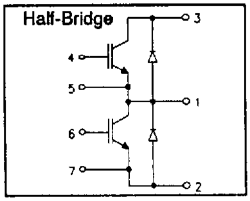
Preliminary Data Sheet No. PD-9.925

International Rectifier

IRGTI0025M12

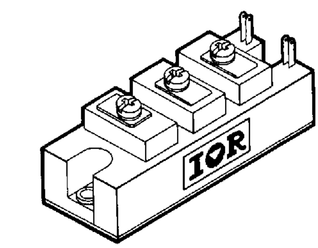
"HALF-BRIDGE" INT-A-PAK™ MODULES

Fast™ IGBT



V_{CE} = 1200V
$I_{C(DC)}$ = 25A
$V_{CE(SAT)}$ < 2.8V
t_{SC} > 10µsec

- 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


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
I_C @ T_C = 25°C	Continuous collector current	25	A
I_C @ T_C = 100°C	Continuous collector current	15	
I_{LM}	Peak switching current	50	
I_{FM}	Peak diode forward current (1)	50	
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 min	2500	
P_D @ T_C = 25°C	Power dissipation	125	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
$V_{(BR)CES}$	Collector-to-emitter breakdown voltage	1200	---	---	V	V_{GE} = 0V, I_C = 500μA
$V_{CE(ON)}$	Collector-to-emitter voltage	---	2.4	2.8	V	V_{GE} = 15V, I_C = 25A
	T_J=150°C	---	1.9	---	V	V_{GE}=15V, I_C=13A
V_{FM}	Diode forward voltage - maximum	---	---	3.2	V	I_F = 25A
	T_J=150°C	---	2.7	---	V	V_{GE} = 0V
V_{GEth}	Gate threshold voltage	3.0	---	5.5	V	I_C=250μA
ΔV_{GEth}	Threshold voltage temperature coefficient	---	-11	---	mV/°C	V_{CE}=V_{GE}, I_C=250μA
g_{fe}	Forward transconductance	9	---	18	s	V_{CE}=25V, I_C=25A
I_{CES}	Collector-to-emitter leakage current	---	---	0.5	mA	V_{GE}=0V, V_{CE}=1200V
	T_J=150°C	---	---	5	mA	
I_{GES}	Gate-to-emitter leakage current	---	---	±0.5	μA	V_{GE}=±20V

Dynamic Characteristics - T_J = 125°C

Parameter	Description	Min	Typ	Max	Units	Test Conditions
E_{on}	Turn-on switching energy	---	0.19	---	mJ/A	R_G=22Ω, V_{CC}=600V
E_{off}	Turn-off switching energy	---	0.36	---	mJ/A	I_C=25A
E_{ts} (1)	Total switching energy	---	---	0.6	mJ/A	V_{GE}=±15V
$t_{d(on)}$	Turn-on delay time	---	150	250	ns	R_G=22Ω, V_{CC}=600V
t_r	Rise time	---	300	450	ns	I_C=25A
$t_{d(off)}$	Turn-off delay time	---	200	300	ns	V_{GE}=±15V
t_f	Fall time	---	650	---	ns	L_S=100nH
I_{rr}	Diode peak recovery current	---	12	---	A	R_G=22Ω, V_{CC}=600V
t_{rr}	Diode peak recovery time	---	220	---	ns	I_C=25A
Q_{rr}	Diode peak recovery charge	---	1.5	---	μC	V_{GE}=±15V
Q_{ge}	Gate-to-emitter charge (turn-on)	11	---	44	nC	V_{CC}=600V
Q_{gc}	Gate-to-collector charge (turn-on)	40	---	83	nC	I_C=25A
Q_g	Total gate charge (turn-on)	125	---	225	nC	V_{GE}=15V
C_{ies}	Input capacitance	2600	---	2800	pF	V_{GE}=0V
C_{oes}	Output capacitance	165	---	280	pF	V_{CC}=30V
C_{res}	Reverse transfer capacitance	165	---	250	pF	f=1MHz
t_{sc}	Short circuit withstand time	10	---	---	μs	V_{CC}=750V, V_{GE}=±15V min. R_G=22Ω, 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	---	0.7	°C/W
R_{thJC} (Diode)	Thermal resistance, junction to case, each diode	---	0.75	°C/W
R_{thCS} (Module)	Thermal resistance, case to sink	0.1	---	°C/W
Wt	Weight of module	150	---	g

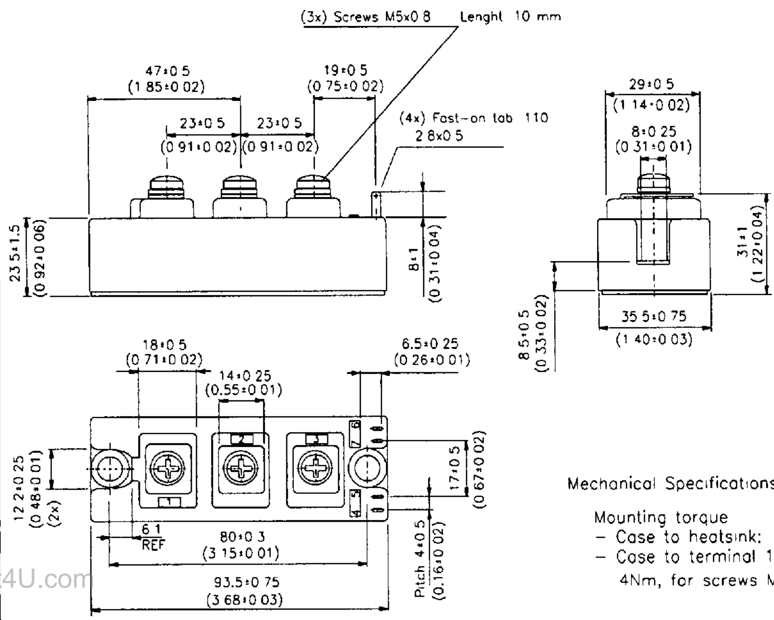
Ordering Information Table

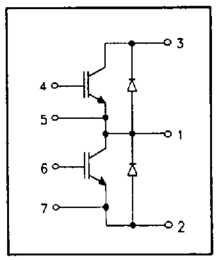
Device Code

IR	G	T	I	0025	M	12
1	2	3	4	5	6	7

- **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





Mechanical Specifications

Mounting torque
- Case to heatsink: 5Nm
- Case to terminal 1-2 & 3: 4Nm, for screws M5x0 8

All dimensions in millimeters (inches)

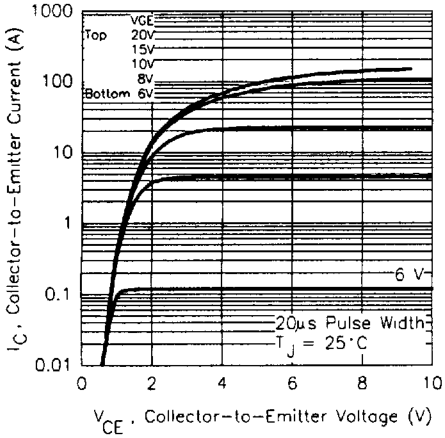


Fig. 1 - Typical Output Characteristics, T_J = 25°C

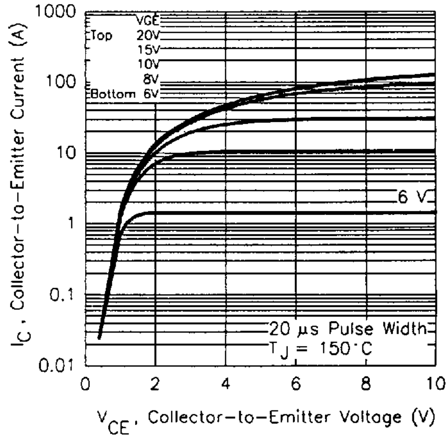


Fig. 2 - Typical Output Characteristics, T_J = 150°C

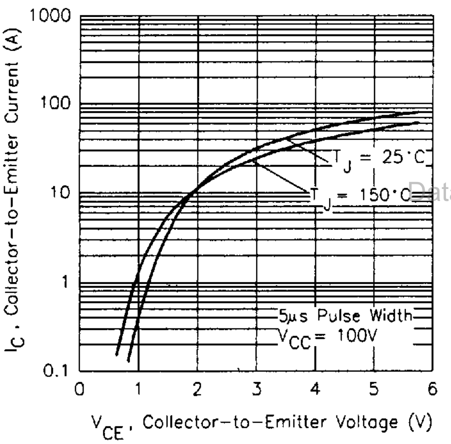


Fig. 3 - Typical Output Characteristics

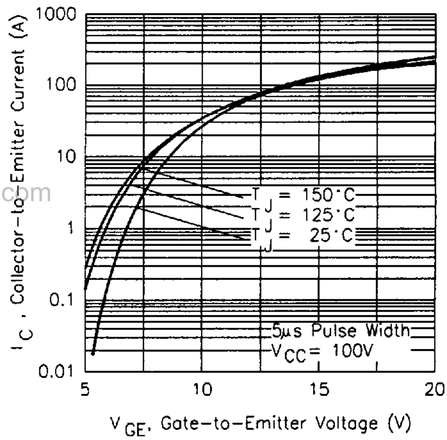


Fig. 4 - Typical Transfer Characteristics

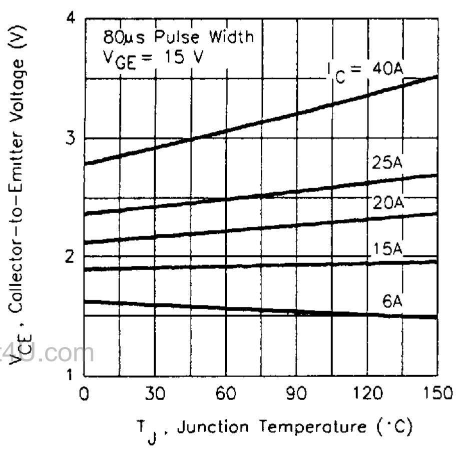


Fig. 5 - Collector-to-Emitter Saturation Typical Voltage vs. Junction Temperature

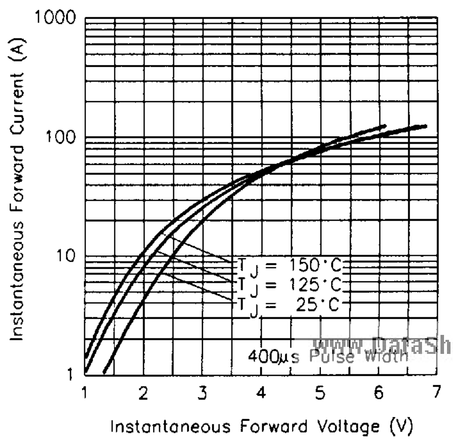


Fig. 6 - Forward Voltage Drop Characteristics

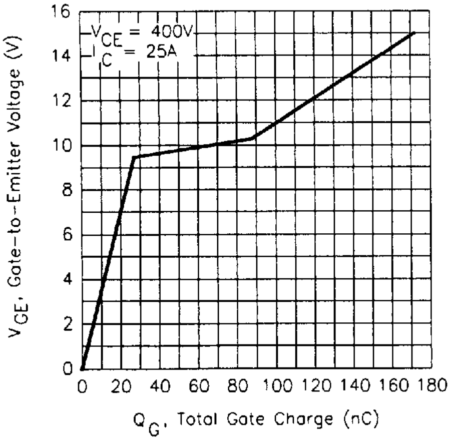


Fig. 7 - Typical Gate Charge vs. Gate-to-Emitter Voltage

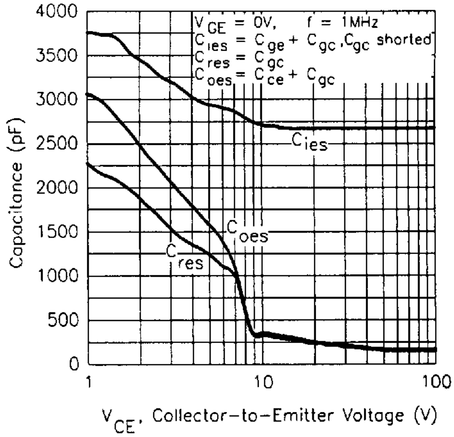


Fig. 8 - Typical Capacitance vs. Collector-to-Emitter Voltage

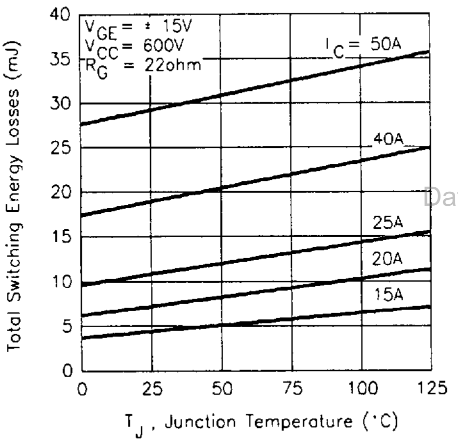


Fig. 9 - Typical Switching Losses vs. Junction Temperature

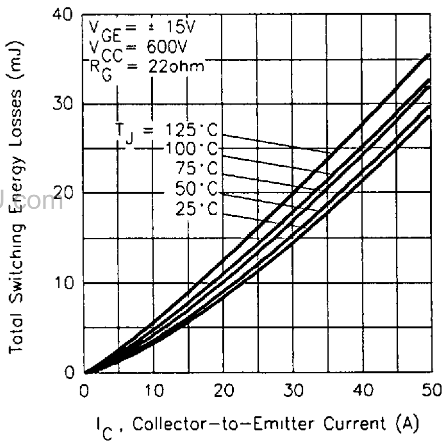


Fig. 10 - Typical Switching Losses vs. Collector-to-Emitter Current

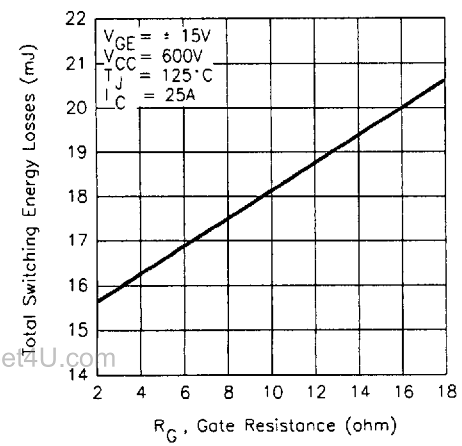


Fig. 11 - Typical Switching Losses vs. Gate Resistance

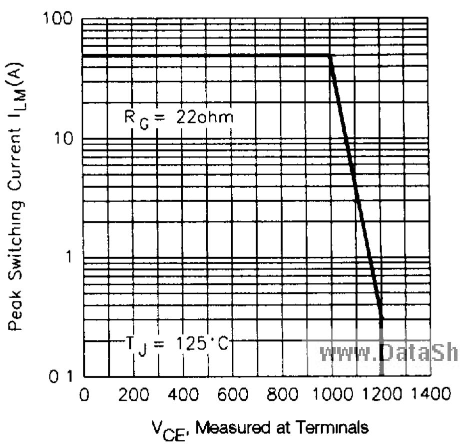


Fig. 12 - Safe Operating Area for Repetitive Switching

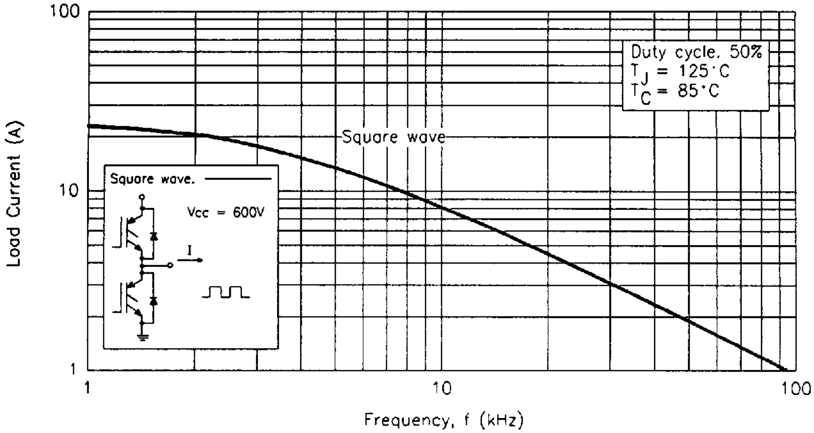


Fig. 13 - Typical Load Current vs. Frequency
(For square wave, $I = I_{RMS}$ of fundamental; for triangular wave, $I = I_{pk}$)

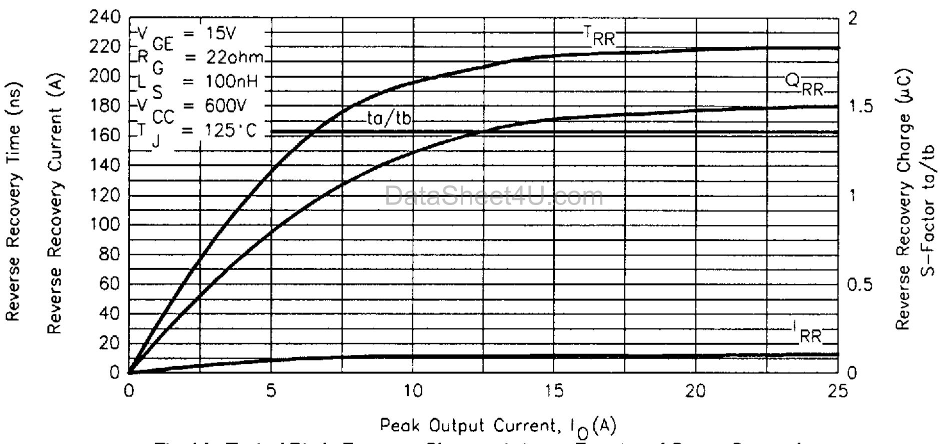


Fig. 14 - Typical Diode Recovery Characteristics as Function of Output Current I_O

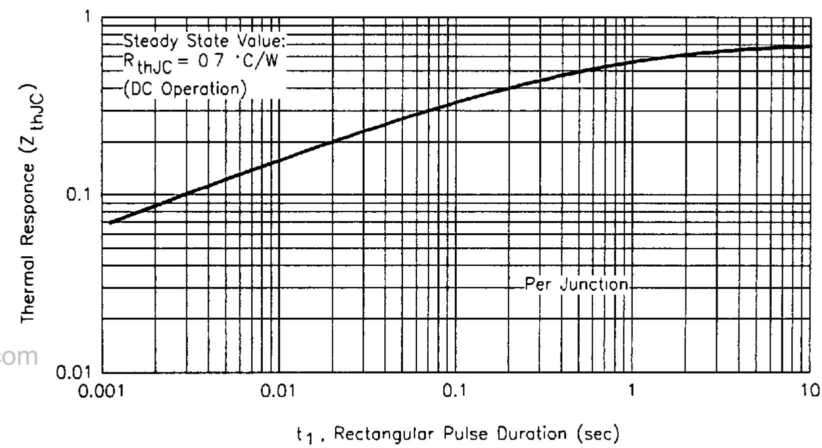


Fig. 15 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

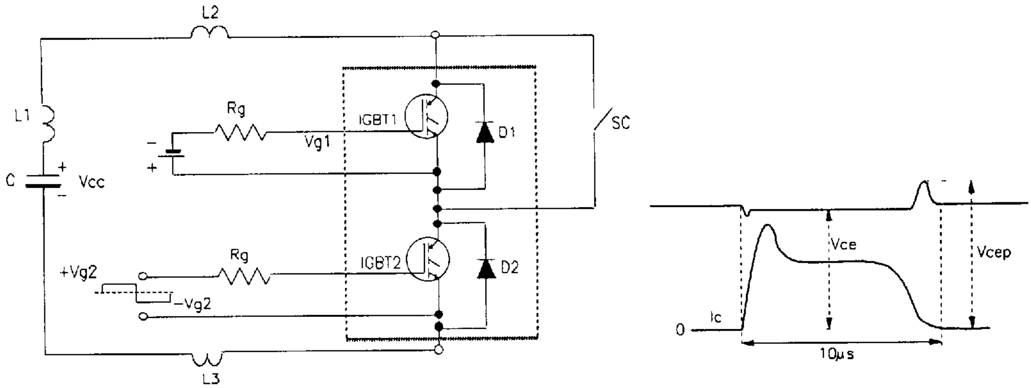
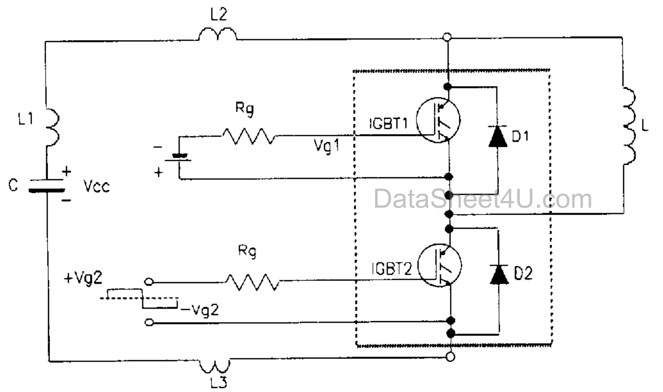


Fig. 16 - Test Circuit for Short Circuit



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

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

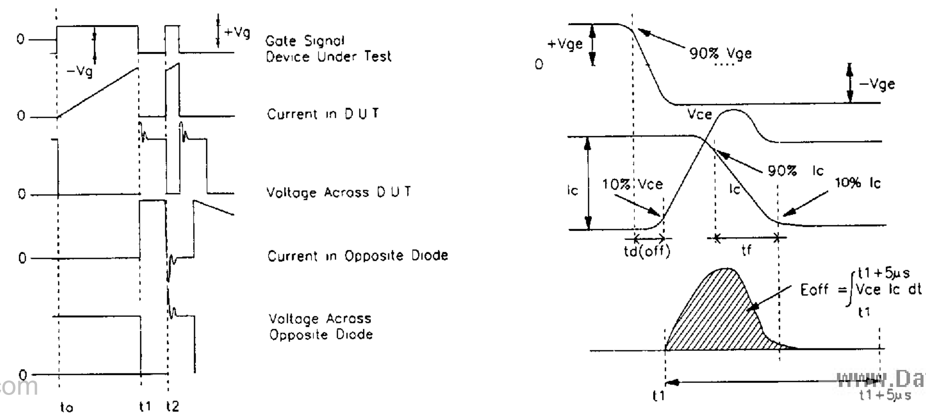


Fig. 18 - Test Waveforms for Circuit of Fig. 17

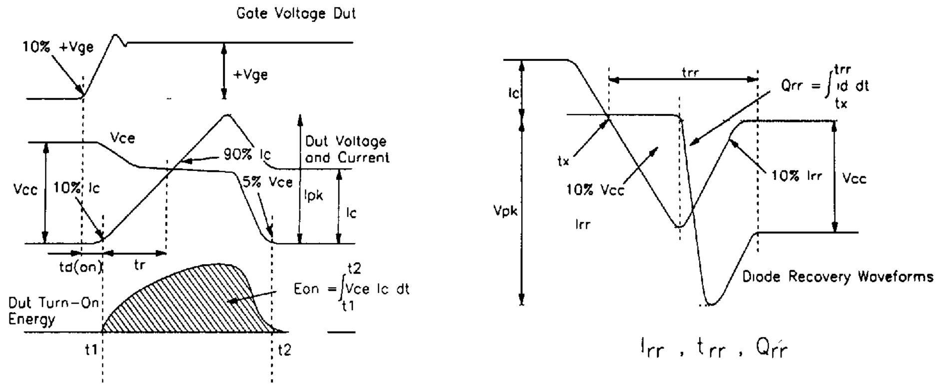


Fig. 19 - Test Waveforms for Circuit of Fig. 17, Defining E_{ON}, E_{REC}, Q_{RR}

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