

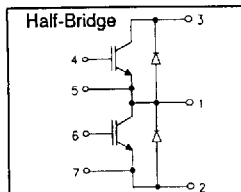
International IOR Rectifier

IRGTI0050M12

"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



$$V_{CE} = 1200V$$

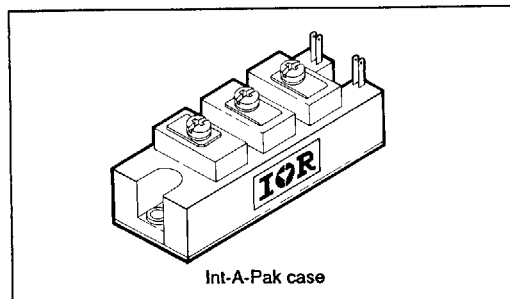
$$I_{C(DC)} = 50A$$

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

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

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.



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Absolute Maximum Ratings

Parameter	Description	Value	Units
$I_C @ T_C = 25^\circ\text{C}$	Continuous collector current	50	A
$I_C @ T_C = 100^\circ\text{C}$	Continuous collector current	30	
I_{LM}	Peak switching current	100	
I_{FM}	Peak diode forward current (1)	100	
V_{CE}	Continuous collector to emitter voltage	1200	V
V_{GE}	Gate to emitter voltage	± 20	
V_{ISOL}	RMS isolation voltage, any terminal to case, $t = 1 \text{ min}$	2500	
$P_D @ T_C = 25^\circ\text{C}$	Power dissipation	300	W
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.

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	$V_{GE} = 0V, I_C = 1mA$
$V_{CE(ON)}$	Collector-to-emitter voltage	---	2.4	2.8		$V_{GE} = 15V, I_C = 50A$
		$T_J = 150^\circ\text{C}$	---	1.9		---
V_{FM}	Diode forward voltage - maximum	---	---	3.2		$I_F = 50A$
		$T_J = 150^\circ\text{C}$	---	2.7	---	$V_{GE} = 0V$
V_{GEth}	Gate threshold voltage	3.0	---	5.5		$I_C = 500\mu A$
ΔV_{GEth}	Threshold voltage temperature coefficient	---	-11	---	mV/ $^\circ\text{C}$	$V_{CE} = V_{GE}, I_C = 500\mu A$
g_{fe}	Forward transconductance	18	---	35	s	$V_{CE} = 25V, I_C = 50A$
I_{CES}	Collector-to-emitter leakage current	---	---	1	mA	$V_{GE} = 0V, V_{CE} = 1200V$
		$T_J = 150^\circ\text{C}$	---	---		
I_{GES}	Gate-to-emitter leakage current	---	---	± 1	μA	$V_{GE} = \pm 20V$

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	$R_G = 15\Omega, V_{CC} = 600V$
E_{off}	Turn-off switching energy	---	0.36	---		$I_C = 50A$
$E_{ts(1)}$	Total switching energy	---	---	0.6		$V_{GE} = \pm 15V$
$t_{d(on)}$	Turn-on delay time	---	150	250	ns	$R_G = 15\Omega, V_{CC} = 600V$
t_r	Rise time	---	300	450		$I_C = 50A$
$t_{d(off)}$	Turn-off delay time	---	200	300		$V_{GE} = \pm 15V$
t_f	Fall time	---	650	---		$L_S = 100nH$
I_{rr}	Diode peak recovery current	---	24	---		A
t_{rr}	Diode peak recovery time	---	220	---	ns	$I_C = 50A$
Q_{rr}	Diode peak 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		$I_C = 50A$
Q_g	Total gate charge (turn-on)	250	---	450		$V_{GE} = 15V$
C_{ies}	Input capacitance	5250	---	5500	pF	$V_{GE} = 0V$
C_{oes}	Output capacitance	330	---	550		$V_{CC} = 30V$
C_{res}	Reverse transfer capacitance	330	---	500		$f = 1MHz$
t_{sc}	Short circuit withstand time	10	---	---	μs	$V_{CC} = 750V, V_{GE} = \pm 15V$ min. $R_G = 15\Omega, V_{CEP} = 1000V$

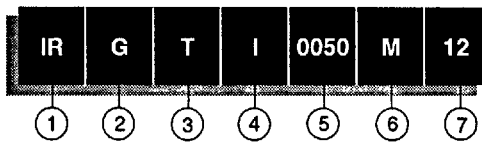
(1) Includes "Tail" losses

Thermal and Mechanical Characteristics

Parameter	Description	Typ	Max	Units
R_{thJC} (IGBT)	Thermal resistance, junction to case, each IGBT	---	0.42	$^\circ\text{C}/W$
R_{thJC} (Diode)	Thermal resistance, junction to case, each diode	---	0.45	
R_{thCS} (Module)	Thermal resistance, case to sink	0.1	---	
Wt	Weight of module	150	---	g

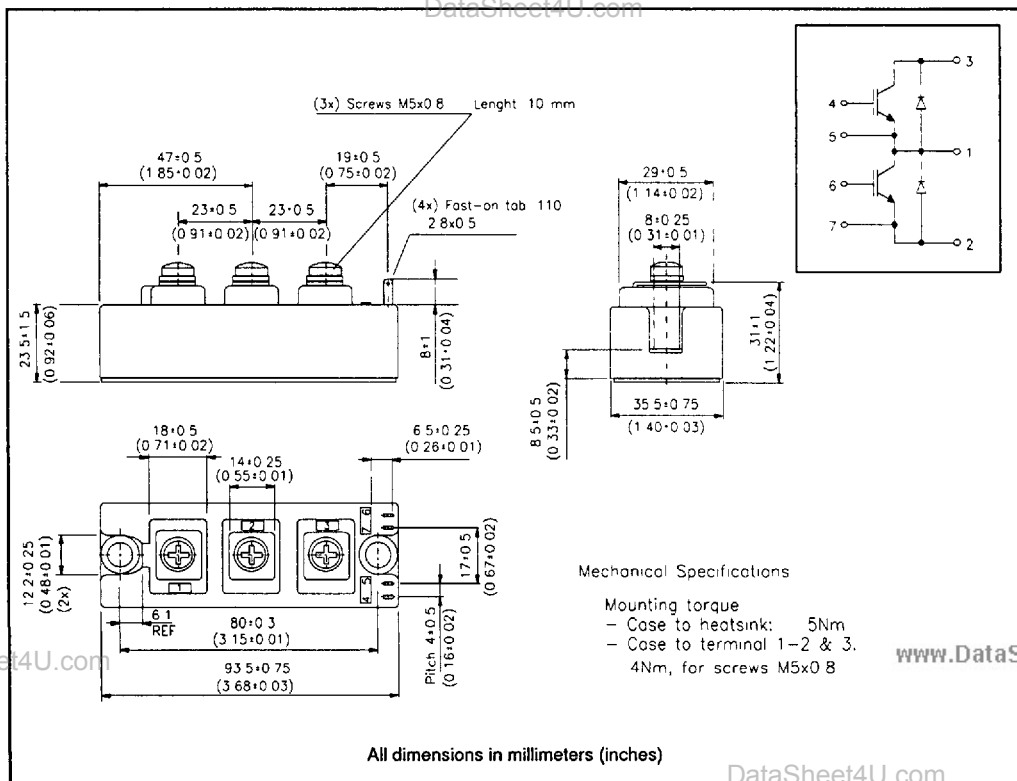
Ordering Information Table

Device Code

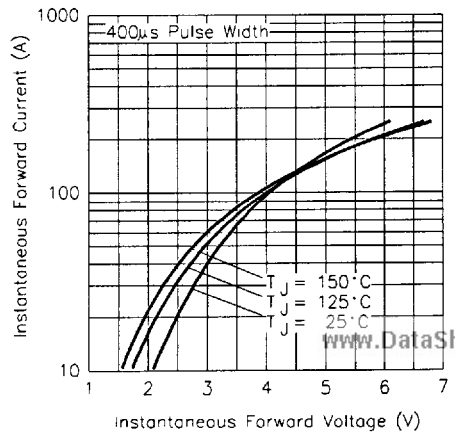
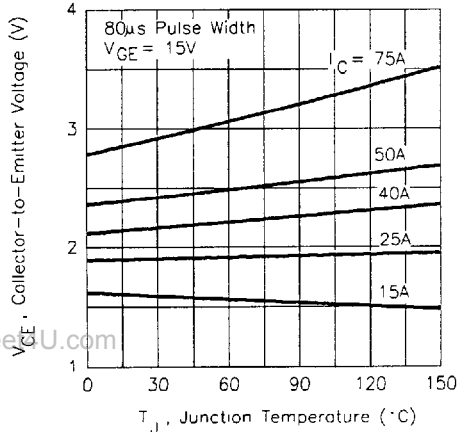
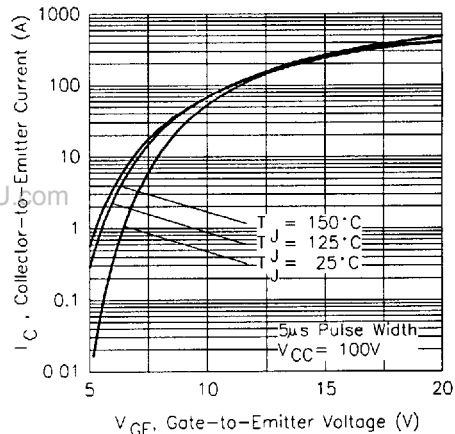
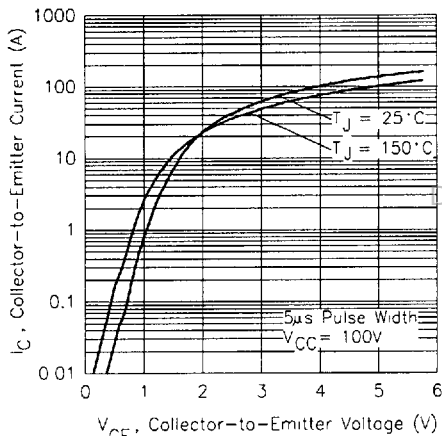
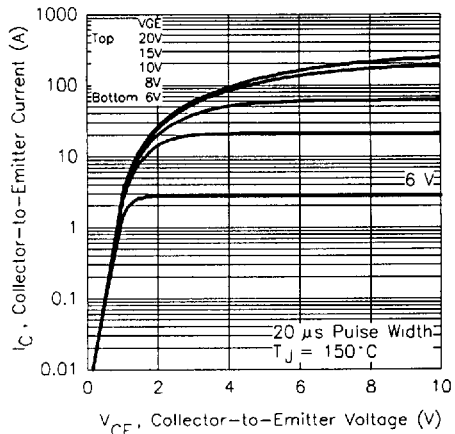
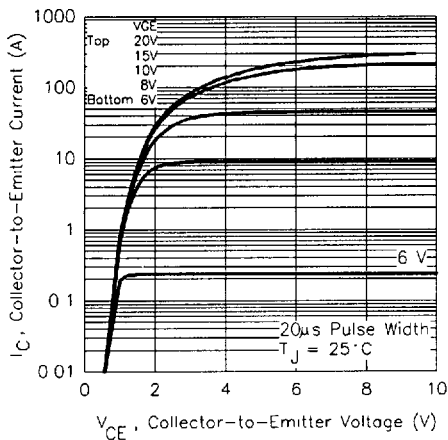


- 1** - IR Logo
- 2** - IGBT
- 3** - Function: T = Half-Bridge
- 4** - Package: I = Int-A-Pak
- 5** - Current rating: 0050 = 50A
- 6** - Speed: M = Fast, short circuit rated
- 7** - Voltage rating: 12 = 1200V

Outline Table



IRGT10050M12



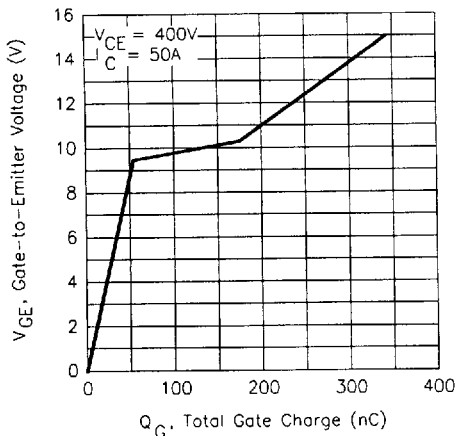


Fig. 7 - Typical Gate Charge vs. Gate-to-Emitter Voltage

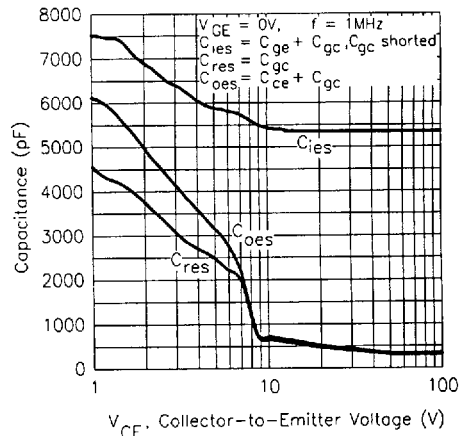


Fig. 8 - Typical Capacitance vs. Collector-to-Emitter Voltage

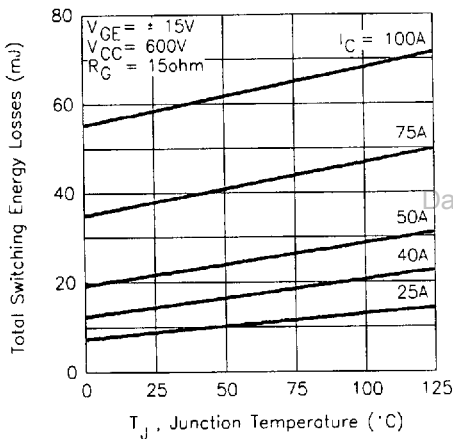


Fig. 9 - Typical Switching Losses vs. Junction Temperature

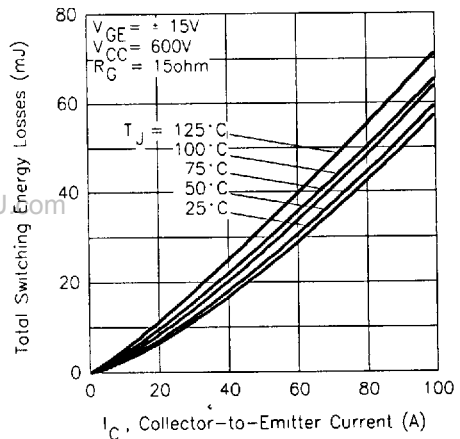


Fig. 10 - Typical Switching Losses vs. Collector-to-Emitter Current

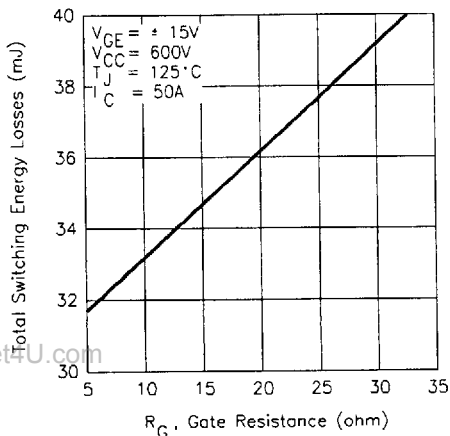


Fig. 11 - Typical Switching Losses vs. Gate Resistance

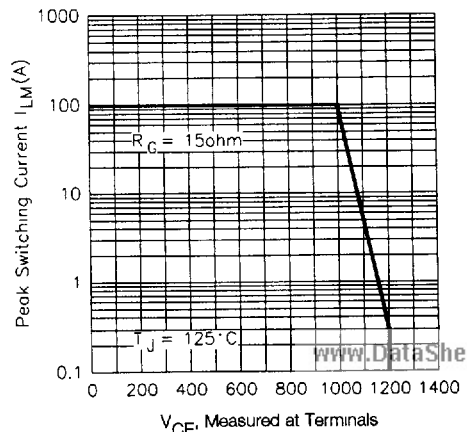


Fig. 12 - Safe Operating Area for Repetitive Switching

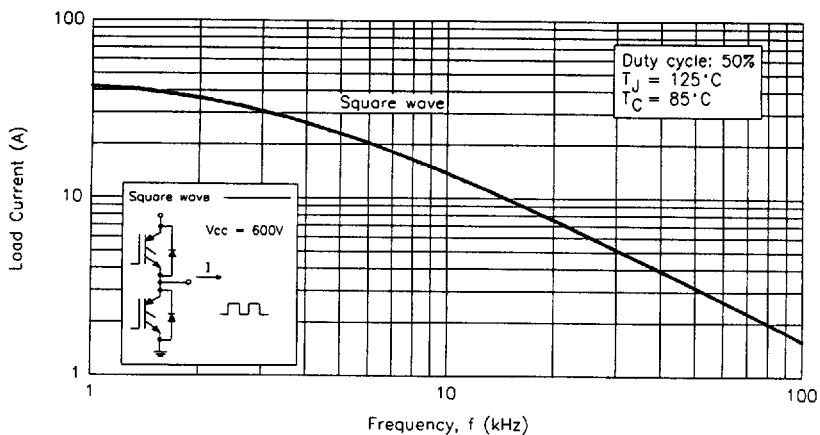


Fig. 13 - Typical Load Current vs. Frequency
(For square wave, $I = I_{\text{RMS}}$ of fundamental; for triangular wave, $I = I_{\text{pk}}$)

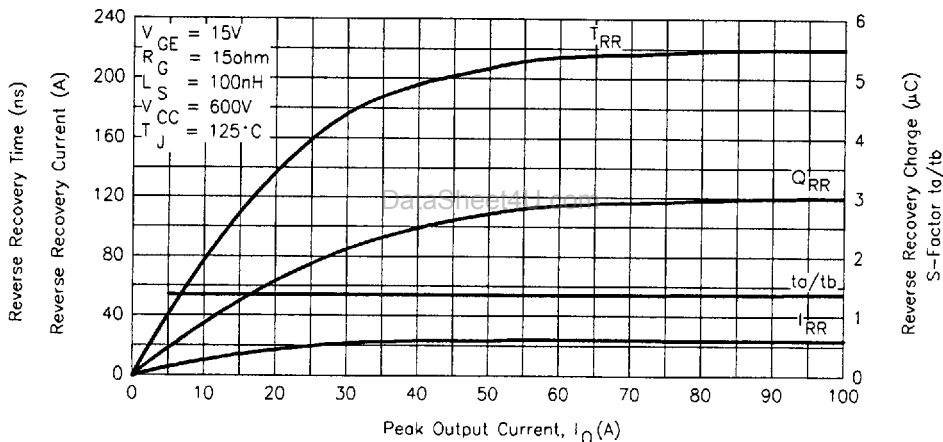


Fig. 14 - Typical Diode Recovery Characteristics as Function of Output Current I_O

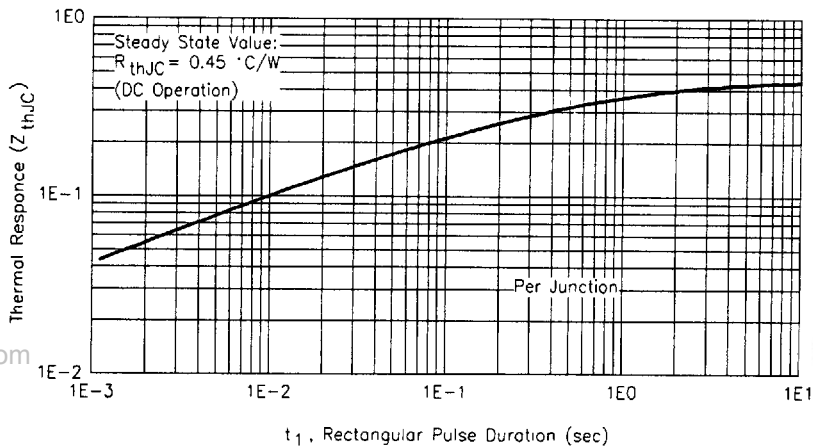


Fig. 15 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

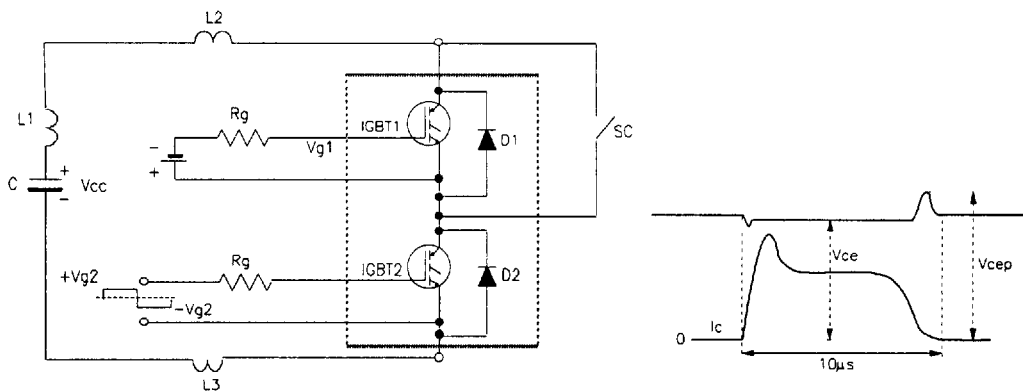


Fig. 16 - Test Circuit for Short Circuit

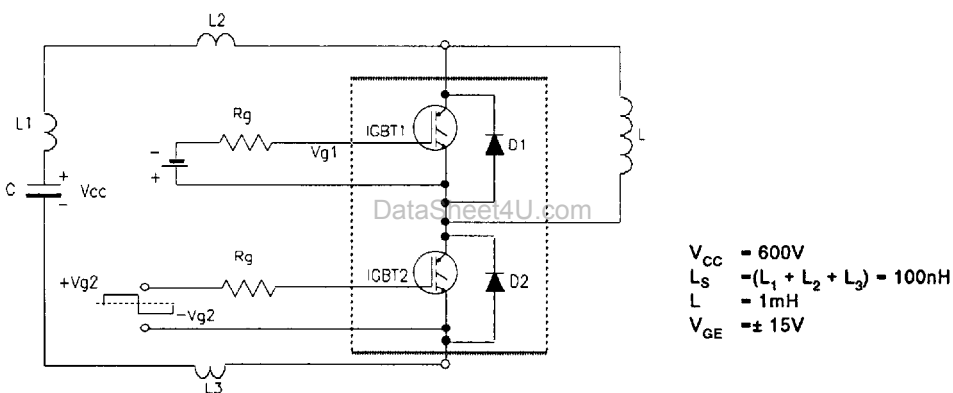
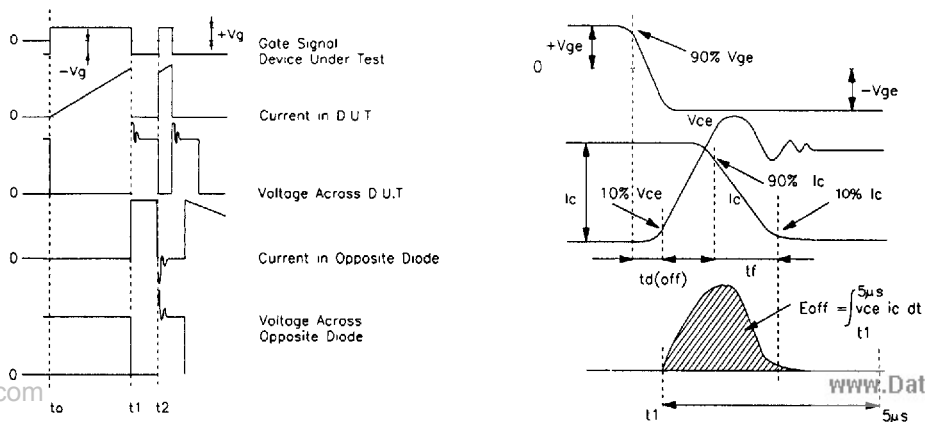
Fig. 17 - Test Circuit for Measurement of I_{LM} , E_{ON} , E_{OFF} , Q_{RR} 

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

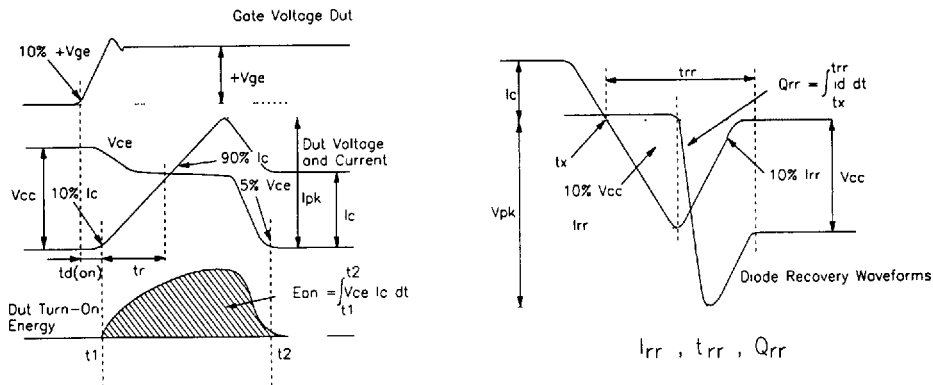


Fig. 19 - Test Waveforms for Circuit of Fig. 17, Defining E_{ON} , E_{REC} , Q_{RR}

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