上海捷瑞德半导体
Jerrett Semiconductor

JRG40T65FDL

IGBT

1. Description

JRG40T65FDL is obtained by advanced Trench Field Stop (T-FS) technology which is characteristic with low gate charge Q_g and optimized switching performance. The IGBT is suitable device for welding, UPS, and high switching frequency applications.

KEY CHARACTERISTICS

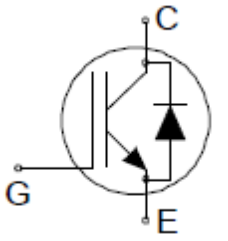
Parameter	Value	Unit
V_{CES}	650	V
I_C	40	A
$V_{CE(sat).typ}$	1.45	V
P_D (T_C=25℃)	298	W

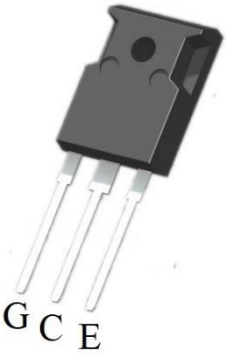
FEATURES

- Fast Switching
- Positive temperature coefficient
- Fast recovery anti-parallel diode
- RoHS product

APPLICATIONS

- Welding converters
- UPS
- Air condition
- Photovoltaic Inverter





TO-247-3L

ORDERING INFORMATION

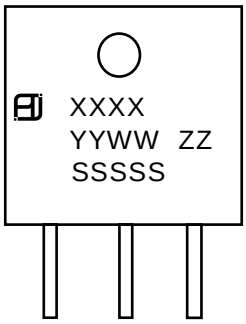
Ordering Codes	Package	Product Code	Packing
JRG40T65FDL-F	TO-247	G4065FDL	Tube

JRG40T65FDL-F

(2) Package type

(1) Chip name

(1) JRG40T65FDL: 650V 40A
(2) F:TO-247



XXXX：Product Code

YYWW：Year & Week

ZZ：Assembly Code

SSSSS：Lot Code

2. ABSOLUTE RATINGS

at T_C = 25°C, unless otherwise specified

Symbol	Parameter	Values	Units
V_{CES}	Collector-Emitter Voltage	650	V
I_C	Collector Current @T_C=25°C	80	A
	Collector Current @T_C=100°C	40	A
I_{CM}	Pulsed Collector Current, tp limited by T_{Jmax}	160	A
I_F	Diode Continuous Forward Current @T_C=25°C	80	A
	Diode Continuous Forward Current @T_C=100°C	40	A
I_{FM}	Diode Maximum Forward Current, limited by T_{Jmax}	160	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: ≥ 1.0s,T_J ≤ 175°C	6.0	us
P_D	Power Dissipation @T_C=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	℃

3. Thermal characteristics

Symbol	Parameter	RATINGS	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

4. Electrical Characteristics

at T_C = 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 = 40A T_J=25℃ T_J=125℃ T_J=175℃	 -- -- --	 1.45 1.70 1.80	 1.95 -- --	V

$V_{GE(TH)}$	Gate Threshold Voltage	V_{CE} = V_{GE},I_C = 1mA	5.1	5.8	6.5	V
V_F	Diode Forward Voltage	I_F=20A T_J=25℃ T_J=125℃ T_J=175℃	-- -- --	1.80 1.50 1.30	2.40 -- --	V
V_F	Diode Forward Voltage	I_F=40A T_J=25℃ T_J=125℃ T_J=175℃	-- -- --	2.40 2.05 1.95	3.00 -- --	V
I_{CES}	Collector-Emitter Leakage Current	V_{CE} = 650V, V_{GE} = 0V	--	--	4	μA
$I_{GES(F)}$	Gate-Emitter Leakage Current	V_{GE} = +30V	--	--	200	nA
$I_{GES(R)}$	Gate-Emitter Reverse Leakage	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	--	2250	--	pF
C_{oss}	Output Capacitance		--	165	--	
C_{rss}	Reverse Transfer Capacitance		--	25	--	
Q_G	Gate charge	Vcc=520V I_{CE}=40A V_{GE}=15V	--	165	--	nC
Q_{GC}	Gate-collector charge		--	55	--	
Q_{GE}	Gate-emitter charge		--	23	--	
$I_{C(SC)}$	Short circuit collector current Max.1000 short circuits, Times between short circuits: ≥ 1.0s	VGE=15.0V,VCC≤400V，tSC≤5us，TJ⩽175℃		250		A

Switching Characteristics

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 =10Ω	--	11	--	ns
tr	Rise Time		--	80	--	
$t_{d(off)}$	Turn-Off Delay Time		--	110	--	

t_f	Fall Time	T_J=25°C Inductive Load	--	55	--	
E_{on}	Turn-On Switching Loss		--	1.6	--	mJ
E_{off}	Turn-Off Switching Loss		--	1.0	--	
E_{ts}	Total Switching Loss		--	2.6	--	

Diode Characteristics

Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
T_{rr}	Reverse Recovery Time	I_F=40A, di/dt=200A/us, T_J=25°C	--	41	--	ns
Q_{rr}	Reverse Recovery Charge		--	55	--	nC
I_{rrm}	Reverse Recovery Current		--	2.0	--	A

5. Characteristics Curves

Figure 1. Forward Bias Safe Operating Area

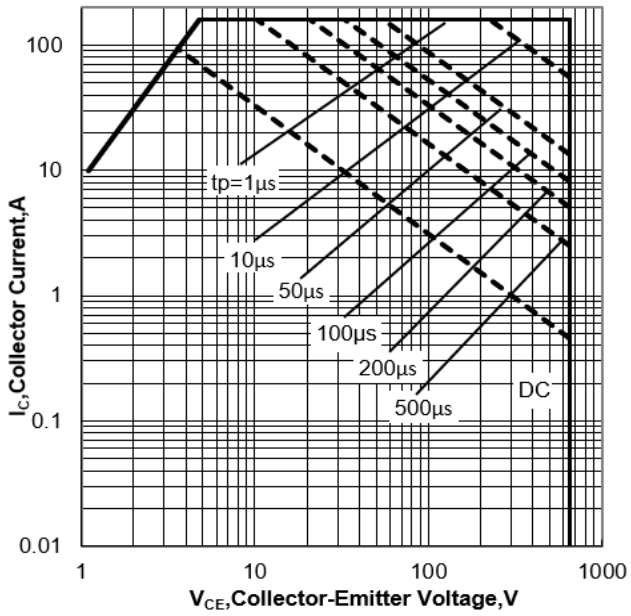


Figure 2. Power Dissipation vs Case Temperature

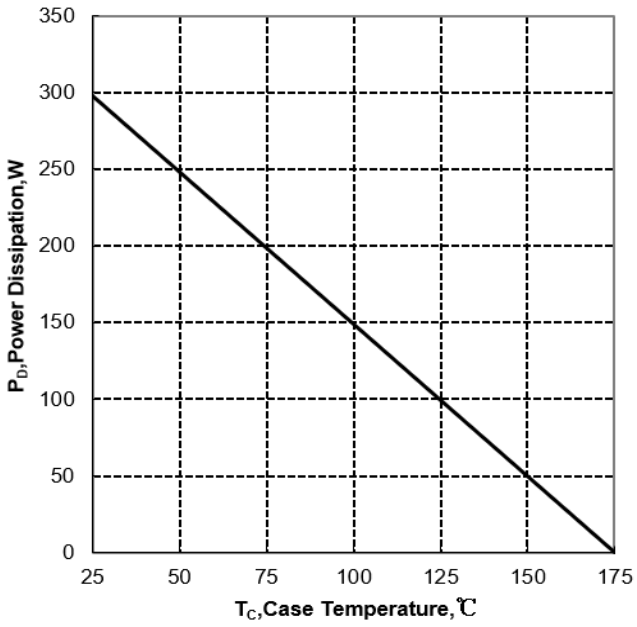


Figure 3. Collector Current vs Case Temperature

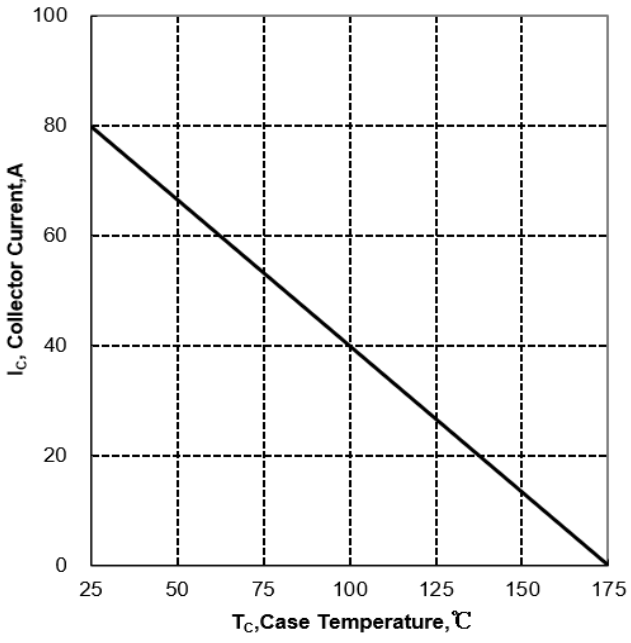


Figure 4. Typical Transfer Characteristics

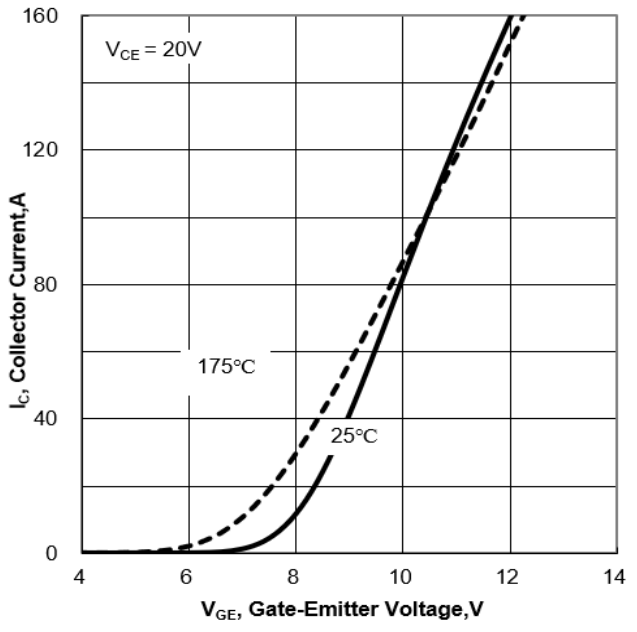


Figure 5. Typical Output Characteristics (T_C=25℃)

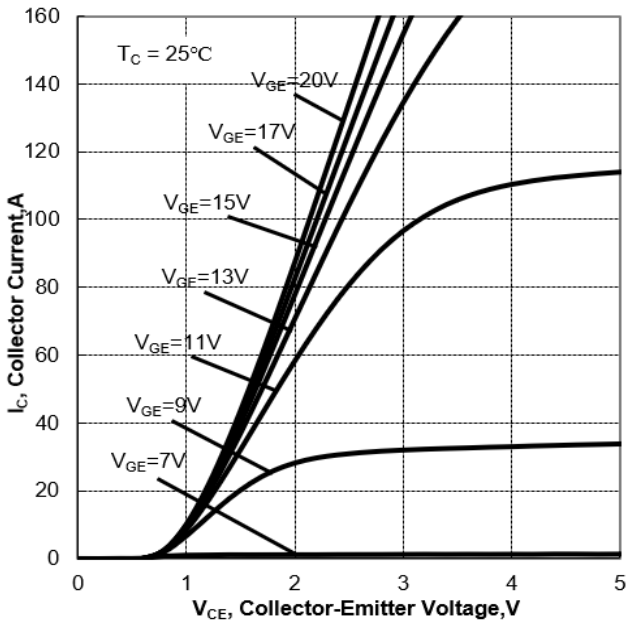


Figure 6. Typical Output Characteristics (T_C=175℃)

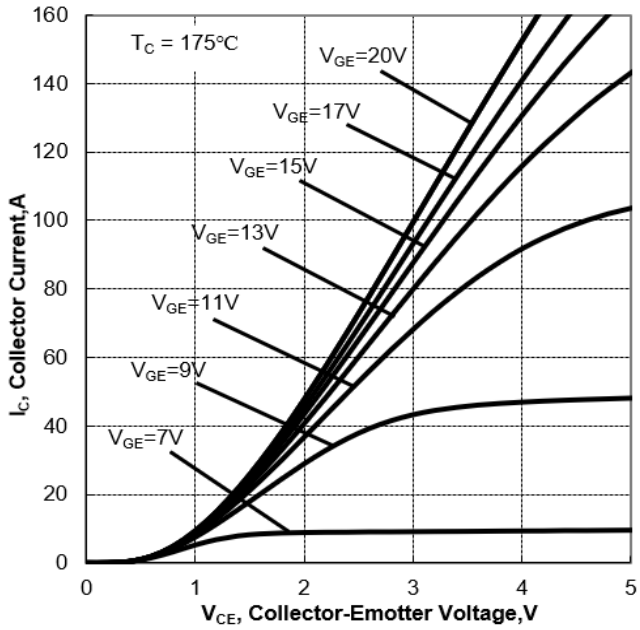


Figure 7. Typical Gate Charge

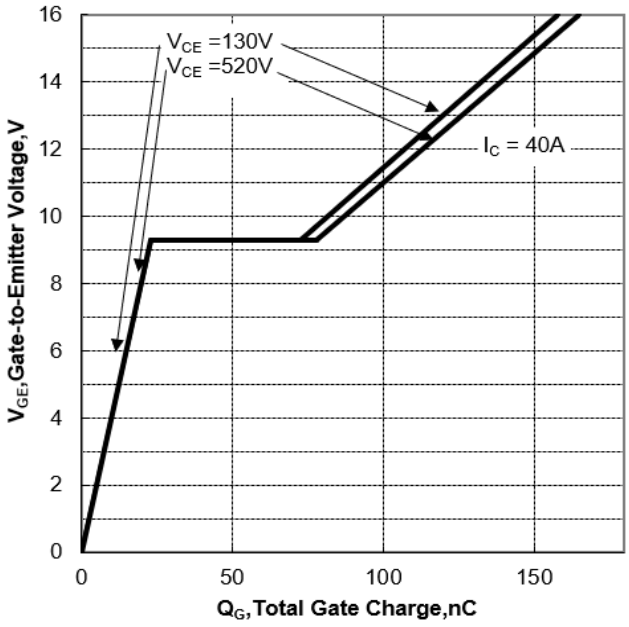


Figure 8. Typical Capacitance vs Collector-Emitter Voltage

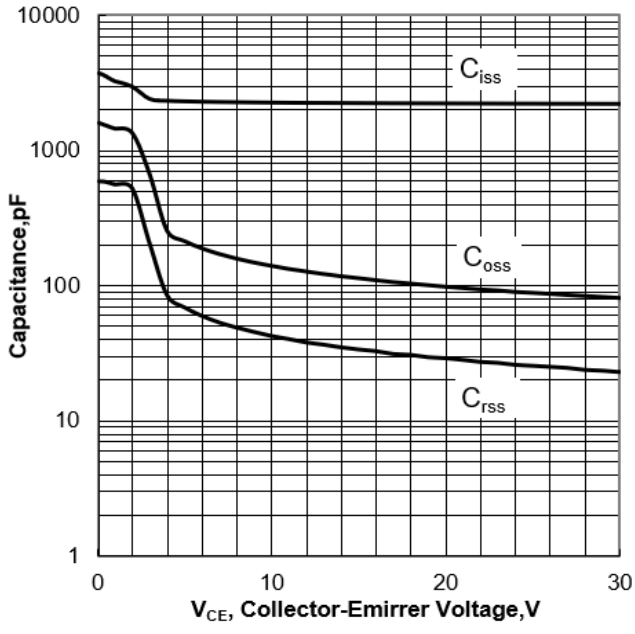


Figure 9. IGBT Transient Thermal Impedance vs Pulse Width(TO3PN/TO247)

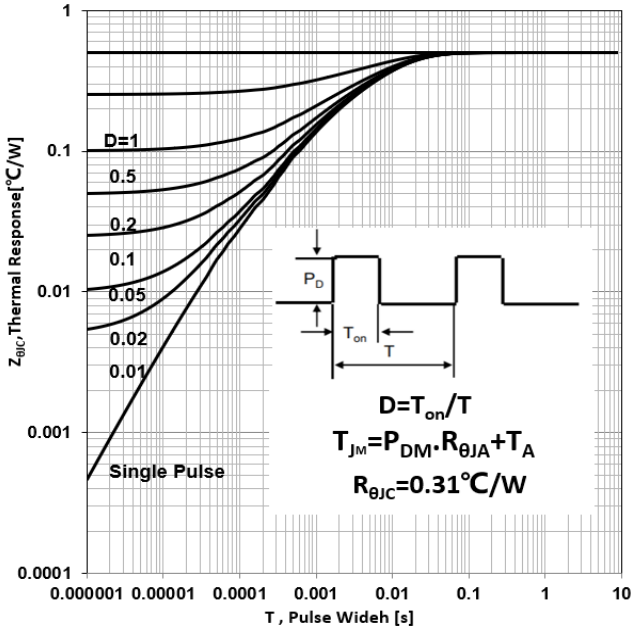


Figure 10. Diode Transient Thermal Impedance vs Pulse Width(TO3PN/TO247)

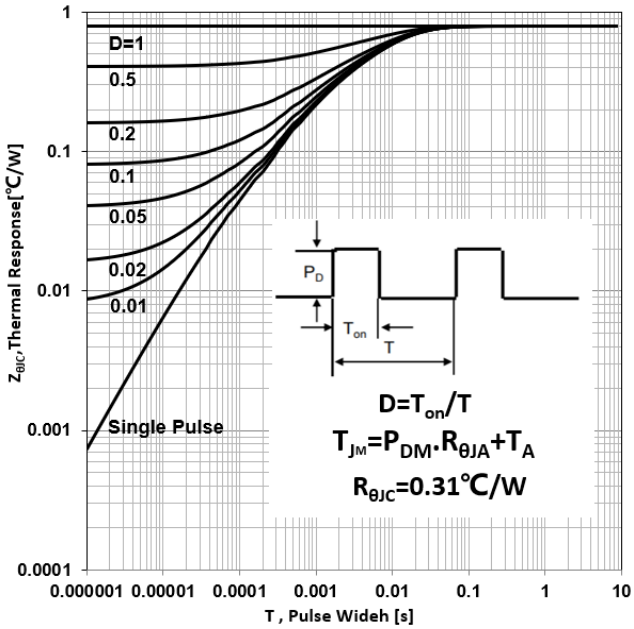
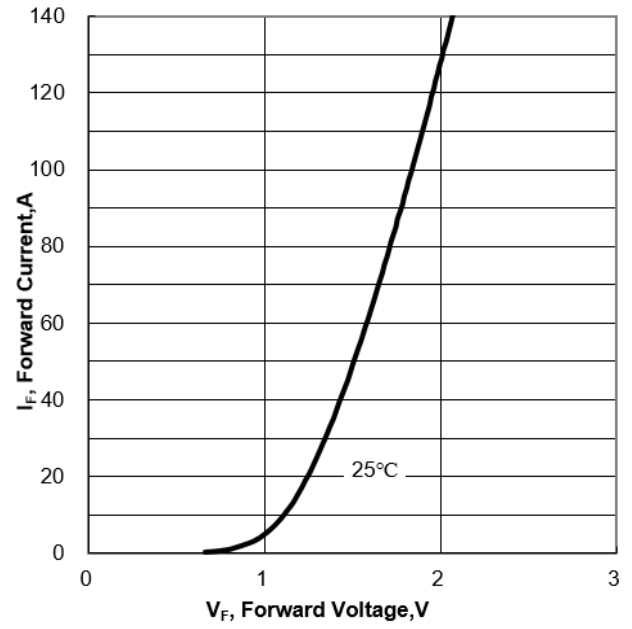


Figure 11. Typical Diode Forward Current vs Forward Voltage



6. Test Circuit and Waveform

Figure 11. Inductive Switching Test Circuit

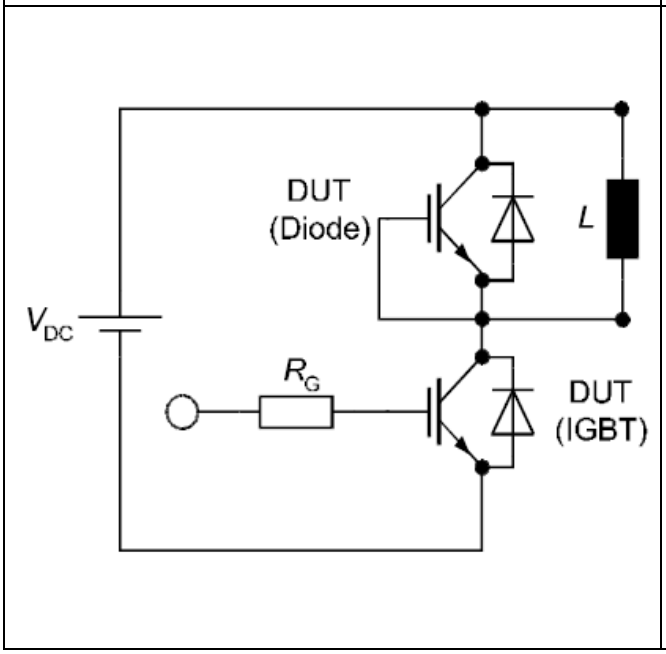


Figure 12. Definition of switching times

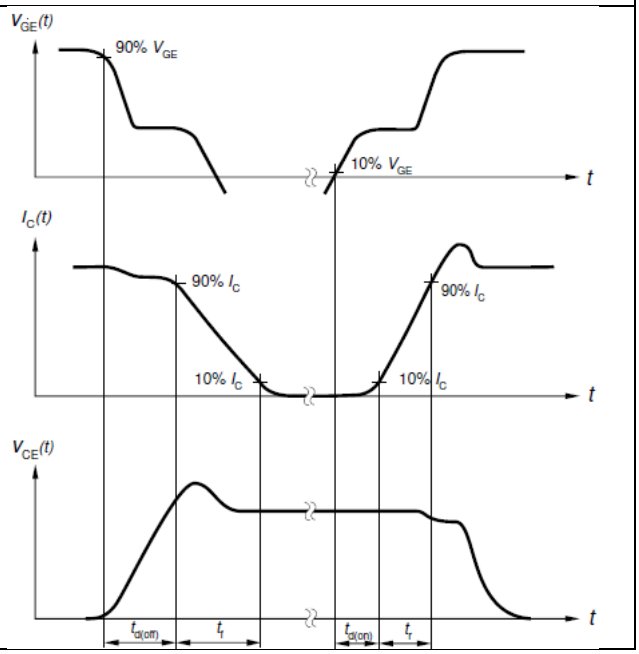


Figure 13. Definition of switching losses

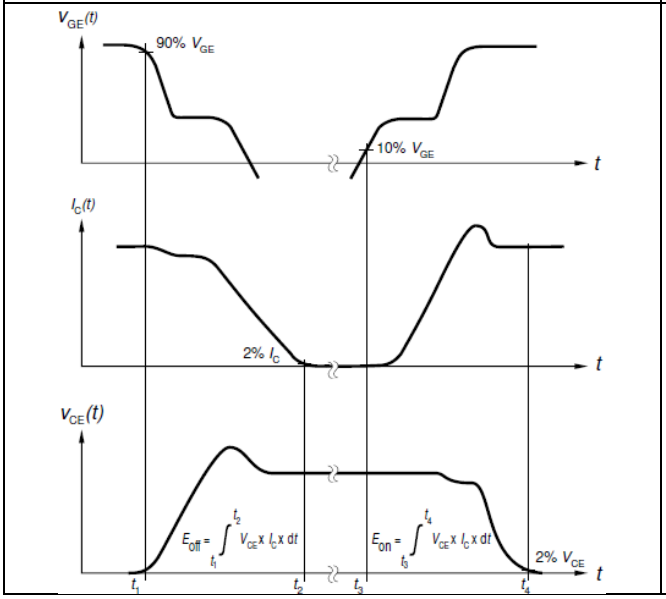
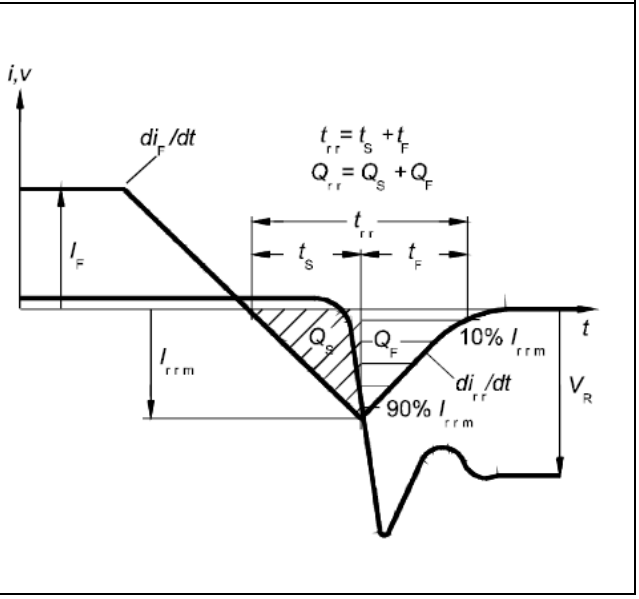
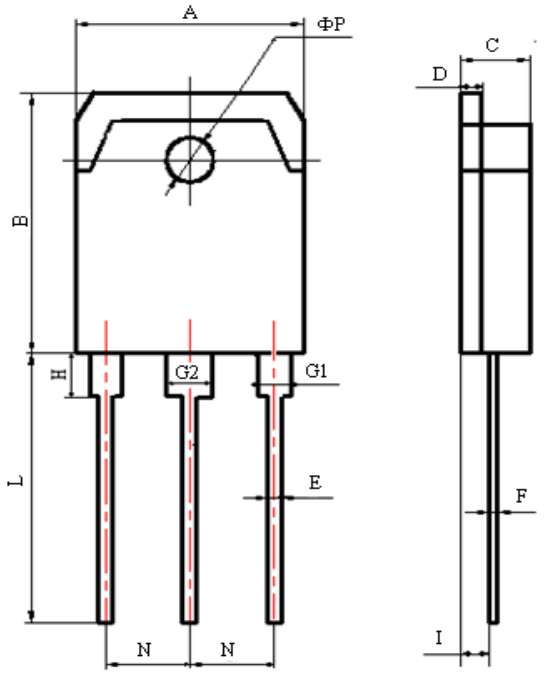


Figure 14. Definition of diode switching characteristics

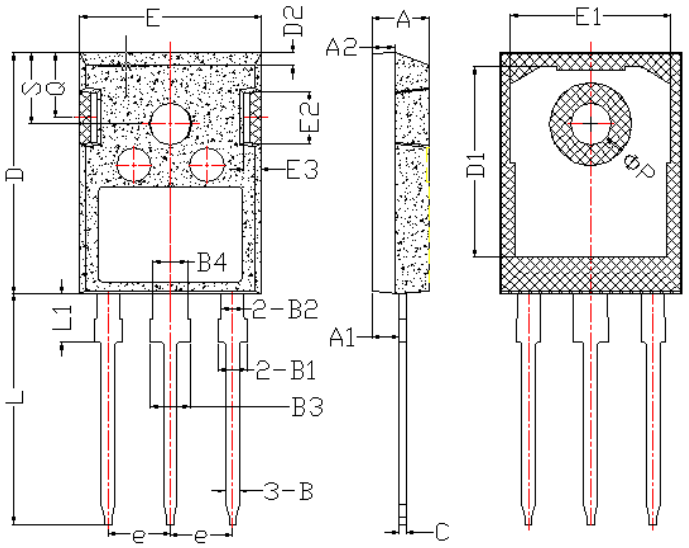


7. Package Description



TO-3PN 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
ϕ P	3.10	3.30



TO-247 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

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.