STARPOWER

SEMICONDUCTOR™

IGBT

GD600HFT170C3S Preliminary

Molding Type Module

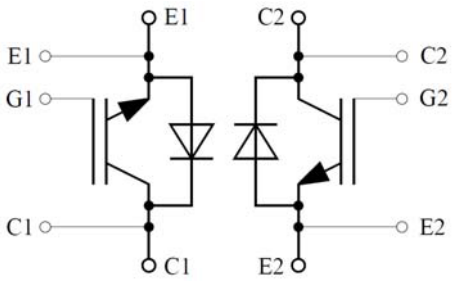
1700V/600A 2 in one-package

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 high power converters.

Features

- Low $V_{CE(sat)}$ trench IGBT technology
- 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
- Uninterruptible Power Supply
- Wind Turbines

Absolute Maximum Ratings T_C=25℃ unless otherwise noted

Symbol	Description	GD600HFT170C3S	Units
V_{CES}	Collector-Emitter Voltage	1700	V
V_{GES}	Gate-Emitter Voltage	±20	V
I_C	Collector Current @ T_C=25℃	950	A
	@ T_C=80℃	600	
$I_{CM(1)}$	Pulsed Collector Current t_p= 1ms	1200	A
I_F	Diode Continuous Forward Current	600	A
I_{FM}	Diode Maximum Forward Current	1200	A
P_D	Maximum power Dissipation @ T_j=175℃	3571	W
T_j	Maximum Junction Temperature	150	℃
T_{STG}	Storage Temperature Range	-40 to +125	℃
V_{ISO}	Isolation Voltage RMS,f=50Hz,t=1min	3400	V
Mounting Torque	Power Terminal Screw:M4	1.8 to 2.1	N.m
	Power Terminal Screw:M8	8.0 to 10	
	Mounting Screw:M6	4.25 to 5.75	N.m

Notes:

(1) Repetitive rating: Pulse width limited by max. junction temperature

Electrical Characteristics of IGBT T_C=25℃ unless otherwise noted

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℃			5.0	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=24mA,V_{CE}=V_{GE}, T_j=25℃	5.2	5.8	6.4	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=600A,V_{GE}=15V, T_j=25℃		2.00	2.45	V
		I_C=600A,V_{GE}=15V, T_j=125℃		2.40		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Q_G	Gate charge	V_{GE}=-15…+15V		7.0		μC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=600A, R_{Gon}=2.4Ω, R_{Goff}=3.0Ω, V_{GE}=±15V,T_j=25℃		650		ns
t_r	Rise Time			155		ns
$t_{d(off)}$	Turn-Off Delay Time			1300		ns
t_f	Fall Time			180		ns
E_{on}	Turn-On Switching Loss			125		mJ
E_{off}	Turn-Off Switching Loss			186		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=600A, R_{Gon}=2.4Ω, R_{Goff}=3.0Ω, V_{GE}=±15V,T_j=125℃		701		ns
t_r	Rise Time			198		ns
$t_{d(off)}$	Turn-Off Delay Time			1590		ns
t_f	Fall Time			302		ns
E_{on}	Turn-On Switching Loss			186		mJ
E_{off}	Turn-Off Switching Loss			219		mJ
C_{ies}	Input Capacitance	V_{CE}=25V,f=1MHz, V_{GE}=0V		52.8		nF
C_{oes}	Output Capacitance			2.20		nF
C_{res}	Reverse Transfer Capacitance			1.75		nF
I_{SC}	SC Data	t_{SC}≤10μs,V_{GE}=15V, T_j=125℃,V_{CC}=1000V, V_{CEM}≤1700V		2400		A
R_{Gint}	Internal Gate Resistance			1.3		Ω
L_{CE}	Stray Inductance			20		nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal to Chip			0.18		mΩ

Electrical Characteristics of DIODE T_C=25℃ unless otherwise noted

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	I_F=600A	T_j=25℃		1.80	2.20	V
			T_j=125℃		1.90		
Q_r	Recovered Charge	I_F=600A, V_R=900V, di/dt=-3800A/μs, V_{GE}=-15V	T_j=25℃		580		μC
			T_j=125℃		640		
I_{RM}	Peak Reverse Recovery Current		T_j=25℃		160		A
			T_j=125℃		258		
E_{rec}	Reverse Recovery Energy		T_j=25℃		96		mJ
			T_j=125℃		171		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (per IGBT)		42	K/kW
$R_{\theta JC}$	Junction-to-Case (per Diode)		94	K/kW
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied, per Module)	6		K/kW
Weight	Weight of Module	1500		g

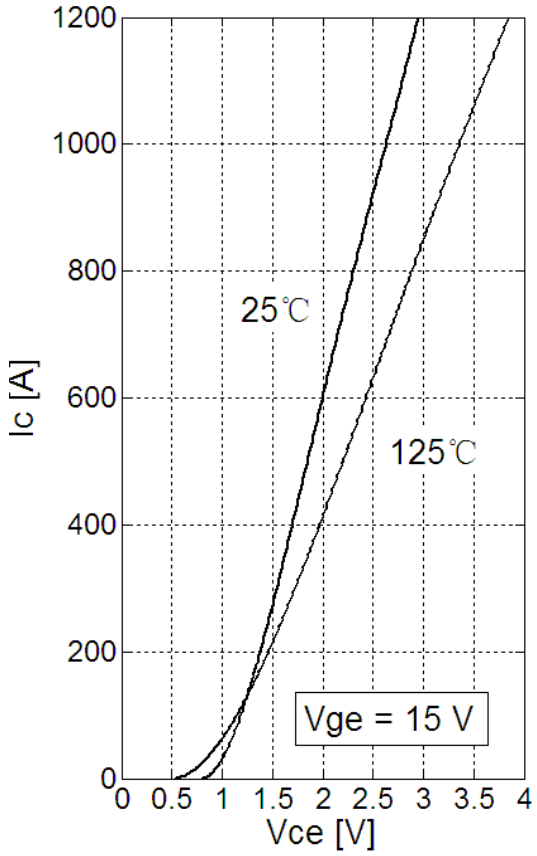


Fig 1. Typical IGBT Output Characteristics

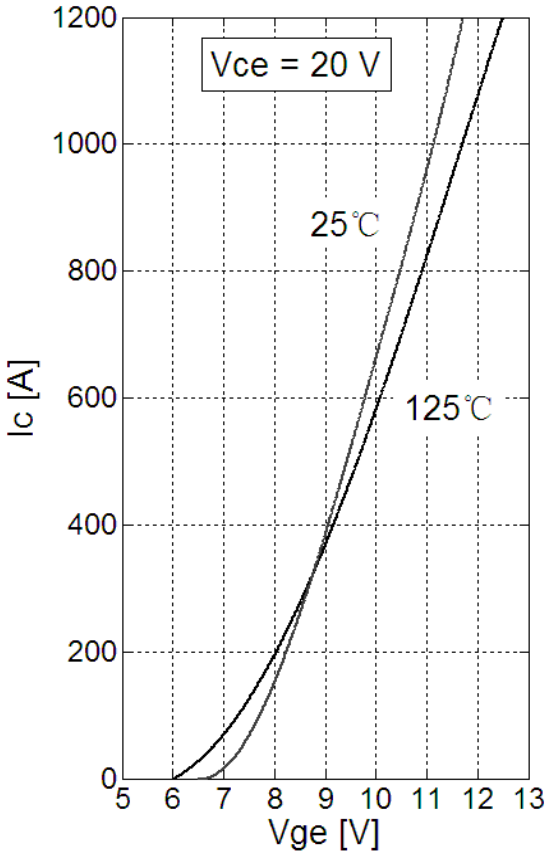


Fig 2. Typical IGBT Transfer Characteristics

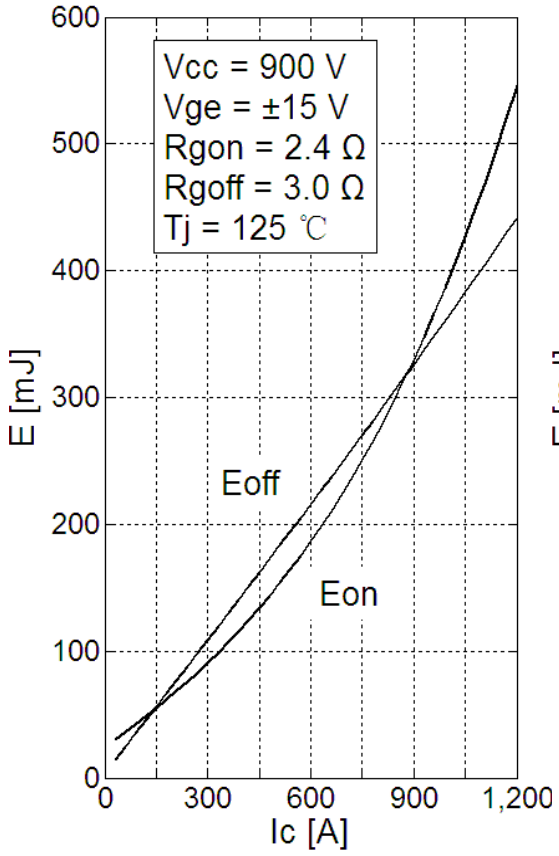


Fig 3. IGBT Switching Loss vs. I_C

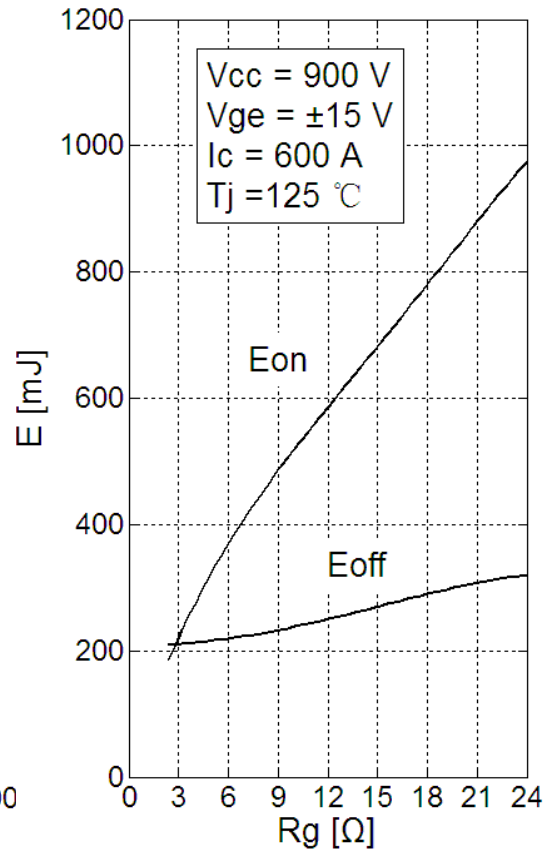


Fig 4. IGBT Switching Loss vs. R_G

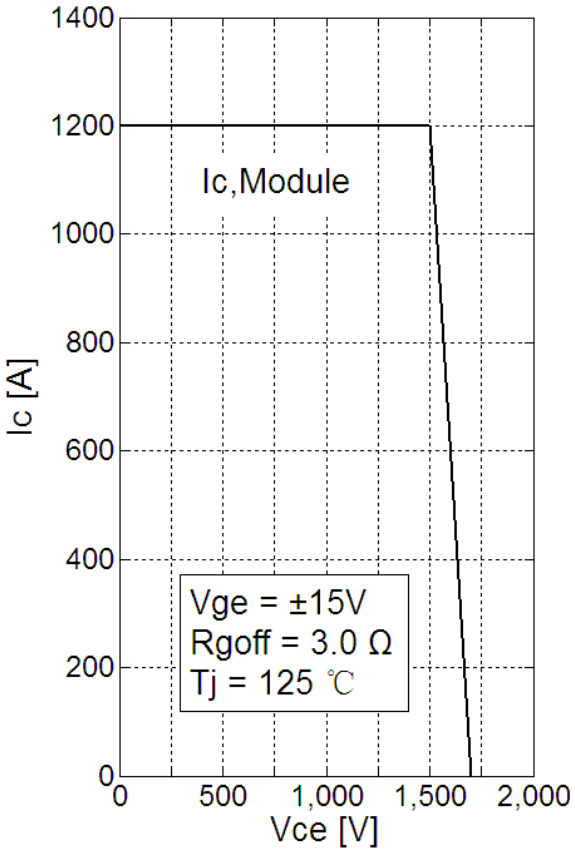


Fig 5. RBSOA

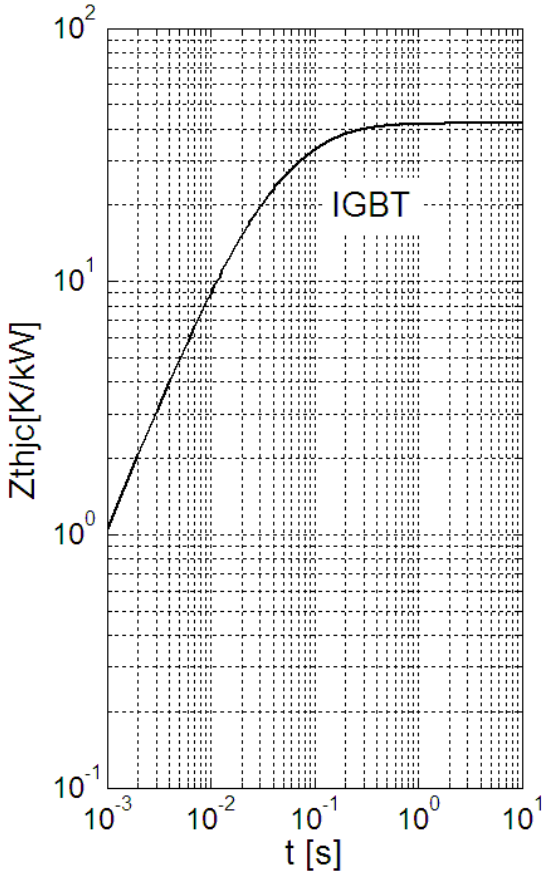


Fig 6. IGBT Transient Thermal Impedance

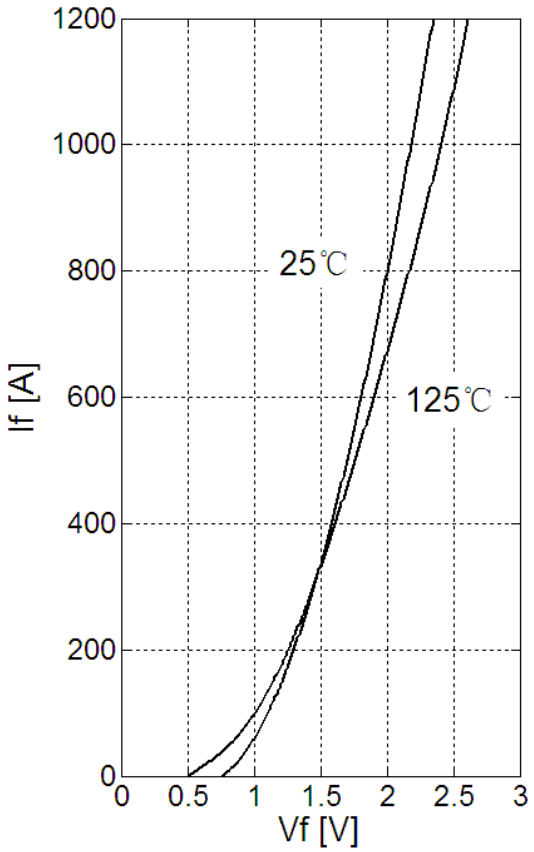


Fig 7. Diode Forward Characteristics

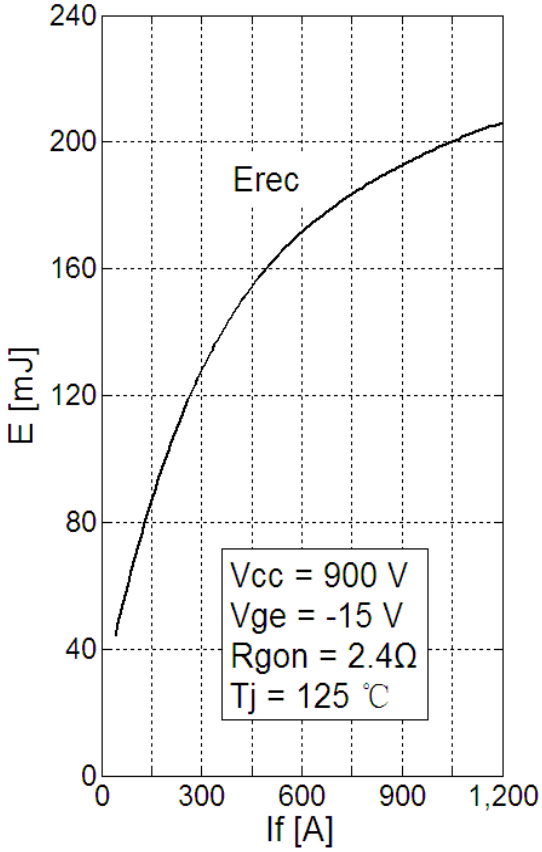


Fig 8. Diode Switching Loss vs. I_C

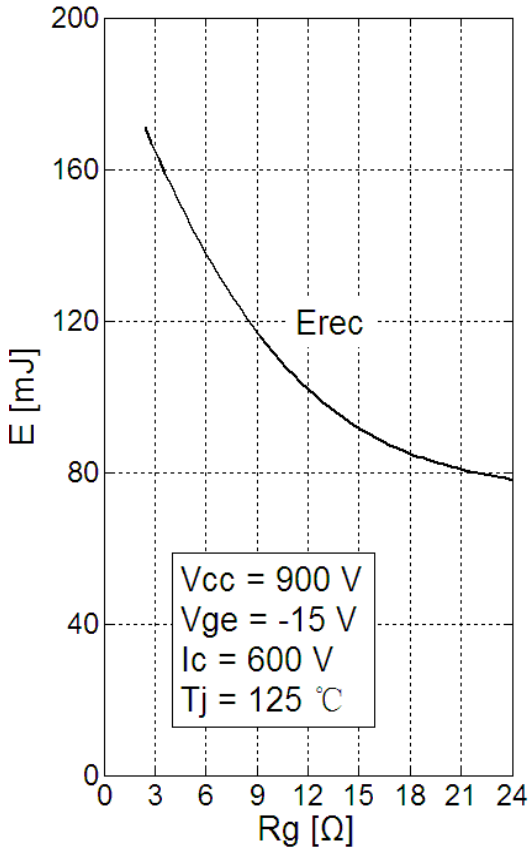


Fig9. Diode Switching Loss vs. R_G

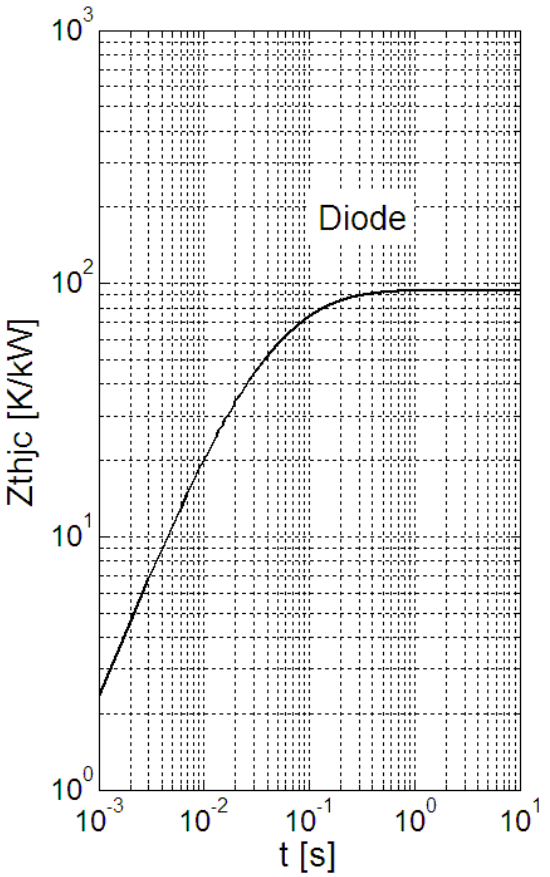
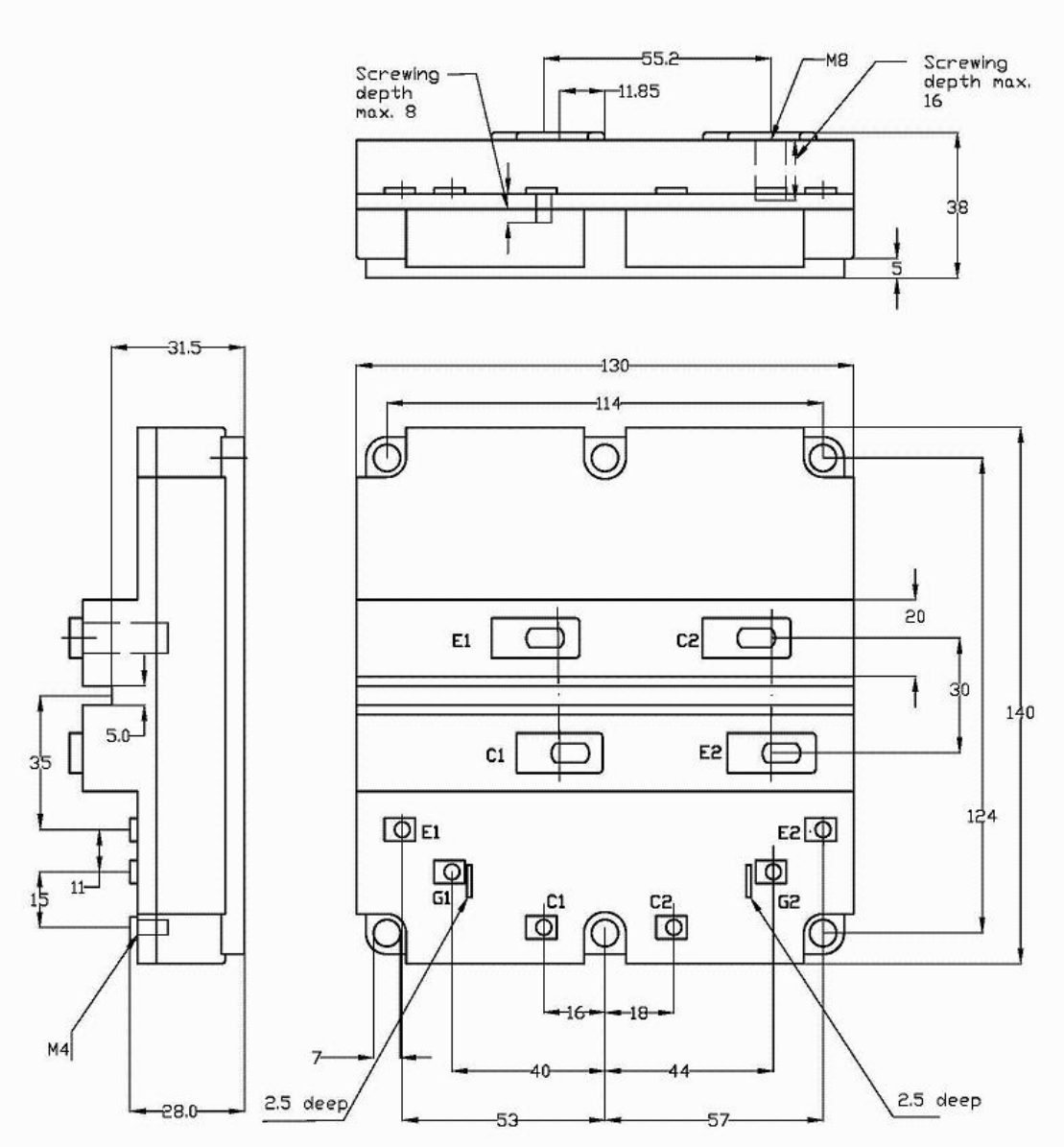


Fig 10. Diode Transient Thermal Impedance

Package Dimension

Dimensions in Millimeters



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