International
IOR Rectifier

PD - 91681A

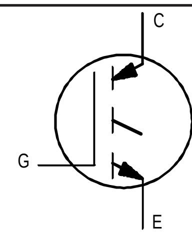
IRG4PSC71U

INSULATED GATE BIPOLAR TRANSISTOR

UltraFast Speed IGBT

Features

- UltraFast switching speed optimized for operating frequencies 8 to 40kHz in hard switching, 200kHz in resonant mode soft switching
- Generation 4 IGBT design provides tighter parameter distribution and higher efficiency (minimum switching and conduction losses) than prior generations
- Industry-benchmark Super-247 package with higher power handling capability compared to same footprint TO-247
- Creepage distance increased to 5.35mm



n-channel

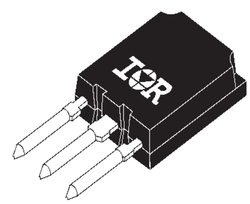
V_{CES} = 600V

$V_{CE(on)\ typ.}$ = 1.67V

@V_{GE} = 15V, I_C = 60A

Benefits

- Generation 4 IGBT's offer highest efficiencies available
- Maximum power density, twice the power handling of the TO-247, less space than TO-264
- IGBTs optimized for specific application conditions
- Cost and space saving in designs that require multiple, paralleled IGBTs



SUPER - 247

Absolute Maximum Ratings

	Parameter	Max.	Units
V_{CES}	Collector-to-Emitter Breakdown Voltage	600	V
I_C @ T_C = 25°C	Continuous Collector Current	85⑥	A
I_C @ T_C = 100°C	Continuous Collector Current	60	
I_{CM}	Pulsed Collector Current ①	200	
I_{LM}	Clamped Inductive Load Current ②	200	
V_{GE}	Gate-to-Emitter Voltage	± 20	V
E_{ARV}	Reverse Voltage Avalanche Energy ③	180	mJ
P_D @ T_C = 25°C	Maximum Power Dissipation	350	W
P_D @ T_C = 100°C	Maximum Power Dissipation	140	
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 150	°C
	Soldering Temperature, for 10 seconds	300 (0.063 in. (1.6mm from case)	

Thermal Resistance\ Mechanical

	Parameter	Min.	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	–––	–––	0.36	°C/W
$R_{\theta CS}$	Case-to-Sink, flat, greased surface	–––	0.24	–––	
$R_{\theta JA}$	Junction-to-Ambient, typical socket mount	–––	–––	38	
	Recommended Clip Force	20.0(2.0)	–––	–––	N (kgf)
	Weight	–––	6 (0.21)	–––	g (oz)

5/12/99

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	18	—	—	V	V_{GE} = 0V, I_C = 1.0A	
$\Delta V_{(BR)CES}/\Delta T_J$	Temperature Coeff. of Breakdown Voltage	—	0.45	—	V/°C	V_{GE} = 0V, I_C = 5.0mA	
$V_{CE(ON)}$	Collector-to-Emitter Saturation Voltage	—	1.67	2.0	V	I_C = 60A	V_{GE} = 15V
		—	1.95	—		I_C = 100A	See Fig.2, 5
		—	1.71	—		I_C = 60A , T_J = 150°C	
$V_{GE(th)}$	Gate Threshold Voltage	3.0	—	6.0		V_{CE} = V_{GE}, I_C = 250µA	
$\Delta V_{GE(th)}/\Delta T_J$	Temperature Coeff. of Threshold Voltage	—	-10	—	mV/°C	V_{CE} = V_{GE}, I_C = 1.0mA	
g_{fe}	Forward Transconductance ⑤	47	70	—	S	V_{CE} = 50V, I_C = 60A	
I_{CES}	Zero Gate Voltage Collector Current	—	—	500	µA	V_{GE} = 0V, V_{CE} = 600V	
		—	—	2.0		V_{GE} = 0V, V_{CE} = 10V, T_J = 25°C	
		—	—	5.0	mA	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)	—	340	520	nC	I_C = 60A	
Q_{ge}	Gate - Emitter Charge (turn-on)	—	44	66		V_{CC} = 400V	See Fig. 8
Q_{gc}	Gate - Collector Charge (turn-on)	—	160	240		V_{GE} = 15V	
$t_{d(on)}$	Turn-On Delay Time	—	34	—	ns		
t_r	Rise Time	—	50	—		T_J = 25°C	
$t_{d(off)}$	Turn-Off Delay Time	—	56	84		I_C = 60A, V_{CC} = 480V	
t_f	Fall Time	—	86	130		V_{GE} = 15V, R_G = 5.0Ω	
E_{on}	Turn-On Switching Loss	—	0.42	—	mJ	Energy losses include "tail"	
E_{off}	Turn-Off Switching Loss	—	1.99	—		See Fig. 10, 11, 13, 14	
E_{ts}	Total Switching Loss	—	2.41	3.2			
$t_{d(on)}$	Turn-On Delay Time	—	30	—	ns	T_J = 150°C,	
t_r	Rise Time	—	49	—		I_C = 60A, V_{CC} = 480V	
$t_{d(off)}$	Turn-Off Delay Time	—	129	—		V_{GE} = 15V, R_G = 5.0Ω	
t_f	Fall Time	—	175	—		Energy losses include "tail"	
E_{ts}	Total Switching Loss	—	4.5	—	mJ	See Fig. 13, 14	
L_E	Internal Emitter Inductance	—	13	—	nH	Measured 5mm from package	
C_{ies}	Input Capacitance	—	7500	—	pF	V_{GE} = 0V	
C_{oes}	Output Capacitance	—	720	—		V_{CC} = 30V	See Fig. 7
C_{res}	Reverse Transfer Capacitance	—	93	—		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 = 5.0Ω, (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.

⑥ Current limited by the package, (Die current = 100A)

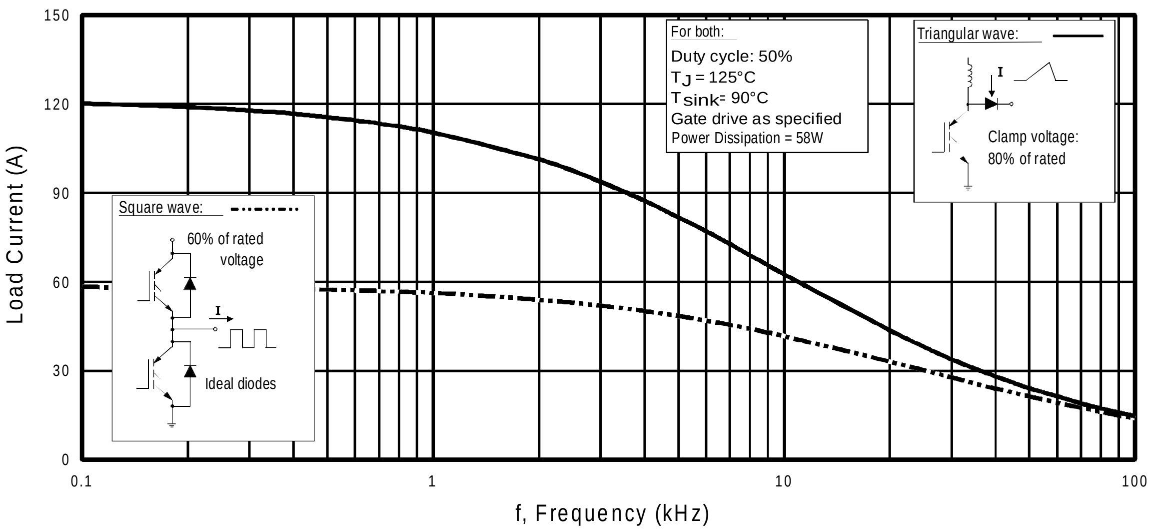


Fig. 1 - Typical Load Current vs. Frequency
(For square wave, $I = I_{RMS}$ of fundamental; for triangular wave, $I = I_{PK}$)

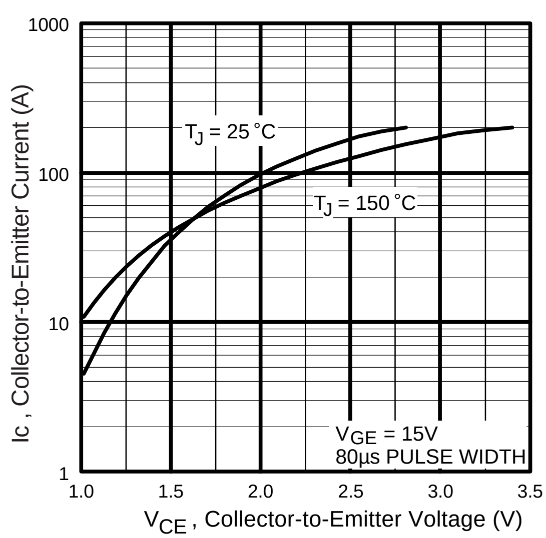


Fig. 2 - Typical Output Characteristics

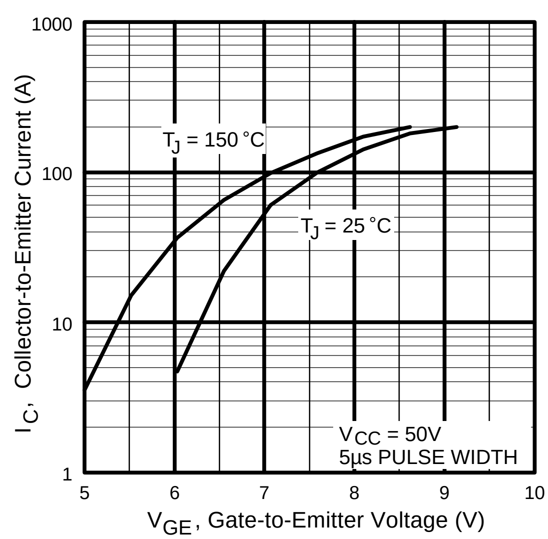


Fig. 3 - Typical Transfer Characteristics

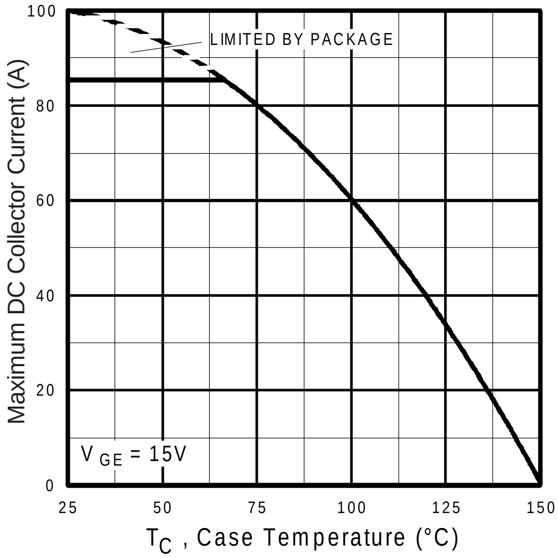


Fig. 4 - Maximum Collector Current vs. Case Temperature

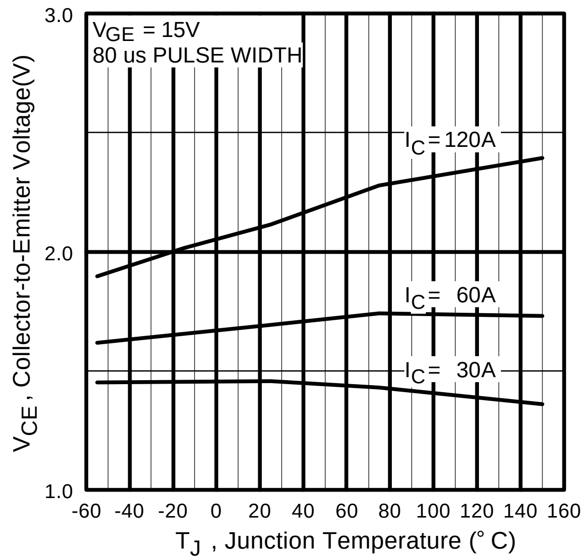


Fig. 5 - Collector-to-Emitter Voltage vs. Junction Temperature

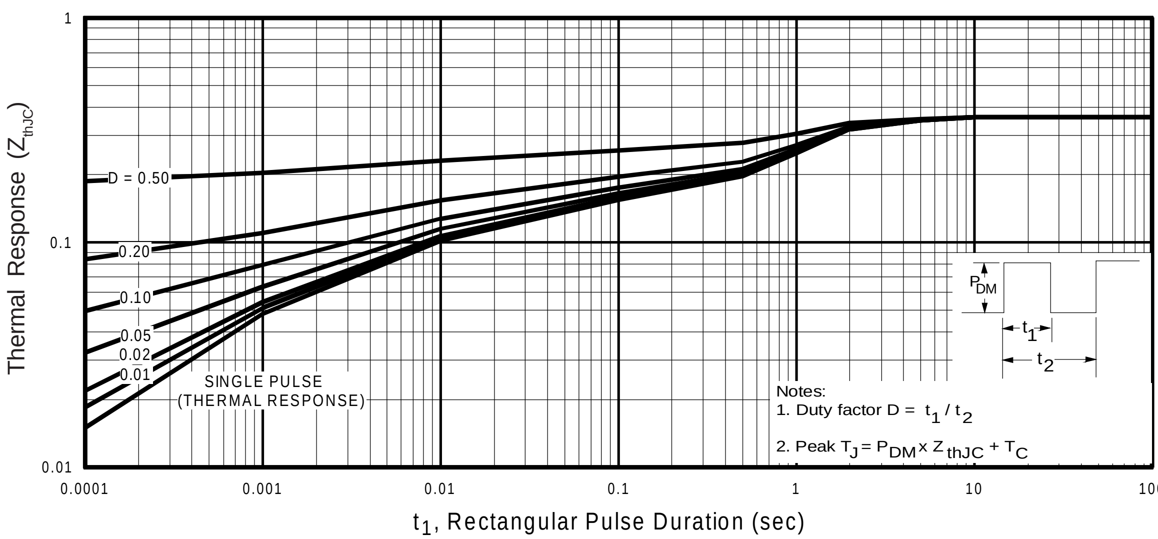


Fig. 6 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

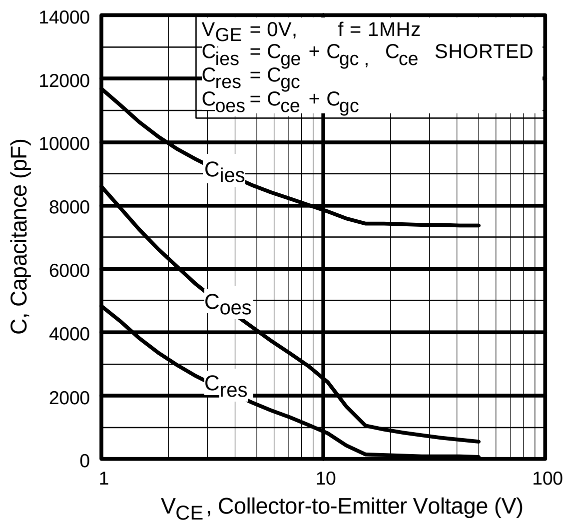


Fig. 7 - Typical Capacitance vs. Collector-to-Emitter Voltage

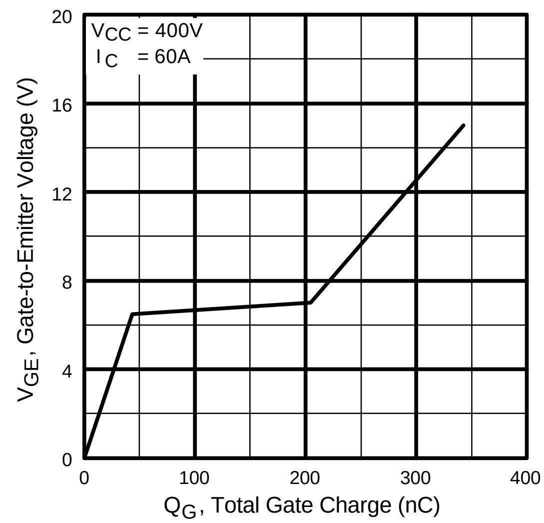


Fig. 8 - Typical Gate Charge vs. Gate-to-Emitter Voltage

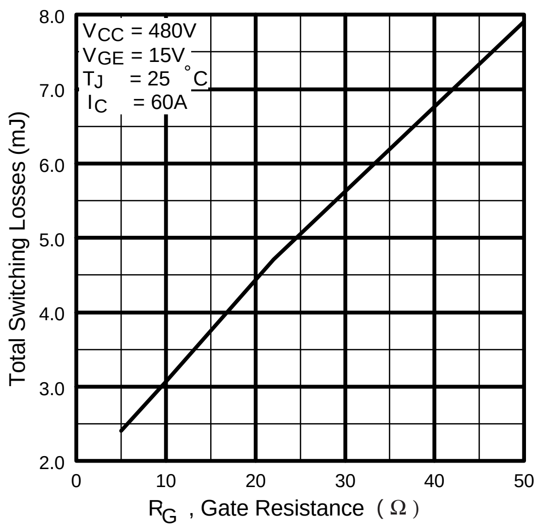


Fig. 9 - Typical Switching Losses vs. Gate Resistance

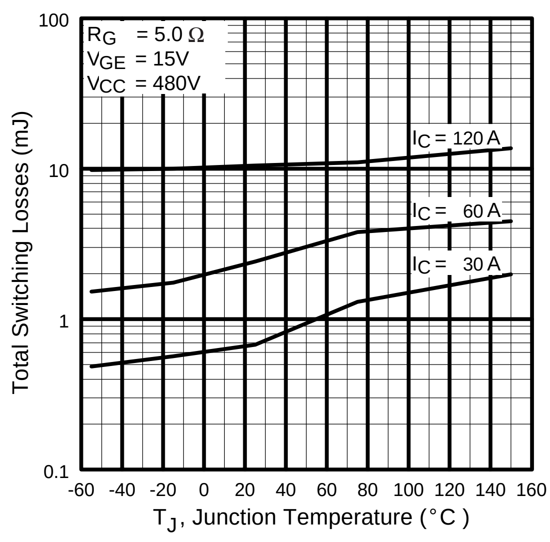


Fig. 10 - Typical Switching Losses vs. Junction Temperature

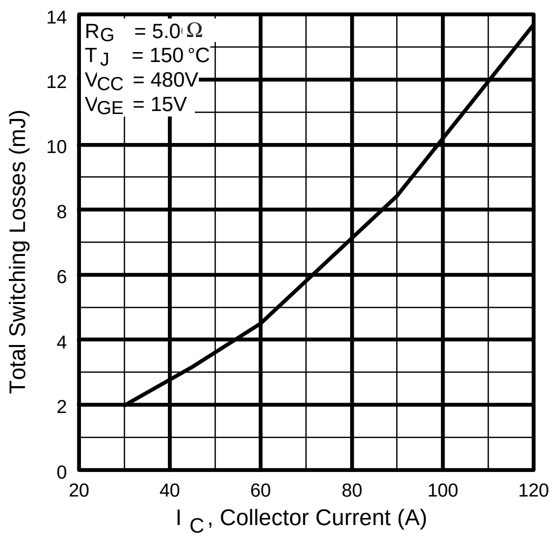


Fig. 11 - Typical Switching Losses vs. Collector-to-Emitter Current

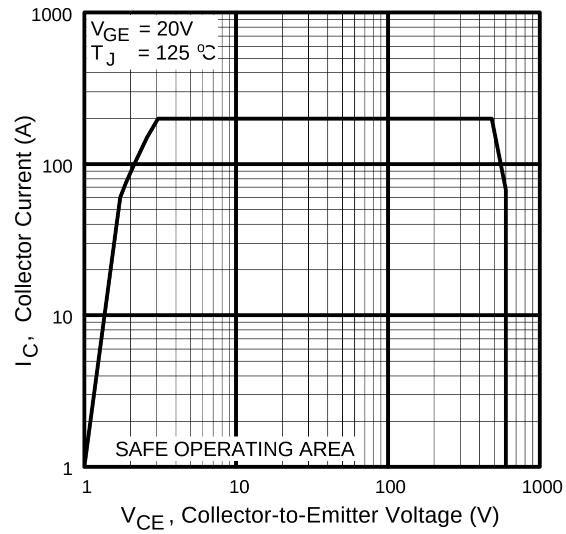
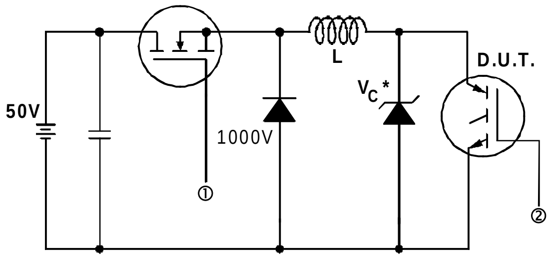


Fig. 12 - Turn-Off SOA



* Driver same type as D.U.T.; Vc = 80% of Vce(max)
* Note: Due to the 50V power supply, pulse width and inductor will increase to obtain rated Id.

Fig. 13a - Clamped Inductive Load Test Circuit

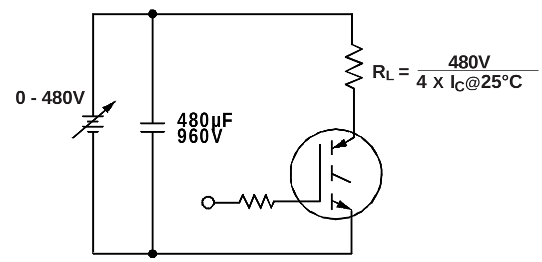


Fig. 13b - Pulsed Collector Current Test Circuit

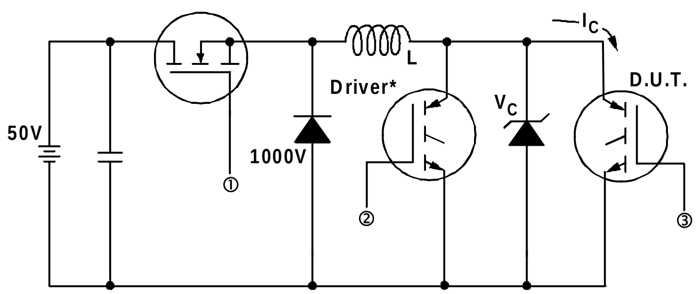


Fig. 14a - Switching Loss Test Circuit

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

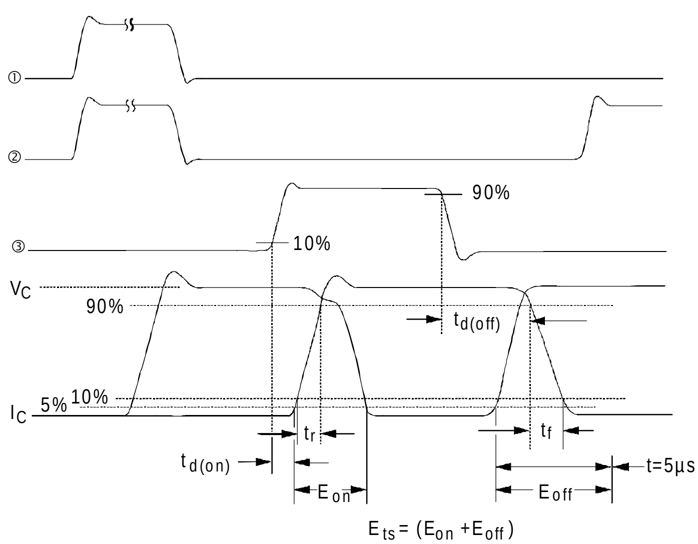
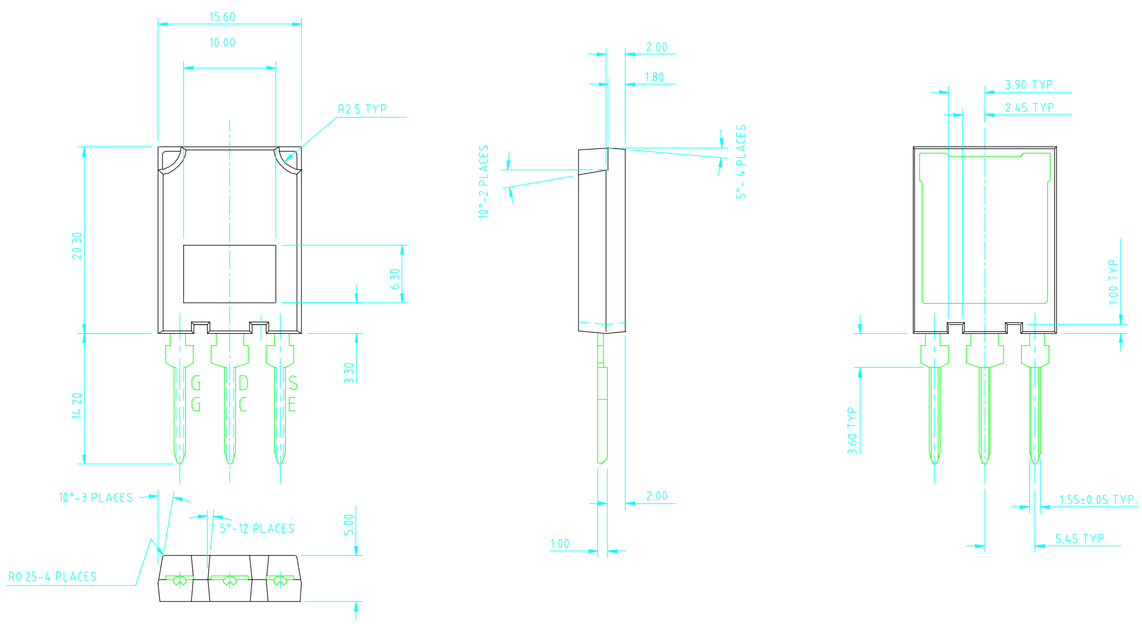


Fig. 14b - Switching Loss Waveforms

Case Outline and Dimensions — Super-247

Dimensions are shown in millimeters



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