

STARPOWER

SEMICONDUCTOR™

IGBT

GD50CUL120C1S

Molding Type Module

1200V/50A chopper in one-package

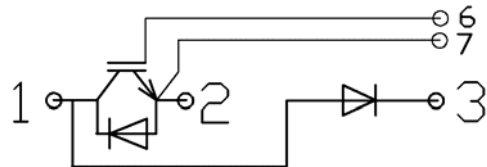
General Description

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



Features

- High short circuit capability, self limiting to $6 \cdot I_C$
- 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	GD50CUL120C1S	Units
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	$\pm 20\text{V}$	V

Symbol	Description	GD50CUL120C1S	Units
I_C	Collector Current @ $T_C=25^\circ\text{C}$	100	A
	@ $T_C=80^\circ\text{C}$	50	
$I_{CM(1)}$	Pulsed Collector Current $t_p=1\text{ms}$	100	A
I_F	Diode Continuous Forward Current	50	A
I_{FM}	Diode Maximum Forward Current	100	A
P_D	Maximum power Dissipation @ $T_j=150^\circ\text{C}$	446	W
T_{SC}	Short Circuit Withstand Time @ $T_j=125^\circ\text{C}$	10	μs
T_j	Operating Junction Temperature	-40 to +150	$^\circ\text{C}$
T_{STG}	Storage Temperature Range	-40 to +125	$^\circ\text{C}$
I^2t -value, Diode	$V_R=0\text{V}$, $t=10\text{ms}$, $T_j=125^\circ\text{C}$	420	A^2s
V_{ISO}	Isolation Voltage RMS, $f=50\text{Hz}$, $t=1\text{min}$	2500	V
Mounting Torque	Power Terminal Screw:M5	2.5 to 5.0	N.m
	Mounting Screw:M6	3.0 to 6.0	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	$T_j=25^\circ\text{C}$	1200			V
I_{CES}	Collector Cut-Off Current	$V_{CE}=V_{CES}$, $V_{GE}=0\text{V}$, $T_j=25^\circ\text{C}$			1.0	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	$I_C=2.0\text{mA}$, $V_{CE}=V_{GE}$, $T_j=25^\circ\text{C}$	5.0	6.2	7.0	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=50\text{A}$, $V_{GE}=15\text{V}$, $T_j=25^\circ\text{C}$		1.70		V
		$I_C=50\text{A}$, $V_{GE}=15\text{V}$, $T_j=125^\circ\text{C}$		1.95		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}$, $I_C=50\text{A}$, $R_G=18\Omega$, $V_{GE}=\pm 15\text{V}$, $T_j=25^\circ\text{C}$		220		ns
t_r	Rise Time			60		ns
$t_{d(off)}$	Turn-Off Delay Time			420		ns
t_f	Fall Time	$V_{CC}=600\text{V}$, $I_C=50\text{A}$,		60		ns

E_{on}	Turn-On Switching Loss	$R_G=18\Omega$, $V_{GE}=\pm 15V$, $T_j=25^\circ C$		2.1		mJ
E_{off}	Turn-Off Switching Loss			2.6		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=50A$, $R_G=18\Omega$, $V_{GE}=\pm 15V$, $T_j=125^\circ C$		270		ns
t_r	Rise Time			60		ns
$t_{d(off)}$	Turn-Off Delay Time			500		ns
t_f	Fall Time			65		ns
E_{on}	Turn-On Switching Loss			4.1		mJ
E_{off}	Turn-Off Switching Loss			4.7		mJ
C_{ies}	Input Capacitance	$V_{CE}=25V$, $f=1MHz$, $V_{GE}=0V$		4.29		nF
C_{oes}	Output Capacitance			0.30		nF
C_{res}	Reverse Transfer Capacitance			0.20		nF
I_{SC}	SC Data	$t_{sc}\leq 10\mu s$, $V_{GE}=15V$, $T_j=125^\circ C$, $V_{CC}=900V$, $V_{CEM}\leq 1200V$		270		A
R_{Gint}	Internal Gate Resistance			10		Ω
L_{CE}	Stray Inductance				30	nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal to Chip	$T_C=25^\circ C$		0.75		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 =50A	T _j =25°C		2.15		V
			T _j =125°C		2.35		
t _{rr}	Diode Reverse Recovery Time	I _F =50A, V _R =600V, di/dt=-2100A/μs, V _{GE} =-15V	T _j =25°C		90		ns
			T _j =125°C		130		
I _{RM}	Diode Peak Reverse Recovery Current		T _j =25°C		52		A
			T _j =125°C		60		
E _{rec}	Reverse Recovery Energy		T _j =25°C		1.9		mJ
			T _j =125°C		4.0		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (IGBT Part, per 1/2 Module)		0.28	K/W
$R_{\theta JC}$	Junction-to-Case (DIODE Part, per 1/2 Module)		0.65	K/W
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)	0.05		K/W
Weight	Weight of Module	150		g

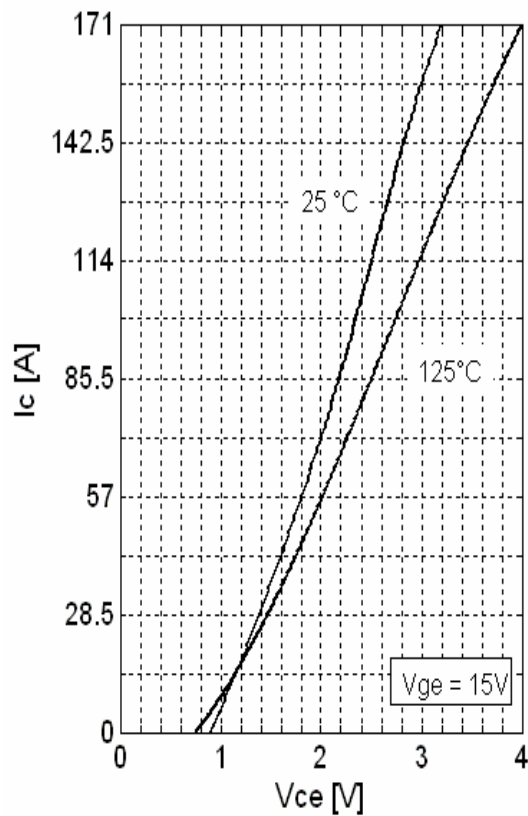


Fig 1. Typical Output Characteristics

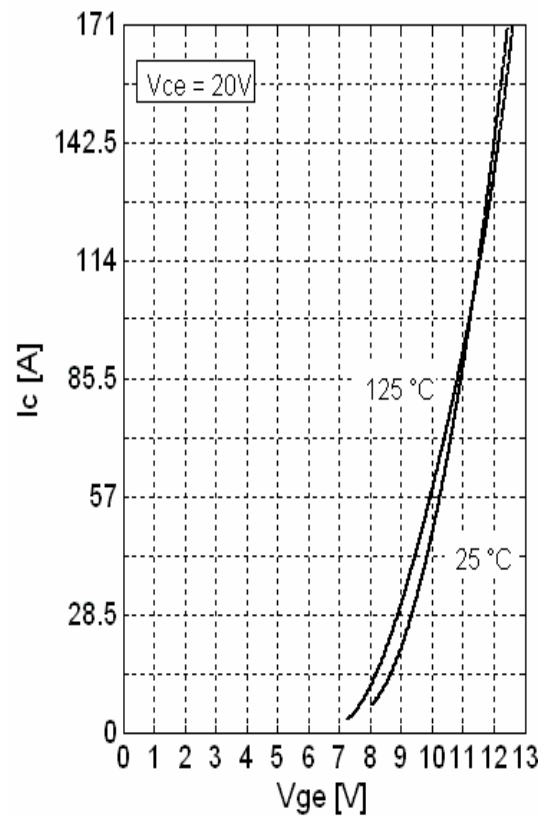


Fig 2. Typical Transfer Characteristics

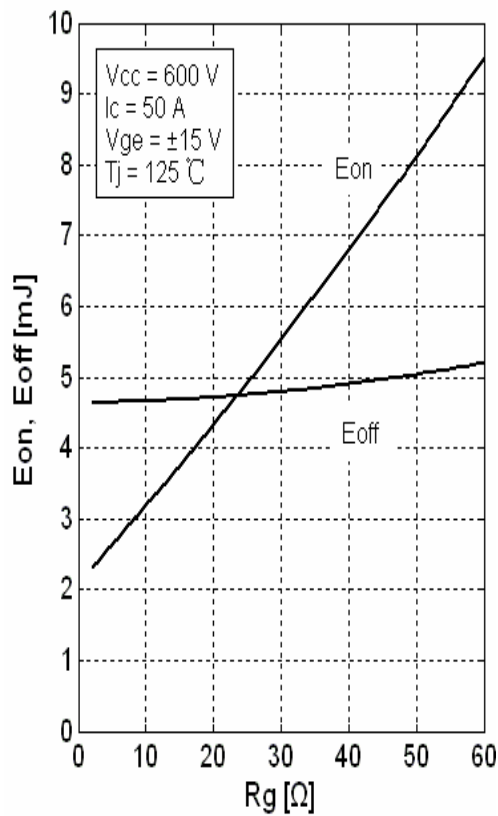


Fig 3. Switching Loss vs. Collector Current

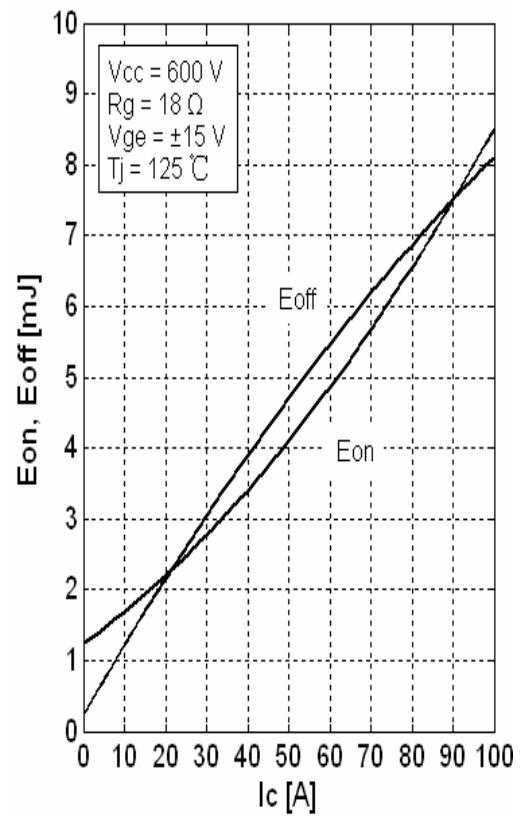


Fig 4. Switching Loss vs. Gate Resistor

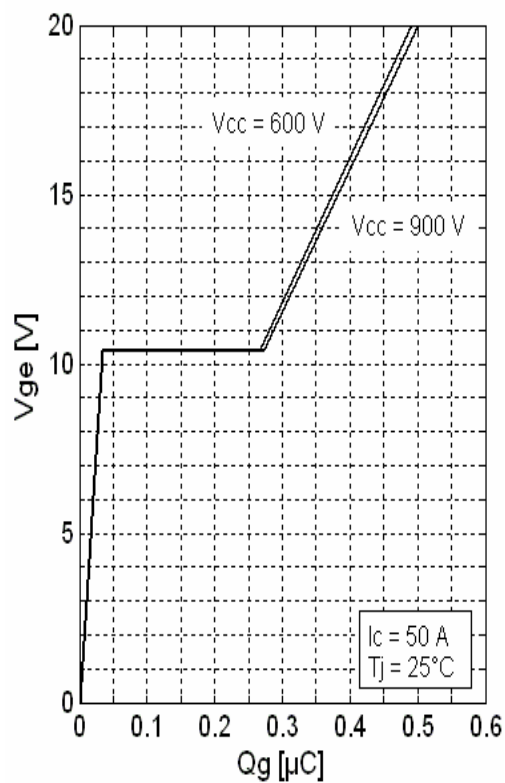
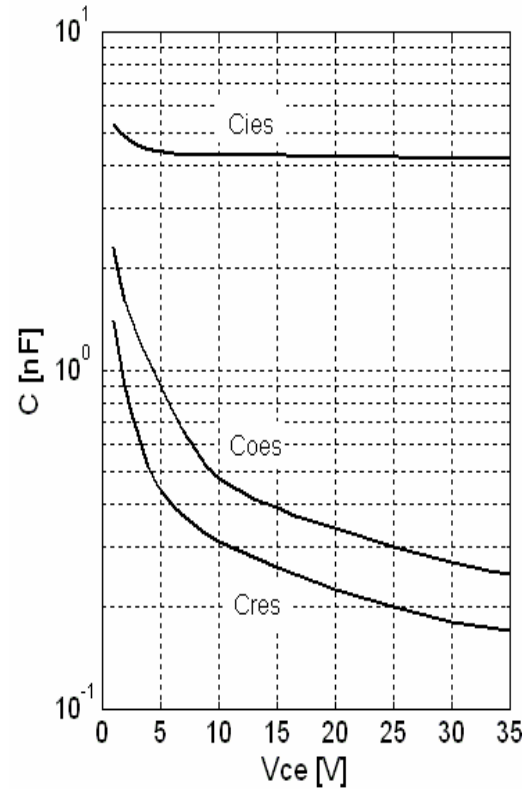
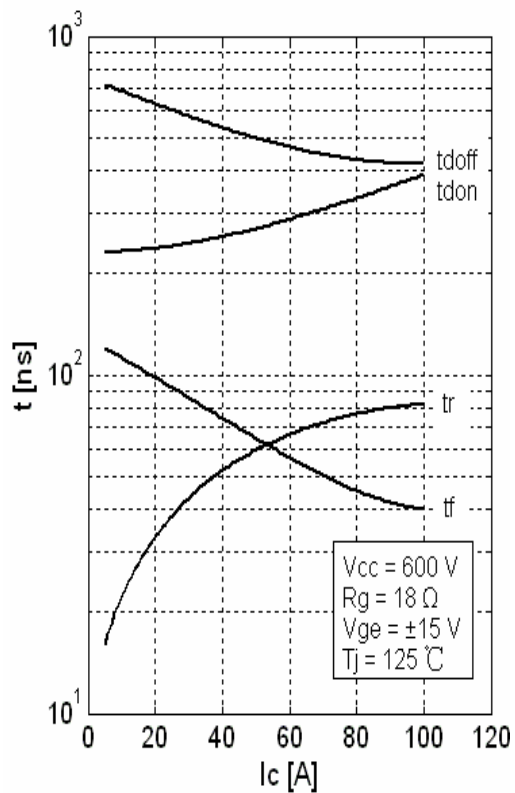
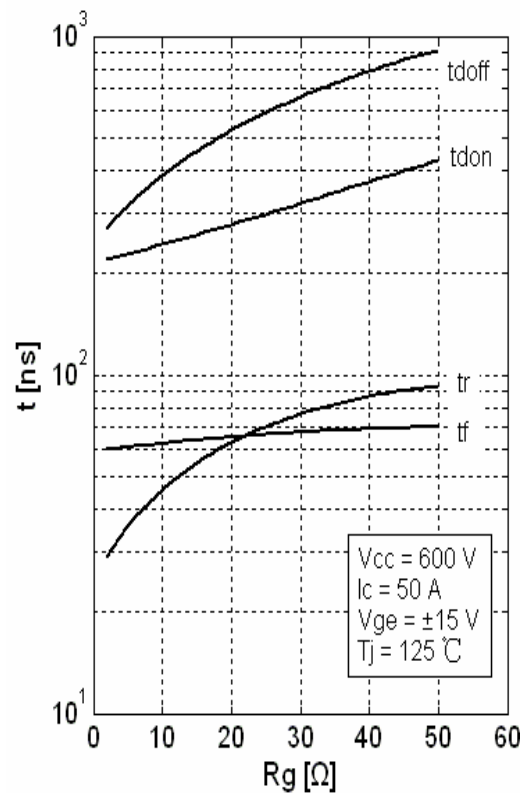


Fig 5. Gate Charge Characteristics.

Fig 6. Typical Capacitance vs.
Collector-Emitter VoltageFig 7. Typical Switching Times vs. I_c Fig 8. Typical Switching Times vs.
Gate Resistance R_g

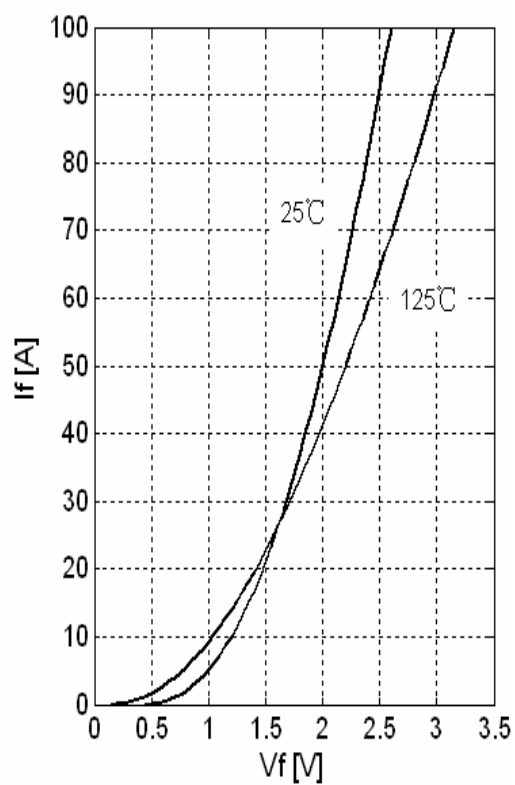


Fig 9. Typical Forward Characteristics (diode)

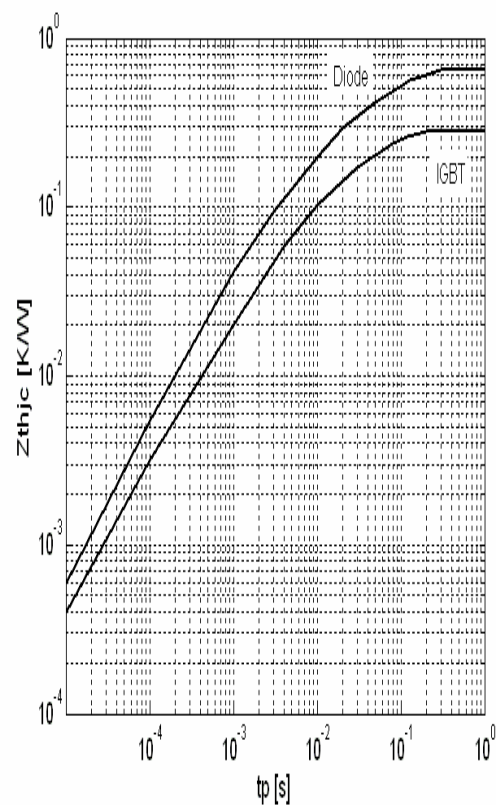
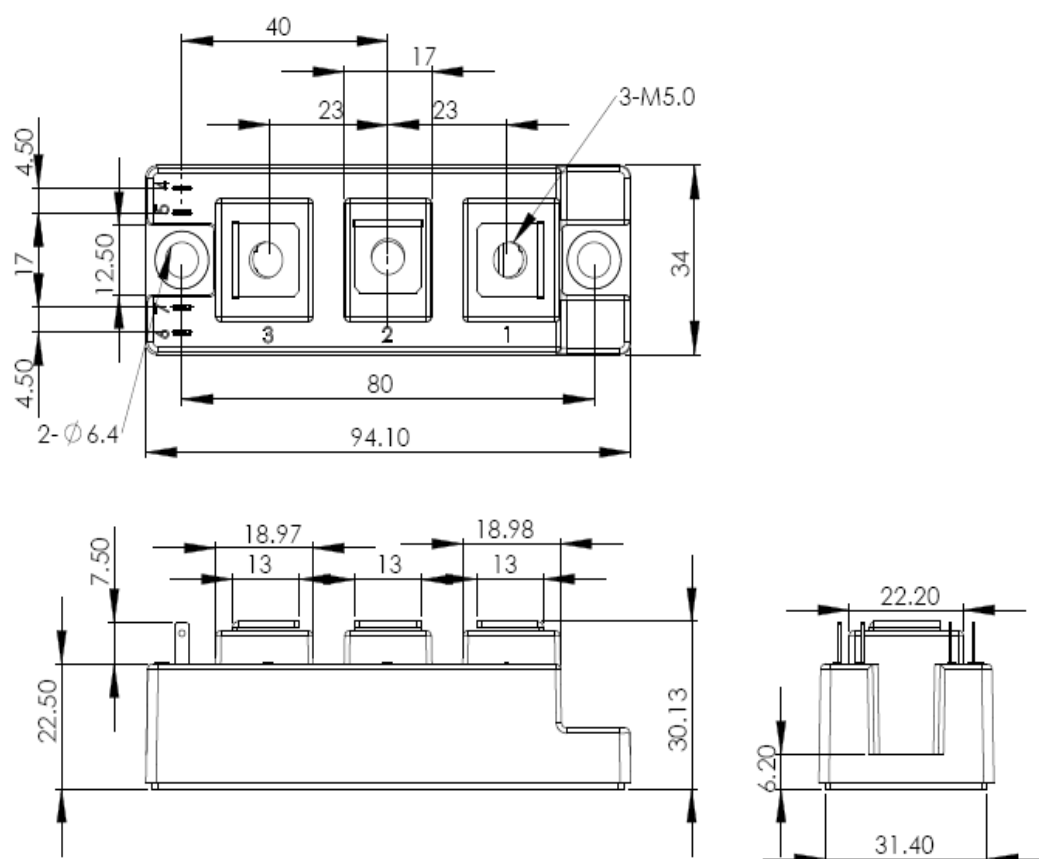


Fig 10. Transient Thermal Impedance

Package Dimension

Dimensions in Millimeters



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