

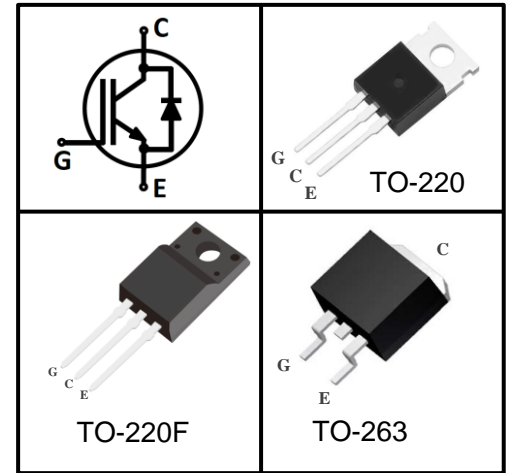
Features

- 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
MPBP15N65EF	MP15N65EF	TO-220-3
MPBA15N65EF	MP15N65EF	TO-220F-3
MPBC15N65EF	MP15N65EF	TO-263

Applications

- Motor Drives



Maximum Rated Values ¹

Parameter	Symbol	Value			Unit
		220	220F	263	
Collector-emitter voltage	V_{CE}	650			V
DC collector current ²					A
$T_C=25^\circ\text{C}$	I_C	30			
$T_C=100^\circ\text{C}$		15			
Pulsed collector current ³	I_{Cpuls}	45			
Diode forward current ²					
$T_C=25^\circ\text{C}$	I_F	30			
$T_C=100^\circ\text{C}$		15			
Diode pulsed current ³	I_{Fpuls}	45			
Short circuit withstanding time $V_{GE} = 15\text{V}, V_{CC} \leq 400\text{V}, T_J \leq 150^\circ\text{C}$	t_{SC}	10			us
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}	125	52	107	
$T_C=100^\circ\text{C}$		63	26	54	
Operating junction temperature	T_j	-55~175			°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	Max			Unit
		220	220F	263	
IGBT thermal resistance, junction-case	R_{thJC}	1.2	2.9	1.4	K/W
Diode thermal resistance, junction-case	R_{thJCD}	2.0	4.6	2.8	
Thermal Resistance, junction-ambient	R_{thJA}	65	65	65	

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	$V_{CE(sat)}$	$V_{GE}=15V, I_C=15A, T_j=25^\circ\text{C}$	-	1.45	1.95	
		$T_j=125^\circ\text{C}$	-	1.60	-	
		$T_j=150^\circ\text{C}$	-	1.80	-	
Diode forward voltage	V_F	$V_{GE}=0V, I_F=15A, T_j=25^\circ\text{C}$	-	1.50	1.80	
		$T_j=125^\circ\text{C}$	-	1.40	-	
		$T_j=150^\circ\text{C}$	-	1.30	-	
G-E threshold voltage	$V_{GE(th)}$	$I_C=250\mu A, V_{CE}=V_{GE}$	4.5	5.8	6.5	
C-E leakage current	I_{CES}	$V_{CE}=650V, V_{GE}=0V, T_j=25^\circ\text{C}$	-	-	0.01	mA
		$T_j=150^\circ\text{C}$	-	-	1.0	
G-E leakage current	I_{GES}	$V_{CE}=0V, V_{GE}=20V$	-	-	250	nA

Dynamic Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Input capacitance	C_{iss}	$V_{CE}=25V,$ $V_{GE}=0V,$ $f=1MHz$	-	1285	-	pF
Output capacitance	C_{oss}		-	69	-	
Reverse transfer capacitance	C_{rss}		-	9	-	
Gate charge	Q_G	$V_{CC}=300V, I_C=15A,$ $V_{GE}=15V$	-	53	-	nC

IGBT Switching Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Turn-on delay time	$t_{d(on)}$	$T_j=25^\circ C,$ $V_{CC}=400V,$ $I_C=15A,$ $V_{GE}=0/15V,$ $R_G=10\Omega,$ Inductive load	-	66	-	ns
Rise time	t_r		-	35	-	
Turn-off delay time	$t_{d(off)}$		-	126	-	
Fall time	t_f		-	57	-	
Turn-on energy	E_{on}		-	0.28	-	mJ
Turn-off energy	E_{off}		-	0.30	-	
Total switching energy	E_{ts}		-	0.58	-	

Diode Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Diode reverse recovery time	t_{rr}	$T_j=25^\circ C,$ $V_R=400V,$ $I_F=15A,$ $di_F/dt=570A/\mu s$	-	82	-	ns
Diode reverse recovery charge	Q_{rr}		-	0.40	-	μC
Diode peak reverse recovery current	I_{rrm}		-	8.5	-	A

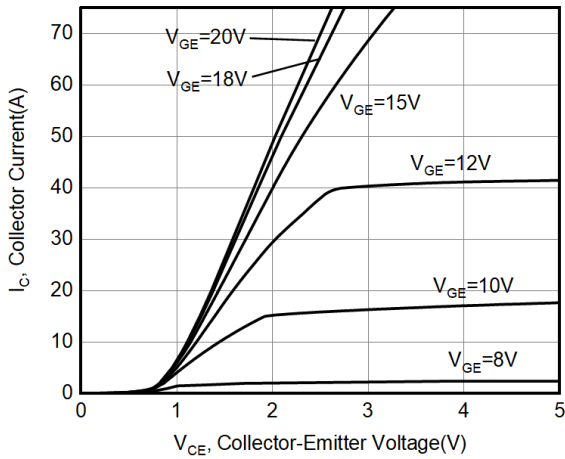


Figure 1. Typical output characteristic
($T_j = 25\text{ }^\circ\text{C}$)

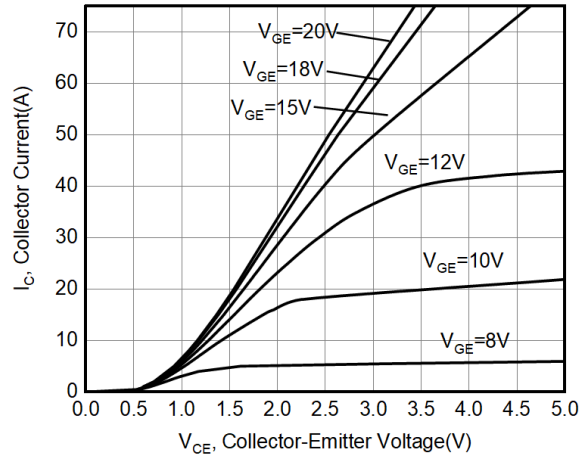


Figure 2. Typical output characteristic
($T_j = 150\text{ }^\circ\text{C}$)

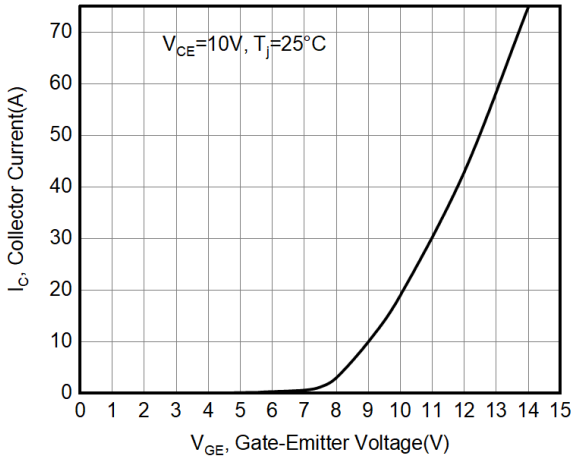


Figure 3. Typical transfer characteristic
($T_j = 25\text{ }^\circ\text{C}$)

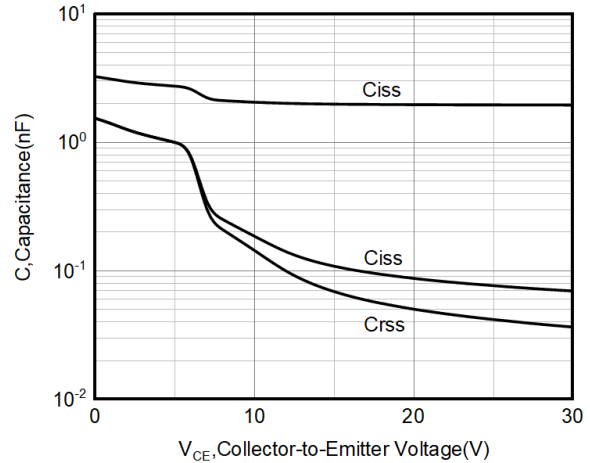


Figure 4. Capacitance characteristic
($V_{GE} = 0\text{V}$, $f = 1\text{MHz}$)

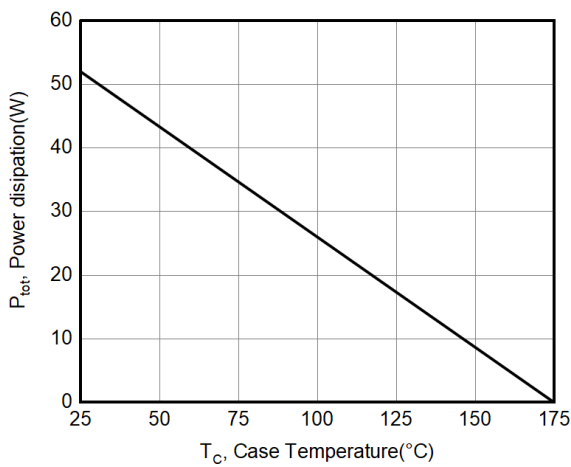


Figure 5. Power dissipation as a function
of case temperature ($T_j \leq 175\text{ }^\circ\text{C}$)

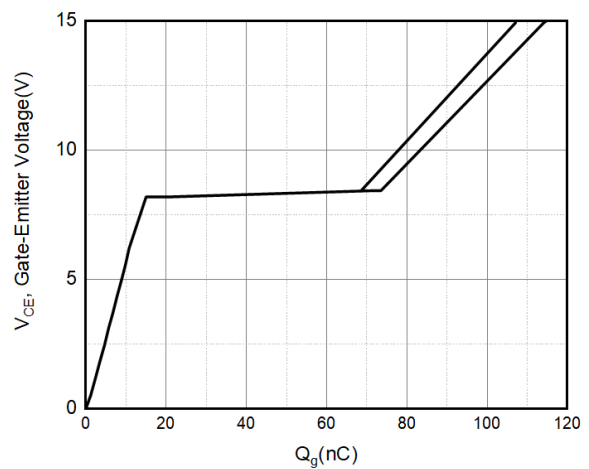


Figure 6. Typical gate charge ($I_C = 15\text{A}$)

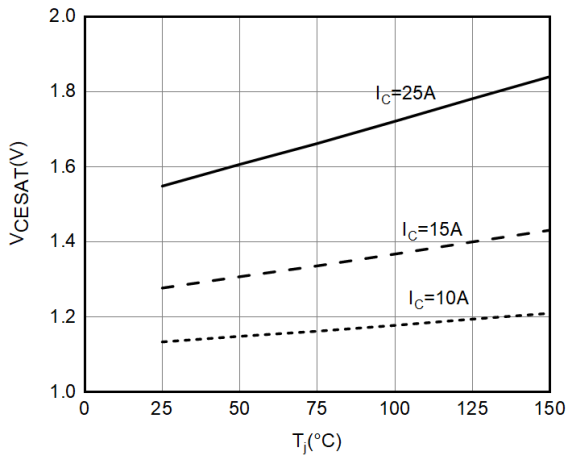


Figure 7. V_{CESAT} as a function of junction temperature ($V_{GE}=15V$)

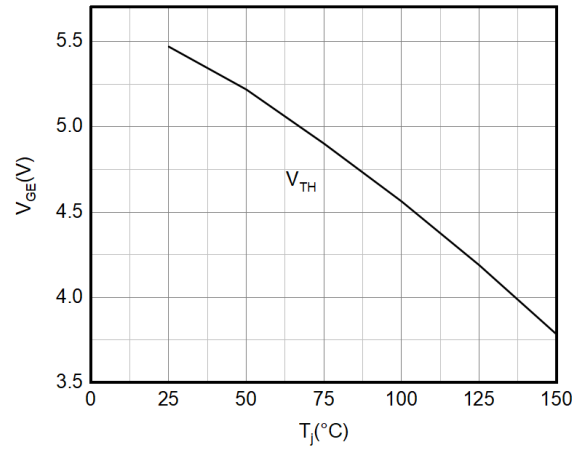


Figure 8. V_{TH} as a function of junction temperature ($I_{CE}=250\mu A$)

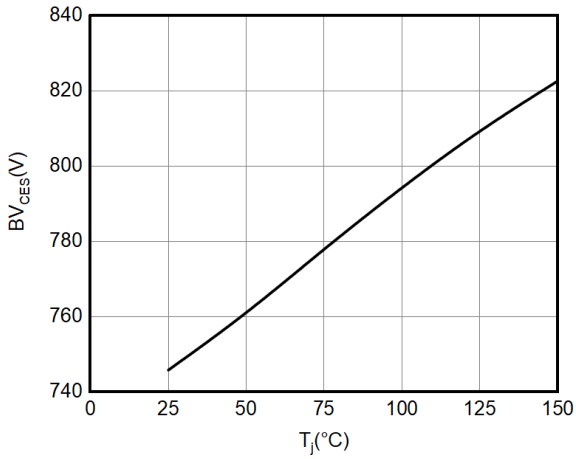


Figure 9. BV as a function of junction temperature ($I_{CE}=250\mu A$)

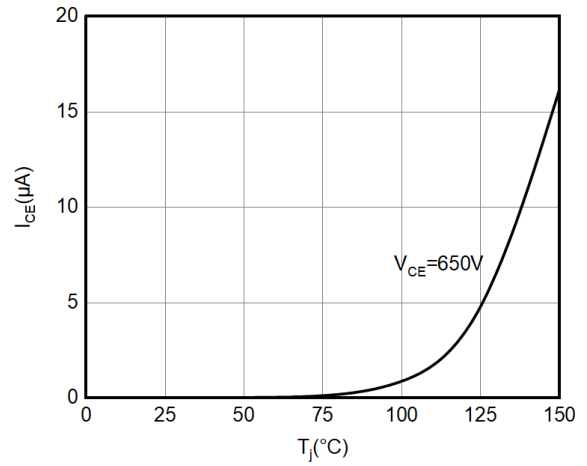


Figure 10. I_{CES} leakage current as a function of junction temperature

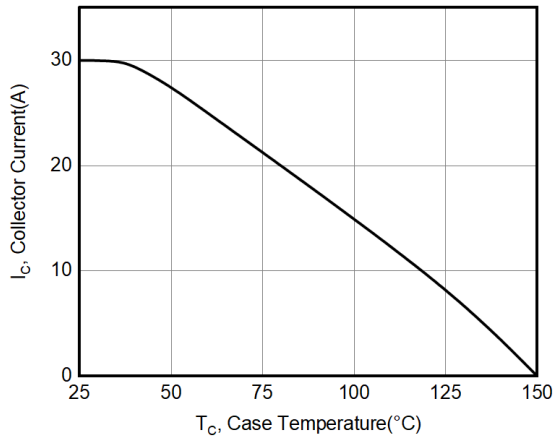


Figure 11. Collector current as a function of case temperature ($V_{GE} \geq 15V$, $T_j \leq 150^\circ C$)

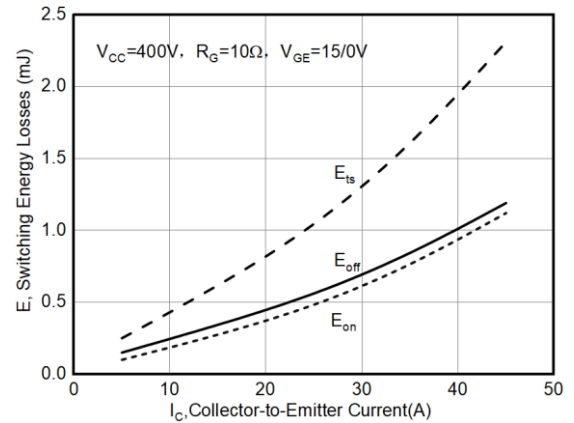


Figure 12. E_{on} , E_{off} as a function of I_C ($T_j=25^\circ C$)

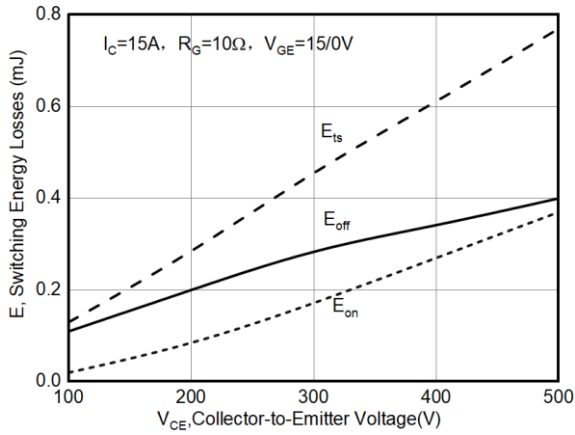


Figure 13. E_{on} , E_{off} as a function of V_{CE} ($T_j=25^\circ C$)

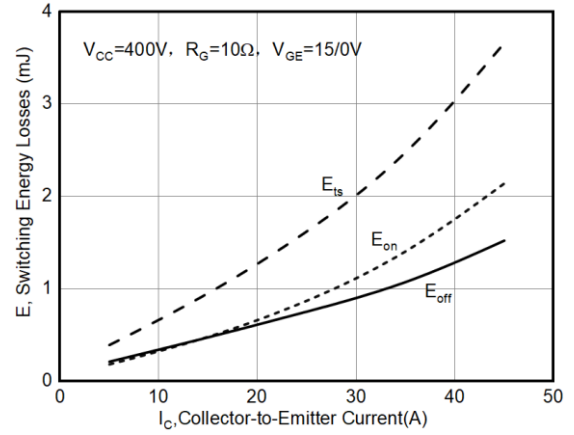


Figure 14. E_{on} , E_{off} as a function of I_C ($T_j=150^\circ C$)

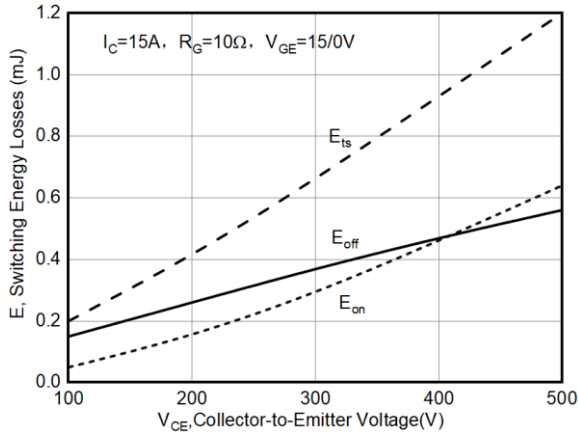


Figure 15. E_{on} , E_{off} as a function of V_{CE} ($T_j=150^\circ C$)

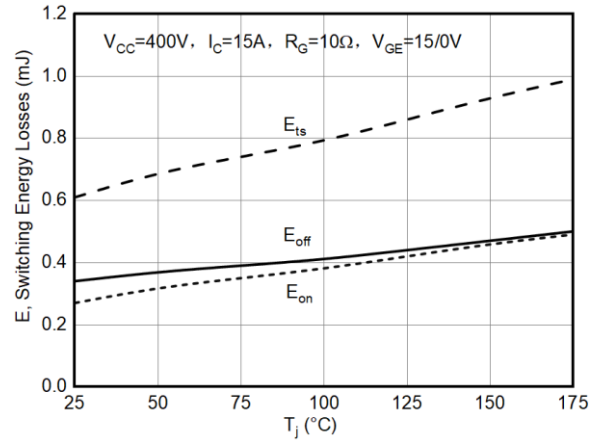


Figure 16. E_{on} , E_{off} as a function of junction temperature

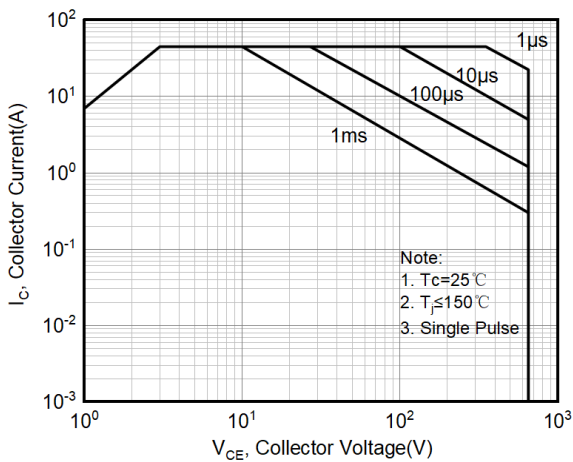
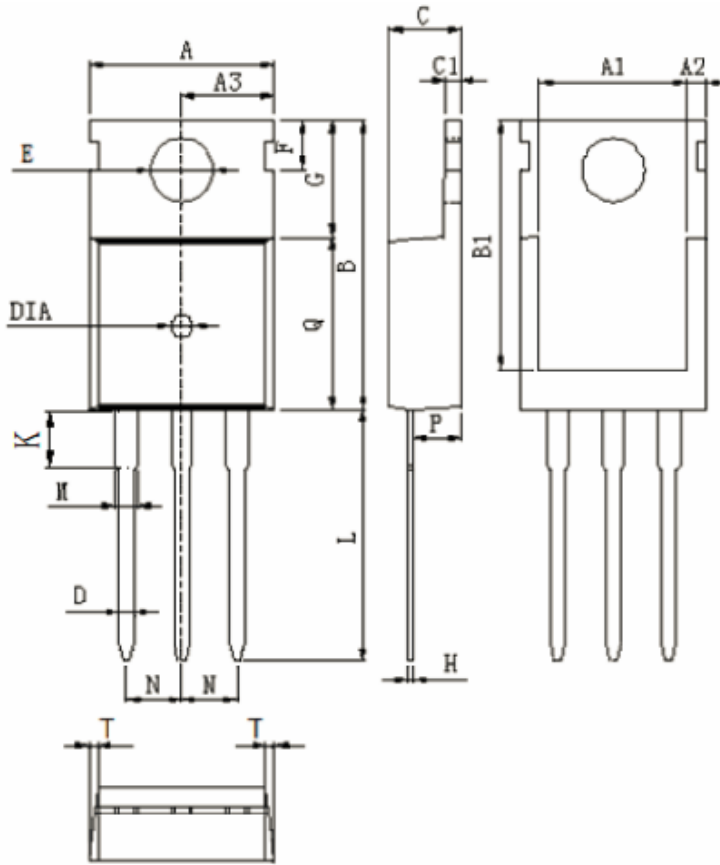


Figure 17. FBSOA

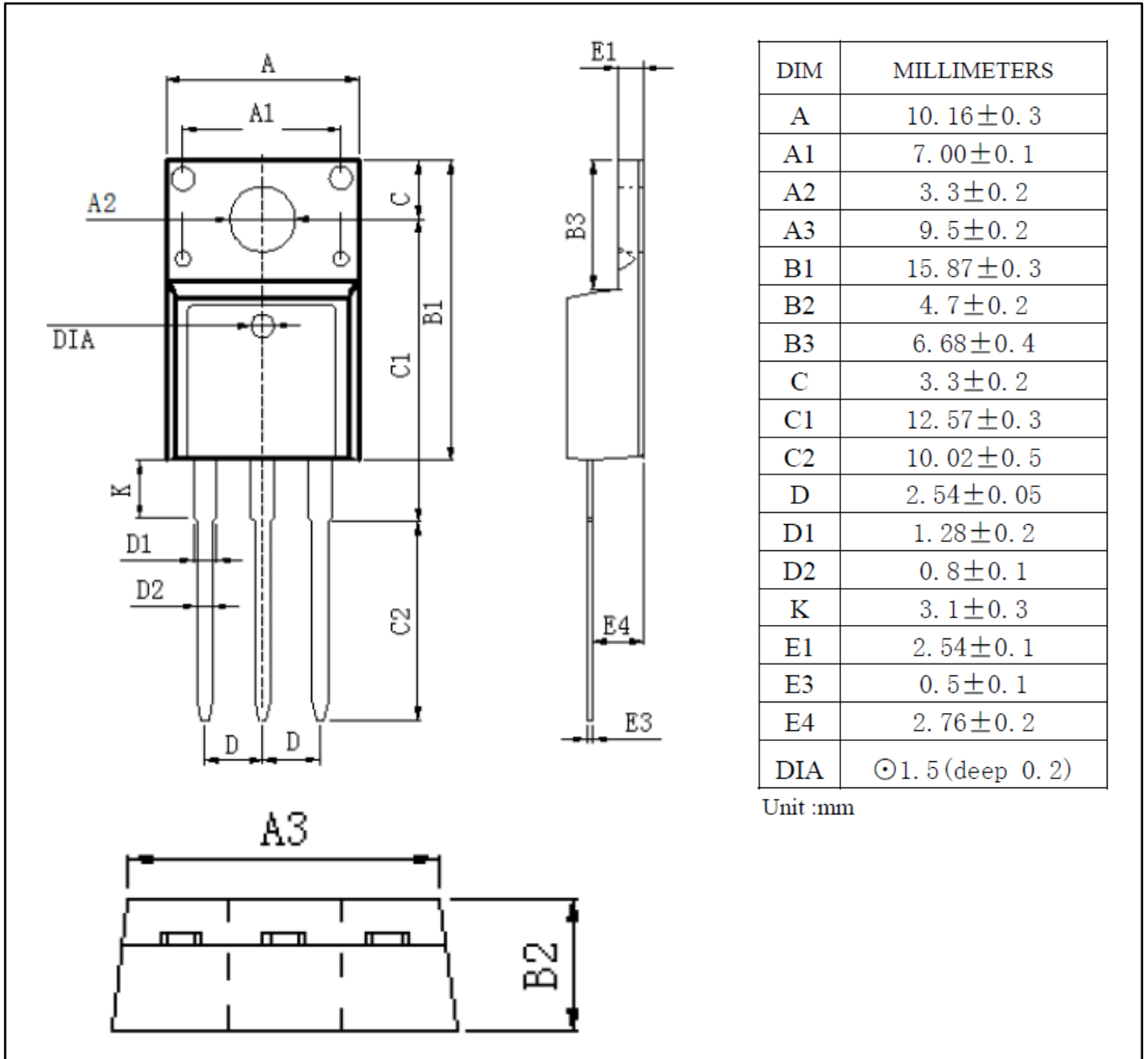
TO-220-3L



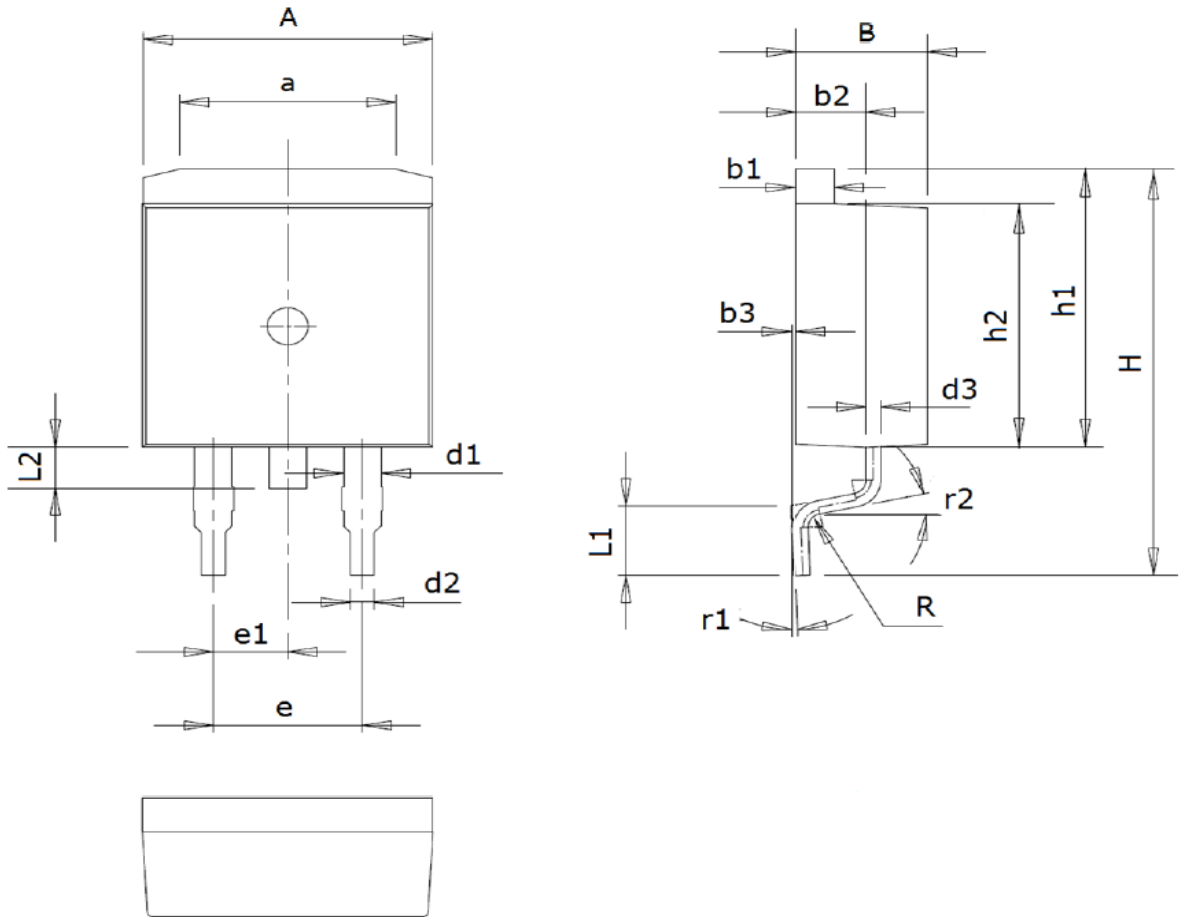
DIM	MILLIMETERS
A	10.0±0.3
A1	8.64±0.2
A2	1.15±0.1
A3	5.0±0.2
B	15.8±0.4
B1	13.2±0.3
C	4.56±0.1
C1	1.3±0.2
D	0.8±0.2
E	3.6±0.2
F	2.95±0.3
G	6.5±0.3
H	0.5±0.1
K	3.1±0.2
L	13.2±0.4
M	1.25±0.1
N	2.54±0.1
P	2.4±0.3
Q	9.0±0.3
T	W:0.35
DIA	⊙1.5 (deep 0.2)

Unit :mm

TO-220F-3L



TO-263



Symbol	Dimensions (mm)	Symbol	Dimensions (mm)	Symbol	Dimensions (mm)
A	9.86~10.26	d2	0.7~0.96	L1	2.0~2.6
a	7.0~7.8	d3	0.3~0.53	L2	1.3~1.8
B	4.37~4.77	e	5.08	R	0.5
b1	1.22~1.42	e1	2.54	r1	0-9°
b2	2.2~2.6	H	14.7~15.5	r2	12°
b3	0~0.25	h1	10.3~10.7		
d1	1.17~1.47	h2	9.1~9.4		



Revision History:

Revision	Date	Subjects (major changes since last revision)
1.0	2022-04	Initial version
1.1	2022-09	Add all the graphs



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