International IOR Rectifier

PD - 9.1073

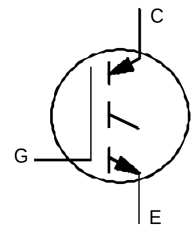
IRGBC40K

INSULATED GATE BIPOLAR TRANSISTOR

Short Circuit Rated
UltraFast IGBT

Features

- Short circuit rated - 10µs @ 125°C, V_{GE} = 15V
- Switching-loss rating includes all "tail" losses
- Optimized for high operating frequency (over 5kHz) See Fig. 1 for Current vs. Frequency curve



n-channel

V_{CES} = 600V

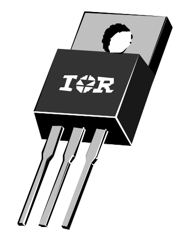
$V_{CE(sat)} \leq$ 3.2V

@V_{GE} = 15V, I_C = 25A

Description

Insulated Gate Bipolar Transistors (IGBTs) from International Rectifier have higher usable current densities than comparable bipolar transistors, while at the same time having simpler gate-drive requirements of the familiar power MOSFET. They provide substantial benefits to a host of high-voltage, high-current applications.

These new short circuit rated devices are especially suited for motor control and other applications requiring short circuit withstand capability.



TO-220AB

Absolute Maximum Ratings

	Parameter	Max.	Units
V_{CES}	Collector-to-Emitter Voltage	600	V
I_C @ T_C = 25°C	Continuous Collector Current	42	A
I_C @ T_C = 100°C	Continuous Collector Current	25	
I_{CM}	Pulsed Collector Current ①	84	
I_{LM}	Clamped Inductive Load Current ②	84	
t_{sc}	Short Circuit Withstand Time	10	µs
V_{GE}	Gate-to-Emitter Voltage	±20	V
E_{ARV}	Reverse Voltage Avalanche Energy ③	15	mJ
P_D @ T_C = 25°C	Maximum Power Dissipation	160	W
P_D @ T_C = 100°C	Maximum Power Dissipation	65	
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to +150	°C
	Soldering Temperature, for 10 sec.	300 (0.063 in. (1.6mm) from case)	
	Mounting torque, 6-32 or M3 screw.	10 lbf•in (1.1N•m)	

Thermal Resistance

	Parameter	Min.	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	------	------	0.77	°C/W
$R_{\theta CS}$	Case-to-Sink, flat, greased surface	------	0.50	------	
$R_{\theta JA}$	Junction-to-Ambient, typical socket mount	------	------	80	
Wt	Weight	------	2 (0.07)	------	g (oz)

Electrical Characteristics @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions	
$V_{(BR)CES}$	Collector-to-Emitter Breakdown Voltage	600	----	----	V	V_{GE} = 0V, I_C = 250µA	
$V_{(BR)ECS}$	Emitter-to-Collector Breakdown Voltage ④	20	----	----	V	V_{GE} = 0V, I_C = 1.0A	
$\Delta V_{(BR)CES}/\Delta T_J$	Temperature Coeff. of Breakdown Voltage	----	0.46	----	V/°C	V_{GE} = 0V, I_C = 1.0mA	
$V_{CE(on)}$	Collector-to-Emitter Saturation Voltage	----	2.1	3.2	V	I_C = 25A	V_{GE} = 15V
		----	2.8	----		I_C = 42A	See Fig. 2, 5
		----	2.5	----		I_C = 25A, T_J = 150°C	
$V_{GE(th)}$	Gate Threshold Voltage	3.0	----	5.5		$V_{CE} = V_{GE}$, I_C = 250µA	
$\Delta V_{GE(th)}/\Delta T_J$	Temperature Coeff. of Threshold Voltage	----	-13	----	mV/°C	$V_{CE} = V_{GE}$, I_C = 250µA	
g_{fe}	Forward Transconductance ⑤	7.0	14	----	S	V_{CE} = 100V, I_C = 25A	
I_{CES}	Zero Gate Voltage Collector Current	----	----	250	µA	V_{GE} = 0V, V_{CE} = 600V	
		----	----	1000		V_{GE} = 0V, V_{CE} = 600V, T_J = 150°C	
I_{GES}	Gate-to-Emitter Leakage Current	----	----	±100	nA	V_{GE} = ±20V	

Switching Characteristics @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
Q_g	Total Gate Charge (turn-on)	----	61	92	nC	I_C = 25A
Q_{ge}	Gate - Emitter Charge (turn-on)	----	13	19		V_{CC} = 400V See Fig. 8
Q_{gc}	Gate - Collector Charge (turn-on)	----	22	33		V_{GE} = 15V
$t_{d(on)}$	Turn-On Delay Time	----	35	----	ns	T_J = 25°C
t_r	Rise Time	----	27	----		I_C = 25A, V_{CC} = 480V
$t_{d(off)}$	Turn-Off Delay Time	----	160	240		V_{GE} = 15V, R_G = 10Ω
t_f	Fall Time	----	130	200		Energy losses include "tail"
E_{on}	Turn-On Switching Loss	----	0.52	----	mJ	
E_{off}	Turn-Off Switching Loss	----	1.2	----		See Fig. 9, 10, 11, 14
E_{ts}	Total Switching Loss	----	1.7	2.6		
t_{sc}	Short Circuit Withstand Time	10	----	----	µs	V_{CC} = 360V, T_J = 125°C V_{GE} = 15V, R_G = 10Ω, V_{CPK} < 500V
$t_{d(on)}$	Turn-On Delay Time	----	34	----	ns	T_J = 150°C,
t_r	Rise Time	----	28	----		I_C = 25A, V_{CC} = 480V
$t_{d(off)}$	Turn-Off Delay Time	----	300	----		V_{GE} = 15V, R_G = 10Ω
t_f	Fall Time	----	310	----		Energy losses include "tail"
E_{ts}	Total Switching Loss	----	3.6	----	mJ	See Fig. 10, 14
L_E	Internal Emitter Inductance	----	7.5	----	nH	Measured 5mm from package
C_{ies}	Input Capacitance	----	1500	----	pF	V_{GE} = 0V
C_{oes}	Output Capacitance	----	190	----		V_{CC} = 30V See Fig. 7
C_{res}	Reverse Transfer Capacitance	----	17	----		f = 1.0MHz

Notes:

① Repetitive rating; V_{GE}=20V, pulse width limited by max. junction temperature. (See fig. 13b)

② V_{CC}=80%(V_{CES}), V_{GE}=20V, L=10µH, R_G= 10Ω, (See fig. 13a)

③ Repetitive rating; pulse width limited by maximum junction temperature.

④ Pulse width ≤ 80µs; duty factor ≤ 0.1%.

⑤ Pulse width 5.0µs, single shot.

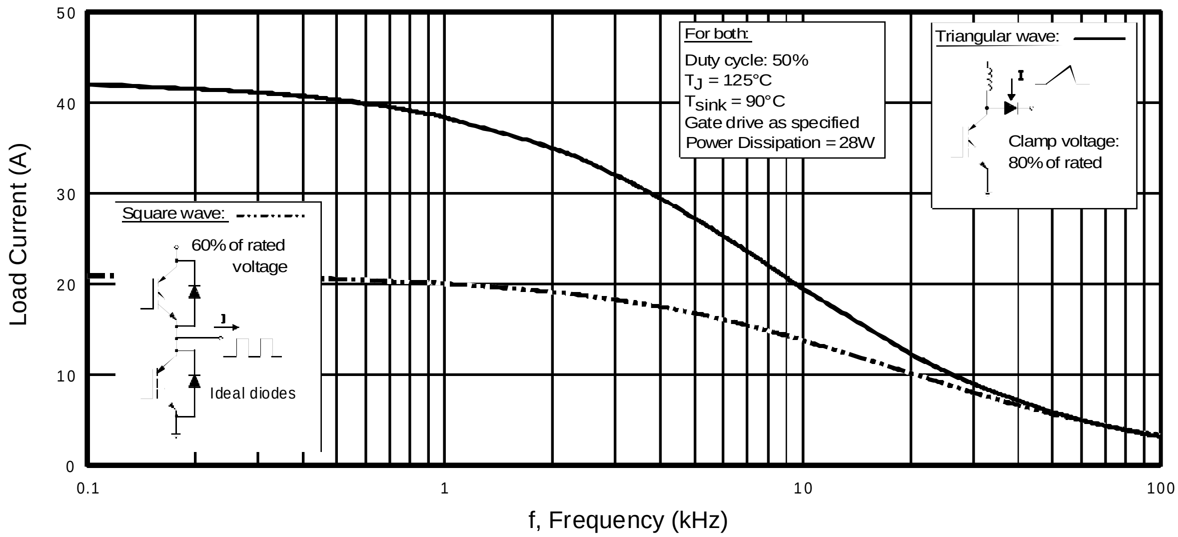


Fig. 1 - Typical Load Current vs. Frequency
(For square wave, $I=I_{RMS}$ of fundamental; for triangular wave, $I=I_{PK}$)

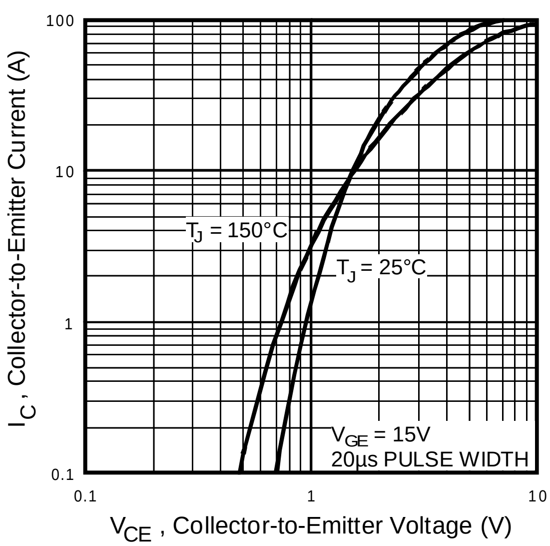


Fig. 2 - Typical Output Characteristics

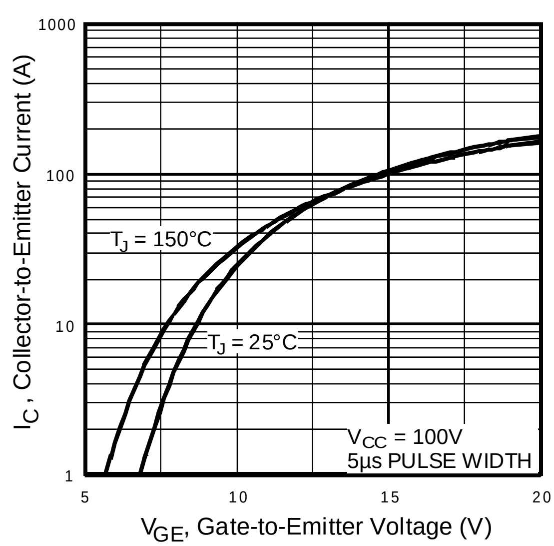


Fig. 3 - Typical Transfer Characteristics

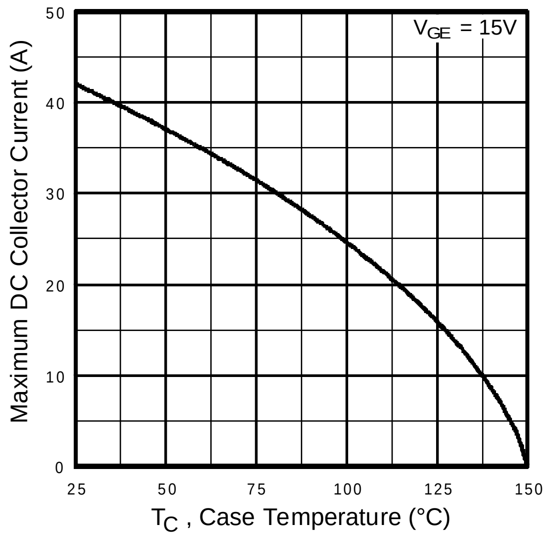


Fig. 4 - Maximum Collector Current vs. Case Temperature

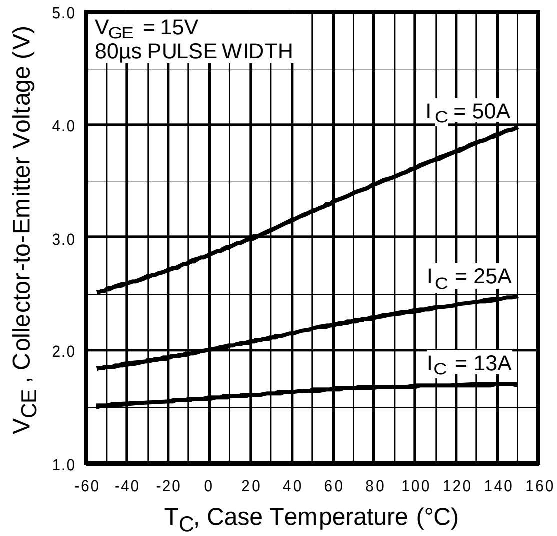


Fig. 5 - Collector-to-Emitter Voltage vs. Case Temperature

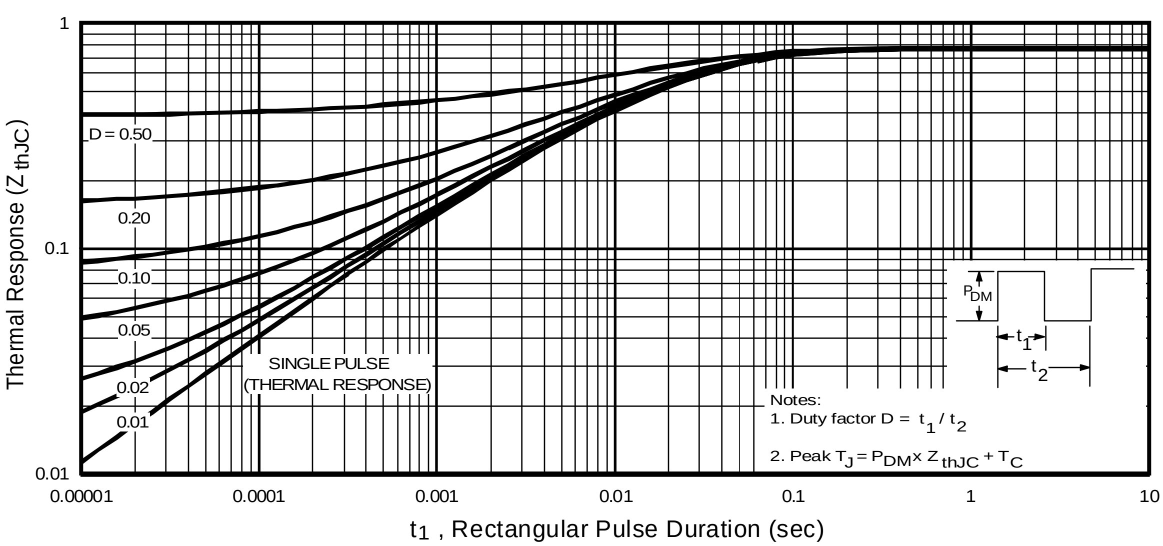


Fig. 6 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

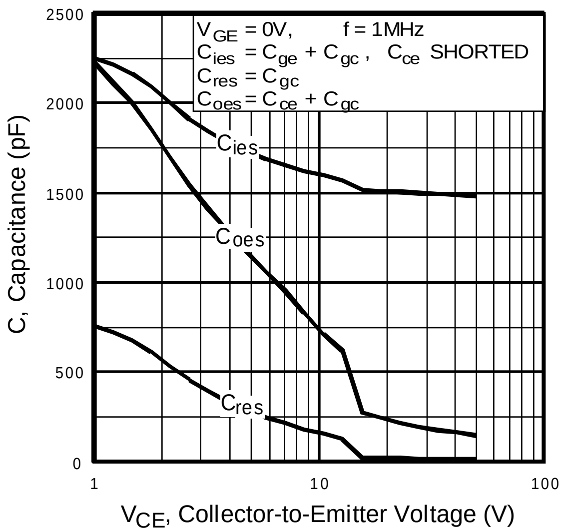


Fig. 7 - Typical Capacitance vs. Collector-to-Emitter Voltage

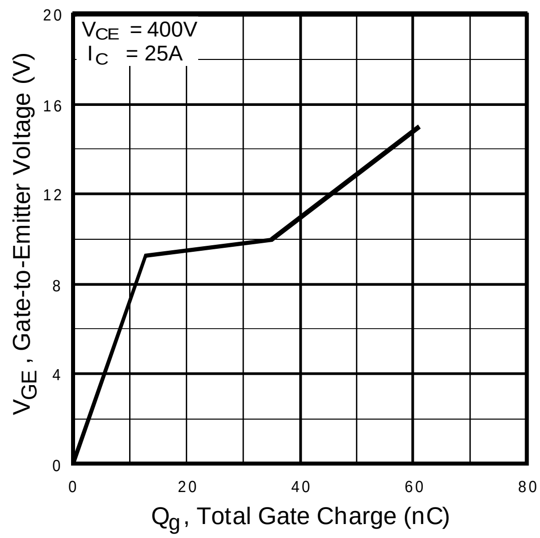


Fig. 8 - Typical Gate Charge vs. Gate-to-Emitter Voltage

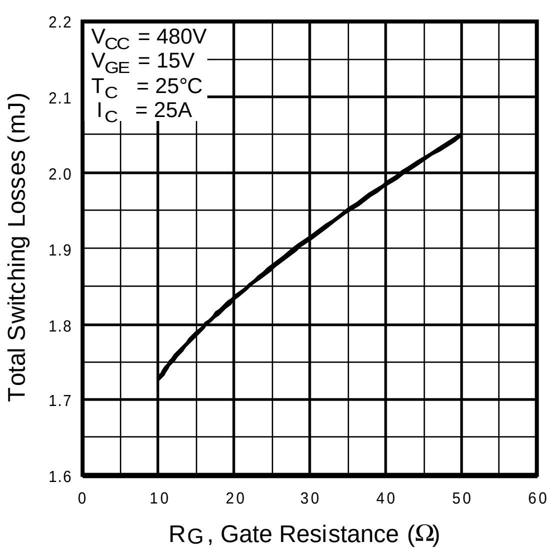


Fig. 9 - Typical Switching Losses vs. Gate Resistance

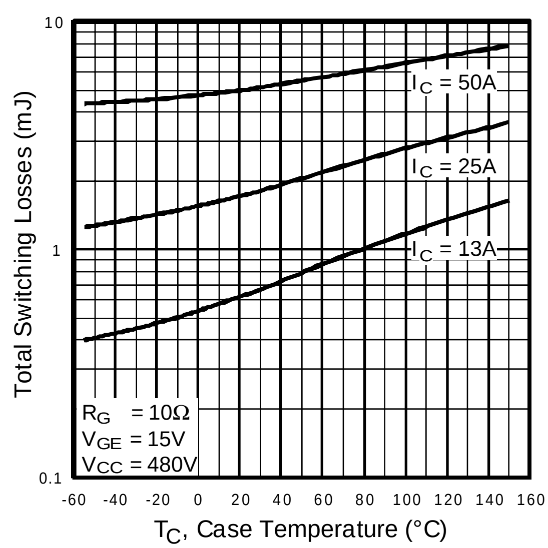


Fig. 10 - Typical Switching Losses vs. Case Temperature

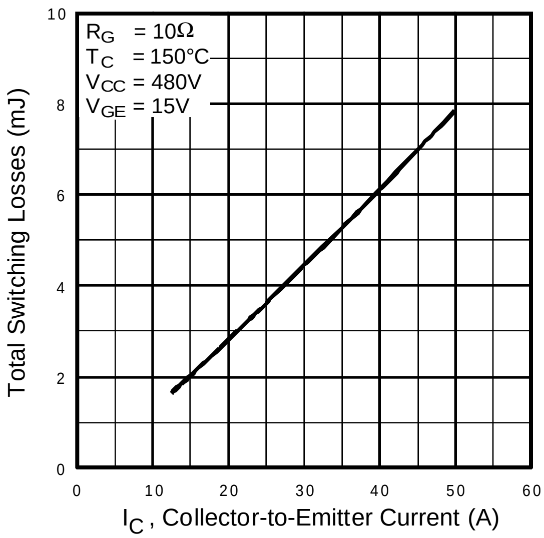


Fig. 11 - Typical Switching Losses vs. Collector-to-Emitter Current

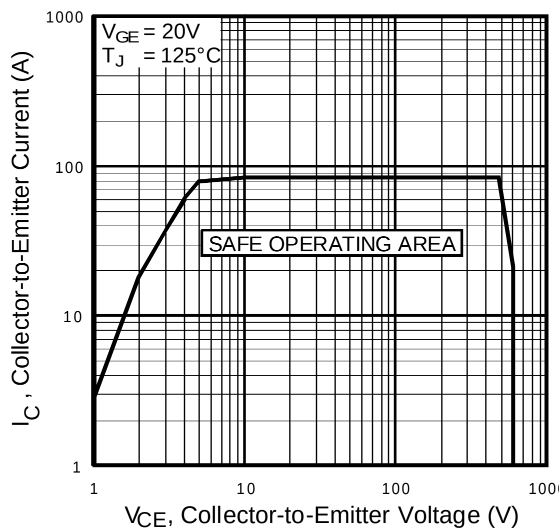
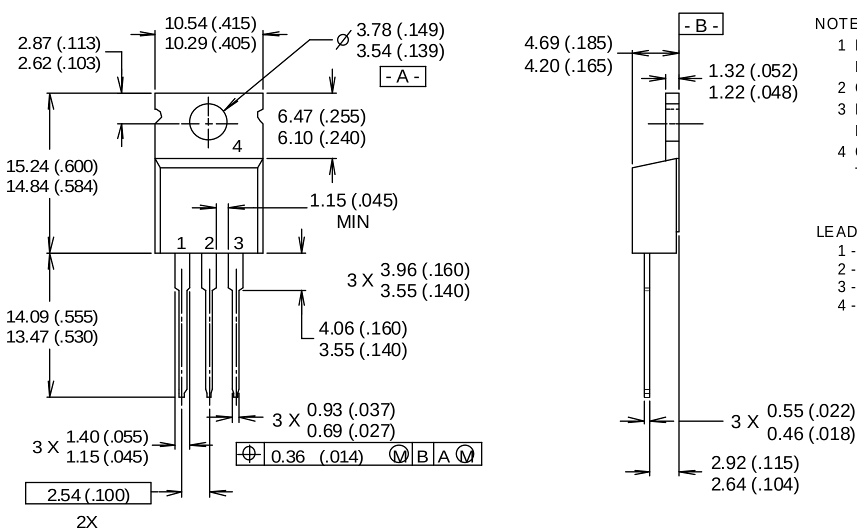


Fig. 12 - Turn-Off SOA



NOTES:

1. DIMENSIONS & TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION : INCH.
3. DIMENSIONS ARE SHOWN MILLIMETERS (INCHES).
4. CONFORMS TO JEDEC OUTLINE TO-220AB.

LEAD ASSIGNMENTS

1 - GATE
2 - COLLECTOR
3 - EMITTER
4 - COLLECTOR

CONFORMS TO JEDEC OUTLINE TO-220AB

Dimensions in Millimeters and (Inches)

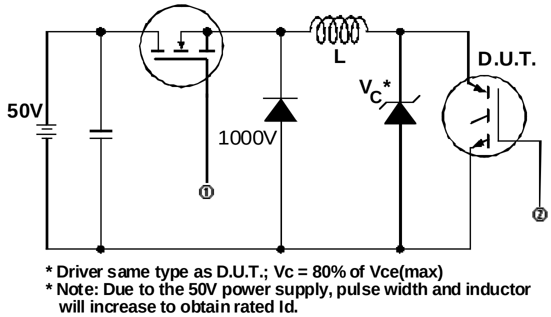


Fig. 13a - Clamped Inductive Load Test Circuit

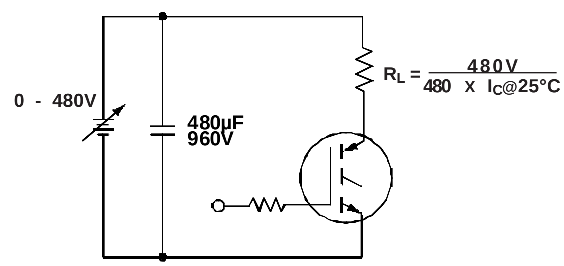


Fig. 13b - Pulsed Collector Current Test Circuit

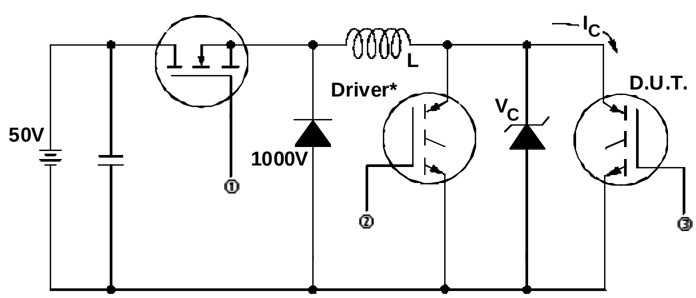


Fig. 14a - Switching Loss Test Circuit

* Driver same type as D.U.T., VC = 480V

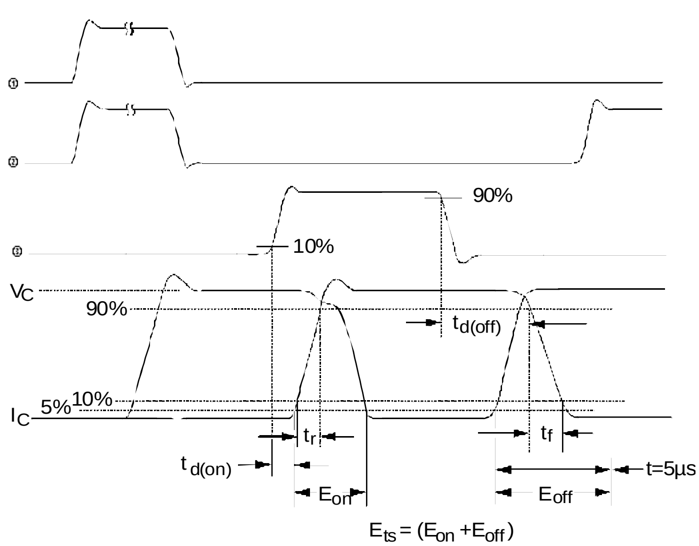


Fig. 14b - Switching Loss Waveforms

Littlediode supplies new, hard to find or obsolete electronic components and semiconductors all over the world.

With over two million different components listed you are sure to find the part you need.

Feel free to visit us today at our online store:

LittleDiode.com

Looking forward to providing you with the best possible service.