ShinDengen

P24B4SBK

Power MOSFETs
40V, 24A, N-channel

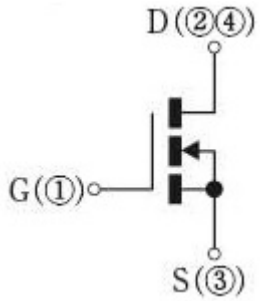
Feature

- N-channel
- SMD
- Low Ron
- 4.5V Gate Drive
- Low Capacitance
- Based on AEC-Q101
- Halogen free • Pb free terminal
- RoHS:Yes

OUTLINE

Package (House Name): FB
Package (JEDEC Code): TO-252AA

Equivalent circuit



Absolute Maximum Ratings (unless otherwise specified : Tc=25℃)

Item	Symbol	Conditions	Ratings	Unit
Storage temperature	Tstg		-55 to 175	℃
Channel tempertature	Tch		-55 to 175	℃
Drain-source voltage	V_{DSS}		40	V
Gate-source voltage	V_{GSS}		±20	V
Continuous drain current(DC)	I_D		24	A
Continuous drain current(Peak)	I_{DP}	Pulse width 10μs, duty=1/100	72	A
Continuous source current(DC)	Is		24	A
Total power dissipation	P_T	With heatsink※	23	W
Total power dissipation	P_T	Measured on the 1 inch² glass epoxy substrate pattern area：586.81㎟	3.3	W
Total power dissipation	P_T	Measured on the 1 inch² glass epoxy substrate pattern area：102.19㎟	2	W
Single avalanche current	I_{AS}	Starting Tch=25℃ Tch≦150℃	17	A
Single avalanche energy	E_{AS}	Starting Tch=25℃ Tch≦150℃	29	mJ

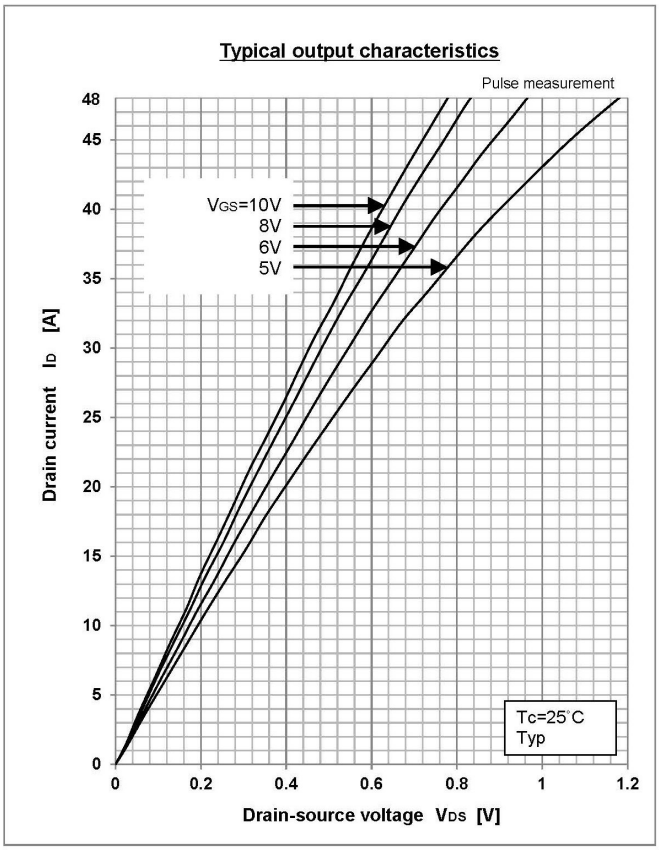
※ ：See the original Specifications

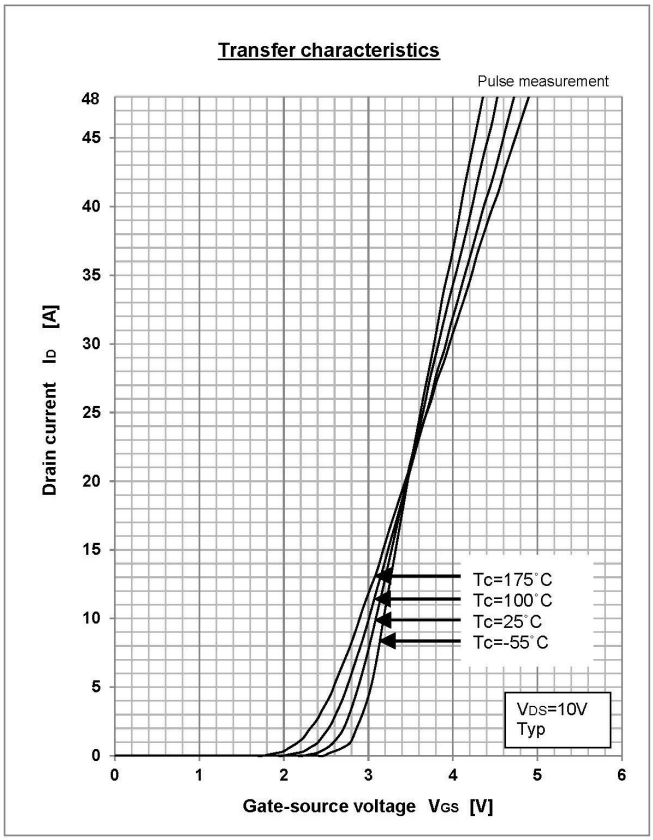
Electrical Characteristics (unless otherwise specified : Tc=25℃)

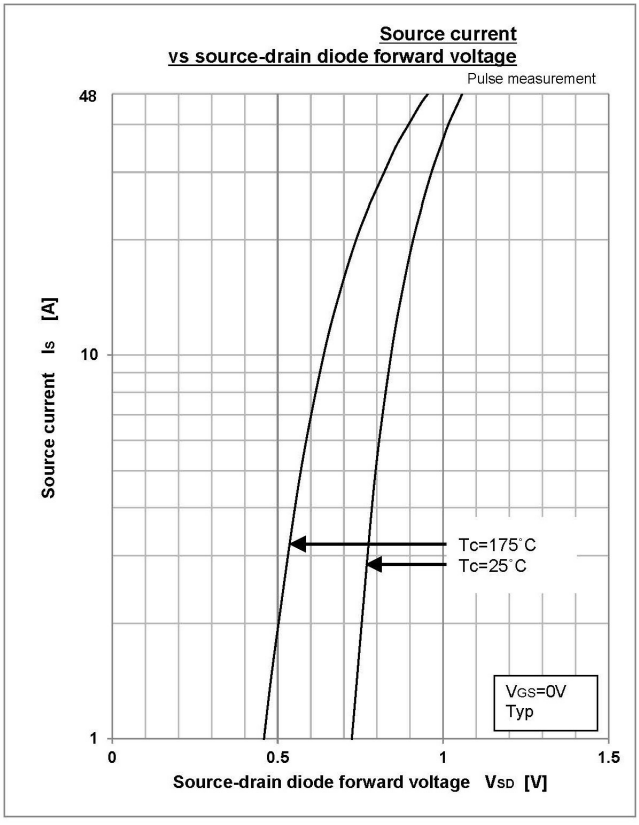
Item	Symbol	Conditions	Ratings			Unit
			MIN	TYP	MAX	
Drain-Source breakdown voltage	$V_{(BR)DSS}$	ID=1mA, VGS=0V	40			V
Zero gate voltage drain current	I_{DSS}	VDS=40V, VGS=0V			1	μA
Gate-source leakage current	I_{GSS}	VGS=±20V, VDS=0V			±10	μA
Forward transconductance	g_{fs}	ID=12A, VDS=10V	6			S
Static drain-source on-state resistance	$R_{DS(ON)}$	ID=12A, VGS=10V		0.0148	0.0185	Ω
Static drain-source on-state resistance	$R_{DS(ON)}$	ID=12A, VGS=4.5V		0.022	0.029	Ω
Gate threshold voltage	Vth	ID=1mA, VDS=10V	1.5	2	2.5	V
Source-drain diode forward voltage	V_{SD}	IS=24A, VGS=0V			1.5	V
Thermal resistance	Rth(j-c)	Junction to case, with heatsink ※			6.28	℃/W
Thermal resistance	Rth(j-a)	Junction to ambient Measured on the 1 inch² glass epoxy substrate pattern area：586.81㎟			45	℃/W
Thermal resistance	Rth(j-a)	Junction to ambient Measured on the 1 inch² glass epoxy substrate pattern area：102.19㎟			75	℃/W
Total gate charge	Qg	VDD=32V, VGS=10V, ID=24A		16.5		nC
Gate to source charge	Qgs	VDD=32V, VGS=10V, ID=24A		4.3		nC
Gate to drain charge	Qgd	VDD=32V, VGS=10V, ID=24A		4.1		nC
Input capacitance	Ciss	VDS=25V, VGS=0V, f=1MHz		645		pF
Reverce transfer capacitnce	Crss	VDS=25V, VGS=0V, f=1MHz		55		pF
Output capacitance	Coss	VDS=25V, VGS=0V, f=1MHz		115		pF
Turn-on delay time	td(on)	ID=12A, RL=1.67Ω, VDD=20V, Rg=0Ω, VGS(+)=10V, VGS(-)=0V		3.5		ns
Rise time	tr	ID=12A, RL=1.67Ω, VDD=20V, Rg=0Ω, VGS(+)=10V, VGS(-)=0V		11		ns
Turn-off delay time	td(off)	ID=12A, RL=1.67Ω, VDD=20V, Rg=0Ω, VGS(+)=10V, VGS(-)=0V		12		ns
Fall time	tf	ID=12A, RL=1.67Ω, VDD=20V, Rg=0Ω, VGS(+)=10V, VGS(-)=0V		4.5		ns
Diode reverse recovery time	trr	IF=24A, VGS=0V, di/dt=100A/μs		34		ns
Diode reverse recovery charge	Qrr	IF=24A, VGS=0V, di/dt=100A/μs		29		nC

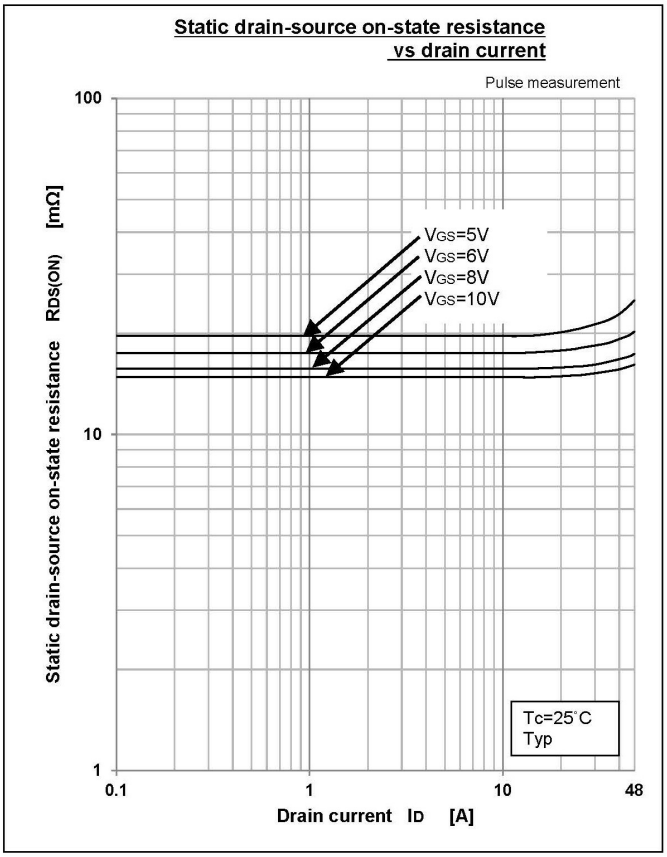
※ ：See the original Specifications

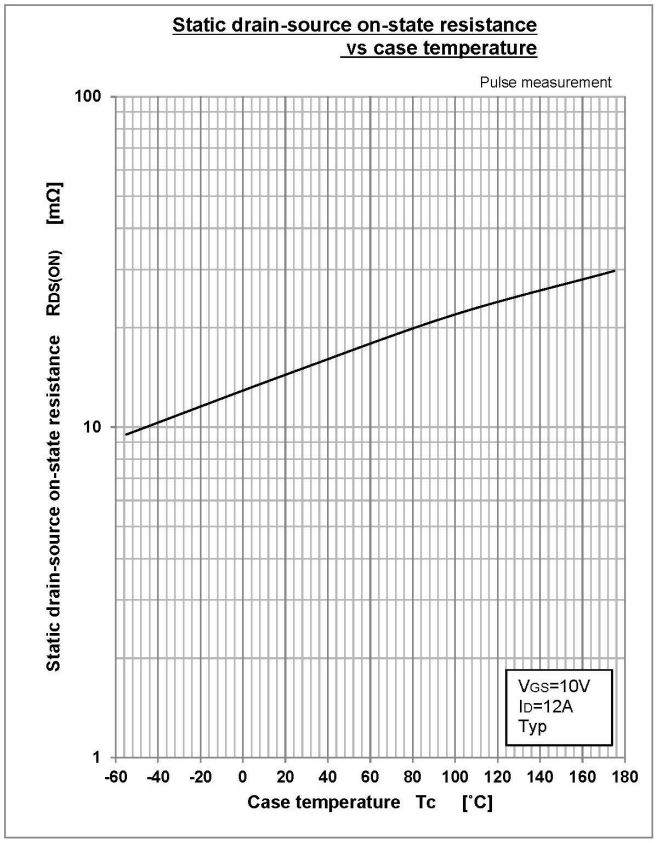
CHARACTERISTIC DIAGRAMS

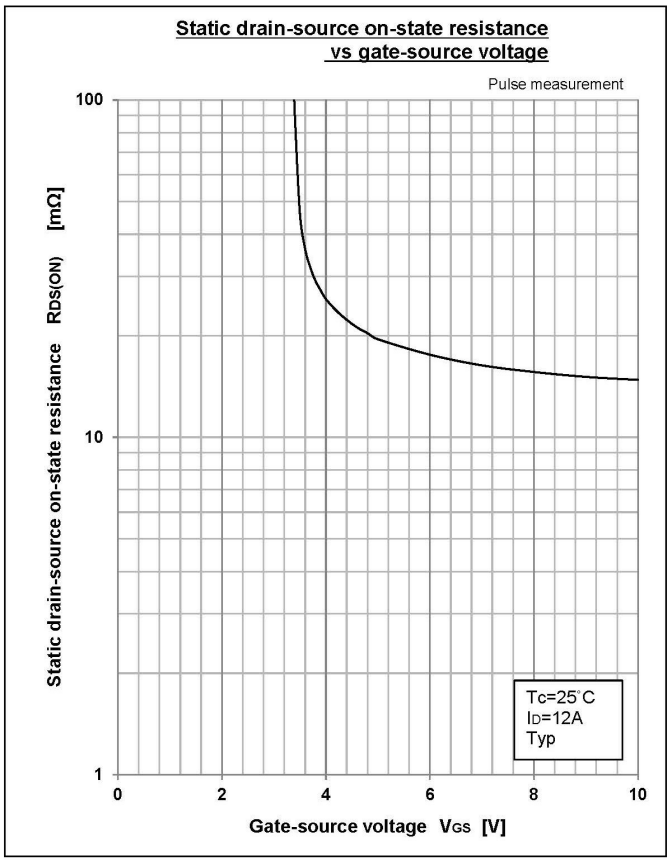


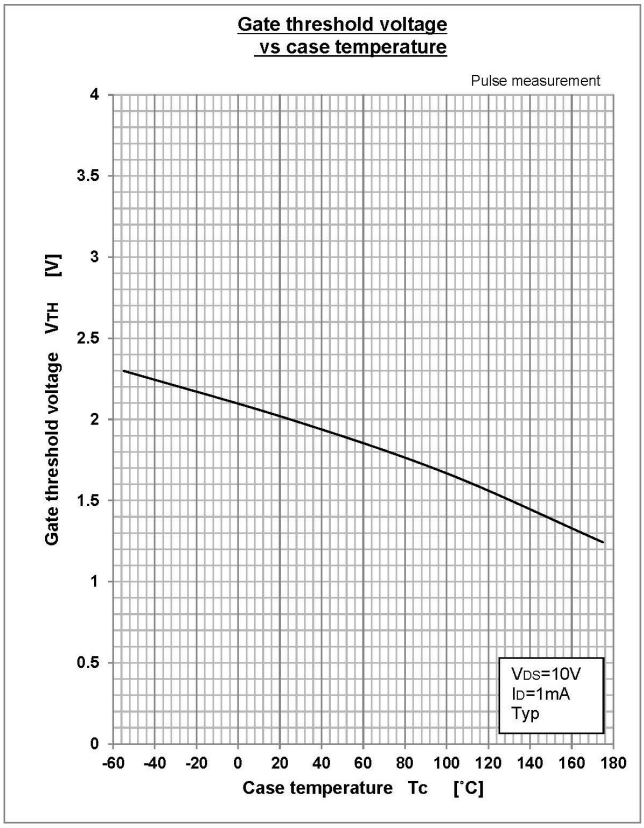


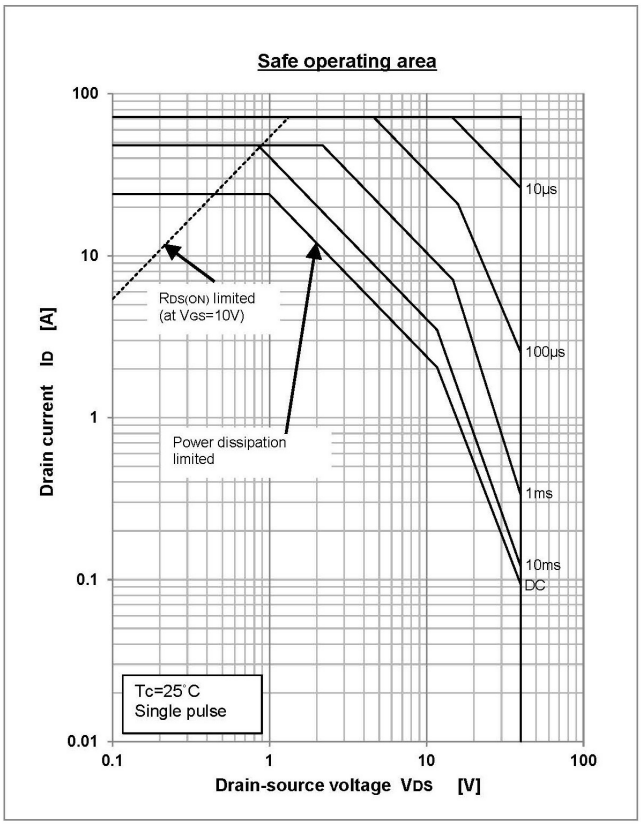


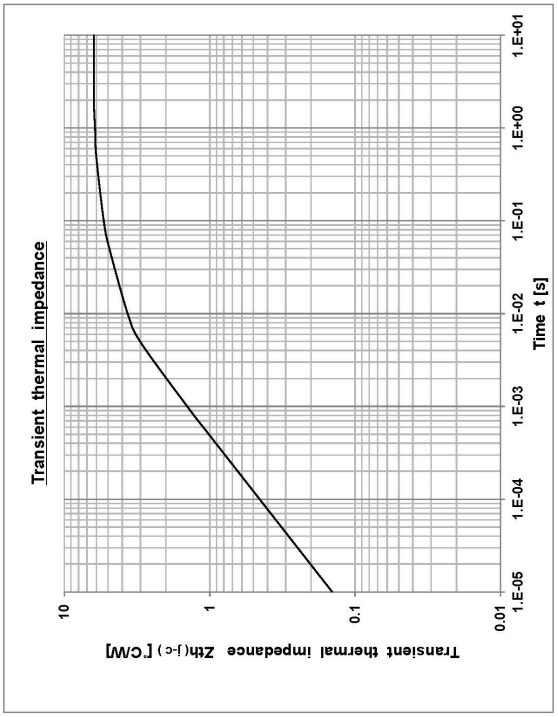



Static drain-source on-state resistance
vs case temperature
Pulse measurement
Static drain-source on-state resistance RDS(ON) [mΩ]
100
10
1
-60 -40 -20 0 20 40 60 80 100 120 140 160 180
Case temperature Tc [°C]
VGS=10V
ID=12A
Typ

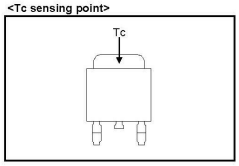

Static drain-source on-state resistance
vs gate-source voltage
Pulse measurement
Static drain-source on-state resistance RDS(ON) [mΩ]
100
10
1
0 2 4 6 8 10
Gate-source voltage VGS [V]
Tc=25°C
ID=12A
Typ


Gate threshold voltage
vs case temperature
Pulse measurement
Gate threshold voltage VTH [V]
4
3.5
3
2.5
2
1.5
1
0.5
0
-60 -40 -20 0 20 40 60 80 100 120 140 160 180
Case temperature Tc [°C]
VDS=10V
ID=1mA
Typ


Safe operating area
Drain current ID [A]
100
10
1
0.1
0.01
0.1 1 10 100
Drain-source voltage VDS [V]
10μs
100μs
1ms
10ms
DC
RDS(ON) limited
(at VGS=10V)
Power dissipation
limited
Tc=25°C
Single pulse



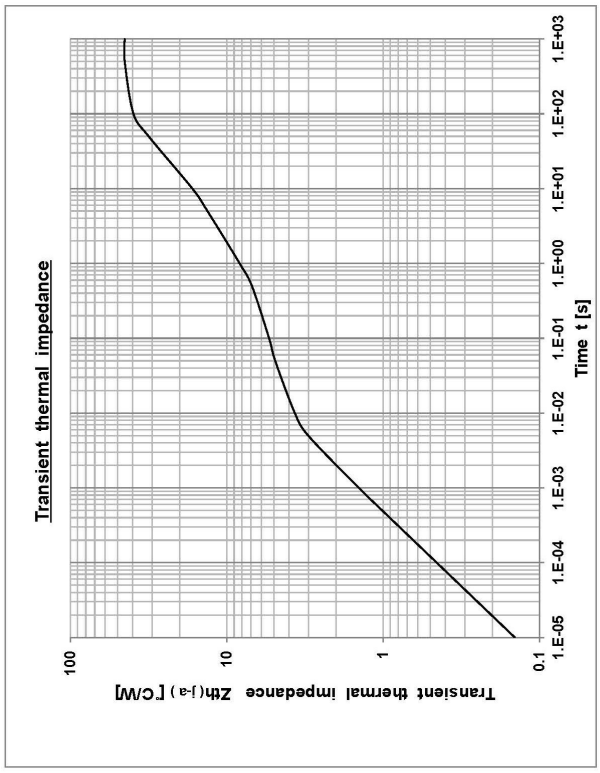
<Tc sensing point>



<Substrate detail>

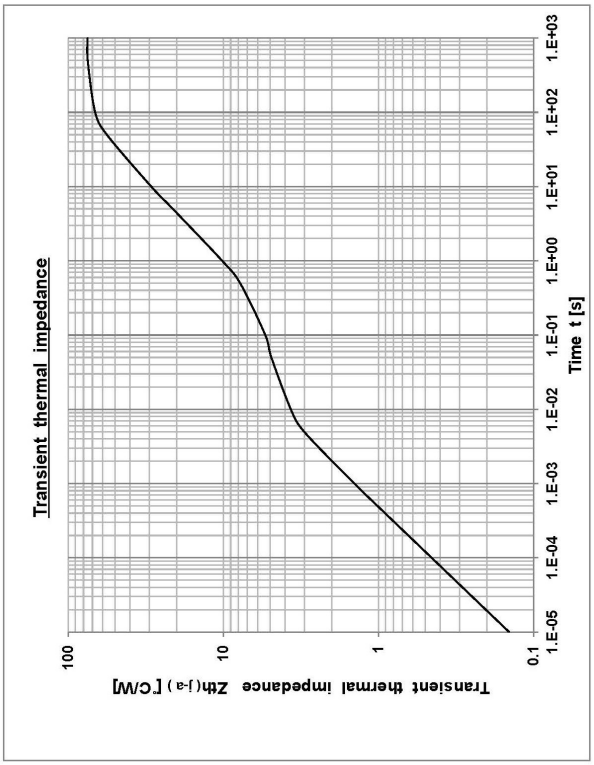
Type	Alumina
Size	1 inch^2
Thickness	0.64 mm
Conductor thickness	20 µm
Pattern area	65 mm^2

Specification No.	P



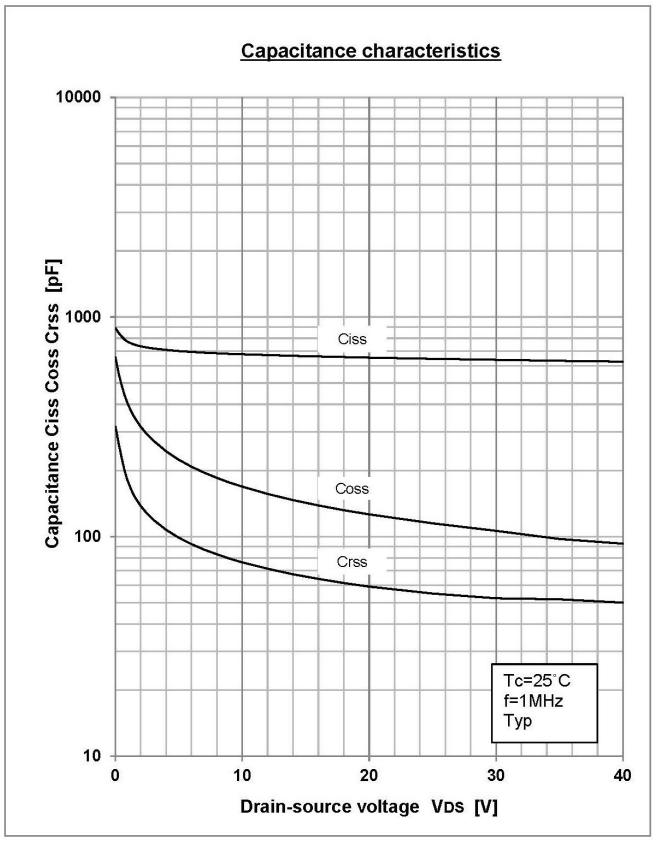
<Substrate detail>

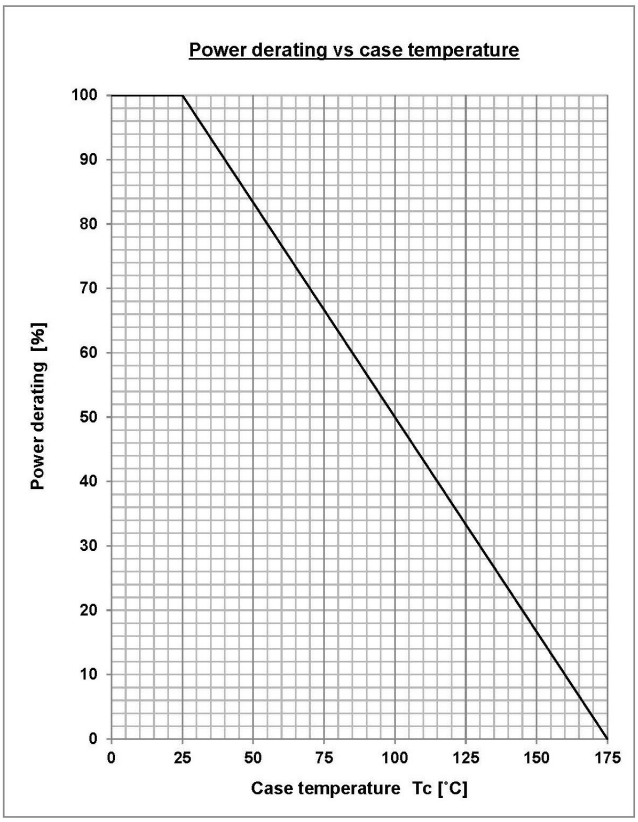
Type	Glass-epoxy
Size	1 inch^2
Thickness	1.6 mm
Conductor thickness	70 µm
Pattern area	586.81 mm^2

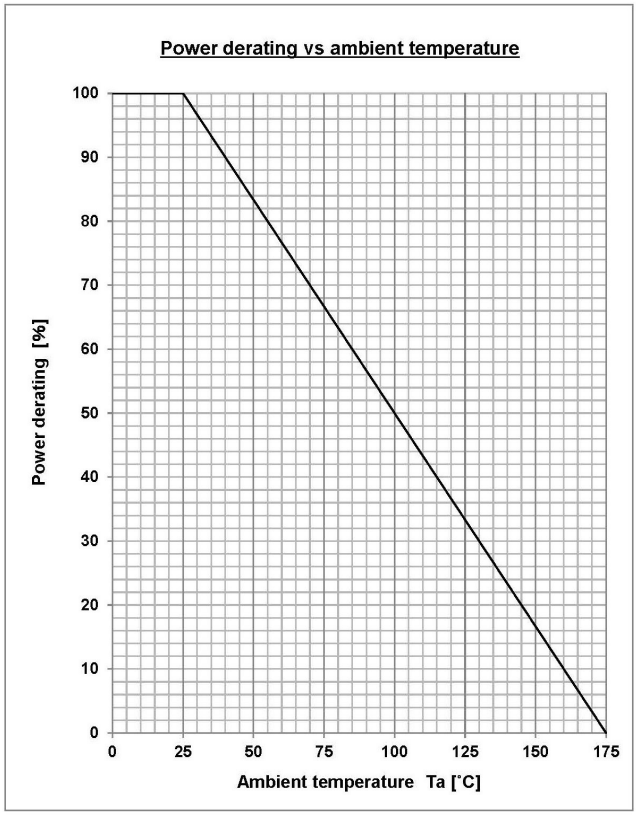


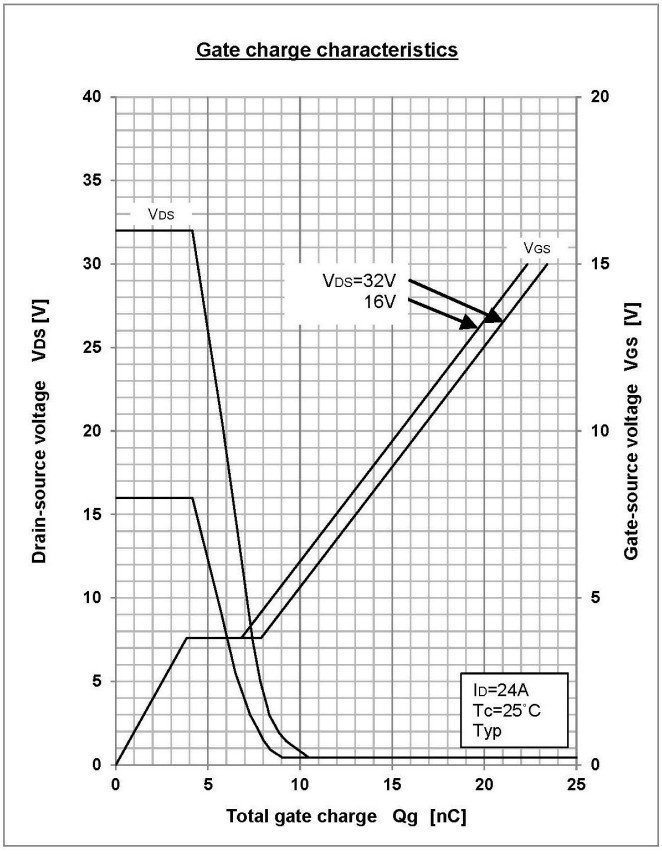
<Substrate detail>

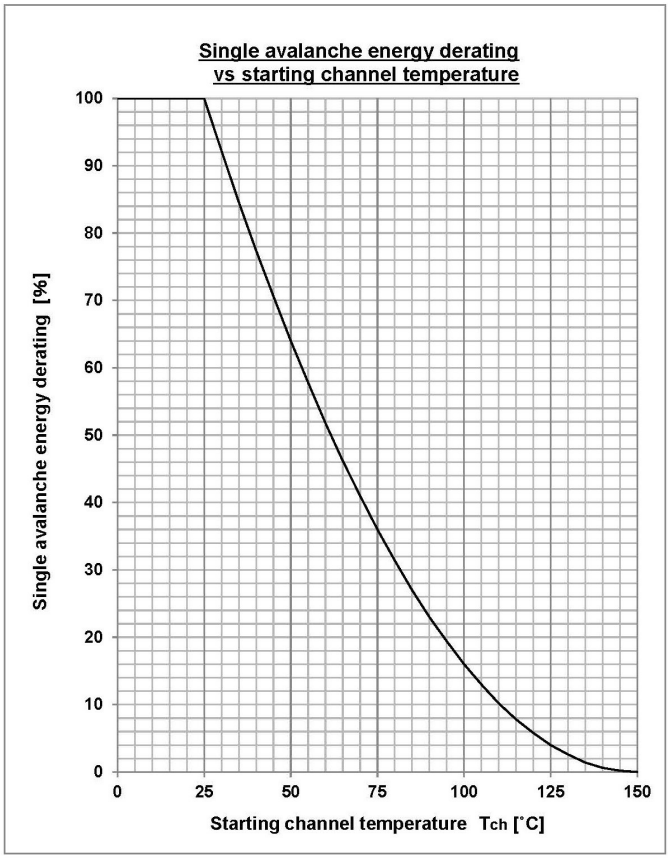
Type	Glass-epoxy
Size	1 inch^2
Thickness	1.6 mm
Conductor thickness	70 µm
Pattern area	102.19 mm^2




Power derating vs case temperature
Power derating [%]
Case temperature Tc [˚C]
0
10
20
30
40
50
60
70
80
90
100
0
25
50
75
100
125
150
175


Power derating vs ambient temperature
Power derating [%]
Ambient temperature Ta [˚C]
0
10
20
30
40
50
60
70
80
90
100
0
25
50
75
100
125
150
175


Gate charge characteristics
Drain-source voltage VDS [V]
Gate-source voltage VGS [V]
Total gate charge Qg [nC]
VDS
VGS
VDS=32V
16V
ID=24A
Tc=25˚C
Typ
0
5
10
15
20
25
30
35
40
0
5
10
15
20

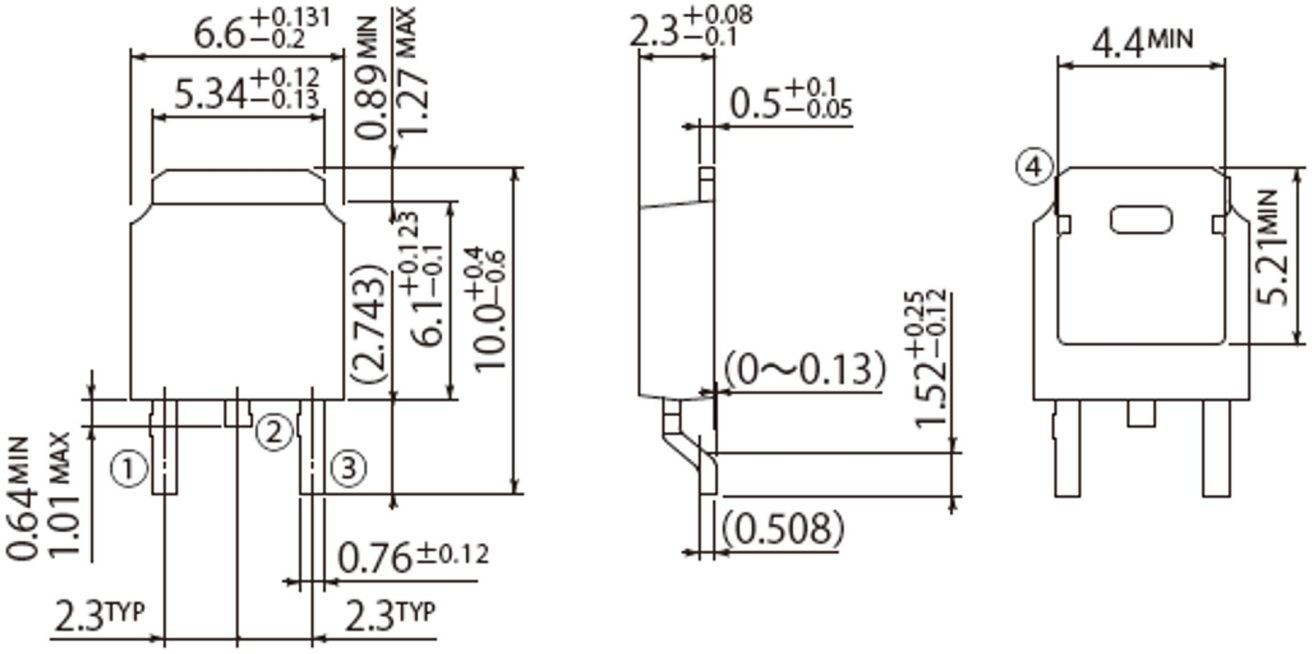

Single avalanche energy derating
vs starting channel temperature
Single avalanche energy derating [%]
Starting channel temperature Tch [˚C]
0
10
20
30
40
50
60
70
80
90
100
0
25
50
75
100
125
150

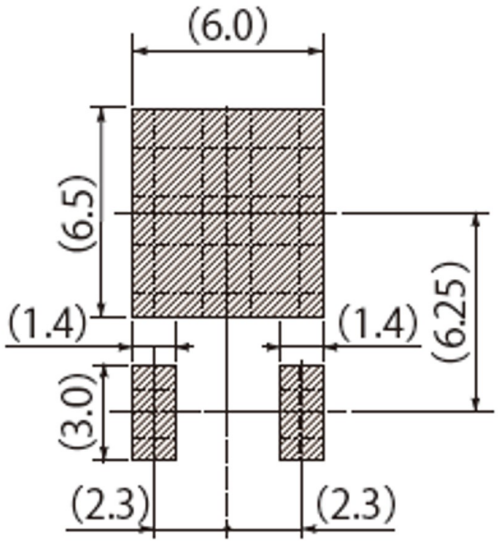
Outline Dimensions

unit:mm

G2

JEDEC Code	TO-252AA
JEITA Code	–
House Name	FB





Referential Soldering Pad

Notes

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