

PROVISIONAL

PD - 94240

International
IOR Rectifier

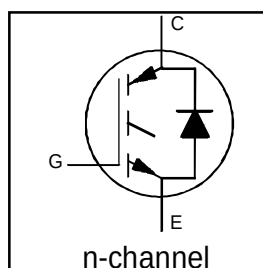
IRGPS40B120UD

INSULATED GATE BIPOLAR TRANSISTOR WITH
ULTRAFast SOFT RECOVERY DIODE

UltraFast CoPack IGBT

Features

- Low $V_{CE(on)}$ Non Punch Through IGBT Technology
- Low Diode V_F
- 10 μ s Short Circuit Capability
- Square RBSOA
- Ultrasoft Diode Reverse Recovery Characteristics
- Positive $V_{CE(on)}$ Temperature Coefficient
- Super-247 Package



$$V_{CES} = 1200V$$

$$V_{CE(on)} \text{ typ.} = 3.12V$$

$$@V_{GE} = 15V, I_C = 40A$$

$$T_J = 25^\circ C$$

Benefits

- Benchmark Efficiency above 20KHz
- Rugged Transient Performance
- Low EMI
- Excellent Current Sharing in Parallel Operation



Absolute Maximum Ratings

	Parameter	Max.	Units
V_{CES}	Collector-to-Emitter Voltage	1200	V
$I_C @ T_C = 25^\circ C$	Continuous Collector Current	80	A
$I_C @ T_C = 100^\circ C$	Continuous Collector Current	40	
I_{CM}	Pulsed Collector Current	160	
I_{LM}	Clamped Inductive Load Current	160	
$I_F @ T_C = 25^\circ C$	Diode Continuous Forward Current	80	
$I_F @ T_C = 100^\circ C$	Diode Continuous Forward Current	40	
I_{FM}	Diode Maximum Forward Current	160	
V_{GE}	Gate-to-Emitter Voltage	± 20	V
$P_D @ T_C = 25^\circ C$	Maximum Power Dissipation	595	W
$P_D @ T_C = 100^\circ C$	Maximum Power Dissipation	238	
T_J	Operating Junction and	-55 to +150	$^\circ C$
T_{STG}	Storage Temperature Range		
	Soldering Temperature, for 10 sec.	300 (0.063 in. (1.6mm) from case)	

Thermal Resistance

	Parameter	Min.	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case - IGBT	—	—	0.21	$^\circ C/W$
$R_{\theta JC}$	Junction-to-Case - Diode	—	—	0.41	
$R_{\theta CS}$	Case-to-Sink, flat, greased surface	—	0.24	—	
$R_{\theta JA}$	Junction-to-Ambient, typical socket mount	—	—	40	
Wt	Weight	—	6.0	—	g (oz)
L_E	Internal Emitter Inductance	—	13	—	nH

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Electrical Characteristics @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ	Max	Units	Conditions	Ref. Fig.
V _{(BR)CES}	Collector-to-Emitter Breakdown Voltage	1200			V	V _{GE} = 0V, I _C = 500 μA	
ΔV _{(BR)CES} / ΔT _J	Temperature Coeff. of Breakdown Voltage		0.4		V/°C	V _{GE} = 0V, I _C = 1 mA (25 -125 °C)	
V _{CE(on)}	Collector-to-Emitter Saturation Voltage		3.12	3.50	V	I _C = 40A, V _{GE} = 15V	
			3.41	3.85		I _C = 50A, V _{GE} = 15V	
			3.87	4.55		I _C = 40A, V _{GE} = 15V, T _J = 125°C	
			4.26	5.10		I _C = 50A, V _{GE} = 15V, T _J = 125°C	
V _{GE(th)}	Gate Threshold Voltage	4.0	5.0	6.0	V	V _{CE} = V _{GE} , I _C = 250 μA	
	Temperature Coeff. of Threshold Voltage		-12		mV/°C	V _{CE} = V _{GE} , I _C = 1 mA (25 -125 °C)	
g _{fe}	Forward Transconductance		30.5		S	V _{CE} = 50V, I _C = 40A, PW = 80μs	
I _{CES}	Zero Gate Voltage Collector Current		15		μA	V _{GE} = 0V, V _{CE} = 1200V	
			500			V _{GE} = 0V, V _{CE} = 1200V, T _J = 125°C	
V _{FM}	Diode Forward Voltage Drop		2.03	2.40	V	I _F = 40A	
			2.19	2.60		I _F = 50A	
			2.26	2.66		I _F = 40A, T _J = 125°C	
			2.49	2.95		I _F = 50A, T _J = 125°C	
I _{GES}	Gate-to-Emitter Leakage Current			±100	nA	V _{GE} = ±20V	

Switching Characteristics @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions	Ref. Fig.
Q _g	Total Gate charge (turn-on)		340		nC	I _C = 40A	
Q _{ge}	Gate - Emitter Charge (turn-on)		40			V _{CC} = 400V	
Q _{gc}	Gate - Collector Charge (turn-on)		165			V _{GE} = 15V	
E _{on}	Turn-On Switching Loss		1515		μJ	I _C = 40A, V _{CC} = 600V	
E _{off}	Turn-Off Switching Loss		1783			V _{GE} = 15V, R _g = 4.7Ω, L=200μH, L _S =150nH	
E _{tot}	Total Switching Loss		3300			T _J = 25°C, Energy losses include tail and diode reverse recovery	
td(on)	Turn - on delay time		76		ns	I _C = 40A, V _{CC} = 600V	
tr	Rise time		38			V _{GE} = 15V, R _g = 4.7Ω, L=200μH, L _S =150nH	
td(off)	Turn - off delay time		292			T _J = 25°C,	
tf	Fall time		22				
E _{on}	Turn-on Switching Loss		2273		μJ	I _C = 40A, V _{CC} = 600V	1
E _{off}	Turn-off Switching Loss		2500			V _{GE} = 15V, R _g = 4.7Ω, L=200μH, L _S =150nH	2
E _{tot}	Total Switching Loss		4772			T _J = 125°C, Energy losses include tail and diode reverse recovery	3
td(on)	Turn - on delay time		76		ns	I _C = 40A, V _{CC} = 600V	
tr	Rise time		39			V _{GE} = 15V, R _g = 4.7Ω, L=200μH, L _S =150nH	
td(off)	Turn - off delay time		332			T _J = 125°C,	
tf	Fall time		25				
C _{ies}	Input Capacitance		4400		pF	V _{GE} = 0V	
C _{oes}	Output Capacitance		420			V _{CC} = 30V	
C _{res}	Reverse Transfer Capacitance		170			f = 1.0 MHz	
RBSOA	Reverse bias safe operating area	FULL SQUARE				T _J = 150°C, I _C = 160A V _{CC} = 1000V, V _P = 1200V R _g = 4.7Ω, V _{GE} = +15V to 0 V	
SCSOA	Short Circuit Safe Operating Area	10	----	----	μs	T _J = 150°C V _{CC} = 900V, V _P = 1200V R _g = 22Ω, V _{GE} = +15V to 0 V	
E _{rec}	Reverse recovery energy of the diode		2800		μJ	T _J = 125°C	
t _{rr}	Diode Reverse recovery time		135		ns	V _{CC} = 600V, I _F = 40A	
I _{rr}	Peak Reverse Recovery Current		49		A	V _{GE} = 15V, R _g = 4.7Ω, L=200μH, L _S =150nH	

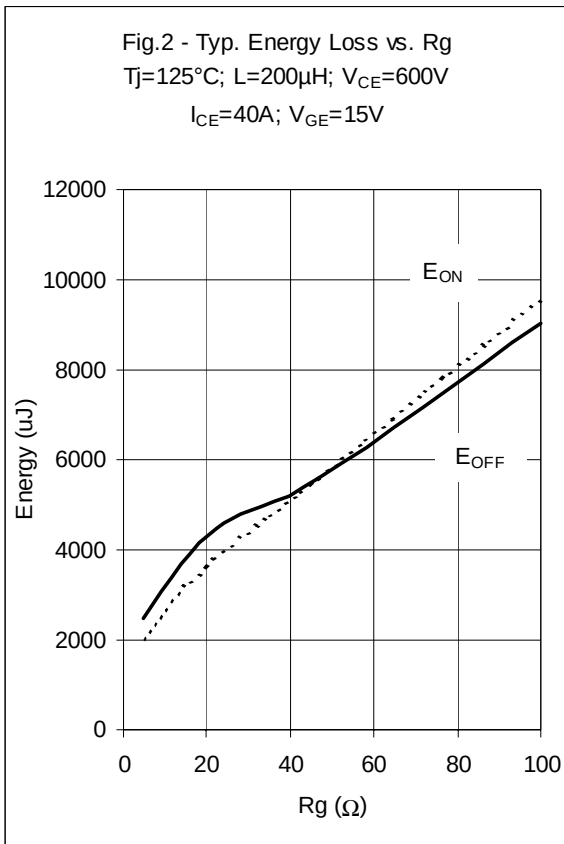
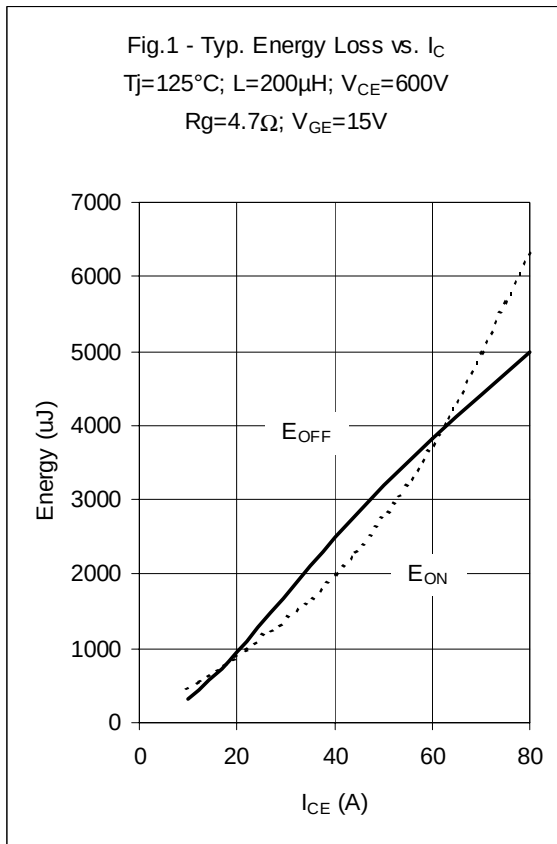
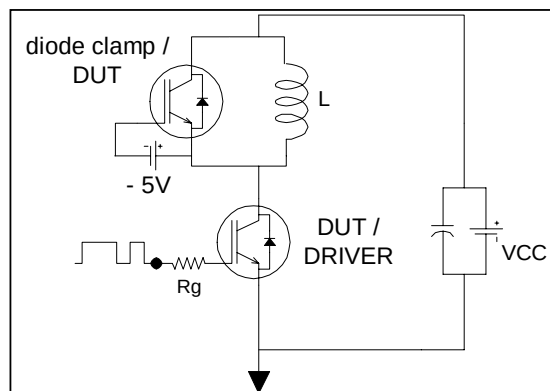


Fig.3 - Switching Loss Circuit

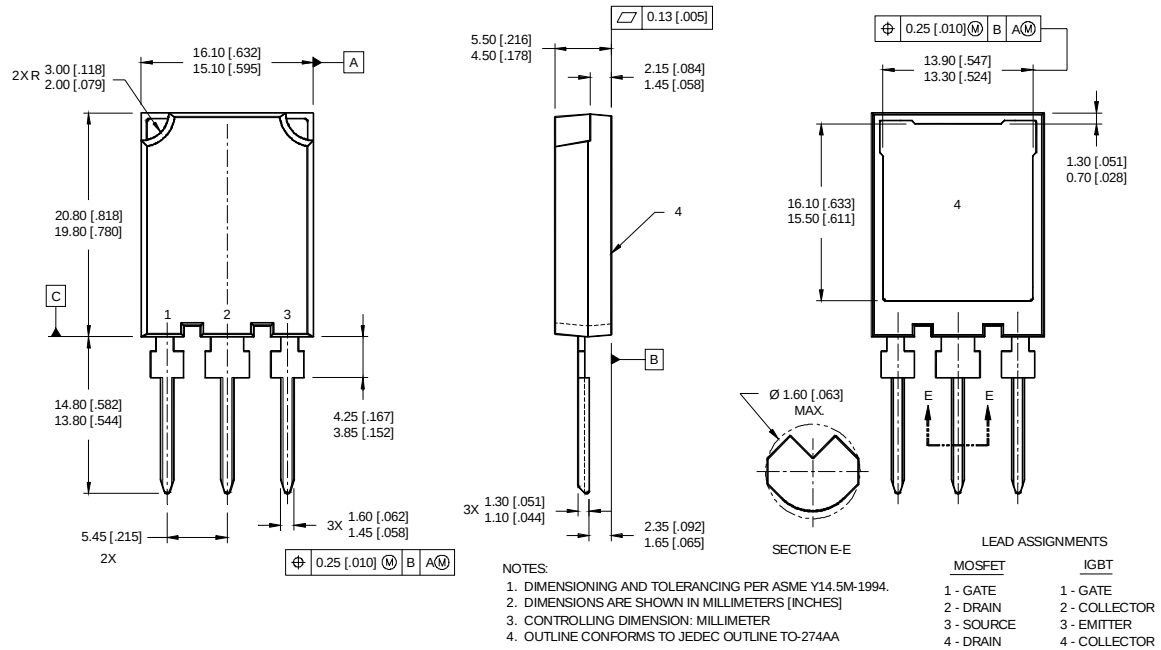


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Super-247™ Package Outline



Data and specifications subject to change without notice.
This product has been designed and qualified for the Industrial market.
Qualification Standards can be found on IR's Web site.

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