MPBP40N65EH

650V-40A Trench and Field Stop IGBT

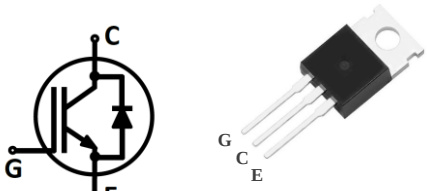
Features

- 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
MPBP40N65EH	MP40N65EH	TO-220-3L



Maximum Rated Values [1]

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CE}	650	V
DC collector current[2]			A
T_C=25℃	I_C	75	
T_C=100℃		40	
Pulsed collector current[3]	I_{Cpuls}	160	
Diode forward current[2]			
T_C=25℃	I_F	40	
T_C=100℃		20	
Diode pulsed current[3]	I_{Fpuls}	120	
Gate-emitter voltage	V_{GE}	±20	V
Transient Gate-emitter voltage（t_p≤10us)		±30	
Power dissipation			W
T_C=25℃	P_{tot}	250	
T_C=100℃		125	
Operating junction temperature	T_j	-55~175	℃
Storage temperature	T_{stg}	-55~150	

1:Reference standard: JESD-022 2: limited by Tjmax 3: Tp limited by Tjmax ;

Thermal Characteristics

Parameter	Symbol	Max	Unit
IGBT thermal resistance, junction-case	R_{thJC}	0.6	K/W
Diode thermal resistance, junction-case	R_{thJCD}	1.8	
Thermal Resistance, junction-ambient	R_{thJA}	65	

Electrical Characteristics（at Tj=25℃, 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=40A T_j=25℃	-	1.50		
		T_j=125℃	-	1.70	-	
		T_j=150℃	-	1.80	-	
Diode forward voltage	V_F	V_{GE}=0V， I_F=20A T_j=25℃	-	1.45		
		T_j=125℃	-	1.30	-	
		T_j=150℃	-	1.20	-	
G-E threshold voltage	$V_{GE(th)}$	I_C=0.8mA,V_{CE}=V_{GE}		5.5		
C-E leakage current	I_{CES}	V_{CE}=650V, V_{GE}=0V T_j=25℃	-	-	0.1	mA
		T_j=150℃	-	-	1	
G-E leakage current	I_{GES}	V_{CE}=0V, V_{GE}=20V	-	-	250	nA
Transconductance	g_{FS}	V_{CE}=20V, I_C=40A	-	35	-	S

Dynamic Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Input capacitance	C_{iss}	V_{CE}=25V, V_{GE}=0V, f=1MHz	-	2700	-	pF
Output capacitance	C_{oss}		-	120	-	
Reverse transfer capacitance	C_{rss}		-	40	-	
Gate charge	Q_G	V_{CC}=100V, I_C=40A, V_{GE}=15V	-	110	-	nC

IGBT Switching Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Turn-on delay time	$t_{d(on)}$	T_j=25℃, V_{CC}=400V, I_C=40A, V_{GE}=0/15V, R_G=10Ω, Inductive load	-	85	-	ns
Rise time	t_r		-	55	-	
Turn-off delay time	$t_{d(off)}$		-	190	-	
Fall time	t_f		-	40	-	
Turn-on energy	E_{on}		-	0.81	-	mJ
Turn-off energy	E_{off}		-	0.85	-	
Total switching energy	E_{ts}		-	1.66	-	
Turn-on delay time	$t_{d(on)}$	T_j=150℃, V_{CC}=400V, I_C=40A, V_{GE}=0/15V, R_G=10Ω, Inductive load	-	85	-	ns
Rise time	t_r		-	70	-	
Turn-off delay time	$t_{d(off)}$		-	210	-	
Fall time	t_f		-	60	-	
Turn-on energy	E_{on}		-	1.43	-	mJ
Turn-off energy	E_{off}		-	1.12	-	
Total switching energy	E_{ts}		-	2.55	-	

Diode Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Diode reverse recovery time	t_{rr}	T_j=25℃, V_R=400V, I_F=40A, di_F/dt=640A/μs	-	150	-	ns
Diode reverse recovery charge	Q_{rr}		-	1.06	-	μC
Diode peak reverse recovery current	I_{rrm}		-	15.4	-	A
Diode reverse recovery time	t_{rr}	T_j=150℃, V_R=400V, I_F=40A, di_F/dt=640A/μs	-	240	-	Ns
Diode reverse recovery charge	Q_{rr}		-	2.32	-	μC
Diode peak reverse recovery current	I_{rrm}		-	21.0	-	A

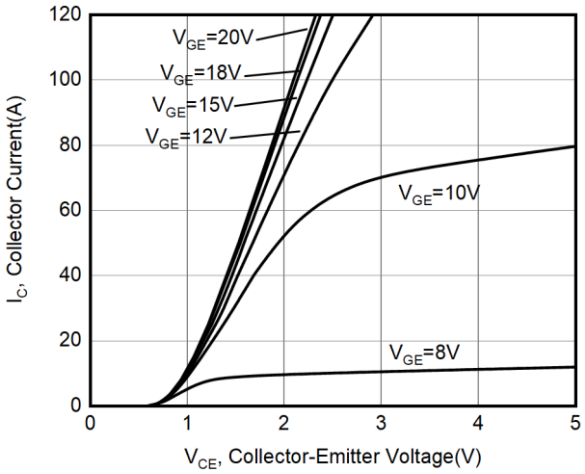


Figure 1. Typical output characteristic (T_j =25℃)

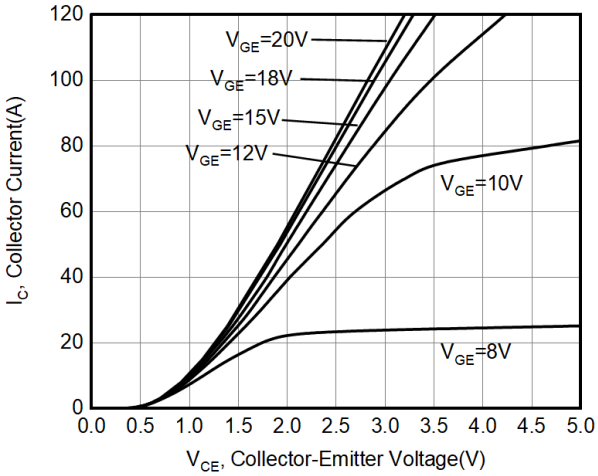


Figure 2. Typical output characteristic (T_j =150℃)

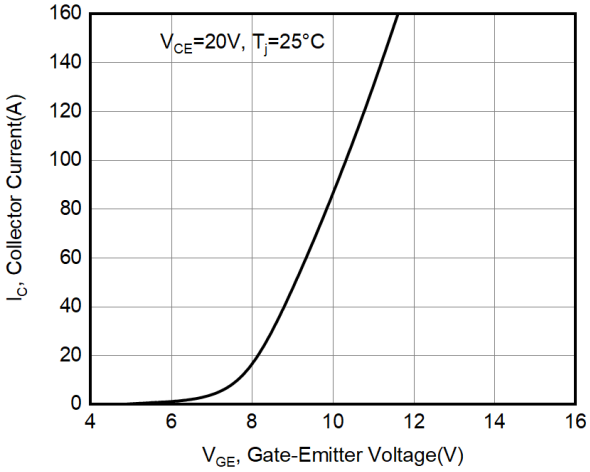


Figure 3. Typical transfer characteristic (T_j =25℃)

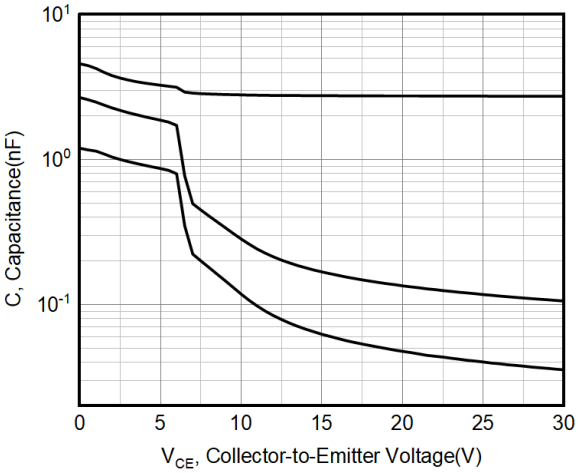


Figure 4. Capacitance characteristic (V_{GE}=0V, f=1MHz)

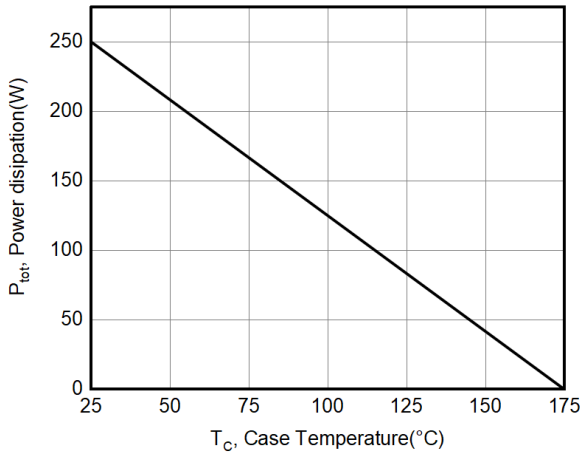


Figure 5. Power dissipation as a function of case temperature (T_j ≤175℃)

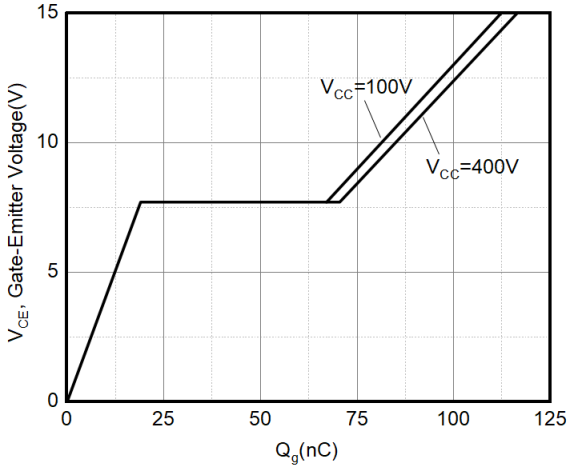


Figure 6. Typical gate charge (I_C =40A)

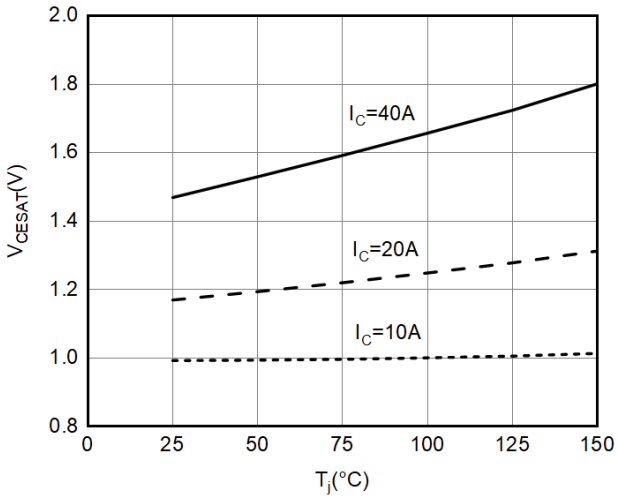


Figure 7. V_{CESAT} as a function of junction temperature (V_{GE}=15V)

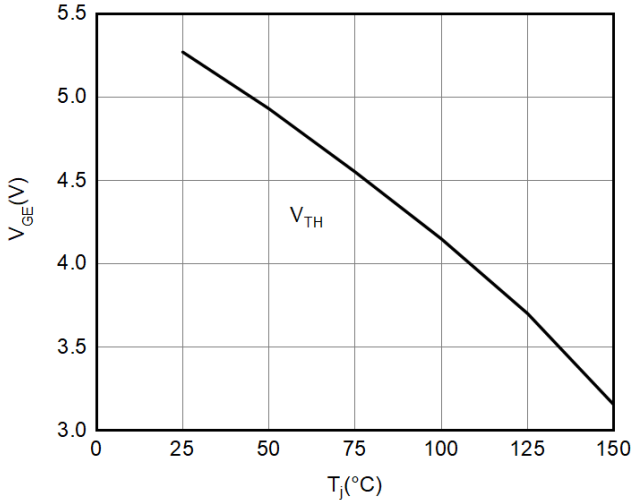


Figure 8. V_{TH} as a function of junction temperature (I_{CE}=250μA)

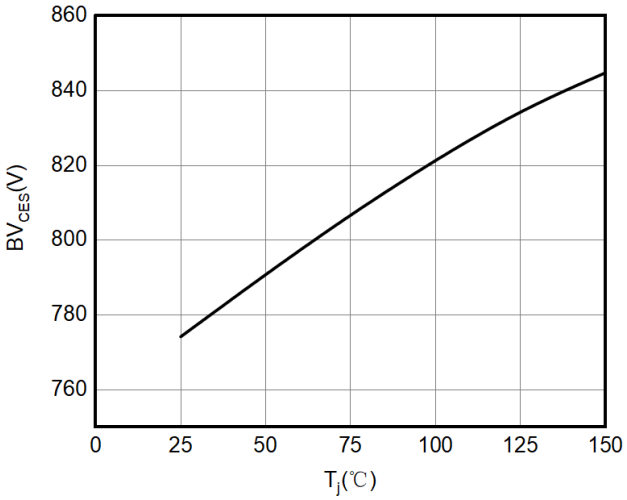


Figure 9. BV as a function of junction temperature (I_{CE}=250μA)

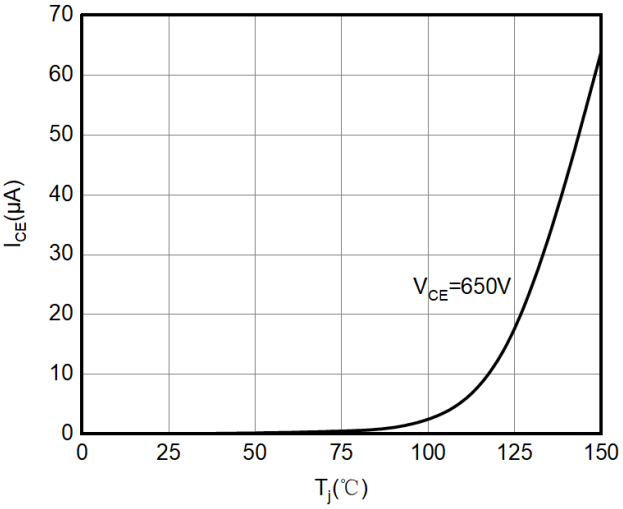


Figure 10. I_{CES} leakage current as a function of junction temperature

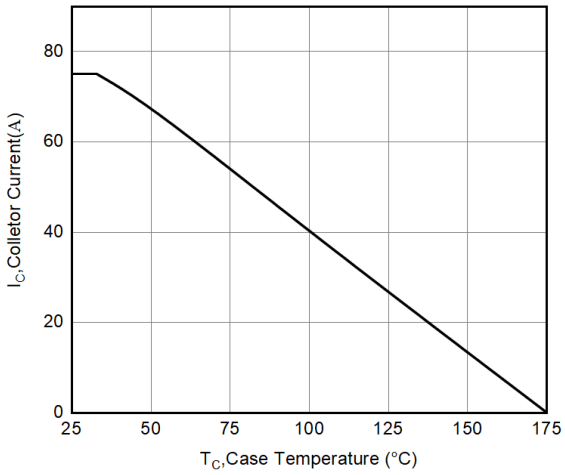


Figure 11. Collector current as a function of case temperature(V_{GE}≥15V, T_j≤150℃)

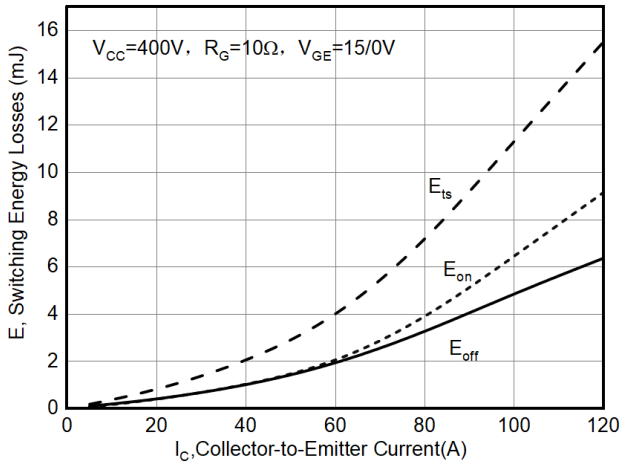


Figure 12. E_{on}, E_{off} as a function of I_C (T_j=25℃)

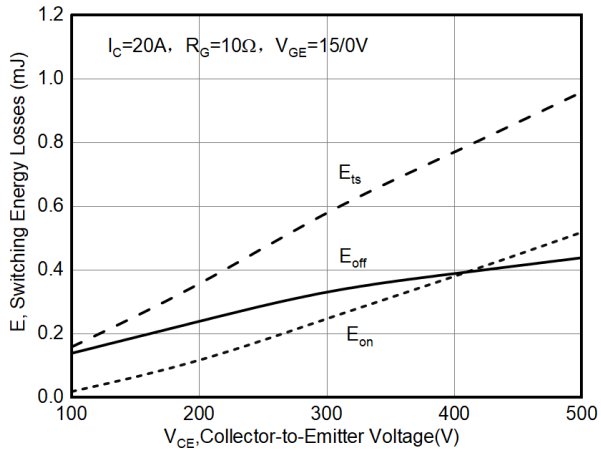


Figure 13. E_{on}, E_{off} as a function of V_{CE} (T_j=25℃)

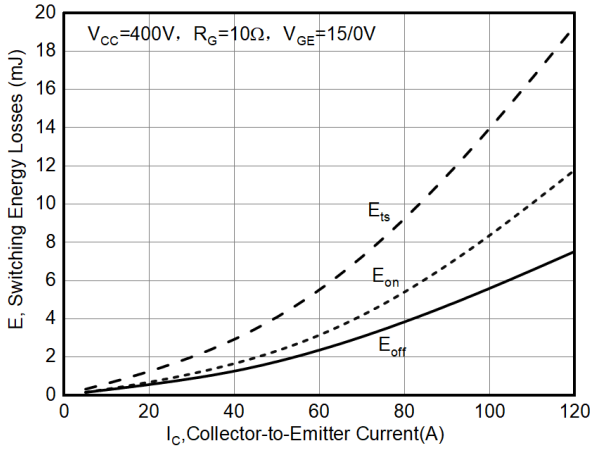


Figure 14. E_{on}, E_{off} as a function of I_C (T_j=150℃)

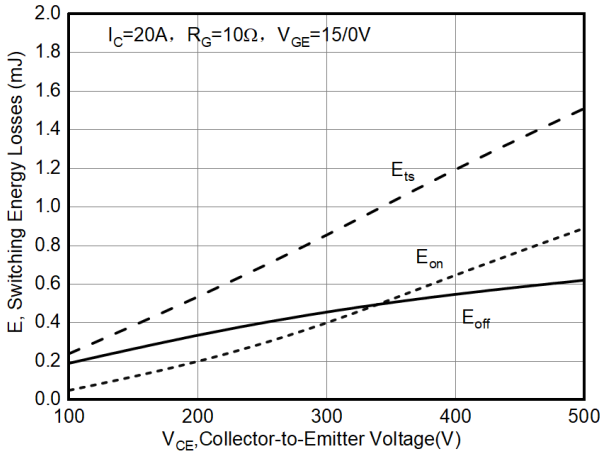


Figure 15. E_{on}, E_{off} as a function of V_{CE} (T_j=150℃)

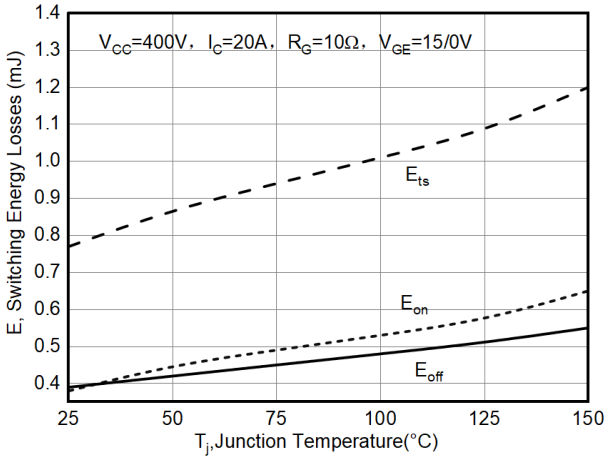


Figure 16. E_{on}, E_{off} as a function of junction temperature

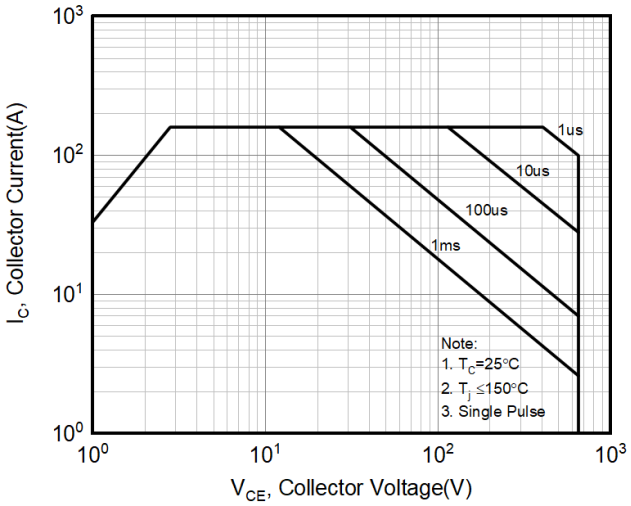
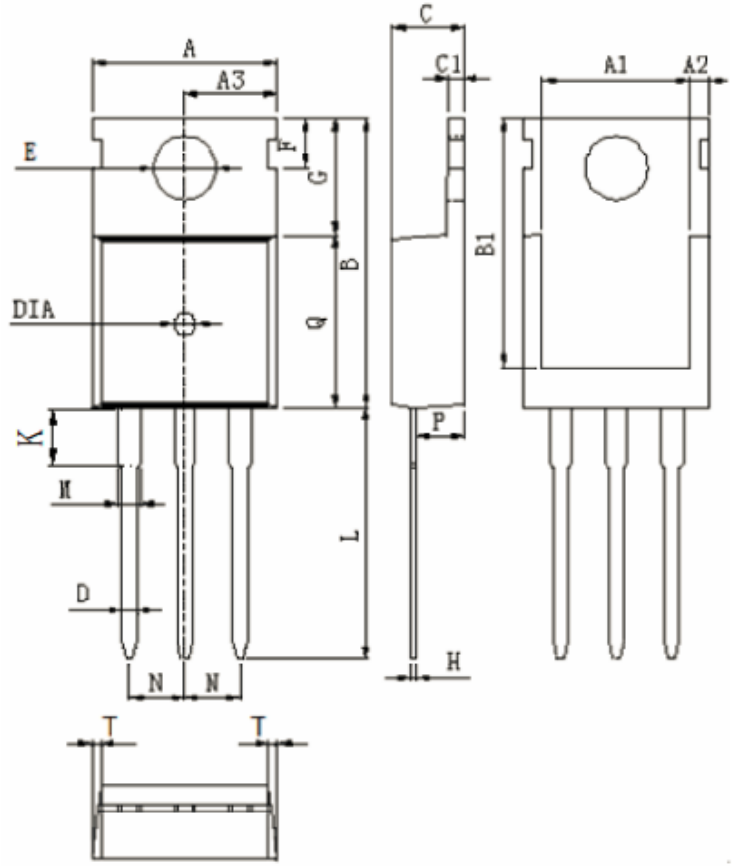


Figure 17. FBSOA

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

Revision History：

Revision	Date	Subjects (major changes since last revision)
1.0	2023-02	Initial Version

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