STARPOWER

SEMICONDUCTOR™ **IGBT**

GD400HFL120C2SN

Molding Type Module

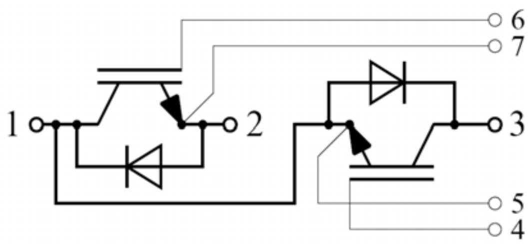
1200V/400A 2 in one-package

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 $V_{CE(sat)}$ SPT+ IGBT technology
- 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

- Inverter for motor drive
- AC and DC servo drive amplifier
- Uninterruptible power supply

Absolute Maximum Ratings T_C=25℃ unless otherwise noted

Symbol	Description	GD400HFL120C2SN	Units
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	±20	V
I_C	Collector Current @ T_C=25℃	650	A
	@ T_C=80℃	400	
$I_{CM(1)}$	Pulsed Collector Current t_p=1ms	800	A
I_F	Diode Continuous Forward Current @ T_C=80℃	400	A
I_{FM}	Diode Maximum Forward Current	800	A
P_D	Maximum Power Dissipation @ T_j=150℃	2450	W
T_{jmax}	Maximum Junction Temperature	150	℃
T_{STG}	Storage Temperature Range	-40 to +125	℃
V_{ISO}	Isolation Voltage RMS,f=50Hz,t=1min	2500	V
Mounting Torque	Power Terminal Screw:M6 Mounting Screw:M6	2.5 to 5.0 3.0 to 5.0	N.m

Notes:

(1) Repetitive rating: Pulse width limited by max. junction temperature

Electrical Characteristics of IGBT T_C=25℃ unless otherwise noted

Off Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	T_j=25℃	1200			V
I_{CES}	Collector Cut-Off Current	$V_{CE}=V_{CES}$,V_{GE}=0V, T_j=25℃			5.0	mA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=V_{GES}$,V_{CE}=0V, T_j=25℃			400	nA

On Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=16mA,$V_{CE}=V_{GE}$, T_j=25℃	5.0	6.2	7.0	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=400A,V_{GE}=15V, T_j=25℃		1.90	2.35	V
		I_C=400A,V_{GE}=15V, T_j=125℃		2.10		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=400A, R_G=4.1Ω,V_{GE}=±15V, T_j=25℃		910		ns
t_r	Rise Time			200		ns
$t_{d(off)}$	Turn-Off Delay Time			848		ns
t_f	Fall Time			110		ns
E_{on}	Turn-On Switching Loss			33.5		mJ
E_{off}	Turn-Off Switching Loss			39.5		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=400A, R_G=4.1Ω,V_{GE}=±15V, T_j=125℃		1047		ns
t_r	Rise Time			201		ns
$t_{d(off)}$	Turn-Off Delay Time			998		ns
t_f	Fall Time			150		ns
E_{on}	Turn-On Switching Loss			46.0		mJ
E_{off}	Turn-Off Switching Loss			57.6		mJ
C_{ies}	Input Capacitance	V_{CE}=25V,f=1MHz, V_{GE}=0V		29.7		nF
C_{oes}	Output Capacitance			2.08		nF
C_{res}	Reverse Transfer Capacitance			1.36		nF
I_{SC}	SC Data	t_{SC}≤10μs,V_{GE}=15V, T_j=25℃,V_{CC}=600V, V_{CEM}≤1200V		1800		A
R_{Gint}	Internal Gate Resistance			0.5		Ω
L_{CE}	Stray Inductance				20	nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal to Chip	T_C=25℃		0.35		mΩ

Electrical Characteristics of DIODE T_C=25℃ unless otherwise noted

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	I_F=400A	T_j=25℃		1.80	2.40	V
			T_j=125℃		1.85		
Q_r	Recovered Charge	I_F=400A, V_R=600V, di/dt=-2680A/μs, V_{GE}=-15V	T_j=25℃		26		μC
			T_j=125℃		49		
I_{RM}	Peak Reverse Recovery Current		T_j=25℃		212		A
			T_j=125℃		281		
E_{rec}	Reverse Recovery Energy		T_j=25℃		13.4		mJ
			T_j=125℃		23.8		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (per IGBT)		0.051	K/W
$R_{\theta JC}$	Junction-to-Case (per DIODE)		0.072	K/W
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)	0.035		K/W
Weight	Weight of Module	300		g

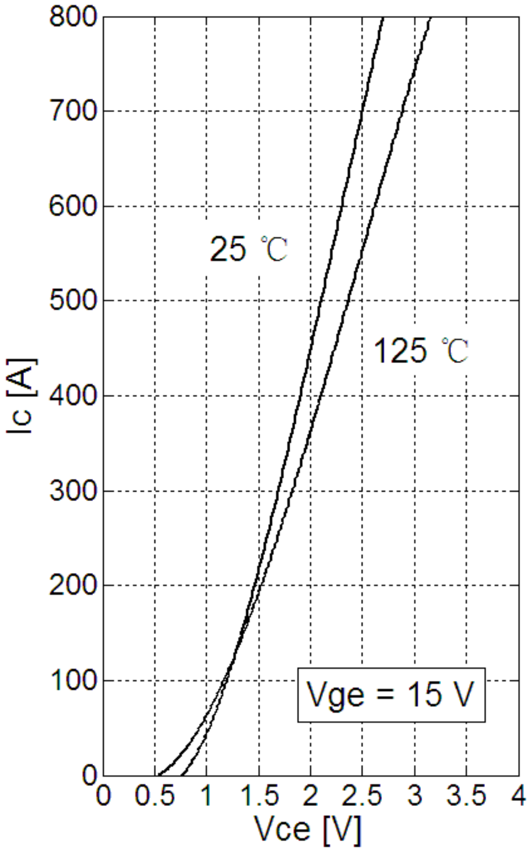


Fig 1. IGBT Typical Output Characteristics

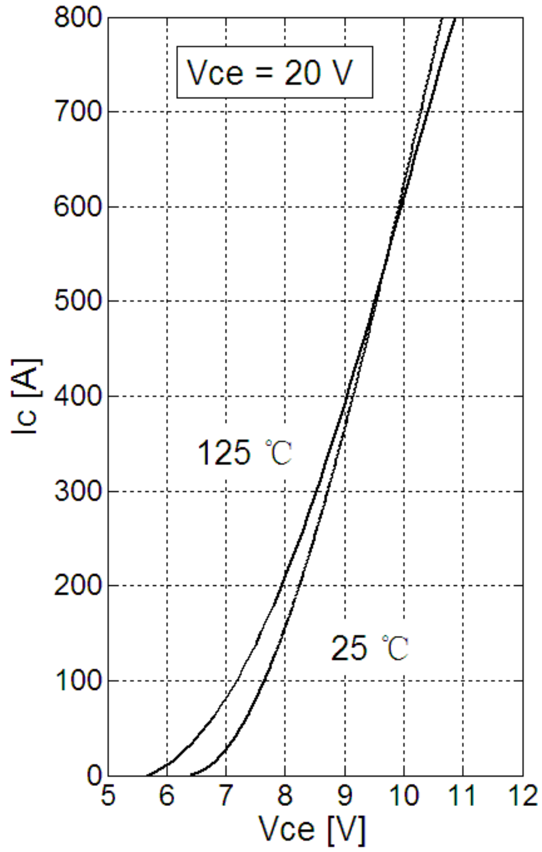


Fig 2. IGBT Typical Transfer Characteristics

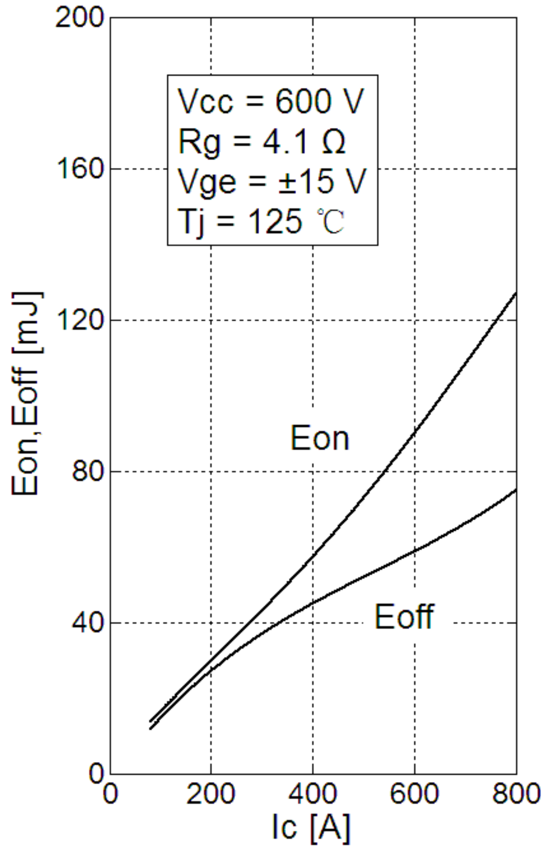


Fig 3. IGBT Switching Loss vs. I_C

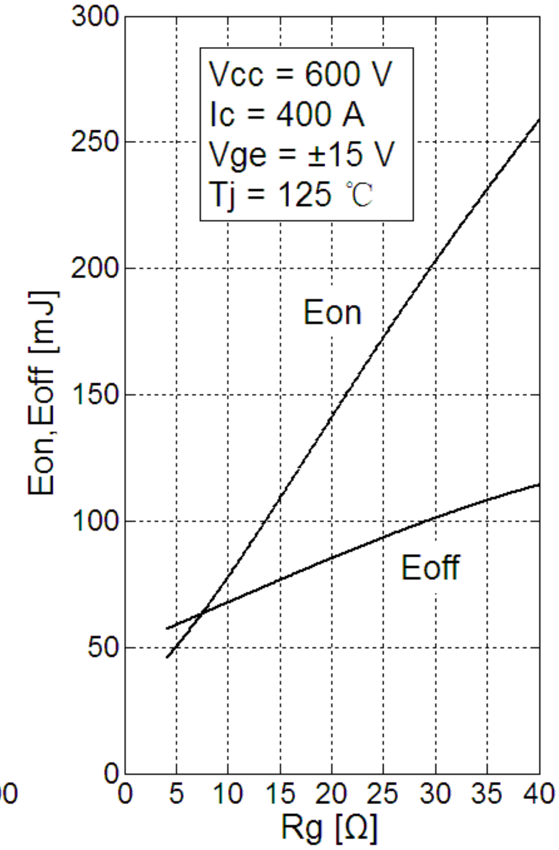


Fig 4. IGBT Switching Loss vs. R_G

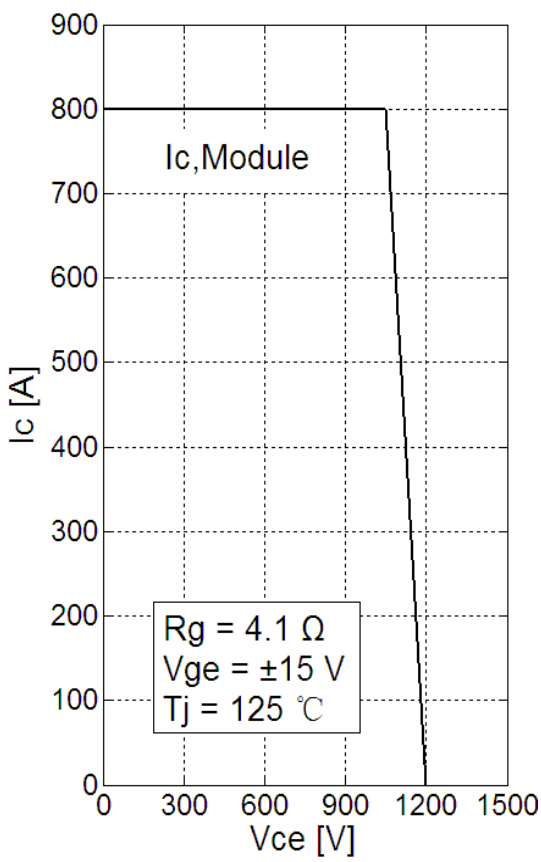


Fig 5. RBSOA

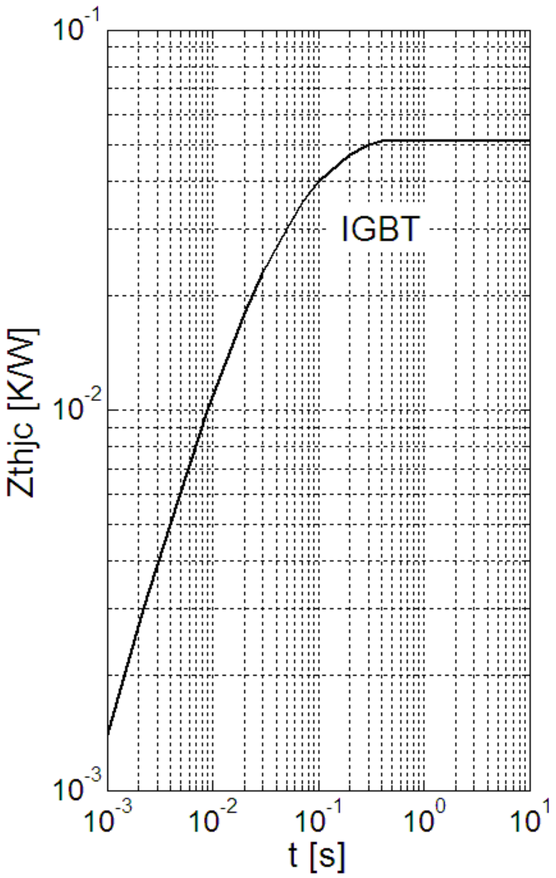


Fig 6. IGBT Transient Thermal Impedance

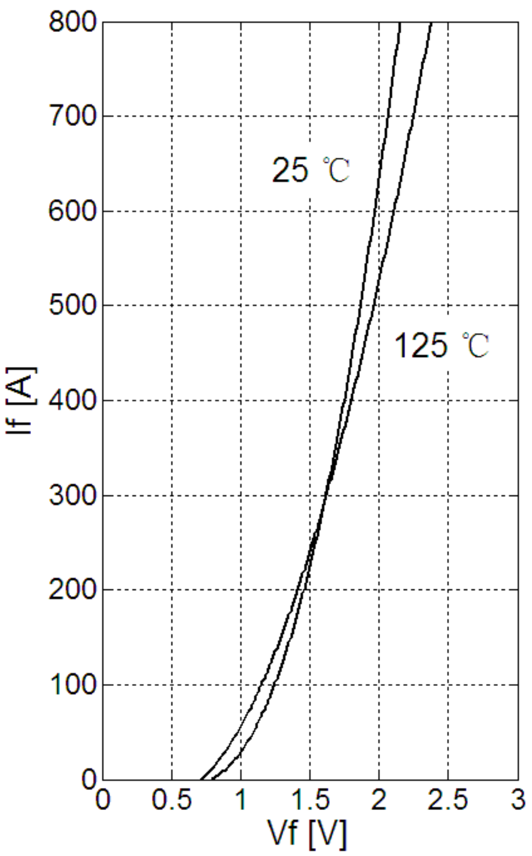


Fig 7. Diode Typical Forward Characteristics

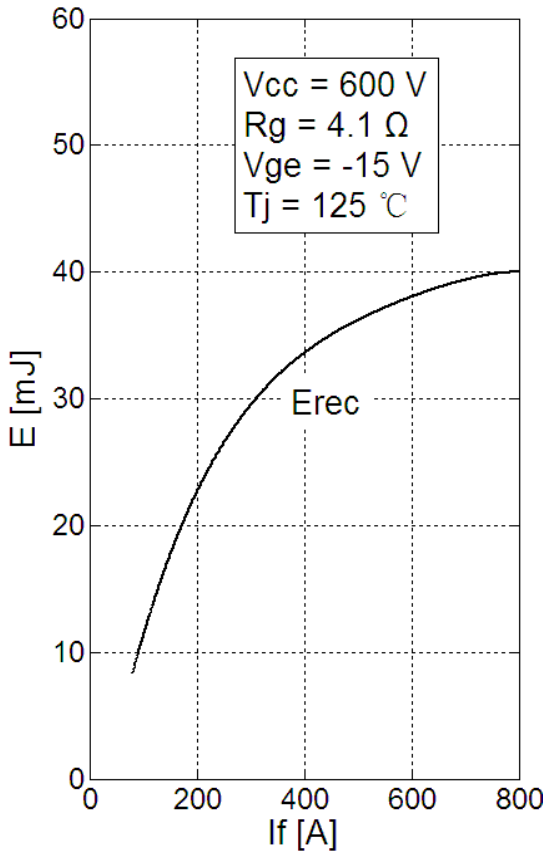


Fig 8. Diode Switching Loss vs. I_F

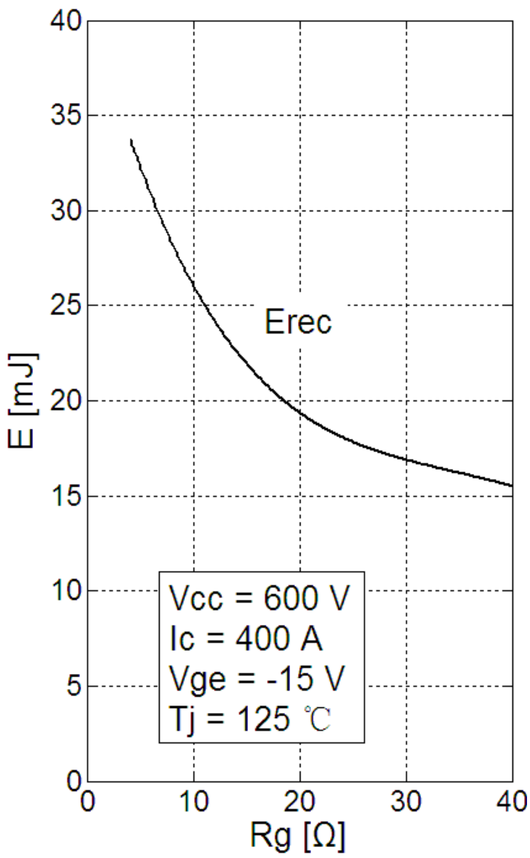


Fig 9. Diode Switching Loss vs. R_G

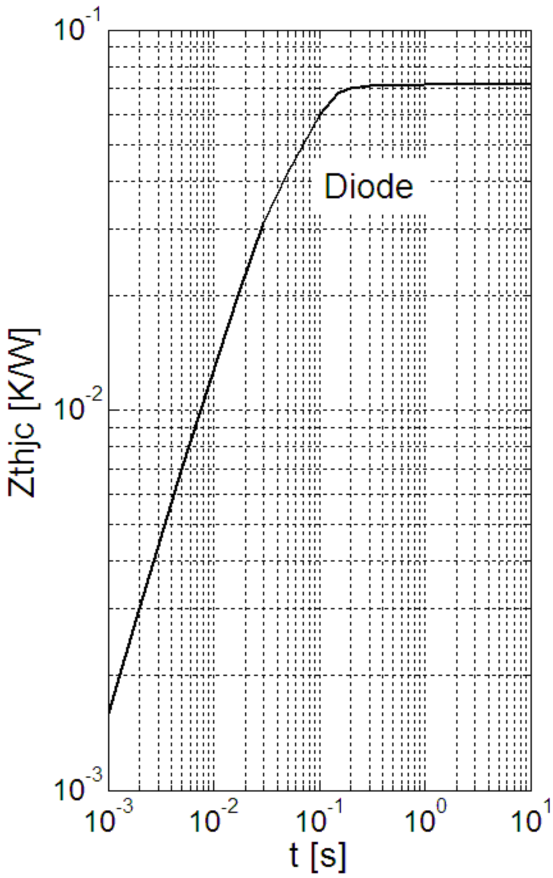
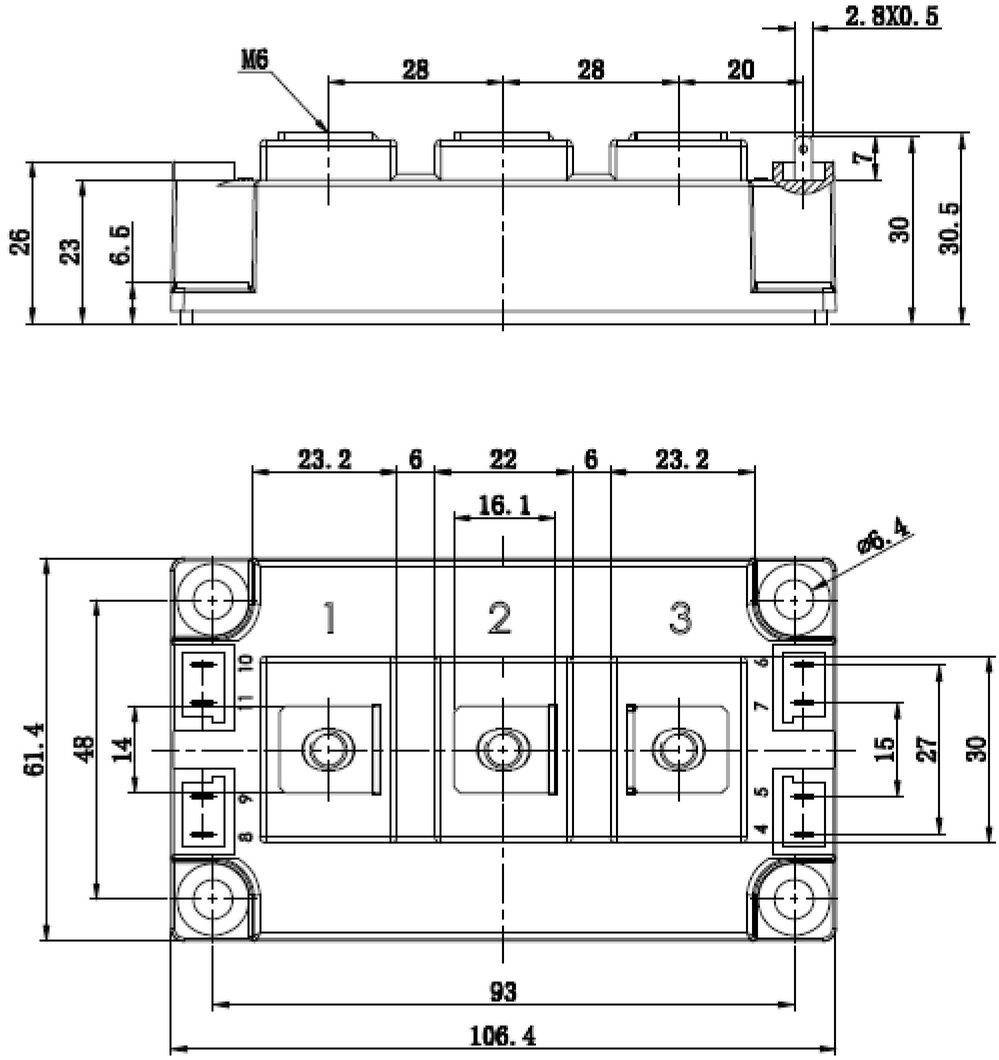


Fig 10. Diode Transient Thermal Impedance

Package Dimension

Dimensions in Millimeters



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