

IGBT

GD400CUL120C2S

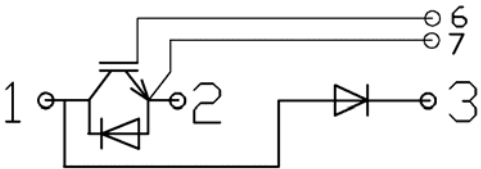
Molding Type Module

1200V/400A chopper in one-package



Features

- High short circuit capability, self limiting to 6*I_C
- 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
- Switching mode power supplies
- Electronic welders

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

Symbol	Description	GD400CUL120C2S	Units
V _{CES}	Collector-Emitter Voltage	1200	V
V _{GES}	Gate-Emitter Voltage	± 20V	V

Symbol	Description	GD400CUL120C2S	Units
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$	575	A
	@ $T_C=80^{\circ}\text{C}$	400	
$I_{CM(1)}$	Pulsed Collector Current $t_p=1\text{ms}$	800	A
I_F	Diode Continuous Forward Current	400	A
I_{FM}	Diode Maximum Forward Current	800	A
P_D	Maximum power Dissipation @ $T_j=150^{\circ}\text{C}$	2907	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	$V_R=0\text{V}$, $t=10\text{ms}$, $T_j=125^{\circ}\text{C}$	34	kA^2s
V_{ISO}	Isolation Voltage RMS, $f=50\text{Hz}$, $t=1\text{min}$	2500	V
Mounting Torque	Power Terminal Screw:M6	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	$I_C=6.0\text{mA}$, $V_{CE}=V_{GE}$, $T_j=25^{\circ}\text{C}$	5.0	6.1	7.0	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=400\text{A}$, $V_{GE}=15\text{V}$, $T_j=25^{\circ}\text{C}$		1.87		V
		$I_C=400\text{A}$, $V_{GE}=15\text{V}$, $T_j=125^{\circ}\text{C}$		2.08		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}$, $I_C=400\text{A}$, $R_G=2.5\Omega$, $V_{GE}=\pm 15\text{V}$, $T_j=25^{\circ}\text{C}$		125		ns
t_r	Rise Time			71		ns
$t_{d(off)}$	Turn-Off Delay Time			540		ns
t_f	Fall Time			72		ns

GD400CUL120C2S**IGBT Module**

E_{on}	Turn-On Switching Loss	$V_{CC}=600V, I_C=400A,$ $R_G=2.5\Omega, V_{GE}=\pm 15V,$ $T_j=25^\circ C$		44		mJ
E_{off}	Turn-Off Switching Loss			40		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=400A,$ $R_G=2.5\Omega, V_{GE}=\pm 15V,$ $T_j=125^\circ C$		130		ns
t_r	Rise Time			75		ns
$t_{d(off)}$	Turn-Off Delay Time			600		ns
t_f	Fall Time			80		ns
E_{on}	Turn-On Switching Loss			48		mJ
E_{off}	Turn-Off Switching Loss			43		mJ
C_{ies}	Input Capacitance	$V_{CE}=25V, f=1MHz,$ $V_{GE}=0V$		32.7		nF
C_{oes}	Output Capacitance			2.42		nF
C_{res}	Reverse Transfer Capacitance			1.50		nF
I_{SC}	SC Data	$t_{sc}\leq 10\mu s, V_{GE}=15V,$ $T_j=125^\circ C, V_{CC}=900V,$ $V_{CEM}\leq 1200V$		1900		A
R_{Gint}	Internal Gate Resistance			0.6		Ω
L_{CE}	Stray Inductance				18	nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal to Chip	$T_C=25^\circ C$		0.32		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 =400A	T _j =25℃		2.13		V
			T _j =125℃		2.32		
Q _r	Diode Reverse Recovery Charge	I _F =400A, V _R =600V, di/dt=-6000A/μs, V _{GE} =-15V	T _j =25℃		52		μC
			T _j =125℃		64		
I _{RM}	Diode Peak Reverse Recovery Current		T _j =25℃		360		A
			T _j =125℃		420		
E _{rec}	Reverse Recovery Energy		T _j =25℃		20		mJ
			T _j =125℃		27		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (IGBT Part, per 1/2 Module)		0.043	K/W
$R_{\theta JC}$	Junction-to-Case (DIODE Part, per 1/2 Module)		0.085	K/W
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)	0.032		K/W
Weight	Weight of Module	340		g

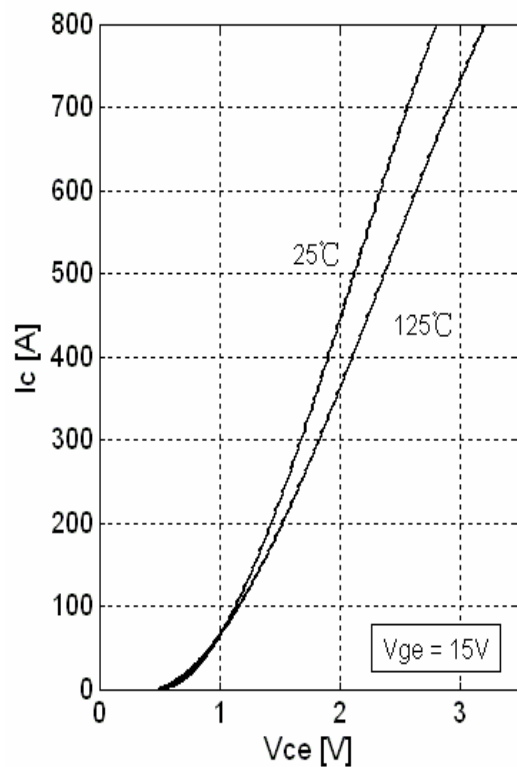


Fig 1. Typical Output Characteristics

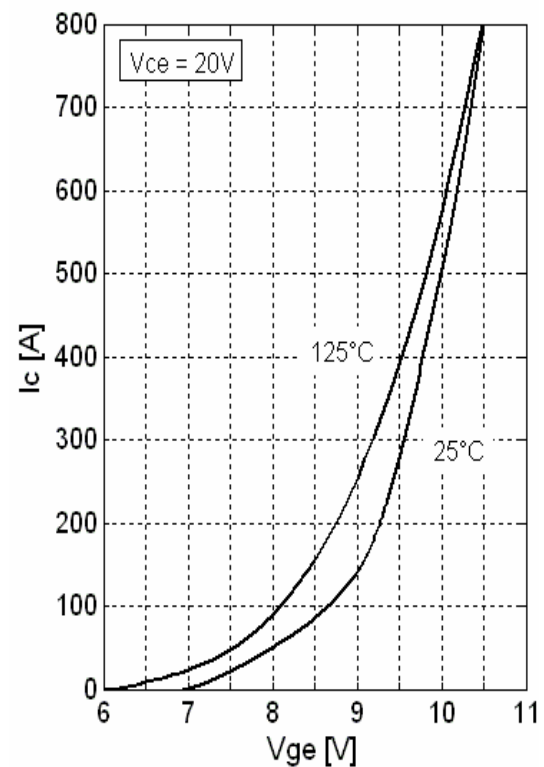


Fig 2. Typical Transfer Characteristics

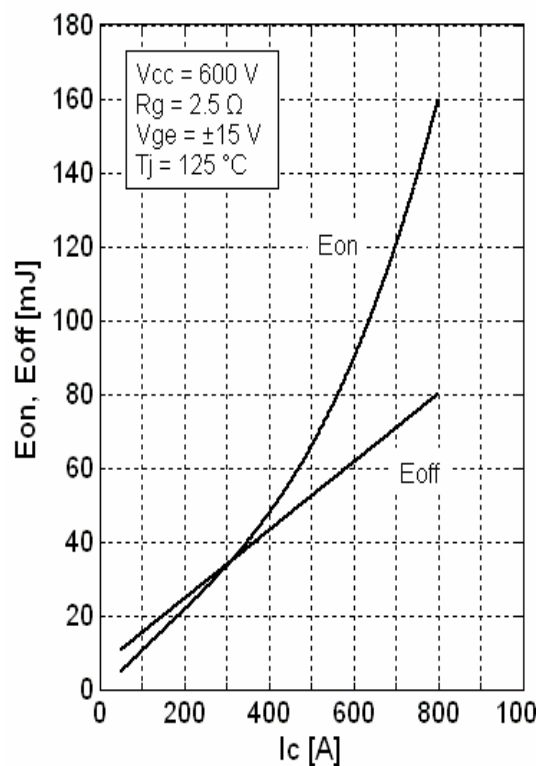


Fig 3. Switching Loss vs. Collector Current

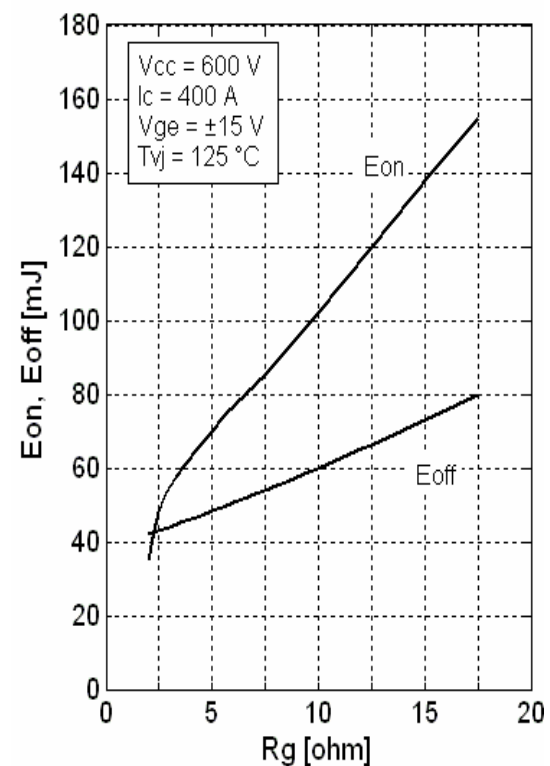


Fig 4. Switching Loss vs. Gate Resistor

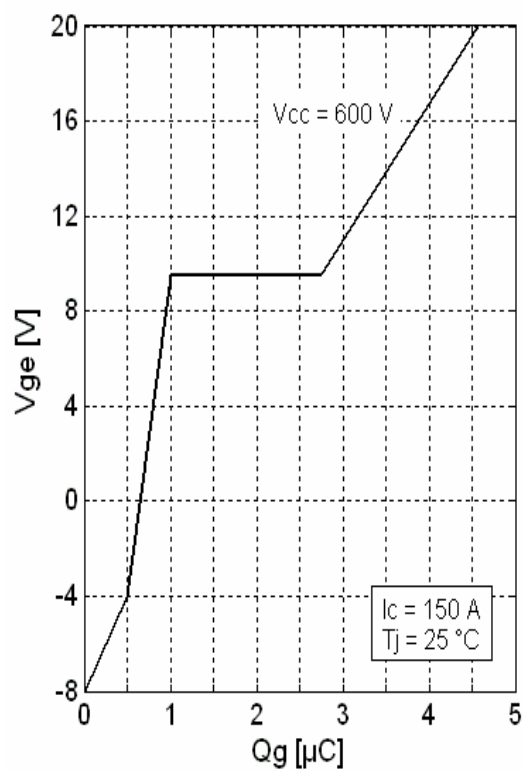
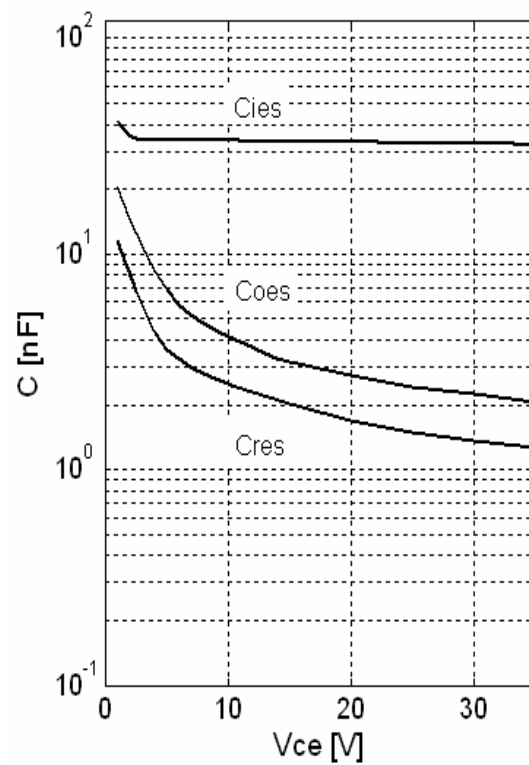
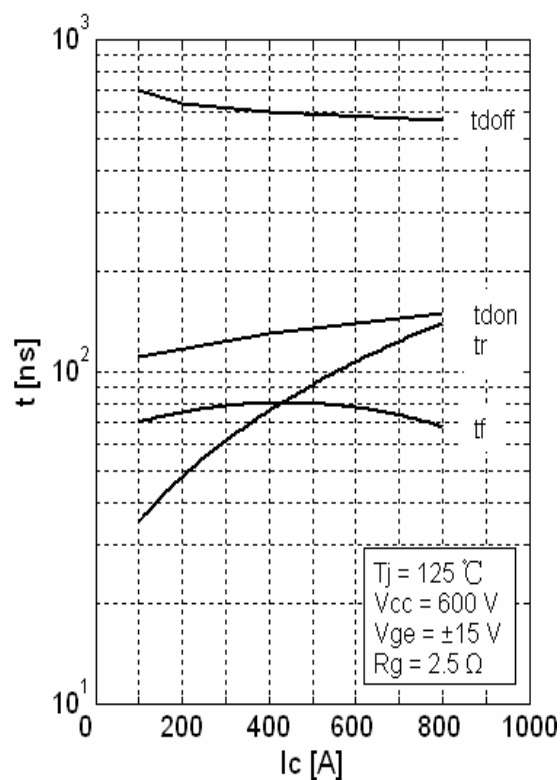
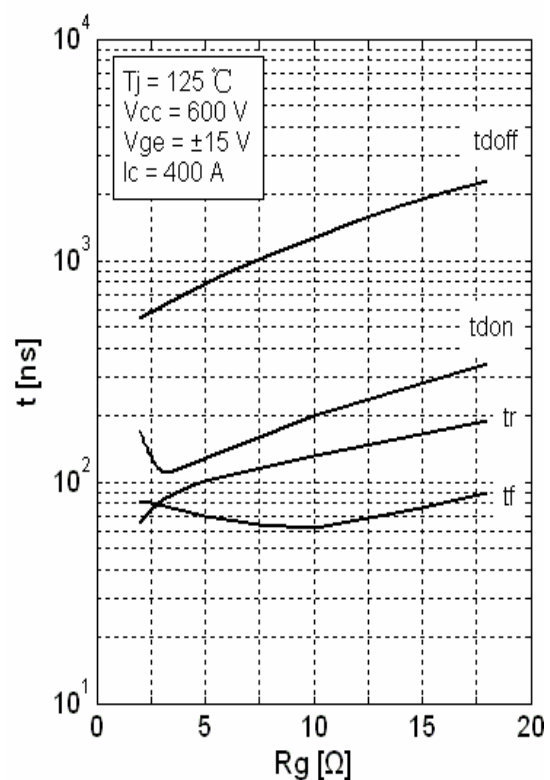


Fig 5. Gate Charge Characteristics

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

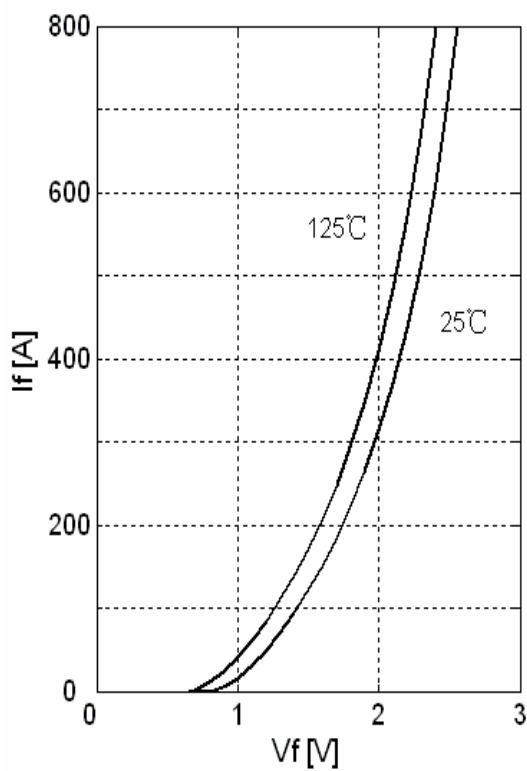


Fig 9. Typical Forward Characteristics(diode)

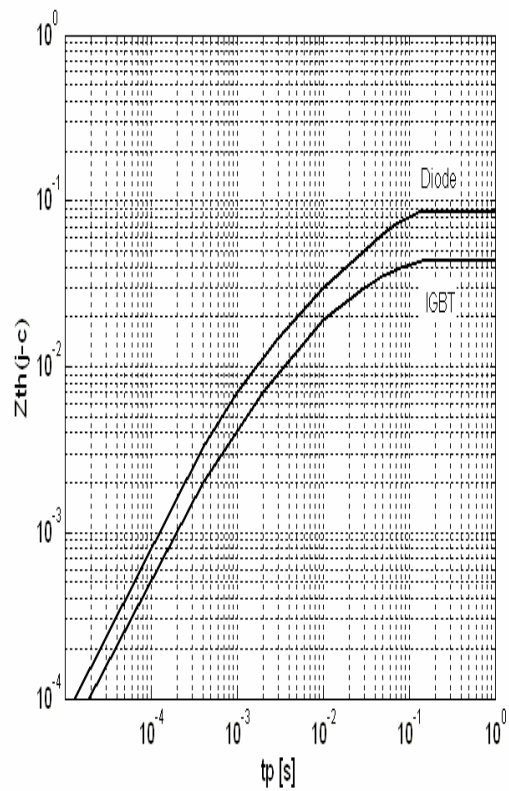


Fig 10. Transient Thermal Impedance

