Features

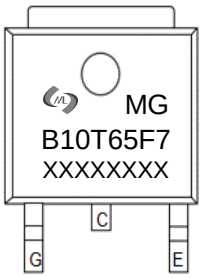
- IGBT CHIP(Trench+Field Stop technology)
- Low Vcesat(typ) 1.48V@IC=10A
- Maximum junction temperature 175℃
- Low gate charge Qg
- RoHS compliant

Application

- DC-AC inverters
- Motion/servo control
- UPS systems

Product Summary

V_{CE}	I_C (T_J=100℃)	$V_{CE(sat)}$
650V	10A	1.48V



B10T65F7 : Device code
XXXXXXXX : Code

Marking and pin assignment



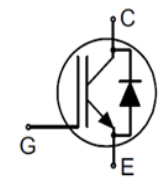
TO-252
top view



TO-263
top view



TO-220F
top view



Schematic diagram

Pb-Free RoHS Halogen-Free

Absolute Maximum Ratings (TC=25℃unless otherwise noted)				
Symbol	**Parameter**		**Rating**	**Unit**
Common Ratings (TC=25°C Unless Otherwise Noted)				
IGBT, Inverter				
V_{CES}	Collector Emitter Voltage	T_J=25°C	650	V
V_{GES}	Gate Emitter Voltage		±30	V
I_C	DC Collector Current	Tc=25°C	20	A
		Tc=100°C	10	A
I_{CRM}	Pulsed Collector Current, Limited by T_{vjmax}	tp=1ms	40	A
P_D	Power Dissipation	Tc=25°C	107	W
		Tc=100°C	53	W
Diode, Inverter				
V_{RRM}	Repetitive Reverse Voltage	T_J=25°C	650	V
I_F	Forward current,DC	Tc=25°C	20	A
		T_J=100°C	10	A
T_J,T_{stg}	Operating Junction and Storage Temperature Range		-55 to +175	°C

Ordering Information (Example)

Type	Package	Marking	Minimum Package(pcs)	Inner Box Quantity(pcs)	Outer Carton Quantity(pcs)	Delivery Mode
MGU10T65F7	TO-252	U10T65F7	25,000	50,000	350,000	13"reel
MGB10T65F7	TO-263	B10T65F7	800	800	4,000	13"reel
MGYF10T65F7	TO-220F	YF10T65F7	50	1,000	5,000	Tube

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IGBT，Inverter

Electrical Characteristics (TC=25℃ unless otherwise noted)							
Symbol	**Parameter**	**Condition**		**Min**	**Typ**	**Max**	**Unit**
Static Electrical Characteristics @ TC= 25°C (unless otherwise stated)							
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	V_{GE}=0V, I_{CE}=0.25mA		650			
$V_{GE(th)}$	Gate Emitter Threshold Voltage	V_{CE}=V_{GE}, I_C=0.25mA, T_J=25°C		4.5	5.4	6.5	V
$V_{CE(sat)}$	Collector - Emitter Saturation Voltage	I_C=10A, V_{GE}=15V, T_J=25℃		--	1.48	2	V
		I_C=10A, V_{GE}=15V, T_J=150℃		--	1.87	--	V
I_{CES}	Collector Leakage Current	V_{CE}=650V, V_{GE}=0V, T_J=25°C		--	--	500	nA
I_{GES}	Gate Leakage Current	V_{CE}=0V,V_{GE}=20V, T_J=25°C		--	--	500	nA
Dynamic Electrical Characteristics @ TJ = 25°C (unless otherwise stated)							
Q_g	Gate Charge	V_{CE}=520V, I_C=10A , V_{GE}=0 to15V		--	29.9	--	nC
Q_{ge}	Gate to Emitter Charge			--	8.68	--	nC
Q_{gc}	Gate to Collector Charge			--	10.7	--	nC
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f =1MHz		--	819	--	pF
C_{oes}	Output Capacitance			--	31.1	--	pF
C_{res}	Reverse Transfer Capacitance			--	3.2	--	pF
$t_{d(on)}$	Turn-on Delay Time	V_{CE}=400V,I_C=10A $R_{G(on)}$ =10Ω,$R_{G(off)}$ =10Ω V_{GE}=15V, Inductive Load	T_J=25℃	--	9.4	--	ns
			T_J=150℃	--	9.9	--	ns
t_r	Turn-on Rise Time		T_J=25℃	--	9.3	--	ns
			T_J=150℃	--	12.2	--	ns
$t_{d(off)}$	Turn-Off Delay Time		T_J=25℃	--	51.3	--	ns
			T_J=150℃	--	66.2	--	ns
t_f	Turn-Off Fall Time		T_J=25℃	--	60.6	--	ns
			T_J=150℃	--	79.1	--	ns
E_{on}	Turn on Energy		T_J=25℃		0.11		mJ
			T_J=150℃	--	0.15	--	mJ
E_{off}	Turn off Energy		T_J=25℃	--	0.1	--	mJ
			T_J=150℃	--	0.14	--	mJ

Diode，Inverter

Absolute Maximum Ratings (TC=25℃unless otherwise noted)							
Symbol	**Parameter**			**Min**	**Typ**	**Max**	**Unit**
Common Ratings (TC=25°C Unless Otherwise Noted)							
V_F	Forward Voltage	I_F=10A , V_{GE}=0V,	T_J=25°C	--	1.73	2.2	V
			T_J=150°C	--	1.55	--	V
t_{rr}	Reverse Recovery Time	I_F=10A , V_R=400V dIF/dt=200A/μs	T_J=25°C	--	36	--	ns
			T_J=150°C	--	109.5	--	ns
I_{rm}	Peak Reverse Recovery Current		T_J=25°C	--	4.22	--	A
			T_J=150°C	--	7	--	A
Q_{rr}	Reverse Recovery Charge		T_J=25°C	--	95.7	--	nC
			T_J=150°C	--	354.8	--	nC

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Typical Operating Characteristics

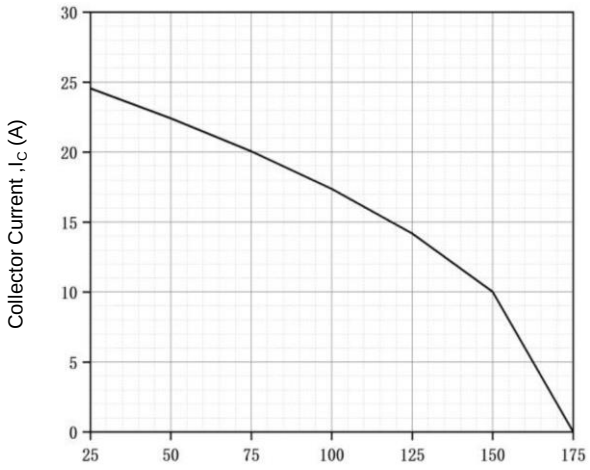


Figure 1. Collector current as a function of case temperature

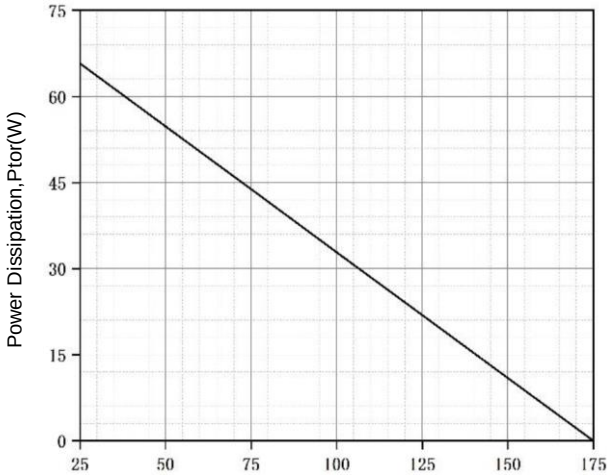


Figure 2. Power dissipation as a function of case temperature

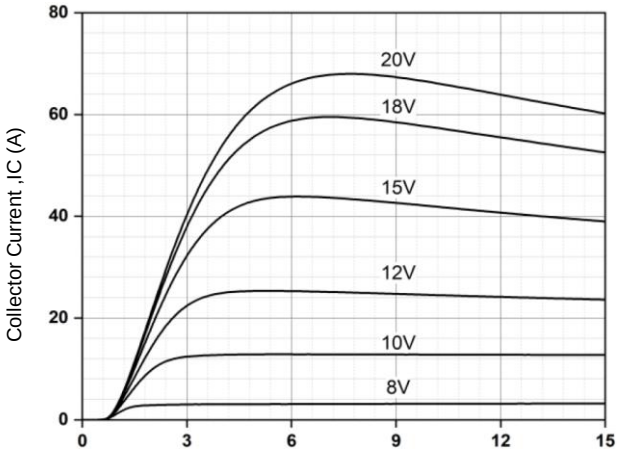


Figure 3. Typical output characteristic（Tj=25℃）

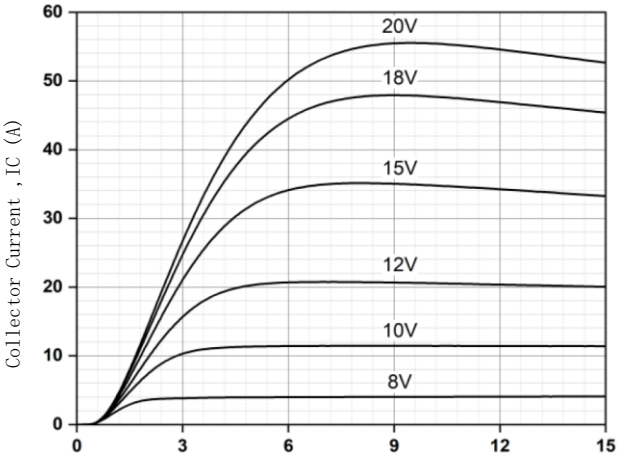


Figure 4. Typical output characteristic（Tj=150℃）

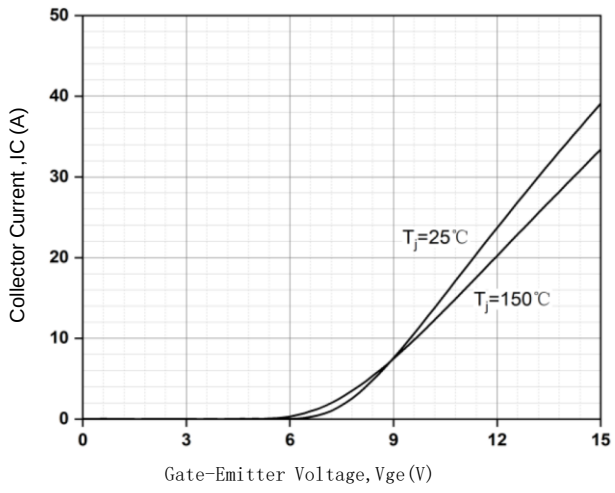


Figure 5. Typical transfer characteristic（V_{CE}=10V）

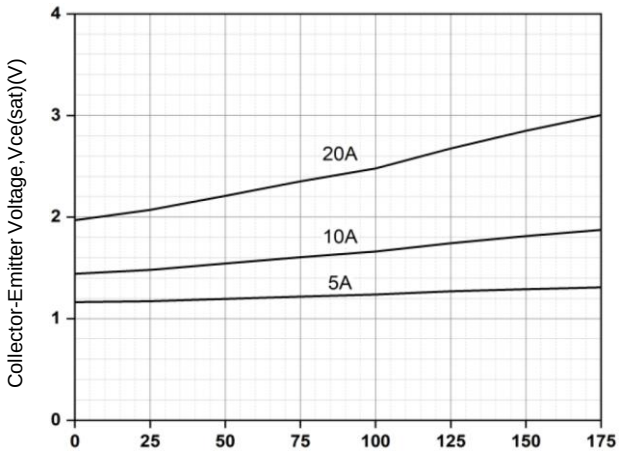


Figure 6. Typical collector-emitter saturation voltage as a function of junction temperature

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Typical Operating Characteristics

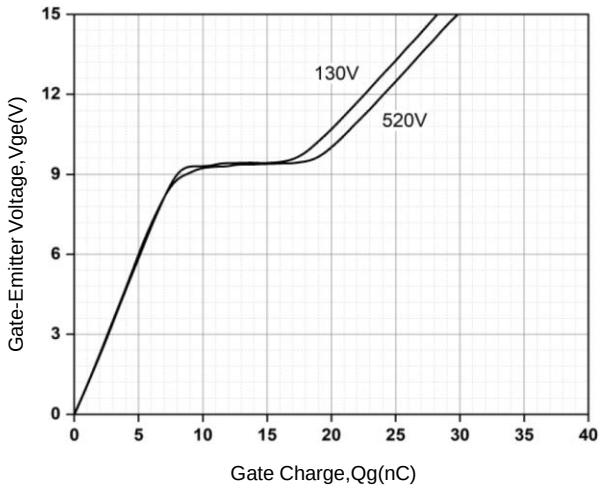


Figure 7. Typical gate charge

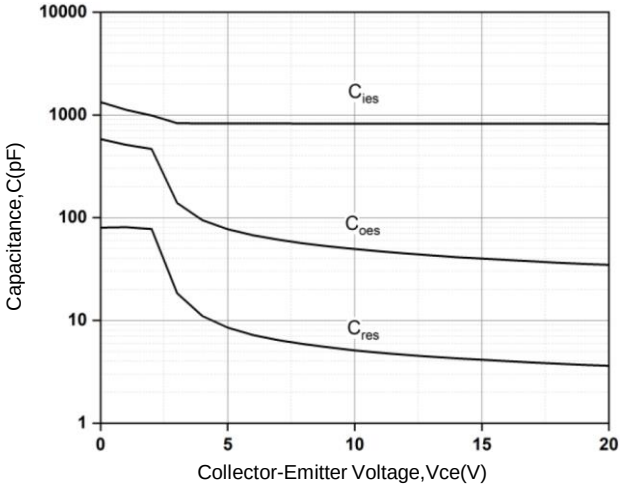


Figure 8. Typical capacitance as a function of collector-emitter voltage（f=1MHz）

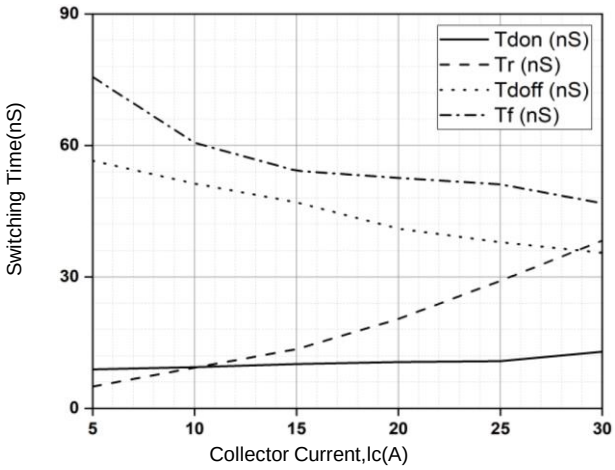


Figure 9. Typical switching times as a function of collector current（Tj=25℃，V_{CC}=400V，Rg=10Ω）

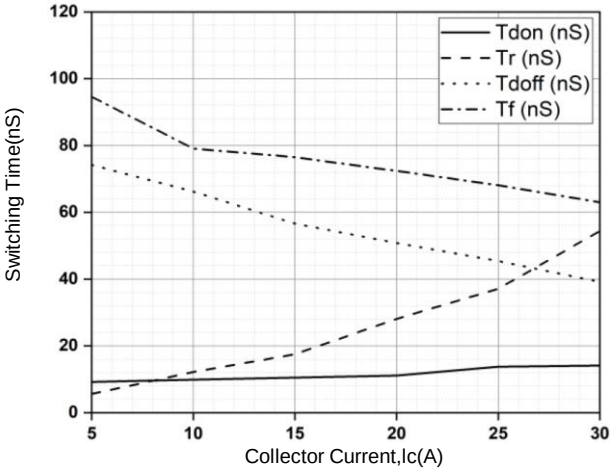


Figure 10. Typical switching times as a function of collector current（Tj=150℃，V_{CC}=400V，Rg=10Ω）

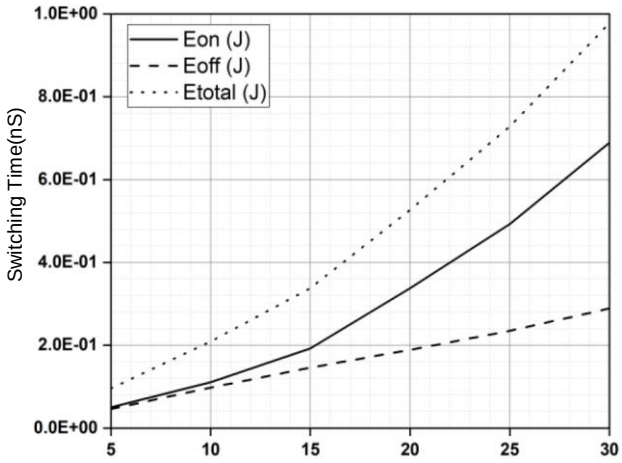


Figure 11. Typical switching energy losses as a function of collector current（Tj=25℃，V_{CC}=400V，Rg=10Ω）

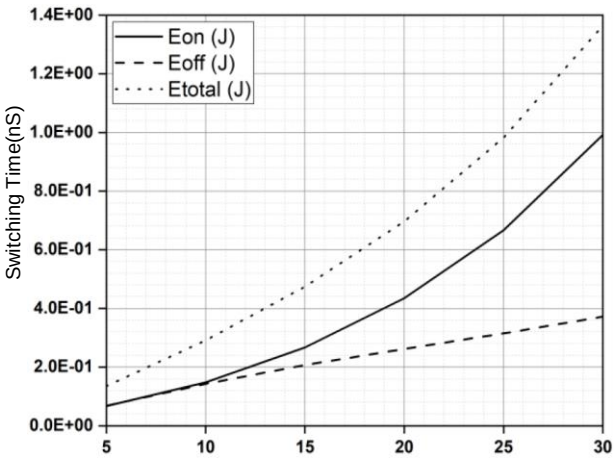


Figure 12. Typical switching energy losses as a function of collector current（Tj=150℃，V_{CC}=400V，Rg=10Ω）

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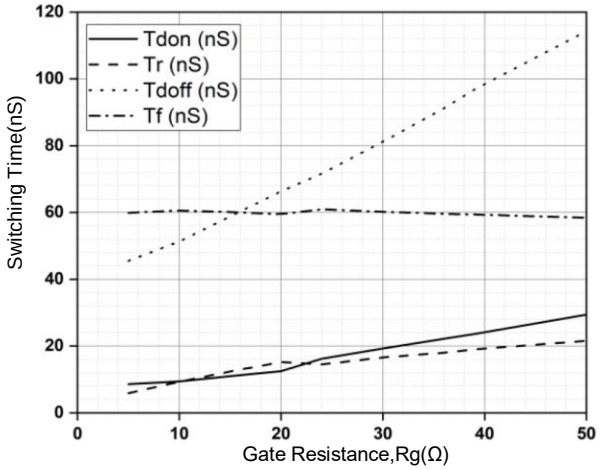


Figure 13. Typical switching times as a function of gate resistor（Tj=25℃，V_{CC}=400V，Ic=10A）

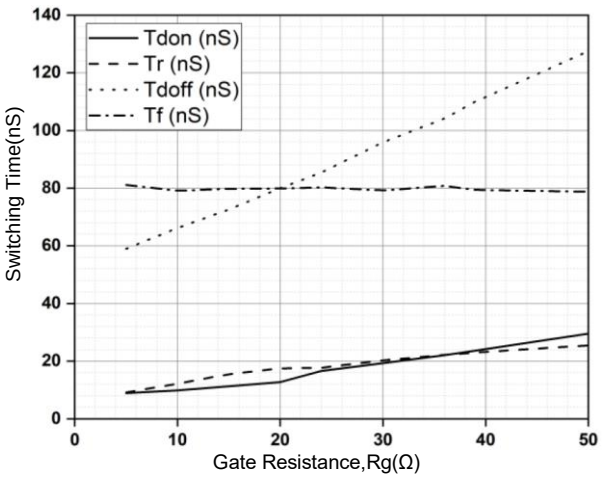


Figure 14. Typical switching times as a function of gate resistor（Tj=150℃，V_{CC}=400V，Ic=10A）

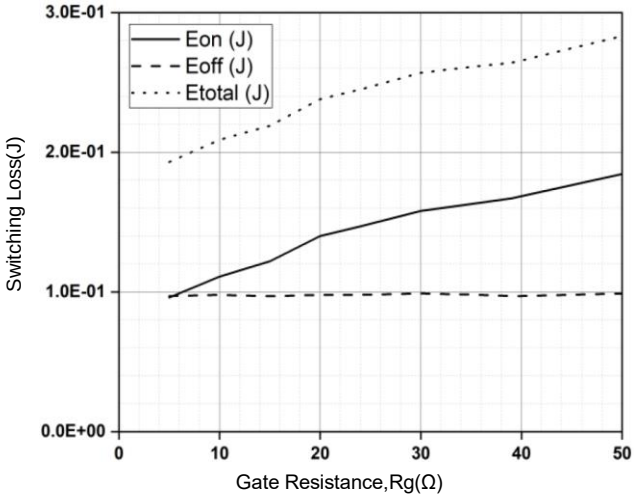


Figure 15. Typical switching energy losses as a function of gate resistor（Tj=25℃，V_{CC}=400V，Ic=10A）

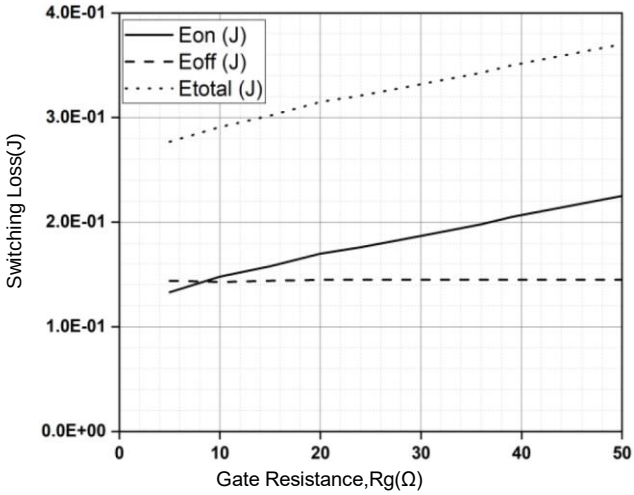


Figure 16. Typical switching energy losses as a function of gate resistor（Tj=150℃，V_{CC}=400V，Ic=10A）

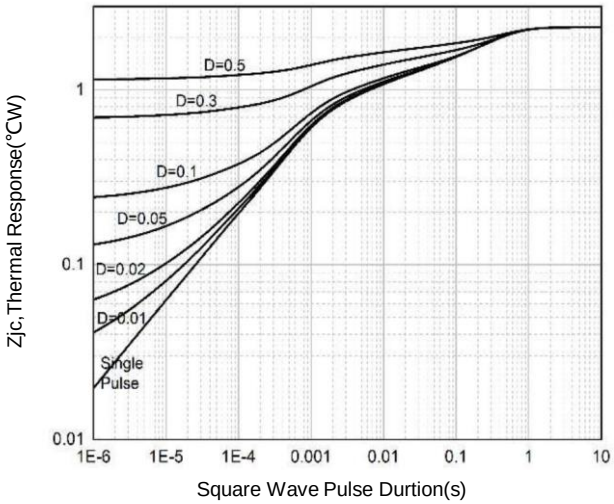


Figure 17. IGBT transient thermal impedance(D=tp/T)

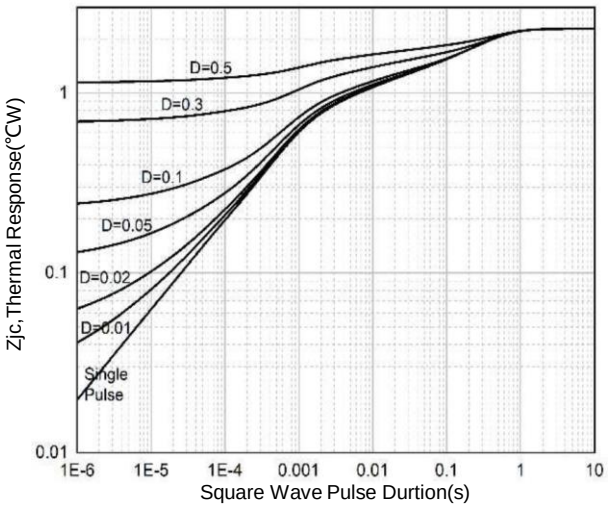


Figure 18. Diode transient thermal impedance as a function of pulse width(D=tp/T)

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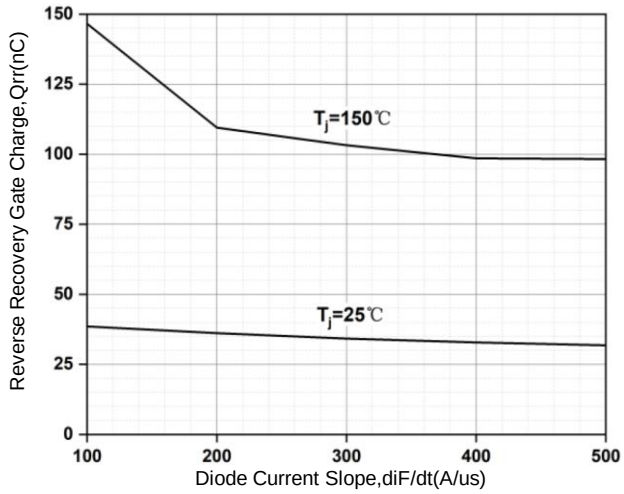


Figure 19. Typical reverse recovery charge as a function of diode current slope（V_{CC}=400V，IF=10A）

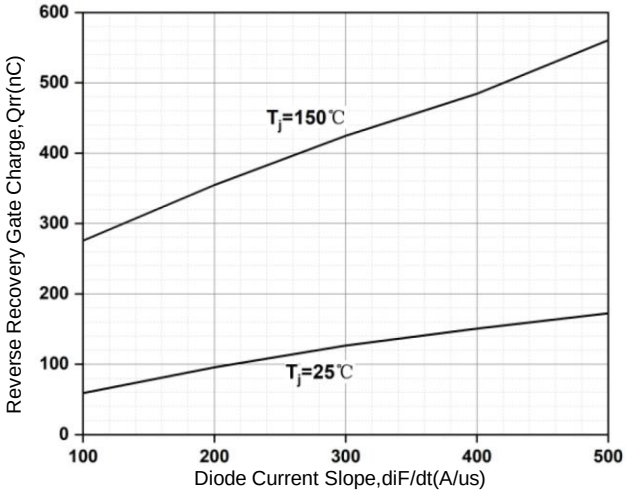


Figure 20. Typical reverse recovery time as a function of diode current slope（V_{CC}=400V，IF=10A）

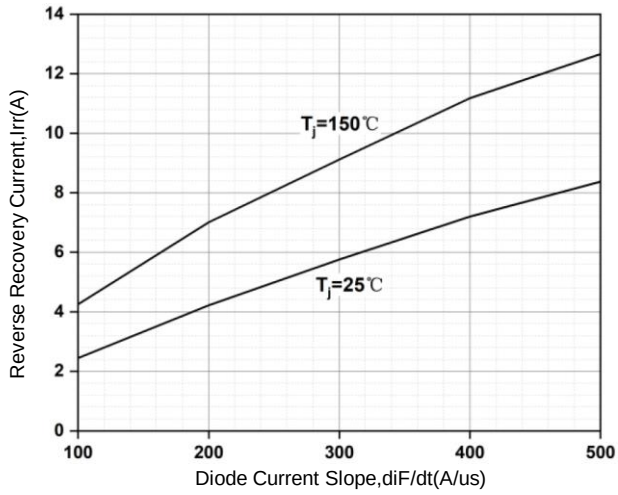


Figure 21. Typical reverse recovery current as a function of diode current slope（V_{CC}=400V，IF=10A）

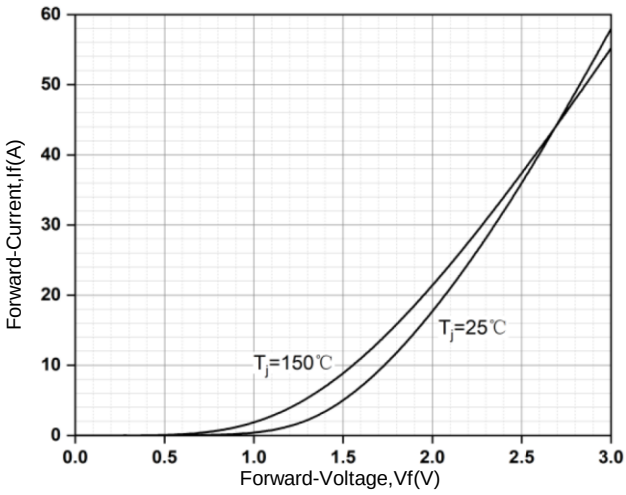


Figure 22. Typical diode forward current as a function of forward voltage

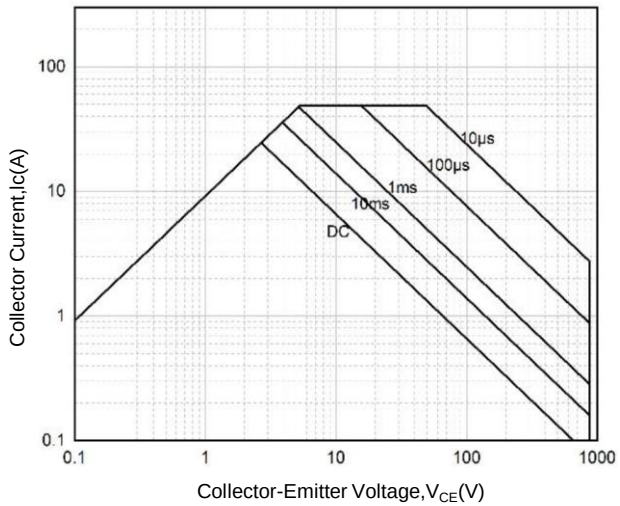
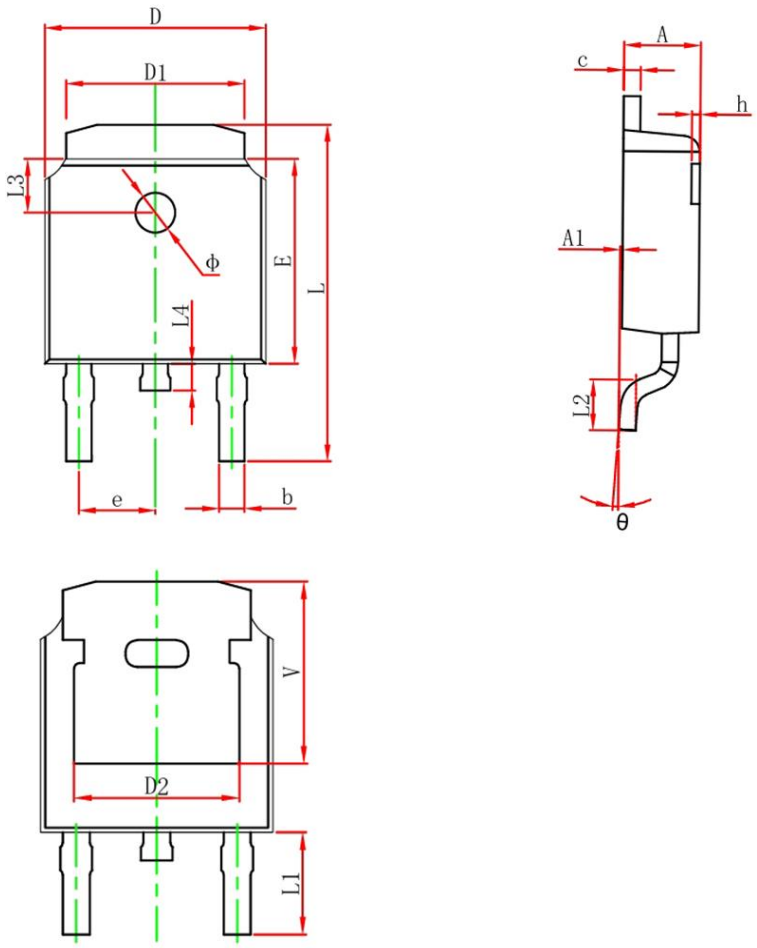


Figure 23. Safe operating area

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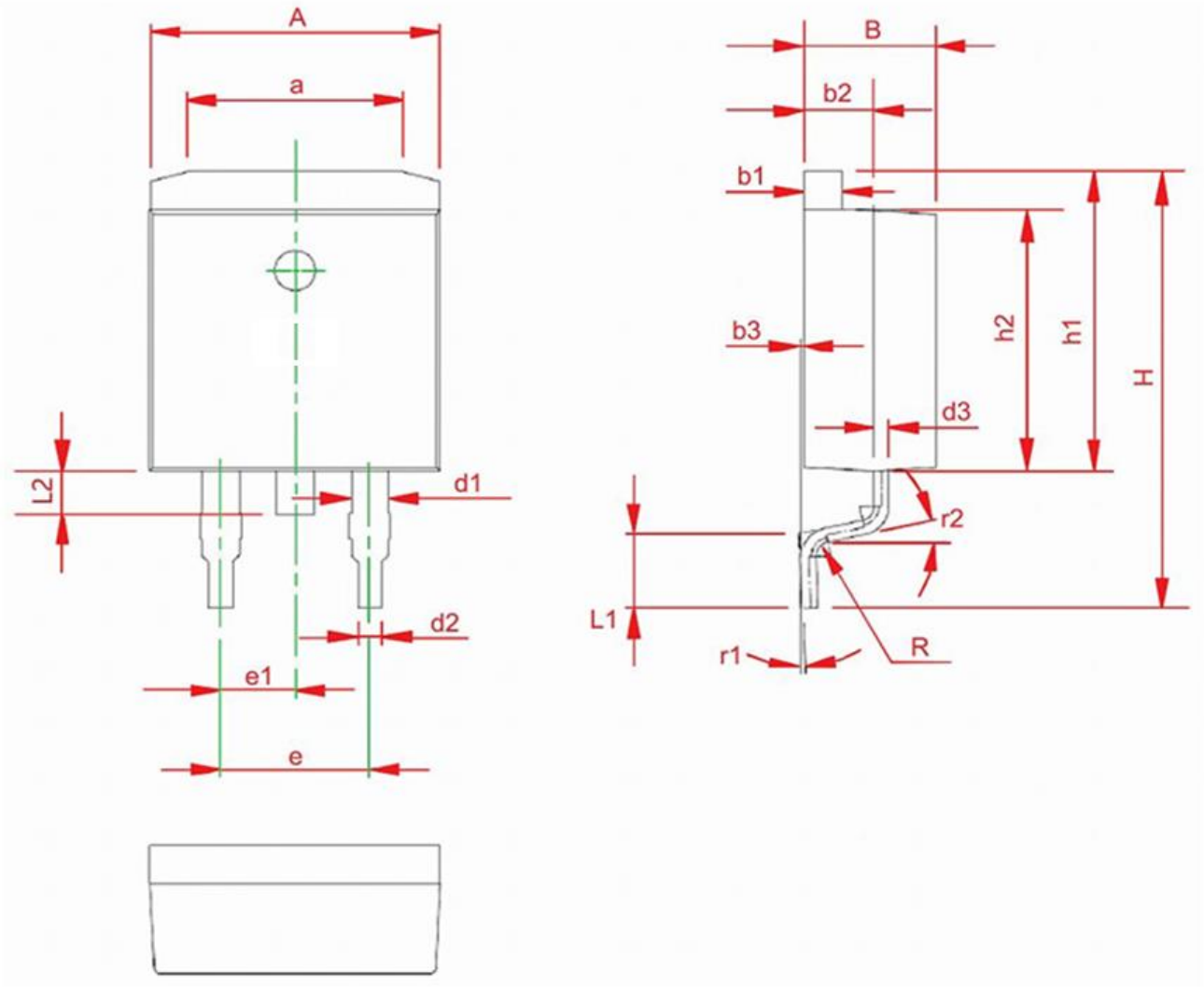
TO-252 Package information



Symbol	Dimensions in Millimeters(mm)		Dimensions In Inches	
	Min	Max	Min	Max
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.635	0.770	0.025	0.030
c	0.450	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	4.830 REF.		0.190 REF.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.712	10.312	0.386	0.406
L1	2.900 REF.		0.114 REF.	
L2	1.400	1.700	0.055	0.067
L3	1.600 REF.		0.063 REF.	
L4	0.600	1.000	0.024	0.039
Φ	1.100	1.300	0.043	0.051
θ	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.250 REF.		0.207 REF.	

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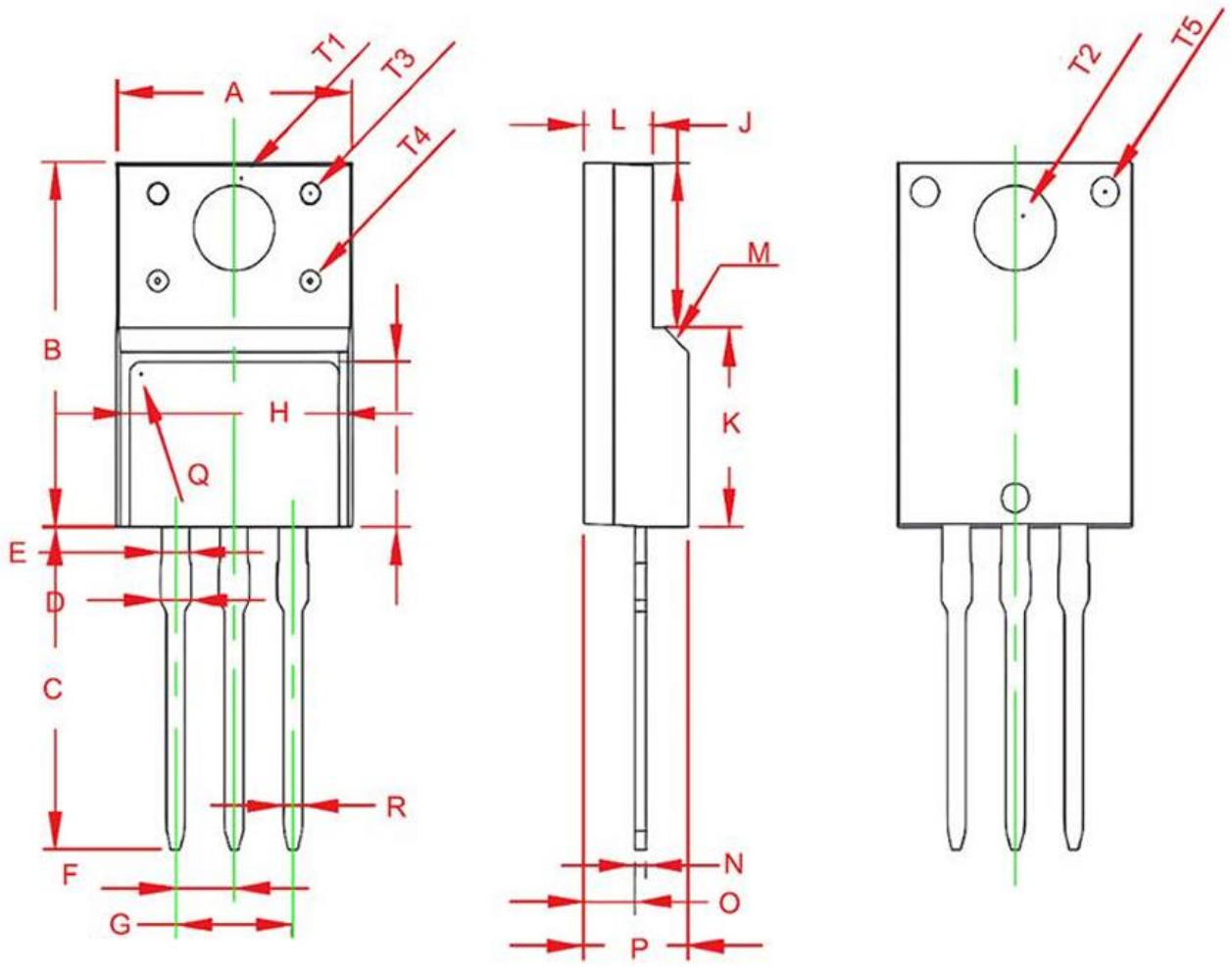
TO-263 Package information



Symbol	Dimensions in Millimeters(mm)		Symbol	Dimensions in Millimeters(mm)	
	Min	Max		Min	Max
A	9.700	10.300	e1	2.54TYP	
a	7.000	7.800	H	14.800	15.600
B	4.300	4.700	h1	10.200	10.700
b1	1.250	1.350	h2	8.900	9.400
b2	2.200	2.600	L1	2.400	2.900
b3	0.000	0.200	L2	1.300	1.800
d1	1.200	1.400	R	0.5TYP	
d2	0.700	0.900	r1	0°	8°
d3	0.400	0.600	r2	12°TYP	
e	5.08TYP				

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TO-220F Package information



Symbol	Dimensions in Millimeters(mm)		Dimensions In Inches	
	Min	Max	Min	Max
A	9.960	10.360	0.392	0.407
B	15.670	16.070	0.616	0.632
C	13.140	13.540	0.517	0.533
D	1.200	1.400	0.047	0.055
E	1.200TYP		0.047TYP	
F	2.540TYP		0.100TYP	
G	5.080TYP		0.200TYP	
H	7.600	8.000	0.299	0.314
I	7.100	7.500	0.279	0.295
J	6.480	6.880	0.255	0.270
K	8.990	9.390	0.353	0.369
L	2.340	2.740	0.092	0.107
M	45°TYP		45°TYP	
N	0.490	0.520	0.019	0.020
O	2.150	2.550	0.084	0.100
P	4.500	4.900	0.177	0.192
Q	0.500TYP		0.019TYP	
S	4.5°TYP		4.5°TYP	
T1	3.450TYP		0.135TYP	
T2	3.180TYP		0.125TYP	
T3	1.500TYP		0.059TYP	
T4	1.200TYP		0.047TYP	
T5	1.500TYP		0.059TYP	
R	0.770	0.830	0.030	0.032

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