International
IOR Rectifier

PROVISIONAL

PD - 94295

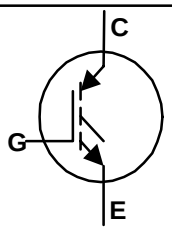
IRGPS40B120U

INSULATED GATE BIPOLAR TRANSISTOR

UltraFast IGBT

Features

- Low $V_{CE(on)}$ Non Punch Through IGBT Technology
- 10µs Short Circuit Capability
- Square RBSOA
- Positive $V_{CE(on)}$ Temperature Coefficient
- Super-247 Package



n-channel

V_{CES} = 1200V

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

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

T_J = 25°C

Benefits

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

Super-247™

Absolute Maximum Ratings

	Parameter	Max.	Units
V_{CES}	Collector-to-Emitter Voltage	1200	V
I_C @ T_C = 25°C	Continuous Collector Current	80	A
I_C @ T_C = 100°C	Continuous Collector Current	40	
I_{CM}	Pulsed Collector Current	160	
I_{LM}	Clamped Inductive Load Current	160	
E_{AS} @ T_C = 25°C	Avalanche Energy, single pulse I_C = 40 A, V_{CC} = 50V, R_{GE} = 5 Ω L = 200 µH	160	mJ
V_{GE}	Gate-to-Emitter Voltage	± 20	V
P_D @ T_C = 25°C	Maximum Power Dissipation	595	W
P_D @ T_C = 100°C	Maximum Power Dissipation	238	
T_J	Operating Junction and	-55 to +150	°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	
$R_{\theta CS}$	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

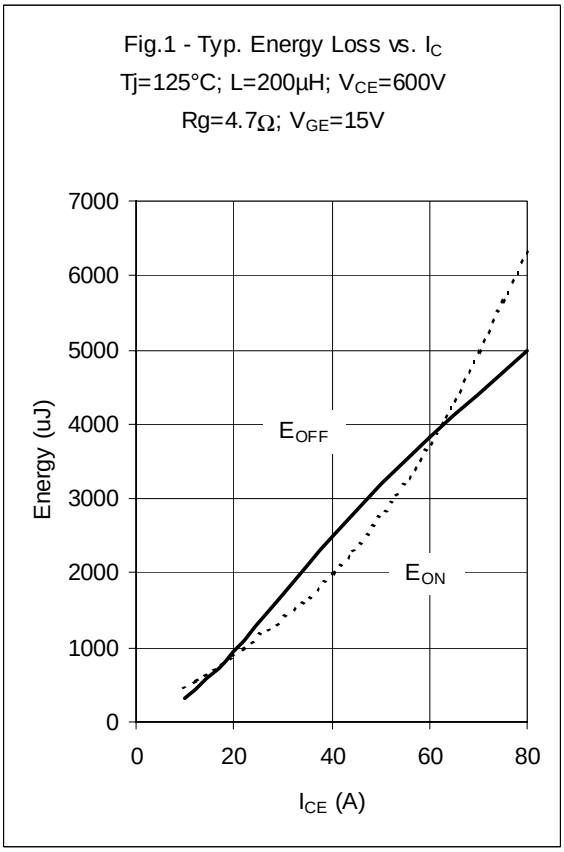
Electrical Characteristics @ T_J = 25°C (unless otherwise specified)

	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	
$V_{(BR)CES}$/ Tj	Temperature Coeff. of Breakdown Voltage		0.4		V/°C	V_{GE} = 0V, I_c = 1 mA (25 -125 °C)	
VCE(on)	Collector-to-Emitter Saturation Voltage		3.12	3.50	V	IC = 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		IC = 50A, VGE = 15V, TJ = 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 =80 s	
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	
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, Rg = 4.7 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, Rg = 4.7 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, Rg = 4.7 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, Rg = 4.7 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, Ic = 160A V_{CC} = 1000V, V_P = 1200V Rg = 4.7 , V_{GE} = +15V to 0 V	
SCSOA	Short Circuit Safe Operating Area	10	----	----	µs	T_J = 150°C V_{CC} = 900V, V_P = 1200V Rg = 22 , V_{GE} = +15V to 0 V	

* Used Diode HF40D120ACE



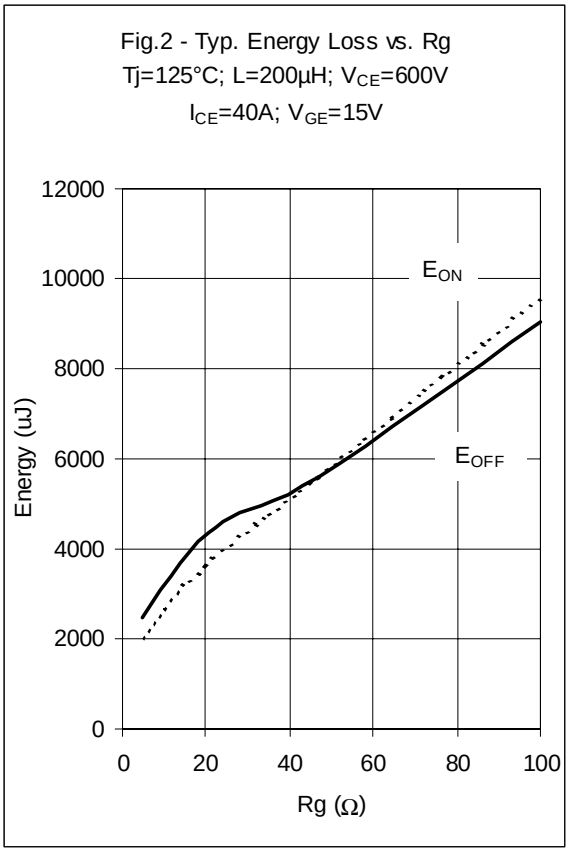
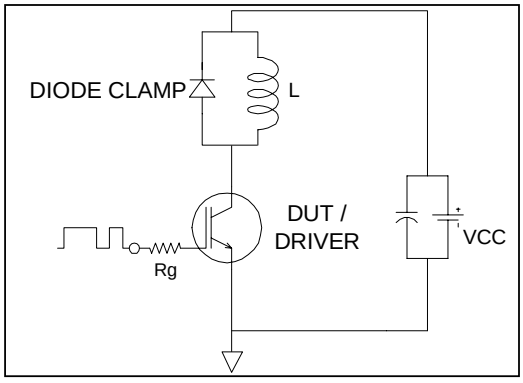
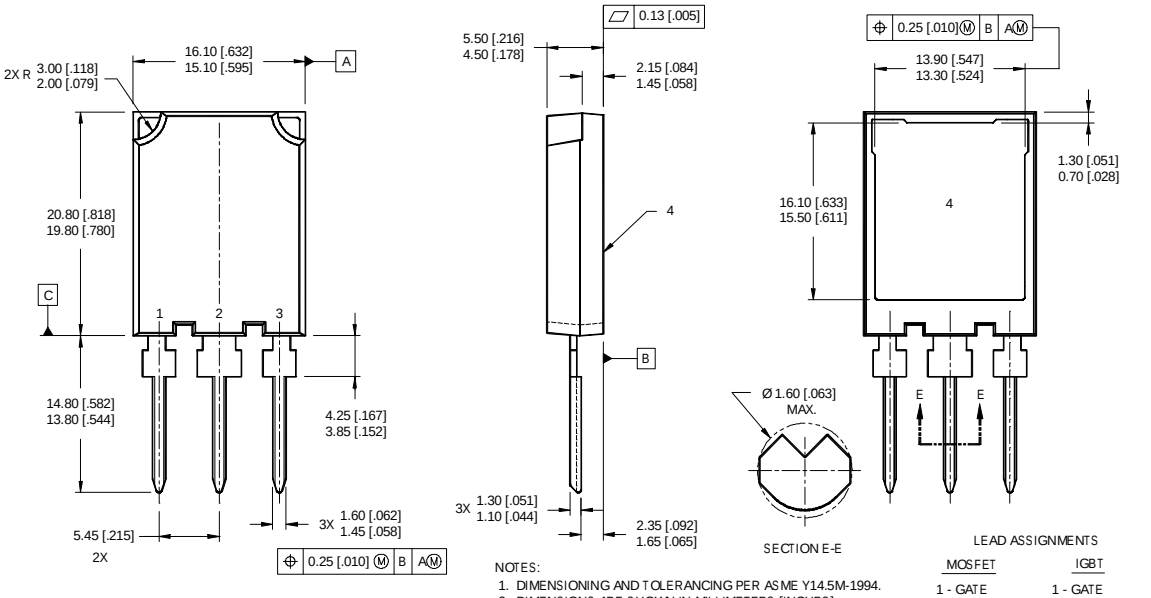


Fig.3 - Switching Loss Circuit



Super-247™ Package Outline



NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.
2. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES]
3. CONTROLLING DIMENSION: MILLIMETER
4. OUTLINE CONFORMS TO JEDEC OUTLINE TO-274AA

LEAD ASSIGNMENTS

MOSFET	IGBT
1 - GATE	1 - GATE
2 - DRAIN	2 - COLLECTOR
3 - SOURCE	3 - EMITTER
4 - DRAIN	4 - COLLECTOR

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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IR WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245, USA Tel: (310) 252-7105
TAC Fax: (310) 252-7903
Visit us at www.irf.com for sales contact information.08/01