_D=21\text{ A},$ 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	-	$\Omega$
Transconductance	$g_{fs}$	$ V_{DS} >2 I_D R_{DS(on)max},$ $I_D=42\text{ A}$	21	42	-	S

<sup>1)</sup> 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](http://www.infineon.com/optimos).

<sup>2)</sup> Defined by design. Not subject to production test.

<sup>3)</sup> Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm<sup>2</sup> (one layer, 70  $\mu\text{m}$  thick) copper area for drain connection. PCB is vertical in still air.

<sup>4)</sup> 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**

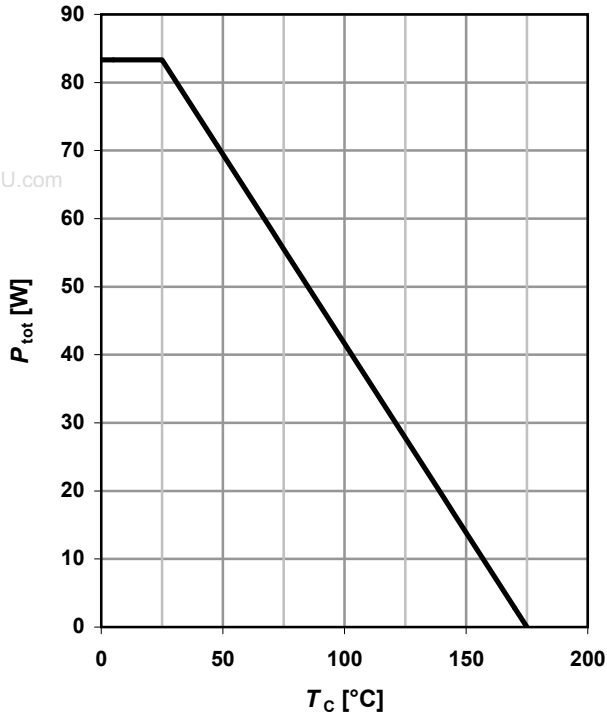
Gate to source charge	$Q_{gs}$	$V_{DD}=24\text{ V}, I_D=21\text{ A},$ $V_{GS}=0\text{ to }10\text{ V}$	-	2.7	3.6	nC
Gate to drain charge	$Q_{gd}$		-	7.9	11.9	
Gate charge total	$Q_g$		-	22.9	30.5	
Gate plateau voltage	$V_{plateau}$		-	3.5	-	V

**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	

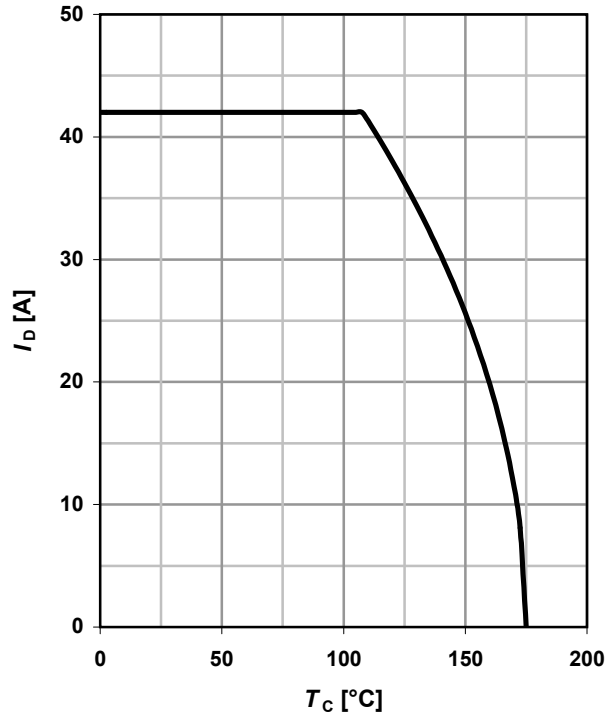
**1 Power dissipation**

$P_{tot}=f(T_C)$



**2 Drain current**

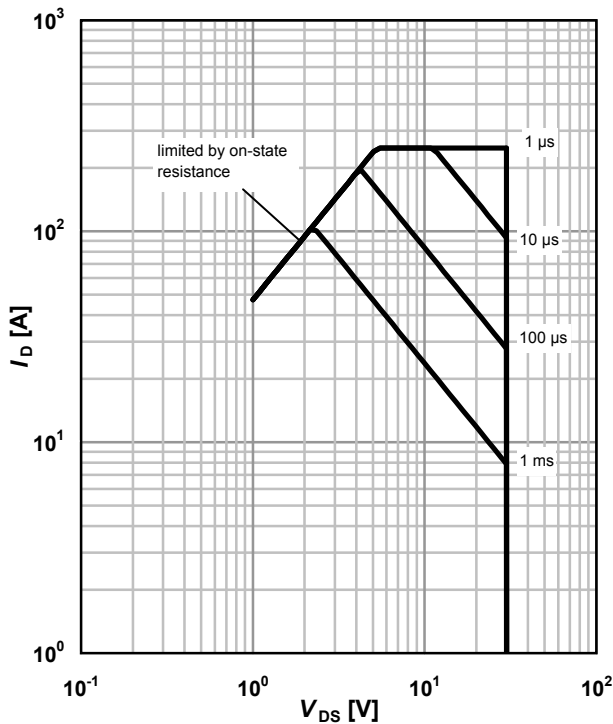
$I_D=f(T_C); V_{GS} \geq 10\text{ V}$



**3 Safe operating area**

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

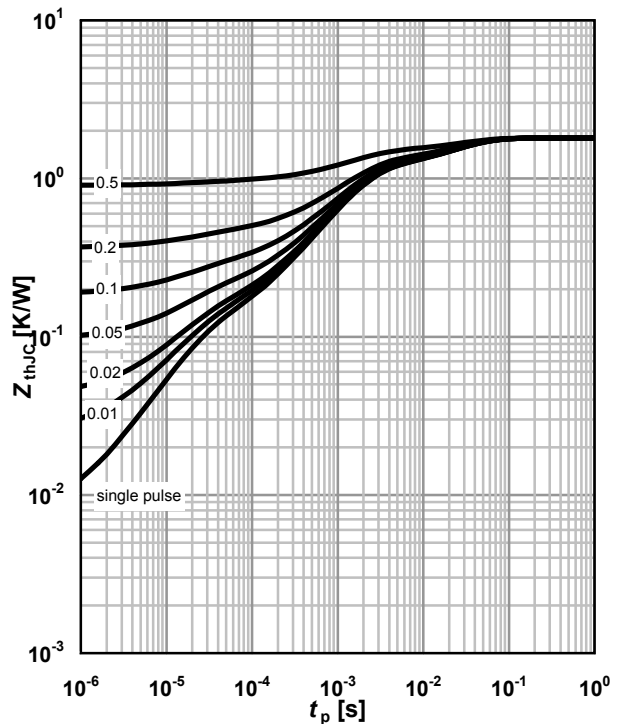
parameter:  $t_p$



**4 Max. transient thermal impedance**

$Z_{thJC}=f(t_p)$

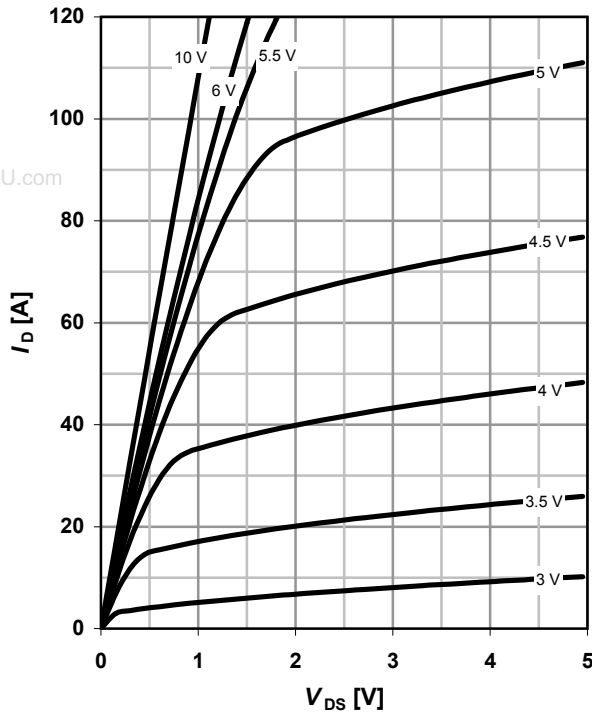
parameter:  $D=t_p/T$



**5 Typ. output characteristics**

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

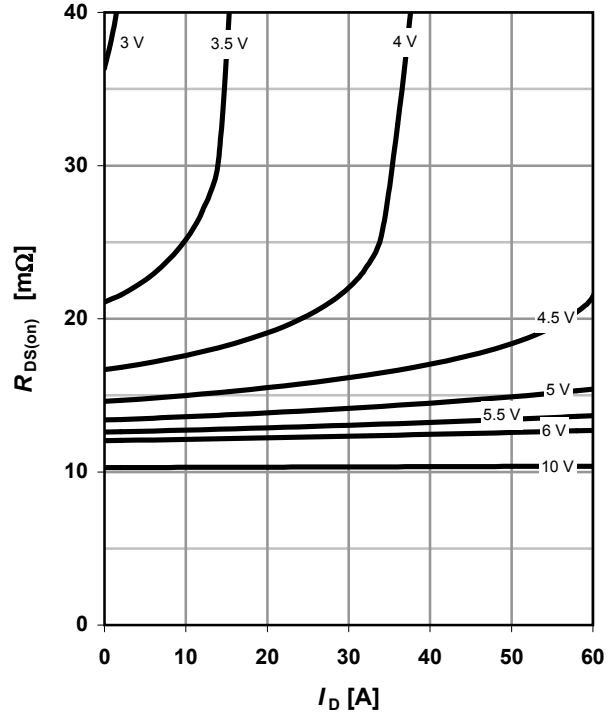
parameter:  $V_{GS}$



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

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

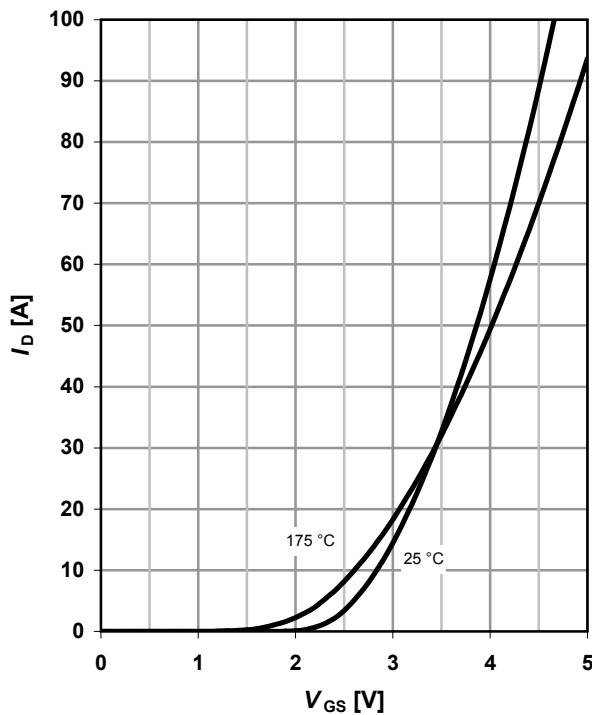
parameter:  $V_{GS}$



**7 Typ. transfer characteristics**

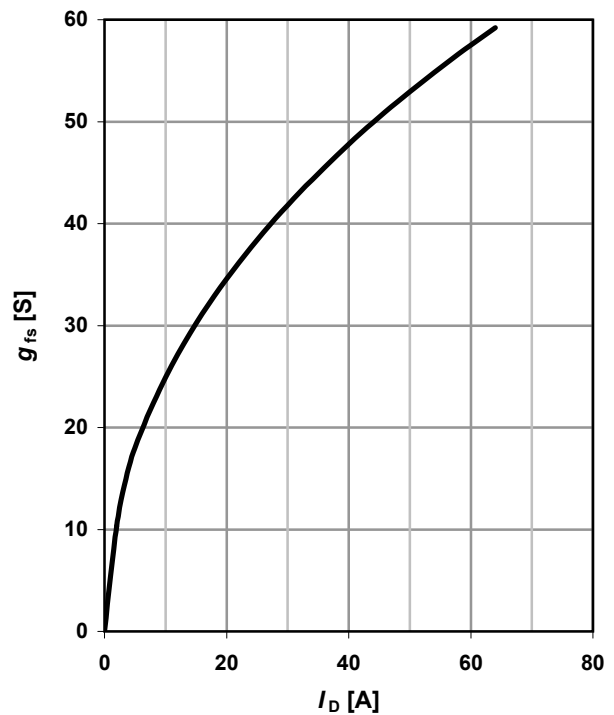
$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}$

parameter:  $T_j$



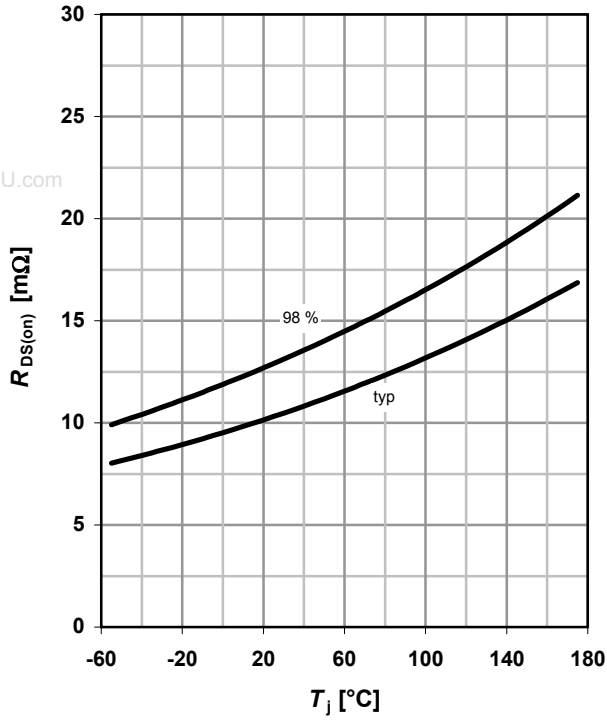
**8 Typ. forward transconductance**

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



**9 Drain-source on-state resistance**

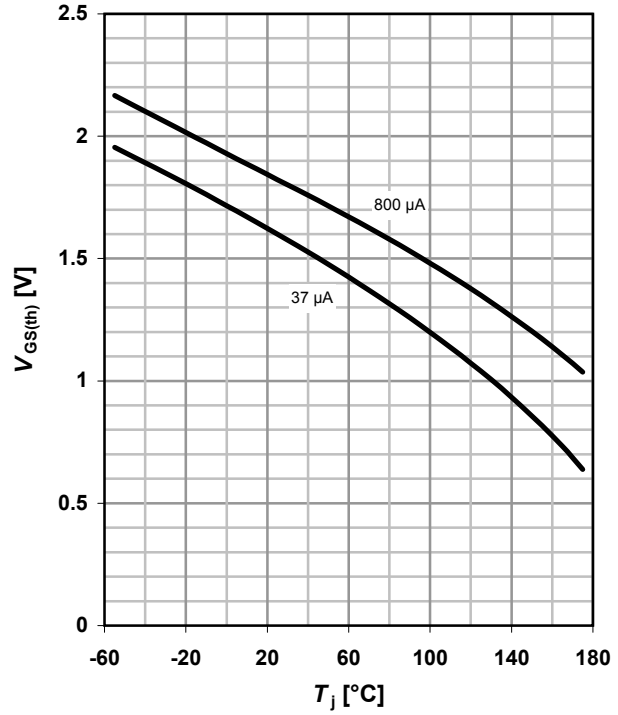
$R_{DS(on)}=f(T_j); I_D=21\text{ A}; V_{GS}=10\text{ V}$



**10 Typ. gate threshold voltage**

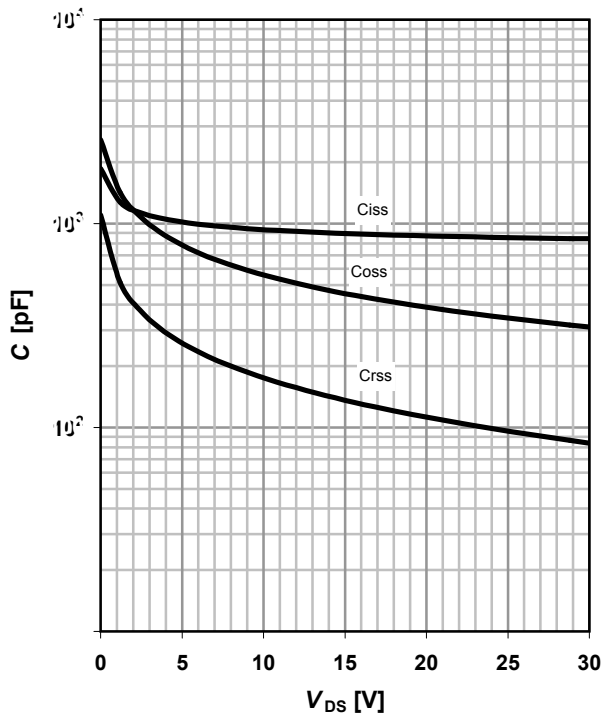
$V_{GS(th)}=f(T_j); V_{GS}=V_{DS}$

parameter:  $I_D$



**11 Typ. capacitances**

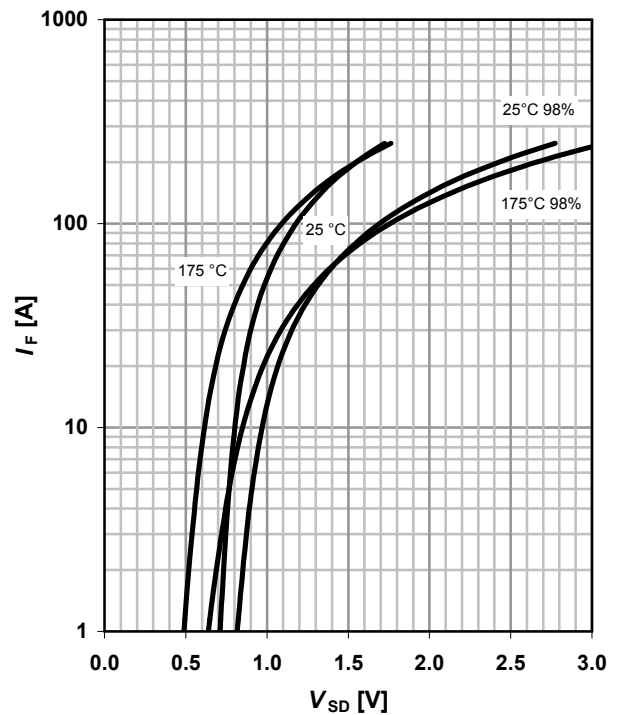
$C=f(V_{DS}); V_{GS}=0\text{ V}; f=1\text{ MHz}$



**12 Forward characteristics of reverse diode**

$I_F=f(V_{SD})$

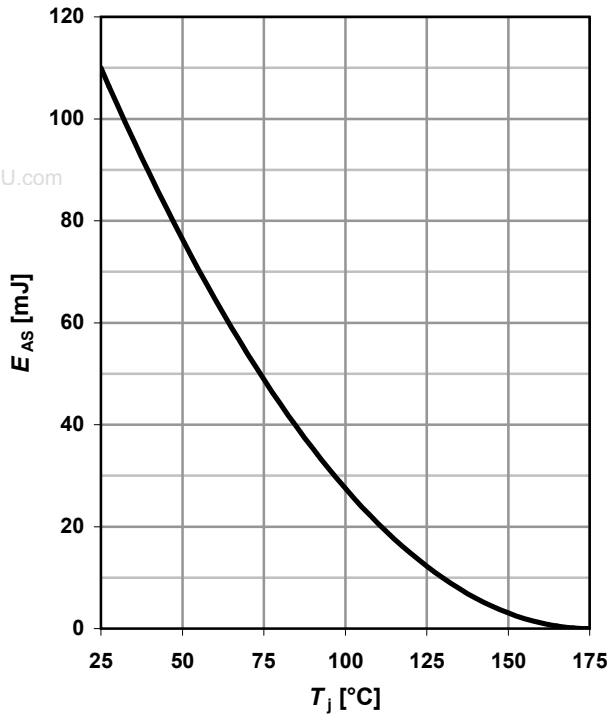
parameter:  $T_j$



**13 Avalanche characteristics**

$E_{AS} = f(T_j)$

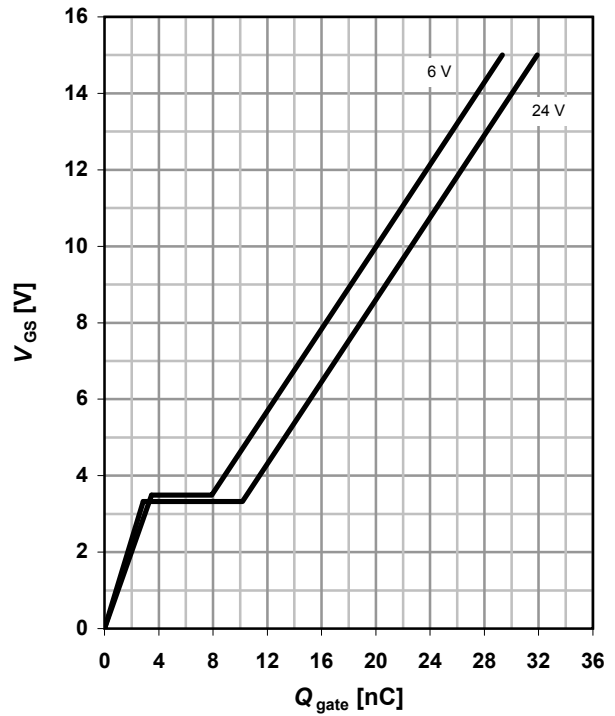
parameter:  $I_D = 42A, V_{DD} = 25V, R_{GS} = 25\Omega$



**14 Typ. gate charge**

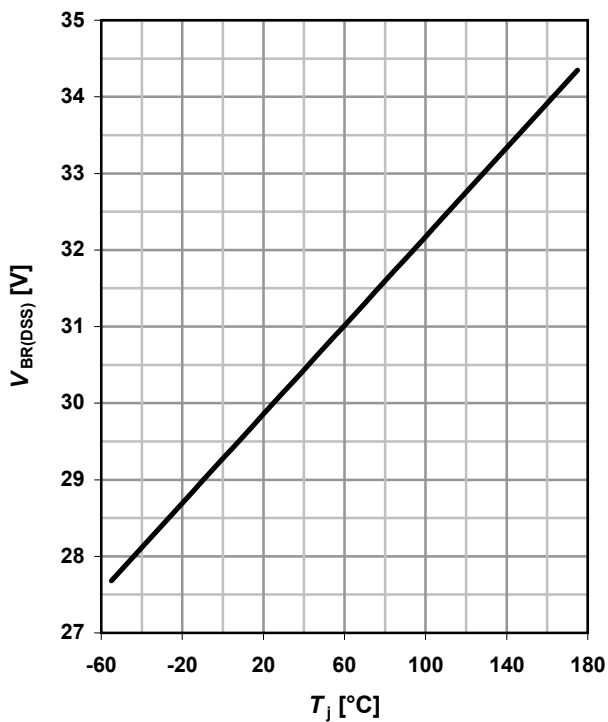
$V_{GS} = f(Q_{gate}); I_D = 21A$  pulsed

parameter:  $V_{DD}$

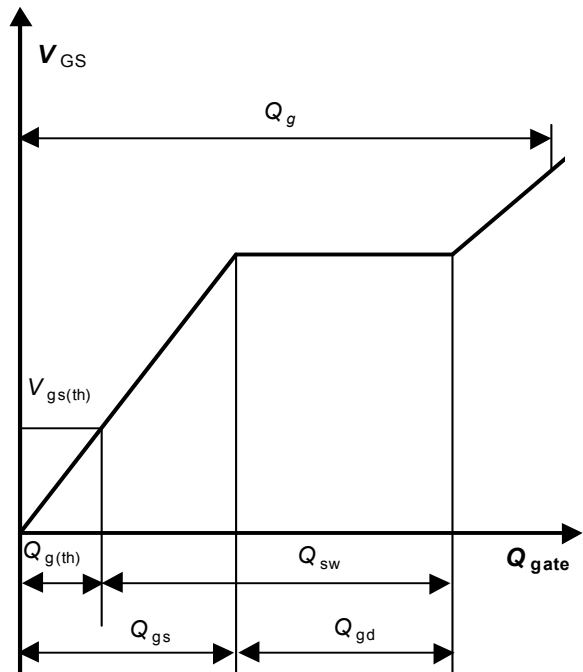


**15 Drain-source breakdown voltage**

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

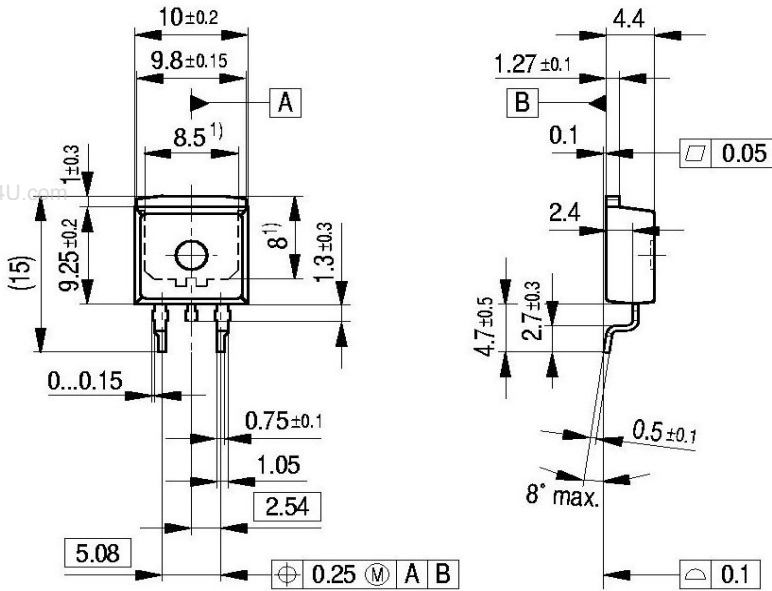


**16 Gate charge waveforms**

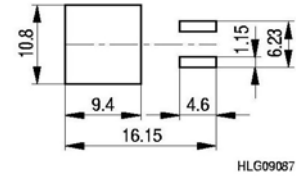


Package Outline

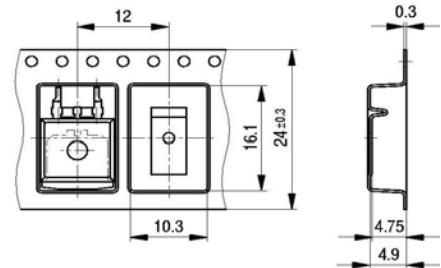
P-TO263-3-2: Outline



Footprint



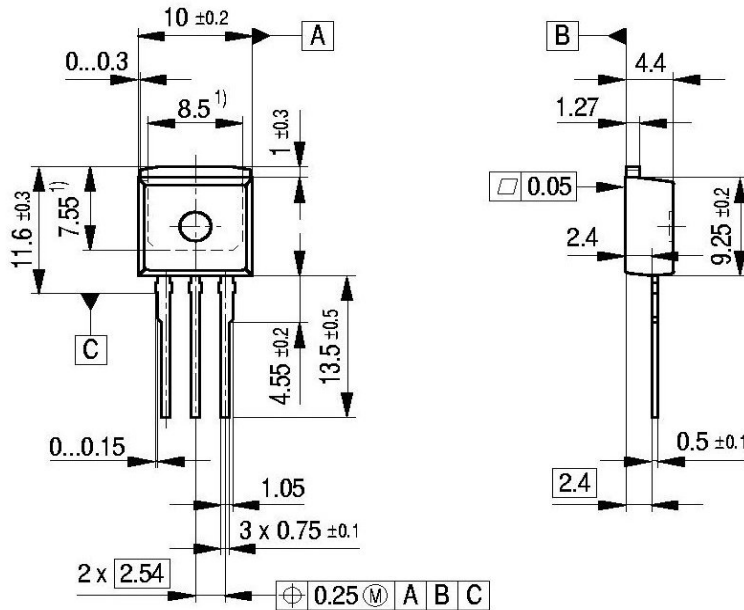
Packaging



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

GPT09085

P-TO262-3-1: Outline



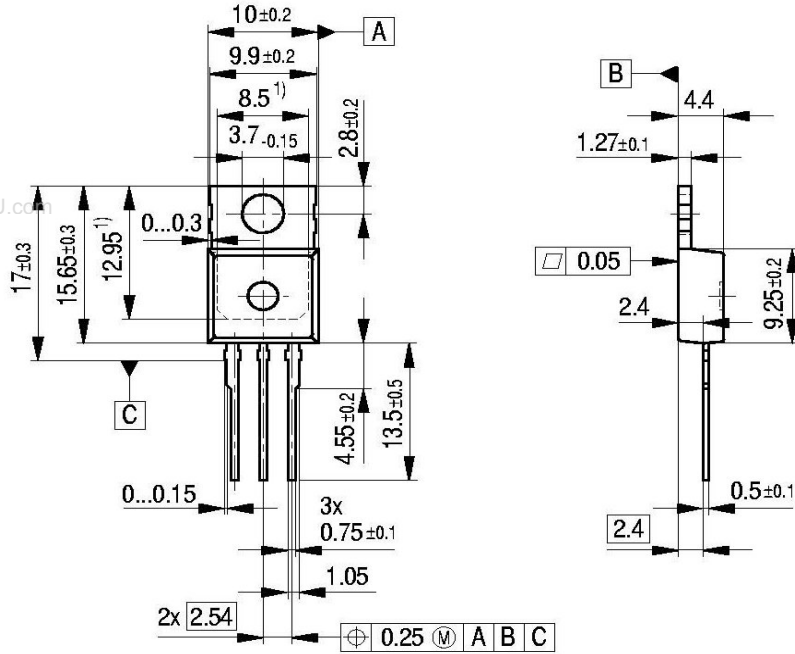
1) Typical  
Metal surface min. X = 7.25, Y = 6.9  
All metal surfaces tin plated, except area of cut.

Dimensions in mm

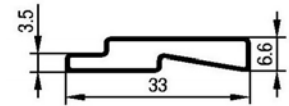


Package Outline

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.