MGA40H65F7

650V/40A IGBT

Features

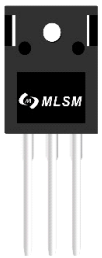
- IGBT CHIP(Trench+Field Stop technology)
- Low Vcesat(typ) 1.6V@IC=40A
- Maximum junction temperature 175℃
- Low gate charge Qg
- RoHS compliant

Application

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

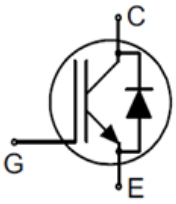
Product Summary

V_{CE}	I_C (T_J=100℃)	$V_{CE(sat)}$
650V	40A	1.6V

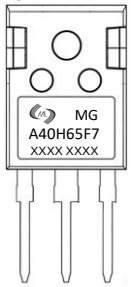


G C E

TO-247 top view



Schematic diagram



A40H65F7 : Device code
XXXXXXXX : Code

Marking and pin assignment

Pb-Free RoHS HAL 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	80	A
		Tc=100°C,T_{jmax}=175°C	40	A
I_{CRM}	Pulsed Collector Current, Limited by T_{vjmax}	tp=1ms	160	A
P_D	Power Dissipation	Tc=25°C	265.49	W
		Tc=100°C	132.74	W
Diode, Inverter				
V_{RRM}	Repetitive Reverse Voltage	T_J=25°C	650	V
I_F	Forward current,DC	Tc=25°C	80	A
		T_J=100°C	40	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)
MGA40H65F7	TO-247	A40H65F7	30	270	2,160

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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)							
$V_{GE(th)}$	Gate Emitter Threshold Voltage	$V_{CE}=V_{GE}$, I_C=0.25mA		4.5	5.0	6.0	V
$V_{CE(sat)}$	Collector - Emitter Saturation Voltage	I_C=40A, V_{GE}=15V, T_J=25°C		--	1.6	2.1	V
		I_C=40A, V_{GE}=15V, T_J=150°C		--	1.82	--	V
I_{CES}	Collector Leakage Current	V_{CE}=650V, V_{GE}=0V, T_J=25°C		--	--	200	nA
I_{GES}	Gate Leakage Current	V_{CE}=0V,V_{GE}=20V, T_J=25°C		--	--	200	nA
Dynamic Electrical Characteristics @ TJ = 25°C (unless otherwise stated)							
Q_g	Gate Charge	V_{CE}=520V, I_C=40A , V_{GE}=15V		--	109.32	--	nC
Q_{ge}	Gate to Emitter Charge			--	24.8	--	nC
Q_{gc}	Gate to Collector Charge			--	38.08	--	nC
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f =1MHz		--	3001	--	pF
C_{oes}	Output Capacitance			--	72	--	pF
C_{res}	Reverse Transfer Capacitance			--	11	--	pF
$t_{d(on)}$	Turn-on Delay Time	V_{CC}=400V,I_C=40A $R_{G(on)}$ =10Ω,$R_{G(off)}$ =10Ω V_{GE}=15V, Inductive Load	T_J=25℃	--	28	--	ns
			T_J=150℃	--	26	--	ns
t_r	Turn-on Rise Time		T_J=25℃	--	60	--	ns
			T_J=150℃	--	58	--	ns
$t_{d(off)}$	Turn-Off Delay Time		T_J=25℃	--	134	--	ns
			T_J=150℃	--	144	--	ns
t_f	Turn-Off Fall Time		T_J=25℃	--	60	--	ns
			T_J=150℃	--	74	--	ns
E_{on}	Turn on Energy		T_J=25℃		1.04		mJ
			T_J=150℃	--	1.12	--	mJ
E_{off}	Turn off Energy		T_J=25℃	--	0.73	--	mJ
			T_J=150℃	--	0.94	--	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=40A , V_{GE}=0V,	T_J=25°C	--	1.62	--	V
			T_J=150°C	--	1.43	--	V
t_{rr}	Reverse Recovery Time	I_F=40A , V_R=400V dIF/dt=400A/μs	T_J=25°C	--	109.24	--	ns
			T_J=150°C	--	195.12	--	ns
I_{rrm}	Peak reverse recovery current		T_J=25°C	--	8.398	--	A
			T_J=150°C	--	23.308	--	A
Q_{rr}	Repetitive peak forward current		T_J=25°C	--	425.98	--	nC
			T_J=150°C	--	2366	--	nC

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Typical Operating Characteristics

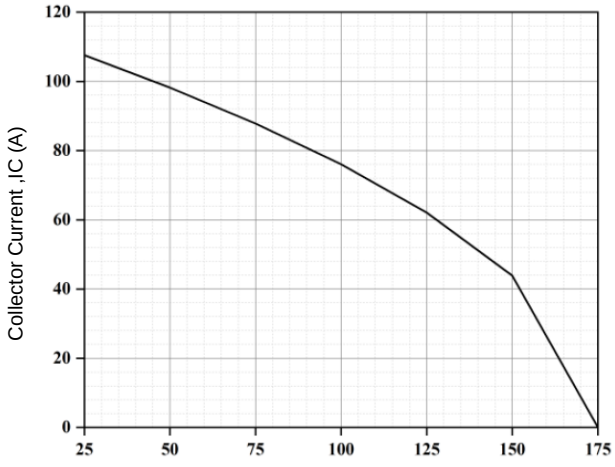


Figure 1. Collector current as a function of case temperature

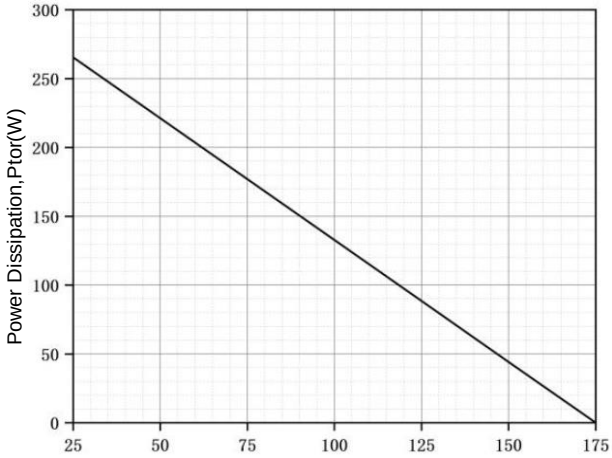


Figure 2. Power dissipation as a function of case temperature

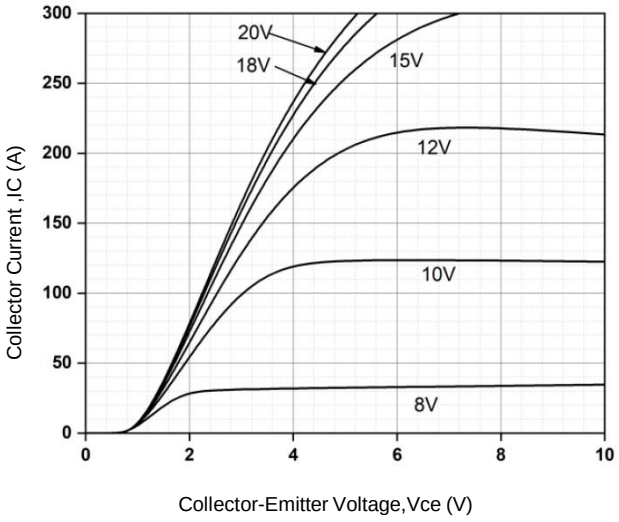


Figure 3. Typical output characteristic（Tj=25℃）

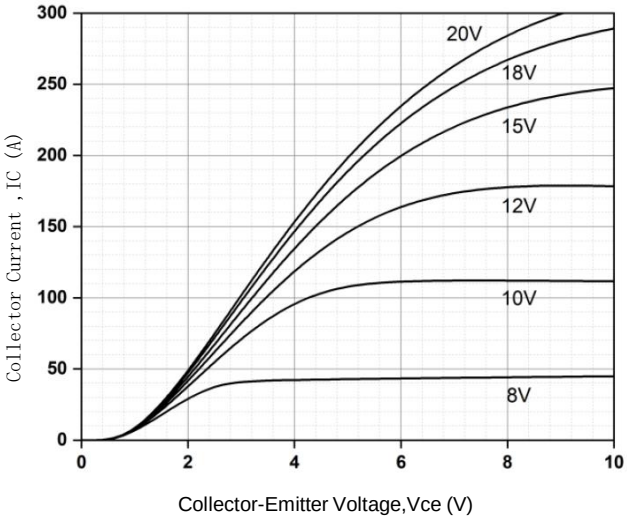


Figure 4. Typical output characteristic（Tj=150℃）

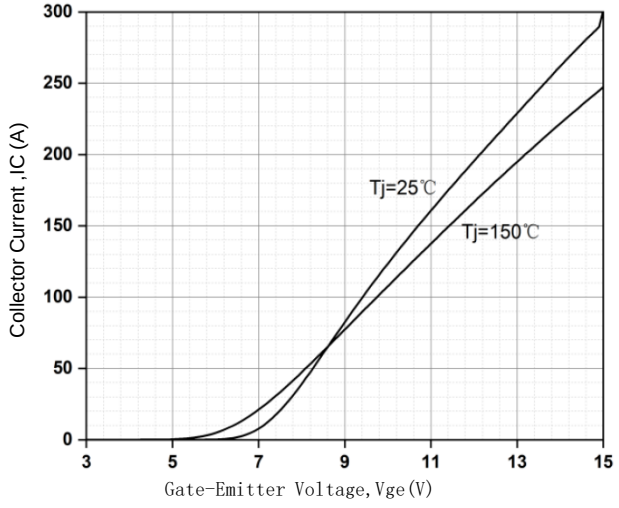


Figure 5. Typical transfer characteristic（V_{CE}=20V）

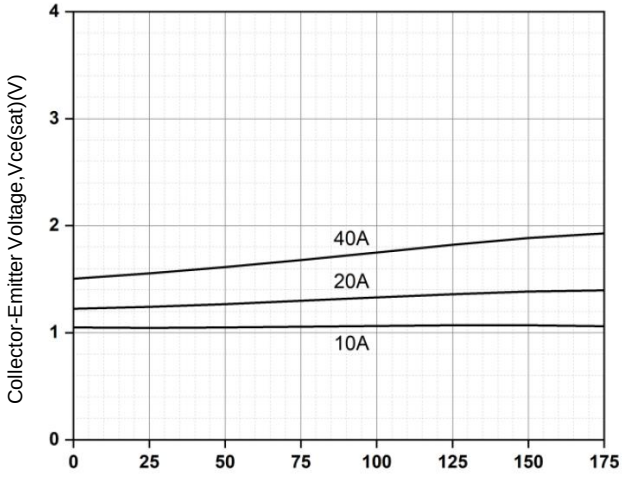


Figure 6. Typical collector-emitter saturation voltage as a function of junction temperature

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Typical Operating Characteristics

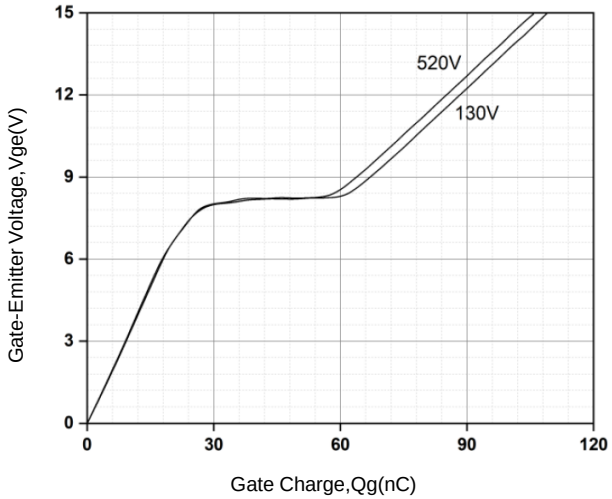


Figure 7. Typical gate charge

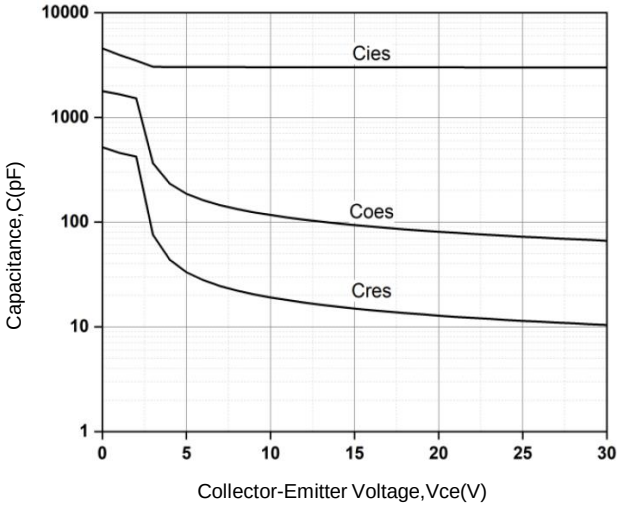


Figure 8. Typical capacitance as a function of collector-emitter voltage（f=1MHz）

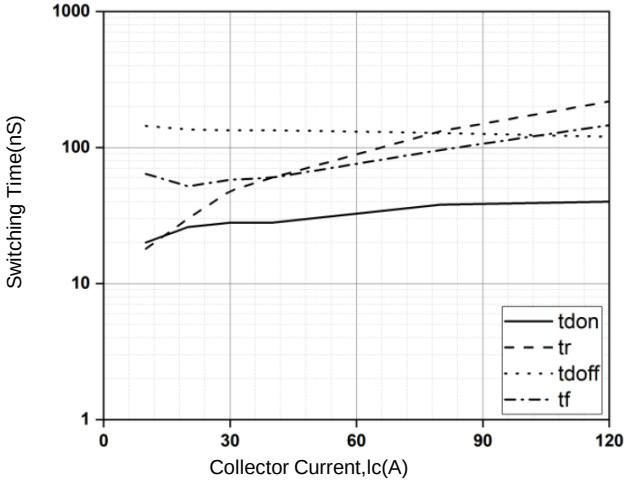


Figure 9. Typical switching times as a function of

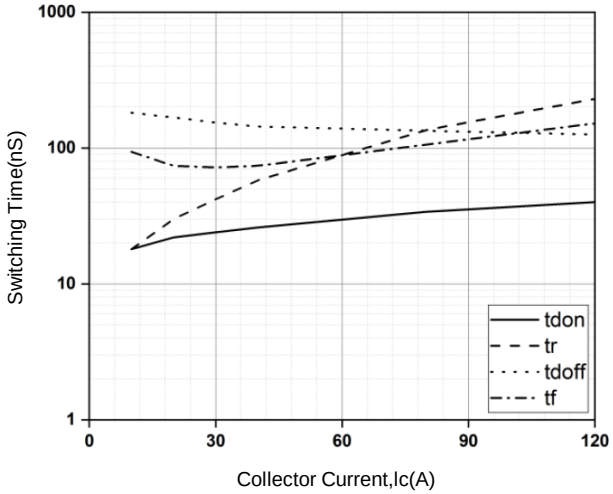


Figure 10. Typical switching times as a function of

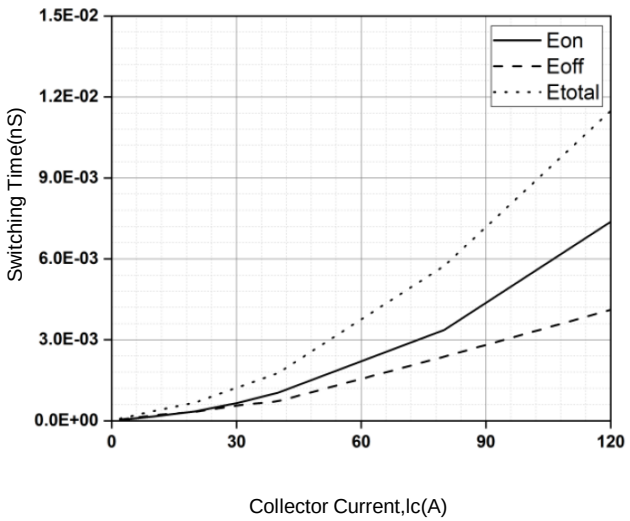


Figure 11. Typical switching energy losses as a function

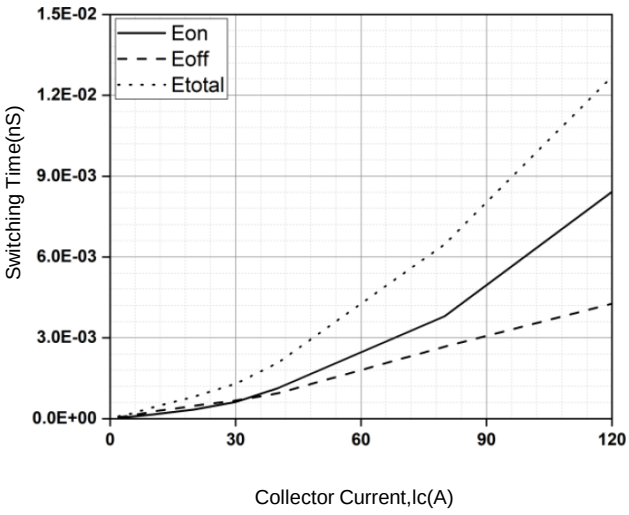


Figure 12. Typical switching energy losses as a function

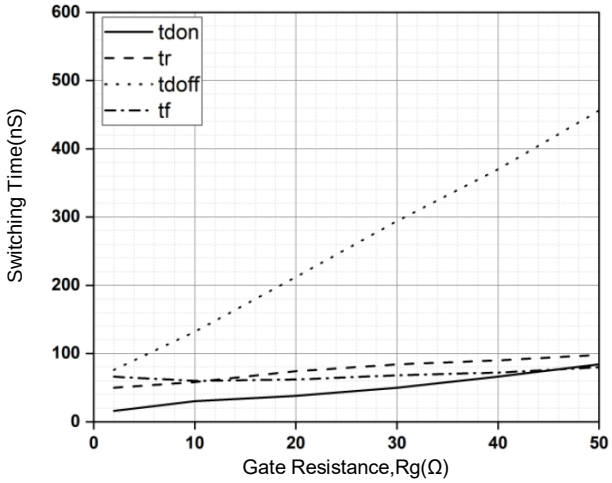


Figure 13. Typical switching times as a function of

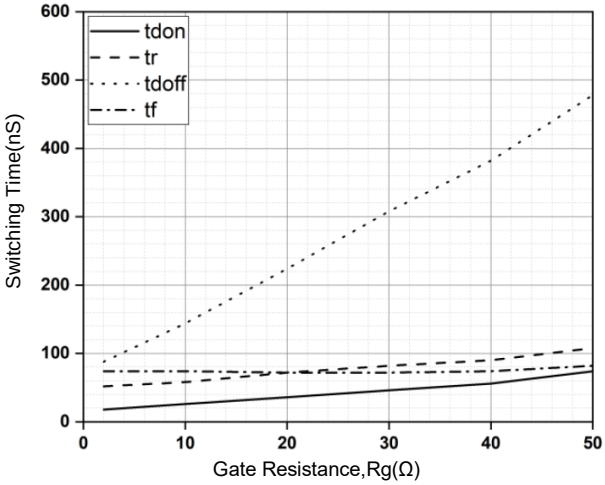


Figure 14. Typical switching times as a function of

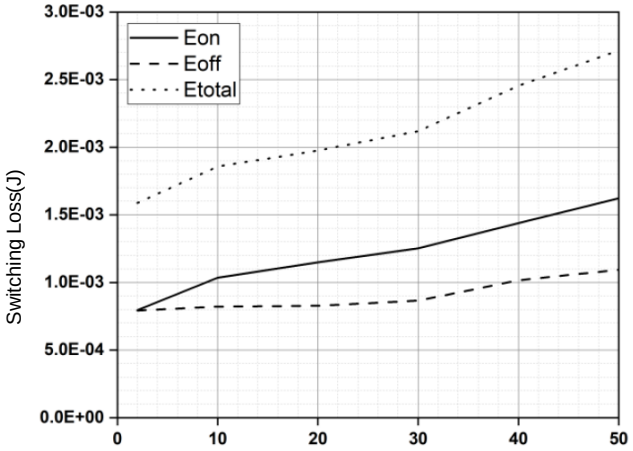


Figure 15. Typical switching energy losses as a function of

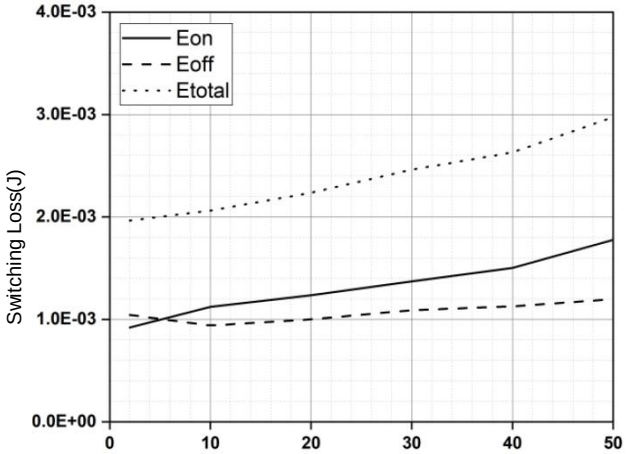


Figure 16. Typical switching energy losses as a function of

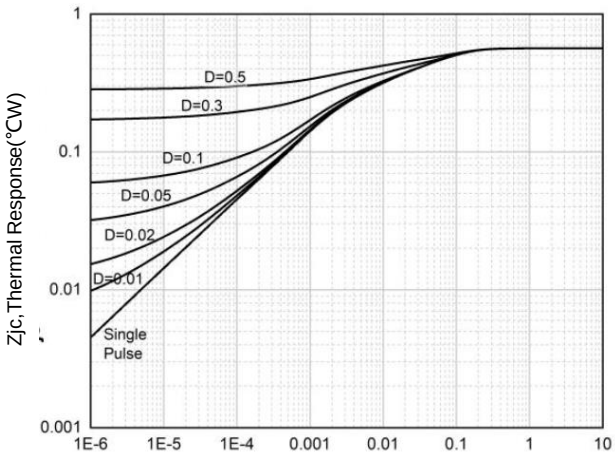


Figure 17. IGBT transient thermal impedance(D=tp/T)

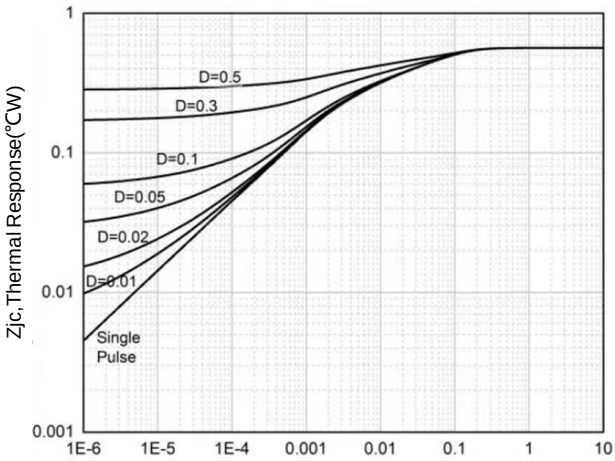


Figure 18. Diode transient thermal impedance as a function of pulse width(D=tp/T)

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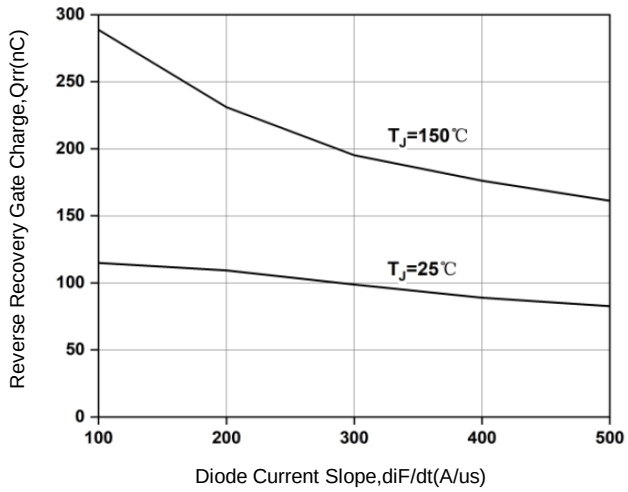


Figure 19. Typical reverse recovery charge as a function of diode current slope（V_{CC}=400V，IF=40A）

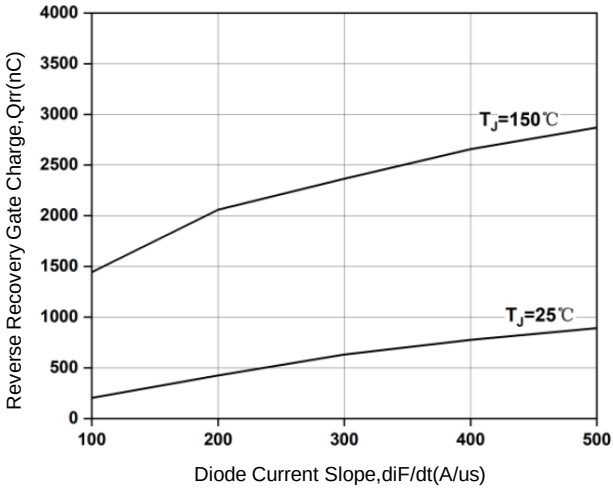


Figure 20. Typical reverse recovery time as a function of diode current slope（V_{CC}=400V，IF=40A）

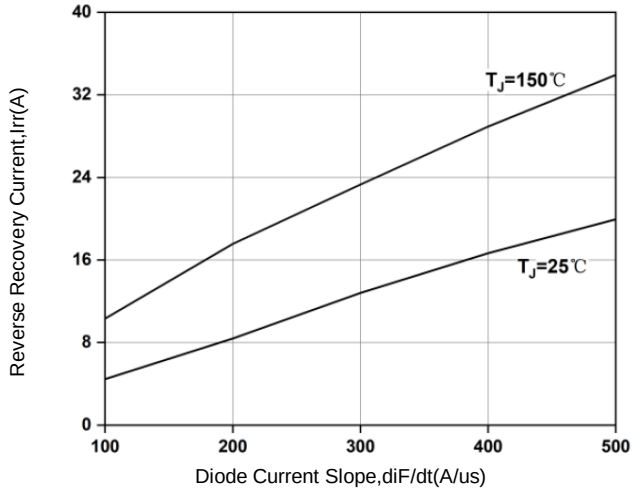


Figure 21. Typical reverse recovery current as a function of diode current slope（V_{CC}=400V，IF=40A）

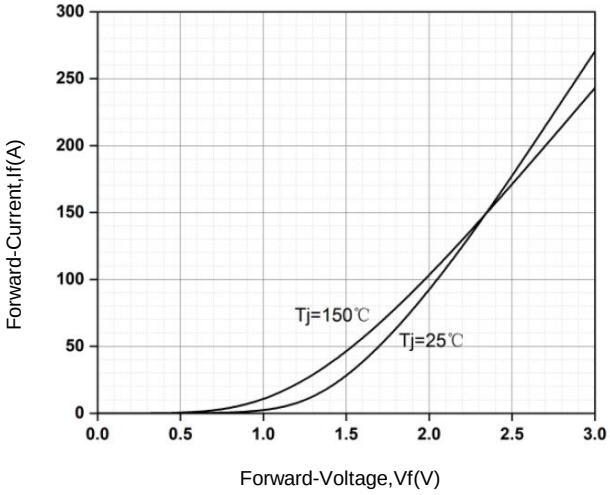


Figure 22. Typical diode forward current as a function of forward voltage

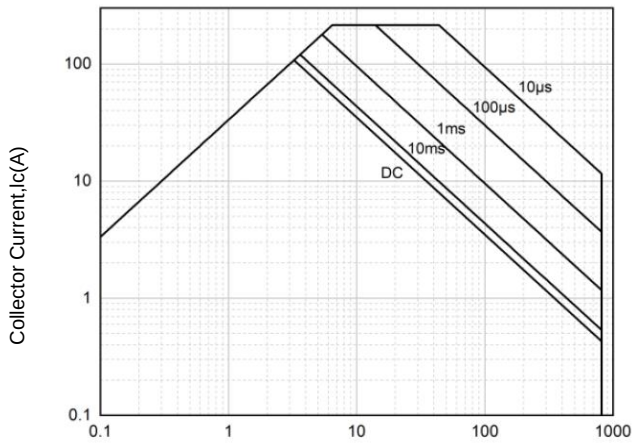
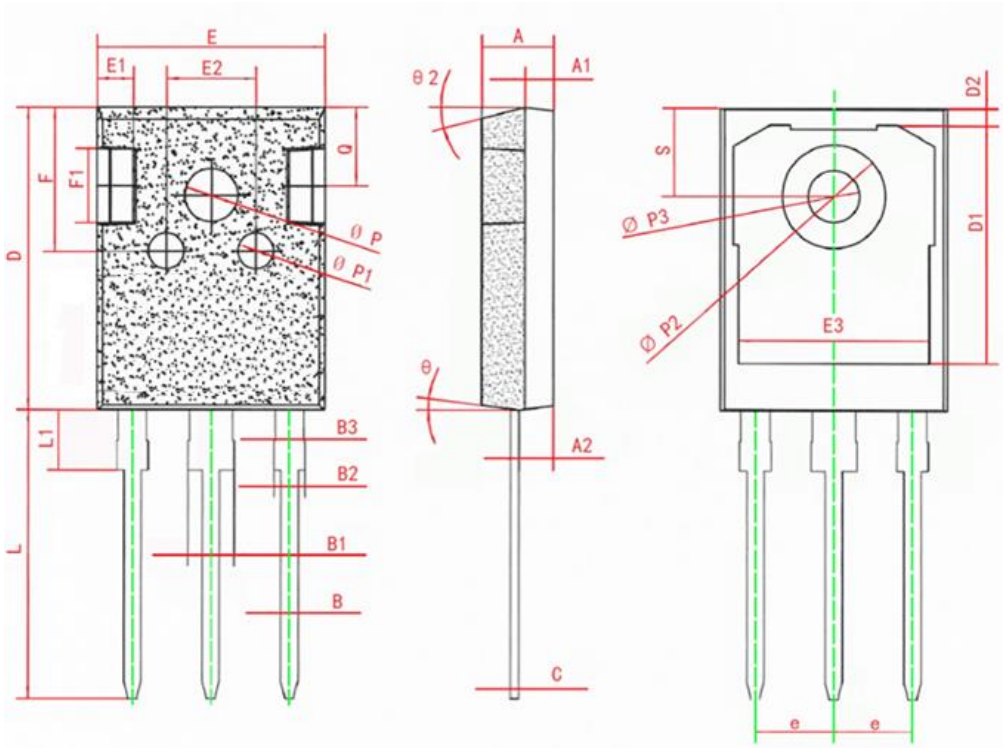


Figure 23. Safe operating area

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TO-247 Package information



Symbol	Dimensions in Millimeters(mm)		Dimensions In Inches	
	Min	Max	Min	Max
A	4.900	5.100	0.192	0.200
A1	1.900	2.100	0.074	0.082
A2	2.300	2.500	0.090	0.098
B	1.140	1.240	0.044	0.048
B1	3.050	3.250	0.120	0.127
B2	2.000	2.200	0.078	0.086
B3	1.900	2.100	0.074	0.082
C	0.550	0.650	0.021	0.025
D	20.800	21.200	0.818	0.834
D1	16.350	16.750	0.643	0.659
D2	1.020	1.320	0.040	0.051
E	15.600	16.000	0.614	0.629
E1	2.400	2.600	0.094	0.102
E2	6.100	6.300	0.240	0.248
E3	13.060	13.460	0.514	0.529
F	9.800	10.200	0.385	0.401
F1	4.800	5.400	0.188	0.212
F2	7.900	8.100	0.311	0.318
e	5.436BSC		0.214BSC	
L	19.720	20.120	0.776	0.792
L1	3.900	4.300	0.153	0.169
ΦP	3.550	3.950	0.139	0.155
ΦP1	2.400	2.600	0.094	0.102
ΦP2	7.090	7.290	0.279	0.287
ΦP3	3.500	3.700	0.137	0.145
S	6.050	6.250	0.238	0.246
Q	5.400	5.600	0.212	0.220
θ	5°	9°	5°	9°
θ1	5°	9°	5°	9°
θ2	13°	17°	13°	17°

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