

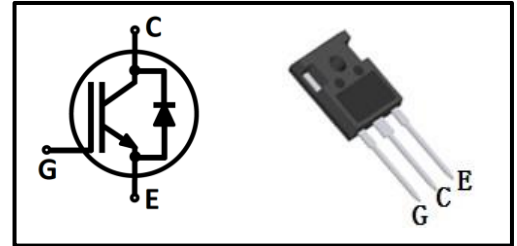
Features

- 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

Applications

- UPS
- PFC
- PTC Heater
- Climate Compressor

Type	Marking	Package Code
MPBW50N65ED	MP50N65ED	TO-247-3



Maximum Rated Values ¹

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CE}	650	V
DC collector current ²			A
$T_C=25^\circ\text{C}$	I_C	80	
$T_C=100^\circ\text{C}$		50	
Pulsed collector current ³	I_{Cpuls}	200	
Diode forward current ²			
$T_C=25^\circ\text{C}$	I_F	80	
$T_C=100^\circ\text{C}$		50	
Diode pulsed current ³	I_{Fpuls}	200	
Gate-emitter voltage	V_{GE}	± 20	V
Transient Gate-emitter voltage ($t_p \leq 10\mu\text{s}$)		± 30	
Power dissipation			W
$T_C=25^\circ\text{C}$	P_{tot}	300	
$T_C=100^\circ\text{C}$		150	
Operating junction temperature	T_j	-55~175	$^\circ\text{C}$
Storage temperature	T_{stg}	-55~150	

1:Reference standard: JESD-022 2: limited by T_{jmax} 3: T_p limited by T_{jmax} ;



Thermal Characteristics

Parameter	Symbol	Min	Typ	Max	Unit
IGBT thermal resistance, junction-case	R_{thJC}	-	-	0.5	K/W
Diode thermal resistance, junction-case	R_{thJCD}	-	-	0.65	
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	$V_{(BR)CES}$	$V_{GE}=0V, I_C=0.25mA$	650	-	-	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	$V_{GE}=15V, I_C=50A, T_j=25^\circ\text{C}$	-	1.60	1.90	
		$T_j=125^\circ\text{C}$	-	1.72	-	
		$T_j=150^\circ\text{C}$	-	1.80	-	
Diode forward voltage	V_F	$V_{GE}=0V, I_F=50A, T_j=25^\circ\text{C}$	-	1.95	2.25	
		$T_j=125^\circ\text{C}$	-	1.87	-	
		$T_j=150^\circ\text{C}$	-	1.82	-	
G-E threshold voltage	$V_{GE(th)}$	$I_C=1mA, V_{CE}=V_{GE}$	4.5	5.5	6.5	
C-E leakage current	I_{CES}	$V_{CE}=650V, V_{GE}=0V, T_j=25^\circ\text{C}$	-	-	0.01	
		$T_j=150^\circ\text{C}$	-	-	1.0	
G-E leakage current	I_{GES}	$V_{CE}=0V, V_{GE}=20V$	-	-	250	nA
Transconductance	g_{FS}	$V_{CE}=20V, I_C=50A$	-	21	-	S

Dynamic Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Input capacitance	C_{iss}	$V_{CE}=25V, V_{GE}=0V, f=1MHz$	-	5810	-	pF
Output capacitance	C_{oss}		-	130	-	
Reverse transfer capacitance	C_{rss}		-	65	-	
Gate charge	Q_G	$V_{CC}=300V, I_C=50A, V_{GE}=15V$	-	230	-	nC



IGBT Switching Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit	
Turn-on delay time	$t_{d(on)}$	$T_j=25^{\circ}\text{C}$, $V_{CC}=400\text{V}$, $I_C=50\text{A}$, $V_{GE}=0/15\text{V}$, $R_G=10\Omega$, Inductive load	-	107	-	ns	
Rise time	t_r		-	62	-		
Turn-off delay time	$t_{d(off)}$		-	265	-		
Fall time	t_f		$T_j=150^{\circ}\text{C}$, $V_{CC}=400\text{V}$, $I_C=50\text{A}$, $V_{GE}=0/15\text{V}$, $R_G=10\Omega$, Inductive load	-	48	-	mJ
Turn-on energy	E_{on}			-	0.90	-	
Turn-off energy	E_{off}			-	1.12	-	
Total switching energy	E_{ts}			-	2.02	-	
Turn-on delay time	$t_{d(on)}$	$T_j=150^{\circ}\text{C}$, $V_{CC}=400\text{V}$, $I_C=50\text{A}$, $V_{GE}=0/15\text{V}$, $R_G=10\Omega$, Inductive load	-	100	-	ns	
Rise time	t_r		-	62	-		
Turn-off delay time	$t_{d(off)}$		-	335	-		
Fall time	t_f		$T_j=150^{\circ}\text{C}$, $V_{CC}=400\text{V}$, $I_C=50\text{A}$, $V_{GE}=0/15\text{V}$, $R_G=10\Omega$, Inductive load	-	50	-	mJ
Turn-on energy	E_{on}			-	1.35	-	
Turn-off energy	E_{off}			-	1.40	-	
Total switching energy	E_{ts}			-	2.75	-	

Diode Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Diode reverse recovery time	t_{rr}	$T_j=25^{\circ}\text{C}$, $V_R=400\text{V}$, $I_F=50\text{A}$, $di_F/dt=640\text{A}/\mu\text{s}$	-	57	-	ns
Diode reverse recovery charge	Q_{rr}		-	0.39	-	μC
Diode peak reverse recovery current	I_{rrm}		-	10.6	-	A
Diode reverse recovery time	t_{rr}	$T_j=150^{\circ}\text{C}$, $V_R=400\text{V}$, $I_F=50\text{A}$, $di_F/dt=640\text{A}/\mu\text{s}$	-	92.8	-	ns
Diode reverse recovery charge	Q_{rr}		-	1.48	-	μC
Diode peak reverse recovery current	I_{rrm}		-	24	-	A

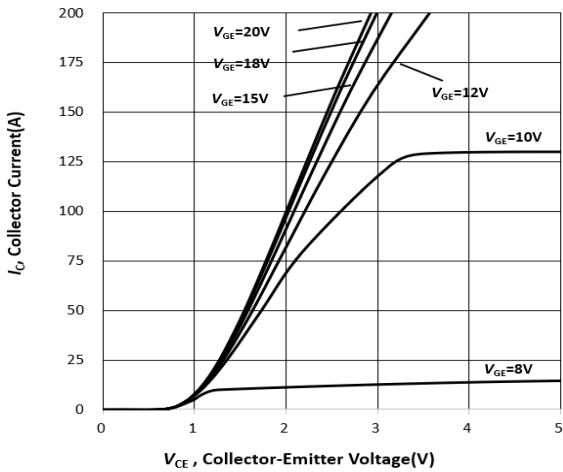


Figure 1. Typical output characteristic ($T_j = 25^\circ\text{C}$)

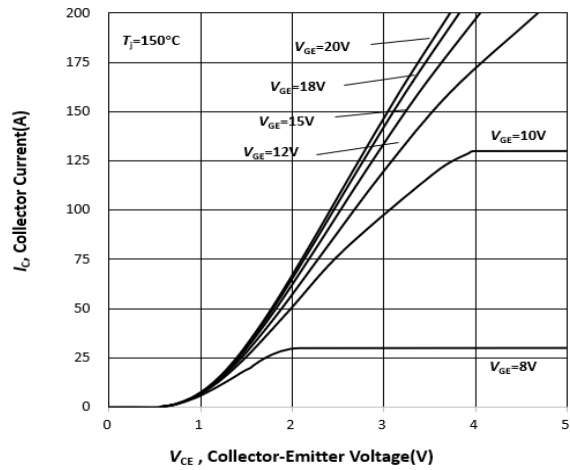


Figure 2. Typical output characteristic ($T_j = 150^\circ\text{C}$)

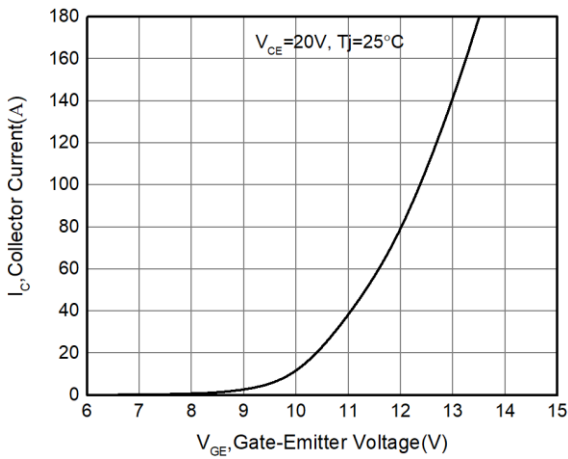


Figure 3. Typical transfer characteristic ($T_j = 25^\circ\text{C}$)

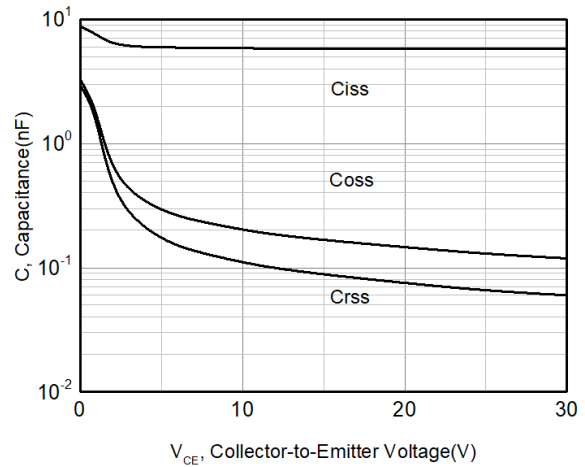


Figure 4. Capacitance characteristic ($V_{GE} = 0\text{V}$, $f = 1\text{MHz}$)

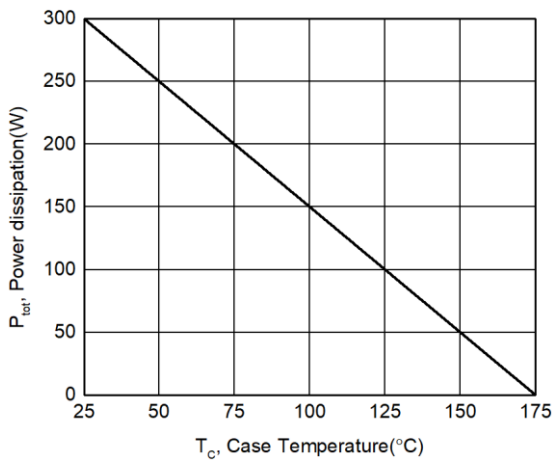


Figure 5. Power dissipation as a function of case temperature ($T_j \leq 175^\circ\text{C}$)

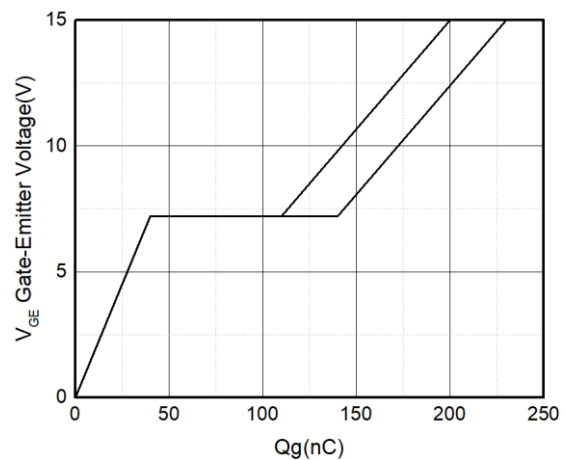


Figure 6. Typical gate charge ($I_C = 50\text{A}$)

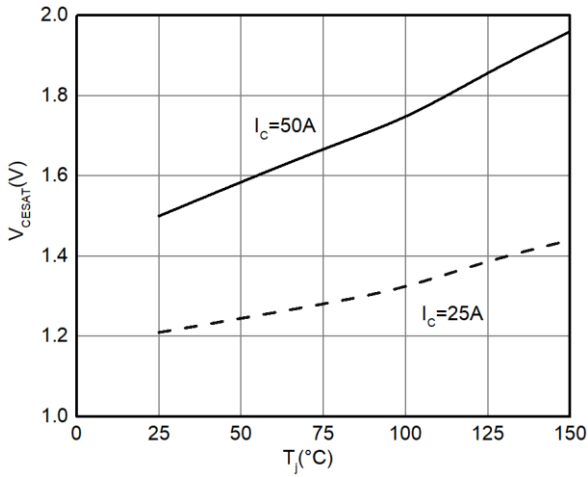


Figure 7. V_{CESAT} as a function of junction temperature ($V_{GE}=15V$)

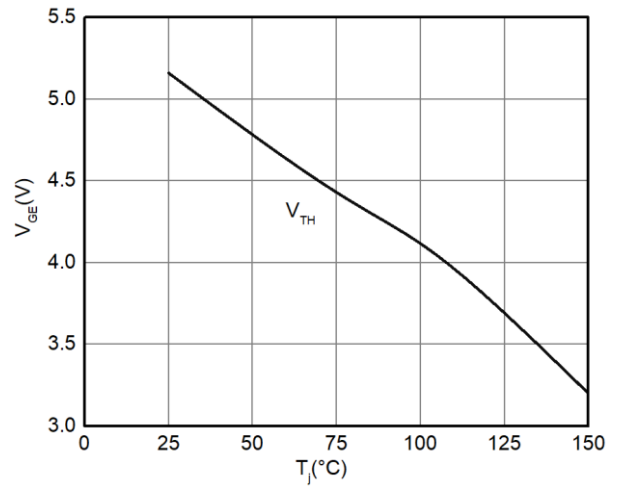


Figure 8. V_{TH} as a function of junction temperature ($I_{CE}=250\mu A$)

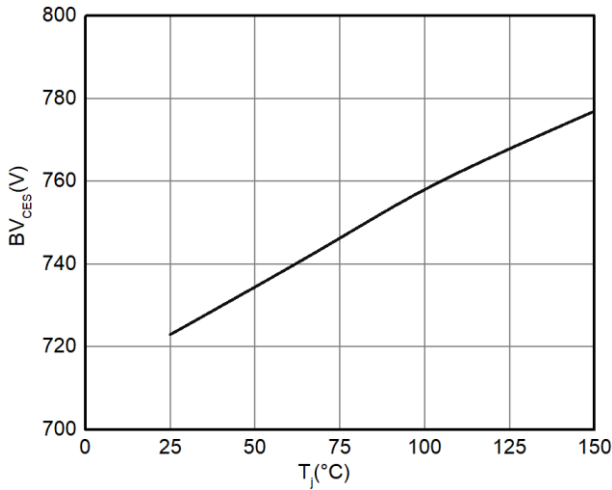


Figure 9. BV as a function of junction temperature ($I_{CE}=250\mu A$)

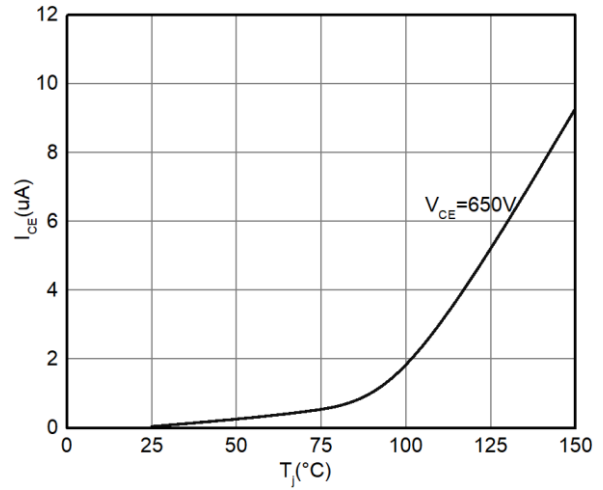


Figure 10. I_{CES} leakage current as a function of junction temperature

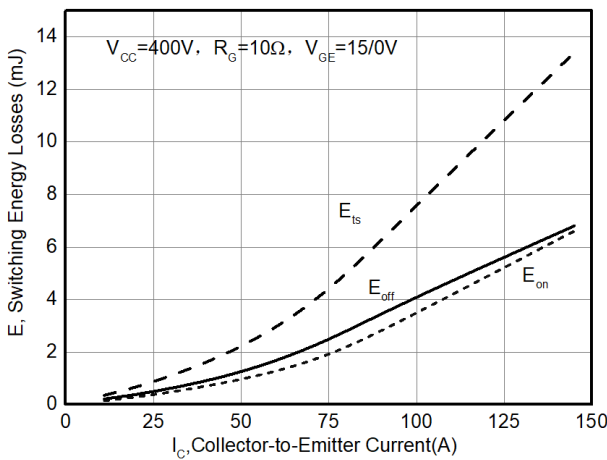


Figure 11. E_{on} , E_{off} as a function of I_C ($T_j=25^\circ C$)

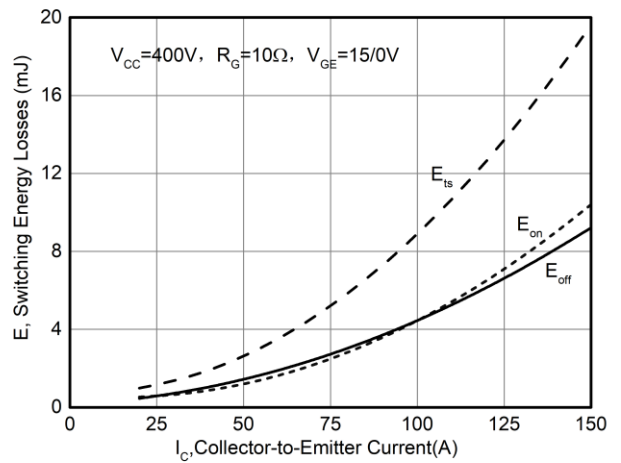


Figure 12. E_{on} , E_{off} as a function of I_C ($T_j=150^\circ C$)

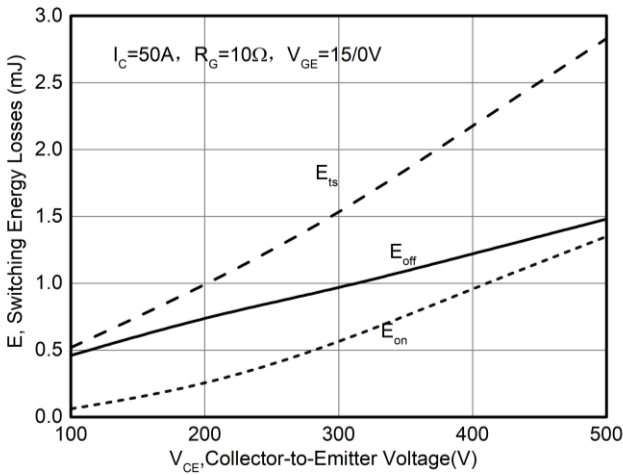


Figure 13. E_{on} , E_{off} as a function of V_{CE} ($T_j=25^\circ\text{C}$)

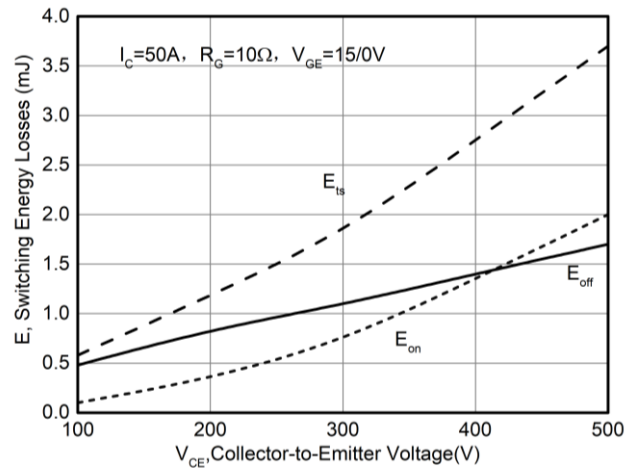


Figure 14. E_{on} , E_{off} as a function of V_{CE} ($T_j=150^\circ\text{C}$)

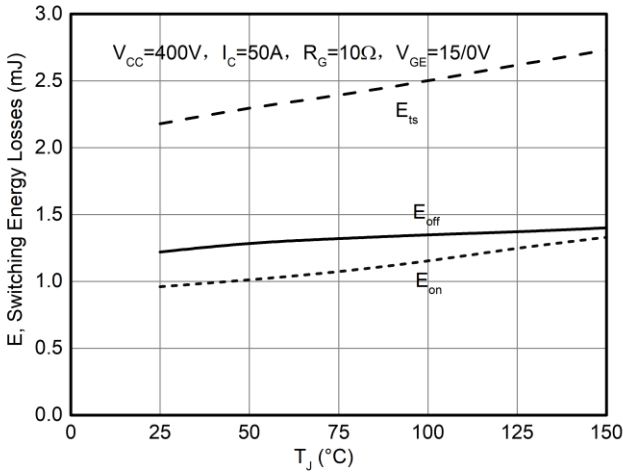


Figure 15. E_{on} , E_{off} as a function of T_j

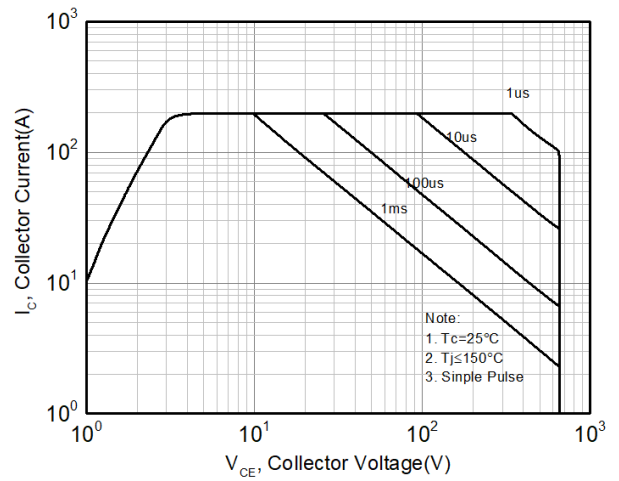


Figure 16. FBSOA

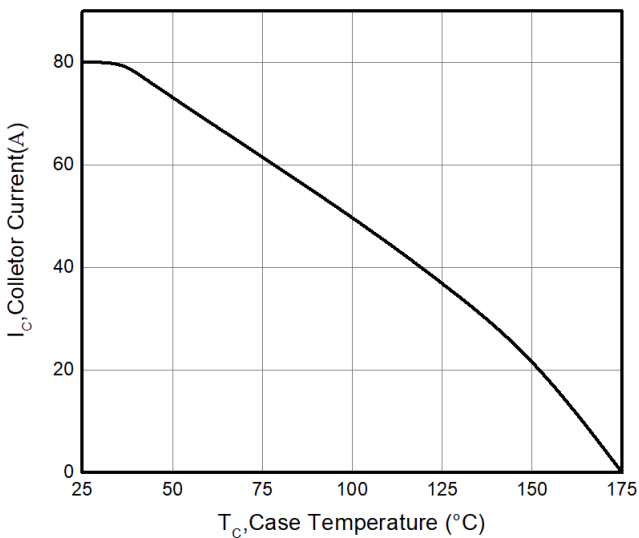
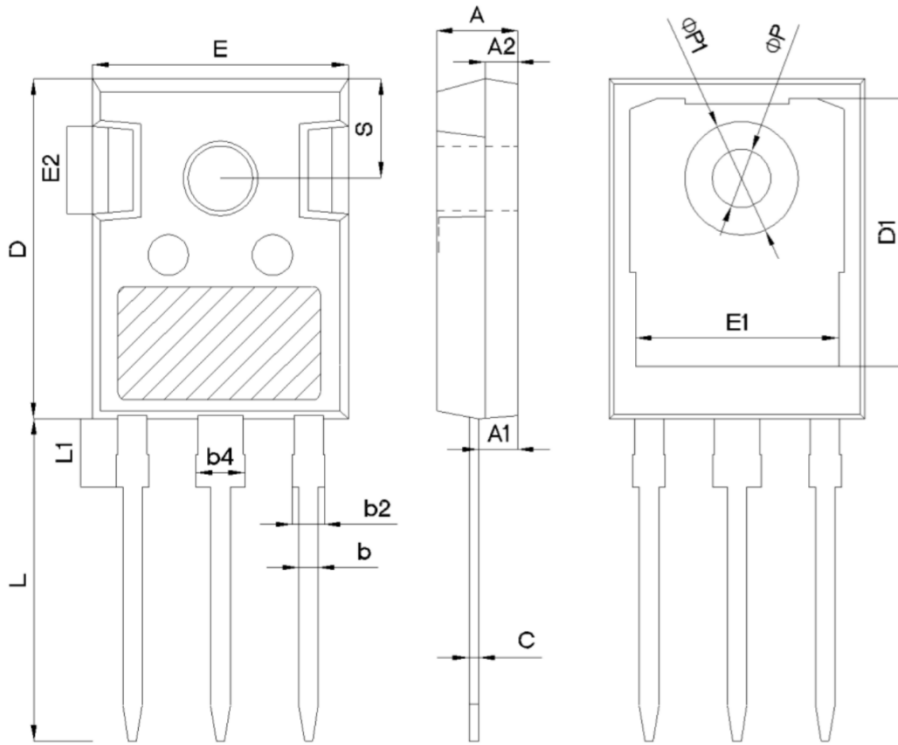


Figure 17. Collector current as a function of case temperature ($V_{GE} \geq 15\text{V}$, $T_j \leq 175^\circ\text{C}$)

TO-247



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	Date	Subjects (major changes since last revision)
1.0	2022-03	Initial Version
1.1	2022-06	Data supplement



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