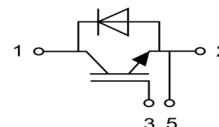


$V_{CES} = 1200V$
$I_C = 400A$ at $T_C = 80^\circ C$
$t_{SC} \geq 10\mu sec$
$V_{CE(ON)} = 3.20V$ at $I_C = 400A$

**Single Switch IGBT with Soft Recovery Diode**  
**POWIR 62™ Package**



**Applications:**

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

Features	Benefits
Low $V_{CE(ON)}$ and Switching Losses	High Efficiency in a Wide Range of Applications
RBSOA Tested	Rugged Transient Performance
10 $\mu sec$ Short Circuit Safe Operating Area	
<b>POWIR 62™</b> Package	Industry Standard
Lead Free	RoHS Compliant, Environmental Friendly

Base Part Number	Package Type	Standard Pack	Quantity	Orderable Part Number
IRG5U400SD12B	<b>POWIR 62™</b>	Box	45	IRG5U400SD12B

**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	$T_C = 80^\circ C$	400 A
		$T_C = 25^\circ C$	600 A
$I_{CM}$	Pulse Collector Current	$T_J = 150^\circ C$	800 A
$P_D$	Maximum Power Dissipation (IGBT)	$T_C = 25^\circ C, T_J = 150^\circ C$	2500 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	$V_{GE} = 0V, I_C = 5mA$	
$V_{GE(th)}$	Gate Threshold Voltage	4.5	5.3	6.0	V	$I_C = 1 mA, V_{CE} = V_{GE}$	
$V_{CE(ON)}$	Collector to Emitter Saturation Voltage		3.20	3.50	V	$T_J = 25^\circ\text{C}$	$I_C = 400A, V_{GE} = 15V$
			3.80		V	$T_J = 125^\circ\text{C}$	
$I_{CES}$	Collector to Emitter Leakage Current			5	mA	$V_{GE} = 0V, V_{CE} = V_{CES}$	
$I_{GES}$	Gate to Emitter Leakage Current			400	nA	$V_{GE} = \pm 20V, V_{CE} = 0$	
$R_{Gint}$	Internal Gate Resistance		0.62		$\Omega$		

**Switching Characteristics of IGBT**

Parameter		Min.	Typ.	Max.	Unit	Test Conditions	
$t_{d(on)}$	Turn-on Delay Time		405		ns	$T_J = 25^\circ\text{C}$	$V_{CC}=600V, I_C = 400A, R_G = 3.3\Omega, V_{GE}=\pm 15V, \text{Inductive Load}$
			390			$T_J = 125^\circ\text{C}$	
$t_r$	Rise Time		150		ns	$T_J = 25^\circ\text{C}$	
			160			$T_J = 125^\circ\text{C}$	
$t_{d(off)}$	Turn-off Delay Time		900		ns	$T_J = 25^\circ\text{C}$	
			1000			$T_J = 125^\circ\text{C}$	
$t_f$	Fall Time		130		ns	$T_J = 25^\circ\text{C}$	
			160			$T_J = 125^\circ\text{C}$	
$E_{on}$	Turn-on Switching Loss		21.2		mJ	$T_J = 25^\circ\text{C}$	
			35.0			$T_J = 125^\circ\text{C}$	
$E_{off}$	Turn-off Switching Loss		17.2		mJ	$T_J = 25^\circ\text{C}$	
			25.2			$T_J = 125^\circ\text{C}$	
$Q_g$	Total Gate Charge		4900		nC	$T_J = 25^\circ\text{C}$	
$C_{ies}$	Input Capacitance		45.5		nF	$V_{CE} = 25V, V_{GE} = 0V, f = 1MHz, T_J = 25^\circ\text{C}$	
$C_{oes}$	Output Capacitance		3.64				
$C_{res}$	Reverse Transfer Capacitance		1.46				
RBSOA	Reverse Bias Safe Operating Area	Trapezoid				$I_C = 800A, V_{CC} = 960V, V_P = 1200V, R_G = 15\Omega, V_{GE} = +15V \text{ to } 0V, T_J = 150^\circ\text{C}$	
SCSOA	Short Circuit Safe Operating Area	10			$\mu\text{s}$	$V_{CC} = 600V, V_{GE} = 15V, T_J = 150^\circ\text{C}$	

**Absolute Maximum Ratings of Freewheeling Diode**

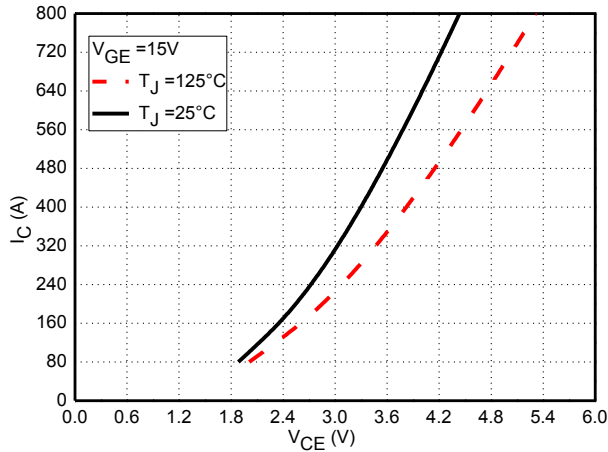
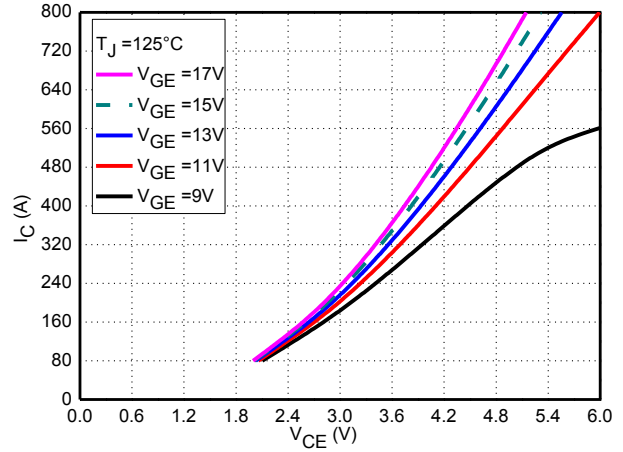
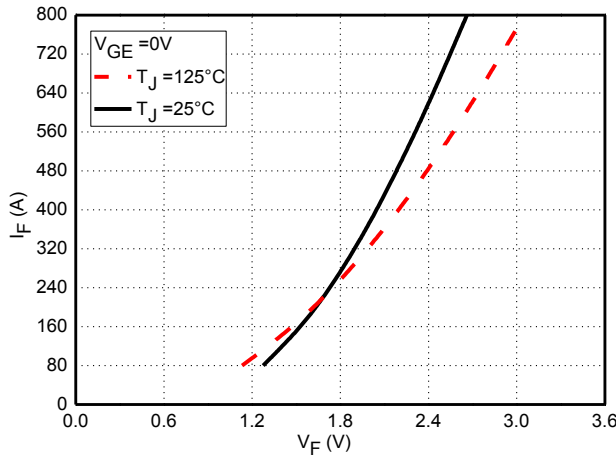
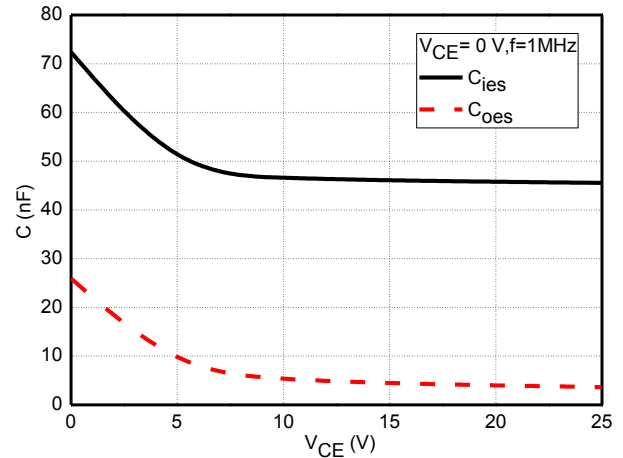
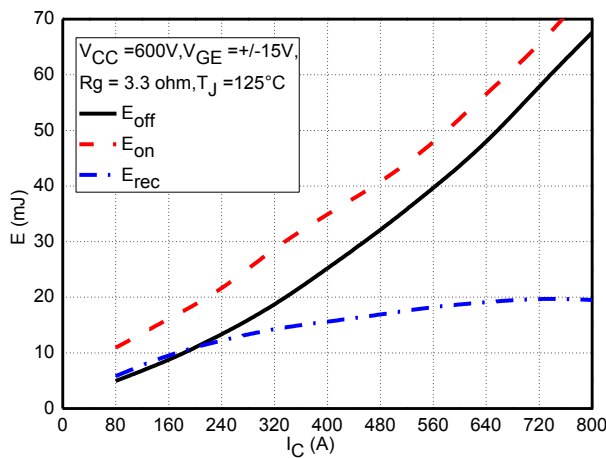
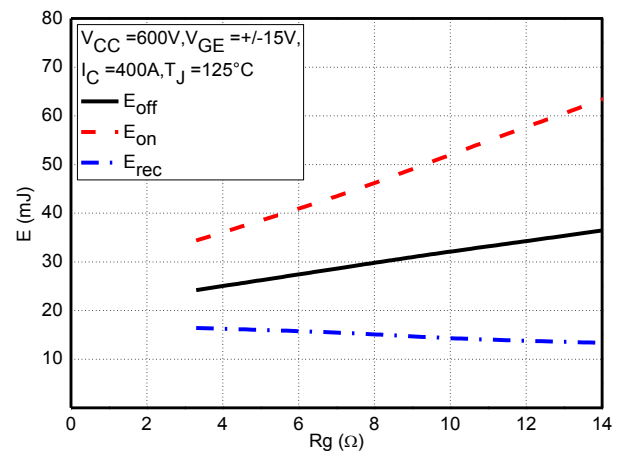
$V_{RRM}$	Repetitive Peak Reverse Voltage	1200	V
$I_F$	Diode Continuous Forward Current, $T_C = 25^\circ\text{C}$	800	A
	Diode Continuous Forward Current, $T_C = 80^\circ\text{C}$	400	
$I_{FM}$	Pulse Diode Current	800	A

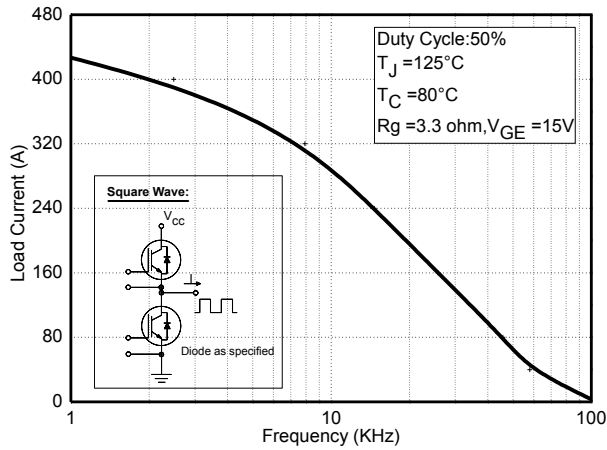
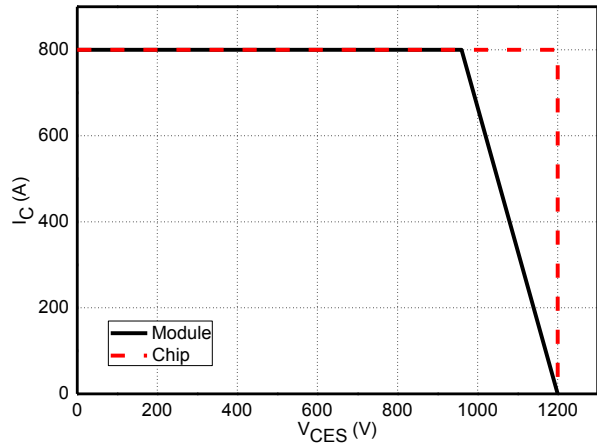
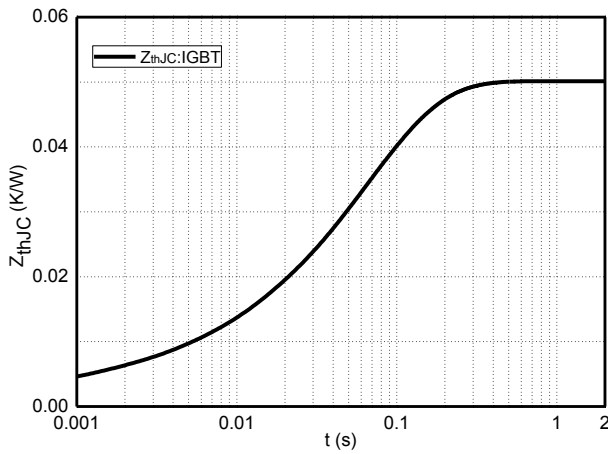
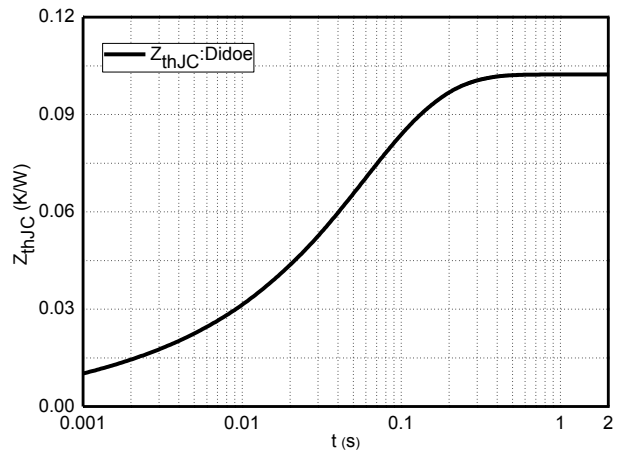
**Electrical and Switching Characteristics of Freewheeling Diode**

Parameter		Typ.	Max.	Unit	Test Conditions	
$V_F$	Forward Voltage	2.00	2.70	V	$T_J = 25^\circ\text{C}$	$I_F = 400\text{A}$ , $V_{GE} = 0\text{V}$
		2.20			$T_J = 125^\circ\text{C}$	
$I_{rr}$	Peak Reverse Recovery Current	170		A	$T_J = 25^\circ\text{C}$	$I_F = 400\text{A}$ , $di/dt = 3000\text{A}/\mu\text{s}$ , $V_{rr} = 600\text{V}$ , $V_{GE} = -15\text{V}$
		360			$T_J = 125^\circ\text{C}$	
$Q_{rr}$	Reverse Recovery Charge	26.8		$\mu\text{C}$	$T_J = 25^\circ\text{C}$	
		45.0			$T_J = 125^\circ\text{C}$	
$E_{rec}$	Reverse Recovery Energy	7.2		mJ	$T_J = 25^\circ\text{C}$	
		15.6			$T_J = 125^\circ\text{C}$	

**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)		0.050		$^\circ\text{C}/\text{W}$
$R_{\theta JC}$	Junction-to-Case (Freewheeling Diode)		0.102		$^\circ\text{C}/\text{W}$
$R_{\theta CS}$	Case-To-Sink (Conductive Grease Applied)		0.1		$^\circ\text{C}/\text{W}$
M	Power Terminals Screw: M6	3.0		5.0	N·m
M	Mounting Screw: M6	4.0		6.0	N·m
G	Weight		310		g


**Fig.1 Typical IGBT Saturation Characteristics**

**Fig.2 Typical IGBT Output Characteristics**

**Fig.3 Typical Diode Forward 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)**

