

STARPOWER

SEMICONDUCTOR™

IGBT

GD800HFT170C3S

Preliminary

Molding Type Module

1700V/800A 2 in one-package

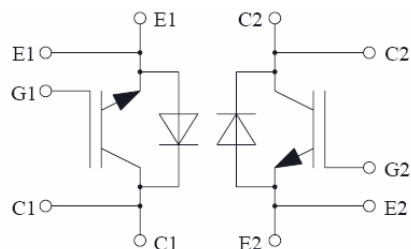
General Description

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 and UPS.



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
- Switching mode power supplies
- Electronic welders

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

Symbol	Description	GD800HFT170C3S	Units
V_{CES}	Collector-Emitter Voltage	1700	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$ @ $T_C=80^{\circ}\text{C}$	1200	A
		800	
$I_{CM(1)}$	Pulsed Collector Current $t_p=1\text{ms}$	1600	A
I_F	Diode Continuous Forward Current	800	A
I_{FM}	Diode Maximum Forward Current	1600	A
P_D	Maximum power Dissipation @ $T_J=150^{\circ}\text{C}$	4464	W
T_{SC}	Short Circuit Withstand Time @ $T_J=125^{\circ}\text{C}$	10	μs
T_J	Maximum Junction Temperature	150	$^{\circ}\text{C}$
T_{STG}	Storage Temperature Range	-40 to +125	$^{\circ}\text{C}$
I^2t -value, Diode	$V_R=0\text{V}$, $t=10\text{ms}$, $T_J=125^{\circ}\text{C}$	124	kA^2s
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
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	$I_C=32\text{mA}$, $V_{CE}=V_{GE}$, $T_J=25^{\circ}\text{C}$	5.0	5.8	6.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=800\text{A}$, $V_{GE}=15\text{V}$, $T_J=25^{\circ}\text{C}$		2.00	2.45	V
		$I_C=800\text{A}$, $V_{GE}=15\text{V}$, $T_J=125^{\circ}\text{C}$		2.40		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Q_{ge}	Gate charge	$V_{GE} = -15 \dots +15V$		9.0		μC
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=900V, I_C=800A,$ $R_{Gon}=1.8\Omega,$ $R_{Goff}=2.2\Omega,$ $V_{GE} = \pm 15V, T_j=25^\circ C$		648		ns
t_r	Rise Time			162		ns
$t_{d(off)}$	Turn-Off Delay Time			1310		ns
t_f	Fall Time			177		ns
E_{on}	Turn-On Switching Loss			164		mJ
E_{off}	Turn-Off Switching Loss			201		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=900V, I_C=800A,$ $R_{Gon}=1.8\Omega,$ $R_{Goff}=2.2\Omega,$ $V_{GE} = \pm 15V, T_j=125^\circ C$		701		ns
t_r	Rise Time			201		ns
$t_{d(off)}$	Turn-Off Delay Time			1590		ns
t_f	Fall Time			298		ns
E_{on}	Turn-On Switching Loss			239		mJ
E_{off}	Turn-Off Switching Loss			296		mJ
C_{ies}	Input Capacitance	$V_{CE}=25V, f=1MHz,$ $V_{GE}=0V$		70.5		nF
C_{oes}	Output Capacitance			2.93		nF
C_{res}	Reverse Transfer Capacitance			2.34		nF
I_{SC}	SC Data	$t_{sc} \leq 10\mu s, V_{GE}=15V,$ $T_j=125^\circ C, V_{CC}=1000V,$ $V_{CEM} \leq 1200V$		3200		A
R_{Gint}	Internal Gate Resistance			1.9		Ω
L_{CE}	Stray Inductance			20		nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal to Chip	$T_C=25^\circ C$		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	$I_F=800A$	$T_j=25^\circ C$	1.80	2.20	V
			$T_j=125^\circ C$	1.90		
Q_r	Recovered Charge	$I_F=800A,$	$T_j=25^\circ C$	203		μC
			$T_j=125^\circ C$	348		
I_{RM}	Peak Reverse Recovery Current	$V_R=900V,$ $di/dt=-4900A/\mu s,$	$T_j=25^\circ C$	781		A
			$T_j=125^\circ C$	848		
E_{rec}	Reverse Recovery Energy	$V_{GE}=-15V$	$T_j=25^\circ C$	131		mJ
			$T_j=125^\circ C$	225		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (IGBT Part, per 1/2 Module)		28	K/kW
$R_{\theta JC}$	Junction-to-Case (Diode Part, per 1/2 Module)		56	K/kW
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied, per Module)	6		K/kW
Weight	Weight of Module	1500		g

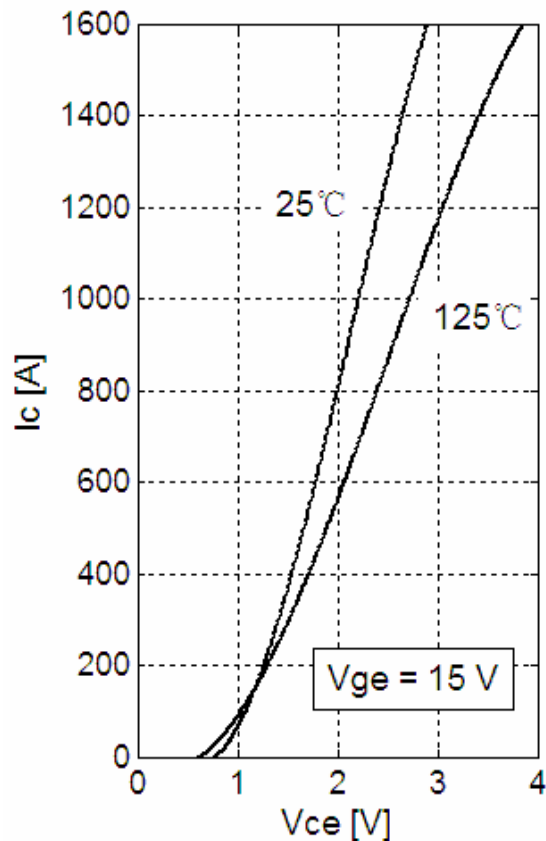


Fig 1. Typical IGBT Output Characteristics

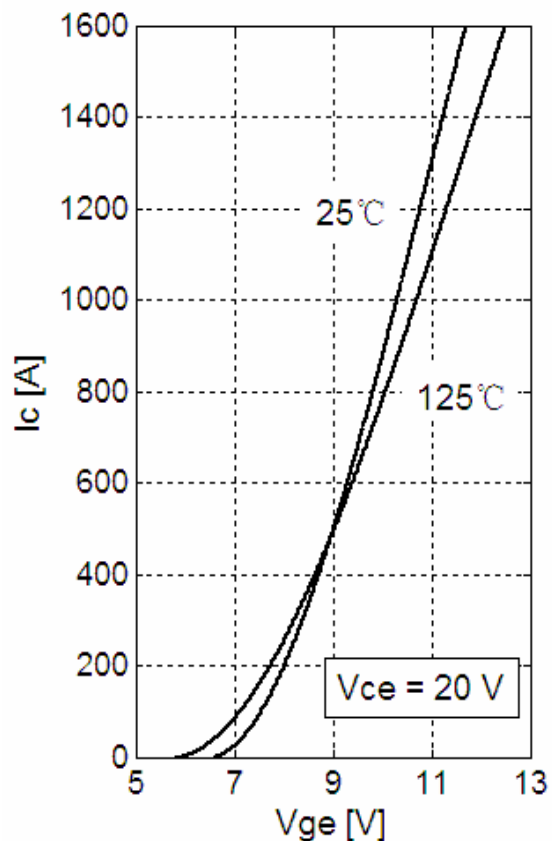
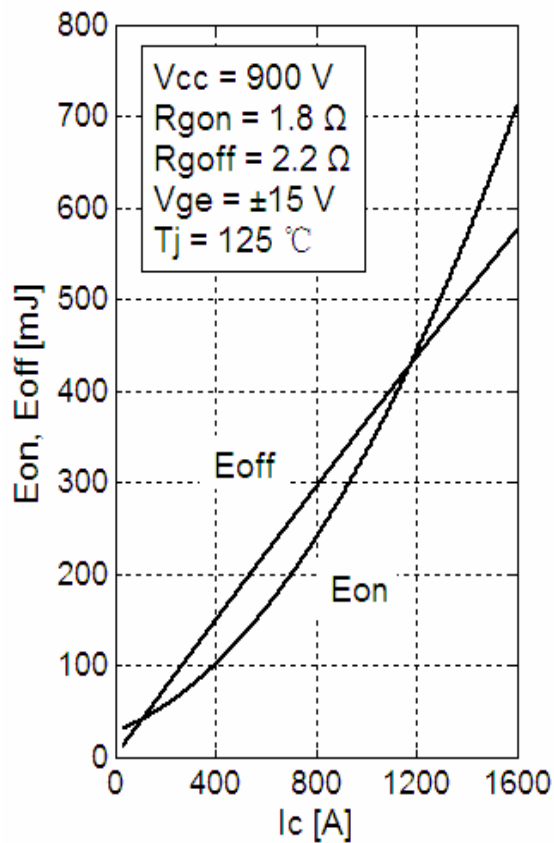
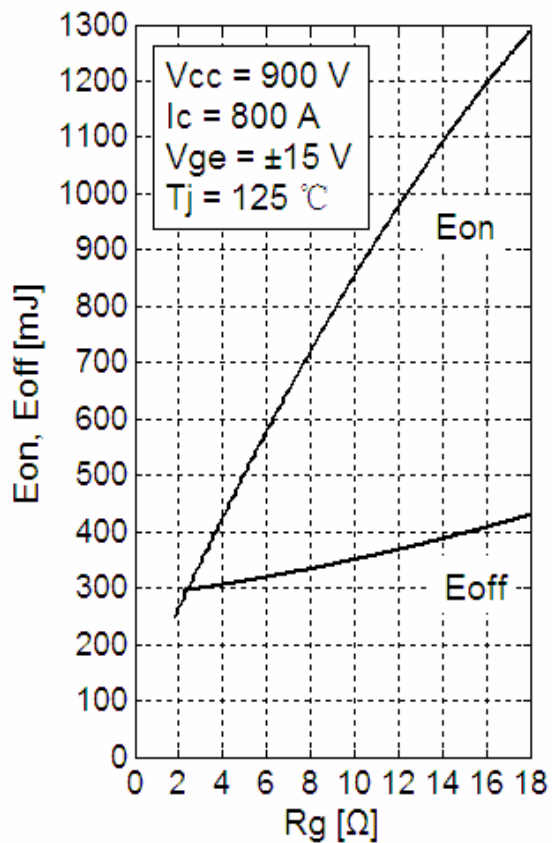


Fig 2. Typical IGBT Transfer Characteristics

Fig 3. IGBT Switching Loss vs. I_c Fig 4. IGBT Switching Loss vs. R_g

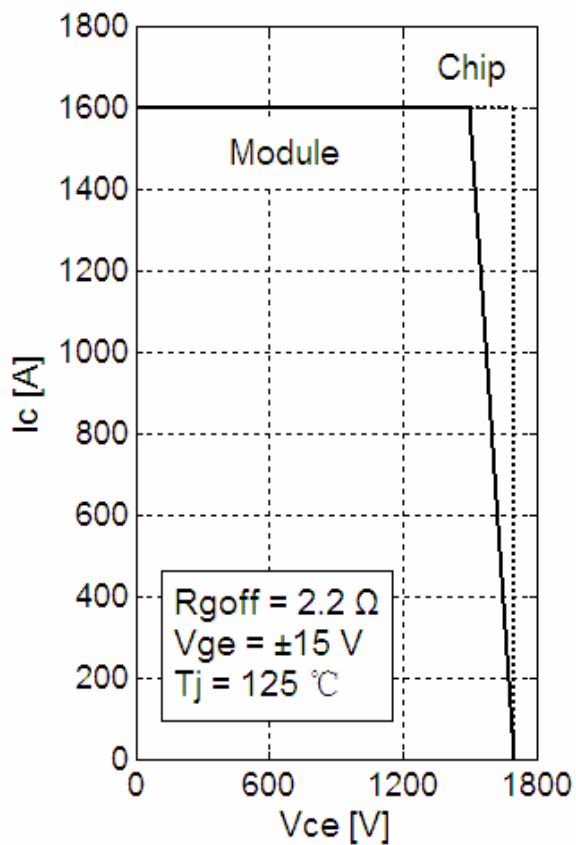


Fig 5. RBSOA

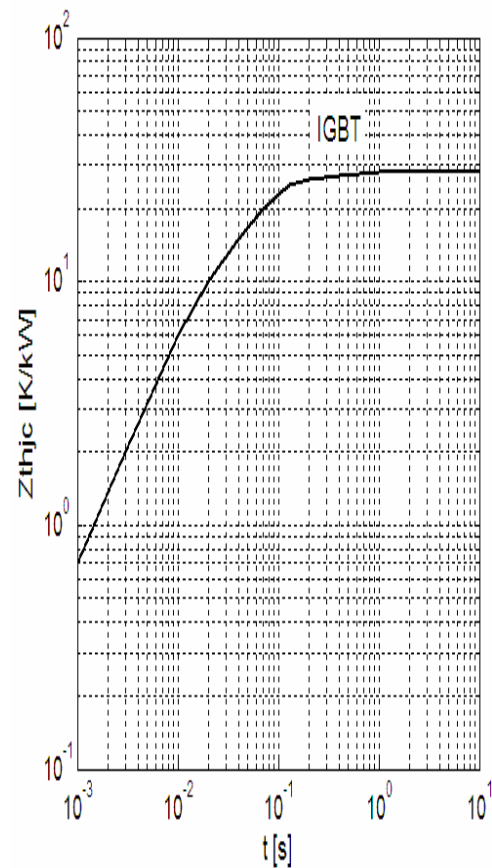


Fig 6. IGBT Transient Thermal Impedance

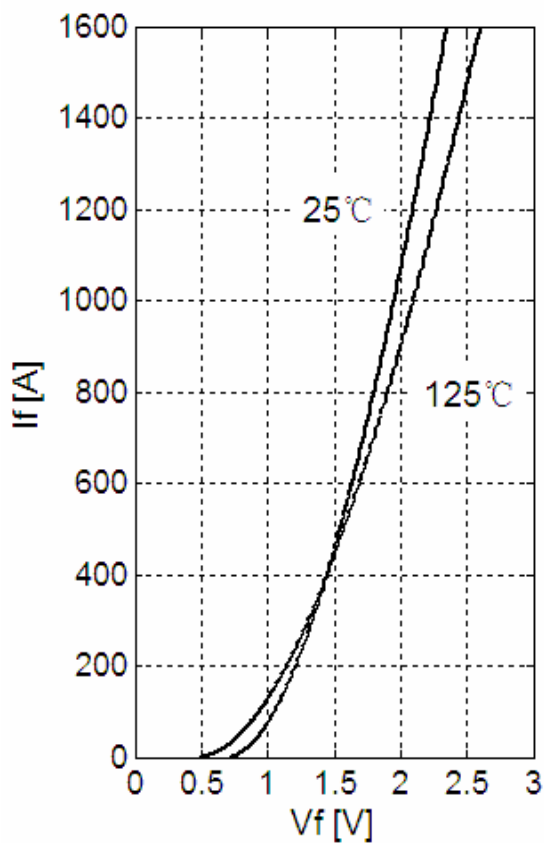
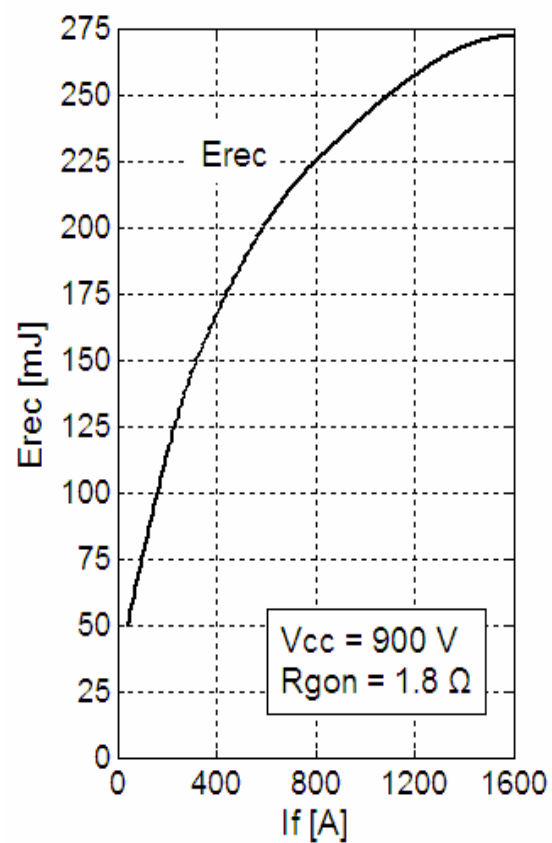


Fig 7. Diode Forward Characteristics

Fig 8. Diode Switching Loss vs. I_c

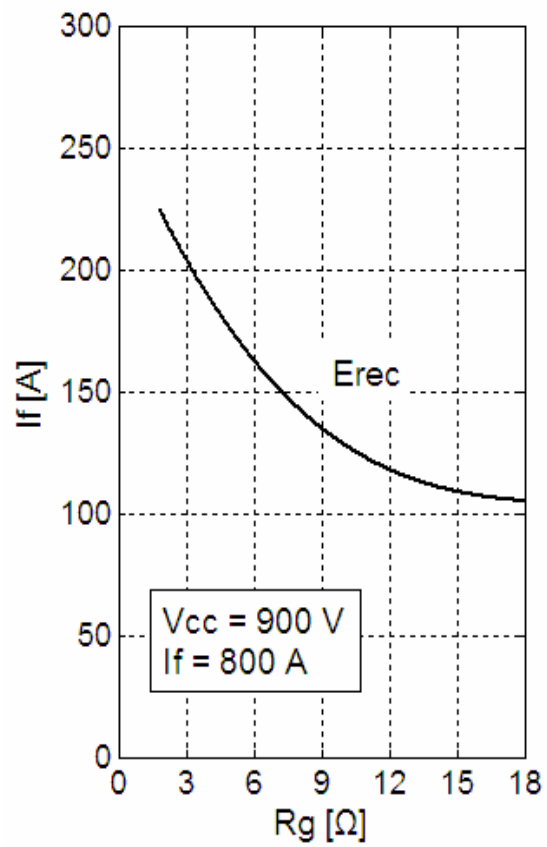
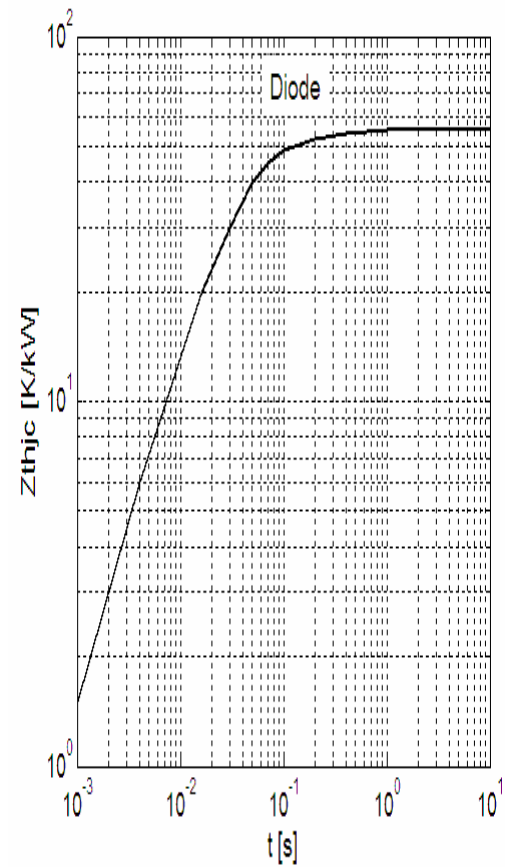
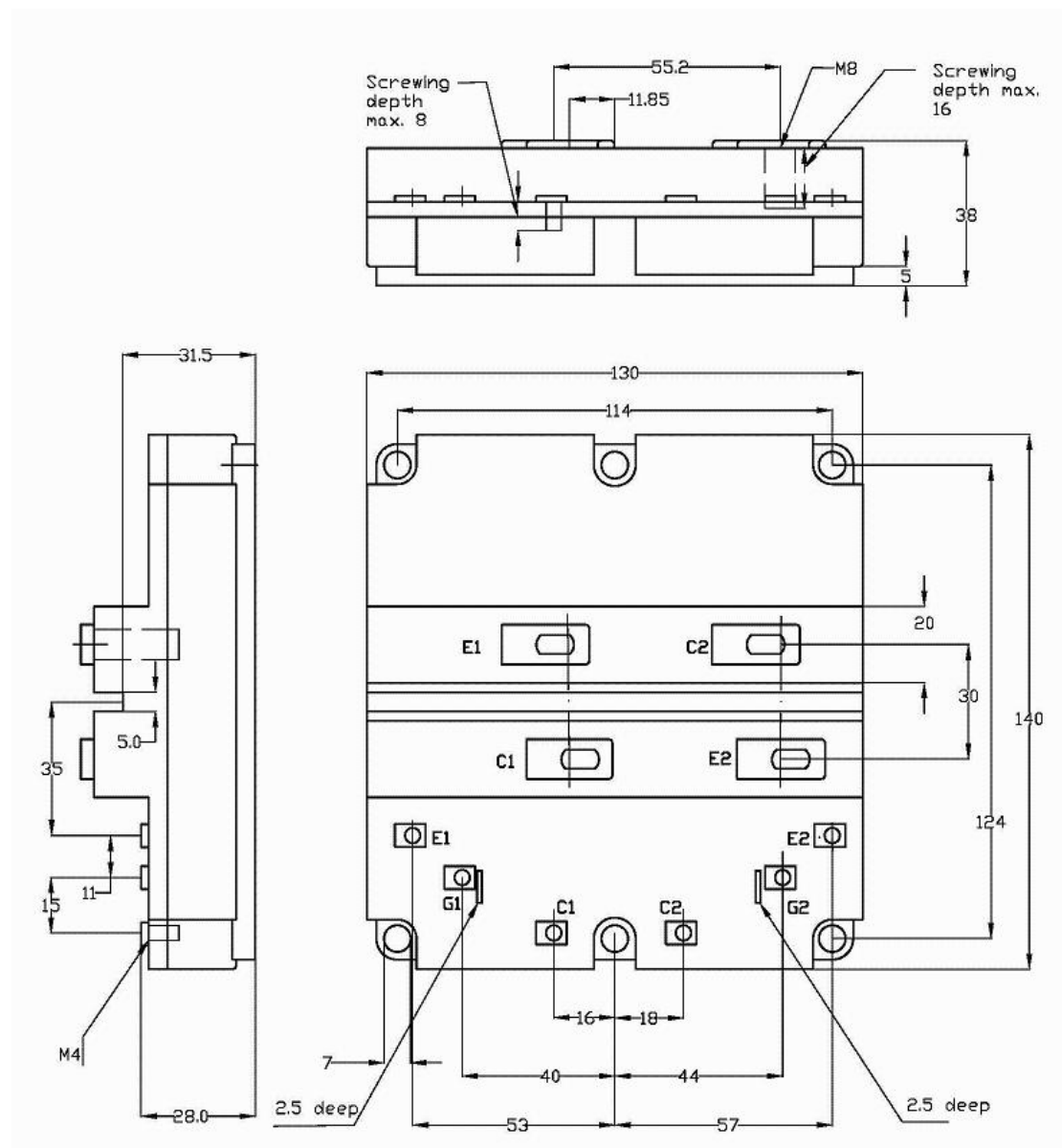
Fig9. Diode Switching Loss vs. R_g 

Fig 10. Diode Transient Thermal Impedance

Package Dimension

Dimensions in Millimeters



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