PD-9.1166

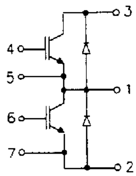
International IOR Rectifier

IRGTIN025M12

"HALF-BRIDGE" IGBT INT-A-PAK

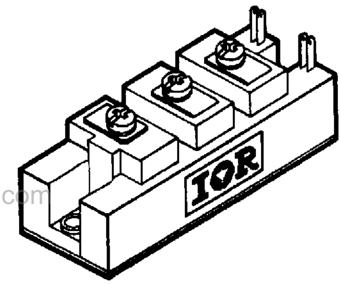
Low conduction loss IGBT

Half-Bridge



$V_{CE} = 1200V$
$I_C = 25A$
$V_{CE}(ON) < 2.7V$
$t_{sc} > 10\mu s$

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



INT-A-PAK case

Description

IR's advanced IGBT technology is the key to this line of 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. These modules are short circuit rated for applications such as motor control requiring this important feature.

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	50	A
I_C @ $T_C = 85°C$	Maximum Continuous collector current	45	
I_C @ $T_C = 100°C$	Maximum Continuous collector current	35	
I_{LM}	Peak IGBT switching current	50	
I_{FM}	Peak diode forward switching current (1)	50	
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	385	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	$V_{GE} = 0V, I_C = 1mA$
$V_{CE}(ON)$	Collector-to-emitter voltage	—	2.2	2.7	V	$V_{GE} = 15V, I_C = 25A$
		—	1.85	—	V	$V_{GE} = 15V, I_C = 15A, T_J = 150°C$
V_{FM}	Diode forward voltage - maximum	—	3.2	3.4	V	$I_F = 25A, V_{GE} = 0V$
		—	2.6	—	V	$I_F = 25A, V_{GE} = 0V, T_J = 150°C$
V_{GEth}	Gate threshold voltage	3.0	—	5.5	V	$I_C = 500\mu A$
ΔV_{GEth}	Threshold voltage temp. coefficient	—	-11	—	mV/°C	$V_{CE} = V_{GE}, I_C = 500\mu A$
g_{fe}	Forward transconductance	18	—	35	S(℧)	$V_{CE} = 25V, I_C = 25A$
I_{CES}	Collector-to-emitter leakage current	—	—	1	mA	$V_{GE} = 0V, V_{CE} = 1200V$
		—	—	10	mA	$V_{GE} = 0V, V_{CE} = 1200V, T_J = 150°C$
I_{GES}	Gate-to-emitter leakage current	—	—	±1	µA	$V_{GE} = \pm 20V$

Dynamic Characteristics - $T_J = 125°C$, unless otherwise stated

Parameter	Description	Min	Typ	Max	Units	Test Conditions
E_{on}	Turn-on switching energy	—	0.19	—	mJ/A	$R_G = 15\Omega, V_{CC} = 600V$
E_{off} (1)	Turn-off switching energy	—	0.36	—	mJ/A	$I_C = 25A, L_S = 100nH$
E_{ts} (1)	Total switching energy	—	—	0.60	mJ/A	$V_{GE} = \pm 15V$
$t_{d(on)}$	Turn-on delay time	—	200	250	ns	$R_G = 15\Omega, V_{CC} = 600V$
t_r	Rise time	—	200	250	ns	$I_C = 25A$
$t_{d(off)}$	Turn-off delay time	—	125	200	ns	$V_{GE} = \pm 15V$
t_f	Fall time	—	650	—	ns	Resistive load, $T_J = 25°C$
I_{rr}	Diode peak recovery current	—	25	—	A	$R_G = 15\Omega, V_{CC} = 600V$
t_{rr}	Diode recovery time	—	215	—	ns	$I_C = 25A$
Q_{rr}	Diode recovery charge	—	3	—	µC	$V_{GE} = \pm 15V$
Q_{ge}	Gate-to-emitter charge (turn-on)	23	—	88	nC	$V_{CC} = 600V$
Q_{gc}	Gate-to-collector charge (turn-on)	80	—	170	nC	$I_C = 25A$
Q_g	Total gate charge (turn-on)	250	—	450	nC	$V_{GE} = 15V$
C_{ies}	Input capacitance	5250	—	5500	pF	$V_{GE} = 0V$
C_{oes}	Output capacitance	330	—	550	pF	$V_{CC} = 30V$
C_{res}	Reverse transfer capacitance	330	—	500	pF	f = 1MHz
t_{sc}	Short circuit withstand time	10	---	---	µs	$V_{CC} = 720V, V_{GE} = \pm 15V$ Min. $R_G = 15\Omega, V_{CEP} = 1000V$

(1) Includes tail losses

Thermal and Mechanical Characteristics

Parameter	Description	Typ	Max	Units
R_{thJC} (IGBT)	Thermal resistance, junction to case, each IGBT	—	0.352	°C/W
R_{thJC} (Diode)	Thermal resistance, junction to case, each diode	—	0.480	°C/W
R_{thCS} (Module)	Thermal resistance, case to sink	0.041	0.100	°C/W
Wt	Weight of module	150	—	g

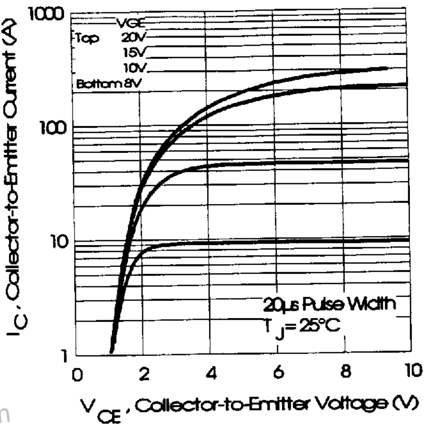


Fig. 1 - Typical Output Characteristics, T_J = 25°C

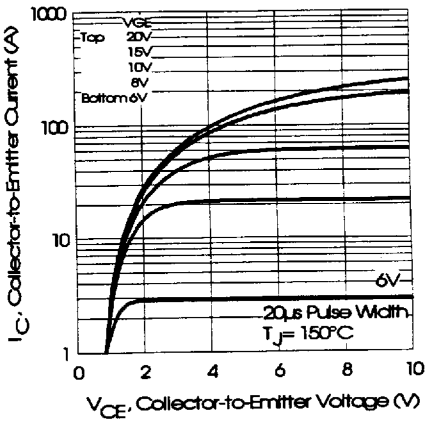


Fig. 2 - Typical Output Characteristics, T_J = 150°C

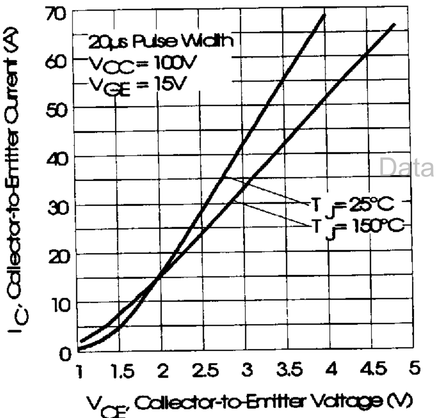


Fig. 3 - Typical Output Characteristics

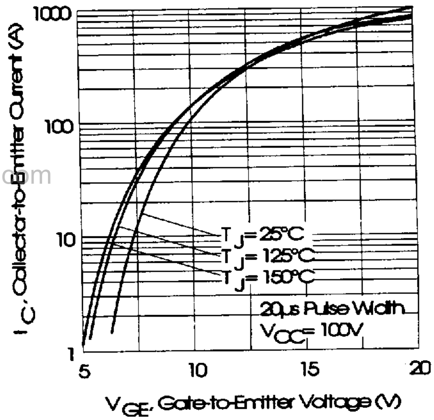


Fig. 4 - Typical Transfer Characteristics

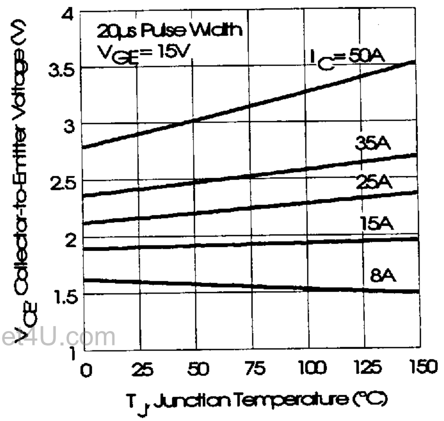


Fig. 5 - Collector-to-Emitter Saturation Typical Voltage vs. Junction Temperature

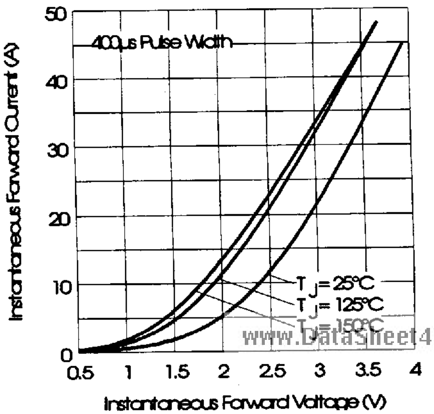


Fig. 6 - Forward Voltage Drop Characteristics

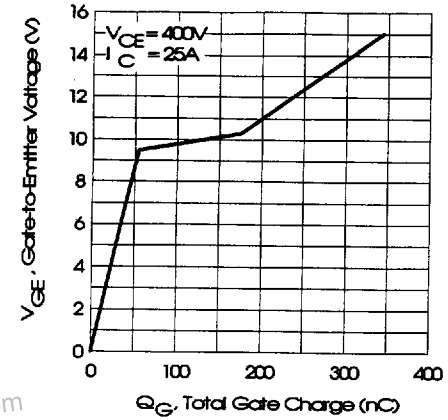


Fig. 7 - Typical Gate Charge vs. Gate-to-Emitter Voltage

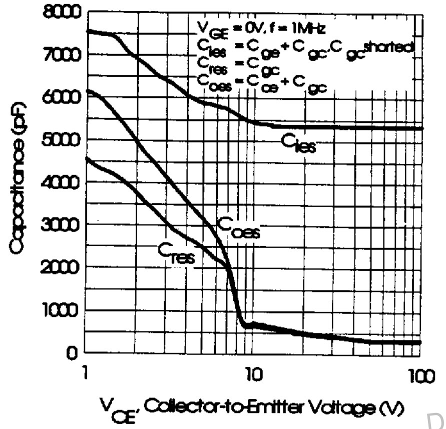


Fig. 8 - Typical Capacitance vs. Collector-to-Emitter Voltage

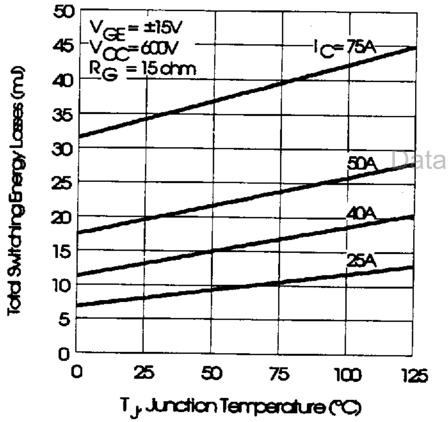


Fig. 9 - Typical Switching Losses vs. Junction Temperature

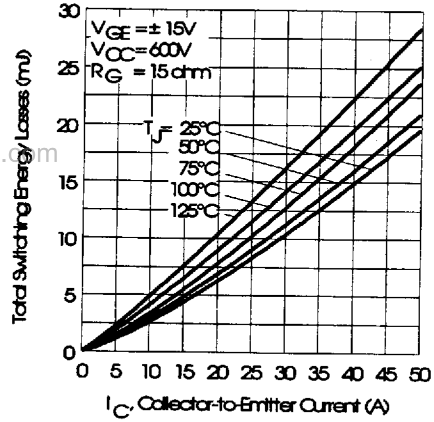


Fig. 10 - Typical Switching Losses vs. Collector-to-Emitter Current

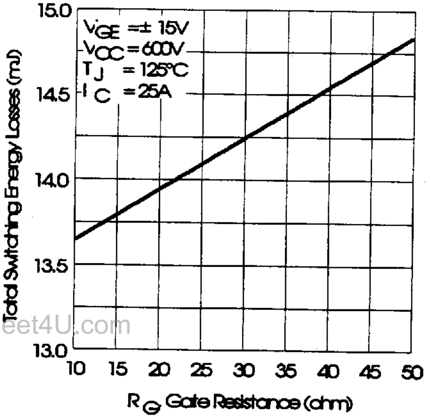


Fig. 11 - Typical Switching Losses vs. Gate Resistance

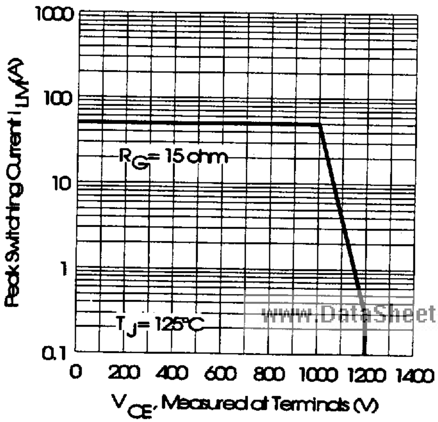


Fig. 12 - Reverse Bias Safe Operating Area

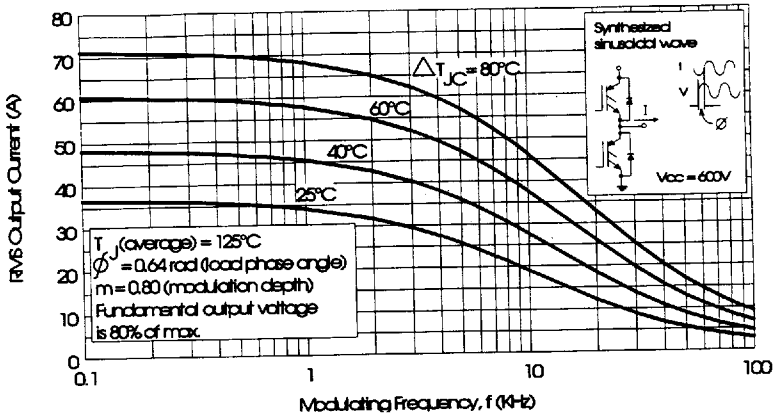


Fig. 13 - Typical RMS Output Current per phase vs. Frequency (Synthesized Sinusoidal Wave)

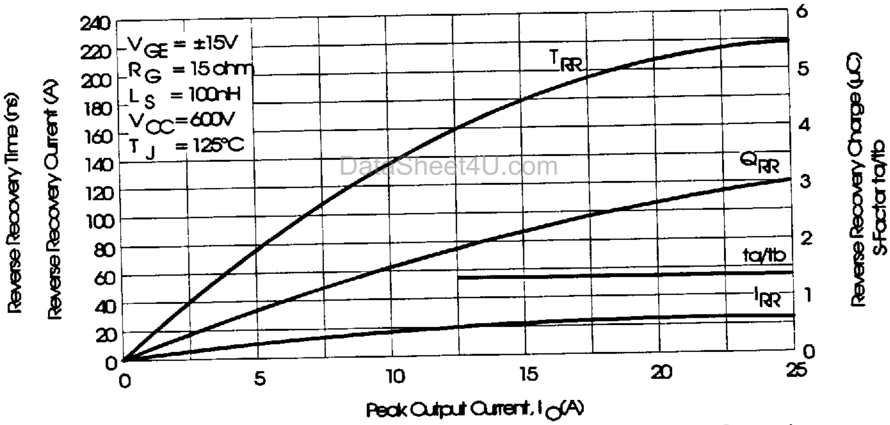


Fig. 14 - Typical Diode Recovery Characteristics as Function of Output Current I_O

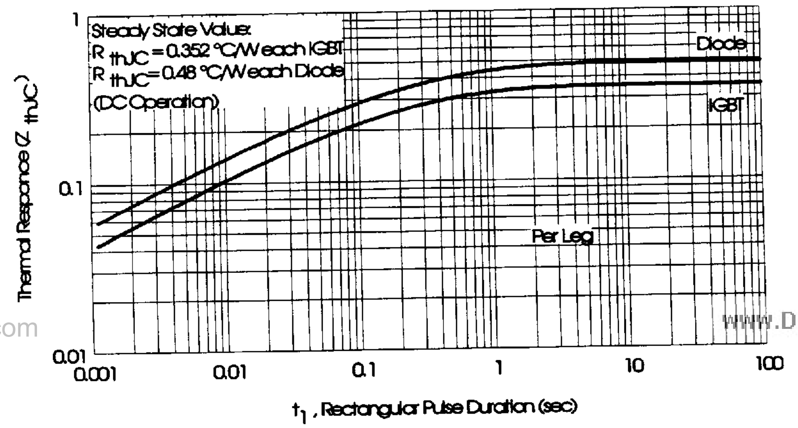


Fig. 15 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

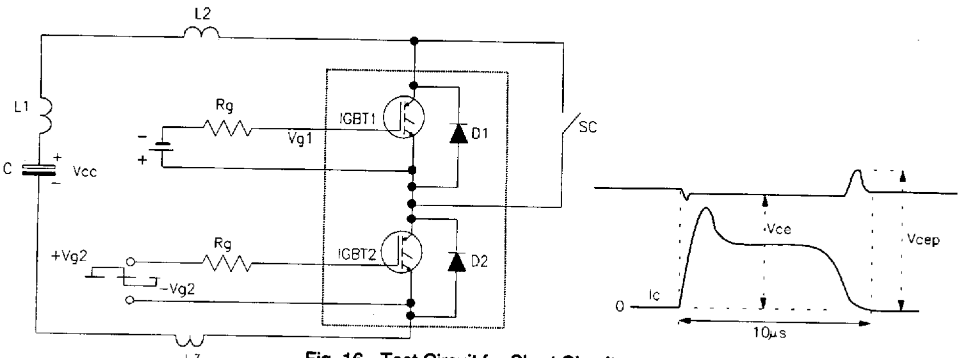
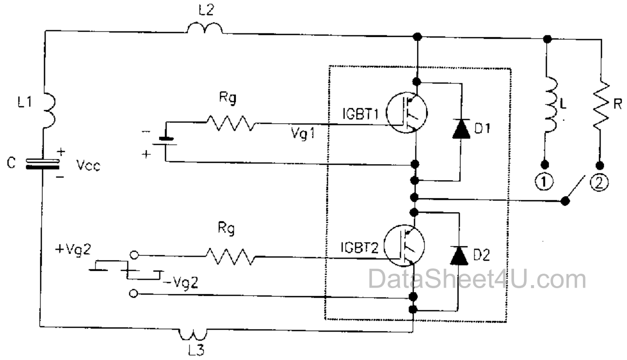


Fig. 16 - Test Circuit for Short Circuit



① = Inductive Load

② = Resistive Load

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

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

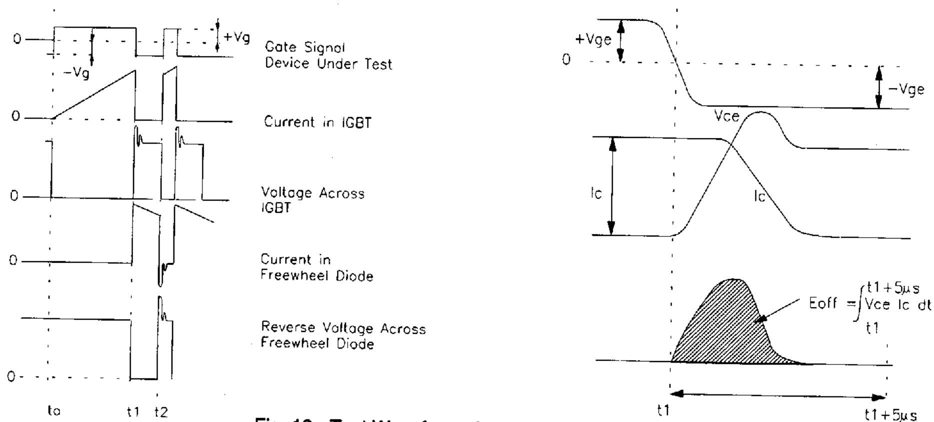


Fig. 18 - Test Waveforms for Circuit of Fig. 17

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 11- INT-A-PAK, New -Half Bridge   Section D - page D-17