

STARPOWER

SEMICONDUCTOR™

IGBT

GD600HFT170C3S

Preliminary

Molding Type Module**1700V/600A 2 in one-package**

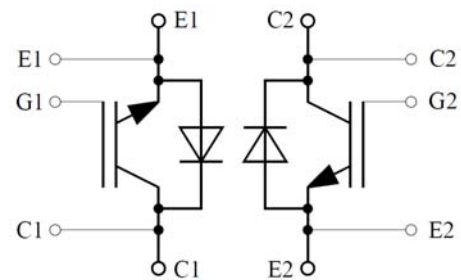
General Description

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
- 10 μ s 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 $T_C=25^\circ\text{C}$ 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 @ $T_C=25^\circ\text{C}$	950	A
	@ $T_C=80^\circ\text{C}$	600	
$I_{CM(1)}$	Pulsed Collector Current $t_p=1\text{ms}$	1200	A
I_F	Diode Continuous Forward Current	600	A
I_{FM}	Diode Maximum Forward Current	1200	A
P_D	Maximum power Dissipation @ $T_j=175^\circ\text{C}$	3571	W
T_j	Maximum Junction Temperature	150	$^\circ\text{C}$
T_{STG}	Storage Temperature Range	-40 to +125	$^\circ\text{C}$
V_{ISO}	Isolation Voltage RMS, $f=50\text{Hz}, t=1\text{min}$	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 $T_C=25^\circ\text{C}$ unless otherwise noted**Off Characteristics**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	$T_j=25^\circ\text{C}$	1700			V
I_{CES}	Collector Cut-Off Current	$V_{CE}=V_{CES}, V_{GE}=0\text{V}, T_j=25^\circ\text{C}$			5.0	mA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=V_{GES}, V_{CE}=0\text{V}, T_j=25^\circ\text{C}$			400	nA

On Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=24\text{mA}, V_{CE}=V_{GE}, T_j=25^\circ\text{C}$	5.2	5.8	6.4	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=600\text{A}, V_{GE}=15\text{V}, T_j=25^\circ\text{C}$		2.00	2.45	V
		$I_C=600\text{A}, V_{GE}=15\text{V}, T_j=125^\circ\text{C}$		2.40		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Q_G	Gate charge	$V_{GE}=-15\dots+15V$		7.0		μC
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=900V, I_C=600A,$ $R_{Gon}=2.4\Omega,$ $R_{Goff}=3.0\Omega,$ $V_{GE}=\pm 15V, T_j=25^\circ C$		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	$V_{CC}=900V, I_C=600A,$ $R_{Gon}=2.4\Omega,$ $R_{Goff}=3.0\Omega,$ $V_{GE}=\pm 15V, T_j=125^\circ C$		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	$t_{sc}\leq 10\mu s, V_{GE}=15V,$ $T_j=125^\circ C, V_{CC}=1000V,$ $V_{CEM}\leq 1700V$		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		m Ω

Electrical Characteristics of DIODE $T_C=25^\circ C$ unless otherwise noted

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

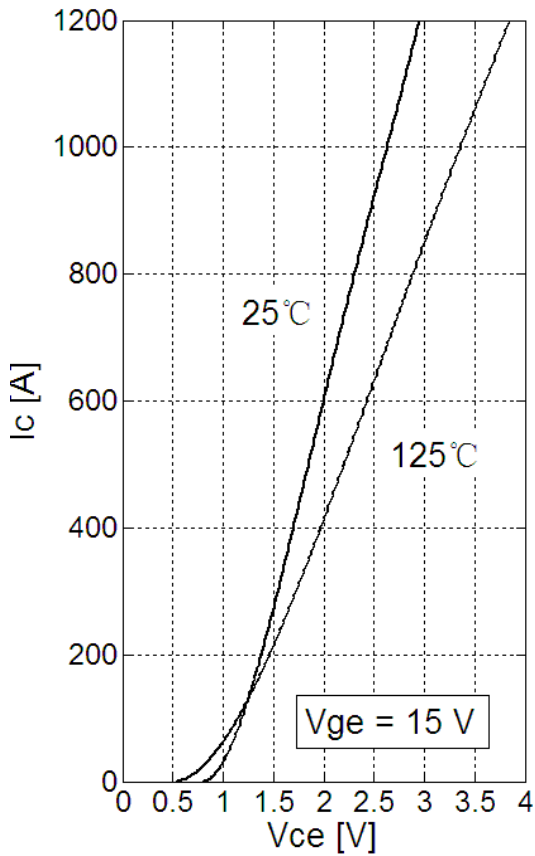


Fig 1. Typical IGBT Output Characteristics

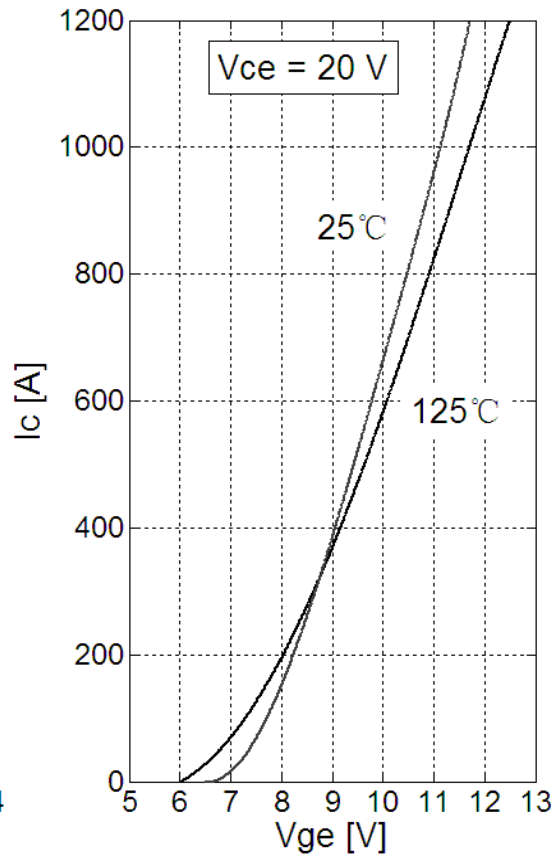


Fig 2. Typical IGBT Transfer Characteristics

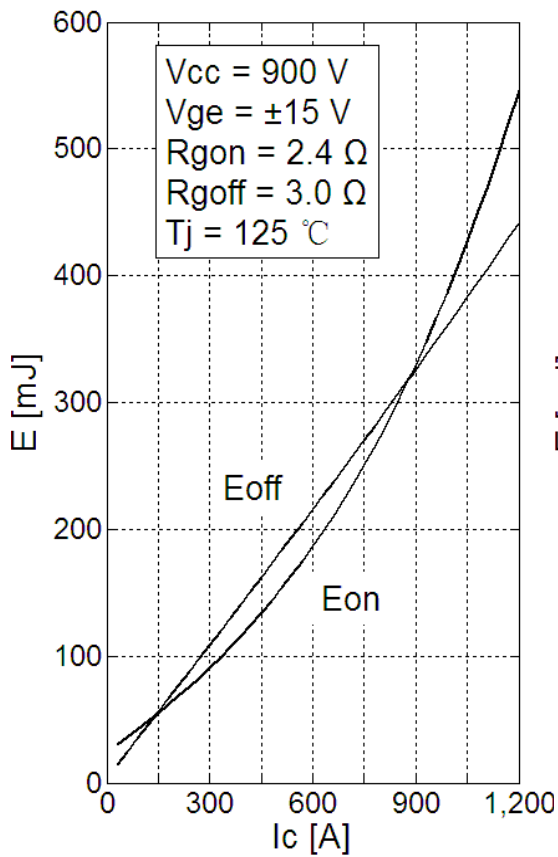


Fig 3. IGBT Switching Loss vs. I_c

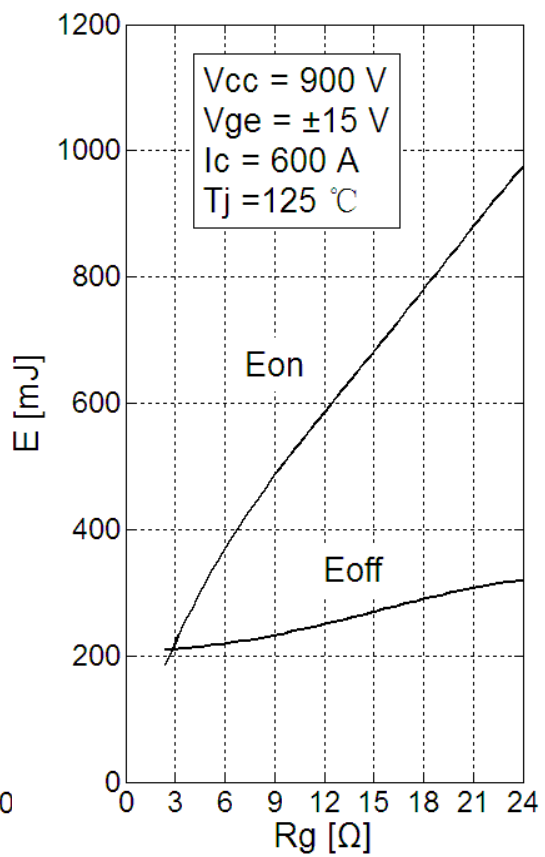


Fig 4. IGBT Switching Loss vs. R_g

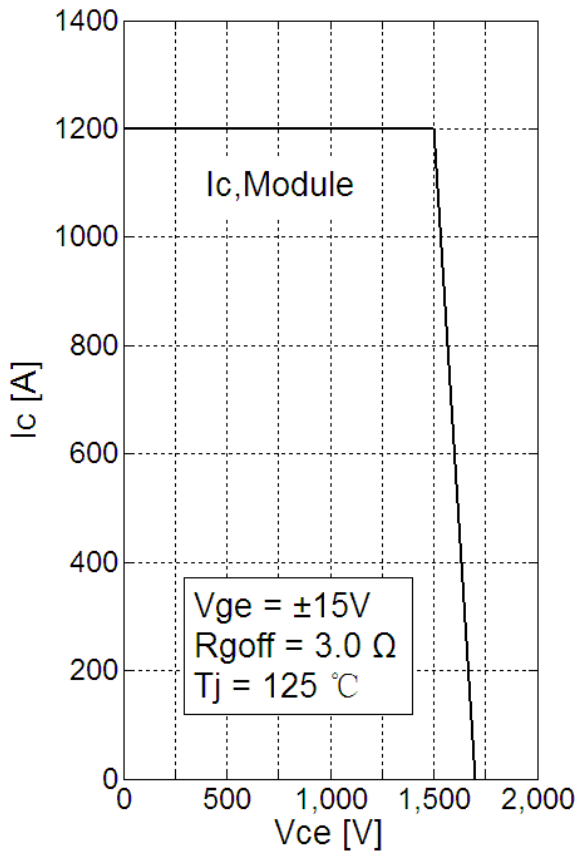


Fig 5. RBSOA

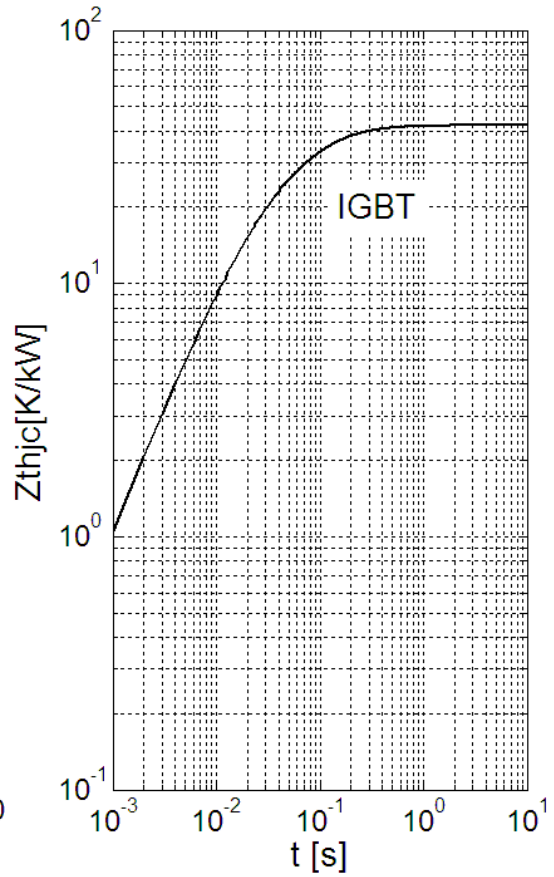


Fig 6. IGBT Transient Thermal Impedance

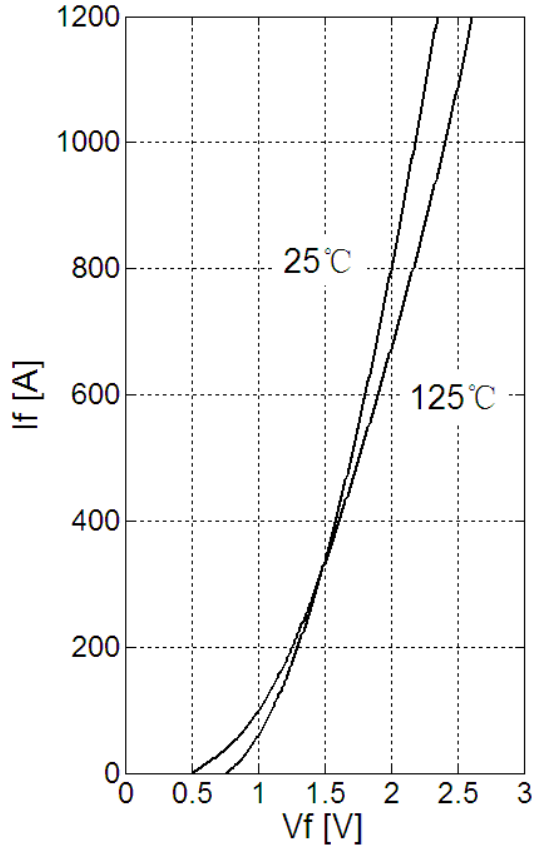


Fig 7. Diode Forward Characteristics

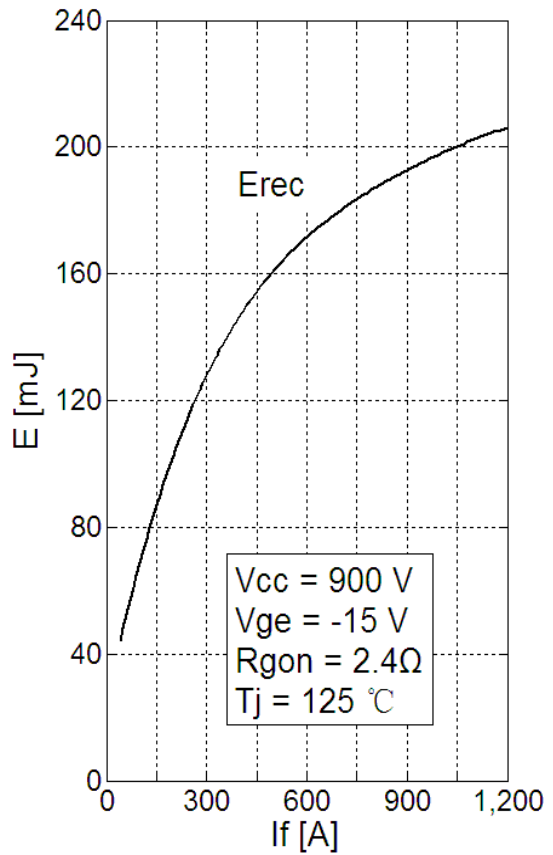


Fig 8. Diode Switching Loss vs. I_c

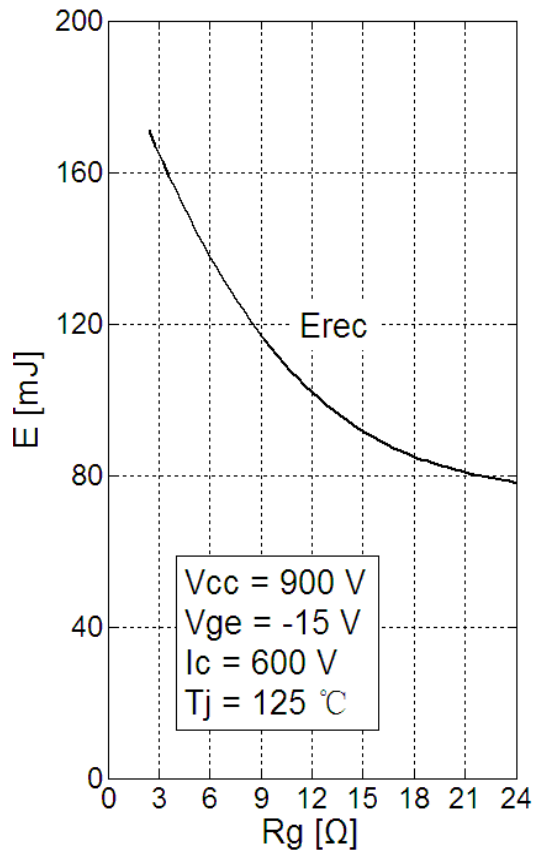


Fig9. Diode Switching Loss vs. R_G

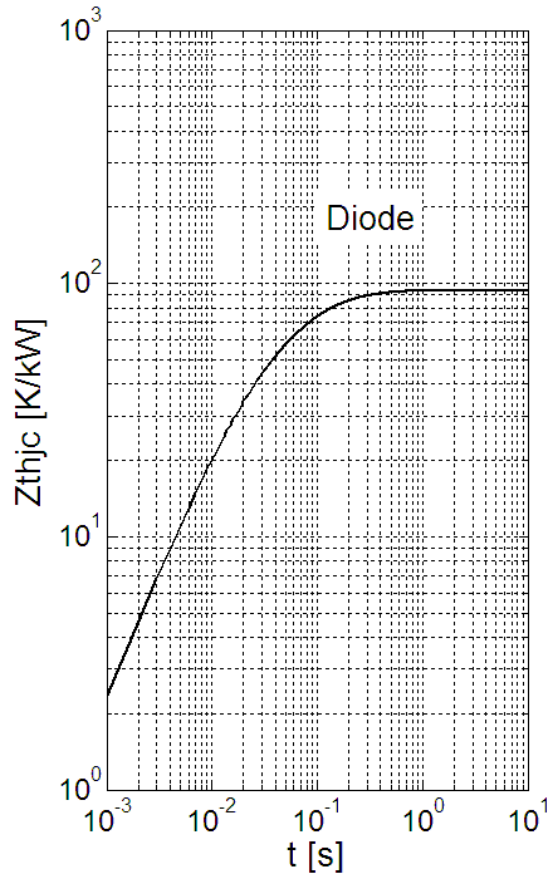
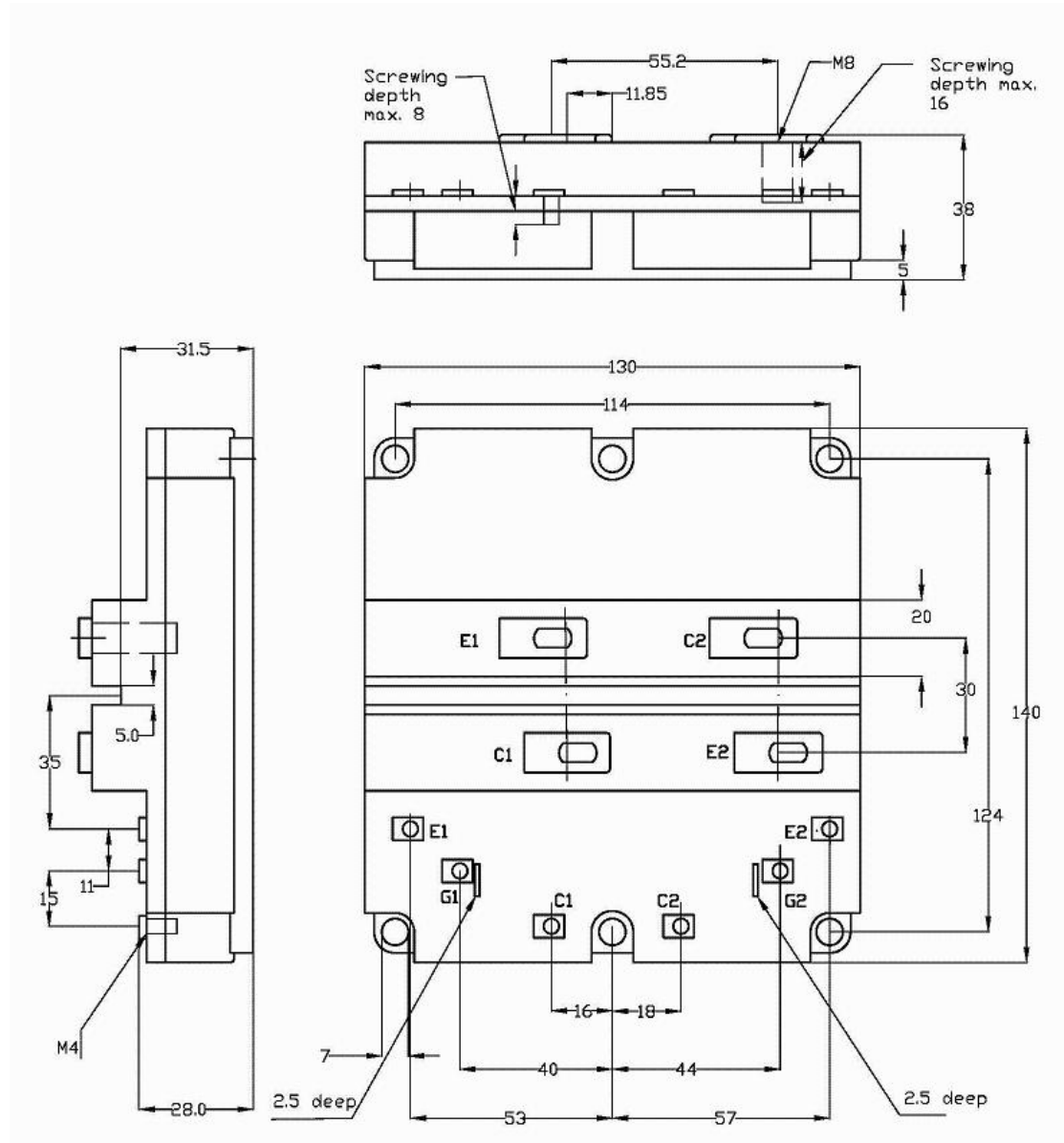


Fig 10. Diode Transient Thermal Impedance

Package Dimension

Dimensions in Millimeters



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