

STARPOWER

SEMICONDUCTOR™

IGBT

GD1200HFT170A3S

Preliminary

Molding Type Module

1700V/1200A 2 in one-package

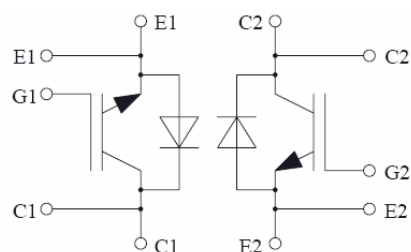
General Description

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



Features

- Low $V_{CE(sat)}$ trench IGBT technology
- 10 μ s short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Low inductance case
- AlSiC baseplate for high power cycling capability
- AlN substrate for low thermal resistance



Equivalent Circuit Schematic

Typical Applications

- AC inverter drives mains 575-750V AC
- Public transport (auxiliary syst.)

Absolute Maximum Ratings $T_C=25^{\circ}\text{C}$ unless otherwise noted

Symbol	Description	GD1200HFT170A3S	Units
V_{CES}	Collector-Emitter Voltage	1700	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$ @ $T_C=80^{\circ}\text{C}$	1700	A
		1200	
$I_{CM(1)}$	Pulsed Collector Current $t_p=1\text{ms}$	2400	A
I_F	Diode Continuous Forward Current	1200	A
I_{FM}	Diode Maximum Forward Current	2400	A
P_D	Maximum power Dissipation @ $T_J=150^{\circ}\text{C}$	5952	W
T_{SC}	Short Circuit Withstand Time @ $T_J=125^{\circ}\text{C}$	10	μs
T_J	Maximum Junction Temperature	-40 to +150	$^{\circ}\text{C}$
T_{STG}	Storage Temperature Range	-40 to +125	$^{\circ}\text{C}$
I^2t -value, Diode	$V_R=0\text{V}, t=10\text{ms}, T_J=125^{\circ}\text{C}$	240	kA^2s
V_{ISO}	Isolation Voltage RMS, $f=50\text{Hz}, t=1\text{min}$	4000	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
BV_{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	$I_C=48.0\text{mA}, V_{CE}=V_{GE},$ $T_J=25^{\circ}\text{C}$	5.2	5.8	6.4	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=1200\text{A}, V_{GE}=15\text{V},$ $T_J=25^{\circ}\text{C}$		2.00	2.45	V
		$I_C=1200\text{A}, V_{GE}=15\text{V},$ $T_J=125^{\circ}\text{C}$		2.40		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Q_G	Gate charge	$V_{GE} = -15 \dots +15V$		14.0		μC
R_{Gint}	Internal Gate Resistor	$T_J = 25^\circ C$		1.6		Ω
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 900V, I_C = 1200A,$ $R_{Gon} = 1.2\Omega,$ $R_{Goff} = 1.5\Omega,$ $V_{GE} = \pm 15V, T_J = 25^\circ C$		730		ns
t_r	Rise Time			190		ns
$t_{d(off)}$	Turn-Off Delay Time			1440		ns
t_f	Fall Time			170		ns
E_{on}	Turn-On Switching Loss			235		
E_{off}	Turn-Off Switching Loss			300		
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 900V, I_C = 1200A,$ $R_{Gon} = 1.2\Omega,$ $R_{Goff} = 1.5\Omega,$ $V_{GE} = \pm 15V, T_J = 125^\circ C$		790		ns
t_r	Rise Time			240		ns
$t_{d(off)}$	Turn-Off Delay Time			1790		ns
t_f	Fall Time			290		ns
E_{on}	Turn-On Switching Loss			345		mJ
E_{off}	Turn-Off Switching Loss			440		mJ
C_{ies}	Input Capacitance	$V_{CE} = 25V, f = 1MHz,$ $V_{GE} = 0V$		106		nF
C_{oes}	Output Capacitance			4.4		nF
C_{res}	Reverse Transfer Capacitance			3.5		nF
I_{SC}	SC Data	$t_{SC} \leq 10\mu s, V_{GE} = 15V,$ $T_J = 125^\circ C, V_{CC} = 1000V,$ $V_{CEM} \leq 1700V$		4800		A
L_{CE}	Stray Inductance			20		nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal To Chip			0.37		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	$I_F = 1200A$	$T_J = 25^\circ C$	1.80	2.20	V
			$T_J = 125^\circ C$	1.90		
Q_r	Recovered Charge	$I_F = 1200A,$	$T_J = 25^\circ C$	303		μC
			$T_J = 125^\circ C$	508		
I_{RM}	Reverse Recovery Current	$V_R = 900V,$ $di/dt = -7000A/\mu s,$	$T_J = 25^\circ C$	1140		A
			$T_J = 125^\circ C$	1245		
E_{rec}	Reverse Recovery Energy	$V_{GE} = -15V$	$T_J = 25^\circ C$	189		mJ
			$T_J = 125^\circ C$	338		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (IGBT Part, per 1/2 Module)		21	K/kW
$R_{\theta JC}$	Junction-to-Case (Diode Part, per 1/2 Module)		39	K/kW
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied, per Module)	6		K/kW
Weight	Weight of Module	1050		g

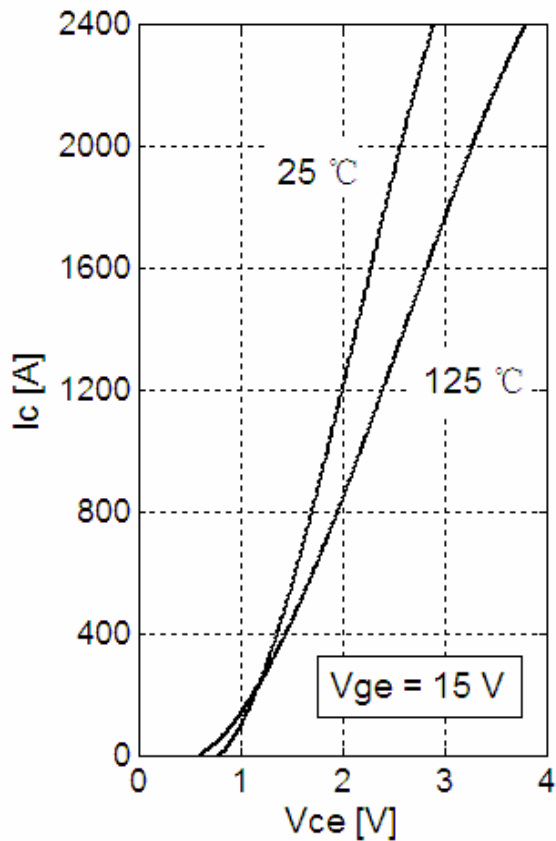


Fig 1. Typical IGBT Output Characteristics

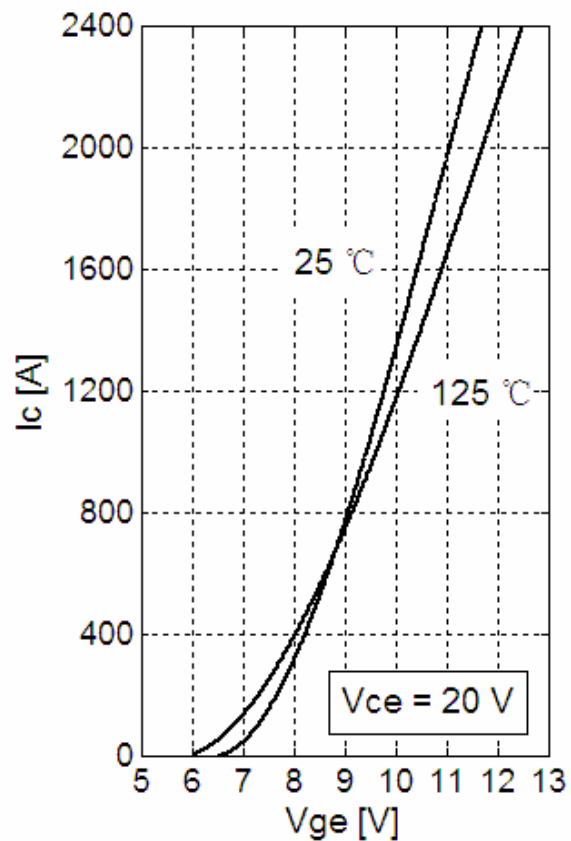
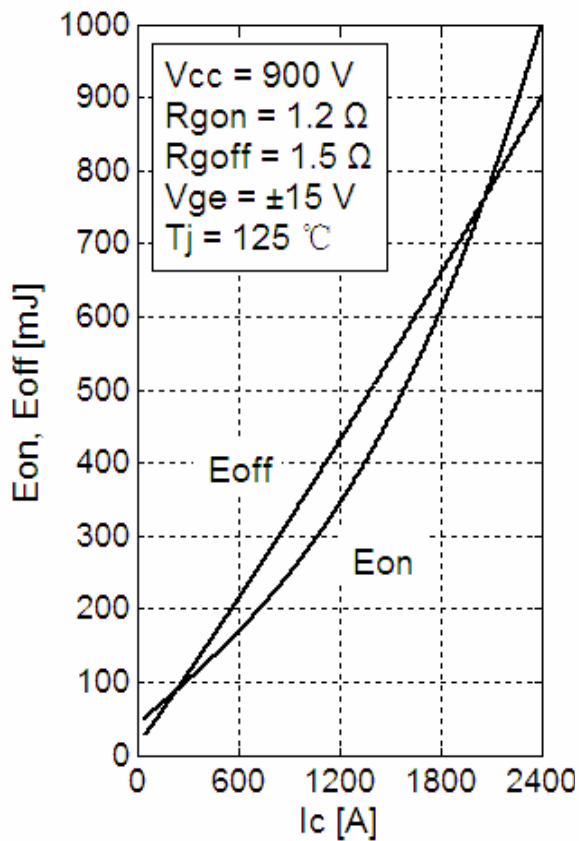
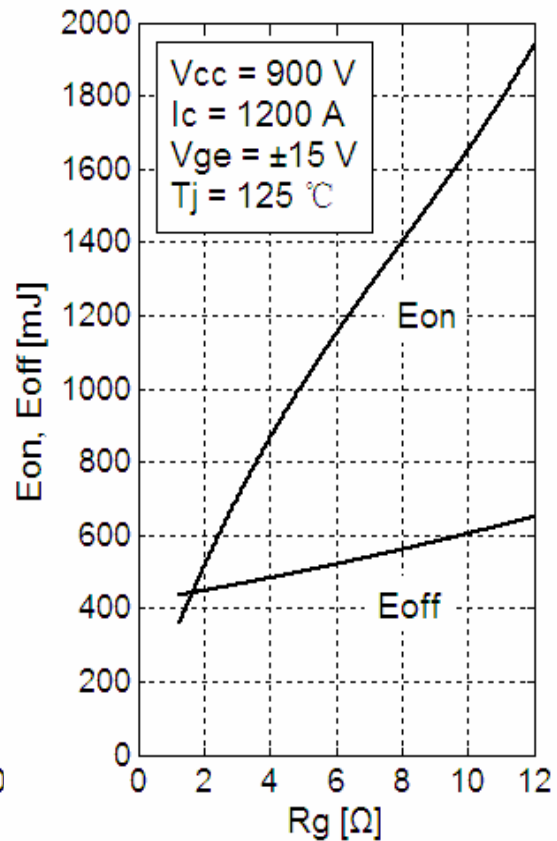


Fig 2. Typical IGBT Transfer Characteristics

Fig 3. IGBT Switching Loss vs. I_C Fig 4. IGBT Switching Loss vs. R_G

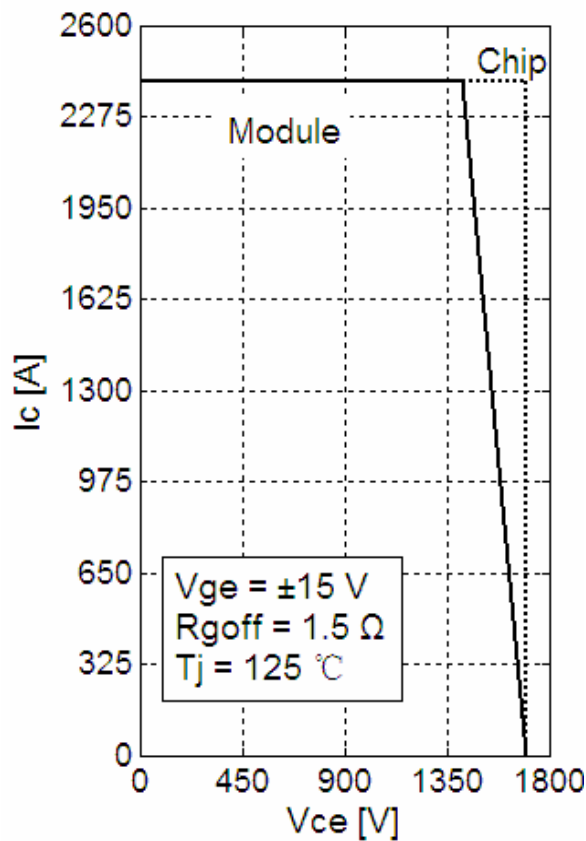


Fig 5. RBSOA

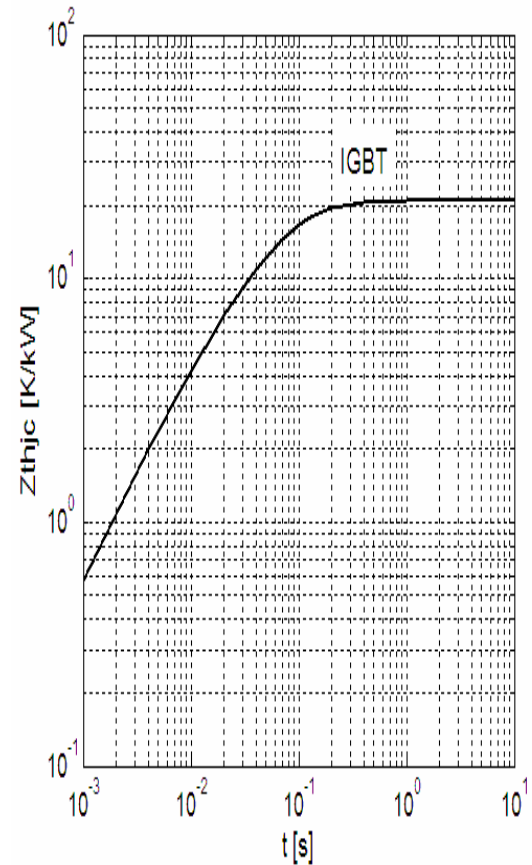


Fig 6. IGBT Transient Thermal Impedance

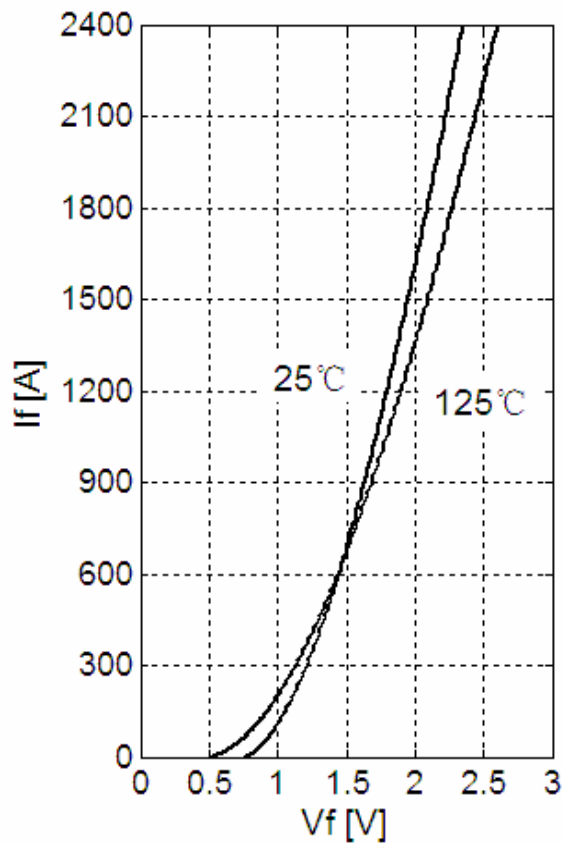
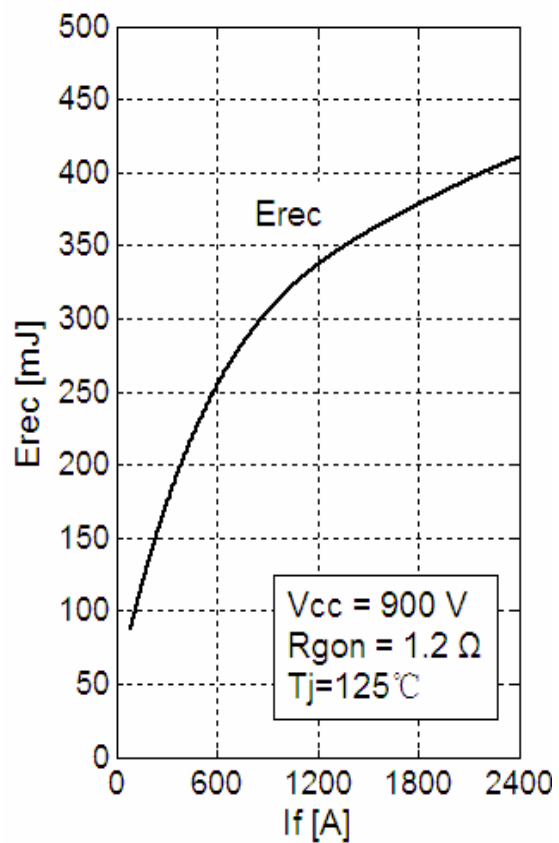


Fig 7. Diode Forward Characteristics

Fig 8. Diode Switching Loss vs. I_f

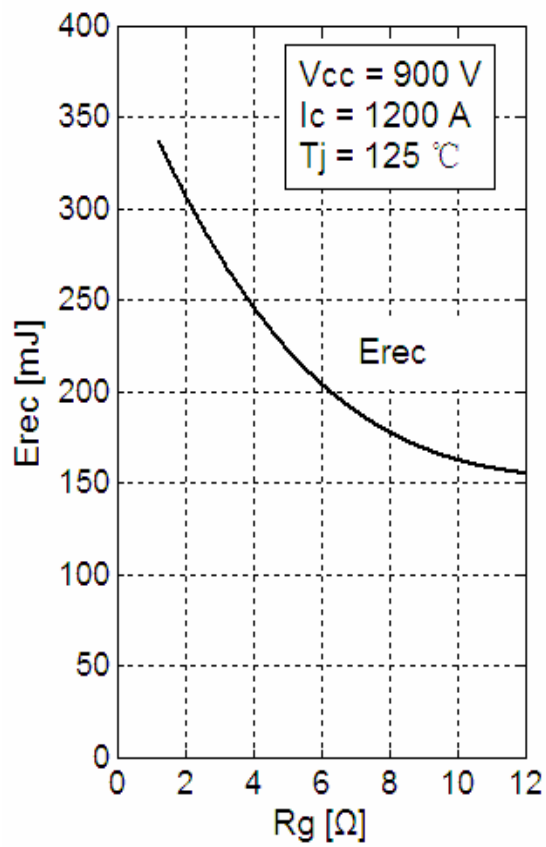
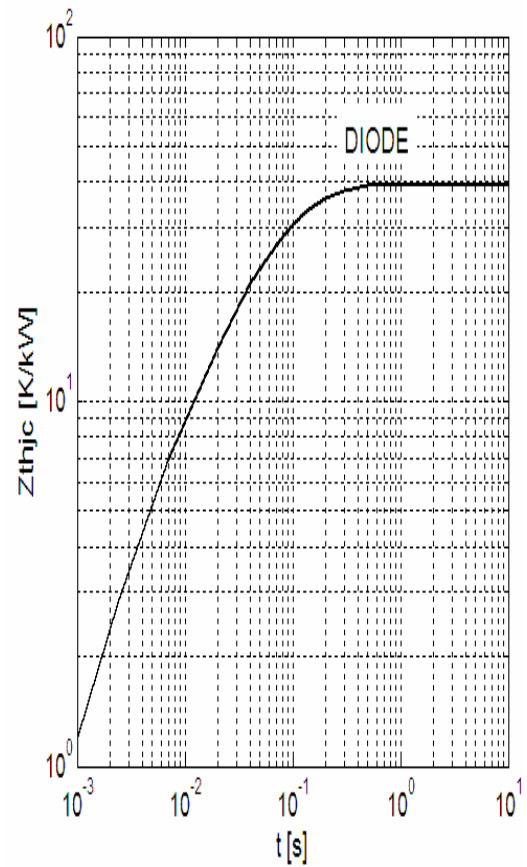
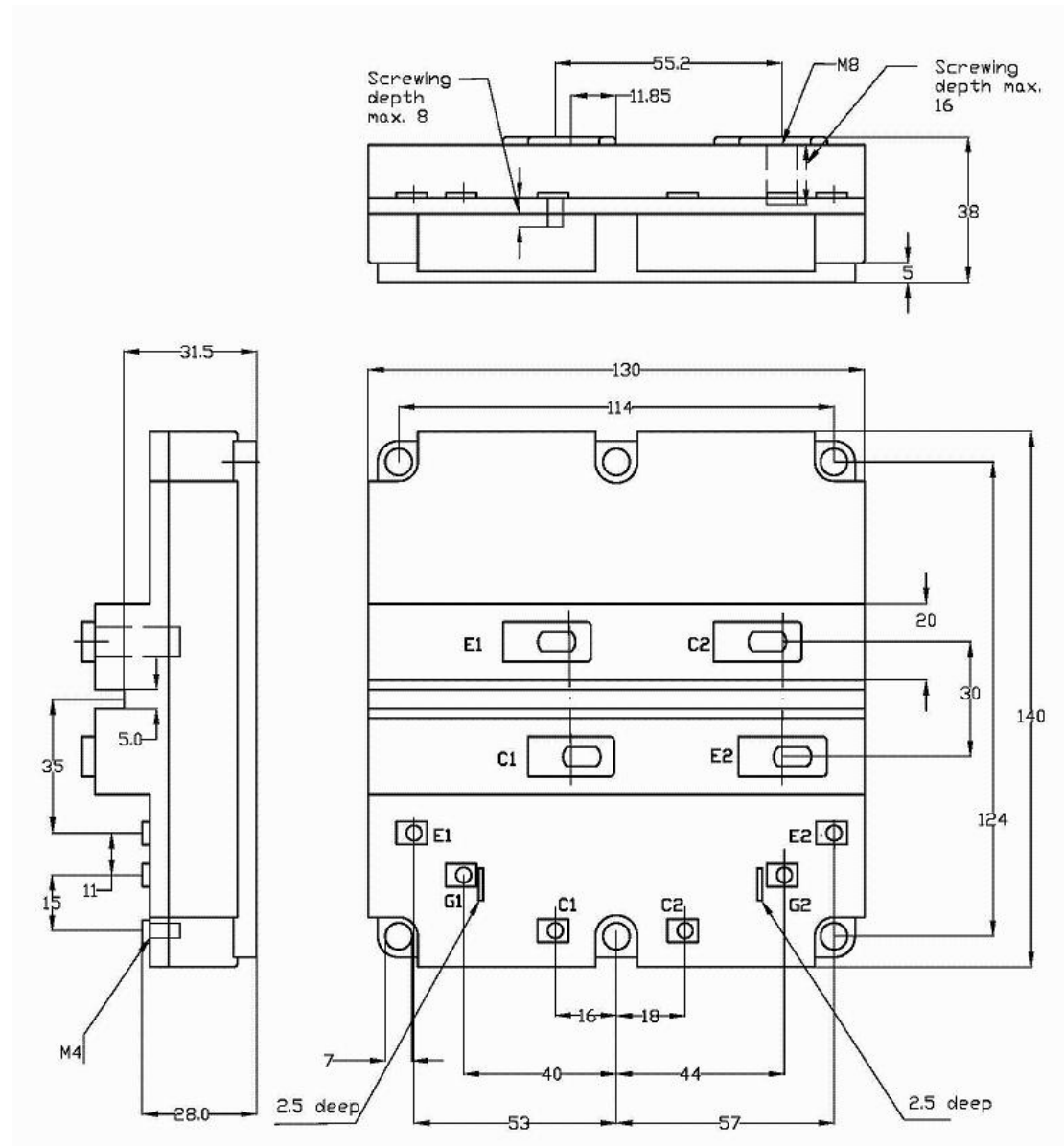
Fig 9. Diode Switching Loss vs. R_g 

Fig 10. Diode Transient Thermal Impedance

Package Dimension

Dimensions in Millimeters



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