

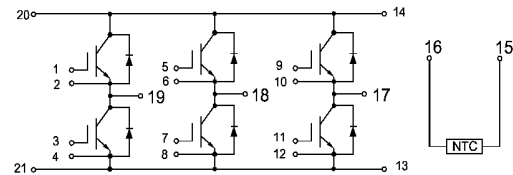
$V_{CES} = 600V$ $I_C = 50A$ at $T_C = 80^\circ C$ $t_{SC} \geq 10\mu sec$ $V_{CE(ON)} = 1.80V$ at $I_C = 50A$

**IGBT Six-Pack
POWER ECO 2™ Package**



Applications:

- Industrial Motor Drive
- Servo drive
- Uninterruptible Power Supply
- AC 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
IRG5K50FF06E	POWER ECO 2™	Box	80	IRG5K50FF06E

Absolute Maximum Ratings of IGBT

V_{CES}	Collector to Emitter Voltage	600	V
V_{GES}	Continuous Gate to Emitter Voltage	±20	V
I_C	Continuous Collector Current	$T_C = 80^\circ C$	50 A
		$T_C = 25^\circ C$	100 A
I_{CM}	Pulse Collector Current	$T_J = 150^\circ C$	100 A
P_D	Maximum Power Dissipation (IGBT)	$T_C = 25^\circ C, T_J = 150^\circ C$	245 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	600			V	$V_{GE} = 0V, I_C = 1mA$	
$V_{GE(th)}$	Gate Threshold Voltage	3.5	4.5	5.5	V	$I_C = 0.25mA, V_{CE} = V_{GE}$	
$V_{CE(ON)}$	Collector to Emitter Saturation Voltage		1.80	2.10	V	$T_J = 25^\circ\text{C}$	$I_C = 50A, V_{GE} = 15V$
			2.00		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		110		ns	$T_J = 25^\circ\text{C}$	$V_{CC}=300V, I_C = 50A, R_G = 30\Omega, V_{GE}=\pm 15V, \text{Inductive Load}$
			100			$T_J = 125^\circ\text{C}$	
t_r	Rise Time		75		ns	$T_J = 25^\circ\text{C}$	
			80			$T_J = 125^\circ\text{C}$	
$t_{d(off)}$	Turn-off Delay Time		220		ns	$T_J = 25^\circ\text{C}$	
			240			$T_J = 125^\circ\text{C}$	
t_f	Fall Time		90		ns	$T_J = 25^\circ\text{C}$	
			110			$T_J = 125^\circ\text{C}$	
E_{on}	Turn-on Switching Loss		0.68		mJ	$T_J = 25^\circ\text{C}$	
			0.78			$T_J = 125^\circ\text{C}$	
E_{off}	Turn-off Switching Loss		0.75		mJ	$T_J = 25^\circ\text{C}$	
			0.92			$T_J = 125^\circ\text{C}$	
Q_g	Total Gate Charge		260		nC	$T_J = 25^\circ\text{C}$	
C_{ies}	Input Capacitance		3.0		nF	$V_{CE} = 25V, V_{GE} = 0V, f = 1MHz, T_J = 25^\circ\text{C}$	
C_{oes}	Output Capacitance		0.35				
C_{res}	Reverse Transfer Capacitance		0.14				
RBSOA	Reverse Bias Safe Operating Area	Trapezoid				$I_C = 100A, V_{CC} = 480V, V_P = 600V, R_G = 15\Omega, V_{GE} = +15V \text{ to } 0V, T_J = 150^\circ\text{C}$	
SCSOA	Short Circuit Safe Operating Area	10			μs	$V_{CC} = 300V, V_{GE} = 15V, T_J = 150^\circ\text{C}$	

Absolute Maximum Ratings of Freewheeling Diode

V_{RRM}	Repetitive Peak Reverse Voltage	600	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

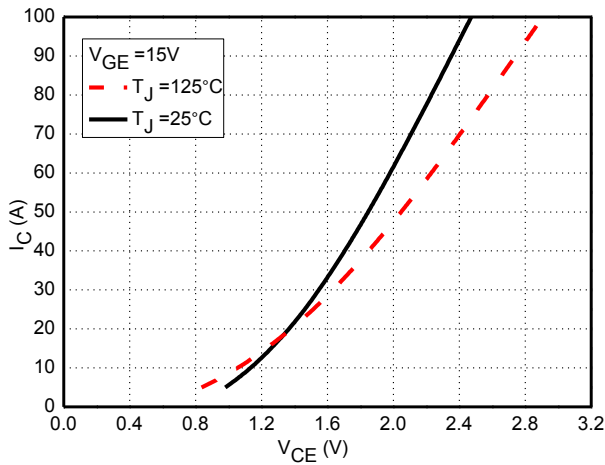
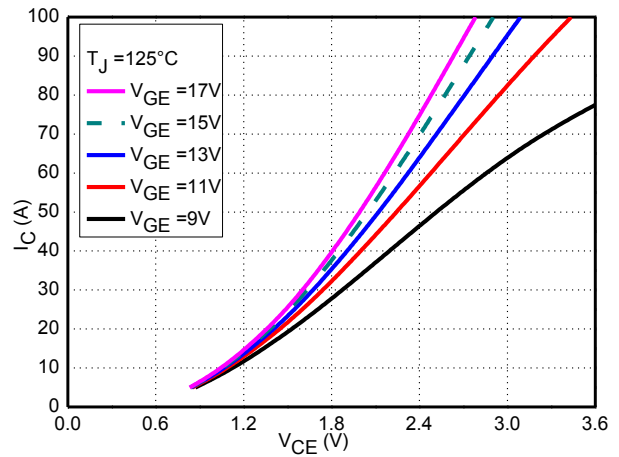
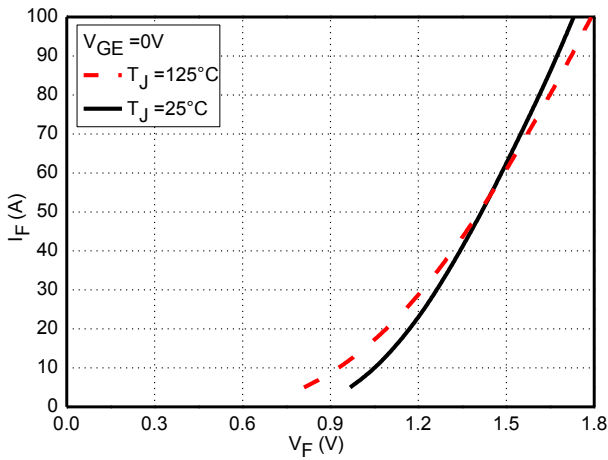
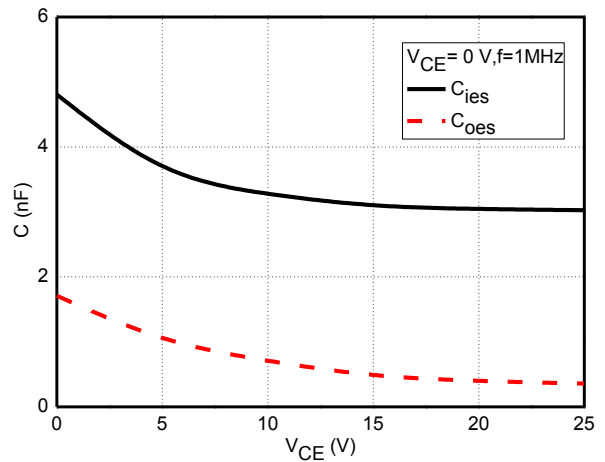
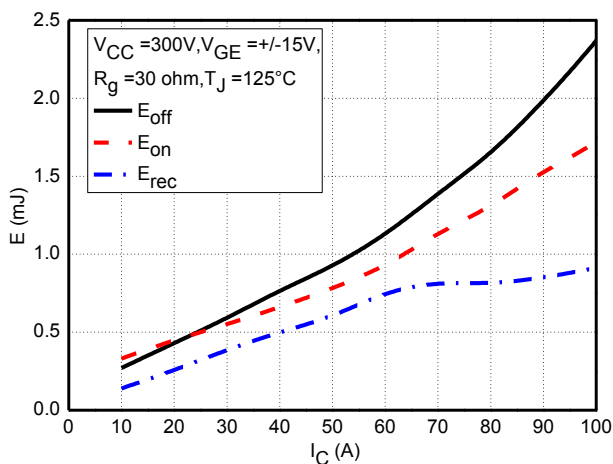
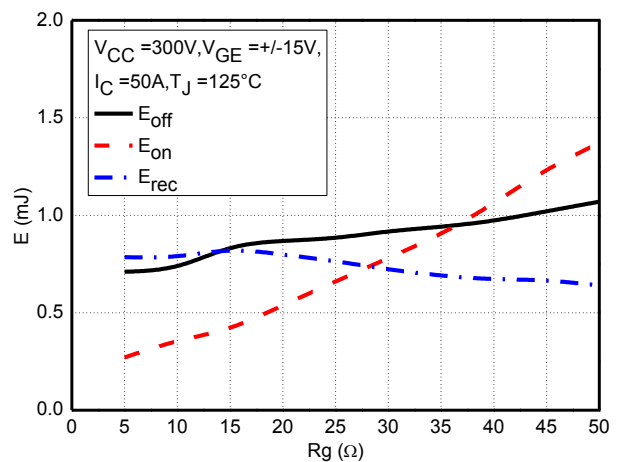
Parameter		Typ.	Max.	Unit	Test Conditions	
V_F	Forward Voltage	1.40	1.70	V	$T_J = 25^\circ\text{C}$	$I_F = 50\text{A}$, $V_{GE} = 0\text{V}$
		1.40			$T_J = 125^\circ\text{C}$	
I_{rr}	Peak Reverse Recovery Current	30		A	$T_J = 25^\circ\text{C}$	$I_F = 50\text{A}$, $di/dt = 840\text{A}/\mu\text{s}$, $V_{rr} = 300\text{V}$, $V_{GE} = -15\text{V}$
		40			$T_J = 125^\circ\text{C}$	
Q_{rr}	Reverse Recovery Charge	2.4		μC	$T_J = 25^\circ\text{C}$	
		3.6			$T_J = 125^\circ\text{C}$	
E_{rec}	Reverse Recovery Energy	0.25		mJ	$T_J = 25^\circ\text{C}$	
		0.70			$T_J = 125^\circ\text{C}$	

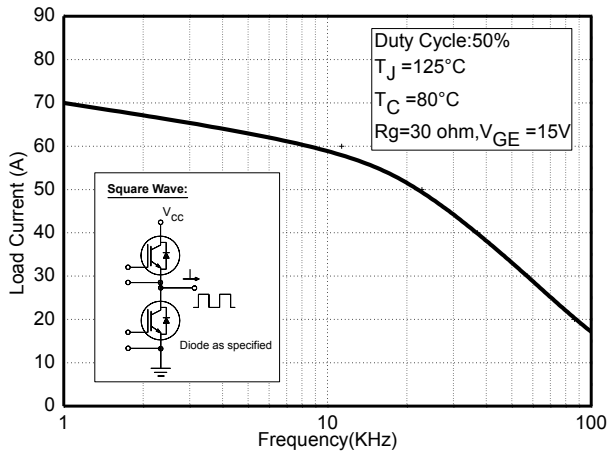
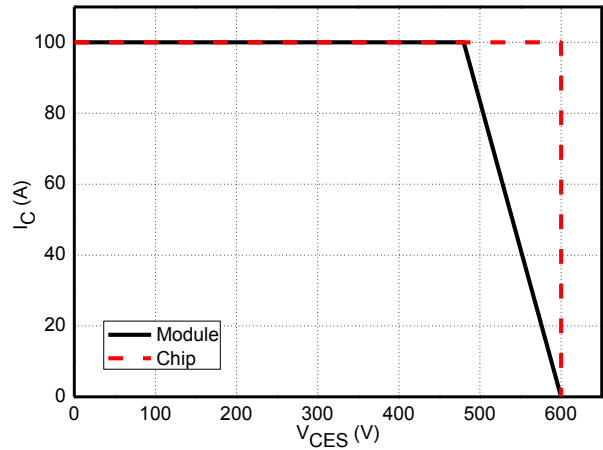
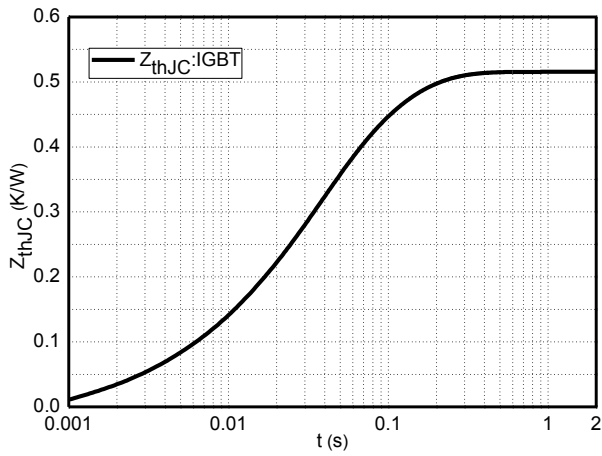
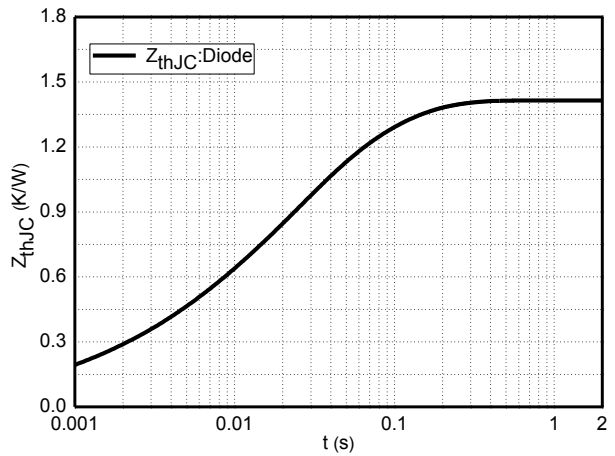
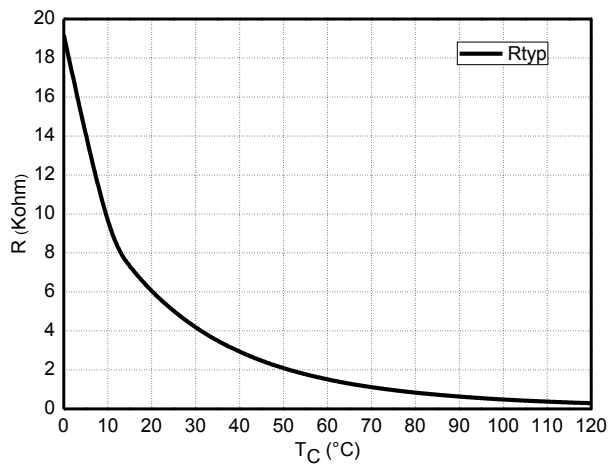
NTC-Thermistor Characteristic Values

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

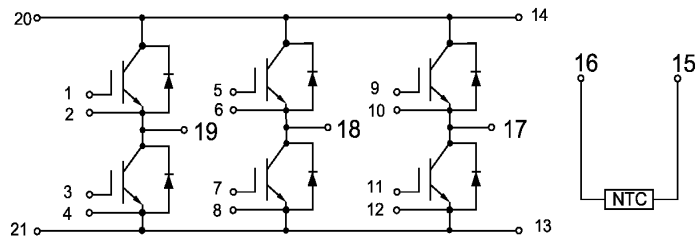
Module Characteristics

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)		0.515		$^\circ\text{C}/\text{W}$
$R_{\theta JC}$	Junction-to-Case (Diode)		1.41		$^\circ\text{C}/\text{W}$
$R_{\theta CS}$	Case-To-Sink (Conductive Grease Applied)		0.10		$^\circ\text{C}/\text{W}$
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

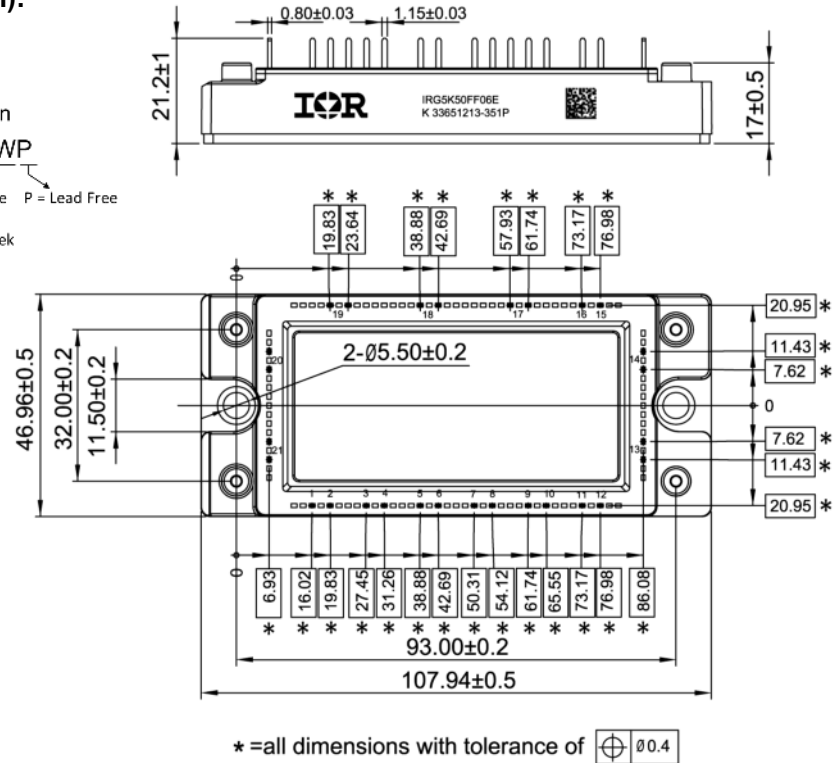

Fig.7 Typical Load Current vs. Frequency

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):

Marking Information
K XXXXXXXX-YWWP
 Assembly Site Code Lot No. Date Code P = Lead Free
 Y = Year
 WW = Week



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/>