WPB4002

N-Channel Power MOSFET
600V, 23A, 0.36Ω, TO-3P-3L

ON Semiconductor®

http://onsemi.com

TO-3P-3L

Features

- Reverse recovery time t_{rr}=115ns (typ)
- Input capacitance Ciss=2200pF (typ)
- ON-resistance R_{DS}(on)=0.28Ω (typ)
- 10V drive
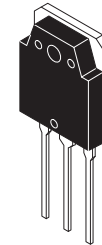
Specifications

Absolute Maximum Ratings at Ta=25°C

Parameter	Symbol	Conditions	Ratings	Unit
Drain to Source Voltage	V_{DSS}		600	V
Gate to Source Voltage	V_{GSS}		±30	V
Drain Current (DC)	I_D		23	A
Drain Current (Pulse)	I_{DP}	PW≤10μs, duty cycle≤1%	80	A
Source to Drain Diode Forward Current (DC)	I_{SD}		23	A
Source to Drain Diode Forward Current (Pulse)	I_{SDP}	PW≤10μs, duty cycle≤1%	80	A
Allowable Power Dissipation	P_D		2.5	W
		Tc=25°C	220	W
Channel Temperature	Tch		150	°C
Storage Temperature	Tstg		−55 to +150	°C
Avalanche Energy (Single Pulse) *1	E_{AS}		157	mJ
Avalanche Current *2	I_{AV}		17	A

Note :*1 V_{DD}=50V, L=1mH, I_{AV}=17A (Fig.1)

*2 L≤1mH, single pulse

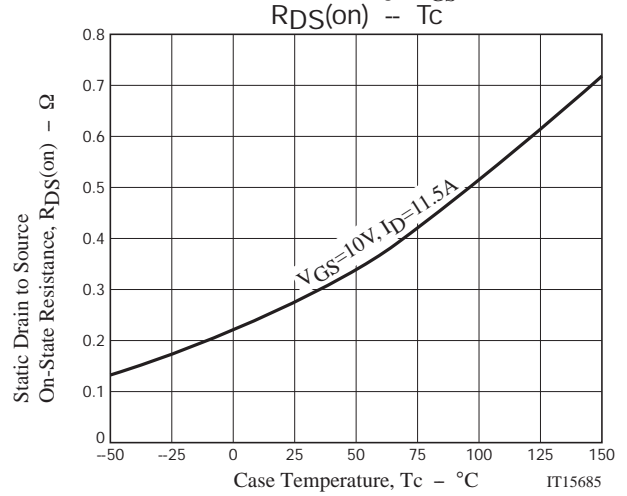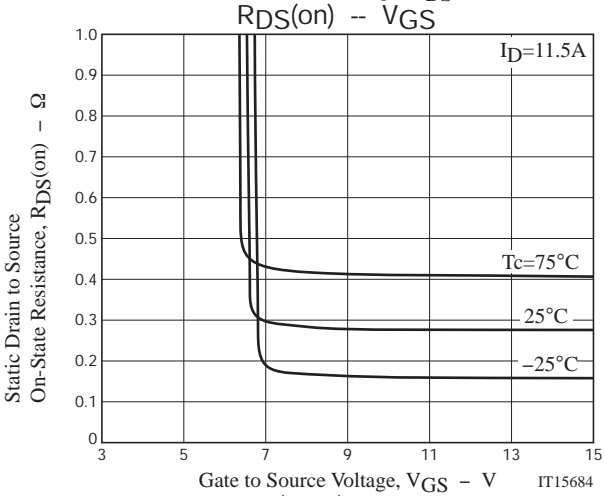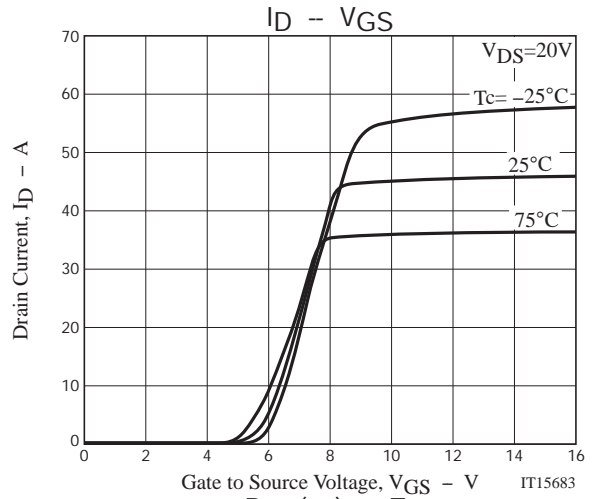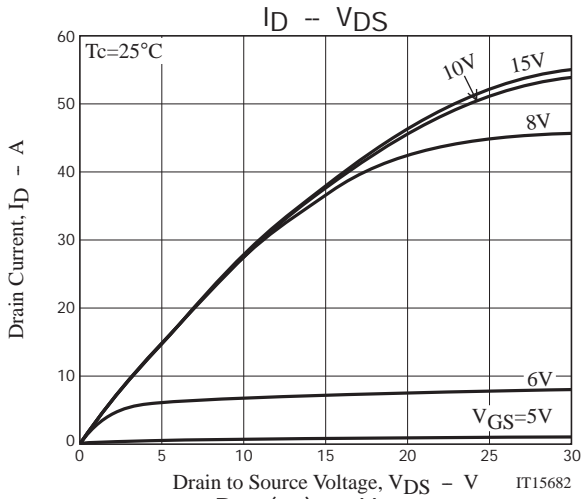Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.
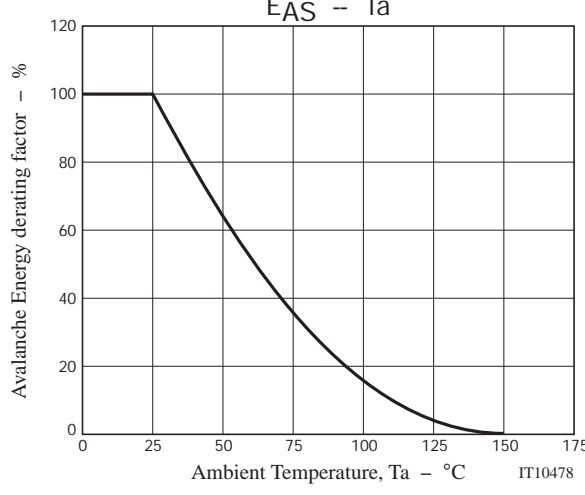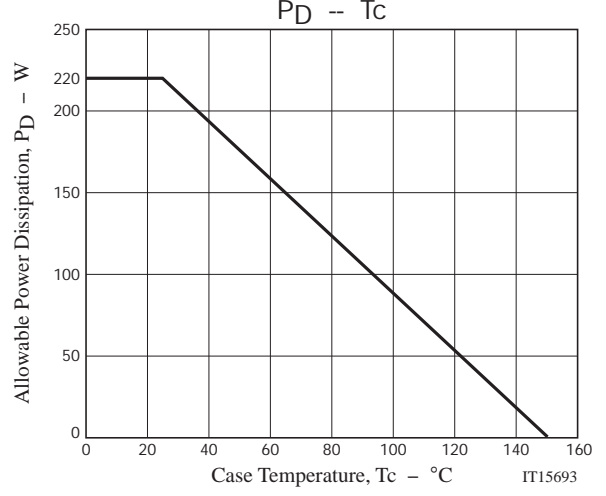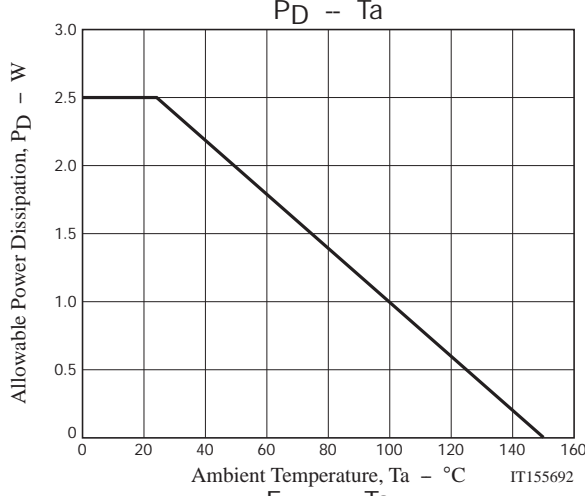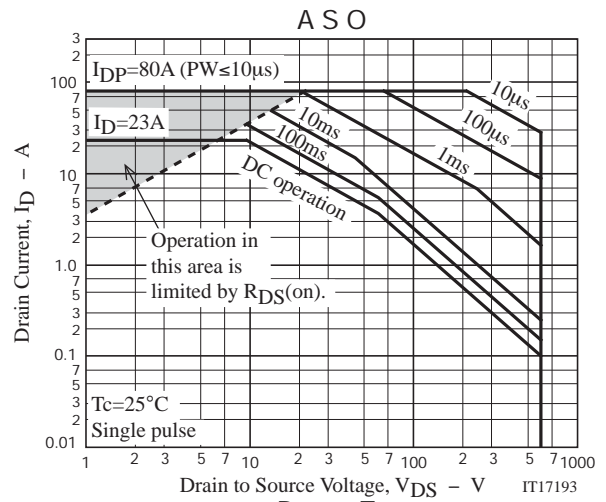
Electrical Characteristics at Ta=25°C

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Drain to Source Breakdown Voltage	$V_{(BR)DSS}$	I_D=10mA, V_{GS}=0V	600			V
Zero-Gate Voltage Drain Current	I_{DSS}	V_{DS}=480V, V_{GS}=0V			100	μA
Gate to Source Leakage Current	I_{GSS}	V_{GS}=±30V, V_{DS}=0V			±100	nA
Cutoff Voltage	V_{GS}(off)	V_{DS}=10V, I_D=1mA	3		5	V
Forward Transfer Admittance	| yfs |	V_{DS}=10V, I_D=11.5A	7.5	15		S
Static Drain to Source On-State Resistance	R_{DS}(on)	I_D=11.5A, V_{GS}=10V		0.28	0.36	Ω
Input Capacitance	Ciss			2200		pF
Output Capacitance	Coss	V_{DS}=30V, f=1MHz		400		pF
Reverse Transfer Capacitance	Crss			83		pF
Turn-ON Delay Time	t_d(on)			42		ns
Rise Time	t_r			130		ns
Turn-OFF Delay Time	t_d(off)	See Fig.2		234		ns
Fall Time	t_f			84		ns
Total Gate Charge	Qg			84		nC
Gate to Source Charge	Qgs	V_{DS}=200V, V_{GS}=10V, I_D=23A		15.2		nC
Gate to Drain "Miller" Charge	Qgd			45.4		nC
Diode Forward Voltage	V_{SD}	I_S=23A, V_{GS}=0V		1.1	1.5	V
Reverse Recovery Time	t_{rr}	See Fig.3		115		ns
Reverse Recovery Charge	Q_{rr}	I_{SD}=23A, V_{GS}=0V, di/dt=100A/μs		340		nC

ORDERING INFORMATION

See detailed ordering and shipping information on page 4 of this data sheet.

I_D -- V_{DS}

Tc=25°C

Drain Current, I_D – A

10V 15V
8V
6V
V_{GS}=5V

Drain to Source Voltage, V_{DS} – V

IT15682

I_D -- V_{GS}

V_{DS}=20V

Tc= −25°C
25°C
75°C

Drain Current, I_D – A

Gate to Source Voltage, V_{GS} – V

IT15683

$R_{DS(on)}$ -- V_{GS}

I_D=11.5A

Static Drain to Source On-State Resistance, $R_{DS(on)}$ – Ω

Tc=75°C
25°C
−25°C

Gate to Source Voltage, V_{GS} – V

IT15684

$R_{DS(on)}$ -- Tc

Static Drain to Source On-State Resistance, $R_{DS(on)}$ – Ω

V_{GS}=10V, I_D=11.5A

Case Temperature, Tc – °C

IT15685

$|y_{fs}|$ -- I_D

V_{DS}=10V

Forward Transfer Admittance, $|y_{fs}|$ – S

25°C
Tc= −25°C
75°C

Drain Current, I_D – A

IT15686

I_S -- V_{SD}

V_{GS}=0V

Source Current, I_S – A

Tc=75°C
25°C
−25°C

Diode Forward Voltage, V_{SD} – V

IT15687

SW Time -- I_D

V_{DD}=200V
V_{GS}=10V

Switching Time, SW Time – ns

$t_{d(off)}$
t_f
t_r
$t_{d(on)}$

Drain Current, I_D – A

IT15688

Ciss, Coss, Crss -- V_{DS}

f=1MHz

Ciss, Coss, Crss – pF

Ciss
Coss
Crss

Drain to Source Voltage, V_{DS} – V

IT15689

WPB4002

V_{GS} -- Qg

Gate to Source Voltage, V_{GS} – V

V_{DS}=200V
I_D=23A

Total Gate Charge, Qg – nC

IT15690

A S O

Drain Current, I_D – A

I_{DP}=80A (PW≤10μs)

I_D=23A

10μs
100μs
10ms
100ms
1ms
DC operation

Operation in this area is limited by R_{DS}(on).

Tc=25°C
Single pulse

Drain to Source Voltage, V_{DS} – V

IT17193

P_D -- Ta

Allowable Power Dissipation, P_D – W

Ambient Temperature, Ta – °C

IT155692

P_D -- Tc

Allowable Power Dissipation, P_D – W

Case Temperature, Tc – °C

IT15693

E_{AS} -- Ta

Avalanche Energy derating factor – %

Ambient Temperature, Ta – °C

IT10478

WPB4002

Package Dimensions
WPB4002-1E

TO-3P-3L
CASE 340AF
ISSUE O
Unit : mm

1: Gate
2: Drain
3: Source

15.6±0.2
5.0±0.2
18.4±0.3
19.9±0.2
3.5±0.2
2.0±0.2
3.0±0.2
20.0±0.2
1.0±0.2

1 2 3

4.8±0.2
1.5 +1.5 −0.05
φ3.2±0.2
φ7.0±0.2
10.0±0.2
13.6±0.2
16.76±0.2
0.6 +0.15 −0.05

1.4±0.2
5.45±0.3   5.45±0.3
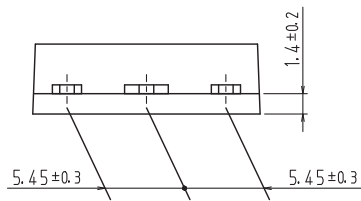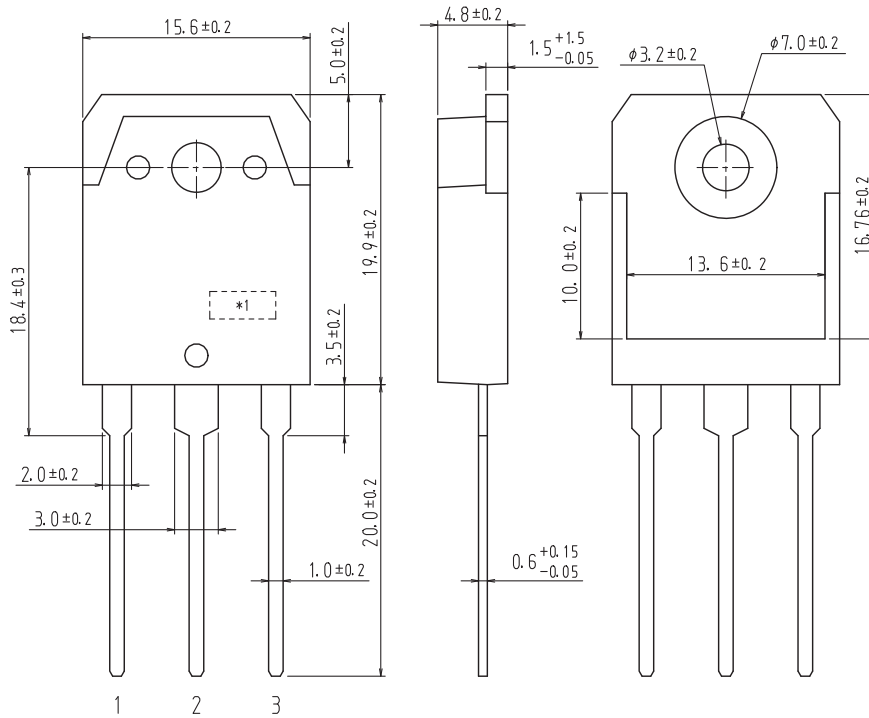
These dimension do not include mold protrusion

*1:Lot indication

Ordering & Package Information

Device	Package	Shipping	memo
WPB4002-1E	TO-3P-3L SC-65, SOT-199, TO-247	30 pcs./tube	Pb-Free

Marking
PB4002
LOT No.
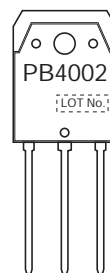
Electrical Connection
2
1
3
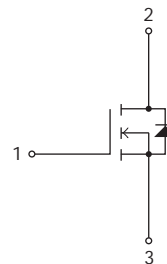
Fig.1 Unclamped Inductive Switching Test Circuit
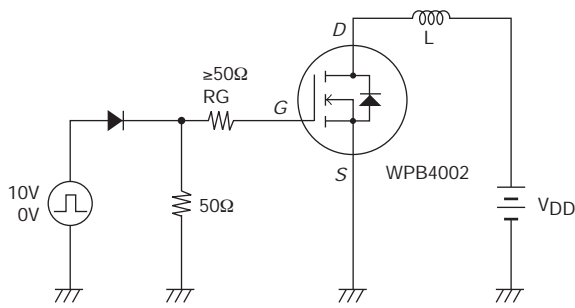
Fig.2 Switching Time Test Circuit
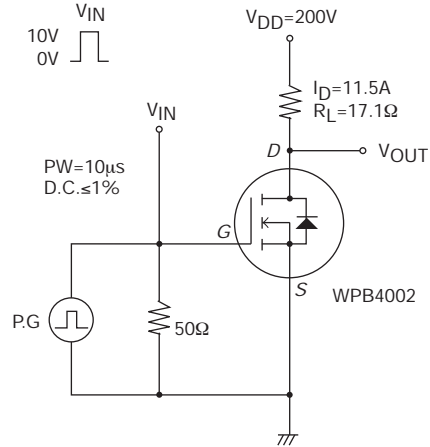
Fig.3 Reverse Recovery Resistance Test Circuit
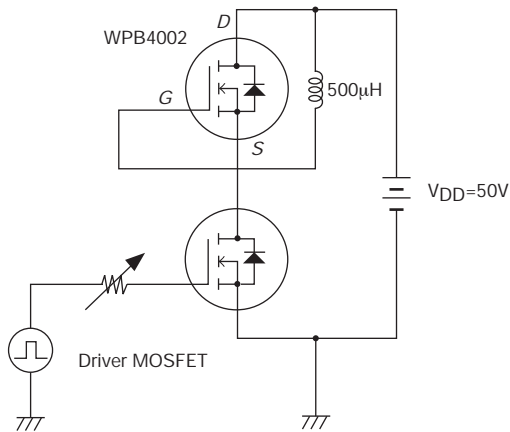
Note on usage : Since the WPB4002 is a MOSFET product, please avoid using this device in the vicinity of highly charged objects.