

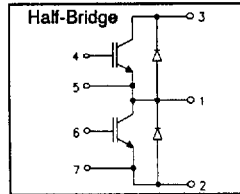
# International IOR Rectifier

## IRGTI0025M12

"HALF-BRIDGE" INT-A-PAK™ MODULES

Fast™ IGBT

- Rugged Design
- Simple gate-drive
- Fast operation up to 10 kHz hard switching, or 50 kHz resonant
- Switching-Loss Rating includes all "tail" losses
- Short circuit rated

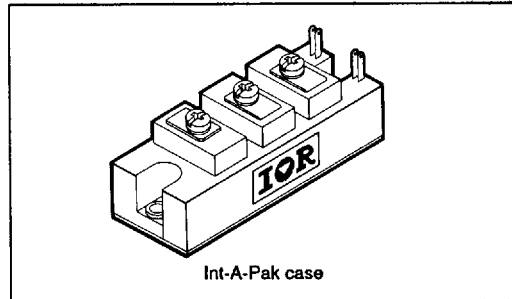


$$V_{CE} = 1200V$$

$$I_{C(DC)} = 25A$$

$$V_{CE(SAT)} < 2.8V$$

$$t_{SC} > 10\mu\text{sec}$$



### 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
$I_C @ T_C = 25^\circ\text{C}$	Continuous collector current	25	A
$I_C @ T_C = 100^\circ\text{C}$	Continuous collector current	15	
$I_{LM}$	Peak switching current	50	
$I_{FM}$	Peak diode forward current (1)	50	V
$V_{CE}$	Continuous collector to emitter voltage	1200	
$V_{GE}$	Gate to emitter voltage	$\pm 20$	
$V_{ISOL}$	RMS isolation voltage, any terminal to case, $t = 1 \text{ min}$	2500	W
$P_D @ T_C = 25^\circ\text{C}$	Power dissipation	125	
$T_J$	Operating junction temperature range	-40 to 150	$^\circ\text{C}$
$T_{STG}$	Storage temperature range	-40 to 125	

(1) Duration limited by max junction temperature.

## IRGTI0025M12

Electrical Characteristics -  $T_J = 25^\circ\text{C}$ , unless otherwise stated

Parameter	Description	Min	Typ	Max	Units	Test Conditions
$V_{(BR)CES}$	Collector-to-emitter breakdown voltage	1200	---	---	V	$V_{GE} = 0\text{V}, I_C = 500\mu\text{A}$
$V_{CE(ON)}$	Collector-to-emitter voltage	---	2.4	2.8		$V_{GE} = 15\text{V}, I_C = 25\text{A}$
		$T_J = 150^\circ\text{C}$	---	1.9		---
$V_{FM}$	Diode forward voltage - maximum	---	---	3.2		$I_F = 25\text{A}$
		$T_J = 150^\circ\text{C}$	---	2.7		---
$V_{GEth}$	Gate threshold voltage	3.0	---	5.5		
$\Delta V_{GEth}$	Threshold voltage temperature coefficient	---	-11	---	mV/°C	$V_{CE} = V_{GE}, I_C = 250\mu\text{A}$
$g_{fe}$	Forward transconductance	9	---	18	s	$V_{CE} = 25\text{V}, I_C = 25\text{A}$
$I_{CES}$	Collector-to-emitter leakage current	---	---	0.5	mA	$V_{GE} = 0\text{V}, V_{CE} = 1200\text{V}$
		$T_J = 150^\circ\text{C}$	---	---		
$I_{GES}$	Gate-to-emitter leakage current	---	---	$\pm 0.5$	$\mu\text{A}$	$V_{GE} = \pm 20\text{V}$

Dynamic Characteristics -  $T_J = 125^\circ\text{C}$ 

Parameter	Description	Min	Typ	Max	Units	Test Conditions
$E_{on}$	Turn-on switching energy	---	0.19	---	mJ/A	$R_G = 22\Omega, V_{CC} = 600\text{V}$
$E_{off}$	Turn-off switching energy	---	0.36	---		$I_C = 25\text{A}$
$E_{ts(1)}$	Total switching energy	---	---	0.6		$V_{GE} = \pm 15\text{V}$
$t_{d(on)}$	Turn-on delay time	---	150	250	ns	$R_G = 22\Omega, V_{CC} = 600\text{V}$
$t_r$	Rise time	---	300	450		$I_C = 25\text{A}$
$t_{d(off)}$	Turn-off delay time	---	200	300		$V_{GE} = \pm 15\text{V}$
$t_f$	Fall time	---	650	---		$L_S = 100\text{nH}$
$I_{rr}$	Diode peak recovery current	---	12	---	A	$R_G = 22\Omega, V_{CC} = 600\text{V}$
$t_{rr}$	Diode peak recovery time	---	220	---	ns	$I_C = 25\text{A}$
$Q_{rr}$	Diode peak recovery charge	---	1.5	---	$\mu\text{C}$	$V_{GE} = \pm 15\text{V}$
$Q_{ge}$	Gate-to-emitter charge (turn-on)	11	---	44	nC	$V_{CC} = 600\text{V}$
$Q_{gc}$	Gate-to-collector charge (turn-on)	40	---	83		$I_C = 25\text{A}$
$Q_g$	Total gate charge (turn-on)	125	---	225		$V_{GE} = 15\text{V}$
$C_{ies}$	Input capacitance	2600	---	2800	pF	$V_{GE} = 0\text{V}$
$C_{oes}$	Output capacitance	165	---	280		$V_{CC} = 30\text{V}$
$C_{res}$	Reverse transfer capacitance	165	---	250		$f = 1\text{MHz}$
$t_{sc}$	Short circuit withstand time	10	---	---	$\mu\text{s}$	$V_{CC} = 750\text{V}, V_{GE} = \pm 15\text{V}$ min. $R_G = 22\Omega, V_{CEP} = 1000\text{V}$

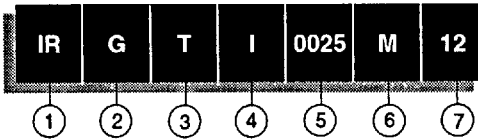
(1) Includes "Tail" losses

## Thermal and Mechanical Characteristics

Parameter	Description	Typ	Max	Units
$R_{thJC}$ (IGBT)	Thermal resistance, junction to case, each IGBT	---	0.7	°C/W
$R_{thJC}$ (Diode)	Thermal resistance, junction to case, each diode	---	0.75	
$R_{thCS}$ (Module)	Thermal resistance, case to sink	0.1	---	
Wt	Weight of module	150	---	g

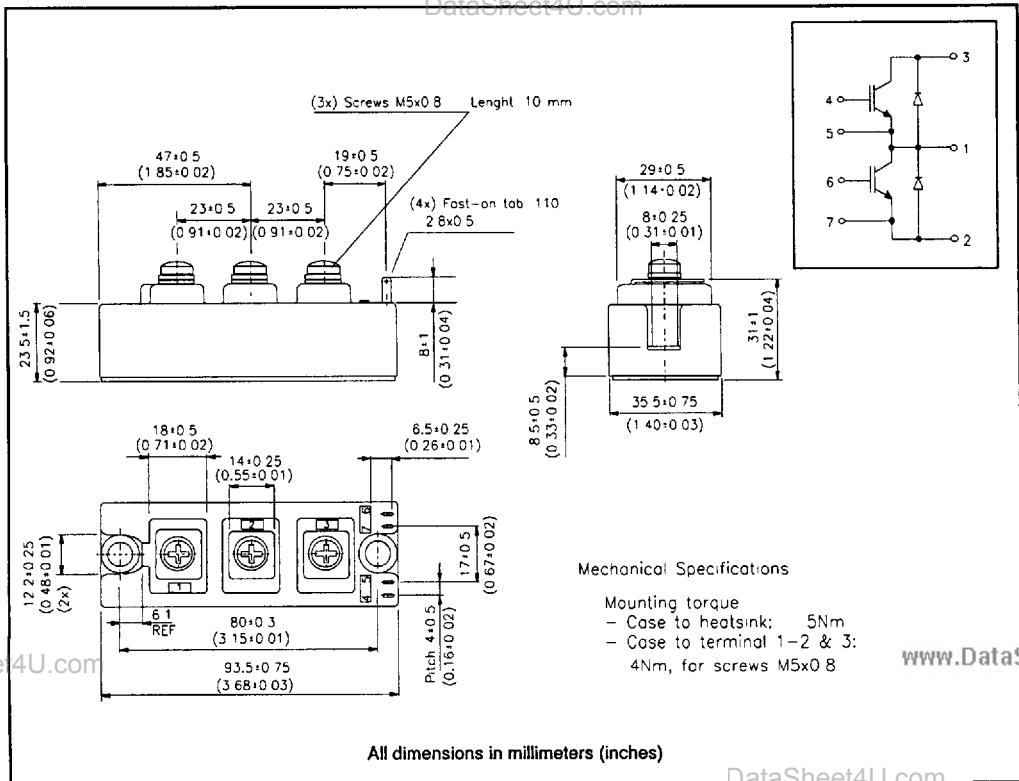
## Ordering Information Table

Device Code



- 1** - IR Logo
- 2** - IGBT
- 3** - Function: T = Half-Bridge
- 4** - Package: I = Int-A-Pak
- 5** - Current rating: 0025 = 25A
- 6** - Speed: M = Fast, short circuit rated
- 7** - Voltage rating: 12 = 1200V

## Outline Table



## IRGT10025M12

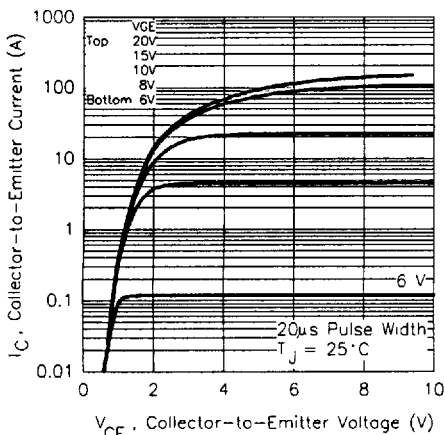
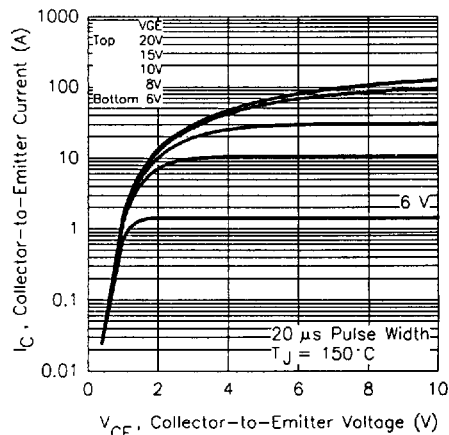
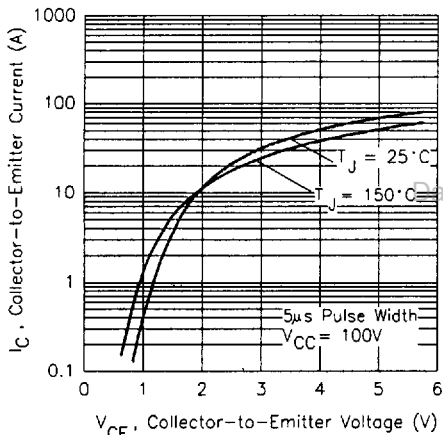
Fig. 1 - Typical Output Characteristics,  $T_J = 25^\circ\text{C}$ Fig. 2 - Typical Output Characteristics,  $T_J = 150^\circ\text{C}$ 

Fig. 3 - Typical Output Characteristics

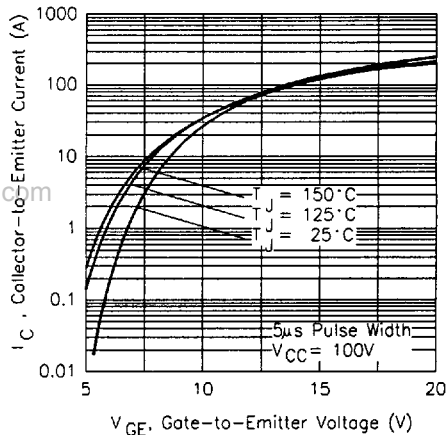


Fig. 4 - Typical Transfer Characteristics

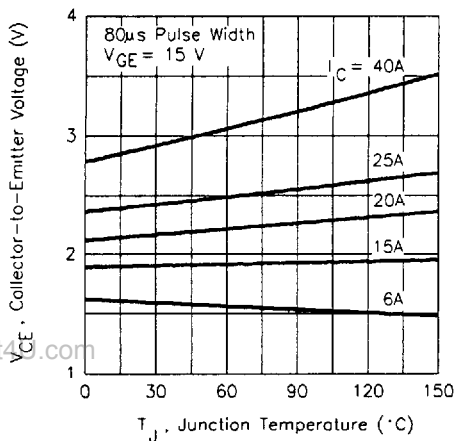
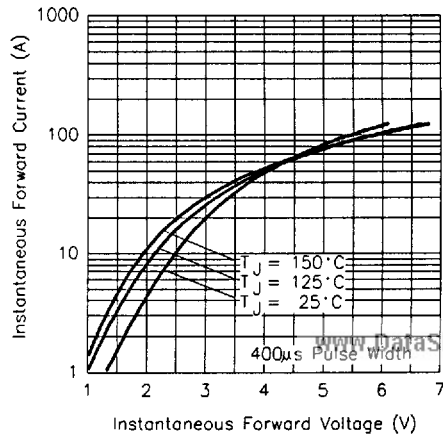
Fig. 5 - Collector-to-Emitter Saturation  
Typical Voltage vs. Junction Temperature

Fig. 6 - Forward Voltage Drop Characteristics

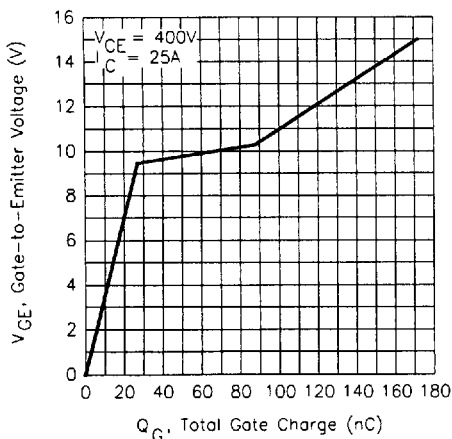


Fig. 7 - Typical Gate Charge vs. Gate-to-Emitter Voltage

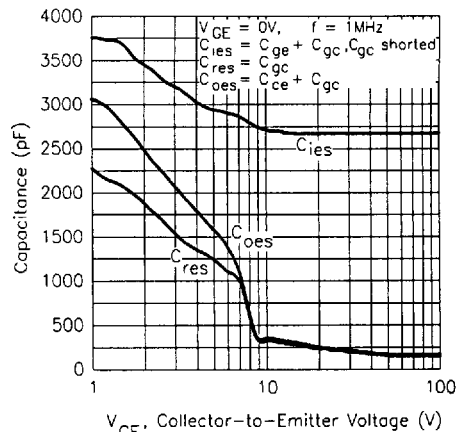


Fig. 8 - Typical Capacitance vs. Collector-to-Emitter Voltage

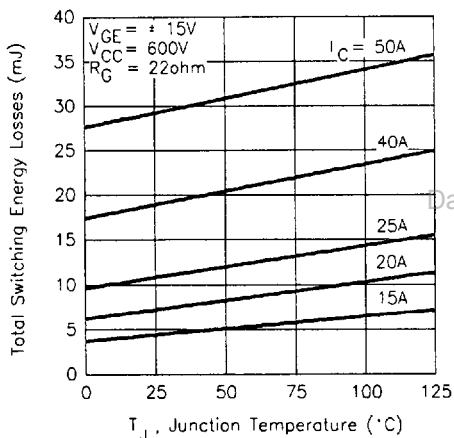


Fig. 9 - Typical Switching Losses vs. Junction Temperature

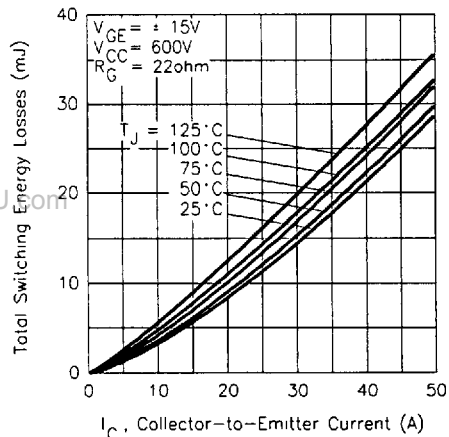


Fig. 10 - Typical Switching Losses vs. Collector-to-Emitter Current

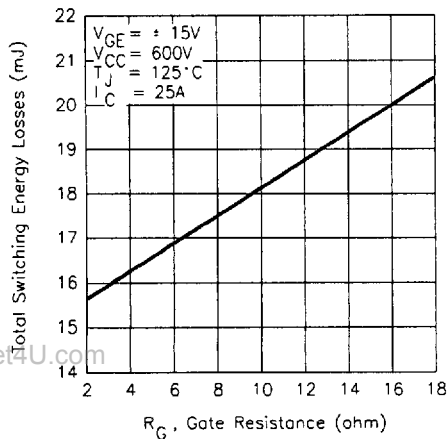


Fig. 11 - Typical Switching Losses vs. Gate Resistance

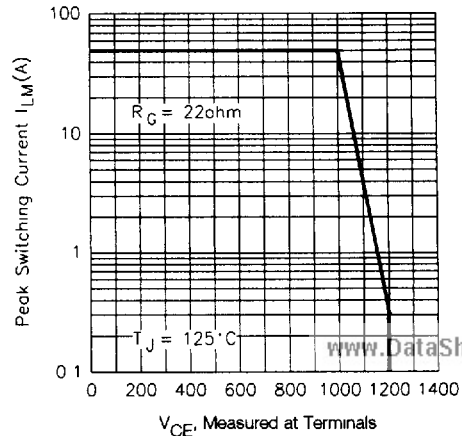


Fig. 12 - Safe Operating Area for Repetitive Switching

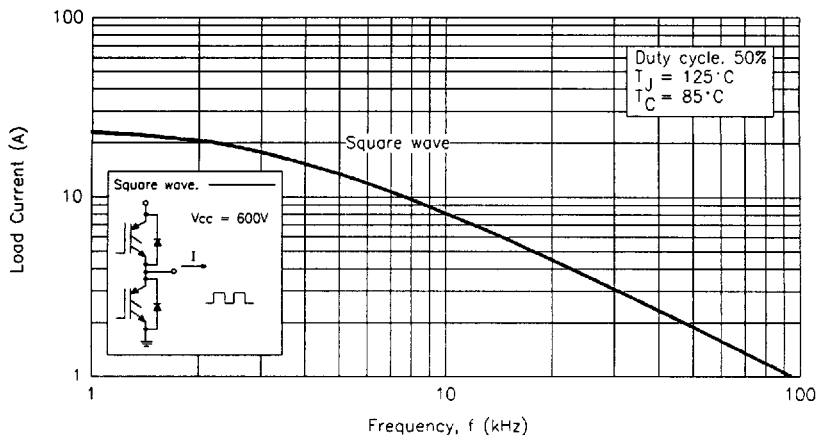


Fig. 13 - Typical Load Current vs. Frequency  
(For square wave,  $I = I_{RMS}$  of fundamental; for triangular wave,  $I = I_{pk}$ )

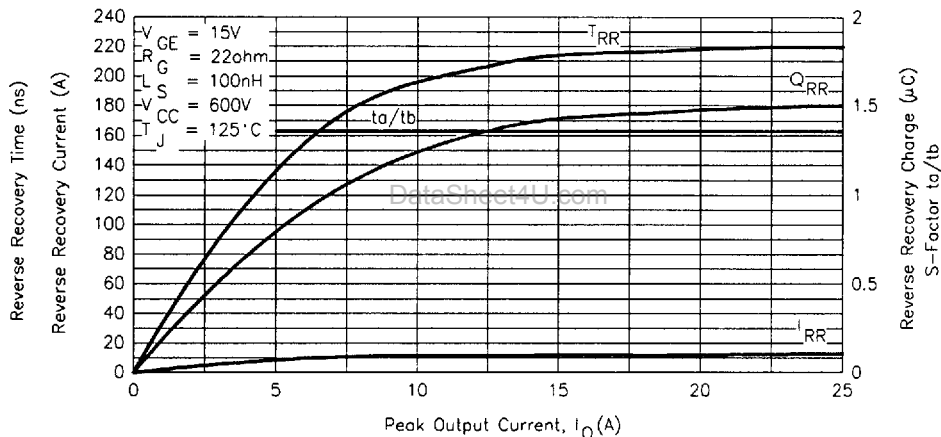


Fig. 14 - Typical Diode Recovery Characteristics as Function of Output Current  $I_O$

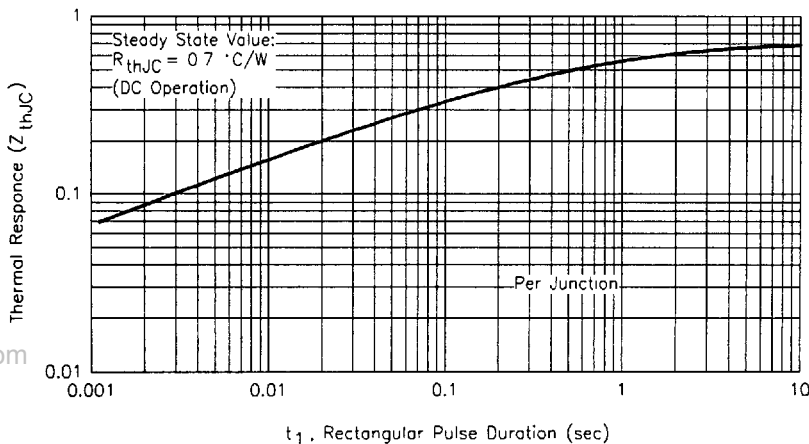


Fig. 15 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

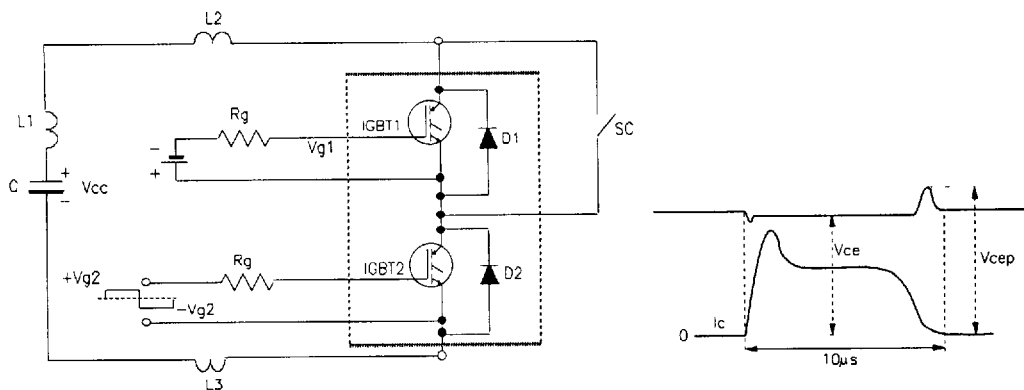


Fig. 16 - Test Circuit for Short Circuit

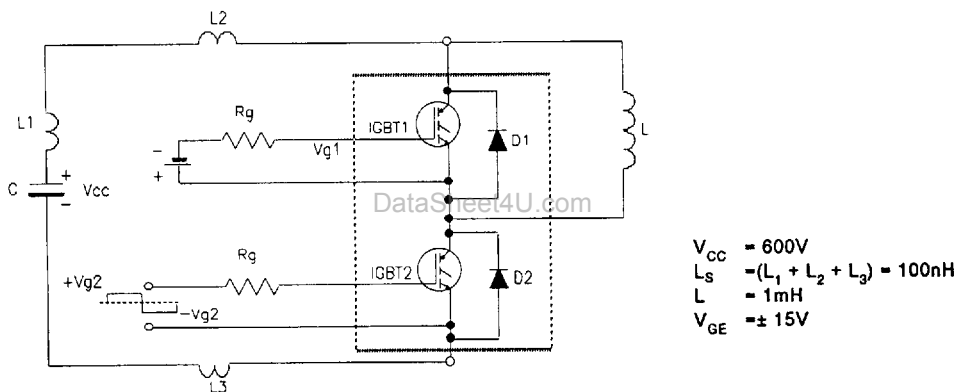


Fig. 17 - Test Circuit for Measurement of  $I_{LM}$ ,  $E_{ON}$ ,  $E_{OFF}$ ,  $Q_{RR}$

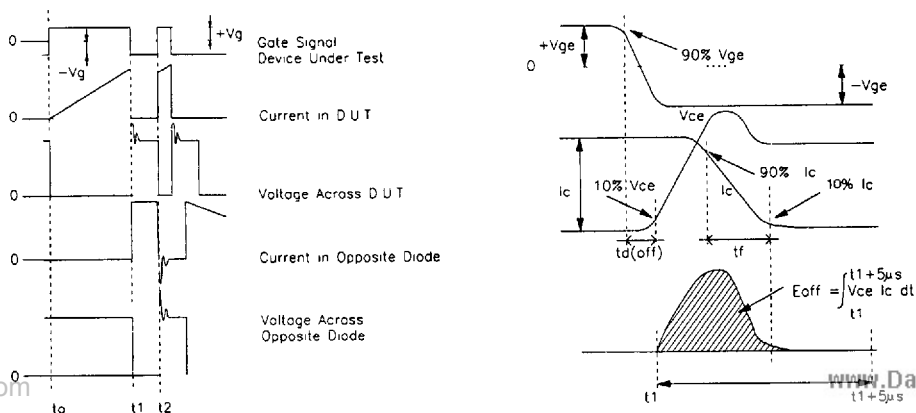


Fig. 18 - Test Waveforms for Circuit of Fig. 17

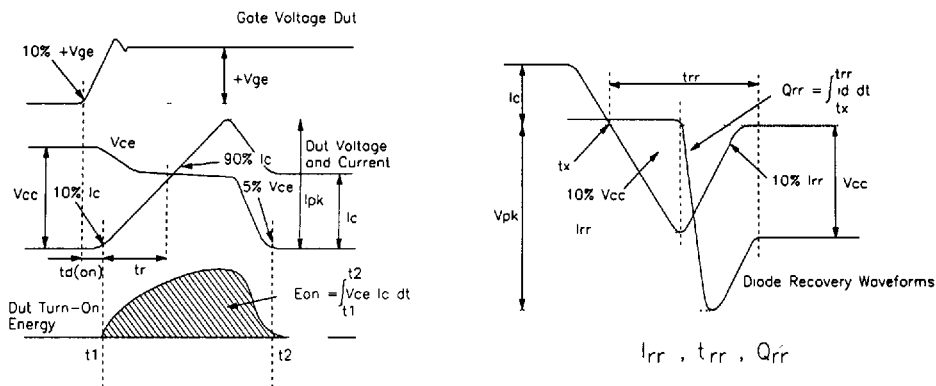


Fig. 19 - Test Waveforms for Circuit of Fig. 17, Defining  $E_{ON}$ ,  $E_{REC}$ ,  $Q_{RR}$

DataSheet4U.com



Printed on Signet recycled offset:  
made from 50% recycled waste paper, including  
10% de-inked, post-consumer waste.



**International**  
**IR Rectifier**

**WORLD HEADQUARTERS:** 233 Kansas St., El Segundo, California 90245, Tel: (310) 322-3381, Fax: (714) 404-0931  
**EUROPEAN HEADQUARTERS:** Hurst Green, Oxted, Surrey RH8 9BB England, Tel: (0883) 713215, Fax: 95219

**IR CANADA:** 101 Bentley St., Markham, Ontario L3R 3L1, Tel: (416) 475-1897. **IR GERMANY:** Saalburgstrasse 157, D-6380 Bad Homburg, Tel: 6172-37066. **IR ITALY:** Via Liguria 49 10071 Borgaro, Torino, Tel: (011) 470 1484. **IR FAR EAST:** K&H Building, 30-4 Nishiikebukuro 3-Chome, Toshima-ku, Tokyo 171 Japan, Tel. (03) 983 0641. **IR SOUTHEAST ASIA:** 190 Middle Road, HEX 10-01 Fortune Centre, Singapore 0718, Tel (65) 336 3922

Sales Offices, Agents and Distributors in Major Cities Throughout the World.