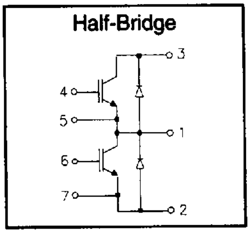
International
IOR Rectifier

PD-9.1206

IRGTDN150M12

"HALF-BRIDGE" IGBT DOUBLE INT-A-PAK

Low conduction loss IGBT

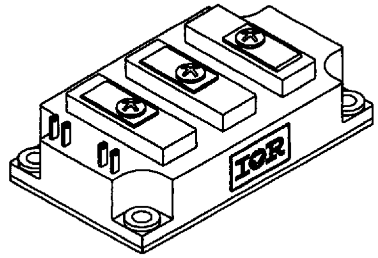


V_{CE} = 1200V
I_C = 150A
$V_{CE}(ON) < 2.5V$
$t_{sc} > 10\mu s$

- Rugged Design
- Simple gate-drive
- Switching-Loss Rating includes all "tail" losses
- Short circuit rated

Description

IR's advanced IGBT technology is the key to this line of DOUBLE INT-A-PAK Power Modules. The efficient geometry and unique processing of the IGBT allow higher current densities than comparable bipolar power module transistors, while at the same time requiring the simpler gate-drive of the familiar power MOSFET. This superior technology has now been coupled to state of the art assembly techniques to produce a higher current module that is highly suited to power applications such as motor drives, uninterruptible power supplies, welding and power factor correction.



DOUBLE INT-A-PAK case

Absolute Maximum Ratings

Parameter	Description	Value	Units
V_{CES}	Continuous collector to emitter voltage	1200	V
I_C @ $T_C = 25°C$	Maximum Continuous collector current	280	A
I_C @ $T_C = 85°C$	Maximum Continuous collector current	160	
I_C @ $T_C = 100°C$	Maximum Continuous collector current	120	
I_{LM}	Peak IGBT switching current	300	
I_{FM}	Peak diode forward switching current (1)	300	
V_{GE}	Gate to emitter voltage	± 20	V
V_{ISOL}	RMS isolation voltage, any terminal to case, t= 1 min	2500	
P_D @ $T_C = 25°C$	Power dissipation	1200	W
T_J	Operating junction temperature range	-40 to 150	°C
T_{STG}	Storage temperature range	-40 to 125	

(1) Duration limited by max junction temperature.

Electrical Characteristics - $T_J = 25°C$, unless otherwise stated

Parameter	Description	Min	Typ	Max	Units	Test Conditions
BV_{CES}	Collector-to-emitter breakdown voltage	1200	—	—	V	$V_{GE} = 0V$, $I_C = 4mA$
$V_{CE}(ON)$	Collector-to-emitter voltage	—	2.3	2.5		$V_{GE} = 15V$, $I_C = 150A$
		—	1.8	—		$V_{GE} = 15V$, $I_C = 75A$, $T_J = 150°C$
V_{FM}	Diode forward voltage - maximum	—	3.2	3.4		$I_F = 150A$, $V_{GE} = 0V$
		—	2.6	—		$I_F = 150A$, $V_{GE} = 0V$, $T_J = 150°C$
V_{GEth}	Gate threshold voltage	3.0	—	5.5		$I_C = 2mA$
ΔV_{GEth}	Threshold voltage temp. coefficient	—	-11	—	mV/°C	$V_{CE} = V_{GE}$, $I_C = 2mA$
g_{fe}	Forward transconductance	70	—	140	S(℧)	$V_{CE} = 25V$, $I_C = 150A$
I_{CES}	Collector-to-emitter leakage current	—	—	4	mA	$V_{GE} = 0V$, $V_{CE} = 1200V$
		—	—	40		$V_{GE} = 0V$, $V_{CE} = 1200V$, $T_J = 150°C$
I_{GES}	Gate-to-emitter leakage current	—	—	±4	μA	$V_{GE} = \pm 20V$

Dynamic Characteristics - $T_J = 125°C$

Parameter	Description	Min	Typ	Max	Units	Test Conditions
E_{on}	Turn-on switching energy	—	0.14	—	mJ/A	$R_G = 10\Omega$, $V_{CC} = 600V$
E_{off} (1)	Turn-off switching energy	—	0.36	—		$I_C = 150A$, $L_S = 100nH$
E_{ts} (1)	Total switching energy	—	—	0.60		$V_{GE} = \pm 15V$
$t_{d(on)}$	Turn-on delay time	—	100	150	ns	$R_G = 10\Omega$, $V_{CC} = 600V$
t_r	Rise time	—	450	600		$I_C = 150A$
$t_{d(off)}$	Turn-off delay time	—	350	500		$V_{GE} = \pm 15V$
t_f	Fall time	—	1500	1800		Resistive Load, $T_J = 25°C$
I_{rr}	Diode peak recovery current	—	90	—	A	$R_G = 10\Omega$, $V_{CC} = 600V$
t_{rr}	Diode recovery time	—	220	—	ns	$I_C = 150A$
Q_{rr}	Diode recovery charge	—	11.0	—	μC	$V_{GE} = \pm 15V$
Q_{ge}	Gate-to-emitter charge (turn-on)	150	—	330	nC	$V_{CC} = 600V$
Q_{gc}	Gate-to-collector charge (turn-on)	210	—	650		$I_C = 150A$
Q_g	Total gate charge (turn-on)	1250	—	1500		$V_{GE} = 15V$
C_{ies}	Input capacitance	21000	—	22000	pF	$V_{GE} = 0V$
C_{oes}	Output capacitance	1300	—	2200		$V_{CC} = 30V$
C_{res}	Reverse transfer capacitance	1300	—	2000		f = 1MHz
t_{sc}	Short circuit withstand time	10	—	—	μs	$V_{CC} = 720V$, $V_{GE} = \pm 15V$ Min. $R_G = 10\Omega$, $V_{CEP} = 1000V$

(1) Includes tail losses

Thermal and Mechanical Characteristics

Parameter	Description	Typ	Max	Units
R_{thJC} (IGBT)	Thermal resistance, junction to case, each IGBT	—	0.105	°C/W
R_{thJC} (Diode)	Thermal resistance, junction to case, each diode	—	0.140	
R_{thCS} (Module)	Thermal resistance, case to sink	0.032	0.075	
Wt	Weight of module	242	—	g

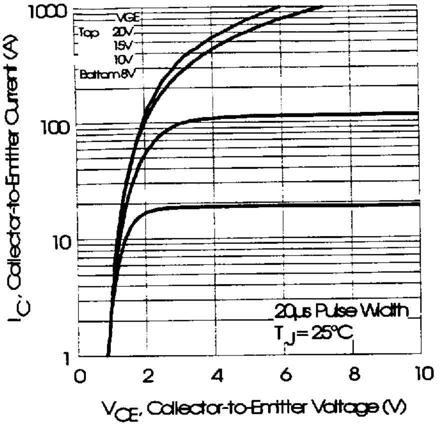


Fig. 1 - Typical Output Characteristics, T_J = 25°C

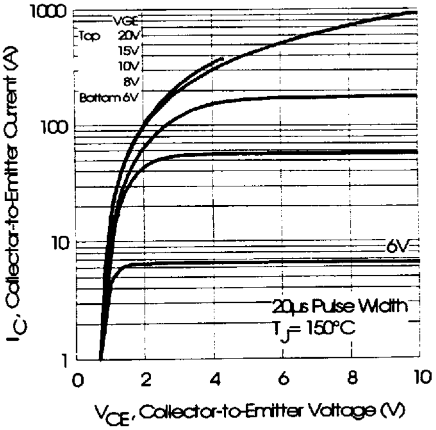


Fig. 2 - Typical Output Characteristics, T_J = 150°C

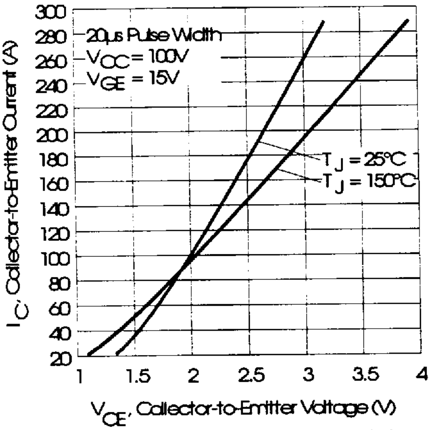


Fig. 3 - Typical Output Characteristics

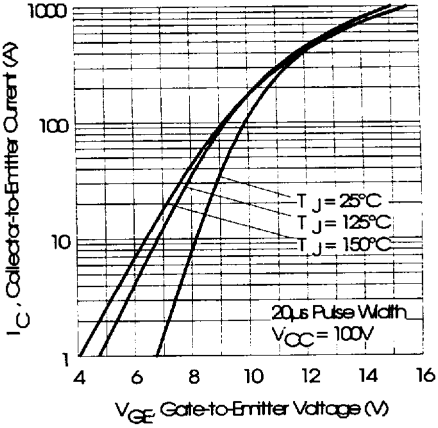


Fig. 4 - Typical Transfer Characteristics

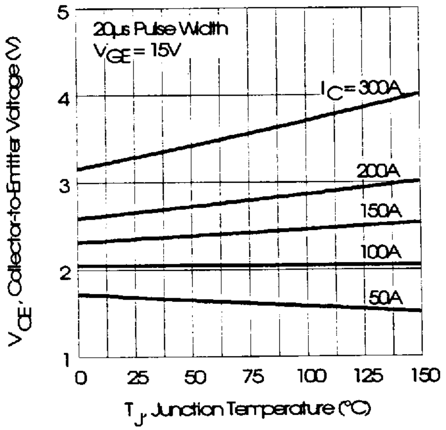


Fig. 5 - Collector-to-Emitter Saturation Typical Voltage vs. Junction Temperature

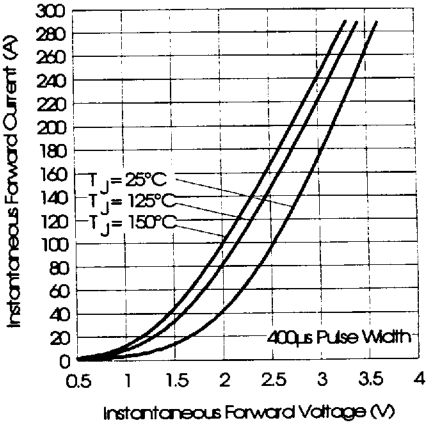


Fig. 6 - Forward Voltage Drop Characteristics

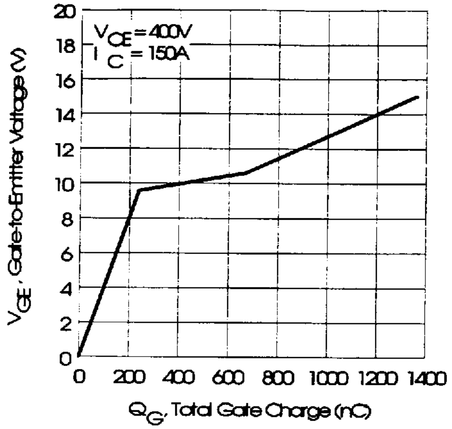


Fig. 7 - Typical Gate Charge vs. Gate-to-Emitter Voltage

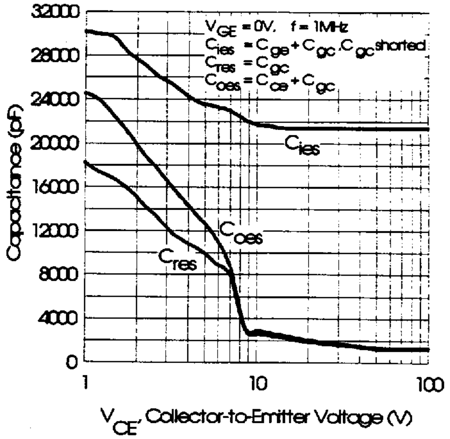


Fig. 8 - Typical Capacitance vs. Collector-to-Emitter Voltage

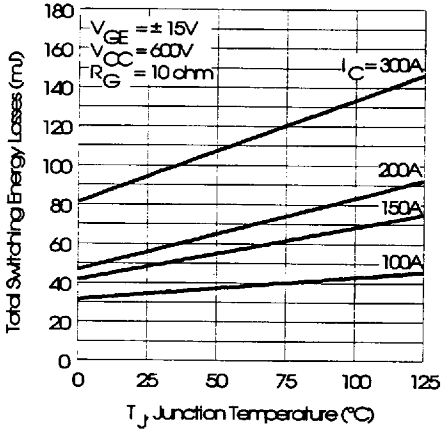


Fig. 9 - Typical Switching Losses vs. Junction Temperature

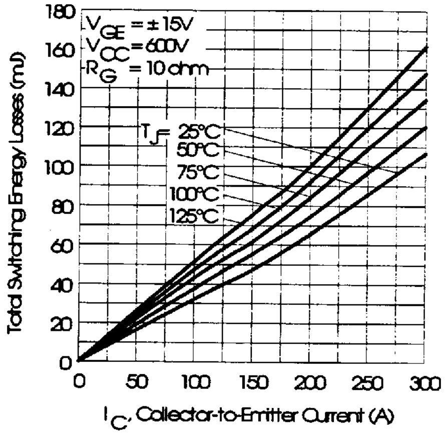


Fig. 10 - Typical Switching Losses vs. Collector-to-Emitter Current

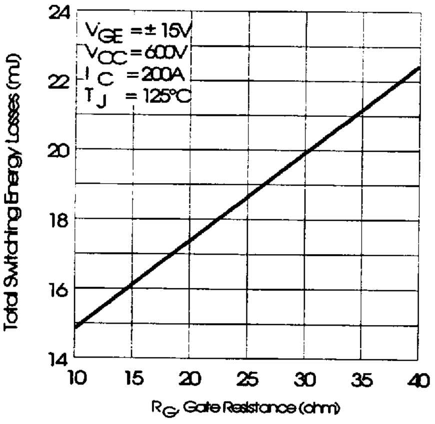


Fig. 11 - Typical Switching Losses vs. Gate Resistance

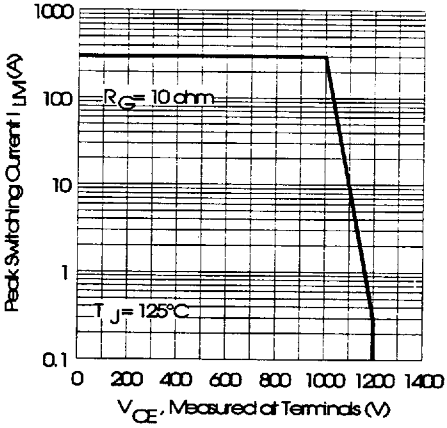


Fig. 12 - Reverse Bias Safe Operating Area

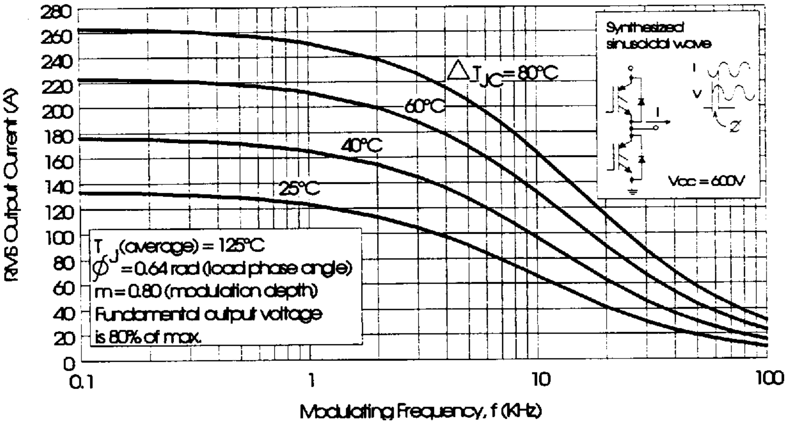


Fig. 13 - Typical RMS Output Current per phase vs. Frequency (Synthesized Sinusoidal Wave)

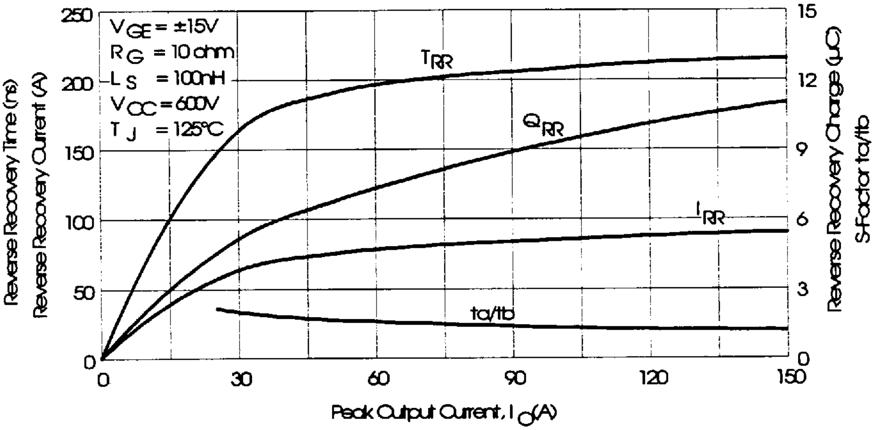


Fig. 14 - Typical Diode Recovery Characteristics as Function of Output Current I_O

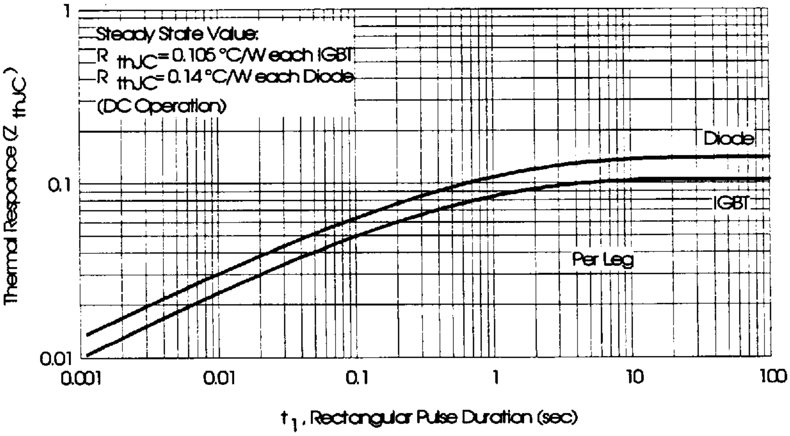


Fig. 15 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

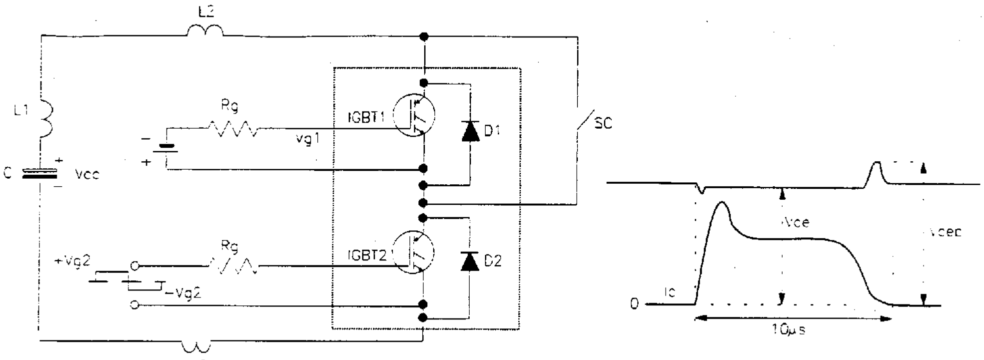
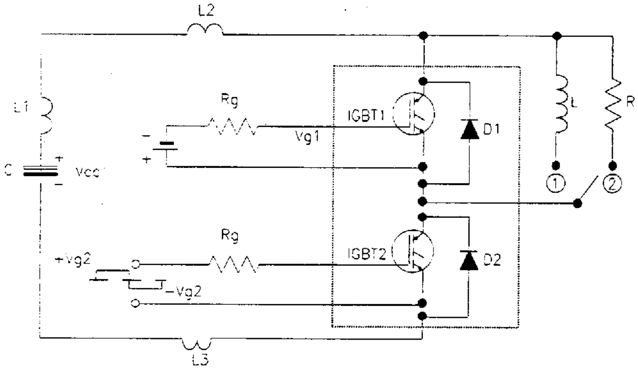


Fig. 16 - Test Circuit for Short Circuit



① = Inductive Load

② = Resistive Load

V_{CC} = 600V
L_S = $(L_1 + L_2 + L_3)$ = 100nH
L = 1mH
V_{GE} = ± 15V
R = 10Ω

Fig. 17 - Test Circuit for Measurement of I_{LM}, E_{ON}, E_{OFF}, Q_{RR}

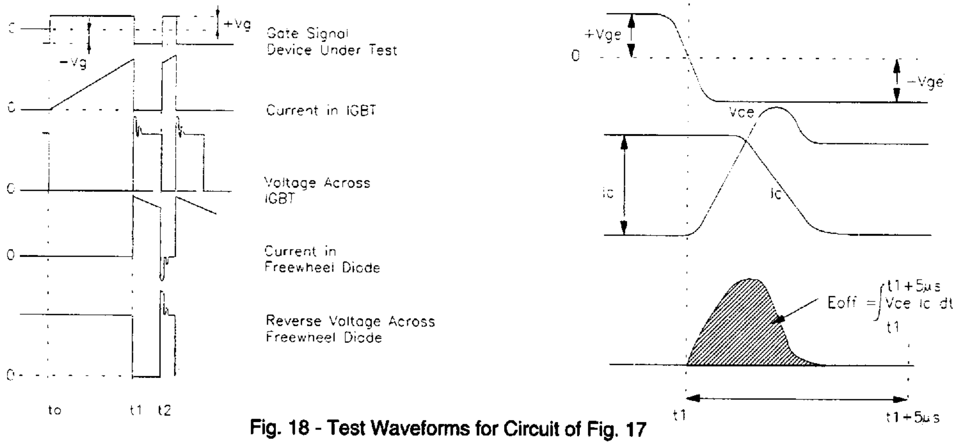


Fig. 18 - Test Waveforms for Circuit of Fig. 17

Refer to Section D for the following:
Appendix I: Section D - page D-11
Fig. 19 - Test Waveforms for Circuit of Fig. 17,
Defining E_{ON}, E_{REC}, Q_{RR}
Fig. 20 - Waveforms for Switching Time

Package Outline 12- Double INT-A-PAK, New Half Bridge **Section D - page D-17**