PROVISIONAL

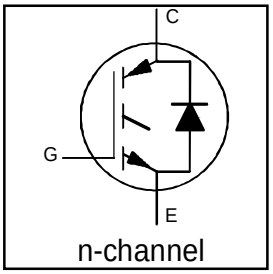
PD - 94239

International
IOR Rectifier

IRGPS60B120KD

Motor Control CoPack IGBT

INSULATED GATE BIPOLAR TRANSISTOR
WITH ULTRAFAST SOFT RECOVERY DIODE



n-channel

V_{CES} = 1200V

$V_{CE(on)\ typ.}$ = 2.5V

@V_{GE} = 15V, I_C = 60A

T_J = 25°C

Features

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

Benefits

- Benchmark Efficiency for Motor Control
- 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	120	A
I_C @ T_C = 100°C	Continuous Collector Current	60	
I_{CM}	Pulsed Collector Current	240	
I_{LM}	Clamped Inductive Load Current	240	
I_F @ T_C = 25°C	Diode Continuous Forward Current	120	
I_F @ T_C = 100°C	Diode Continuous Forward Current	60	
I_{FM}	Diode Maximum Forward Current	240	
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	°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	
$\Delta V_{(BR)CES}$ / ΔTj	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		2.33		V	IC = 50A, V_{GE} = 15V	
			2.50	2.75		I_C = 60A, V_{GE} = 15V	
			2.79			I_C =50A, V_{GE} = 15V, T_J = 125°C	
			3.04	3.50		IC = 60A, 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		34.4		S	V_{CE} = 50V, I_C = 60A, PW =80µs	
I_{CES}	Zero Gate Voltage Collector Current		20		µA	V_{GE} = 0V, V_{CE} = 1200V	
			650			V_{GE} = 0v, V_{CE} = 1200V, T_J =125°C	
V_{FM}	Diode Forward Voltage Drop		1.82		V	I_F = 50A	
			1.93	2.30		I_F = 60A	
			1.96			I_F = 50A, TJ = 125°C	
			2.13	2.50		I_F = 60A, 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 = 60A	
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		3214		µJ	I_C = 60A, V_{CC} = 600V	
E_{off}	Turn-Off Switching Loss		4783			V_{GE} = 15V, Rg = 4.7Ω, L=200µH, L_S=150nH	
E_{tot}	Total Switching Loss		8000			T_J = 25°C, Energy losses include tail and diode reverse recovery	
td(on)	Turn - on delay time		76		ns	I_C = 60A, V_{CC} = 600V	
tr	Rise time		46			V_{GE} = 15V, Rg = 4.7Ω, L=200µH, L_S=150nH	
td(off)	Turn - off delay time		320			T_J = 25°C,	
tf	Fall time		37				
E_{on}	Turn-on Switching Loss		5032		µJ	I_C = 60A, V_{CC} = 600V	1
E_{off}	Turn-off Switching Loss		7457			V_{GE} = 15V, Rg = 4.7Ω, L=200µH, L_S=150nH	2
E_{tot}	Total Switching Loss		12500			T_J = 125°C, Energy losses include tail and diode reverse recovery	3
td(on)	Turn - on delay time		80		ns	I_C = 15A, V_{CC} = 600V	
tr	Rise time		48			V_{GE} = 15V, Rg = 4.7Ω, L=200µH, L_S=150nH	
td(off)	Turn - off delay time		340			T_J = 125°C,	
tf	Fall time		47				
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 = 240A V_{CC} = 1000V, V_P = 1200V Rg = 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 Rg = 22Ω, V_{GE} = +15V to 0 V	
Erec	Reverse recovery energy of the diode		3780		µJ	T_J = 125°C	
trr	Diode Reverse recovery time		165		ns	V_{CC} = 600V, I_F = 60A	
Irr	Peak Reverse Recovery Current		51		A	V_{GE} = 15V, Rg = 4.7Ω, L=200µH, L_S=150nH	

Fig.1 - Typ. Energy Loss vs. I_C
Tj=125°C; L=200µH; V_{CE}=600V
Rg=4.7Ω; V_{GE}=15V

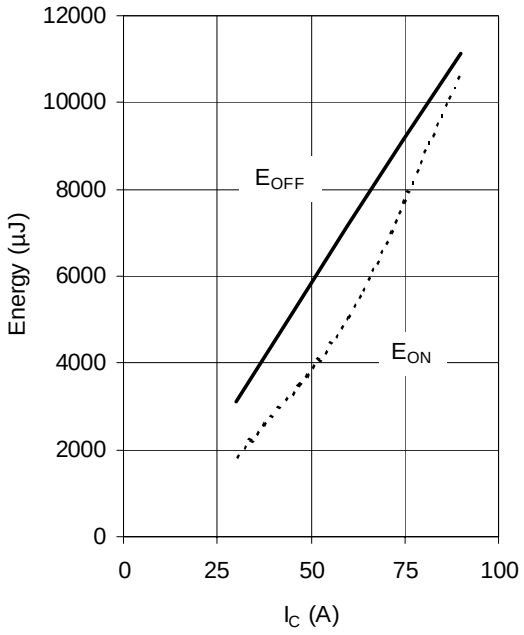


Fig.2 - Typ. Energy Loss vs. Rg
Tj=125°C; L=200µH; V_{CE}=600V
I_{CE}=60A; V_{GE}=15V

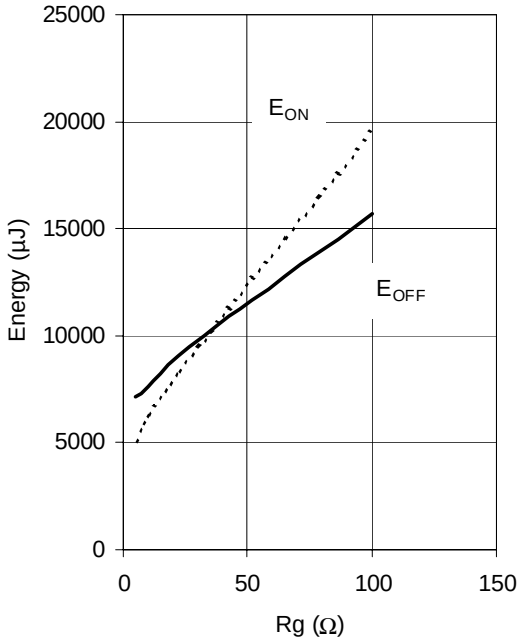
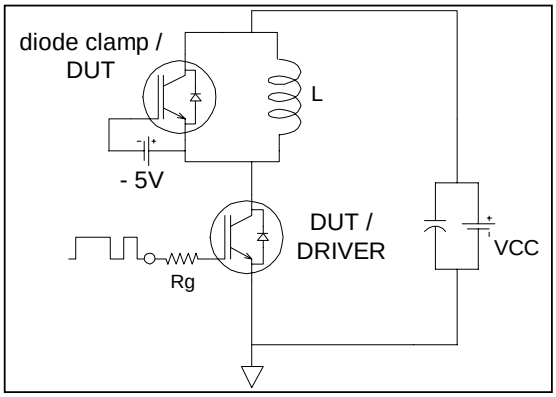


Fig.3 - Switching Loss Circuit



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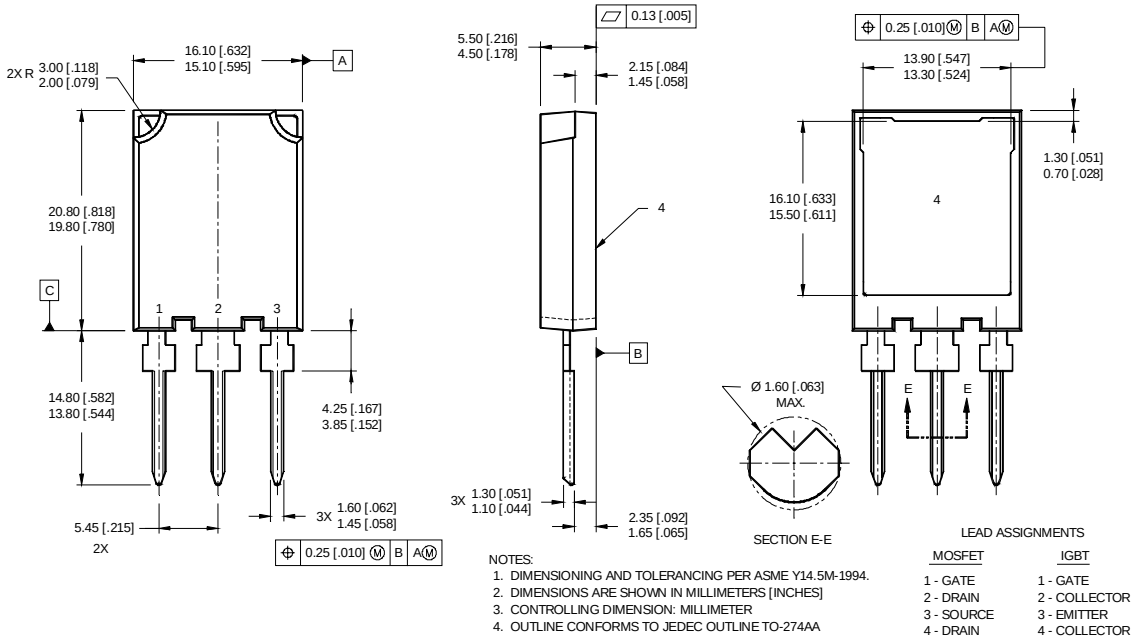
Super-247™ Package Outline



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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