STARPOWER

SEMICONDUCTOR™

IGBT

GD400CUT170C2S

Molding Type Module

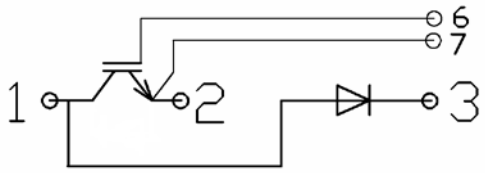
1700V/400A chopper in one-package

General Description

STARPOWER IGBT Power Module provides ultra low conduction loss as well as short circuit ruggedness. They are designed for the applications such as Inverters and UPS.

Features

- Low $V_{CE(sat)}$ trench IGBT technology
- Low switching losses
- 10μs short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper baseplate using DBC technology



Equivalent Circuit Schematic

Typical Applications

- AC inverter drives
- Switching mode power supplies

IGBT T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD400CUT170C2S	Units
V_{CES}	Collector-Emitter Voltage @ T_j=25℃	1700	V
V_{GES}	Gate-Emitter Voltage	±20	V
I_C	Collector Current @ T_C=25℃ @ T_C=80℃	650 400	A
I_{CM}	Pulsed Collector Current t_p=1ms	800	A
P_{tot}	Total Power Dissipation @ T_j=150℃	2403	W
T_{SC}	Short Circuit Withstand Time @ T_j=150℃	10	μs

Off Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	T_j=25℃	1700			V
I_{CES}	Collector Cut-Off Current	V_{CE}=V_{CES},V_{GE}=0V, T_j=25℃			3.0	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE}=V_{GES},V_{CE}=0V, T_j=25℃			400	nA

On Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=16mA,V_{CE}=V_{GE}, T_j=25℃	5.2	5.8	6.4	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=400A,V_{GE}=15V, T_j=25℃		2.00	2.45	V
		I_C=400A,V_{GE}=15V, T_j=125℃		2.40		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=400A, R_G=3.6Ω,V_{GE}=±15V, T_j=25℃		278		ns
t_r	Rise Time			81		ns
$t_{d(off)}$	Turn-Off Delay Time			802		ns
t_f	Fall Time			119		ns
E_{on}	Turn-On Switching Loss			104		mJ
E_{off}	Turn-Off Switching Loss			86		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=400A, R_G=3.6Ω,V_{GE}=±15V, T_j=125℃		302		ns
t_r	Rise Time			99		ns
$t_{d(off)}$	Turn-Off Delay Time			1002		ns
t_f	Fall Time			198		ns

E_{on}	Turn-On Switching Loss	V_{CC}=900V,I_C=400A, R_G=3.6Ω,V_{GE}=±15V, T_j=125℃		136		mJ
E_{off}	Turn-Off Switching Loss			124		mJ
C_{ies}	Input Capacitance	V_{CE}=25V,f=1Mhz, V_{GE}=0V		36		pF
C_{oes}	Output Capacitance			1.5		pF
C_{res}	Reverse Transfer Capacitance			1.2		pF
R_{Gint}	Internal Gate Resistance			1.9		Ω
I_{SC}	SC Data	T_P≤10μs,V_{GE}=15V, T_j=125℃,V_{CC}=1000V, V_{CEM}≤1700V		1600		A

DIODE T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD400CUT170C2S	Units
V_{RRM}	Repetitive Peak Reverse Voltage @ Tj=25℃	1700	V
I_F	DC Forward Current @ T_C=80℃	100	A
I_{FRM}	Repetitive Peak Forward Current t_p=1ms	200	A
I^2t	I^2t-value,V_R=0V,t_p=10ms,T_j=125℃	1800	A^2s

Characteristics Values

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	I_F=100A,V_{GE}=0V	T_j=25℃		1.80	2.20	V
			T_j=125℃		1.90		
Q_r	Diode Reverse Recovery Charge	I_F=100A, V_R=900V, di/dt=-2450A/μs, V_{GE}=-15V	T_j=25℃		29.0		μC
			T_j=125℃		48.5		
I_{RM}	Diode Peak Reverse Recovery Current		T_j=25℃		155		A
			T_j=125℃		165		
E_{rec}	Reverse Recovery Energy		T_j=25℃		15.5		mJ
			T_j=125℃		27.5		

IGBT Module

Symbol	Parameter	Min.	Typ.	Max.	Units
V_{ISO}	Isolation Voltage RMS,f=50Hz,t=1min		2500		V
L_{CE}	Stray Inductance			20	nH
$R_{CC'+EE'}$	Module Lead Resistance,Terminal to Chip @ T_C=25℃		0.35		mΩ
$R_{\theta JC}$	Junction-to-Case (IGBT-inverter,per 1/2 Module)			0.052	K/W
	Junction-to-Case (DIODE-brake-chopper per 1/2 Module)			0.280	
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)		0.035		K/W
T_j	Maximum Junction Temperature		150		℃
T_{STG}	Storage Temperature Range	-40		125	℃
Mounting Torque	Power Terminal Screw:M6	2.5		5.0	N.m
	Mounting Screw:M6	3.0		5.0	
G	Weight of Module		300		g

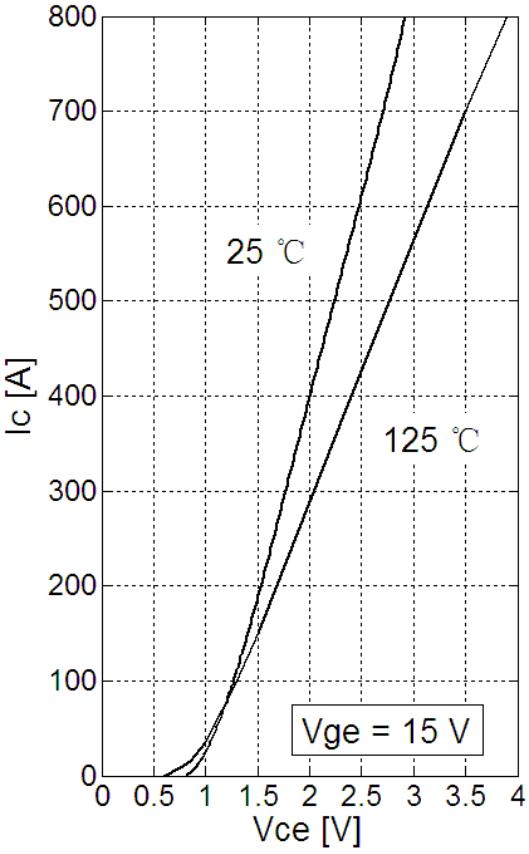


Fig 1. IGBT Typical Output Characteristics

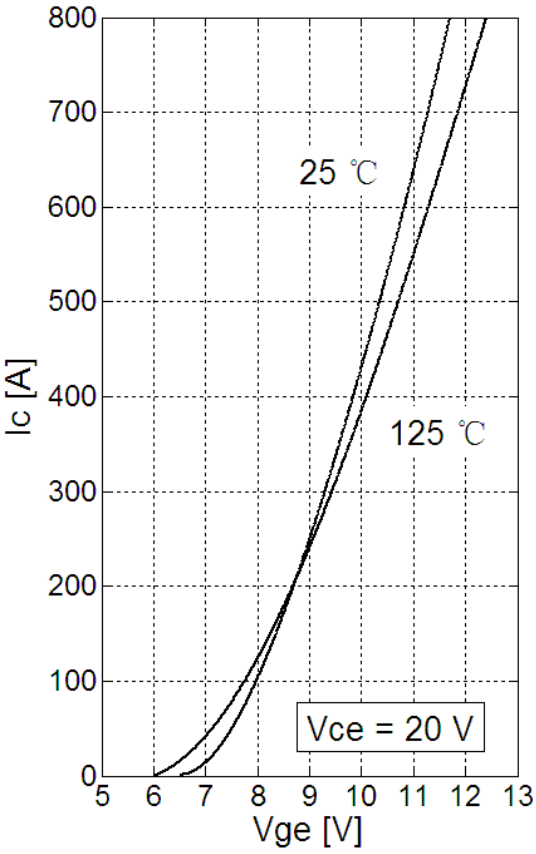


Fig 2. IGBT Typical Transfer Characteristics

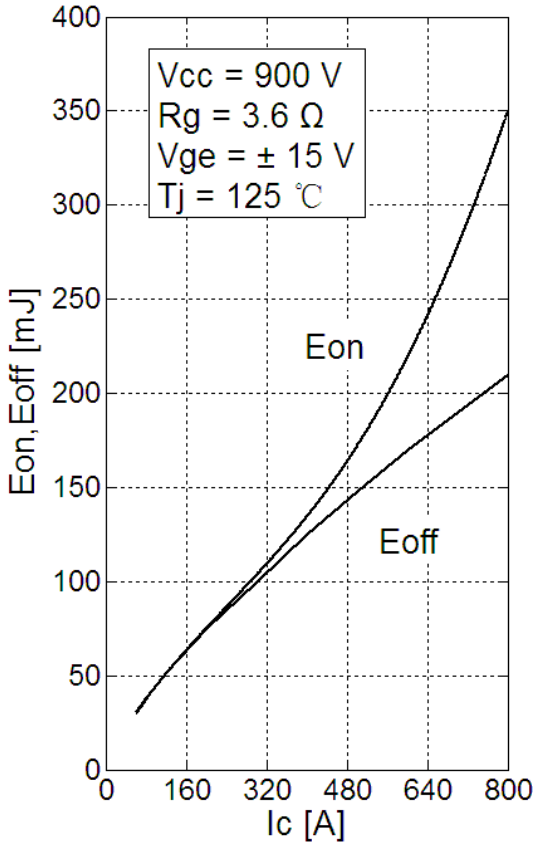


Fig 3. IGBT Switching Loss vs. I_C

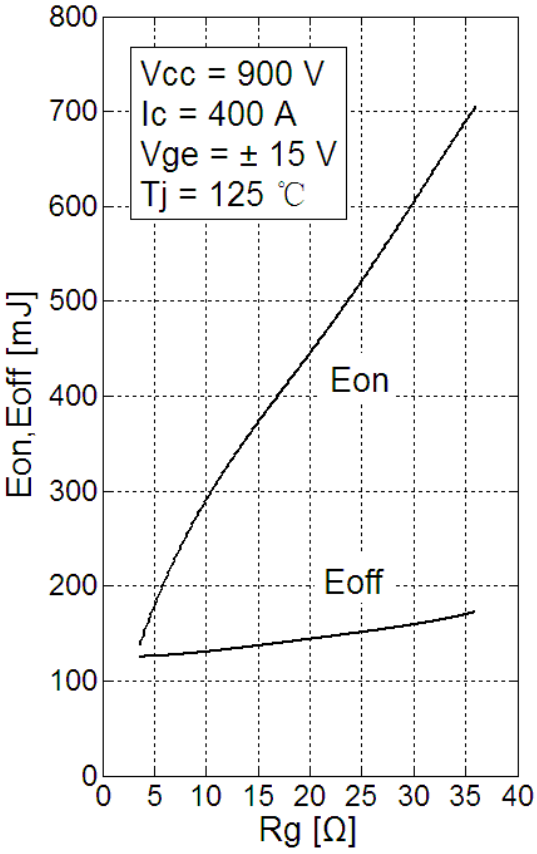


Fig 4. IGBT Switching Loss vs. R_G

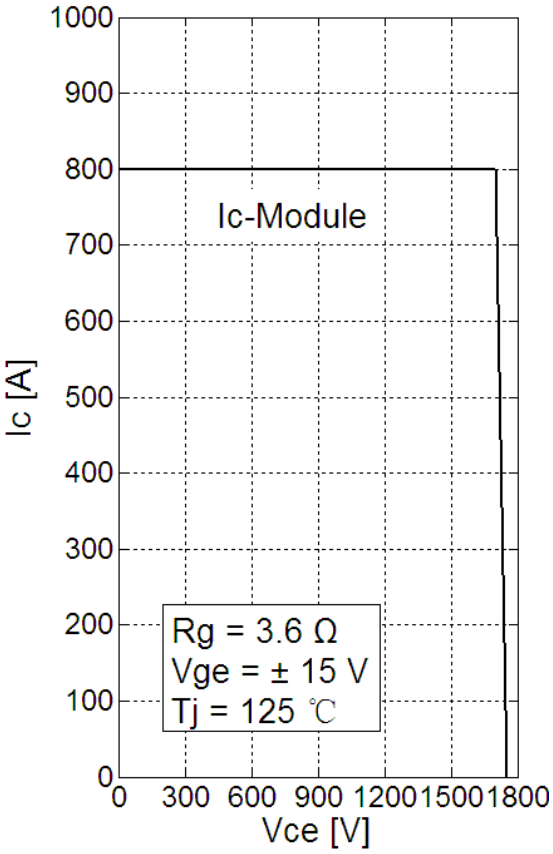


Fig 5. RBSOA

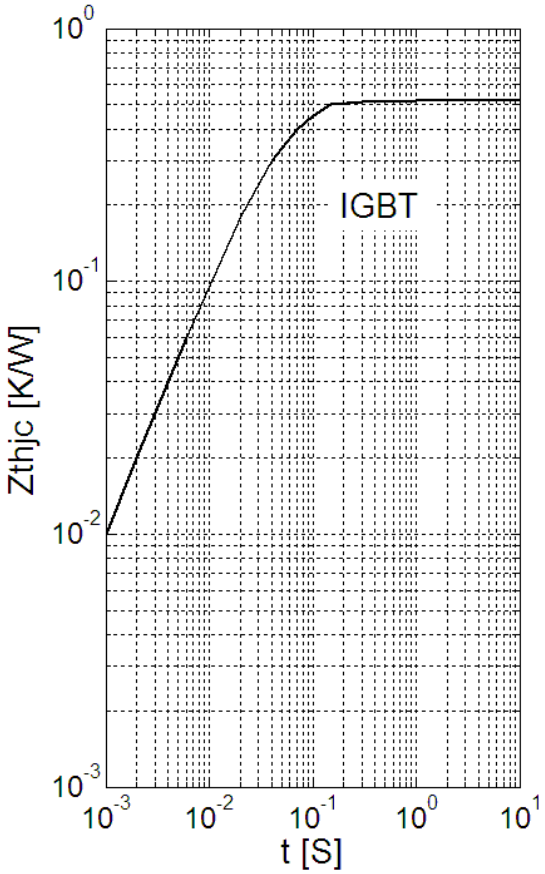


Fig 6. IGBT Transient Thermal Impedance

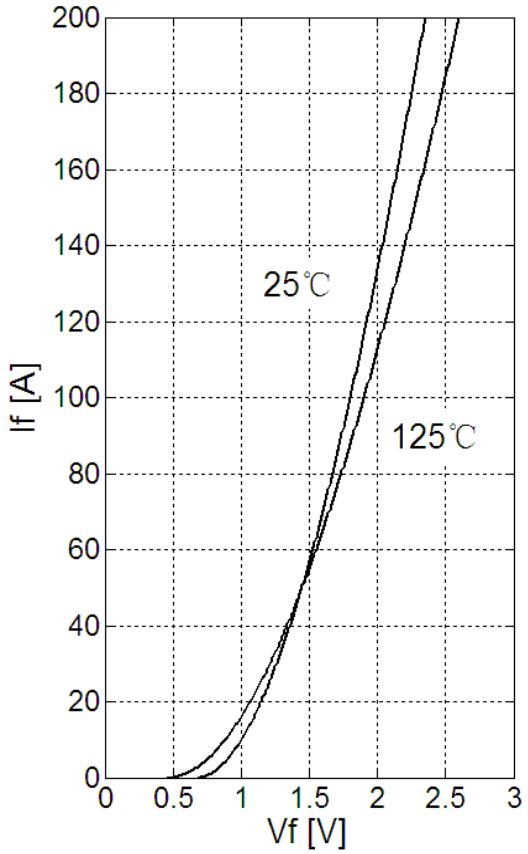


Fig 7. Diode Forward Characteristics

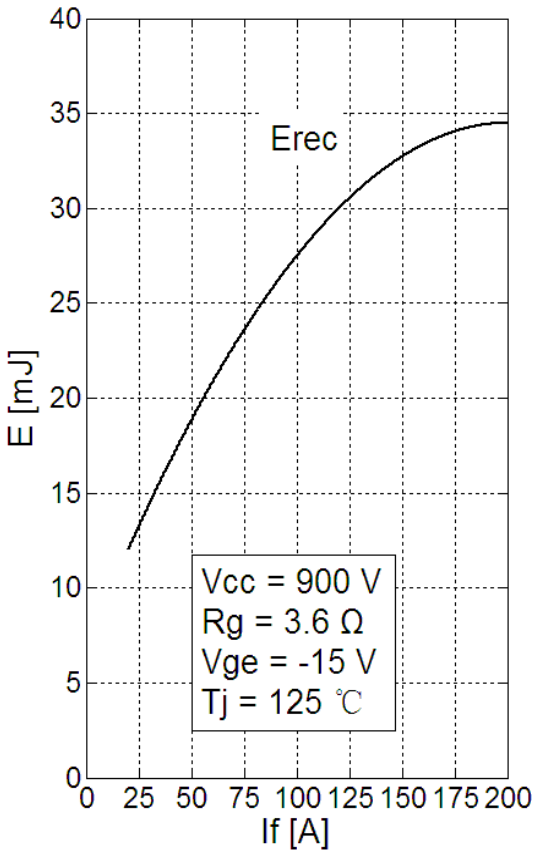


Fig 8. Diode Switching Loss vs. I_F

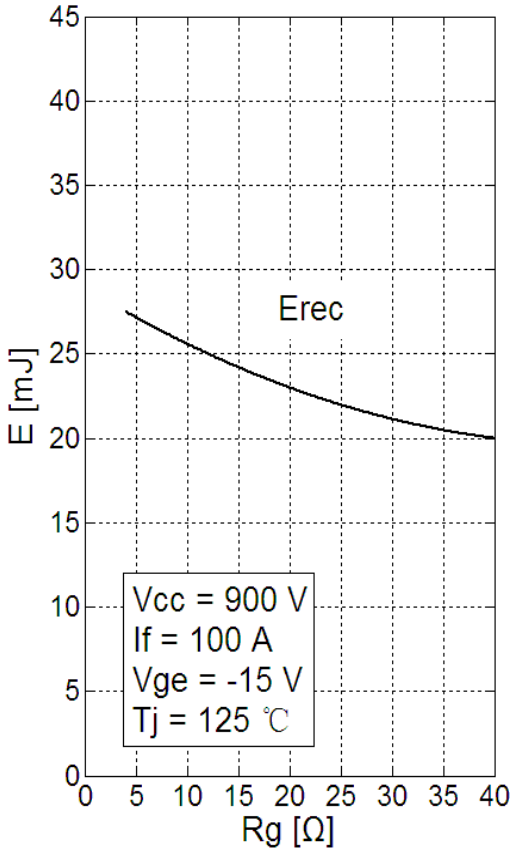


Fig 9. Diode Switching Loss vs. R_G

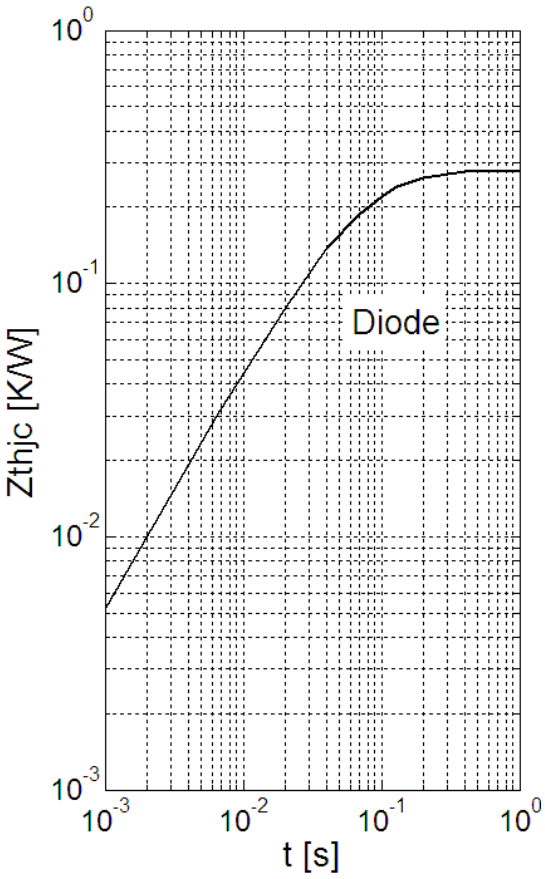
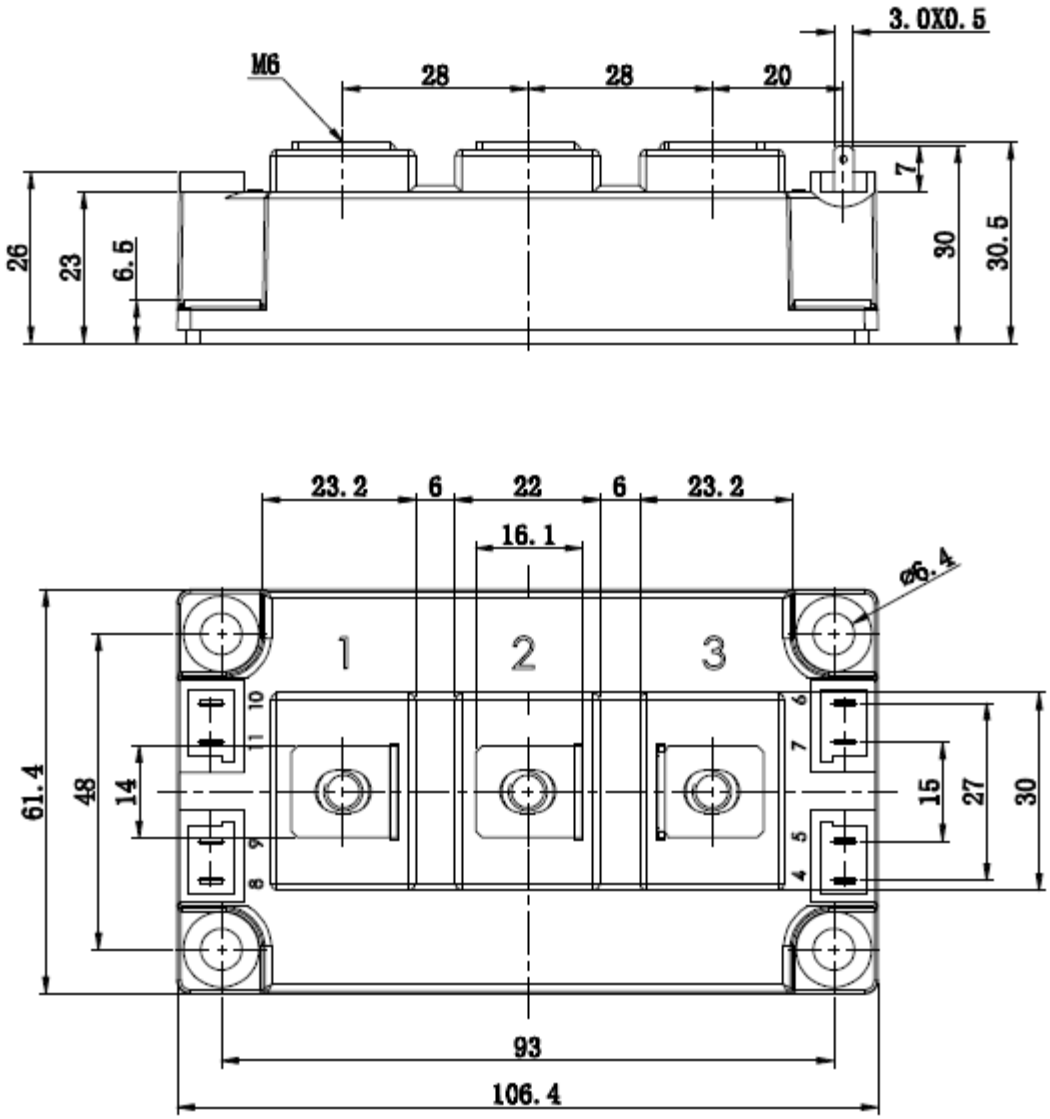


Fig 10. Diode Transient Thermal Impedance

Package Dimension

Dimensions in Millimeters



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