迈诺斯科技

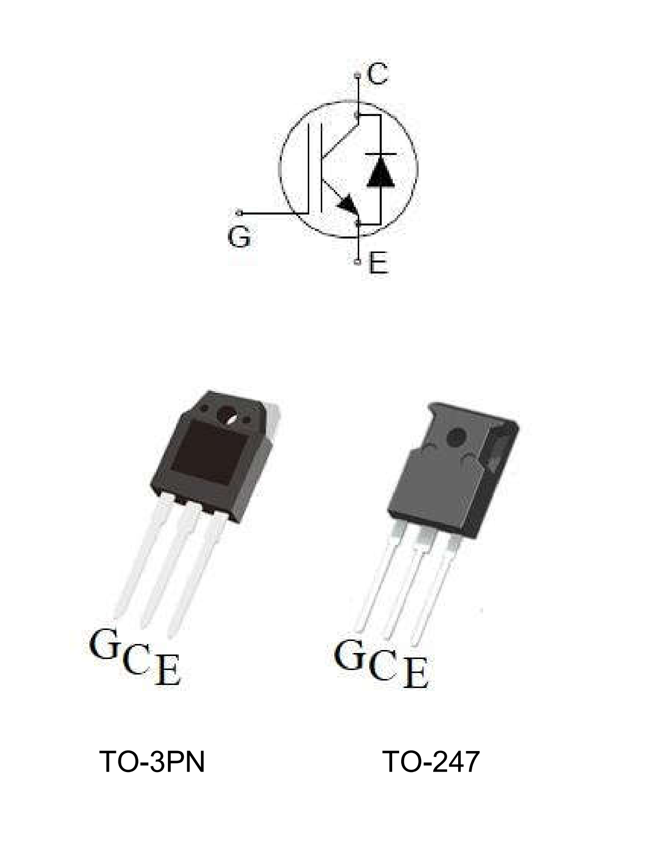
MLG40N60FUK

Description

MLG40N60FUK 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 welding, UPS, and high switching frequency applicatio

KEY CHARACTERISTICS

Parameter	Value	Unit
V_{CES}	600	V
I_C	40	A
$V_{CE(sat).typ}$	1.55	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 Welding converters
② UPS
③ Boost Chopper
④ Air condition

Package Marking And Ordering Information：

Ordering Codes	Package	Product Code	Packing
MLG40N60FUK-W	TO-3PN	G40N60FUK	Tube
MLG40N60FUK-F	TO-247	G40N60FUK	Tube

ABSOLUTE RATINGS

Symbol	Parameter	Values	Units
V_{CES}	Collector-Emitter Voltage	600	V
I_C	Collector Current @TC=25°C	80	A
	Collector Current @TC=100°C	40	A
I_{CM}	Pulsed Collector Current, tp limited by TJmax	160	A
I_F	Diode Continuous Forward Current @TC=25°C	40	A
	Diode Continuous Forward Current @TC=100°C	20	A
I_{FM}	Diode Maximum Forward Current, limited by TJmax	80	A
V_{GES}	Gate-Emitter Voltage	±30	V
t_{SC}	Short circuit withstand time VGE=15V, VCC≤400V, Allowed number of short circuits<1000,Times between short circuits: ≥	3.0	µs
P_D	Power Dissipation @TC=25°C	298	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	Values	Units
$R_{\theta JC}$	Junction-to-Case (IGBT)	0.5	℃/W
$R_{\theta JC}$	Junction-to-Case (Diode)	0.8	℃/W
$R_{\theta JA}$	Junction-to-Ambient	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	600	--	--	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	V_{GE} = 15V, I_C = 40A T_J=25℃ T_J=125℃ T_J=175 ℃	-- -- --	1.55 1.80 1.90	1.95 -- --	V
$V_{GE(TH)}$	Gate Threshold Voltage	V_{CE}=V_{GE},I_C= 1mA	4.8	5.5	6.2	V

V_F	Diode Forward Voltage	I_F=20A T_J=25℃ T_J=125 ℃ T_J=175 ℃	-- -- --	2.20 1.80 1.52	2.80 -- --	V
V_F	Diode Forward Voltage	I_F=40A T_J=25℃ T_J=125 ℃ T_J=175 ℃	-- -- --	2.60 2.25 1.95	3.20 -- --	V
I_{CES}	Collector-Emitter Leakage Current	V_{CE} = 600V, V_{GE} = 0V	--	--	4	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	--	2225	--	pF
C_{oss}	Output Capacitance		--	90	--	
C_{rss}	Reverse Transfer Capacitance		--	27	--	
Q_G	Gate charge	V_{CC}=520V I_{CE}=20A V_{GE}=15V	--	110	--	nC
Q_{GE}	Gate-emitter charge		--	52	--	
Q_{GC}	Gate-collector charge		--	23	--	
$I_{C(SC)}$	Short circuit collector current Max.1000 short circuits, Times between short circuits: ≥ 1.0s	V_{GE}=15.0V,V_{CC} ≤400V , t_{SC}≤3us， T_J≤175℃		320		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 =40A V_{CE} = 400V V_{GE}= 15V R_G =5Ω T_J=25°C Inductive Load	--	19	--	ns
t_r	Rise Time		--	35	--	
$t_{d(off)}$	Turn-Off Delay Time		--	90	--	
t_f	Fall Time		--	26	--	
E_{on}	Turn-On Switching Loss		--	0.60	--	mJ
E_{off}	Turn-Off Switching Loss		--	0.38	--	
E_{ts}	Total Switching Loss		--	0.98	--	

IGBT Switching Characteristics, at TJ=175℃

Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
$t_{d(on)}$	Turn-on Delay Time	I_C =40A V_{CE} = 400V V_{GE} = 15V R_G =5Ω T_J=175°C Inductive Load	--	17	--	ns
t_r	Rise Time		--	32	--	
$t_{d(off)}$	Turn-Off Delay Time		--	142	--	
t_f	Fall Time		--	36	--	
E_{on}	Turn-On Switching Loss		--	0.8	--	mJ
E_{off}	Turn-Off Switching Loss		--	0.65	--	
E_{ts}	Total Switching Loss		--	1.45	--	

Diode Characteristics, at TJ=25℃

Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
T_{rr}	Reverse Recovery Time	I_F=20A, di/dt=200A/µs, T_J=25°C	--	97	--	ns
Q_{rr}	Reverse Recovery Charge		--	109	--	nC
I_{rrm}	Reverse Recovery Current		--	1.8	--	A
T_{rr}	Reverse Recovery Time	I_F=40A, di/dt=200A/µs, T_J=25°C	--	127	--	ns
Q_{rr}	Reverse Recovery Charge		--	326	--	nC
I_{rrm}	Reverse Recovery Current		--	4.8	--	A

Diode Characteristics, at TJ=175℃

Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
T_{rr}	Reverse Recovery Time	I_F=20A, di/dt=200A/µs, TJ=175°C	--	147	--	ns
Q_{rr}	Reverse Recovery Charge		--	742	--	nC
I_{rrm}	Reverse Recovery Current		--	7.8	--	A
T_{rr}	Reverse Recovery Time	I_F=40A, di/dt=200A/µs, TJ=175°C	--	158	--	ns
Q_{rr}	Reverse Recovery Charge		--	870	--	nC
I_{rrm}	Reverse Recovery Current		--	9	--	A

Characteristics Curves

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

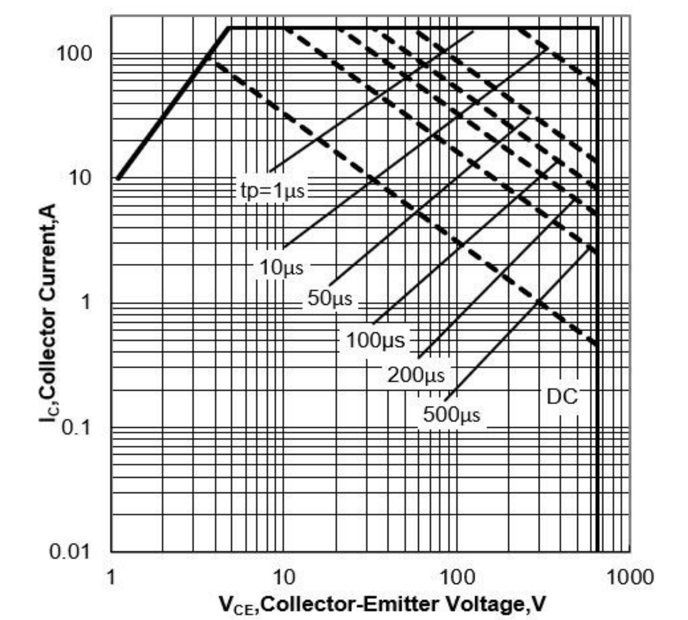


Figure 2. Power Dissipation vs Case Temperature for TO3PN/TO247

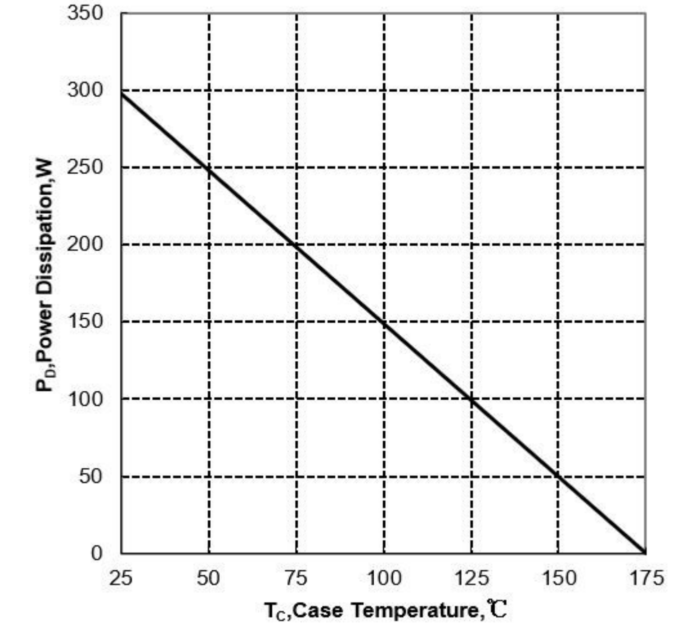


Figure 3. Collector Current vs Case Temperature

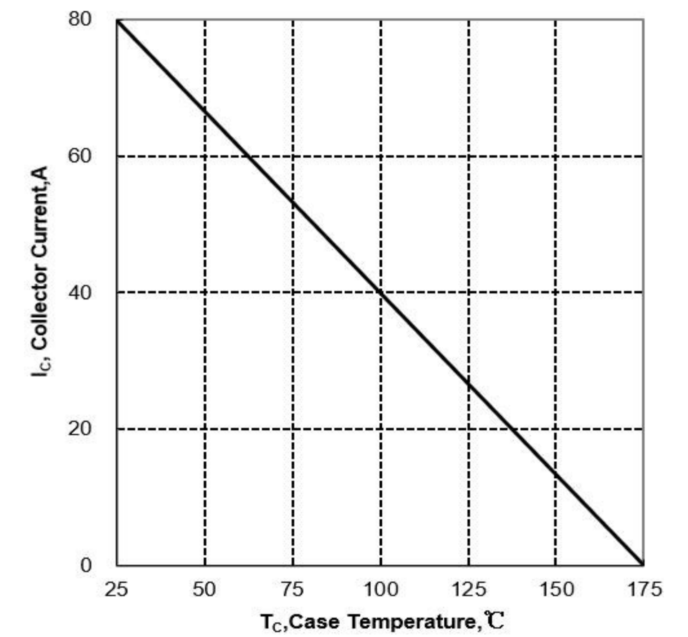


Figure 4. Typical Transfer Characteristics

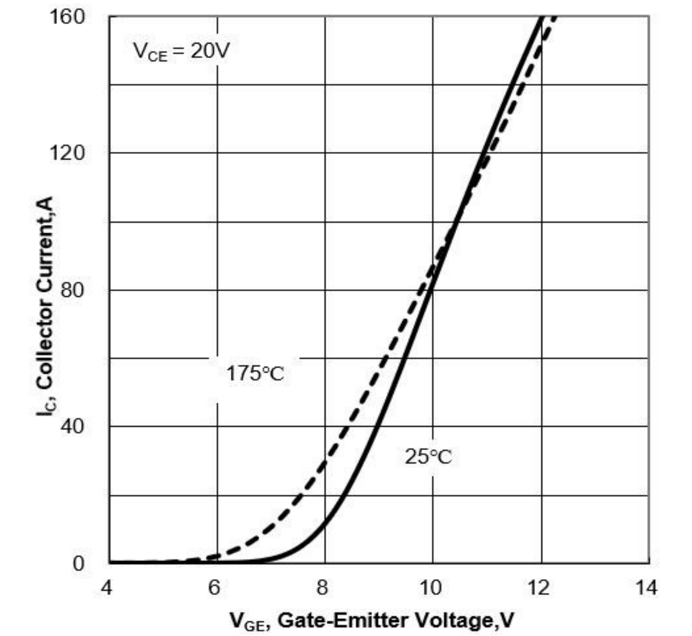


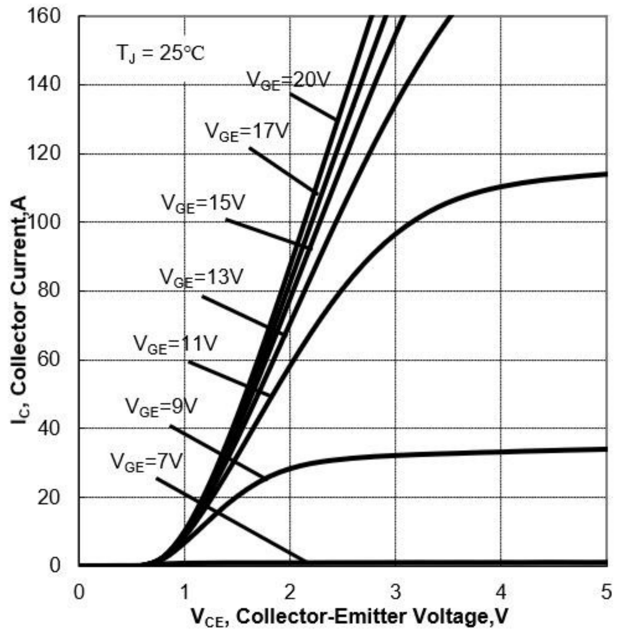
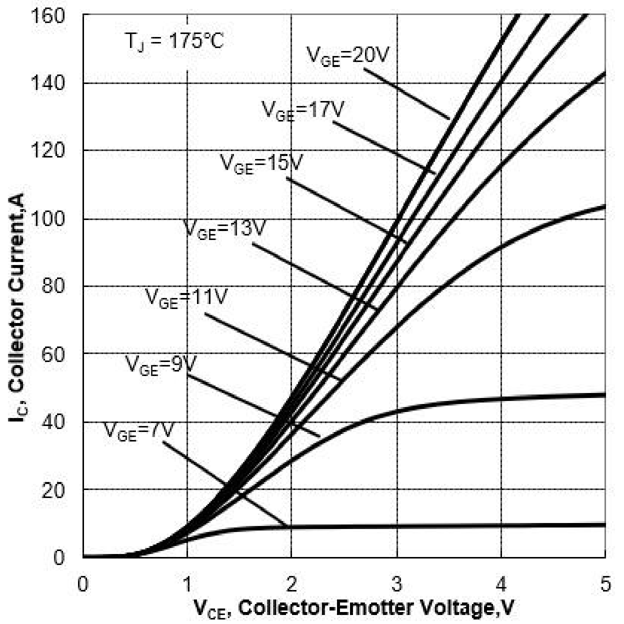
Figure 5. Typical Output Characteristics (TJ=25℃)	Figure 6. Typical Output Characteristics (TJ=175℃)
	

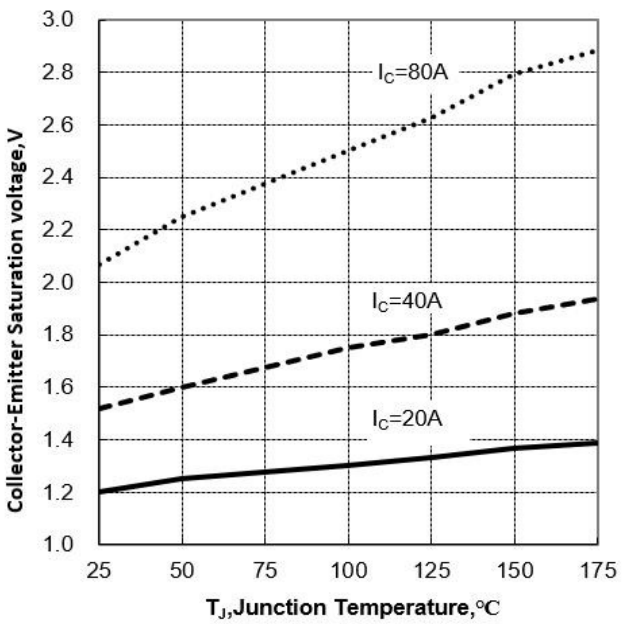
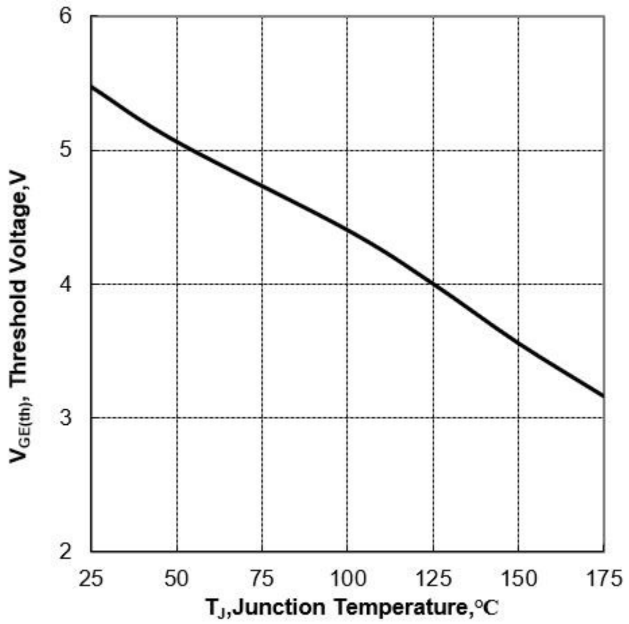
Figure 7. Typical Collector-Emitter Saturation Voltage vs Junction Temperature	Figure 8. Typical Gate-Emitter Threshold Voltage vs Junction Temperature
	

Figure 9. Typical Switching Times vs Gate Resistor (TJ=25℃, VCE=400V, VGE=15/0V, IC=40A)

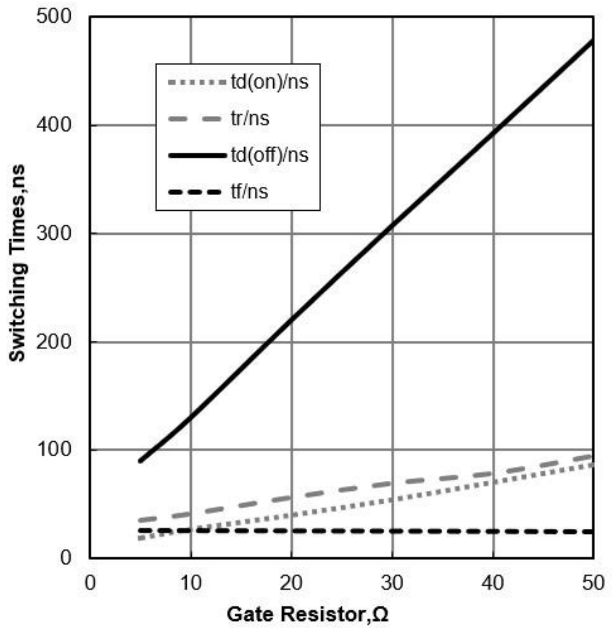


Figure 10. Typical Switching Energy vs Gate Resistor (TJ=25℃, VCE=400V, VGE=15/0V, IC=40A)

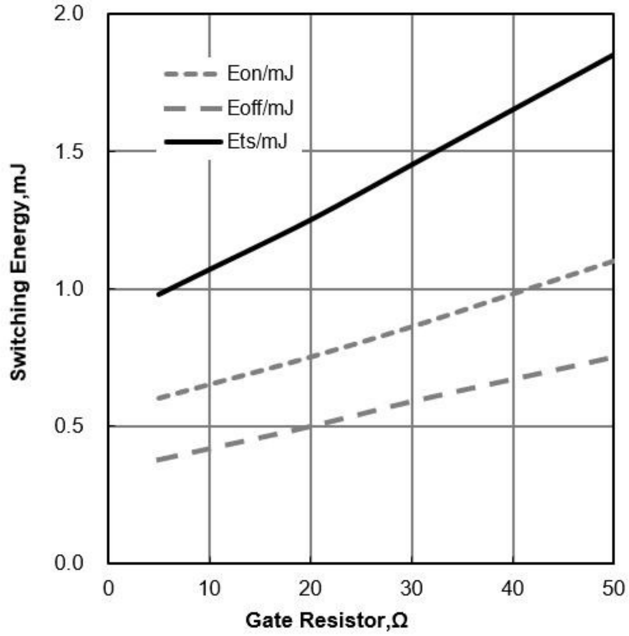


Figure 11. Typical Switching Times vs Junction Temperature (VCE=400V, VGE=15/0V, Ic=40A)

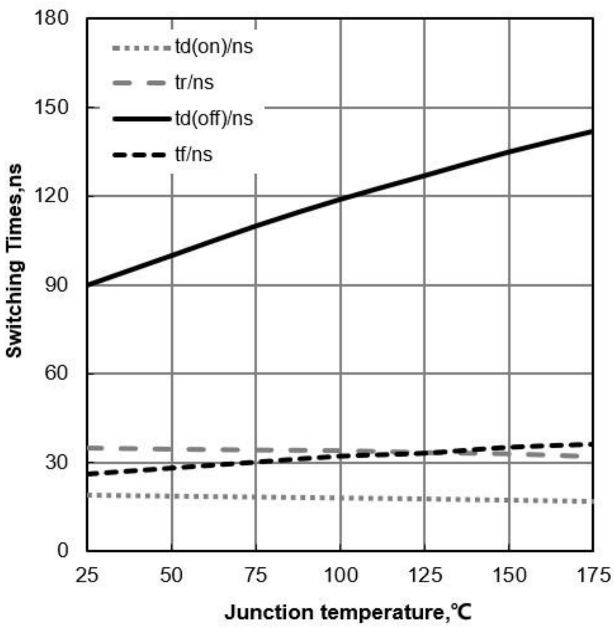


Figure 12. Typical Switching Energy vs Junction Temperature (VCE=400V, VGE=15/0V, Ic=40A)

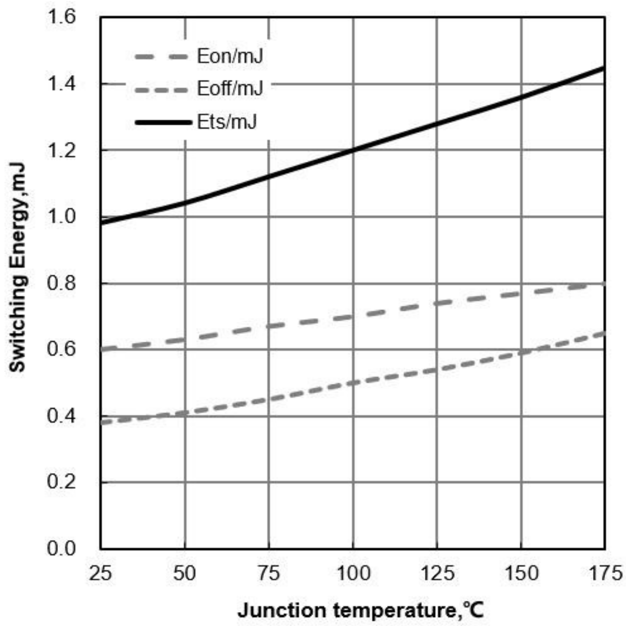


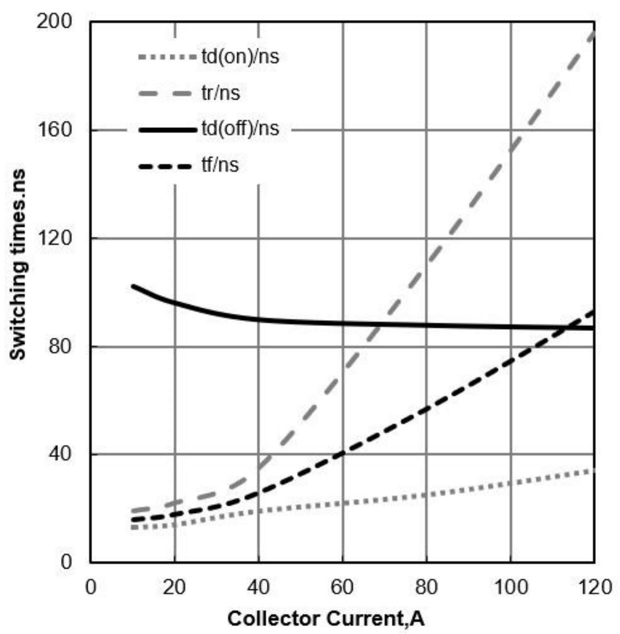
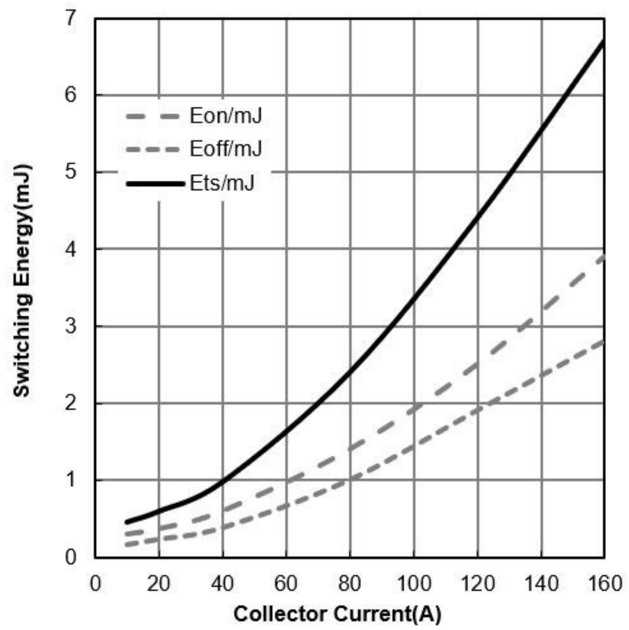
Figure 13. Typical Switching Times vs Collector Current (TJ=25℃, VCE=400V, VGE=15/0V)	Figure 14. Typical Switching Energy vs Collector Current (TJ=25℃, VCE=400V, VGE=15/0V)
	

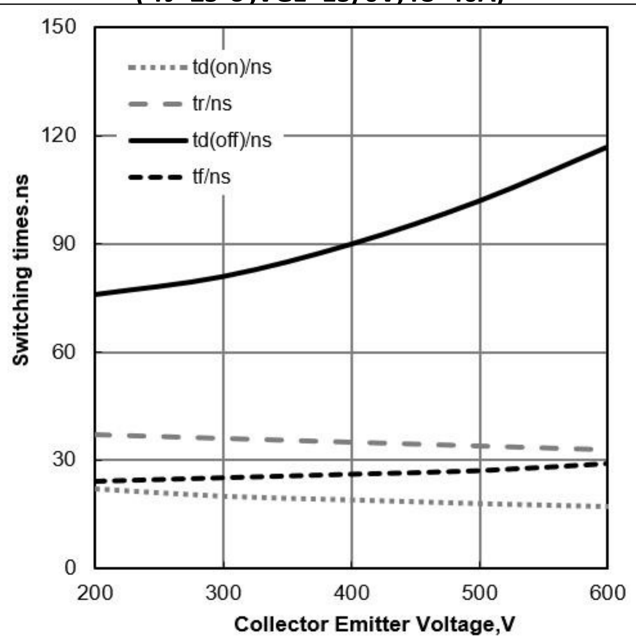
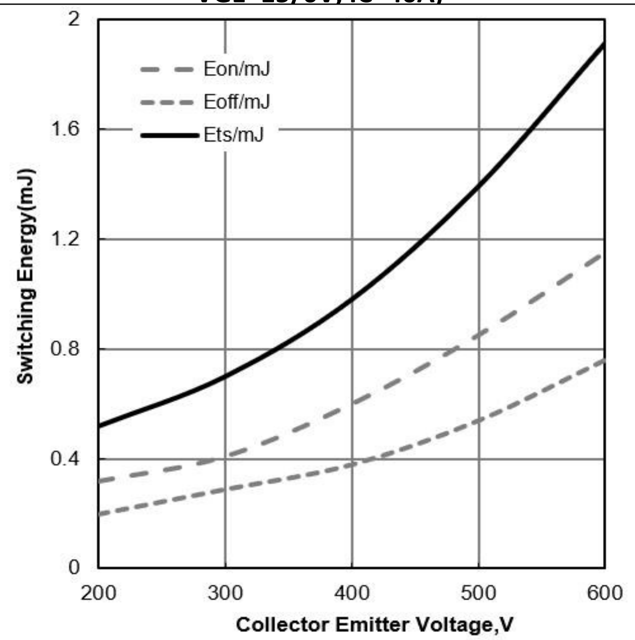
Figure 15. Typical Switching Times vs VCE (TJ=25℃,VGE=15/0V, IC=40A)	Figure 16. Typical Switching Energy vs VCE (TJ=25℃, VGE=15/0V, IC=40A)
	

Figure 17. Typical Gate Charge

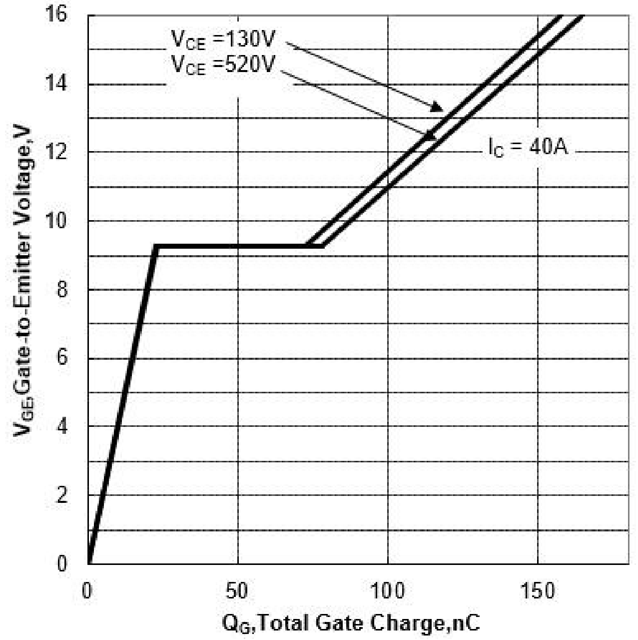


Figure 18. Typical Capacitance vs Collector-Emitter Voltage

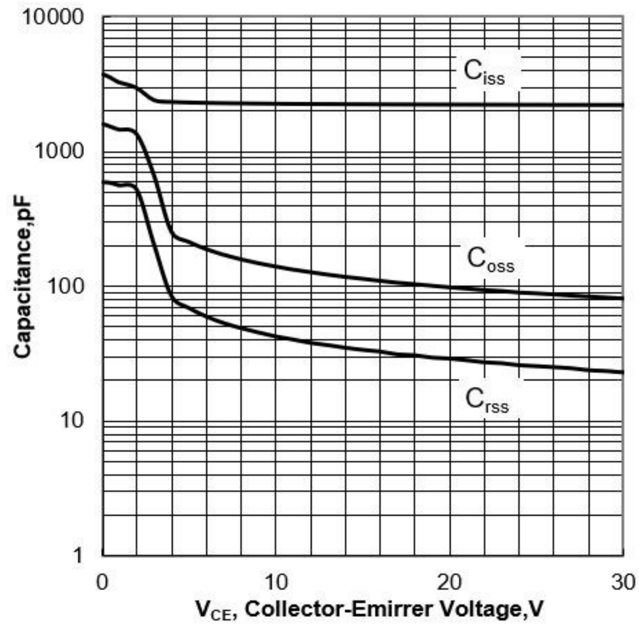


Figure 19. IGBT Transient Thermal Impedance vs Pulse Width(TO3PN/TO247)

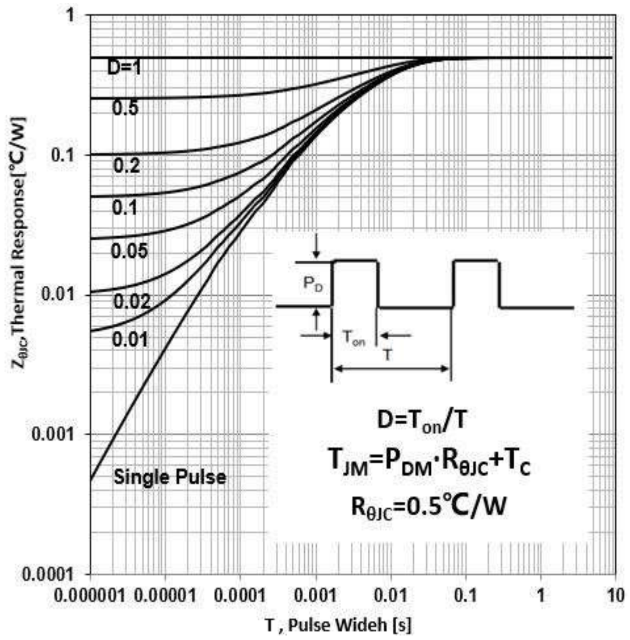


Figure 20. Diode Transient Thermal Impedance vs Pulse Width(TO3PN/TO247)

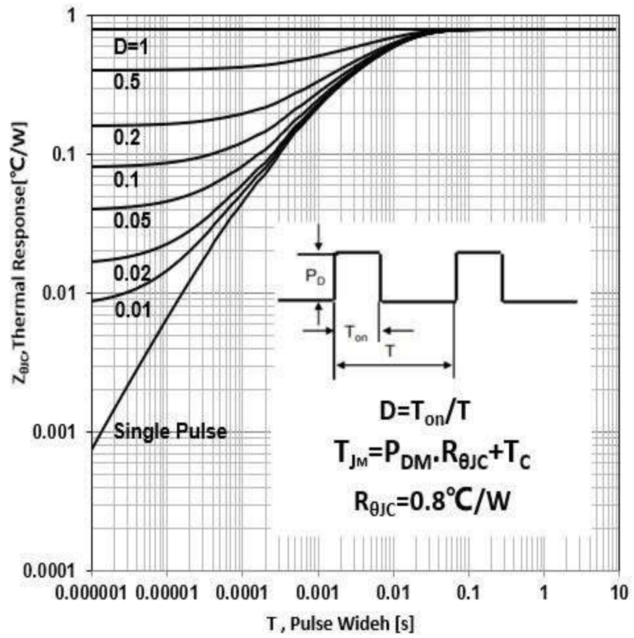
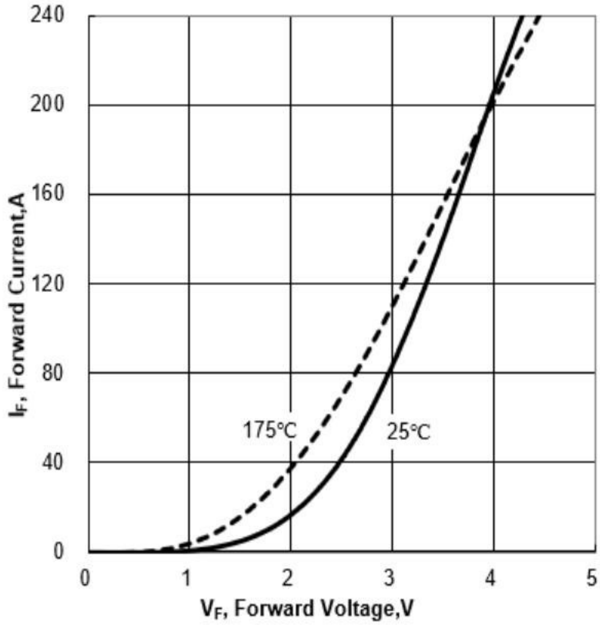


Figure 21. Typical Diode Forward Current vs Forward Voltage



Test Circuit and Waveform

Figure 22. Inductive Switching Test Circuit

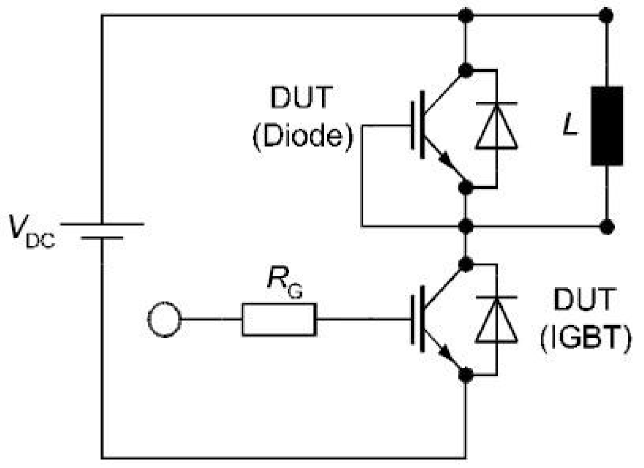


Figure 23. Definition of switching times

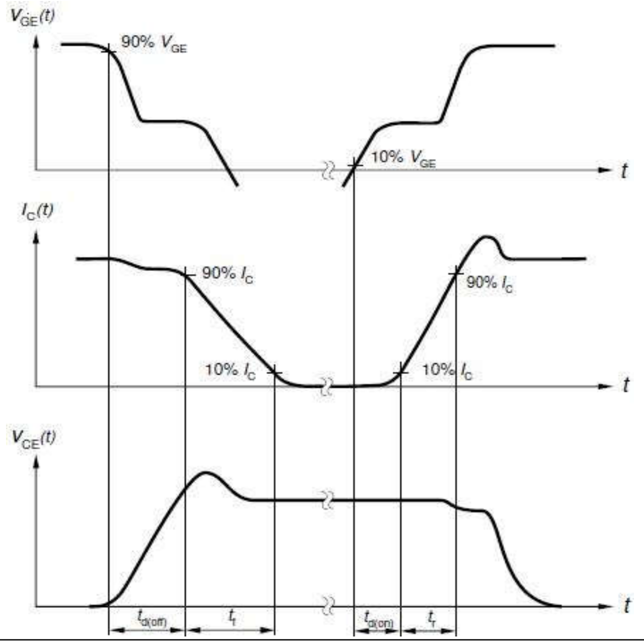


Figure 24. Definition of switching losses

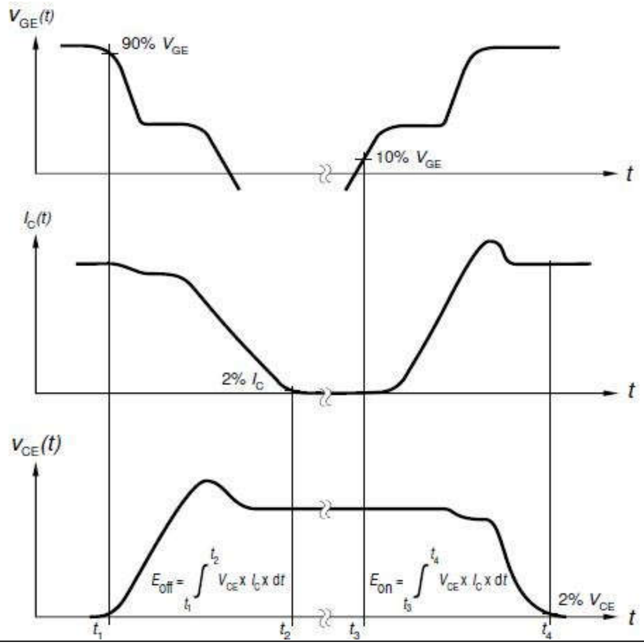
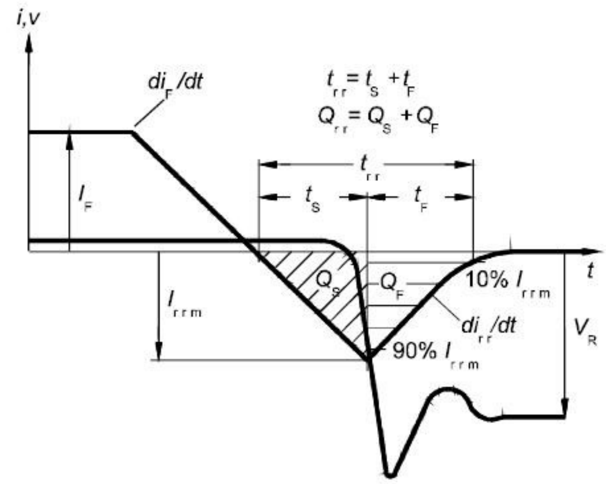
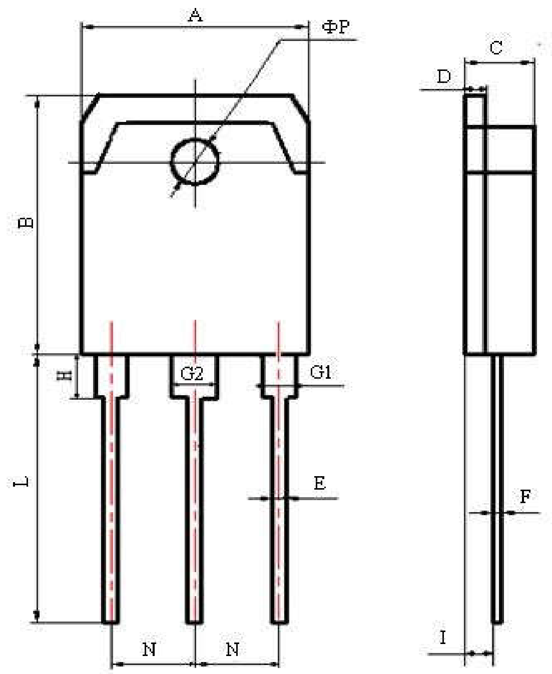


Figure 25. Definition of diode switching characteristics

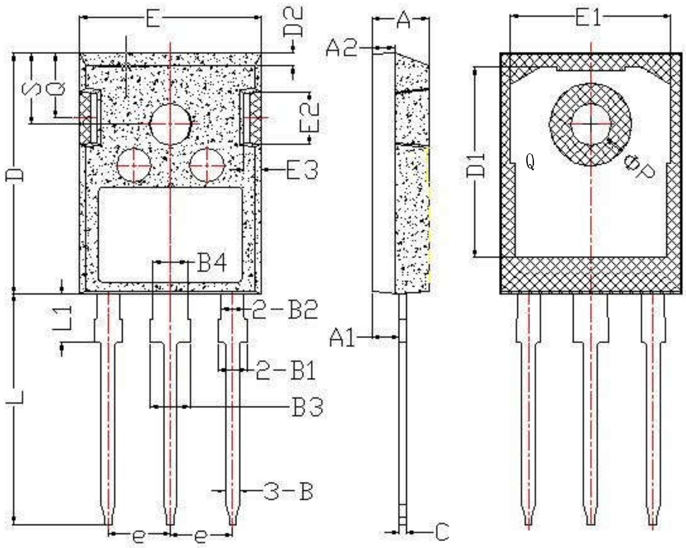


Package Description



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



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

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.

CONTACT:

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