

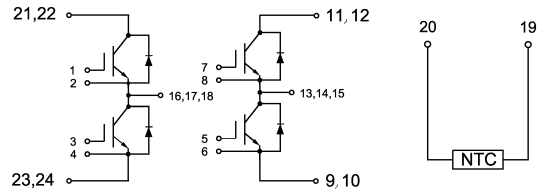
$V_{CES} = 1200V$ $I_C = 50A$ at $T_C = 80^\circ C$ $t_{SC} \geq 10\mu sec$ $V_{CE(ON)} = 3.20V$ at $I_C = 50A$
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**IGBT H-Bridge
POWER ECO 2™ Package**



Applications:

- Industrial Motor Drive
- Uninterruptible Power Supply
- Welding and Cutting Machine
- Switched Mode Power Supply
- Induction Heating
- DC Inverter Drive



Features	Benefits
Low $V_{CE(ON)}$ and Switching Losses	High Efficiency in a Wide Range of Applications
100% RBSOA Tested	Rugged Transient Performance
10μsec Short Circuit Safe Operating Area	
POWER ECO 2™ Package	Industry Standard
Lead Free	RoHS Compliant, Environmental Friendly

Base Part Number	Package Type	Standard Pack	Quantity	Orderable Part Number
IRG5U50HH12E	POWER ECO 2™	Box	80	IRG5U50HH12E

Absolute Maximum Ratings of IGBT

V_{CES}	Collector to Emitter Voltage	1200	V
V_{GES}	Continuous Gate to Emitter Voltage	±20	V
I_C	Continuous Collector Current	$T_C = 80^\circ C$	50 A
		$T_C = 25^\circ C$	85 A
I_{CM}	Pulse Collector Current	$T_J = 150^\circ C$	100 A
P_D	Maximum Power Dissipation (IGBT)	$T_C = 25^\circ C, T_J = 150^\circ C$	390 W
T_J	Maximum IGBT Junction Temperature	150	°C
T_{JOP}	Maximum Operating Junction Temperature Range	-40 to +150	°C
T_{stg}	Storage Temperature	-40 to +125	°C

Electrical Characteristics of IGBT at $T_J = 25^\circ\text{C}$ (Unless Otherwise Specified)

Parameter		Min.	Typ.	Max.	Unit	Test Conditions	
$V_{(BR)CES}$	Collector to Emitter Breakdown Voltage	1200			V	$V_{GE} = 0V, I_C = 1mA$	
$V_{GE(th)}$	Gate Threshold Voltage	4.5	5.3	6.0	V	$I_C = 0.50mA, V_{CE} = V_{GE}$	
$V_{CE(ON)}$	Collector to Emitter Saturation Voltage (Module Level)		3.20	3.50	V	$T_J = 25^\circ\text{C}$	$I_C = 50A, V_{GE} = 15V$
			3.80		V	$T_J = 125^\circ\text{C}$	
I_{CES}	Collector to Emitter Leakage Current			1	mA	$V_{GE} = 0V, V_{CE} = V_{CES}$	
I_{GES}	Gate to Emitter Leakage Current			400	nA	$V_{GE} = \pm 20V, V_{CE} = 0$	

Switching Characteristics of IGBT

Parameter		Min.	Typ.	Max.	Unit	Test Conditions	
$t_{d(on)}$	Turn-on Delay Time		115		ns	$T_J = 25^\circ\text{C}$	$V_{CC} = 600V, I_C = 50A, R_G = 15\Omega, V_{GE} = \pm 15V, \text{Inductive Load}$
			110			$T_J = 125^\circ\text{C}$	
t_r	Rise Time		70		ns	$T_J = 25^\circ\text{C}$	
			70			$T_J = 125^\circ\text{C}$	
$t_{d(off)}$	Turn-off Delay Time		305		ns	$T_J = 25^\circ\text{C}$	
			325			$T_J = 125^\circ\text{C}$	
t_f	Fall Time		125		ns	$T_J = 25^\circ\text{C}$	
			160			$T_J = 125^\circ\text{C}$	
E_{on}	Turn-on Switching Loss		3.6		mJ	$T_J = 25^\circ\text{C}$	
			4.6			$T_J = 125^\circ\text{C}$	
E_{off}	Turn-off Switching Loss		1.0		mJ	$T_J = 25^\circ\text{C}$	
			1.9			$T_J = 125^\circ\text{C}$	
Q_g	Total Gate Charge		630		nC	$T_J = 25^\circ\text{C}$	
C_{ies}	Input Capacitance		6.0		nF	$V_{CE} = 25V, V_{GE} = 0V, f = 1MHz, T_J = 25^\circ\text{C}$	
C_{oes}	Output Capacitance		0.50				
C_{res}	Reverse Transfer Capacitance		0.20				
RBSOA	Reverse Bias Safe Operating Area	Trapezoid				$I_C = 100A, V_{CC} = 960V, V_P = 1200V, R_G = 15\Omega, V_{GE} = +15V \text{ to } 0V, T_J = 150^\circ\text{C}$	
SCSOA	Short Circuit Safe Operating Area	10			μs	$V_{CC} = 600V, V_{GE} = 15V, T_J = 150^\circ\text{C}$	

Absolute Maximum Ratings of Freewheeling Diode

V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current, $T_C = 25^\circ\text{C}$	100	A
	Diode Continuous Forward Current, $T_C = 80^\circ\text{C}$	50	
I_{FM}	Pulse Diode Current	100	A

Electrical and Switching Characteristics of Freewheeling Diode

Parameter		Typ.	Max.	Unit	Test Conditions	
V_F	Forward Voltage	2.20	2.70	V	$T_J = 25^\circ\text{C}$	$I_F = 50\text{A}$, $V_{GE} = 0\text{V}$
		2.40			$T_J = 125^\circ\text{C}$	
I_{rr}	Peak Reverse Recovery Current	40		A	$T_J = 25^\circ\text{C}$	$I_F = 50\text{A}$, $di/dt = 850\text{A}/\mu\text{s}$, $V_{rr} = 600\text{V}$, $V_{GE} = -15\text{V}$
		50			$T_J = 125^\circ\text{C}$	
Q_{rr}	Reverse Recovery Charge	3.0		μC	$T_J = 25^\circ\text{C}$	
		5.6			$T_J = 125^\circ\text{C}$	
E_{rec}	Reverse Recovery Energy	1.02		mJ	$T_J = 25^\circ\text{C}$	
		2.01			$T_J = 125^\circ\text{C}$	

NTC-Thermistor Characteristic Values

Parameter		Typ.	Max.	Unit
R_{25}	$T_C = 25^\circ\text{C}$	5		k Ω
$\Delta R/R$	$T_C = 100^\circ\text{C}$, $R_{100} = 481\Omega$		± 5	%
P_{25}	$T_C = 25^\circ\text{C}$	50		mW
$B_{25/50}$	$R_2 = R_{25} \exp[B_{25/50}(1/T_2 - 1/(298.15\text{K}))]$	3380		K
$B_{25/80}$	$R_2 = R_{25} \exp[B_{25/80}(1/T_2 - 1/(298.15\text{K}))]$	3440		K

Module Characteristics

Parameter		Min.	Typ.	Max.	Unit
V_{iso}	Isolation Voltage (All Terminals Shorted), $f = 50\text{Hz}$, 1minute			2500	V
$R_{\theta JC}$	Junction-to-Case (IGBT)		0.32		$^\circ\text{C}/\text{W}$
$R_{\theta JC}$	Junction-to-Case (Diode)		0.87		$^\circ\text{C}/\text{W}$
$R_{\theta CS}$	Case-To-Sink (Conductive Grease Applied)		0.1		$^\circ\text{C}/\text{W}$
M	Mounting Screw: M6	4.0		6.0	N·m
G	Weight		200		g

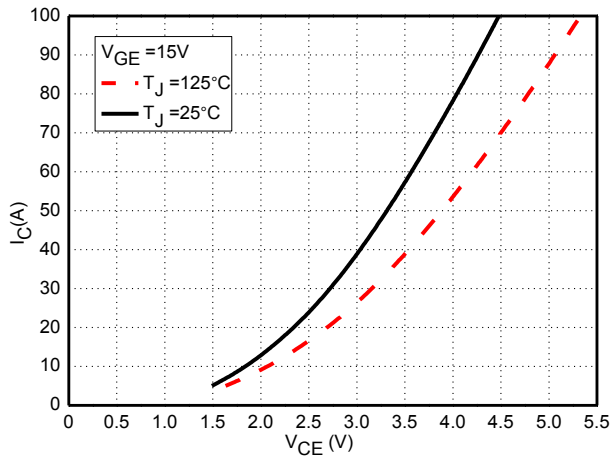


Fig.1 Typical IGBT Saturation Characteristics

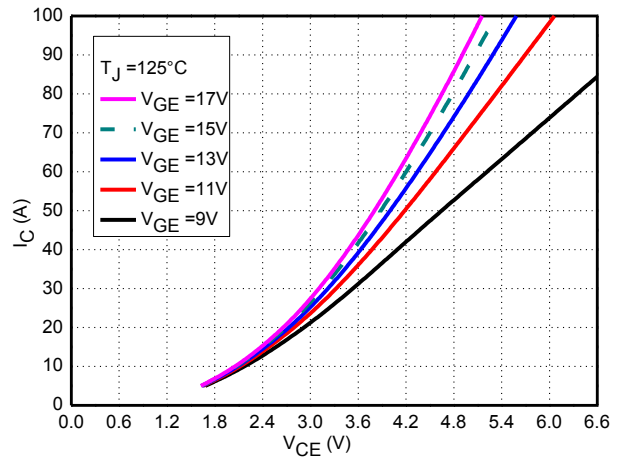


Fig.2 Typical IGBT Output Characteristics

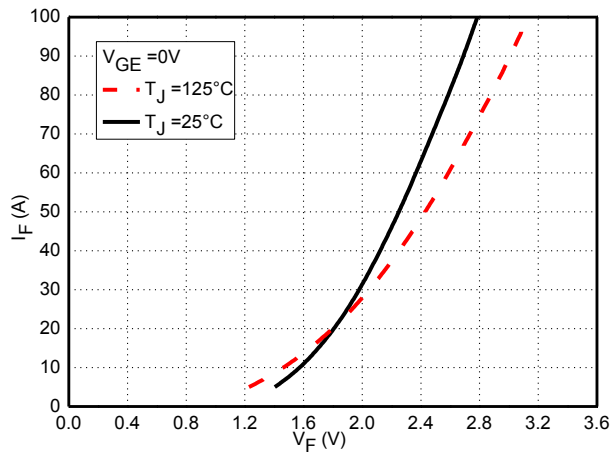


Fig.3 Typical Freewheeling Diode Characteristics

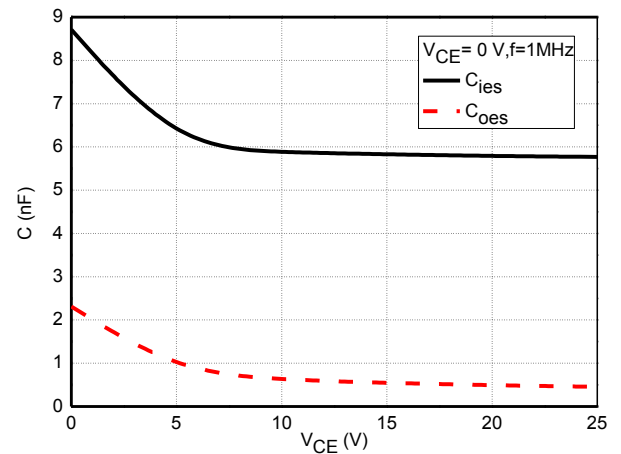


Fig. 4 Typical Capacitance Characteristics

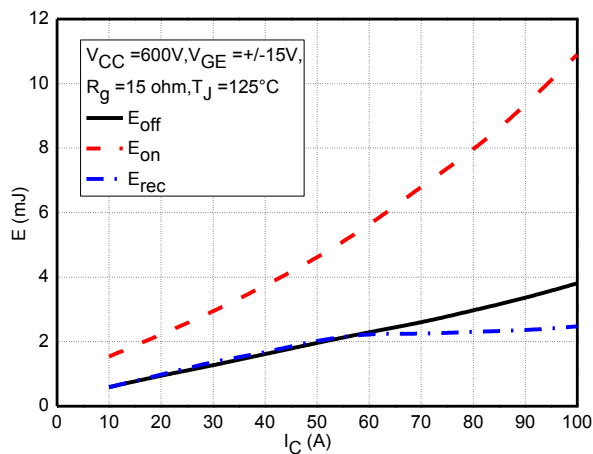


Fig.5 Typical Switching Loss vs. Collector Current

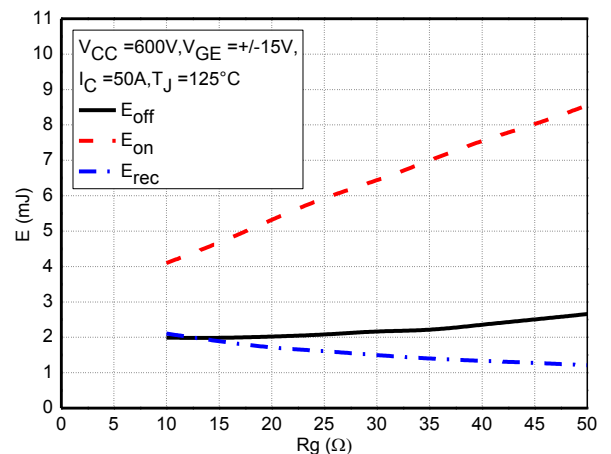
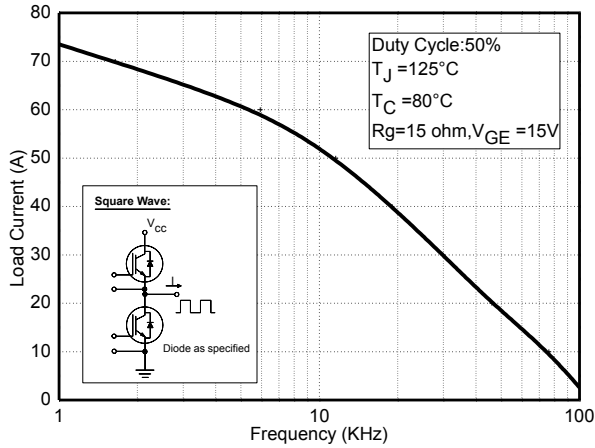
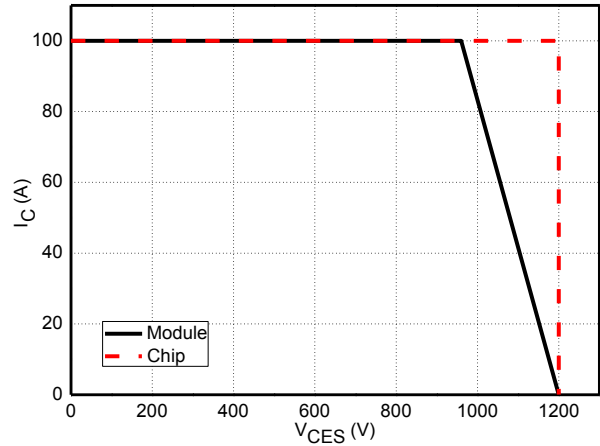
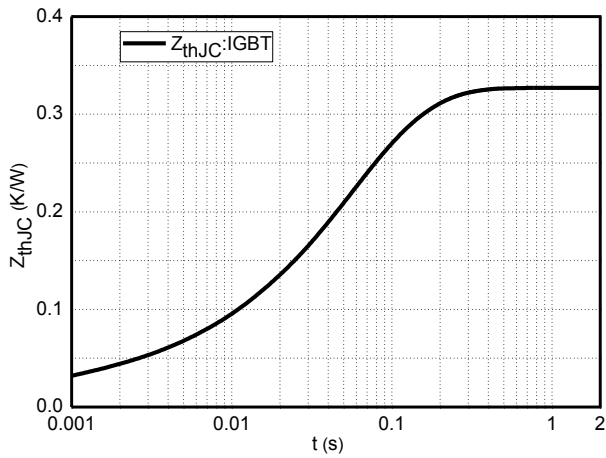
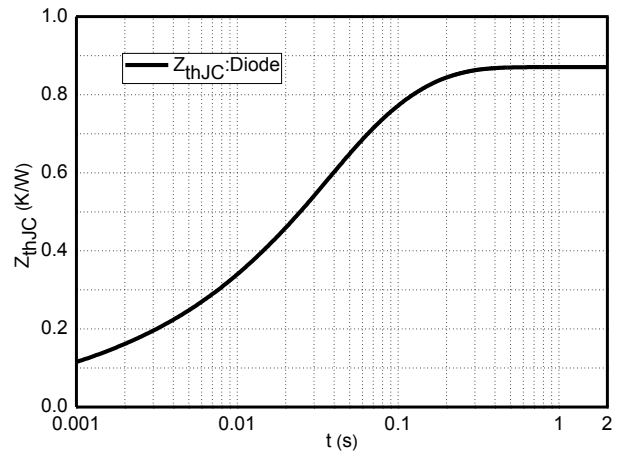
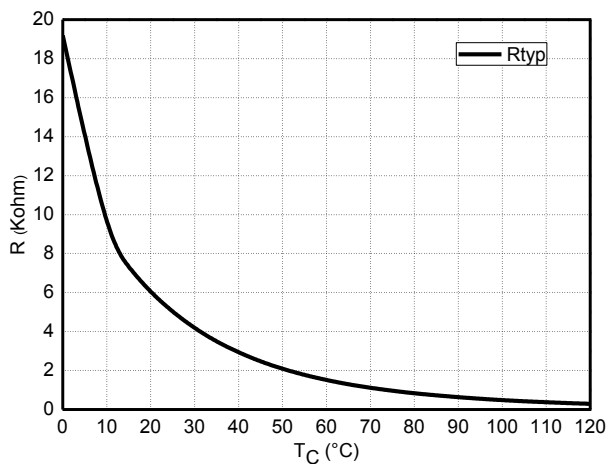
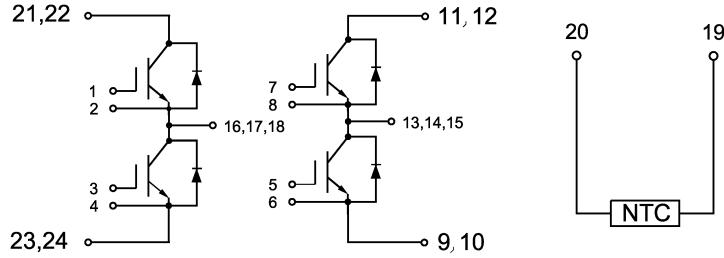


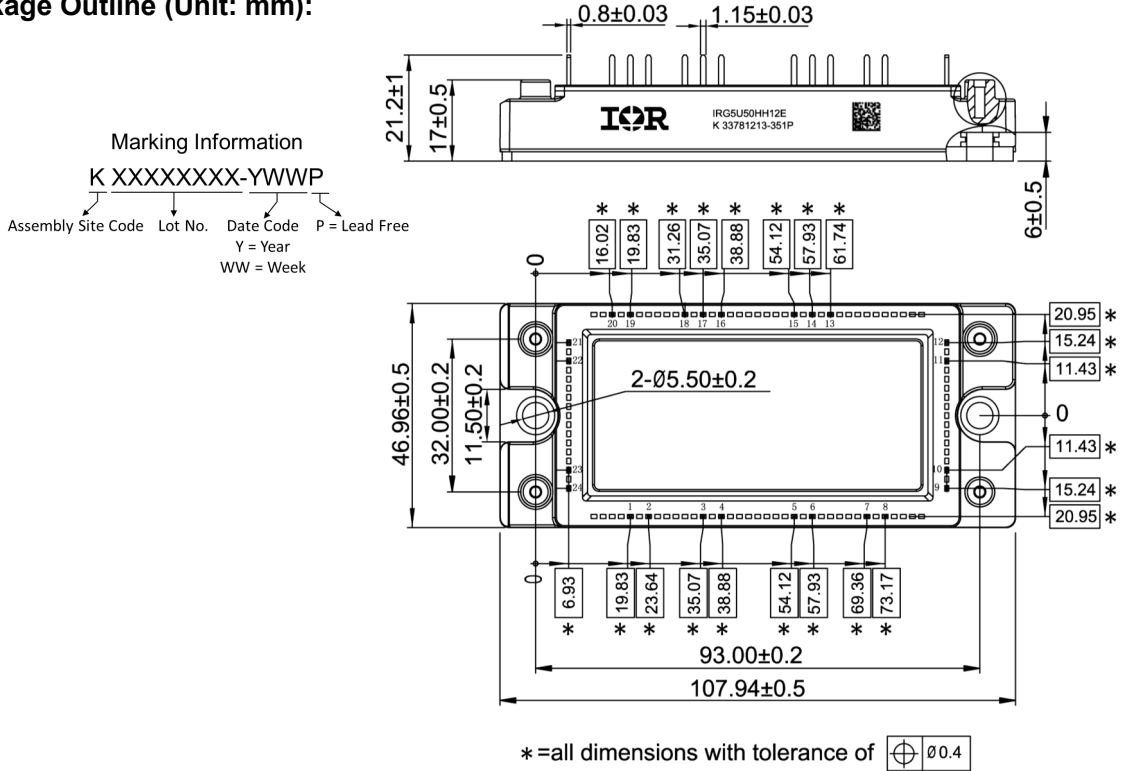
Fig.6 Typical Switching Loss vs. Gate Resistance


Fig.7 Typical Load Current vs. Frequency

Fig.8 Reverse Bias Safe Operation Area (RBSOA)

Fig.9 Typical Transient Thermal Impedance (IGBT)

Fig.10 Typical Transient Thermal Impedance (Diode)

Fig.11 NTC Temperature Characteristics

Internal Circuit:



Package Outline (Unit: mm):



Qualification Information†

Qualification Level	Industrial
Moisture Sensitivity Level	Not Applicable
RoHS Compliant	Yes

† Qualification standards can be found at International Rectifier's web site: <http://www.irf.com/product-info/reliability/>