

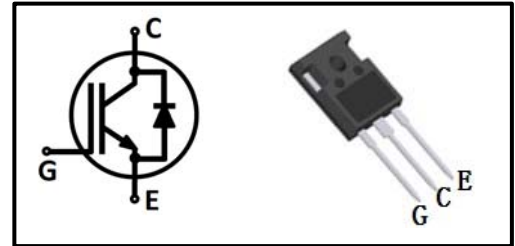
Features

- Easy parallel switching capability due to positive temperature coefficient in V_{CEsat}
- Low V_{CEsat} , fast switching
- High ruggedness, good thermal stability
- Very tight parameter distribution

Type	Marking	Package Code
MPBW15N120BF	MP15N120BF	TO-247-3

Applications

- Frequency converter
- UPS



Maximum Rated Values

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CE}	1200	V
DC collector current, limited by T_{jmax} $T_C=25^\circ\text{C}$ $T_C=100^\circ\text{C}$	I_C	30 15	A
Pulsed collector current, t_p limited by $T_{jmax}^{1)}$	I_{Cpuls}	60	
Diode forward current, limited by T_{jmax} $T_C=25^\circ\text{C}$ $T_C=100^\circ\text{C}$	I_F	30 15	
Diode pulsed current, t_p limited by $T_{jmax}^{1)}$	I_{Fpuls}	60	V
Gate-emitter voltage	V_{GE}	± 20	
Transient Gate-emitter voltage ($t_p \leq 10\mu\text{s}, D < 0.01$)		± 30	
Short circuit withstand time $V_{GE}=15\text{V}, V_{CC}=600\text{V}, T_j \leq 175^\circ\text{C}$ Allowed number of short circuits < 1000 Time between short circuits: $\geq 1.0\text{s}$	t_{SC}	10	μs
Power dissipation $T_C=25^\circ\text{C}$	P_{tot}	214	W
Power dissipation $T_C=100^\circ\text{C}$		107	
Operating junction temperature	T_j	-40~175	$^\circ\text{C}$
Storage temperature	T_{stg}	-55~150	
Soldering temperature, wave soldering 1.6mm (0.063in.) from case for 10s		260	
Mounting torque, M3 screw Maximum of mounting processes: 3	M	0.6	Nm

¹⁾ Defined by design. Not subject to production test.



Thermal Characteristics

Parameter	Symbol	Min	Typ	Max	Unit
IGBT thermal resistance, junction-case	R_{thJC}	-	-	0.7	K/W
Diode thermal resistance, junction-case	R_{thJCD}	-	-	1.2	
Thermal Resistance, junction-ambient	R_{thJA}	-	-	40	

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

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Collector-emitter breakdown voltage	$V_{(BR)CES}$	$V_{GE}=0V, I_C=0.25mA$	1200	-	-	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	$V_{GE}=15V, I_C=15A$ $T_j=25^\circ\text{C}$	-	1.8	2.2	
		$T_j=150^\circ\text{C}$	-	2.2	-	
		$T_j=175^\circ\text{C}$	-	2.3	-	
Diode forward voltage	V_F	$V_{GE}=0V, I_F=15A$ $T_j=25^\circ\text{C}$	-	2.0	-	
		$T_j=150^\circ\text{C}$	-	1.6	-	
		$T_j=175^\circ\text{C}$	-	1.5	-	
G-E threshold voltage	$V_{GE(th)}$	$I_C=0.5mA, V_{CE}=V_{GE}$	5.0	5.8	6.5	
C-E leakage current	I_{CES}	$V_{CE}=1200V,$ $V_{GE}=0V$ $T_j=25^\circ\text{C}$	-	-	0.1	mA
		$T_j=175^\circ\text{C}$	-	-	4.0	
G-E leakage current	I_{GES}	$V_{CE}=0V, V_{GE}=20V$	-	-	250	nA
Transconductance	g_{fs}	$V_{CE}=20V, I_C=15A$	-	10	-	S

Dynamic Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Input capacitance	C_{ies}	$V_{CE}=25V,$ $V_{GE}=0V,$ $f=1MHz$	-	1185	-	pF
Output capacitance	C_{oes}		-	81	-	
Reverse transfer capacitance	C_{res}		-	35	-	
Gate charge	Q_G	$V_{CC}=600V, I_C=15A,$ $V_{GE}=15V$	-	94	-	nC
Short circuit collector current	$I_{C(SC)}$	$V_{GE}=15V,$ $V_{CC}\leq 600V,$ $t_{SC}\leq 10\mu s, T_j=175^\circ\text{C}$	-	60	-	A



IGBT Switching Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit	
Turn-on delay time	$t_{d(on)}$	$T_j=25^\circ\text{C}$, $V_{CC}=600\text{V}$, $I_C=15\text{A}$, $V_{GE}=0/15\text{V}$, $R_G=10\Omega$, Inductive load	-	56	-	ns	
Rise time	t_r		-	65	-		
Turn-off delay time	$t_{d(off)}$		-	226	-		
Fall time	t_f		-	156	-		
Turn-on energy	E_{on}		Inductive load	-	1.17	-	mJ
Turn-off energy	E_{off}			-	0.95	-	
Total switching energy	E_{ts}			-	2.12	-	
Turn-on delay time	$t_{d(on)}$	$T_j=175^\circ\text{C}$, $V_{CC}=600\text{V}$, $I_C=15\text{A}$, $V_{GE}=0/15\text{V}$, $R_G=10\Omega$, Inductive load	-	48	-	ns	
Rise time	t_r		-	63	-		
Turn-off delay time	$t_{d(off)}$		-	312	-		
Fall time	t_f		-	266	-		
Turn-on energy	E_{on}		Inductive load	-	1.28	-	mJ
Turn-off energy	E_{off}			-	1.55	-	
Total switching energy	E_{ts}			-	2.83	-	

Diode Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Diode reverse recovery time	t_{rr}	$T_j=25^\circ\text{C}$, $V_R=600\text{V}$, $I_F=15\text{A}$, $di_F/dt=170\text{A}/\mu\text{s}$	-	153	-	ns
Diode reverse recovery charge	Q_{rr}		-	0.44	-	μC
Diode peak reverse recovery current	I_{rrm}		-	6.2	-	A
Diode reverse recovery time	t_{rr}	$T_j=175^\circ\text{C}$, $V_R=600\text{V}$, $I_F=15\text{A}$, $di_F/dt=170\text{A}/\mu\text{s}$	-	400	-	ns
Diode reverse recovery charge	Q_{rr}		-	2.3	-	μC
Diode peak reverse recovery current	I_{rrm}		-	14	-	A

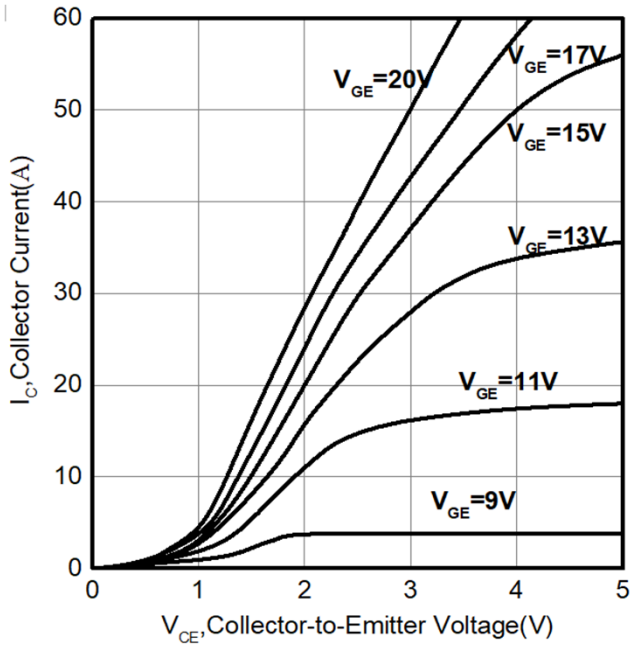


Figure 1. Typical output characteristic ($T_j=25^\circ\text{C}$)

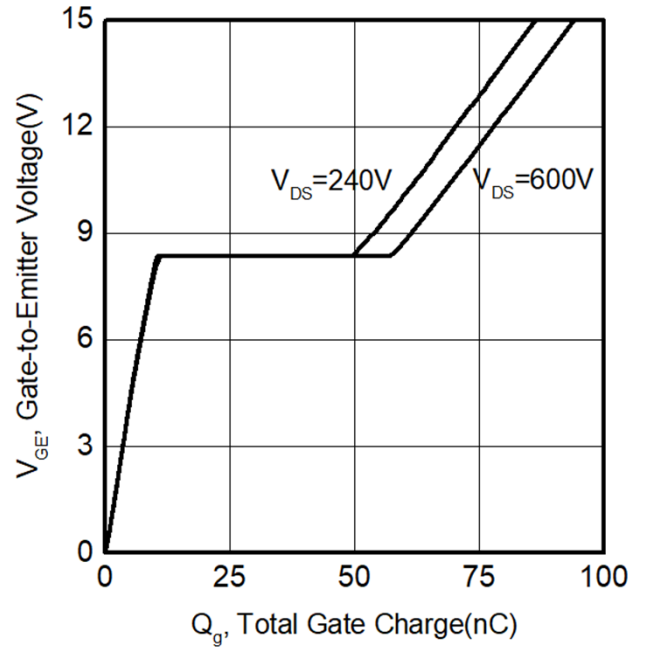


Figure 2 Typical gate charge

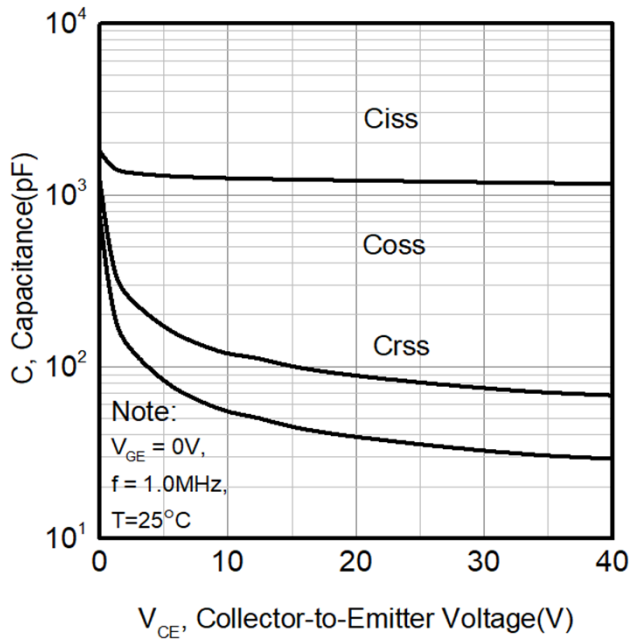


Figure 3 Typical capacitance as a function of collector-emitter voltage

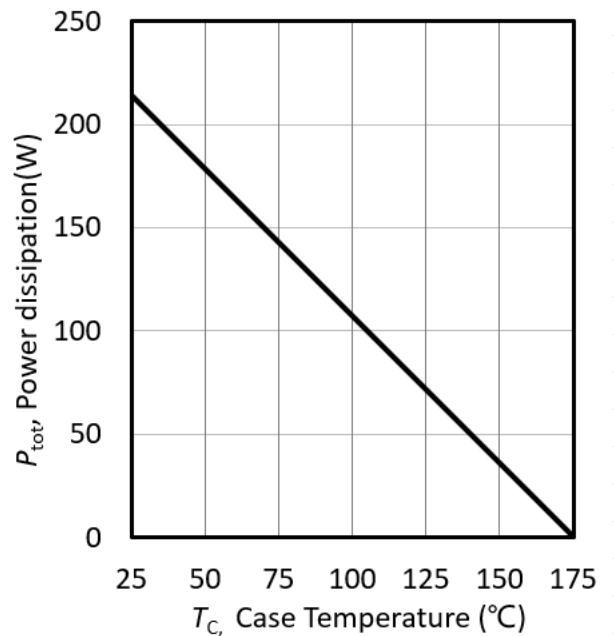


Figure 4. Power dissipation as a function of case temperature ($T_j \leq 175^\circ\text{C}$)

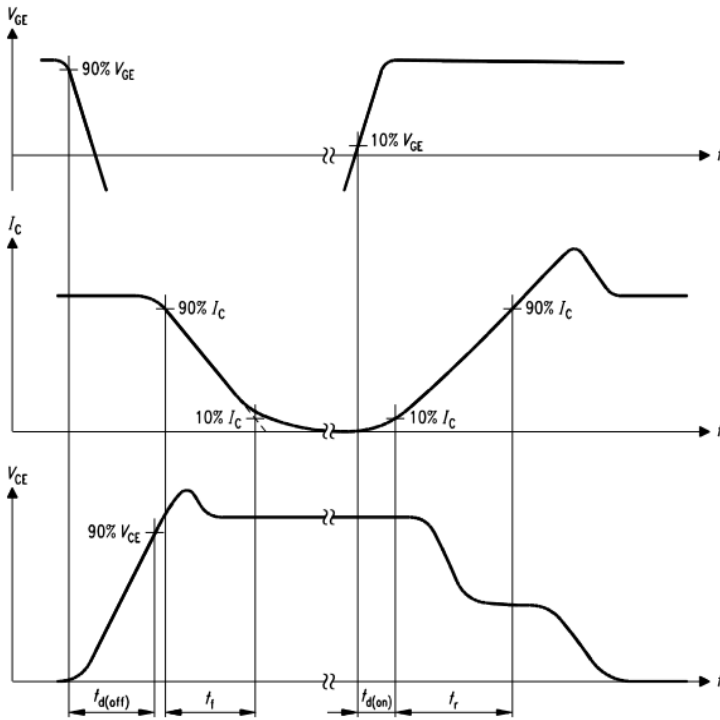


Figure A. Definition of switching times

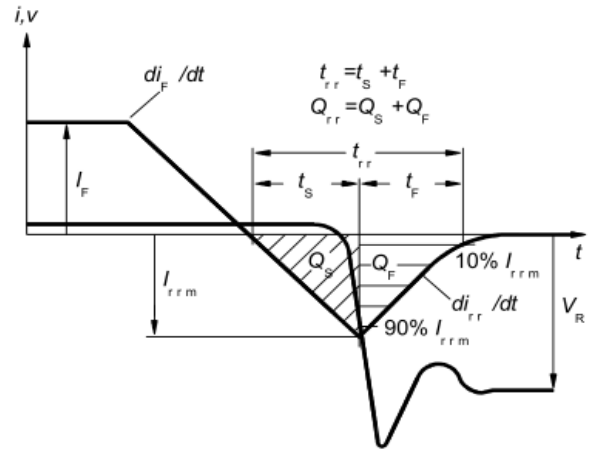


Figure C. Definition of diodes switching characteristics

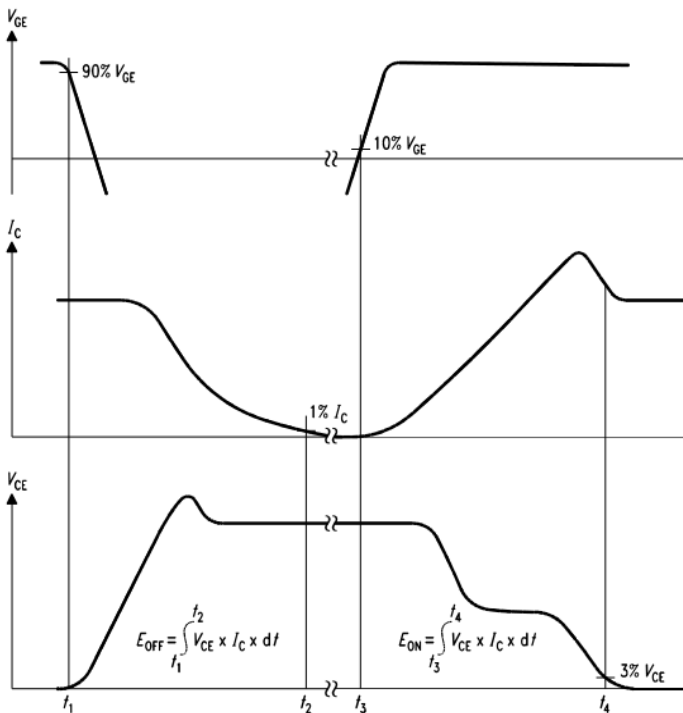


Figure B. Definition of switching losses

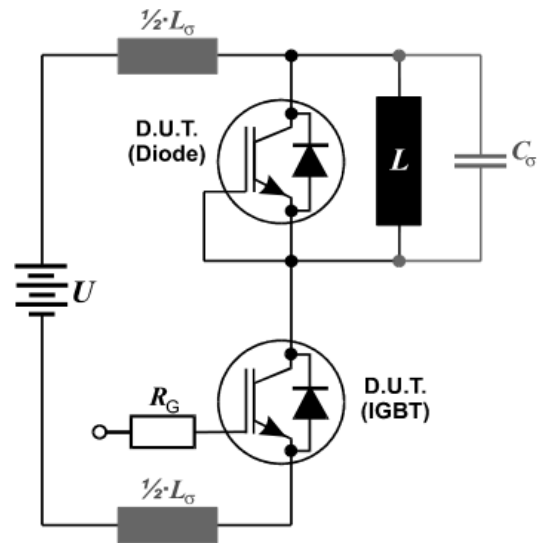
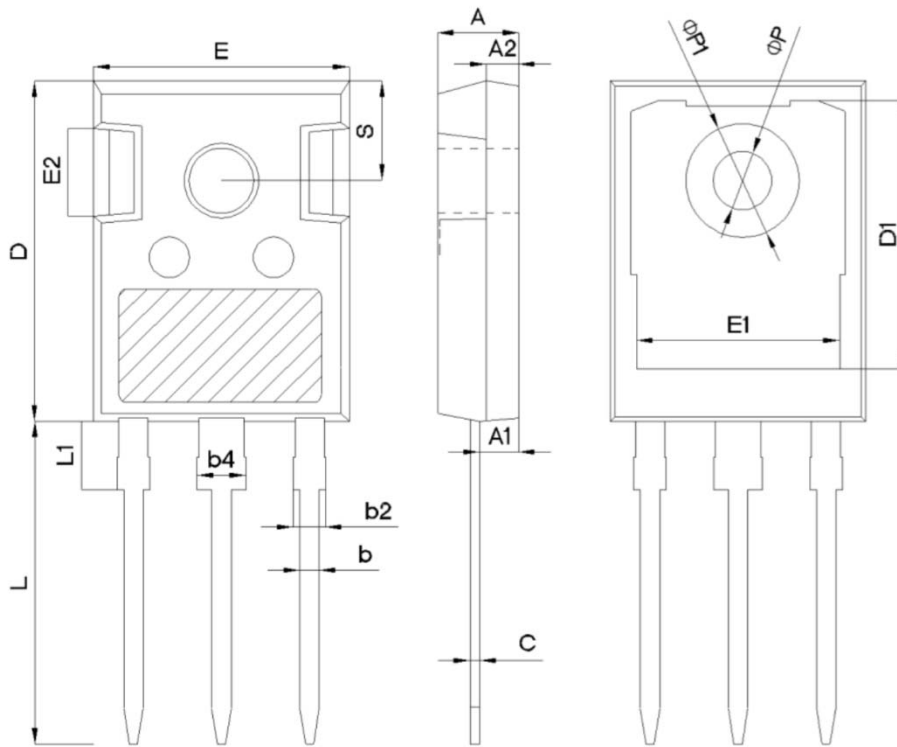


Figure D. Switching test circuit

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SYMBOL	mm		
	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.21	2.41	2.61
A2	1.85	2.00	2.15
b	1.11	1.21	1.36
b2	1.91	2.01	2.21
b4	2.91	3.01	3.21
c	0.51	0.61	0.75
D	20.70	21.00	21.30
D1	16.25	16.55	16.85
E	15.50	15.80	16.10
E1	13.00	13.30	13.60
E2	4.80	5.00	5.20
E3	2.30	2.50	2.70
e	5.44BSC		
L	19.62	19.92	20.22
L1	-	-	4.30
ΦP	3.40	3.60	3.80
ΦP1	-	-	7.30
S	6.15BSC		



Revision History

Revision	Subjects (major changes since last revision)	Date
1.0	Initial version	2019.8
2.0	Add chart	2020.6
2.1	Add Electrical Characteristics at $T_j=175^{\circ}\text{C}$	2021.8

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