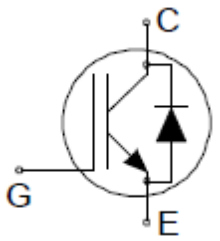
迈诺斯科技

MLG60N60FUK

Description

MLG60N60FUK is obtained by advanced Trench Field Stop (T-FS) technology which is characteristic with low VCE(sat) , optimized switching performance and low gate charge Qg. The IGBT is suitable device for Photovoltaic, UPS, Boost and high switching frequency applications.



TO-3PN TO-247 TO-3PF

KEY CHARACTERISTICS

Parameter	Value	Unit
V_{CES}	600	V
I_C	60	A
$V_{CE(sat).typ}$	1.7	V

FEATURES

① Fast Switching
② Low $V_{CE(sat)}$
③ Positive temperature coefficient
④ Fast recovery anti-parallel diode
⑤ RoHS product

APPLICATIONS

① Photovoltaic converters
② UPS
③ Boost

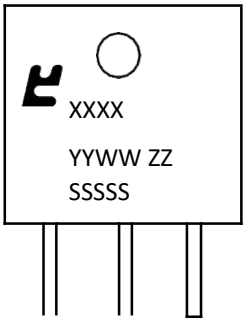
ORDERING INFORMATION

Device Marking	Ordering Codes	Package	Product Code	Packing
60N60FUK	MLG60N60FUK-F	TO-247	G60N60FUK	Tube
	MLG60N60FUK-K	TO-3PF	G60N60FUK	Tube
	MLG60N60FUK-W	TO-3PN	G60N60FUK	Tube

MLG60N60FUK-F/K/W

(2) Package type
(1) Chip name

(1) MLG60N60FUK: 600V 60A
(2) F:TO-247
K:TO-3PF
W:TO-3PN



XXXX：Product Code

YYWW：Year & Week

ZZ：Assembly Code

SSSSS：Lot Code

迈诺斯科技

MLG60N60FUK

ABSOLUTE RATINGS

Symbol	Parameter	TO-3PN/TO- 247	TO-3PF	Units
V_{CES}	Collector-Emitter Voltage	600	600	V
I_C	Collector Current @TC=25°C	120	120	A
	Collector Current @TC=100°C	60	60	A
I_{CM}	Pulsed Collector Current, tp limited by TJmax	240	240	A
I_F	Diode Continuous Forward Current @TC=25°C	120	120	A
	Diode Continuous Forward Current @TC=100°C	60	60	A
I_{FM}	Diode Maximum Forward Current, limited by TJmax	240	240	A
V_{GES}	Gate-Emitter Voltage	±30	±30	V
t_{SC}	Short circuit withstand time VGE=15V, VCC≤400V, Allowed number of short circuits<1000,Times between short circuits: ≥ 1.0s,TJ ≤ 175°C	5		μs
P_D	Power Dissipation @TC=25°C	375	62.5	W
T_{Jmax}, T_{stg}	Operating Junction and Storage Temperature Range	175, –55 to 175		℃
T_L	Maximum Temperature for Soldering	260		℃

Thermal characteristics

Symbol	Parameter	TO-3PN/TO-247	TO-3PF	Units
$R_{\theta JC}$	Junction-to-Case (IGBT)	0.4	2.4	℃/W
$R_{\theta JC}$	Junction-to-Case (Diode)	0.75	1.88	℃/W
$R_{\theta JA}$	Junction-to-Ambient	40	40	℃/W

Electrical Characteristics

at TC = 25°C, unless otherwise specified

Static Characteristics

Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
V_{CES}	Collector-Emitter Breakdown Voltage	V_{GE} = 0V, I_C = 250μA	650	--	--	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	V_{GE} = 15V,I_C = 60A T_J=25℃ T_J=125℃ T_J=175℃	 -- -- --	 1.70 2.10 2.30	 2.10 -- --	V

$V_{GE(TH)}$	Gate Threshold Voltage	V_{CE} = V_{GE},I_C = 1mA	4.7	5.5	6.2	V
V_F	Diode Forward Voltage	I_F=60A T_J=25℃ T_J=125℃ T_J=175℃	-- -- --	2.30 2.00 1.85	3.00 -- --	V
I_{CES}	Collector-Emitter Leakage Current	V_{CE} = 600V, V_{GE} = 0V	--	--	25	μA
$I_{GES(F)}$	Gate-Emitter Forward Leakage Current	V_{GE} = +30V	--	--	200	nA
$I_{GES(R)}$	Gate-Emitter Reverse Leakage Current	V_{GE} = -30V	--	--	-200	nA
Pulse width tp≤300μs, δ≤2%						

Dynamic Characteristics

Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
C_{iss}	Input Capacitance	V_{GE}=0V V_{CE}=25V f =1.0MHz	--	3036	--	pF
C_{oss}	Output Capacitance		--	122	--	
C_{rss}	Reverse Transfer Capacitance		--	31	--	
Q_G	Gate charge	V_{CC}=520V I_{CE}=60A V_{GE}=15V	--	137	--	nC
Q_{GC}	Gate-emitter charge		--	65	--	
Q_{GE}	Gate-collector charge		--	30	--	
$I_{C(SC)}$	Short circuit collector current Max.1000 short circuits, Times between short circuits:	V_{GE}=15.0V,V_{CC}≤400V， t_{SC}≤5us，T_J≤175℃		250		A

IGBT Switching Characteristics, at TJ=25℃

Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
$t_{d(on)}$	Turn-on Delay Time	I_C =60A V_{CE} = 400V V_{GE} = 15V R_G =5Ω T_J=25°C Inductive Load	--	37	--	ns
t_r	Rise Time		--	41	--	
$t_{d(off)}$	Turn-Off Delay Time		--	130	--	
t_f	Fall Time		--	26	--	
E_{on}	Turn-On Switching Loss		--	1.39	--	mJ
E_{off}	Turn-Off Switching Loss		--	1.06	--	
E_{ts}	Total Switching Loss		--	2.45	--	

IGBT Switching Characteristics, at TJ=175℃

Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
$t_{d(on)}$	Turn-on Delay Time	I_C =60A V_{CE} = 400V V_{GE} = 15V R_G =5Ω T_J=175°C Inductive Load	--	36	--	ns
t_r	Rise Time		--	44	--	
$t_{d(off)}$	Turn-Off Delay Time		--	147	--	
t_f	Fall Time		--	63	--	
E_{on}	Turn-On Switching Loss		--	1.5	--	mJ
E_{off}	Turn-Off Switching Loss		--	1.3	--	
E_{ts}	Total Switching Loss		--	2.8	--	

Diode Characteristics, at TJ=25℃

Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
T_{rr}	Reverse Recovery Time	I_F=30A, di/dt=200A/μs, T_J=25°C	--	52	--	ns
Q_{rr}	Reverse Recovery Charge		--	62	--	nC
I_{rrm}	Reverse Recovery Current		--	3.07	--	A
T_{rr}	Reverse Recovery Time	I_F=60A, di/dt=200A/μs, T_J=25°C	--	69	--	ns
Q_{rr}	Reverse Recovery Charge		--	76	--	nC
I_{rrm}	Reverse Recovery Current		--	3.64	--	A

Diode Characteristics, at TJ=175℃

Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
T_{rr}	Reverse Recovery Time	I_F=30A, di/dt=200A/μs, T_J=175°C	--	154	--	ns
Q_{rr}	Reverse Recovery Charge		--	655	--	nC
I_{rrm}	Reverse Recovery Current		--	7.72	--	A
T_{rr}	Reverse Recovery Time	I_F=60A, di/dt=200A/μs, T_J=175°C	--	175	--	ns
Q_{rr}	Reverse Recovery Charge		--	670	--	nC
I_{rrm}	Reverse Recovery Current		--	7.96	--	A

Characteristics Curves

Figure 1. Forward Bias Safe Operating Area for TO247/TO3PN

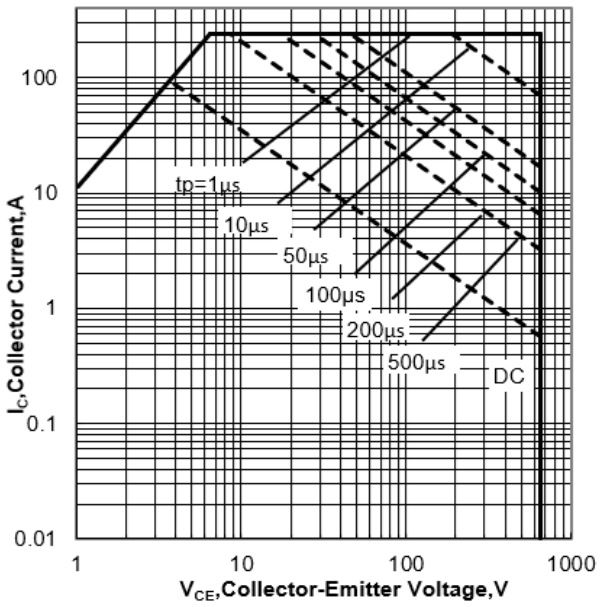


Figure 2. Forward Bias Safe Operating Area for TO3PF

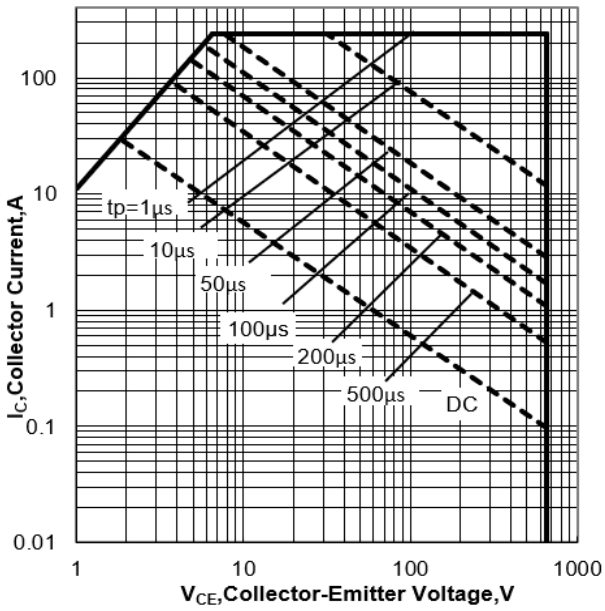


Figure 3. Power Dissipation vs Case Temperature for TO247/TO3PN

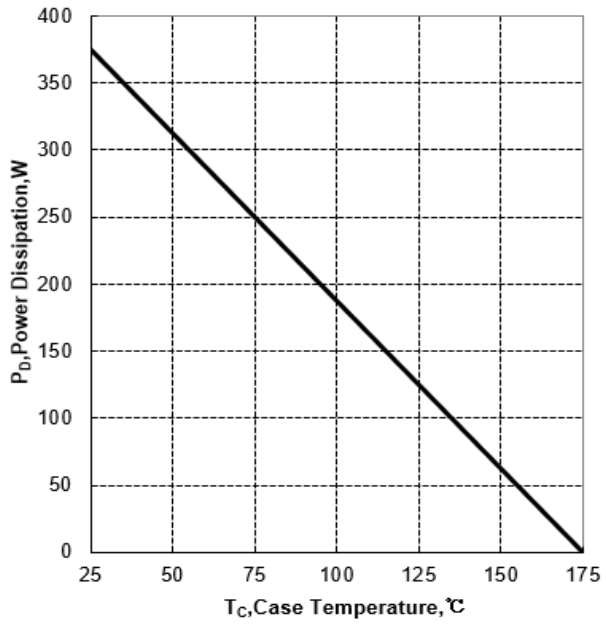


Figure 4. Power Dissipation vs Case Temperature for TO3PF

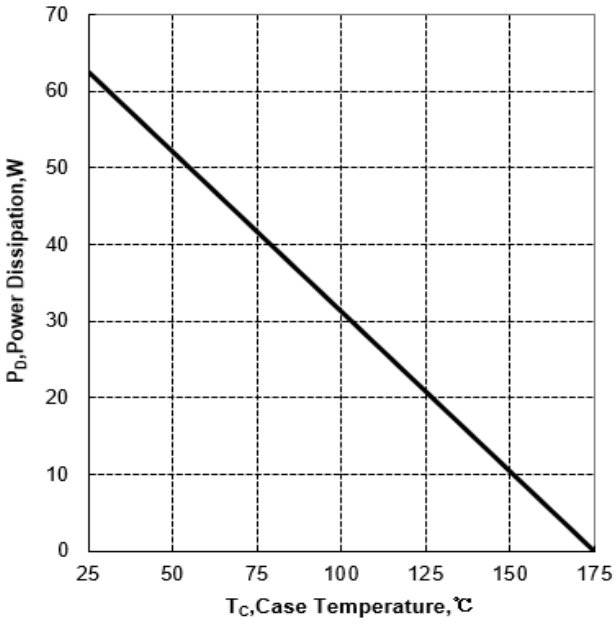


Figure 5. Collector Current vs Case Temperature for TO247/TO3PN

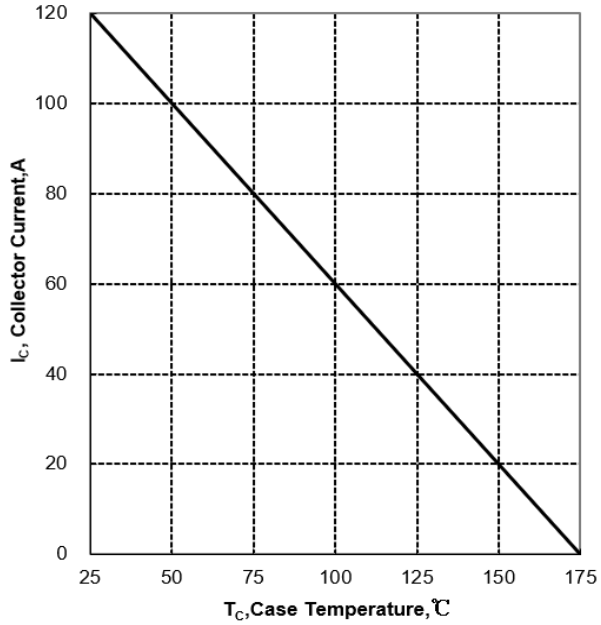


Figure 6. Collector Current vs Case Temperature for TO3PF

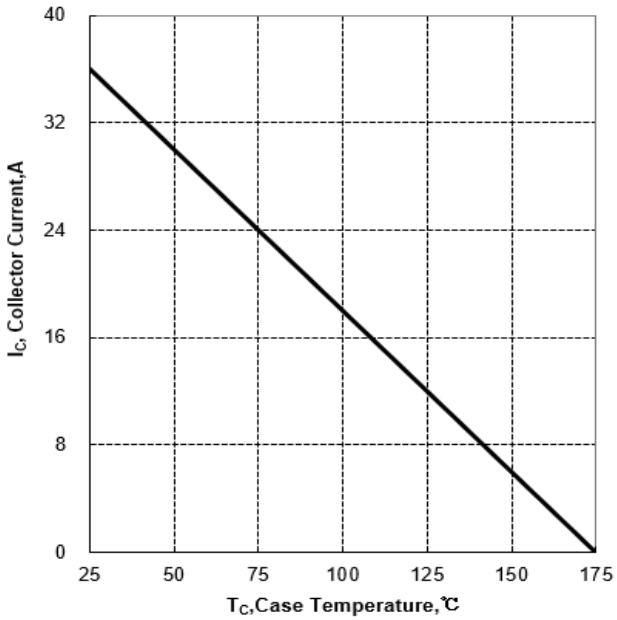


Figure 7. Typical Output Characteristics (TJ=25℃)

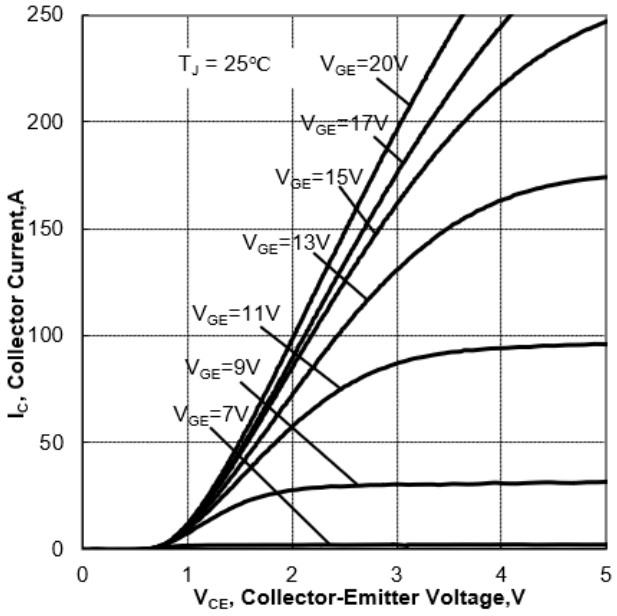


Figure 8. Typical Output Characteristics (TJ=175℃)

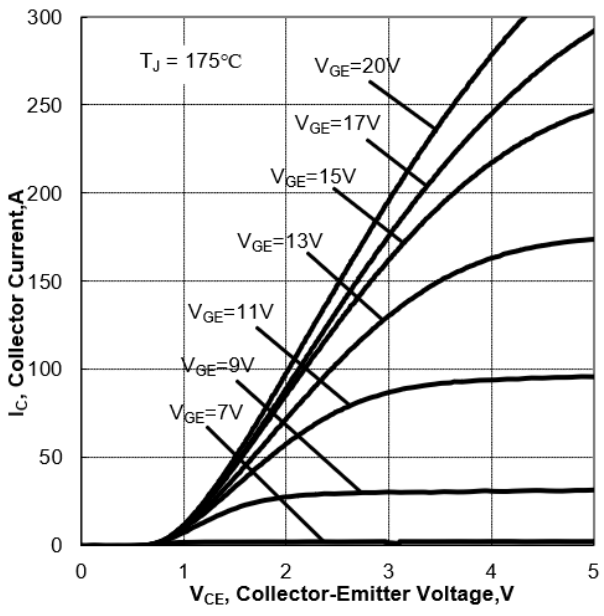


Figure 9. Typical Transfer Characteristics

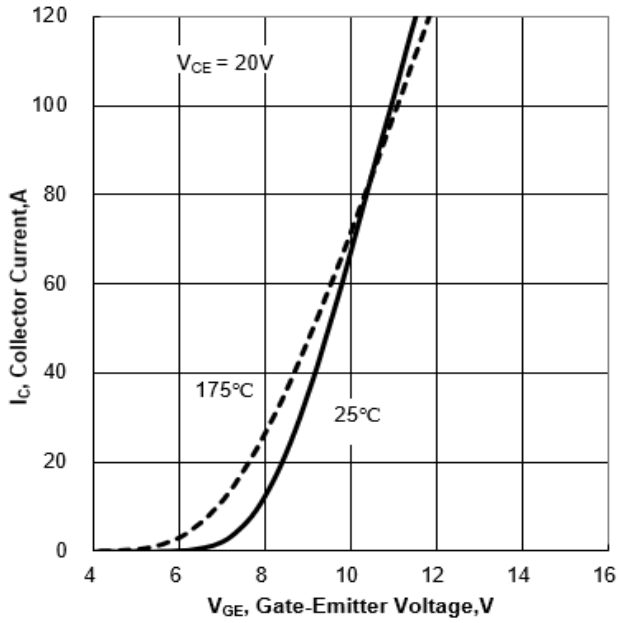


Figure 10. Typical Gate-Emitter Threshold Voltage vs Junction Temperature

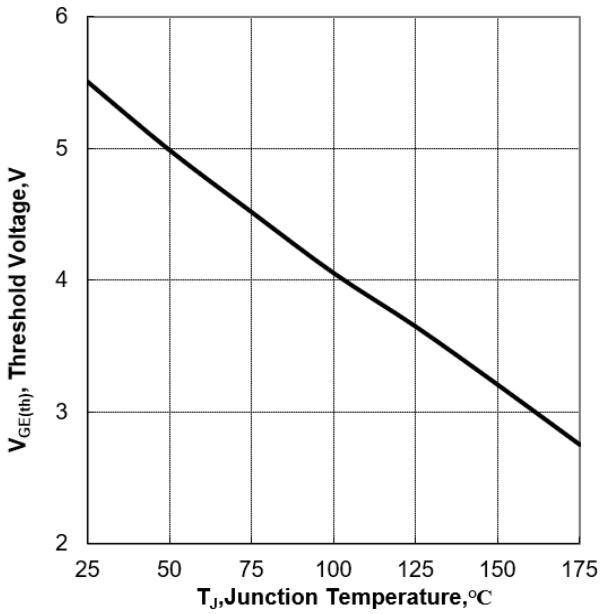


Figure 11. Typical Collector-Emitter Saturation Voltage vs Junction Temperature

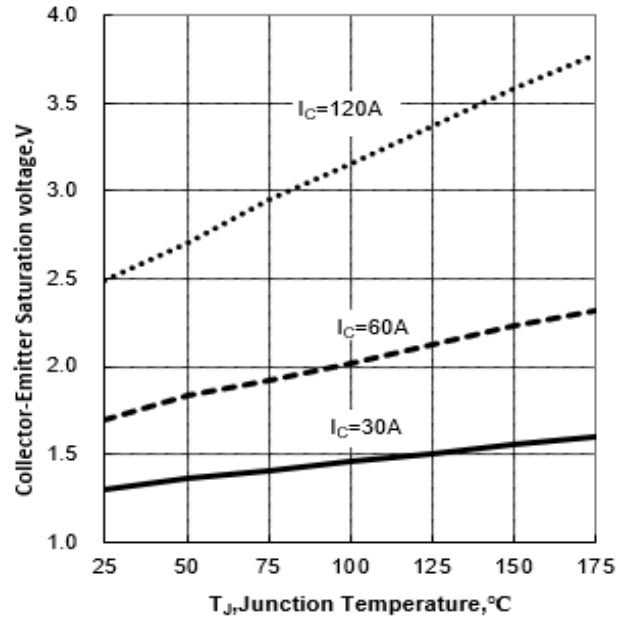


Figure 12. Typical Diode Forward Current vs Forward Voltage

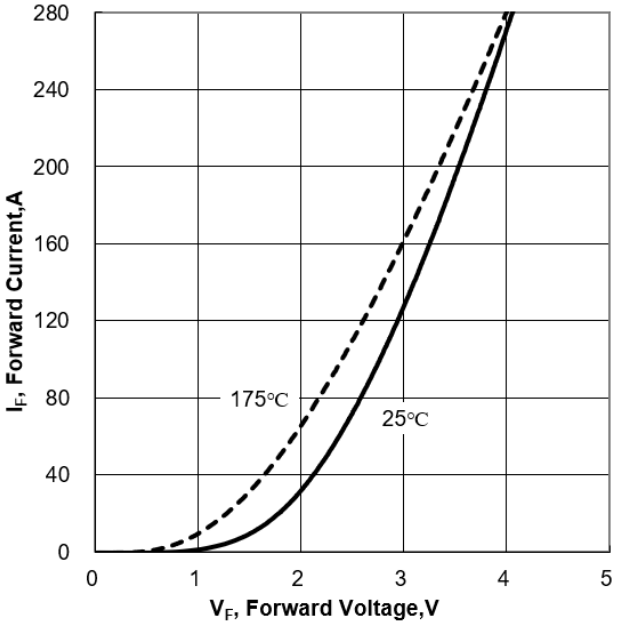


Figure 13. Typical Switching Times vs Gate Resistor (TJ=25℃, VCE=400V, VGE=15/0V, IC=60A)

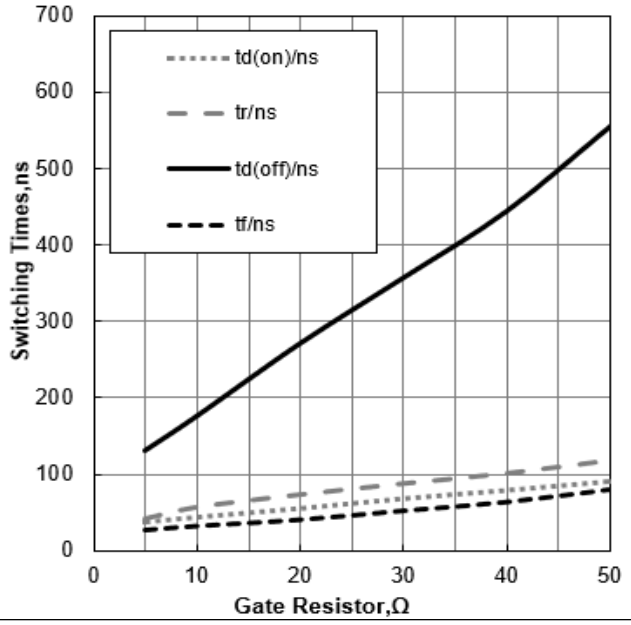


Figure 14. Typical Switching Energy vs Gate Resistor (TJ=25℃, VCE=400V, VGE=15/0V, IC=60A)

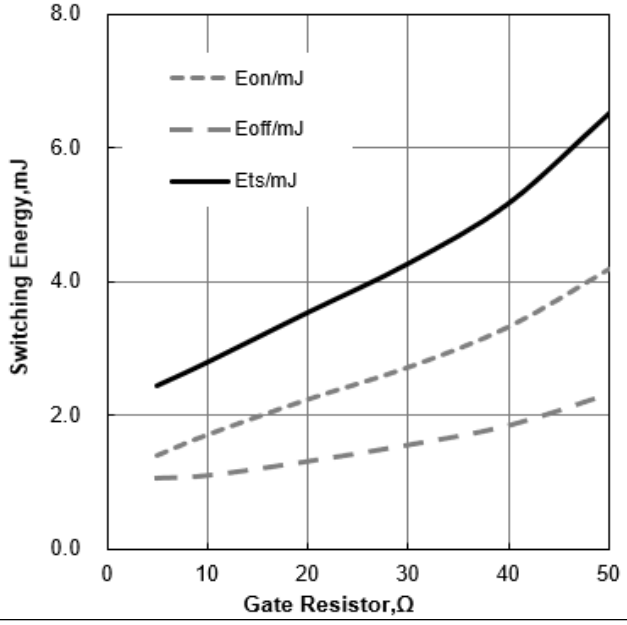


Figure 15. Typical Switching Times vs Junction Temperature (VCE=400V, VGE=15/0V, IC=60A)

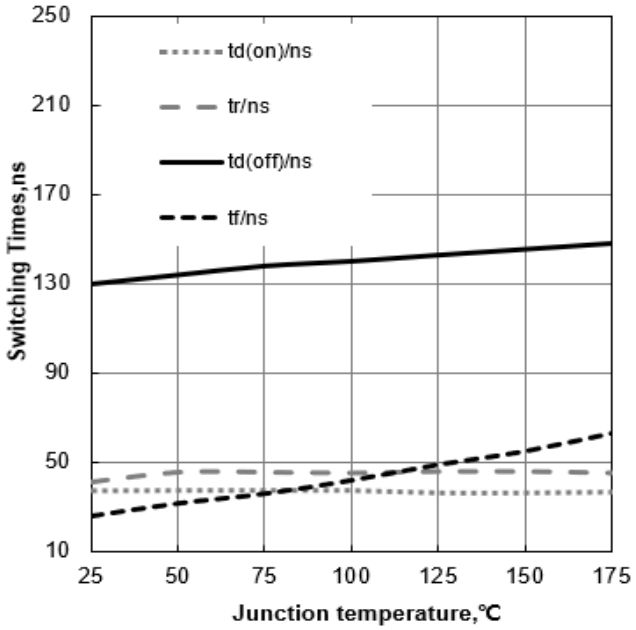


Figure 16. Typical Switching Energy vs Junction Temperature (VCE=400V, VGE=15/0V, IC=60A)

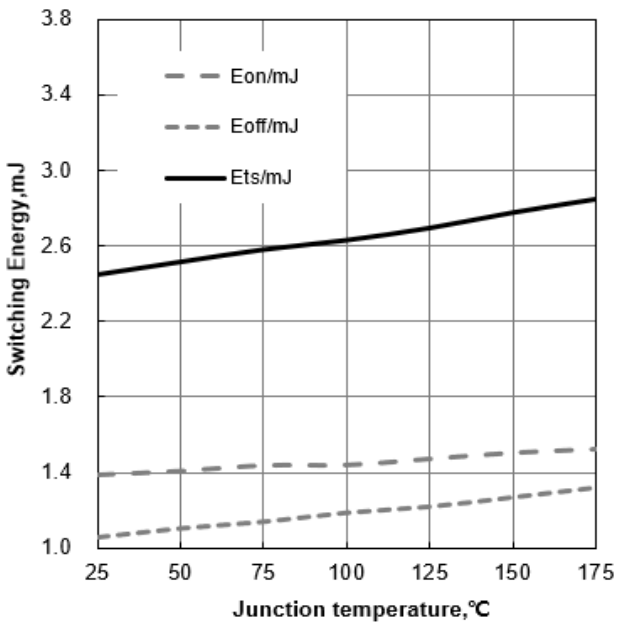


Figure 17. Typical Switching Times vs Collector Current (TJ=25℃, VCE=400V, VGE=15/0V)

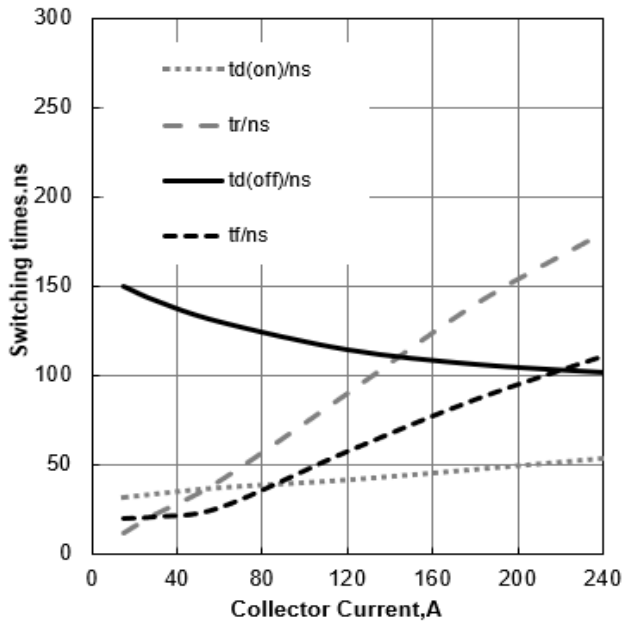


Figure 18. Typical Switching Energy vs Collector Current (TJ=25℃, VCE=400V, VGE=15/0V)

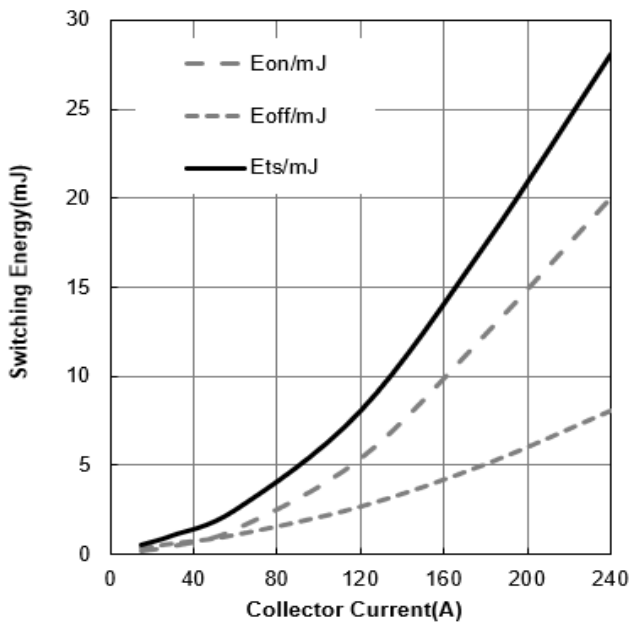


Figure 19. Typical Switching Times vs VCE (TJ=25℃,VGE=15/0V, IC=60A)

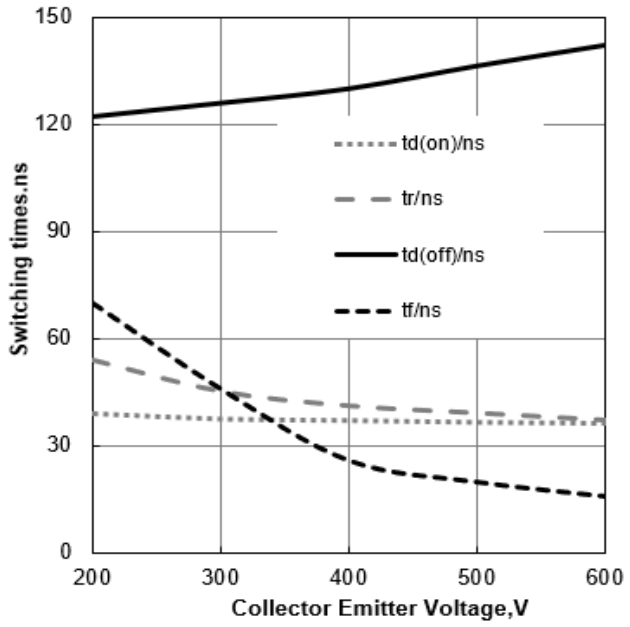


Figure 20. Typical Switching Energy vs VCE (TJ=25℃, VGE=15/0V, IC=60A)

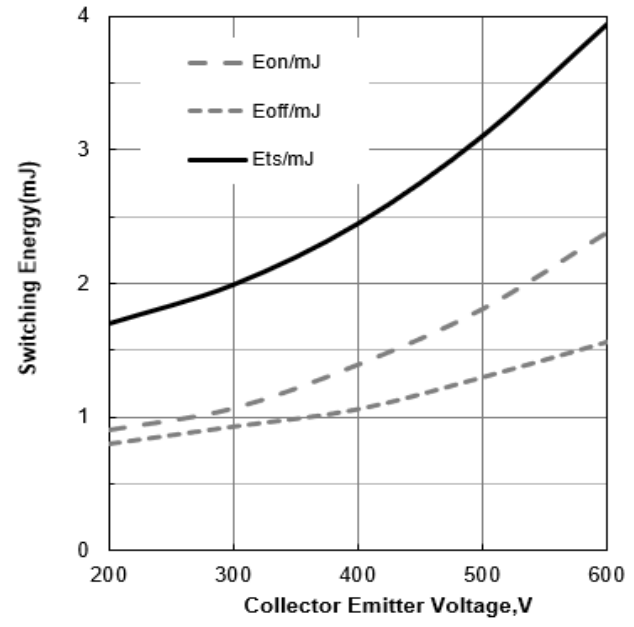


Figure 21. Typical Gate Charge

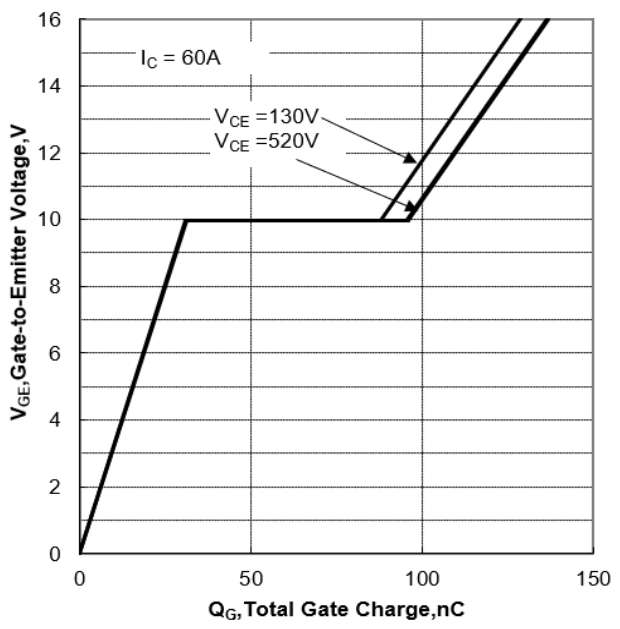


Figure 22. Typical Capacitance vs Collector- Emitter Voltage

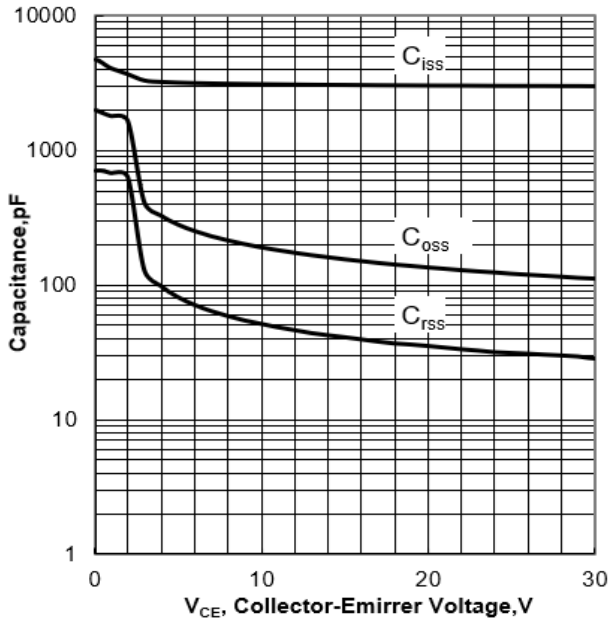


Figure 23. IGBT Transient Thermal Impedance vs Pulse Width(TO247/TO3PN)

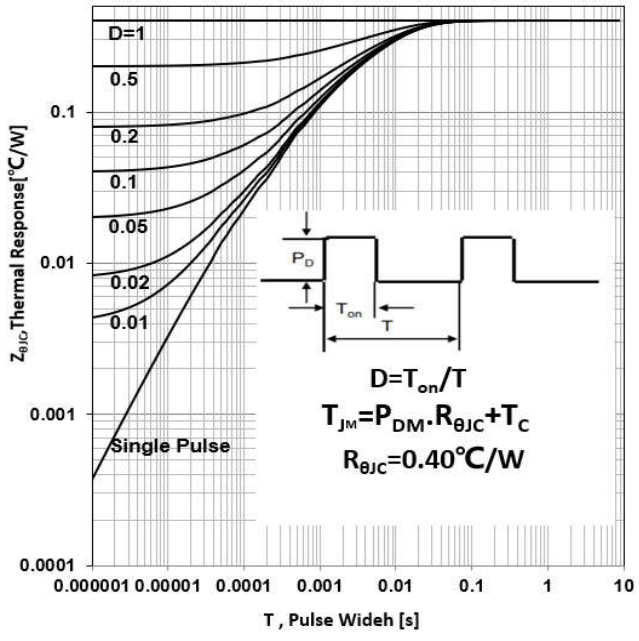


Figure 24. IGBT Transient Thermal Impedance vs Pulse Width(TO3PF)

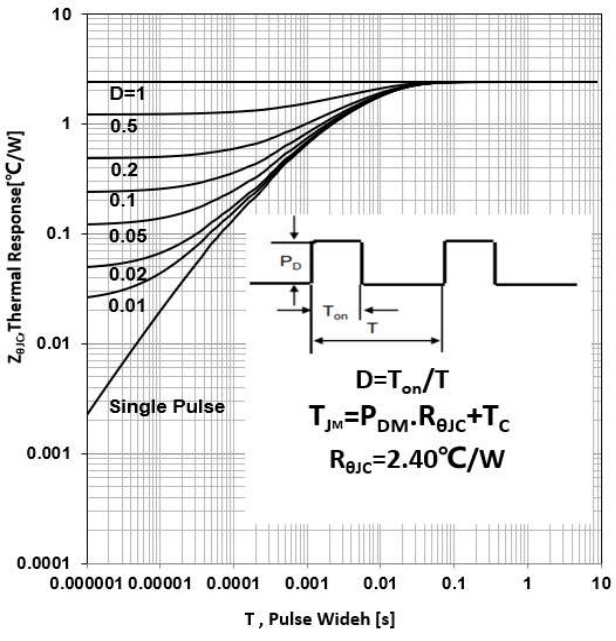
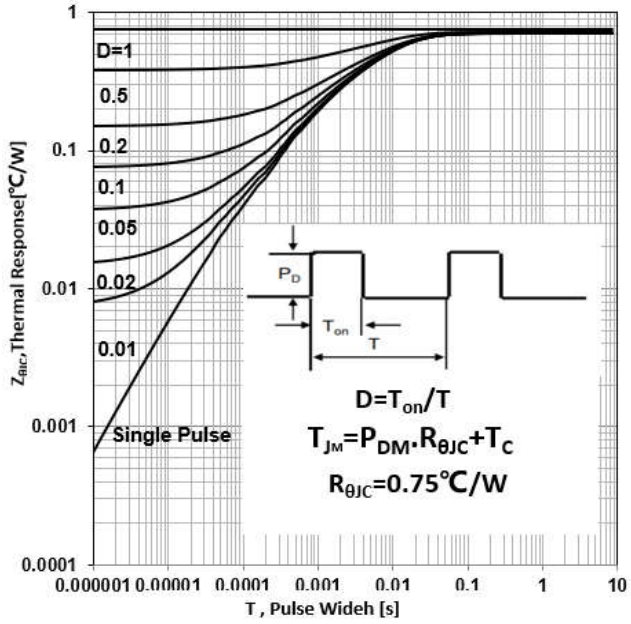
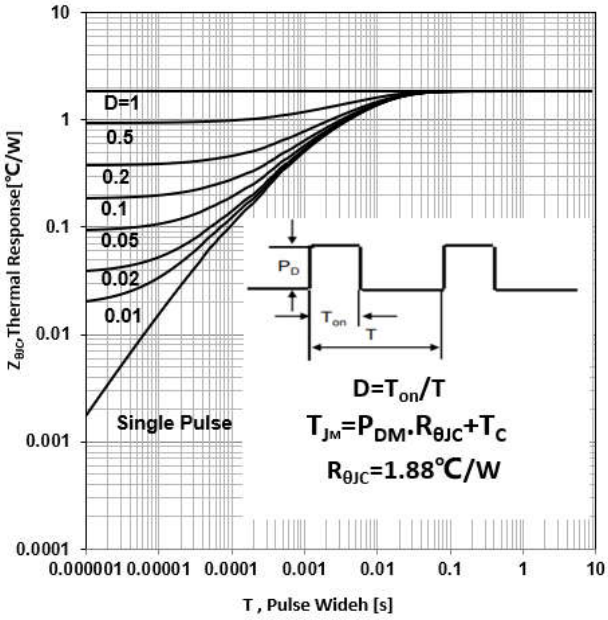


Figure 25. Diode Transient Thermal Impedance vs Pulse Width(TO247/TO3PN)	Figure 26. Diode Transient Thermal Impedance vs Pulse Width (TO3PF)
	

Test Circuit and Waveform

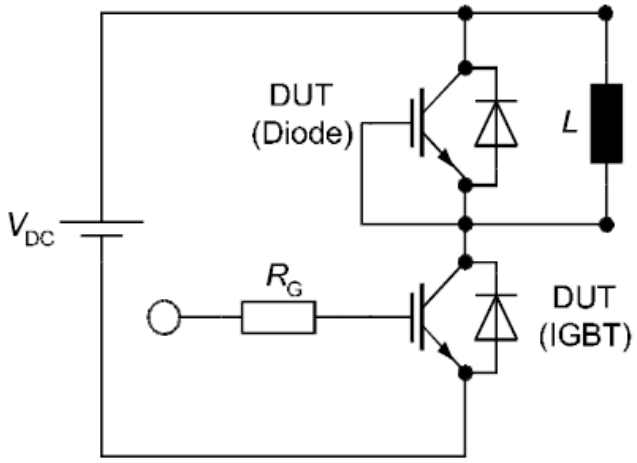
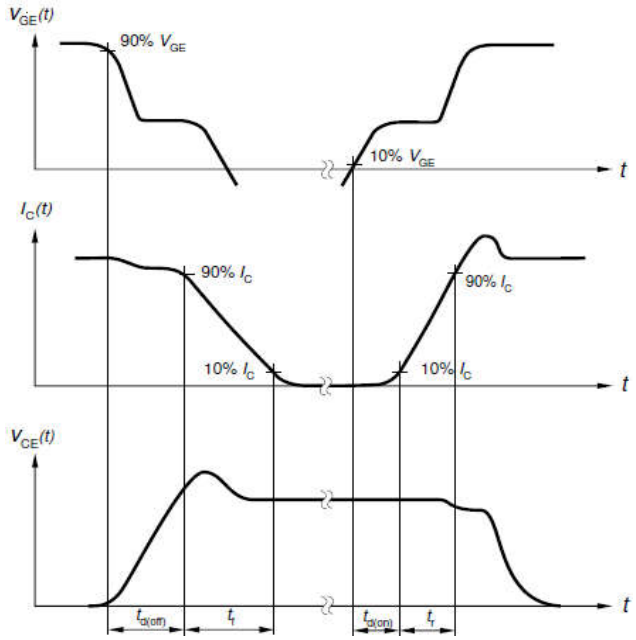
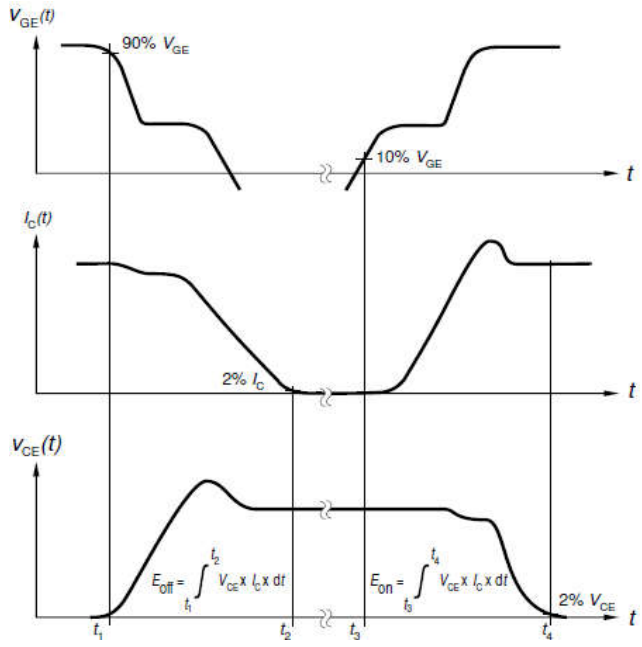
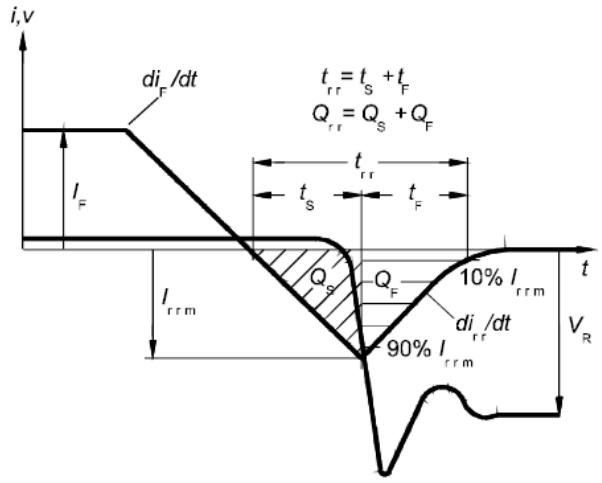
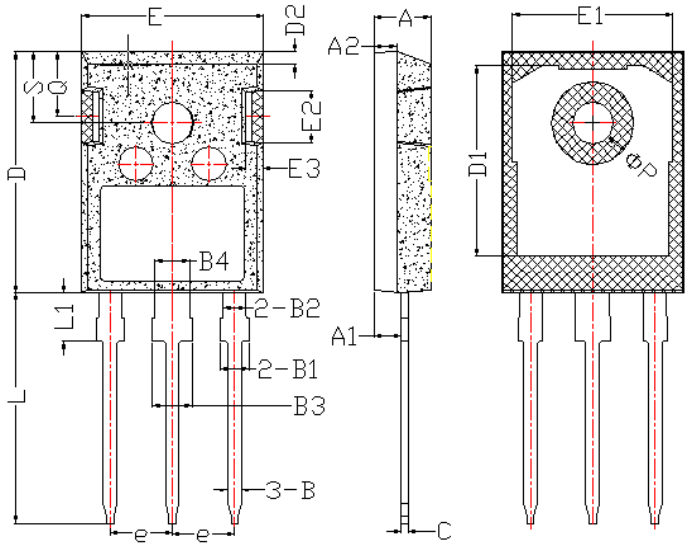
Figure 27. Inductive Switching Test Circuit	Figure 28. Definition of switching times
	

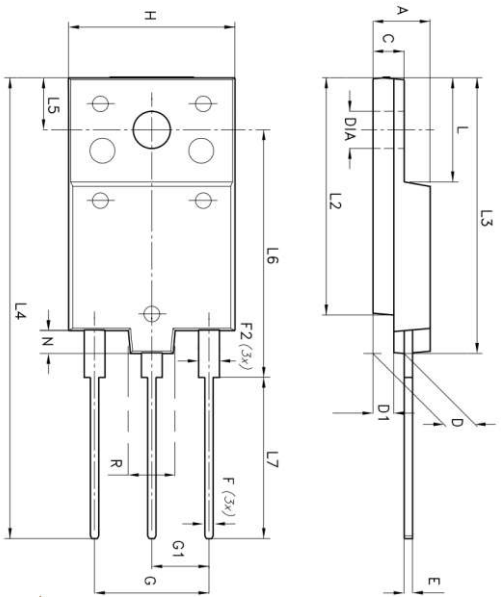
Figure 29. Definition of switching losses	Figure 30. Definition of diode switching characteristics
	

Package Description



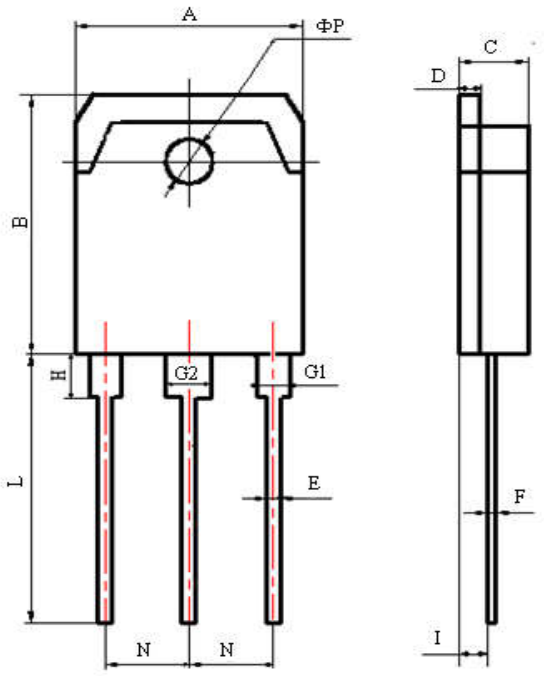
Items	Values（mm）	
	MIN	MAX
A	4.90	5.16
A1	2,27	2.53
A2	1.85	2.11
B	1.07	1.33
B1	1.90	2.41
B2	1.75	2.15
B3	2.87	3.38
B4	2.87	3.13
C	0.55	0.68
D	20.82	21.10
D1	16.25	17.65
D2	1.05	1.35
E	15.70	16.03
E1	13.10	14.15
E2	3.68	5.10
E3	1.68	2.60
e	5.44	
L	19.80	20.31
L1	4.17	4.47
ΦP	3.50	3.70
Q	5.49	6.00
S	6.04	6.30

TO-247 Package



Items	Values（mm）	
	MIN	MAX
A	5.30	5.70
C	2.80	3.20
D	3.10	3.50
D1	1.80	2.20
E	0.80	1.10
F	0.65	0.95
F2	1.80	2.20
G	10.30	11.50
G1	5.45	
H	15.30	15.70
L	9.80	10.20
L2	22.80	23.20
L3	26.30	26.70
L4	43.20	44.40
L5	4.3	4.70
L6	24.3	24.70
L7	14.6	15
N	1.8	2.2
R	3.8	4.2
Dia	3.4	3.8

TO-3PF Package



Items	Values（mm）	
	MIN	MAX
A	15.00	16.00
B	19.20	20.60
C	4.60	5.00
D	1.40	1.60
E	0.90	1.10
F	0.50	0.70
G1	2.00	2.20
G2	3.00	3.20
H	3.00	3.70
I	1.20	1.70
	2.70	2.90
L	19.00	21.00
N	5.25	5.65
ΦP	3.10	3.30

TO-3PN Package

NOTE:

1. Exceeding the maximum ratings of the device in performance may cause damage to the device, even the permanent failure, which may affect the dependability of the machine. Please do not exceed the absolute maximum ratings of the device when circuit designing.
2. When installing the heat sink, please pay attention to the torsional moment and the smoothness of the heat sink.
3. MOSFETs is the device which is sensitive to the static electricity, it is necessary to protect the device from being damaged by the static electricity when using it.
4. Shenzhen Minos reserves the right to make changes in this specification sheet and is subject to change withoutprior notice.

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