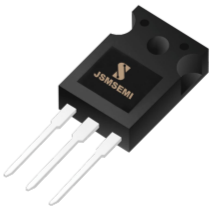
Features

- Positive temperature coefficient
- Fast Switching
- Low $V_{CE(sat)}$
- Reliable and Rugged
- Halogen Free and Green Devices Available (RoHS Compliant)



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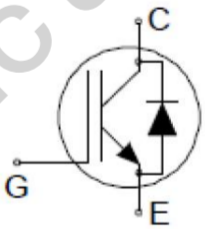
Applications

- Motor drives
- Solar Inverter
- Resonant converters



Package

Parameter	Values	Unit
V_{CES}	650	V
Ic	40	A
$V_{CE(sat)}$.typ	1.65	V

Absolute Maximum Ratings(T_C=25℃,unless otherwise noted)

Parameter	Symbol	Values	Unit	Note/Test Conditions
Collector-Emitter Voltage	V_{CES}	650	V	-
Gate-Emitter Voltage	V_{GES}	±30	V	-
Continuous Collector Current	I_c	80	A	T_C=25℃
		40	A	T_C=100℃
Pulsed Collector Current, tp limited by T_{jmax}	I_{CM}	160	A	-
Diode Continuous Forward Current	I_F	40	A	T_C=25℃
		20	A	T_C=100℃
Diode Maximum Forward Current, limited by T_{jmax}	I_{FM}	60	A	-
Short circuit collector current Max.1000 short circuits, times between short circuits: ≥ 1.0s	$t_{(SC)}$	8	μs	V_{GE}=15V, V_{CC}≤400V,T_j≤175°C
Operating Junction and Storage Temperature Range	T_{jmax},T_{STG}	-55 to 175	℃	-

Thermal Characteristics

Parameter	Symbol	Values			Unit	Note/Test Conditions
Junction-to-Case (IGBT)	$R_{\theta JC}$	-	0.66	-	℃/W	-
Junction-to-Case (Diode)	$R_{\theta JC}$	-	0.58	-		-
Junction-to-Ambient	$R_{\theta JA}$	-	40	-		-

Electrical Characteristics (T_j=25℃,unless otherwise noted)

Static characteristics

Parameter	Symbol	Values			Unit	Note/Test Conditions
		Min	Typ	Max		
Collector-Emitter Breakdown Voltage	V_{CES}	650	-	-	V	V_{GE}=0V,I_C=250μA
Gate Threshold Voltage	$V_{GE(TH)}$	4.3	5.3	6.3	V	V_{CE} = V_{GE},I_C = 1mA
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	-	1.65	1.95	V	V_{GE} =15V,I_C = 40A,T_j=25℃
		-	2.00	-		V_{GE} =15V,I_C = 40A,T_j=125℃
		-	2.15	-		V_{GE} =15V,I_C = 40A,T_j=175℃
Diode Forward Voltage	V_F	-	2.20	2.55	V	I_F=40A,T_j=25℃
		-	1.84	-		I_F=40A,T_j=125℃
		-	1.62	-		I_F=40A,T_j=175℃
Collector-Emitter Leakage Current	I_{CES}	-	-	10	μA	V_{CE}=650V, V_{GE}=0V
Gate-Emitter Forward Leakage Current	$I_{GES(F)}$	-	-	200	nA	V_{GE}=+20V
Gate-Emitter Reverse Leakage Current	$I_{GES(R)}$	-	-	-200	nA	V_{GE}= -20V

Dynamic characteristics

Parameter	Symbol	Values			Unit	Note/Test Conditions
		Min	Typ	Max		
Input Capacitance	C_{iss}	-	2540	-	pF	V_{CE}=25V,V_{GE}=0V,f=1.0MHZ
Output Capacitance	C_{oss}	-	126	-		
Reverse Transfer Capacitance	C_{rss}	-	67	-		
Gate Charge	Q_G	-	146	-	nC	V_{CC}=520V
Gate-emitter charge	Q_{GE}	-	24	-		I_C=40A
Gate-collector charge	Q_{GC}	-	71	-		V_{GE}=15V

IGBT Switching Characteristics

Parameter	Symbol	Values			Unit	Note/Test Conditions
		Min	Typ	Max		
Turn-on Delay Time	$t_{d(on)}$	-	20	-	ns	I_C=40A V_{CC} =400V V_{GE}=15V R_G=5Ω T_j=25°C Inductive Load
Rise Time	t_r	-	67	-		
Turn-Off Delay Time	$t_{d(off)}$	-	104	-		
Fall Time	t_f	-	74	-		
Turn-On Switching Loss	E_{on}	-	0.95	-	mJ	
Turn-Off Switching Loss	E_{off}	-	0.93	-		
Total Switching Loss	E_{ts}	-	1.88	-		
Turn-on Delay Time	$t_{d(on)}$	-	22	-	ns	I_C=40A V_{CC} =400V V_{GE}=15V R_G=5Ω T_j=175°C Inductive Load
Rise Time	t_r	-	73	-		
Turn-Off Delay Time	$t_{d(off)}$	-	178	-		
Fall Time	t_f	-	70	-		
Turn-On Switching Loss	E_{on}	-	1.82	-	mJ	
Turn-Off Switching Loss	E_{off}	-	1.16	-		
Total Switching Loss	E_{ts}	-	2.98	-		

Diode Characteristics

Parameter	Symbol	Values			Unit	Note/Test Conditions
		Min	Typ	Max		
Reverse Recovery Time	T_{rr}	-	188	-	ns	I_F=40A,
Reverse Recovery Charge	Q_{rr}	-	243	-	nC	di/dt=200A/μs,
Reverse Recovery Current	I_{rrm}	-	6.8	-	A	T_j=25°C
Reverse Recovery Time	T_{rr}	-	215	-	ns	I_F=40A,
Reverse Recovery Charge	Q_{rr}	-	278	-	nC	di/dt=200A/μs,
Reverse Recovery Current	I_{rrm}	-	9.7	-	A	T_j=175°C

Characteristics Curves

Figure.1 Power Dissipation

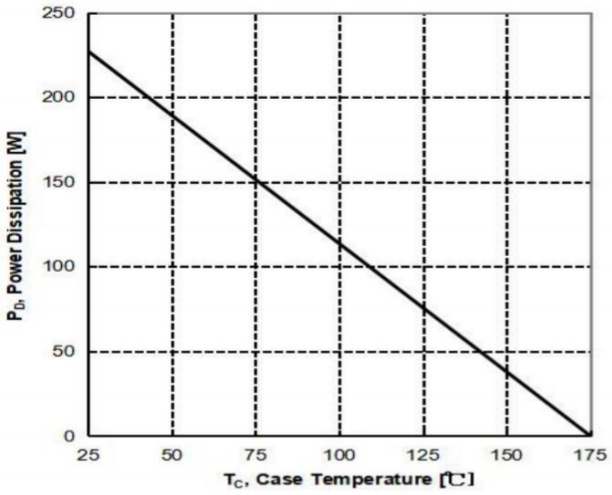


Figure.2 : Collector Current vs. Case Temperature

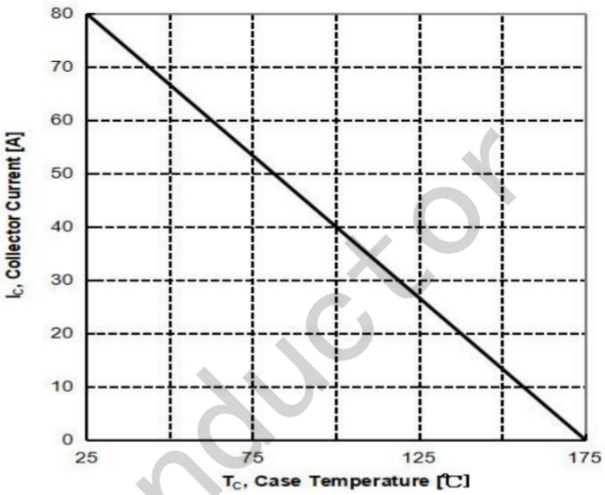


Figure.3 Safe Operation Area

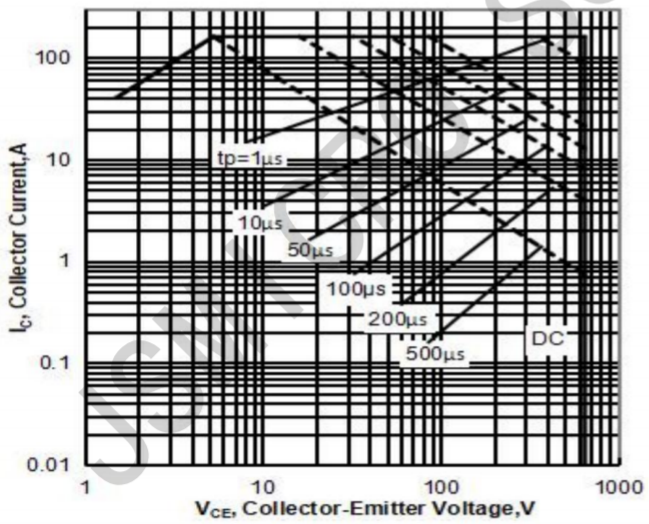


Figure.4 Typical Transfer Characteristics

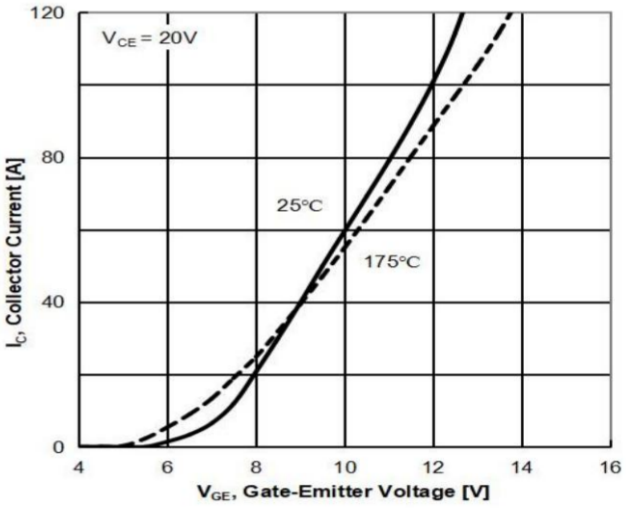


Figure.5 Typical Output Characteristics

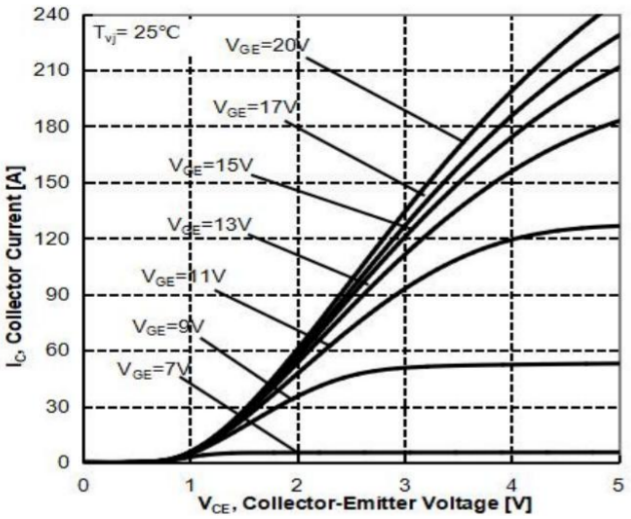


Figure.6 Typical Output Characteristics

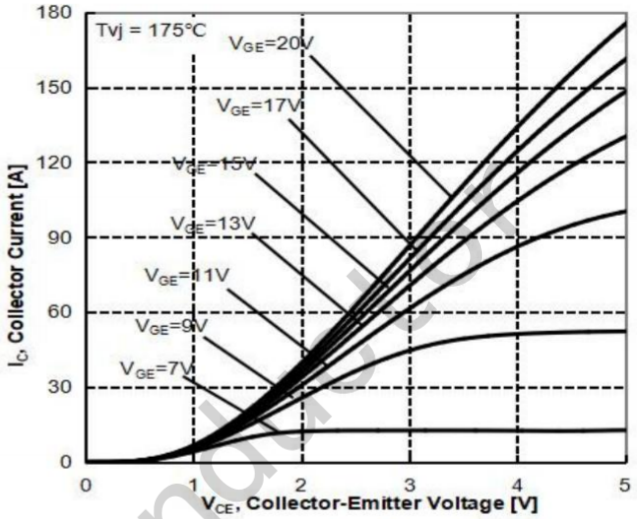


Figure.7 Typical Collector-Emitter Saturation Voltage vs. Junction Temperature

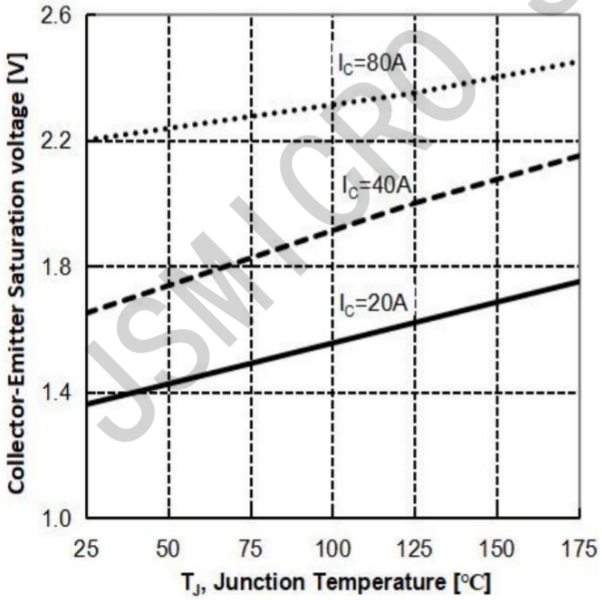


Figure.8 Typical Gate-Emitter Threshold Voltage vs. Junction Temperature

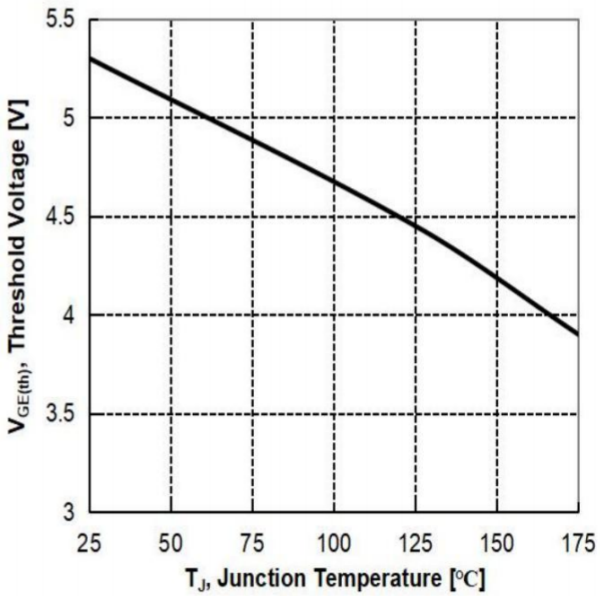


Figure.9 Typical Switching Times vs. Gate Resistor (T_j=25℃, V_{CE}=400V, V_{GE}=15/0V, I_C=40A)

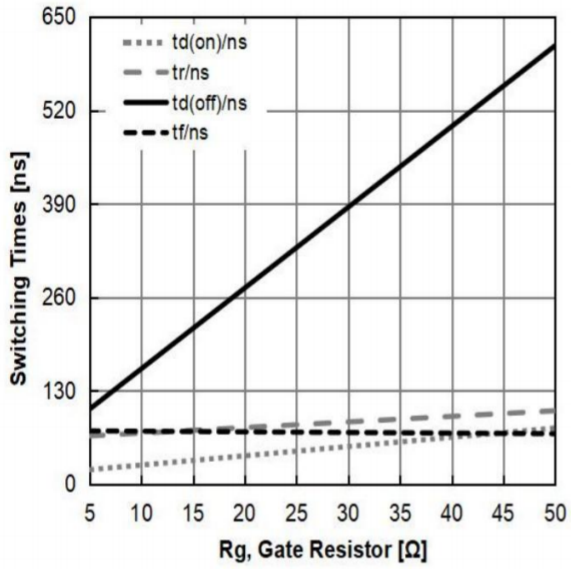


Figure.10 Typical Switching Energy vs. Gate Resistor (T_j=25℃, V_{CE}=400V, V_{GE}=15/0V, I_C=40A)

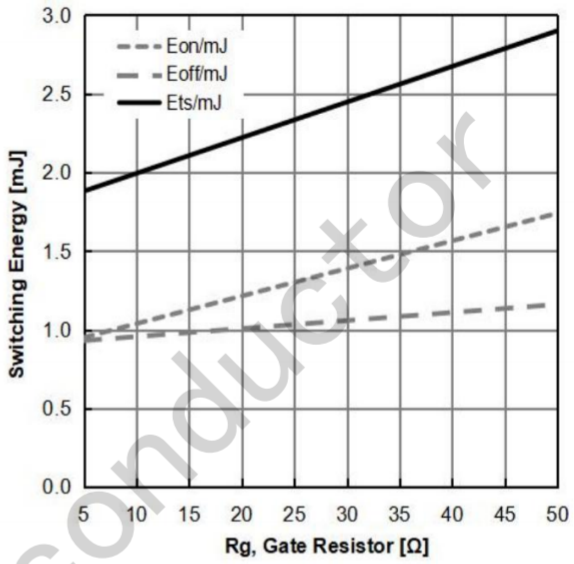


Figure.11 Typical Switching Times vs. Junction Temperature (V_{CE}=400V, V_{GE}=15/0V, I_C=40A)

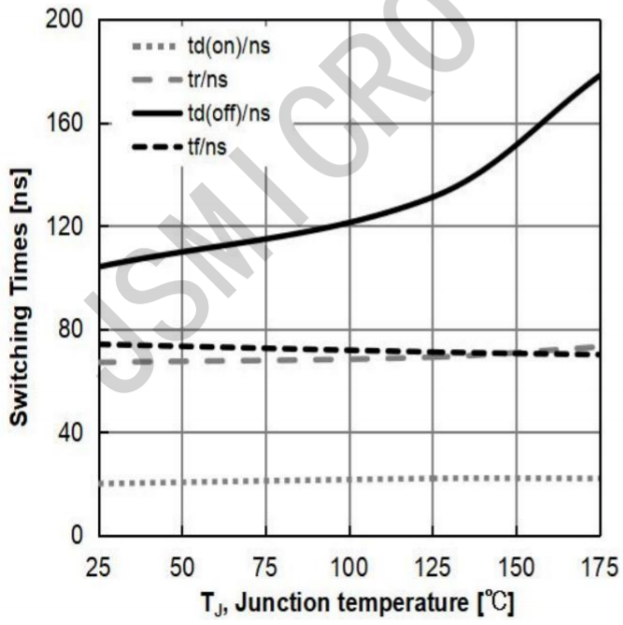


Figure.12 Typical Switching Energy vs. Junction Temperature (V_{CE}=400V, V_{GE}=15/0V, I_C=40A)

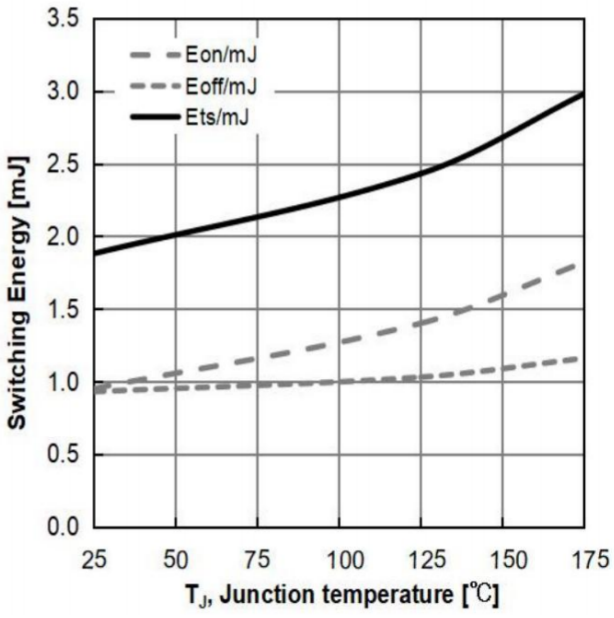


Figure.13 Typical Switching Times vs. Collector Current (T_j=25℃, V_{CE}=400V, V_{GE}=15/0V)

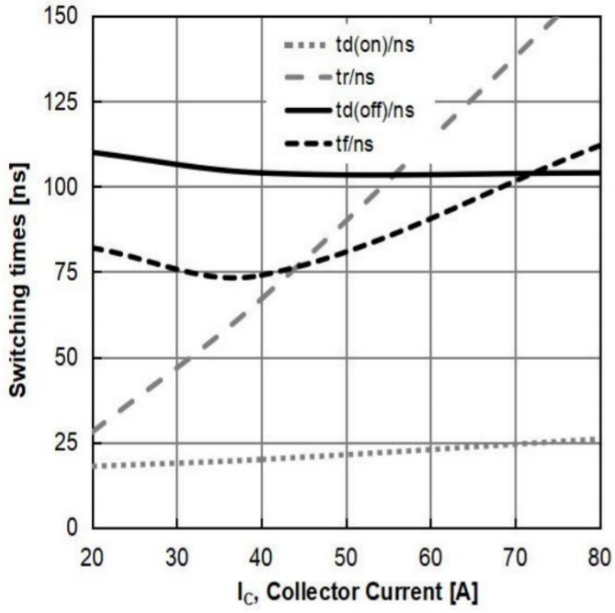


Figure.14 Typical Switching Energy vs. Collector Current (T_j=25℃, V_{CE}=400V, V_{GE}=15/0V)

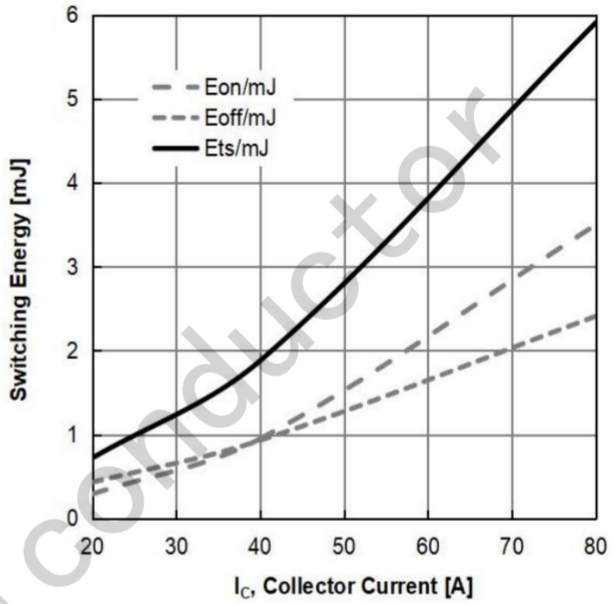


Figure.15 Typical Switching Times vs. V_{CE} (T_j=25℃, V_{GE}=15/0V, I_C=40A)

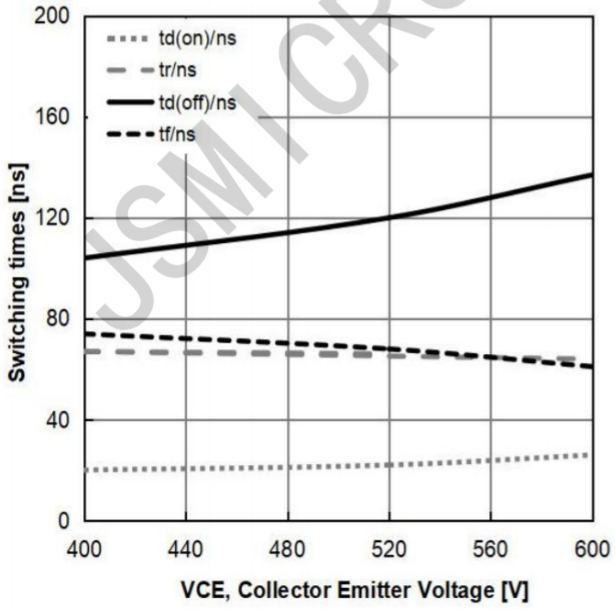


Figure.16 Typical Switching Energy vs. V_{CE} (T_j=25℃, V_{GE}=15/0V, I_C=40A)

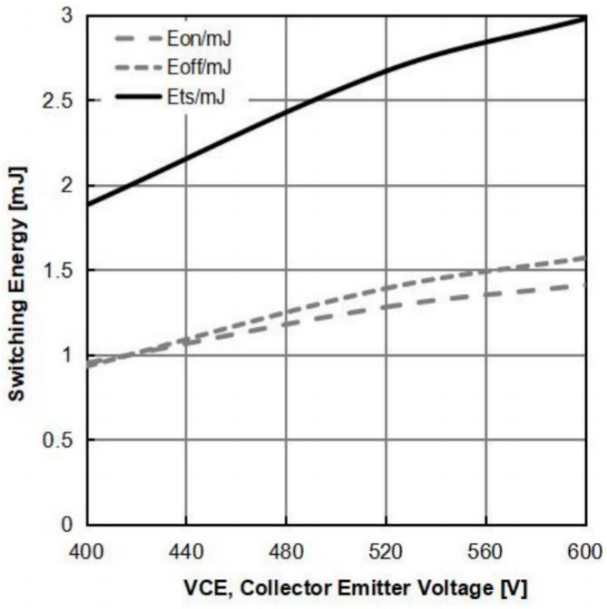


Figure.17 Typical Gate Charge

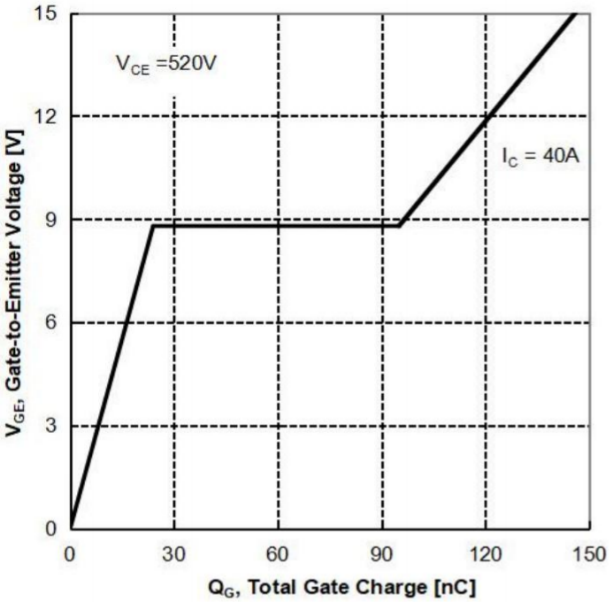


Figure.18 Typical Capacitance vs. Collector- Emitter Voltage

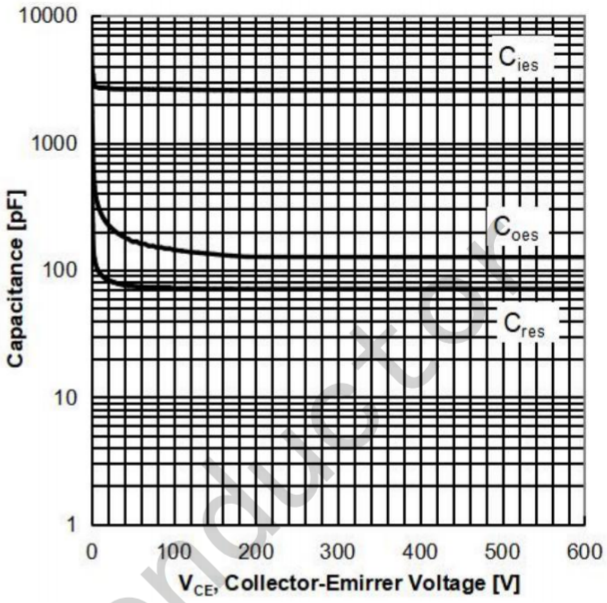


Figure.19 IGBT Transient Thermal Impedance vs. Pulse Width

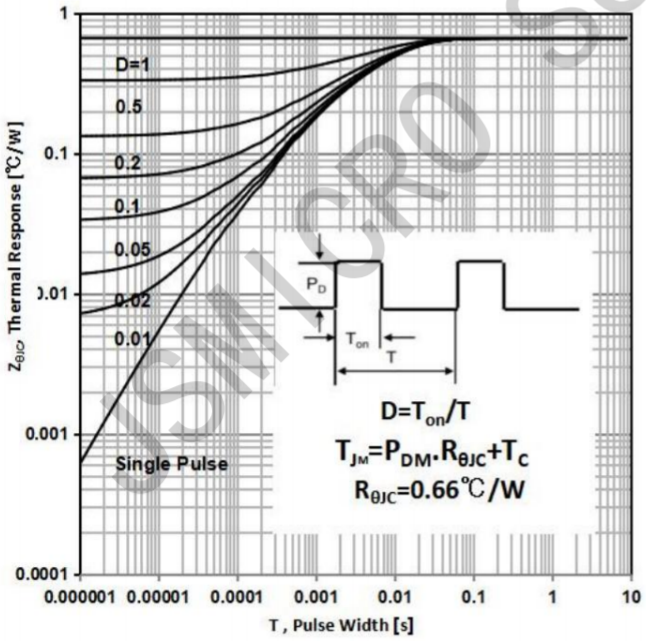


Figure.20 Diode Transient Thermal Impedance vs. Pulse Width

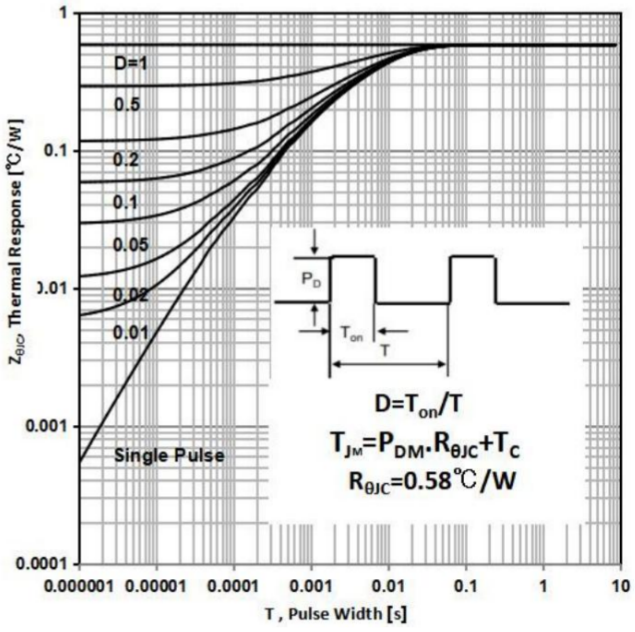
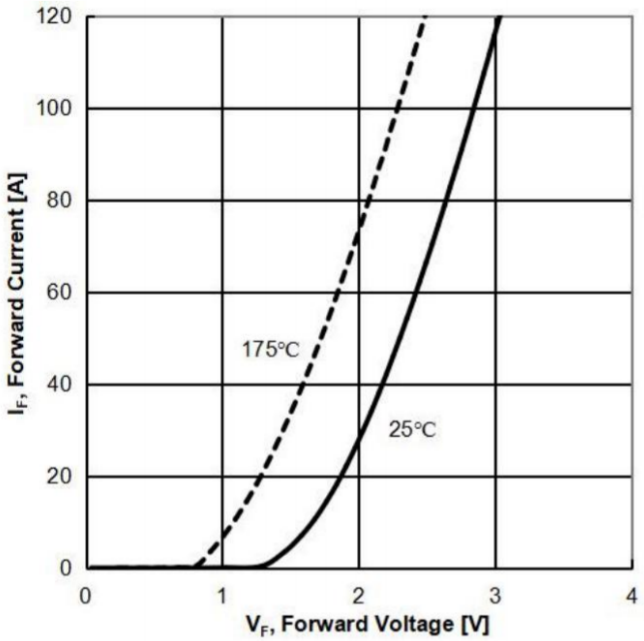


Figure.21 Typical Diode Forward Current vs. Forward Voltage



Test Circuit and Waveform

Figure.1 Inductive Switching Test Circuit

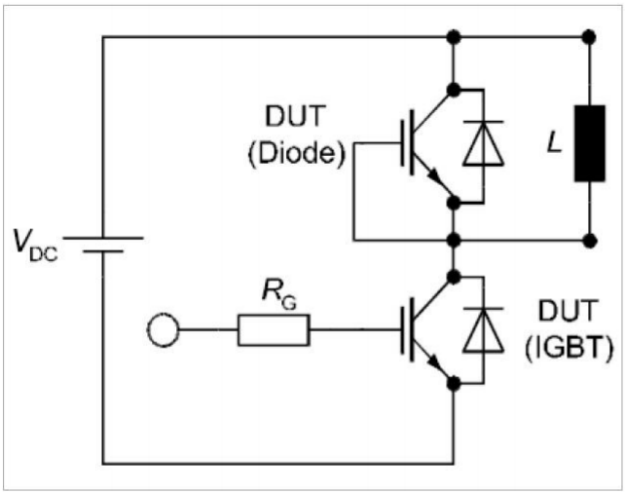


Figure.2 Definition of switching times

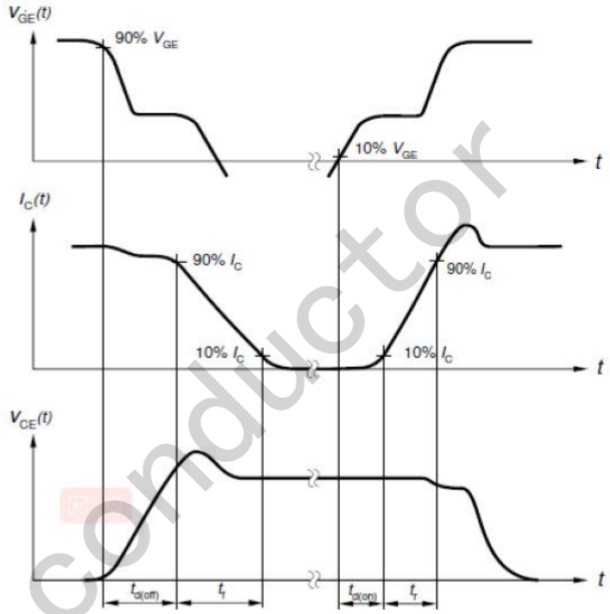


Figure.3 Definition of switching losses

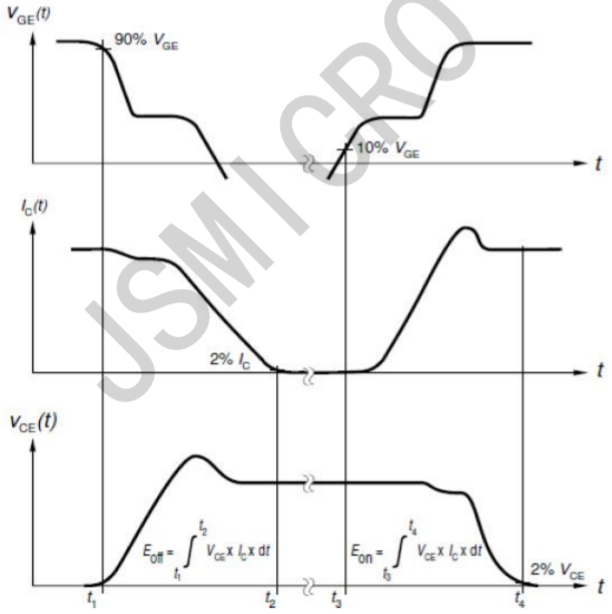
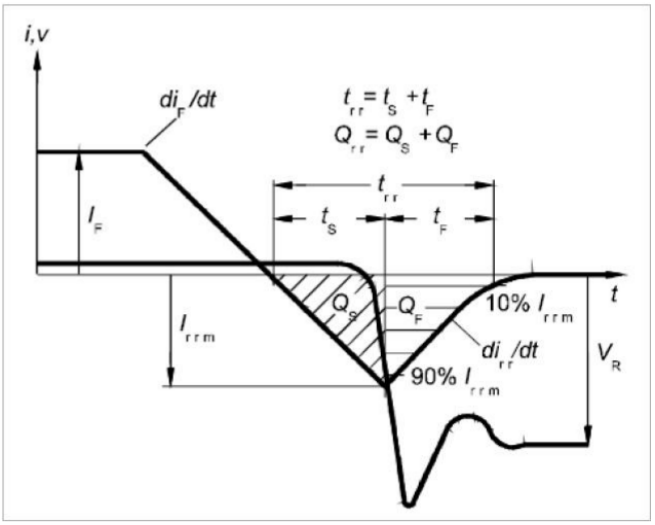
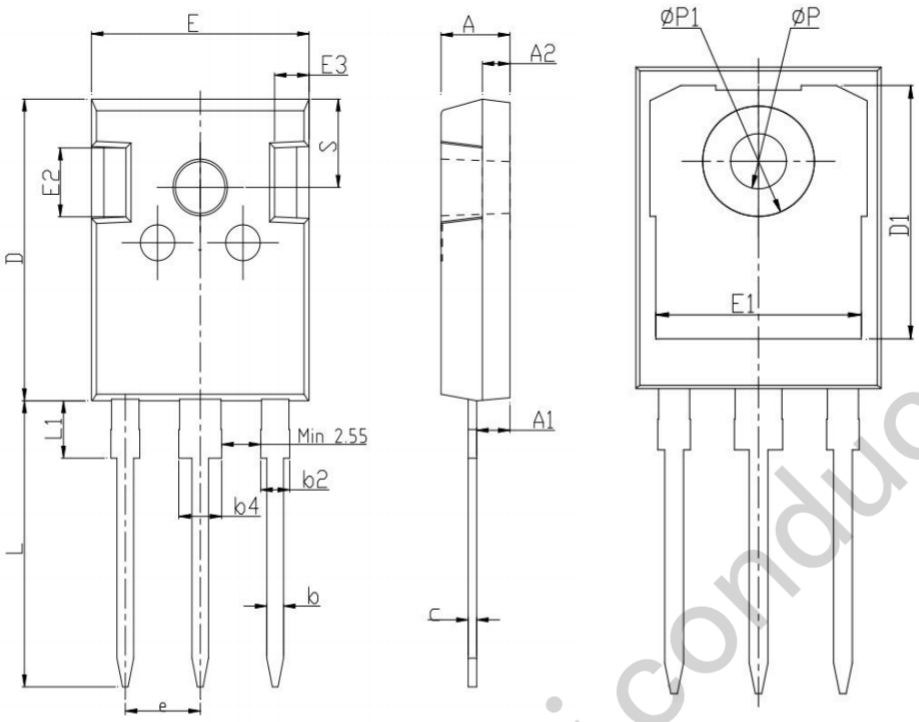


Figure.4 Definition of diode switching characteristics



Package Outline:TO-247-3L



SYMBOL	mm		
	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.21	2.41	2.59
A2	1.85	2.00	2.15
b	1.11	1.21	1.36
b2	1.91	2.01	2.21
b4	2.91	3.01	3.21
c	0.51	0.61	0.75
D	20.70	21.00	21.30
D1	16.25	16.55	16.85
E	15.50	15.80	16.10
E1	13.00	13.30	13.60
E2	4.80	5.00	5.20
E3	2.30	2.50	2.70
e	5.44 BSC		
L	19.62	19.92	20.22
L1	-	-	4.30
ØP	3.40	3.60	3.80
ØP1	-	-	7.30
S	6.15 BSC		