1. Product Features

1.1 Electrical features

- V_{CES}=650V
- $I_{C\ nom}$=200A / I_{CRM}=400A
- Low switching losses
- Low inductance
- Fast switching and short tail current
- High power and thermal cycling capability

Figure1 IGBT Module

1.2 Mechanical features

- Al_2O_3 substrate with low thermal resistance
- Copper base plate

2. Typical Applications

- Switching mode power supply
- Uninterruptible power supply

3. Description

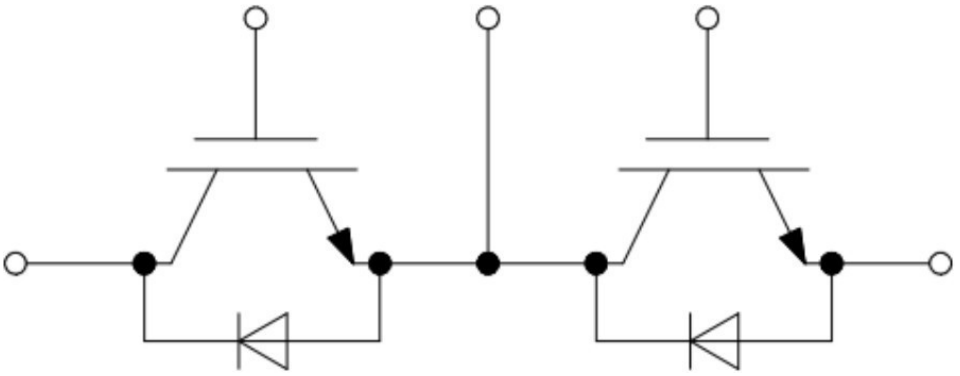


Figure 2 Half Bridge

4. IGBT

4.1 Maximum rated values

Parameter	Note or test condition	Symbol	Values	Unit
Collector-emitter voltage	T_{vj} = 25°C	V_{CES}	650	V
Continuous DC collector current	T_C = 80°C, $T_{vj\,max}$ = 150°C	$I_{C\,nom}$	200	A
Repetitive peak collector current	t_P = 1 ms	I_{CRM}	400	A
Total power dissipation	T_C = 25°C, $T_{vj\,max}$ = 175°C	P_{tot}	650	W
Gate-emitter peak voltage		V_{GES}	+/- 20	V

4.2 Characteristic value

Parameter	Note or test condition		Symbol	Values			Unit
				Min.	Typ.	Max.	
Collector-emitter saturation voltage	I_C = 200 A, V_{GE} = 15 V	T_{vj} = 25°C	$V_{CE,sat}$		1.37		V
		T_{vj} = 125°C			1.48		V
		T_{vj} = 150°C			1.51		V
Gate threshold voltage	I_C = 3.2mA, V_{CE} = V_{GE}, T_{vj} = 25°C		$V_{GE,th}$	5.0	5.8	6.5	V
Gate charge	V_{GE} = -15 V ... +15 V		Q_G		1.51		µC
Internal gate resistor	T_{vj} = 25°C		R_{Gint}		2.90		Ω
Input capacitance	f=1MHz, T_{vj}=25°C, V_{CE}=25V, V_{GE}=0V		C_{ies}		32.4		nF
Reverse transfer capacitance	f=1MHz, T_{vj}=25°C, V_{CE}=25V, V_{GE}=0V		C_{res}		0.14		nF
Collector-emitter cut-off current	V_{CE} = 650 V, V_{GE} = 0 V, T_{vj} = 25°C		I_{CES}			1	mA
Gate-emitter leakage current	V_{CE} = 0 V, V_{GE} = 20 V, T_{vj} = 25°C		I_{GES}			100	nA
Turn-on delay time, inductive load	I_C = 200A, V_{CE} = 300V	T_{vj} = 25°C	$t_{d,on}$		0.09		us
	V_{GE} = +15/-15V	T_{vj} = 125°C			0.10		us
	$R_{G,on}$ = 1.5Ω	T_{vj} = 150°C			0.11		us
Rise time, inductive load	I_C = 200A, V_{CE} = 300V	T_{vj} = 25°C	t_r		0.05		us
	V_{GE} = +15/-15V	T_{vj} = 125°C			0.05		us
	$R_{G,on}$ = 1.5Ω	T_{vj} = 150°C			0.05		us

(table continues...)

Parameter	Note or test condition		Symbol	Values			Unit
				Min.	Typ.	Max.	
Turn-off delay time, inductive load	I_C = 200A, V_{CE} = 300V	T_{vj} = 25°C	$t_{d,off}$		0.16		us
	V_{GE} = +15/-15V	T_{vj} = 125°C			0.19		us
	$R_{G,off}$ = 1.5Ω	T_{vj} = 150°C			0.20		us
Fall time, inductive load	I_C = 200A, V_{CE} = 300V	T_{vj} = 25°C	t_f		0.11		us
	V_{GE} = +15/-15V	T_{vj} = 125°C			0.22		us
	$R_{G,off}$ = 1.5Ω	T_{vj} = 150°C			0.26		us
Turn-on energy loss per pulse	I_C = 200A, V_{CE} = 300V, L_s=30nH	T_{vj} = 25°C	E_{on}		2.09		mJ
	V_{GE} = +15/-15V, di/dt =2970A/μs	T_{vj} = 125°C			2.12		mJ
	$R_{G,on}$ = 1.5Ω (T_{vj} = 150°C)	T_{vj} = 150°C			2.14		mJ
Turn-off energy loss per pulse	I_C = 200A, V_{CE} = 300V, L_s=30nH	T_{vj} = 25°C	E_{off}		4.15		mJ
	V_{GE} = +15/-15V, dv/dt =2860V/μs	T_{vj} = 125°C			7.05		mJ
	$R_{G,off}$ = 1.5Ω (T_{vj} = 150°C)	T_{vj} = 150°C			7.80		mJ
Thermal resistance, junction to case	Per IGBT		R_{thJC}			0.23	K/W

5. Diode

5.1 Maximum rated values

Parameter	Note or test condition	Symbol	Values	Unit
Repetitive peak reverse voltage	T_{vj} = 25°C	V_{RRM}	650	V
Continuous DC forward current		I_F	200	A
Repetitive peak forward current	t_P = 1 ms	I_{FRM}	400	A

5.2 Characteristic value

Parameter	Note or test condition		Symbol	Values			Unit
				Min.	Typ.	Max.	
Forward voltage	I_F = 200 A, V_{GE} = 0 V	T_{vj} = 25°C	V_F		1.22		V
		T_{vj} = 125°C			1.19		V
		T_{vj} = 150°C			1.17		V

(table continues...)

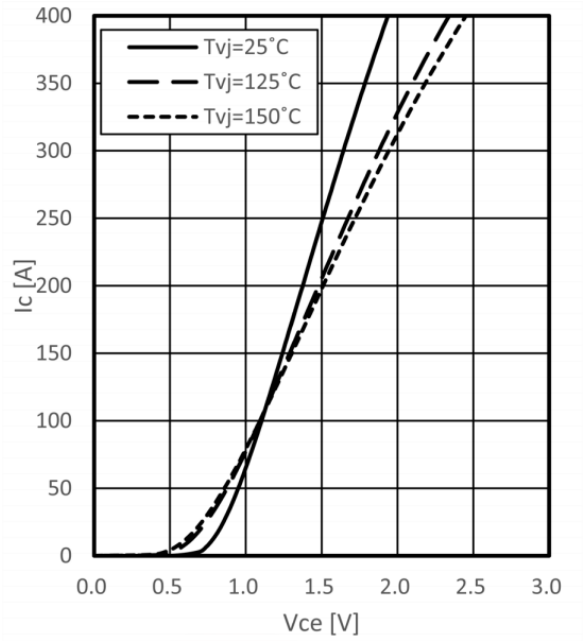
Parameter	Note or test condition		Symbol	Values			Unit
				Min.	Typ.	Max.	
Peak reverse recovery current	I_F = 200A, V_R = 300V	T_{vj} = 25°C	I_{RM}		172		A
	V_{GE} = -15V , - di_F/dt = 2260 A/µs	T_{vj} = 125°C			186		A
	(T_{vj}=150°C)	T_{vj} = 150°C			190		A
Recovered charge	I_F = 200A, V_R = 300V	T_{vj} = 25°C	Q_r		16.6		µC
	V_{GE} = -15V , - di_F/dt = 2260 A/µs	T_{vj} = 125°C			23.3		µC
	(T_{vj}=150°C)	T_{vj} = 150°C			25.9		µC
Reverse recovery energy	I_F = 200A, V_R = 300V	T_{vj} = 25°C	E_{rec}		1.07		mJ
	V_{GE} = -15V , - di_F/dt = 2260 A/µs	T_{vj} = 125°C			2.56		mJ
	(T_{vj}=150°C)	T_{vj} = 150°C			2.99		mJ
Thermal resistance, junction to case	Per diode		R_{thJC}			0.38	K/W

6. Module

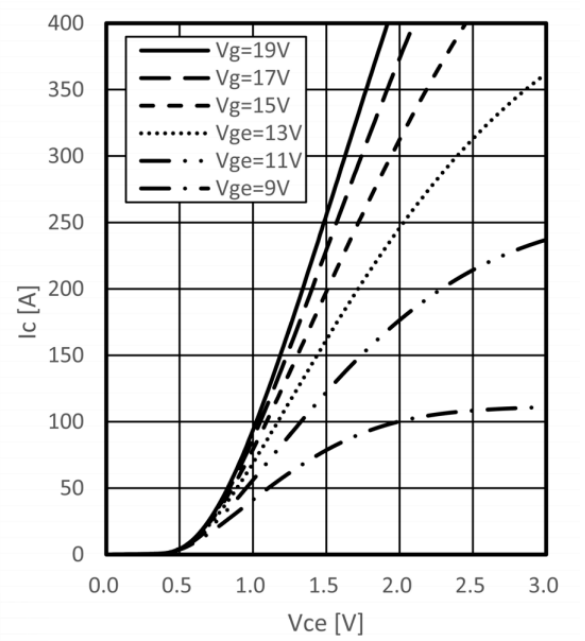
6.1 Characteristic value

Parameter	Note or test condition	Symbol	Values			Unit
			Min.	Typ.	Max.	
Isolation Voltage	RMS, f=50HZ,1min	V_{ISOL}			4000	V
Stray inductance module		L_{sCE}		30		nH
Operation Junction Temperature		T_{jop}	-40		150	° C
Storage Temperature Range		T_{stg}	-40		125	° C
Mounting Torque	Screw M6	M	3.0		5.0	N.m
Terminal Connection Torque	Screw M5	M	2.5		5.0	N.m
Weight of Module		G		160		g

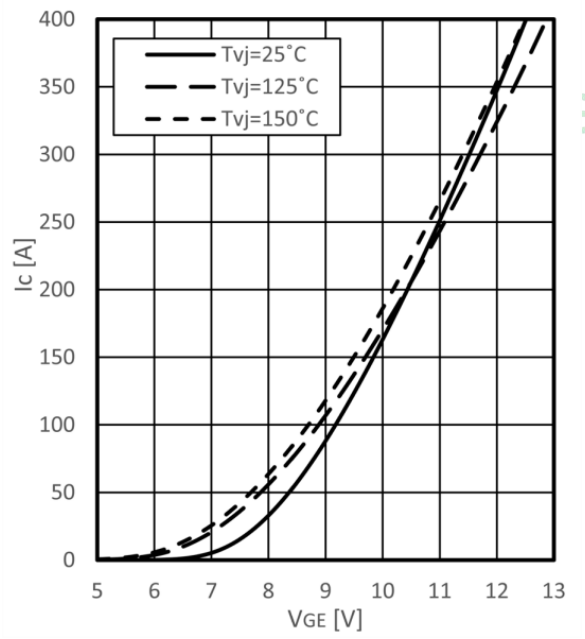
7. Characteristics diagrams



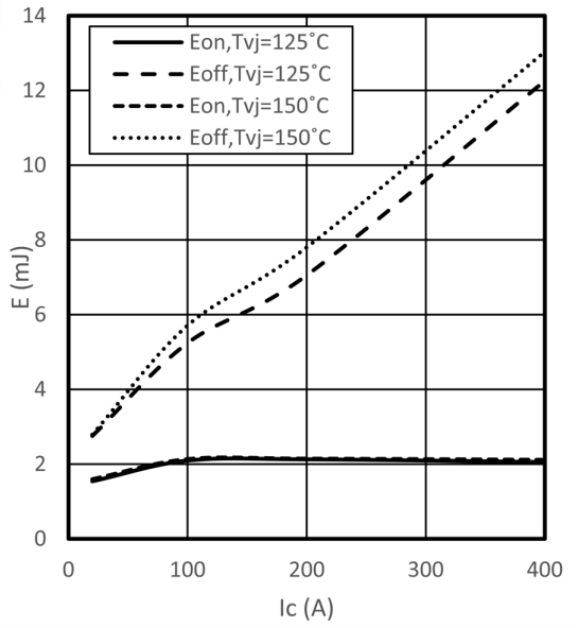
Output characteristic IGBT (typical)
$I_C = f(V_{CE})$
$V_{GE} = 15V$



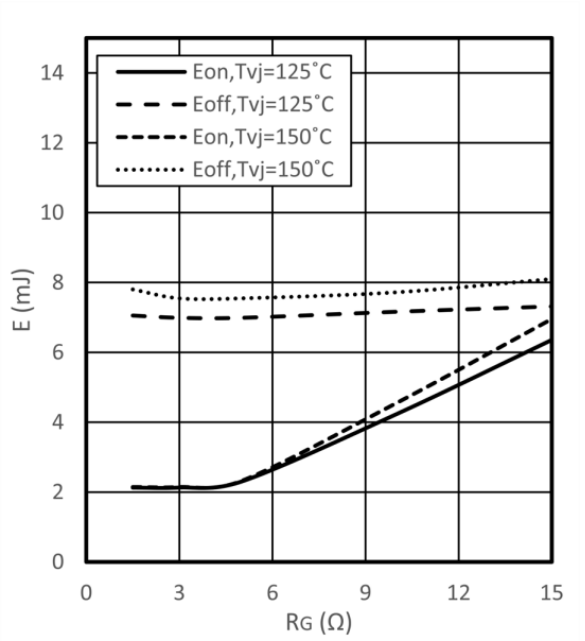
Output characteristic IGBT (typical)
$I_C = f(V_{CE})$
$T_{vj} = 150°C$



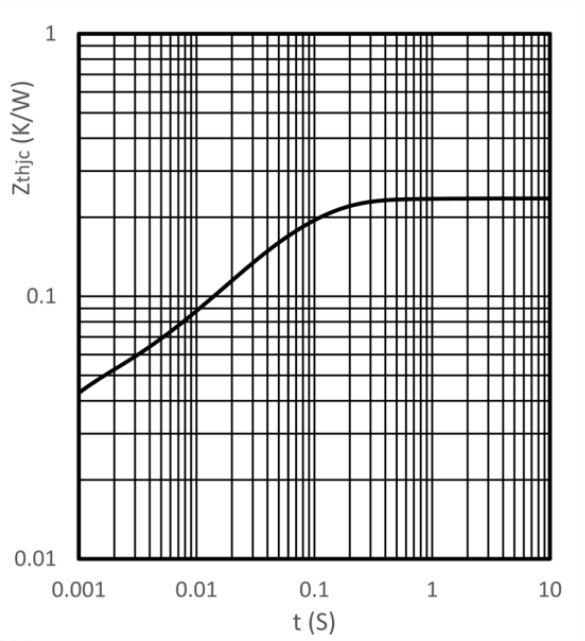
Transfer characteristic IGBT (typical)
$I_C = f(V_{GE})$
$V_{CE} = 20V$



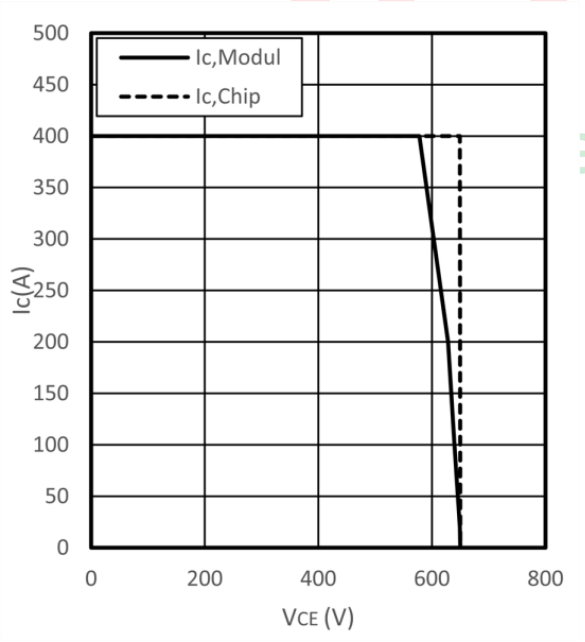
Switching losses IGBT (typical)
$E_{on} = f(I_C)$, $E_{off} = f(I_C)$
$R_{Goff} = 1.5\,\Omega$, $R_{Gon} = 1.5\,\Omega$, $V_{CE} = 300\,V$, $V_{GE} = \pm 15\,V$



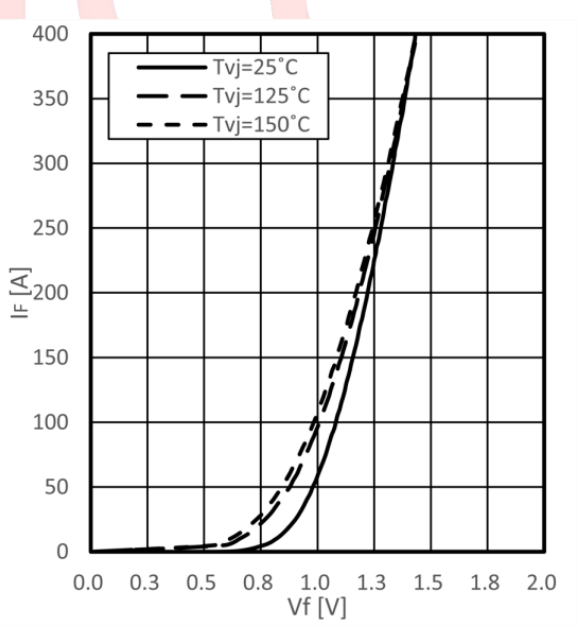
Switching losses IGBT (typical)
$E_{on} = f(R_G)$, $E_{off} = f(R_G)$
$I_C = 200\,A$, $V_{CE} = 300\,V$, $V_{GE} = \pm 15\,V$



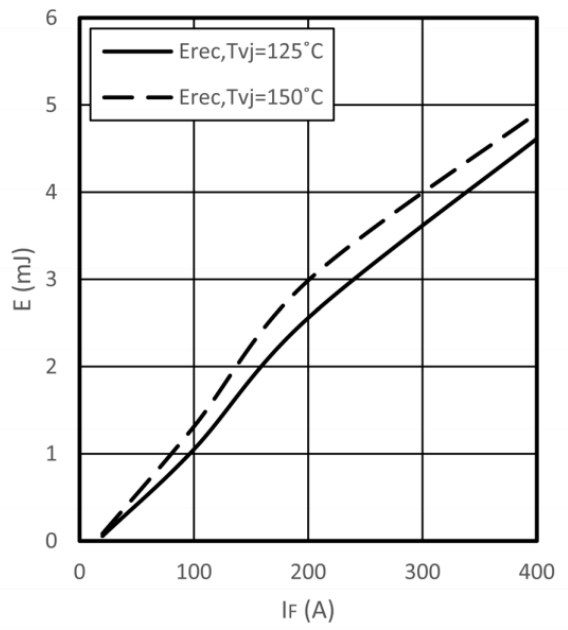
Transient thermal impedance IGBT
$Z_{thJC} = f(t)$



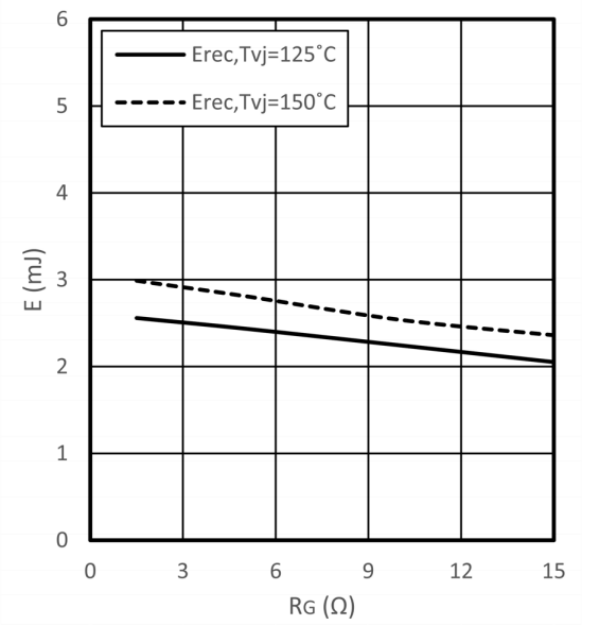
Reverse bias safe operating area IGBT (RBSOA)
$I_C = f(V_{CE})$
$V_{GE} = 15V$, $R_{Goff} = 1.5\,\Omega$, $T_{vj} = 150°C$



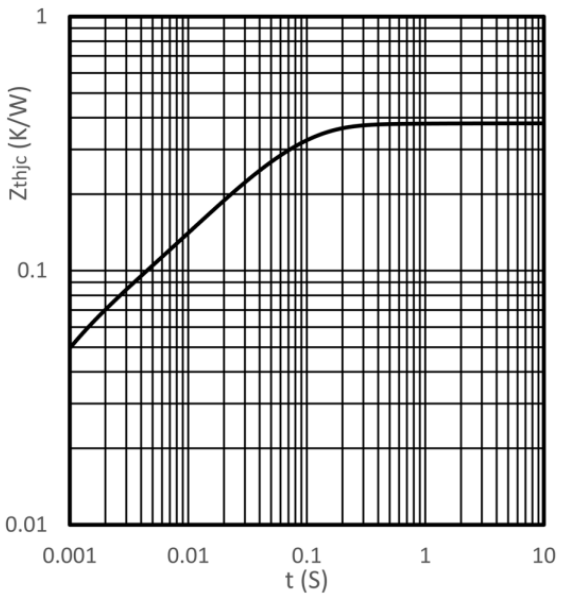
Forward characteristic of Diode, Inverter (typical)
$I_F = f(V_F)$



Switching losses Diode (typical)
$E_{rec} = f(I_F)$
$R_{Gon} = 1.5\ \Omega$, $V_{CE} = 300\ V$



Switching losses Diode (typical)
$E_{on} = f(R_G)$, $E_{off} = f(R_G)$
$I_C = 200\ A$, $V_{CE} = 300\ V$, $V_{GE} = \pm 15\ V$



Transient thermal impedance Diode
$Z_{thJC} = f(t)$

8. Circuit Diagram

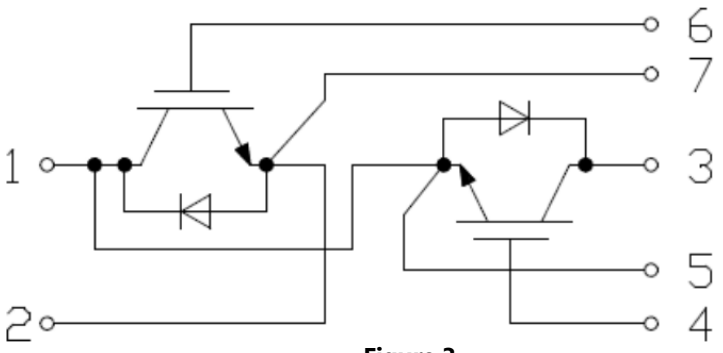


Figure 3

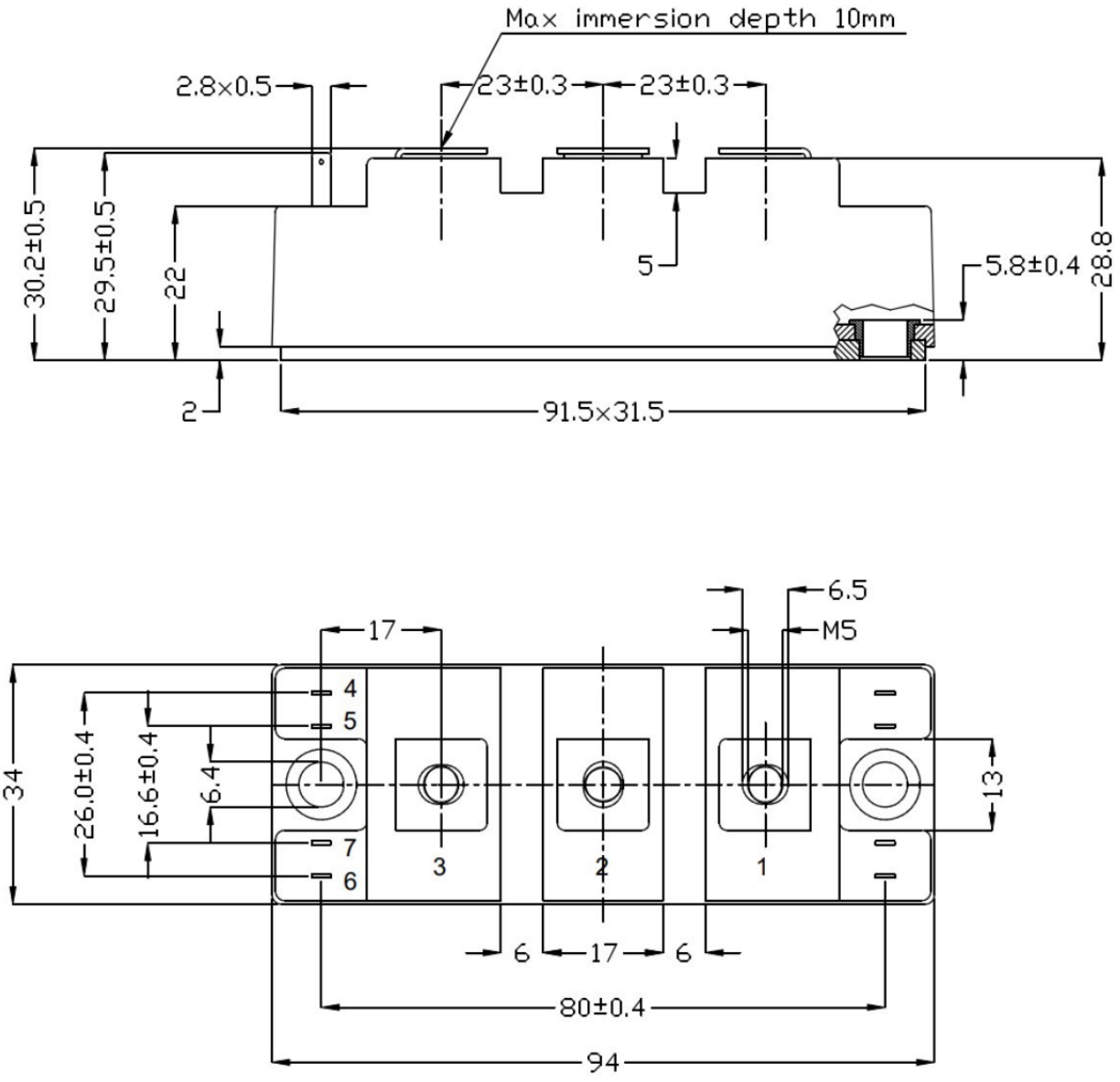


Figure 4