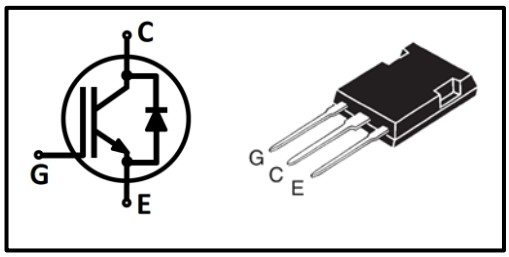
Features

- Easy parallel switching capability due to positive temperature coefficient in V_{CEsat}
- Low V_{CEsat}, fast switching
- High ruggedness, good thermal stability
- Very tight parameter distribution

Applications

- Industrial UPS
- Charger
- EnergyStorage
- Welding

Type	Marking	Package Code
MPBQ75N120E	MP75N120E	TO-247-3L Plus



Maximum Rated Values

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CE}	1200	V
DC collector current, limited by T_{jmax} T_C=25℃ T_C=100℃	I_C	 150 75	A
Pulsed collector current, t_p limited by T_{jmax} [1)]	I_{Cpuls}	225	
Diode forward current, limited by T_{jmax} T_C=25℃ T_C=100℃	I_F	 150 75	
Diode pulsed current, t_p limited by T_{jmax} [1)]	I_{Fpuls}	300	
Gate-emitter voltage	V_{GE}	±20	V
Transient Gate-emitter voltage（t_p≤10us,D<0.01)		±30	
Short circuit withstand time V_{GE}=15V, V_{CC}=600V, T_j≤175℃ Allowed number of short circuits < 1000 Time between short circuits: ≥ 1.0s	t_{SC}	10	μs
Power dissipation T_C=25℃	P_{tot}	833	W
Power dissipation T_C=100℃		416	
Operating junction temperature	T_j	-40~175	℃
Storage temperature	T_{stg}	-55~150	
Soldering temperature, wave soldering 1.6mm (0.063in.) from case for 10s		260	

[1)] Defined by design. Not subject to production test.

Thermal Characteristics

Parameter	Symbol	Min	Typ	Max	Unit
IGBT thermal resistance, junction-case	R_{thJC}	-	-	0.18	K/W
Diode thermal resistance, junction-case	R_{thJCD}	-	-	0.30	
Thermal Resistance, junction-ambient	R_{thJA}	-	-	40	

Electrical Characteristics（at T_j=25℃, unless otherwise specified）

Static Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Collector-emitter breakdown voltage	$V_{(BR)CES}$	V_{GE}=0V, I_C=0.25mA	1200	-	-	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	V_{GE}=15V, I_C=75A T_j=25℃	-	1.58	1.80	
		T_j=125℃	-	2.09	-	
		T_j=150℃	-	2.21	-	
		T_j=175℃	-	2.34	-	
G-E threshold voltage	$V_{GE(th)}$	I_C=2.4mA, V_{CE}=V_{GE}	5.0	5.6	6.2	
C-E leakage current	I_{CES}	V_{CE}=1200V,V_{GE}=0V T_j=25℃	-	-	0.1	mA
		T_j=175℃	-	-	4.0	
G-E leakage current	I_{GES}	V_{CE}=0V, V_{GE}=20V	-	-	250	nA
Transconductance	g_{fs}	V_{CE}=20V, I_C=75A	-	30	-	S

Dynamic Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Input capacitance	C_{ies}	V_{CE}=25V, V_{GE}=0V, f=1MHz	-	11533	-	pF
Output capacitance	C_{oes}		-	253	-	
Reverse transfer capacitance	C_{res}		-	60	-	
Gate charge	Q_G	V_{CC}=600V, I_C=75A, V_{GE}=15V	-	750	-	nC
Short circuit collector current	$I_{C(SC)}$	V_{GE}=15V, V_{CC}≤600V, t_{SC}≤10μs, T_j=175℃	-	350	-	A
Internal emitter inductance measured 5mm (0.197 in.) from case	L_E		-	13	-	nH

IGBT Switching Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Turn-on delay time	$t_{d(on)}$	T_j=25℃, V_{CC}=600V, I_C=75A, V_{GE}=0V/15V, R_G=10Ω, Inductive load	-	151	-	ns
Rise time	t_r		-	86	-	
Turn-off delay time	$t_{d(off)}$		-	488	-	
Fall time	t_f		-	55.6	-	
Turn-on energy	E_{on}		-	4.97	-	mJ
Turn-off energy	E_{off}		-	3.42	-	
Total switching energy	E_{ts}		-	8.39	-	
Turn-on delay time	$t_{d(on)}$	T_j=175℃, V_{CC}=600V, I_C=75A, V_{GE}=0V/15V, R_G=10Ω, Inductive load	-	145	-	ns
Rise time	t_r		-	86	-	
Turn-off delay time	$t_{d(off)}$		-	525	-	
Fall time	t_f		-	81.2	-	
Turn-on energy	E_{on}		-	5.21	-	mJ
Turn-off energy	E_{off}		-	3.98	-	
Total switching energy	E_{ts}		-	9.19	-	

Diode Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Diode forward voltage	V_F	V_{GE}=0V, I_F=75A T_j=25℃	-	2.4	-	V
		T_j=150℃	-	2.2	-	
		T_j=175℃	-	2.1	-	
Diode reverse recovery time	t_{rr}	T_j=25℃, V_R=600V, I_F=75A, di_F/dt=500A/μs	-	255	-	ns
Diode reverse recovery charge	Q_{rr}		-	3.0	-	μC
Diode peak reverse recovery current	I_{rrm}		-	25.5	-	A
Diode reverse recovery time	t_{rr}	T_j=175℃, V_R=600V, I_F=75A, di_F/dt=500A/μs	-	271	-	ns
Diode reverse recovery charge	Q_{rr}		-	3.2	-	μC
Diode peak reverse recovery current	I_{rrm}		-	26.5	-	A

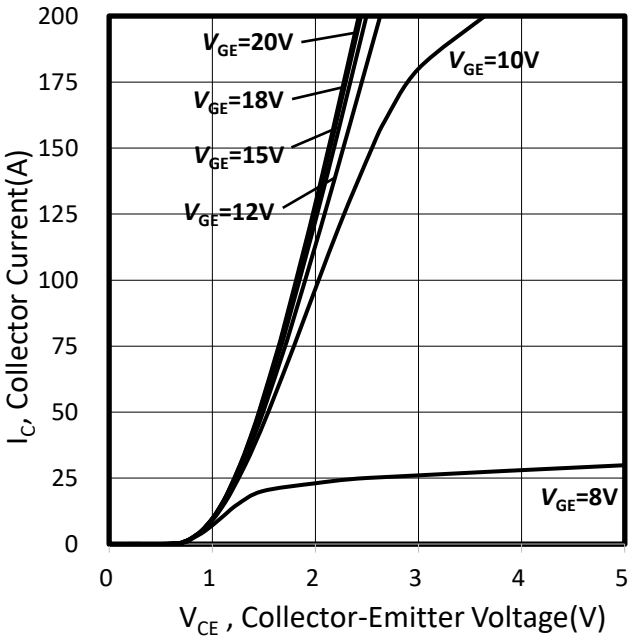


Figure 1. Typical output characteristic
（T_j=25℃）

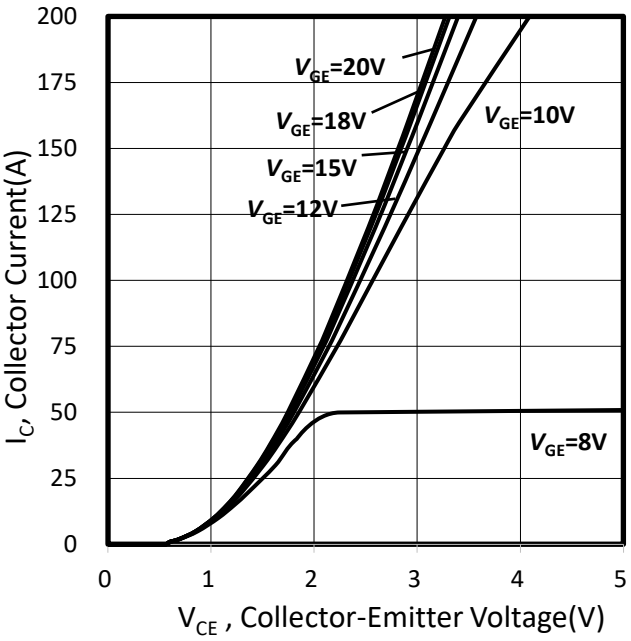


Figure 2. Typical output characteristic
（T_j=125℃）

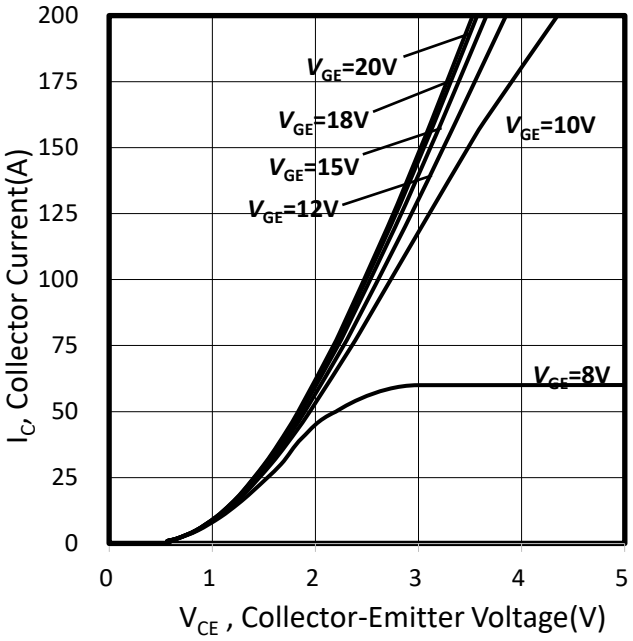


Figure 3. Typical output characteristic
（T_j=150℃）

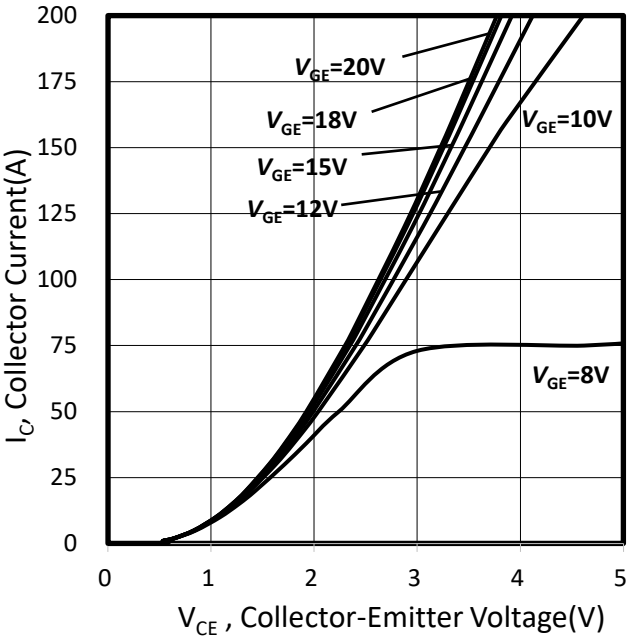


Figure 4. Typical output characteristic
（T_j=175℃）

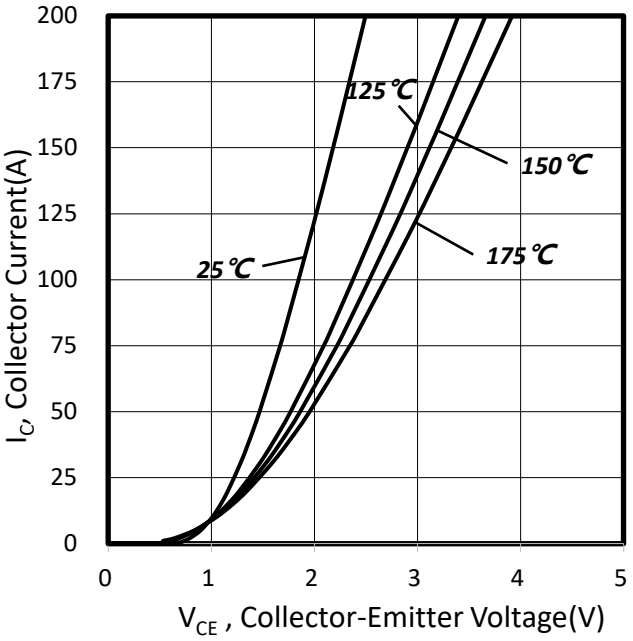


Figure 5. Typical $V_{CE(sat)}$-I_c characteristic
（V_{GE}=15V）

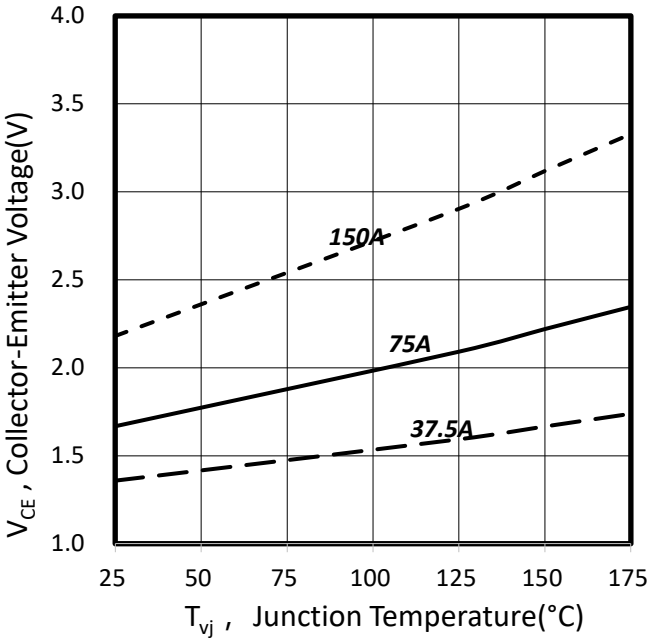


Figure 6. Typical $V_{CE(sat)}$-T_j characteristic
（V_{GE}=15V）

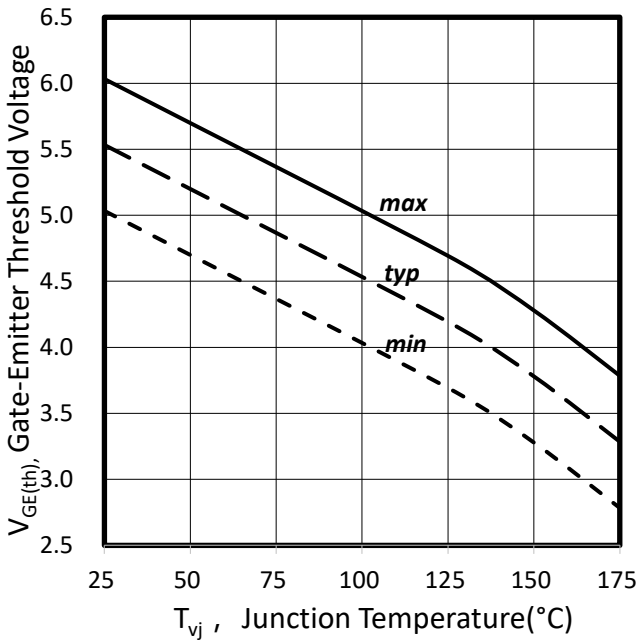


Figure 7.$V_{GE(th)}$-T_j characteristic
（I_c=2.4mA）

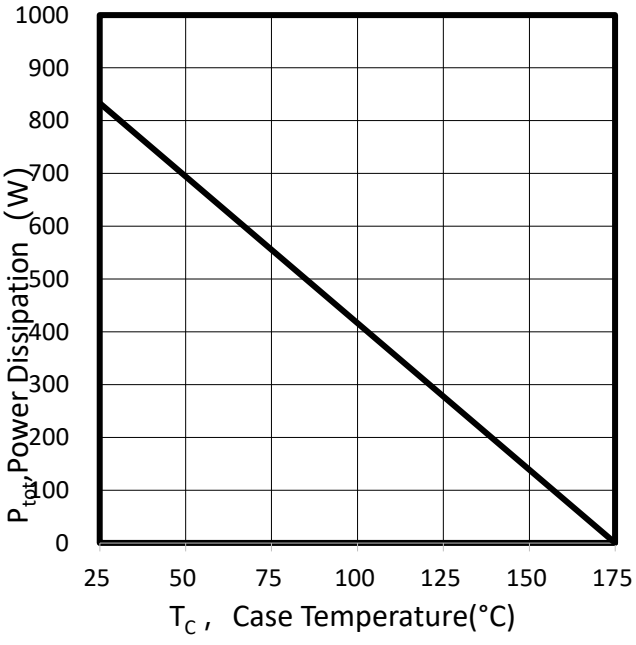


Figure 8. Power dissipation as a function of case temperature（Tj≤175℃ ）

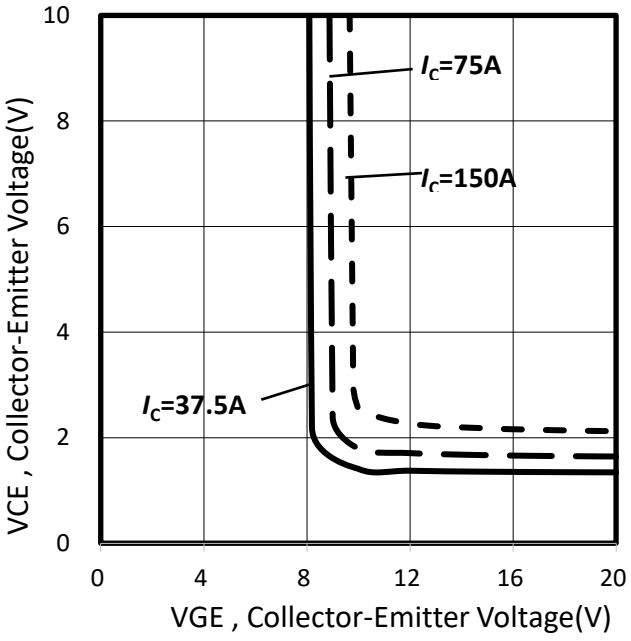


Figure 9. Typical $V_{CE(sat)}$-$V_{GE(th)}$ characteristic
(T_{vj}=25℃)

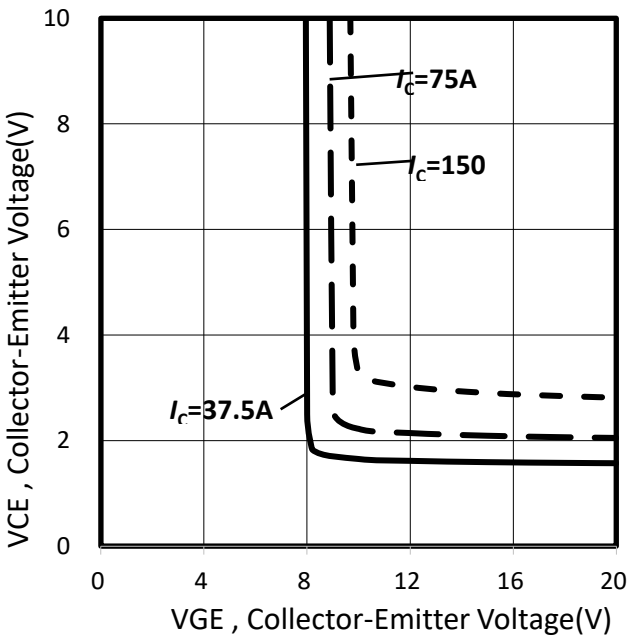


Figure 10. Typical $V_{CE(sat)}$-$V_{GE(th)}$ characteristic
(T_{vj}=125℃)

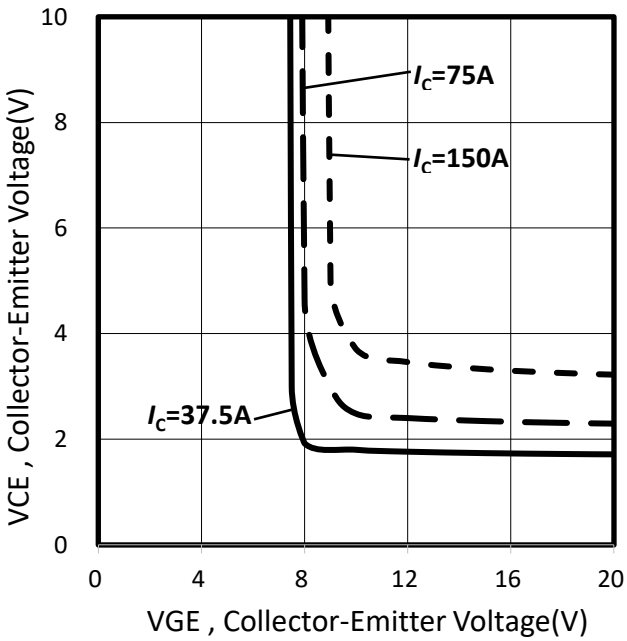


Figure 11. Typical $V_{CE(sat)}$-$V_{GE(th)}$ characteristic
(T_{vj}=150℃)

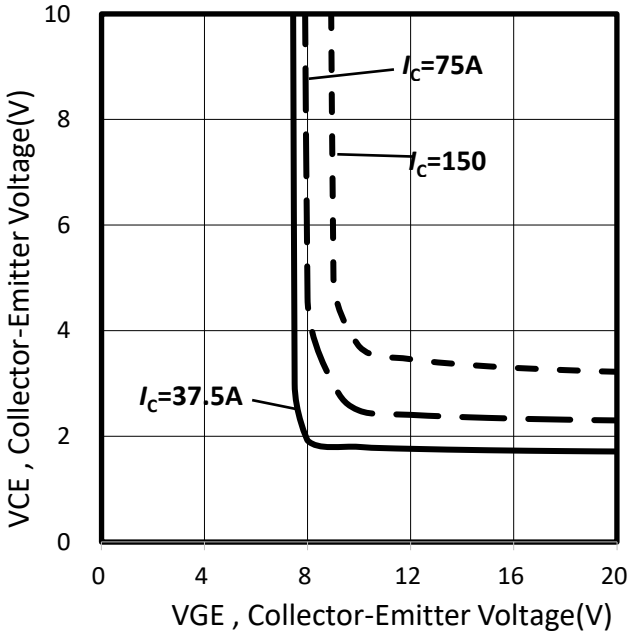


Figure 12. Typical $V_{CE(sat)}$-$V_{GE(th)}$ characteristic
(T_{vj}=175℃)

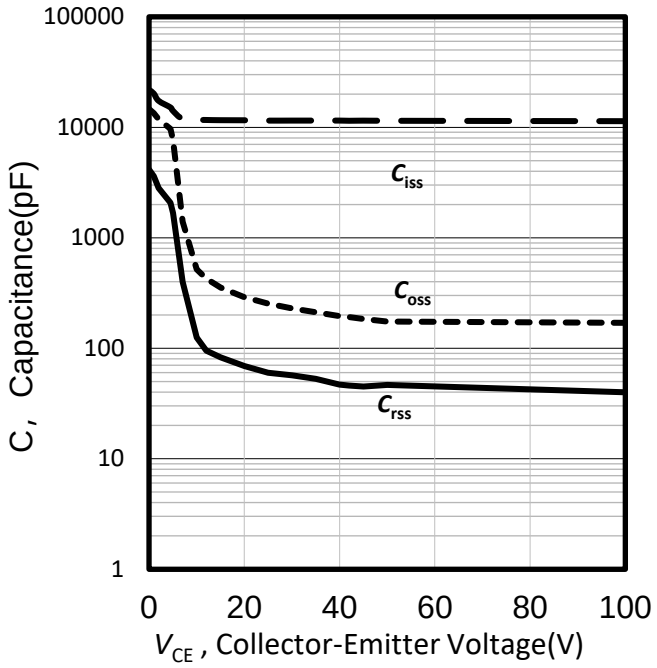


Figure 13. Typical capacitance as a function of collector-emitter voltage
(V_{GE}=0V, f=1MHz)

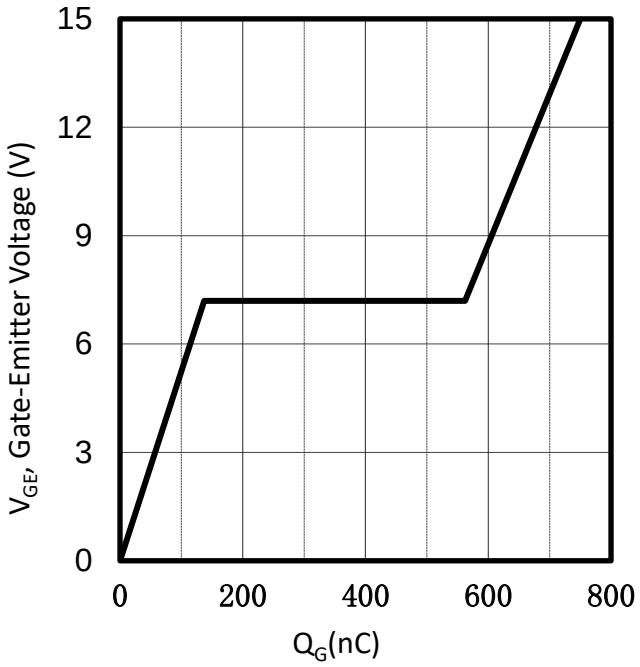


Figure 14. Typical gate charge
(V_{CE}=600V)

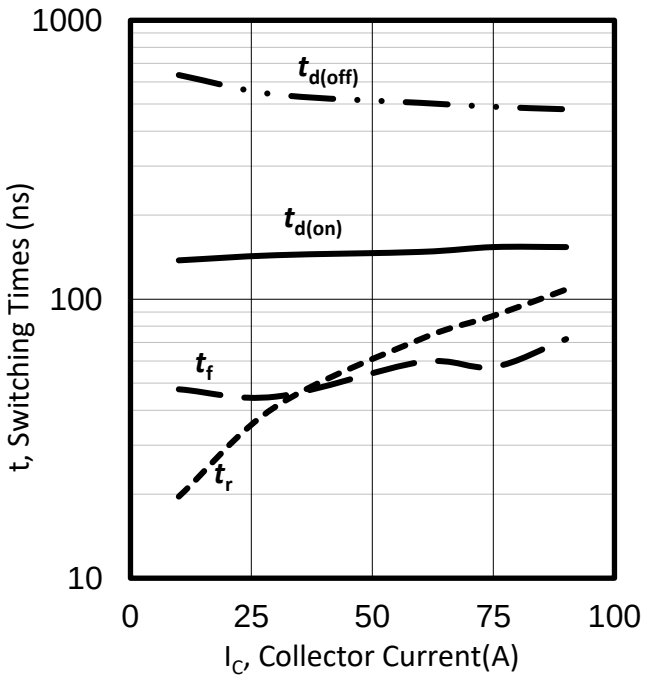


Figure 15. Typical switching times as a function of collector current
(inductive load, T_{vj}=25℃, V_{CE}=600V, V_{GE}=0/15V, R_G=10Ω)

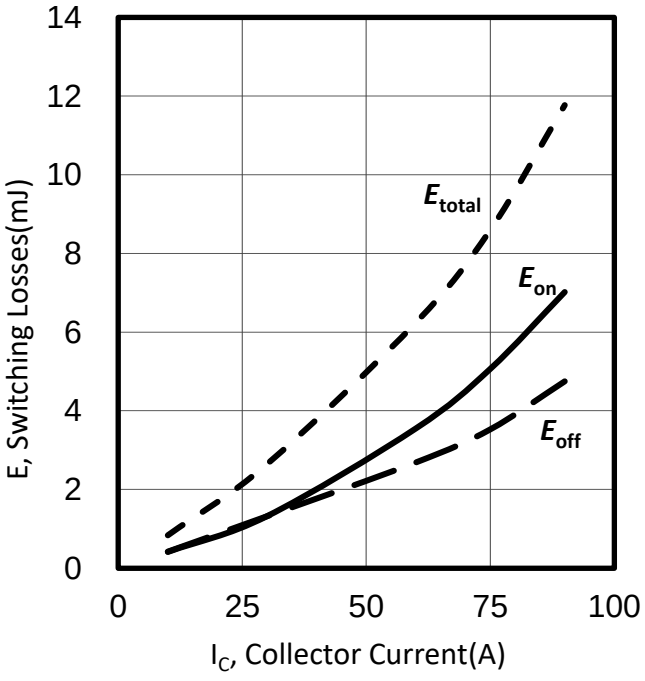


Figure 16. Typical switching times as a function of collector current
(inductive load, T_{vj}=25℃, V_{CE}=600V, V_{GE}=0/15V, R_G=10Ω)

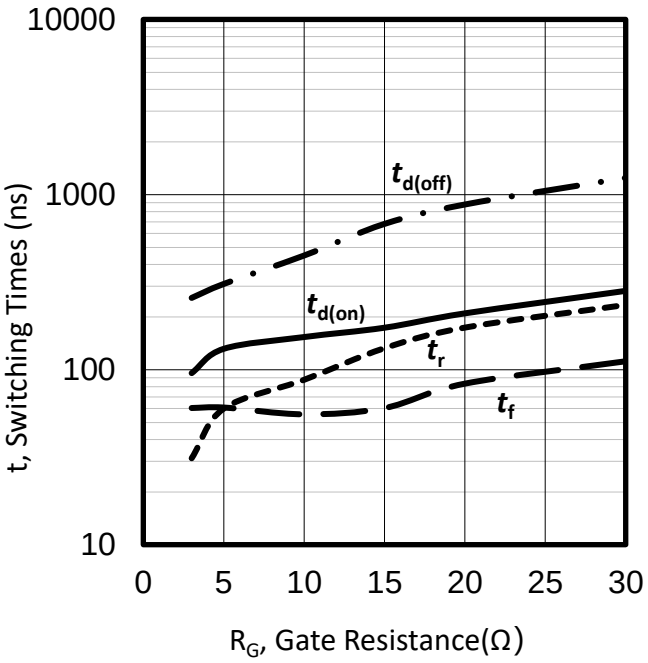


Figure 17. Typical switching times as a function of gate resistor
(inductive load, T_{vj}=25℃, V_{CE}=600V, V_{GE}=0/15V, I_C=75A)

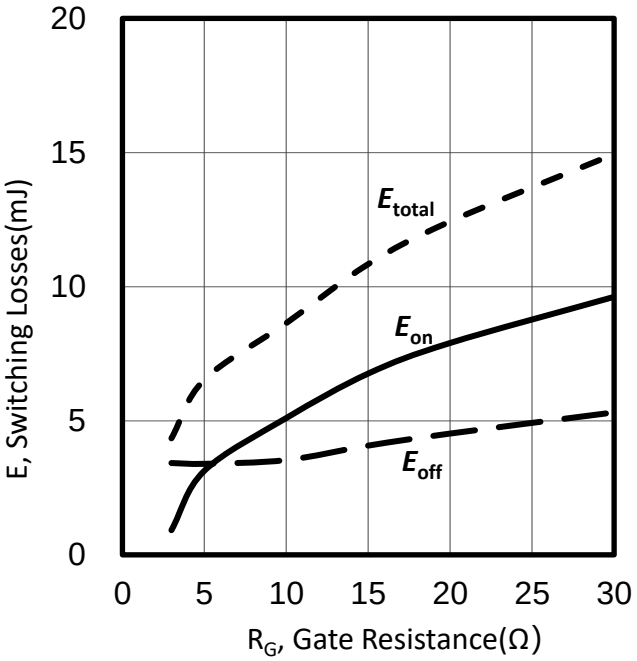


Figure 18. Typical switching energy losses as a function of gate resistor
(inductive load, T_{vj}=25℃, V_{CE}=600V, V_{GE}=0/15V, I_C=75A)

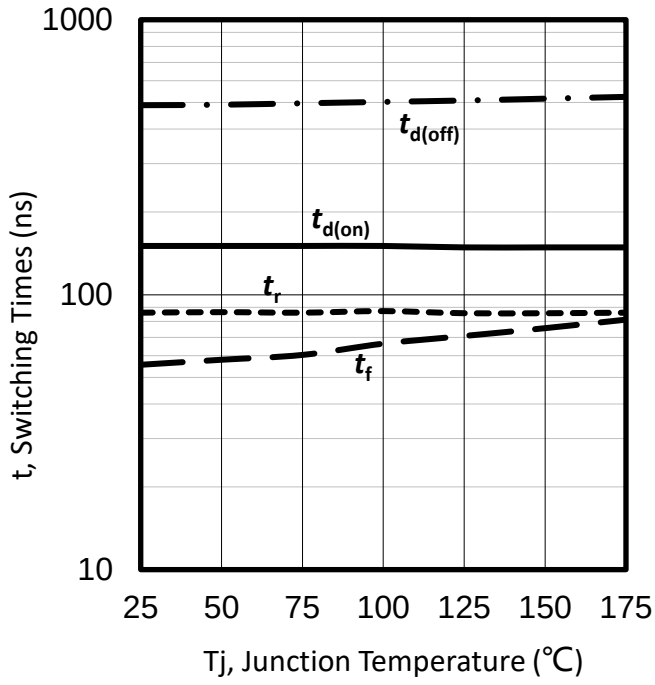


Figure 19. Typical switching times as a function of junction temperature
(inductive load, V_{CE}=600V, V_{GE}=0/15V, I_C=75A, , R_G=10Ω)

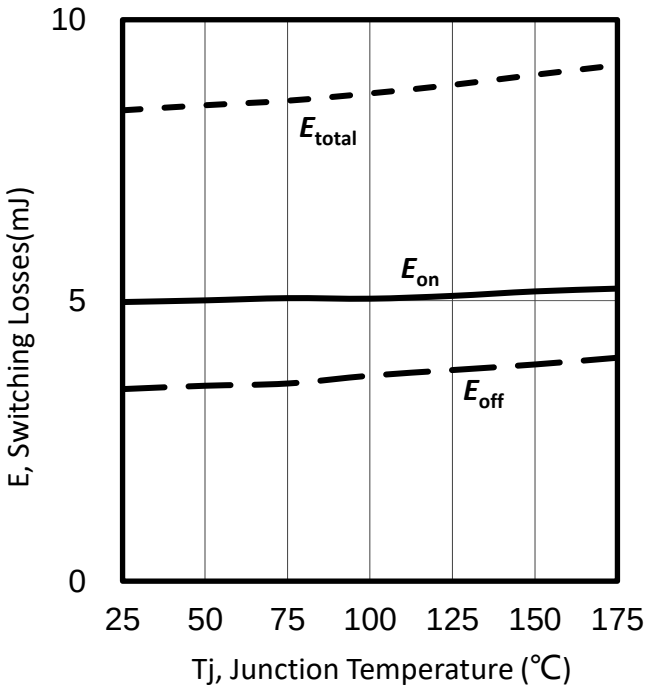


Figure 20. Typical switching energy losses as a function of junction temperature
(inductive load, V_{CE}=600V, V_{GE}=0/15V, I_C=75A, , R_G=10Ω)

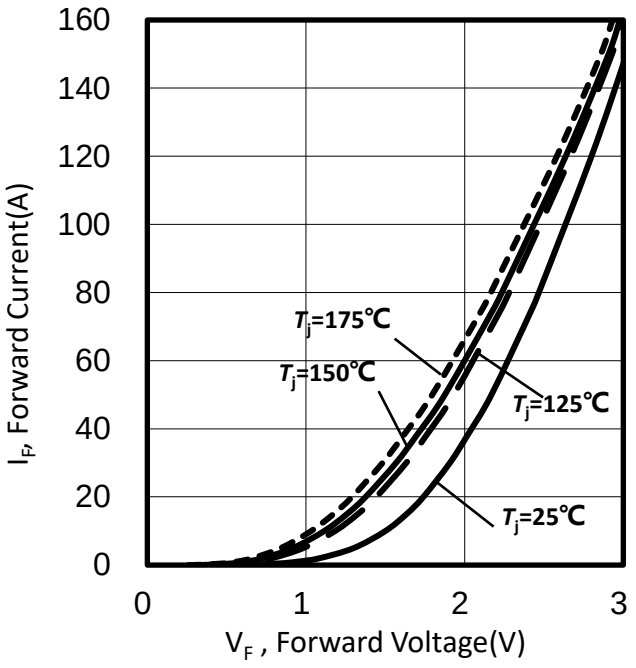


Figure 21. Typical diode forward current as a function of forward voltage

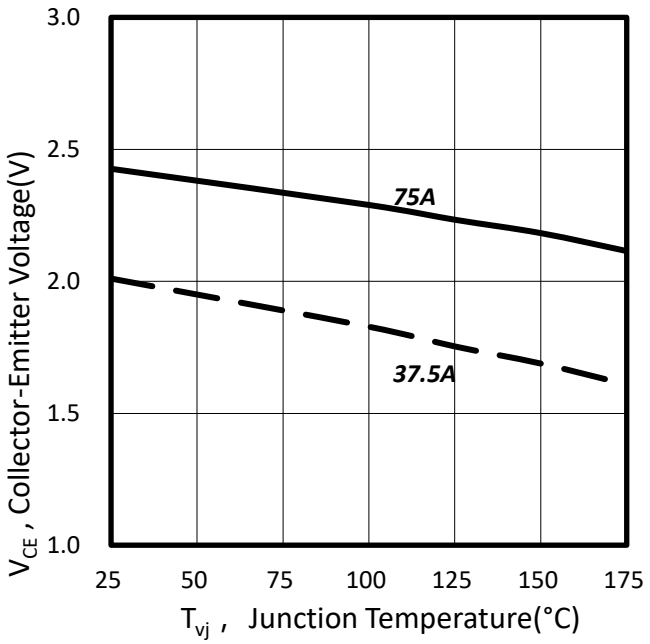


Figure 22. Typical diode forward voltage as a function of junction temperature

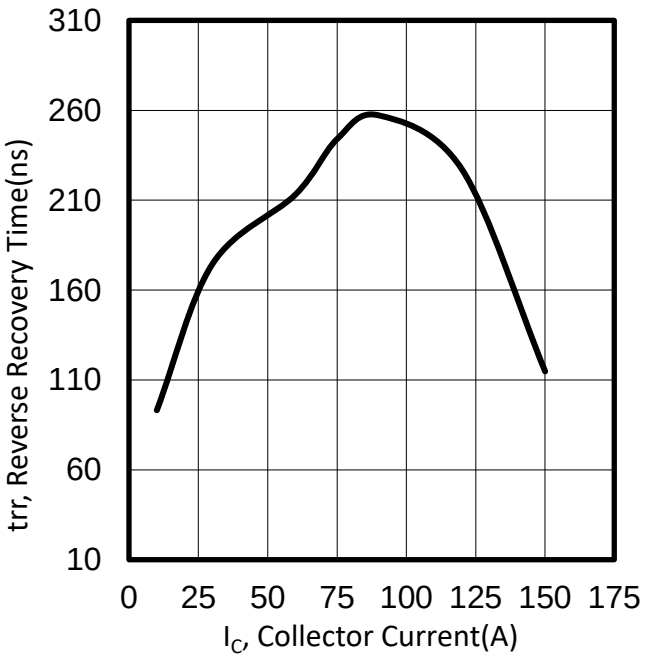


Figure 23. Typical reverse recovery time as a function of collector current
(inductive load, T_{vj}=25℃
V_{CE}=600V, V_{GE}=0/15V, R_G=10Ω)

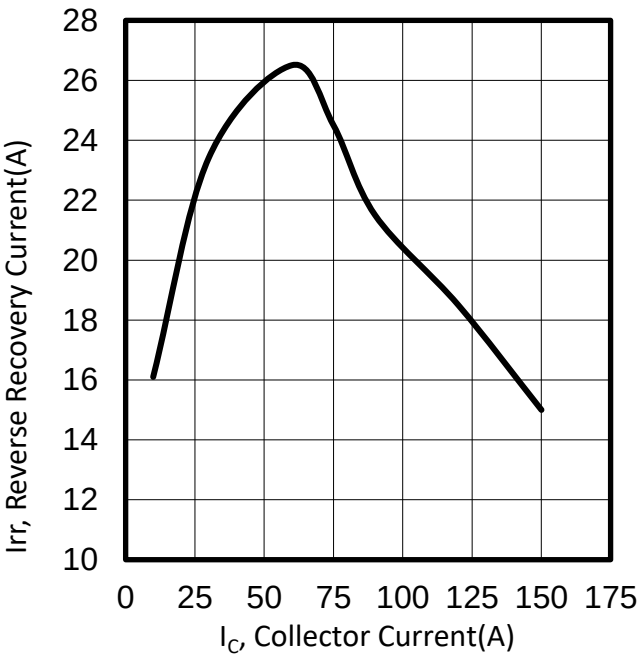


Figure 24. Typical reverse recovery current as a function of collector current
(inductive load, T_{vj}=25℃
V_{CE}=600V, V_{GE}=0/15V, R_G=10Ω)

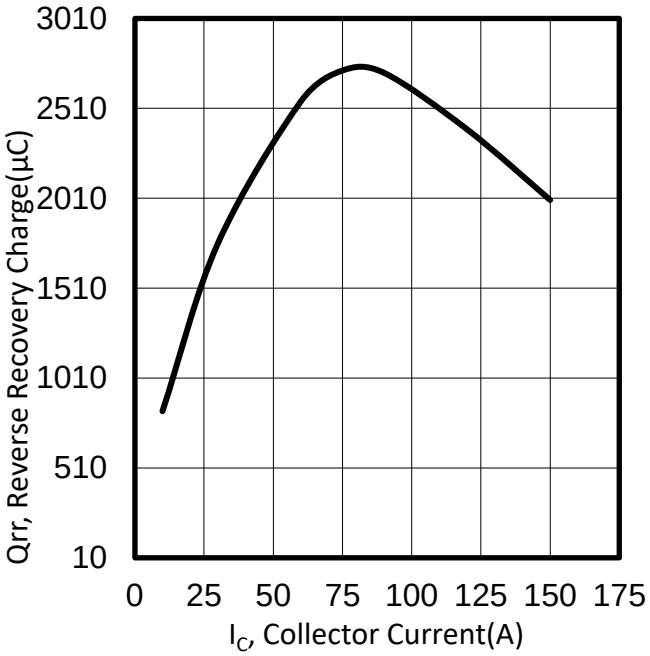


Figure 25. Typical reverse recovery charge as a function of collector current
(inductive load, T_{vj}=25℃
V_{CE}=600V, V_{GE}=0/15V, R_G=10Ω)

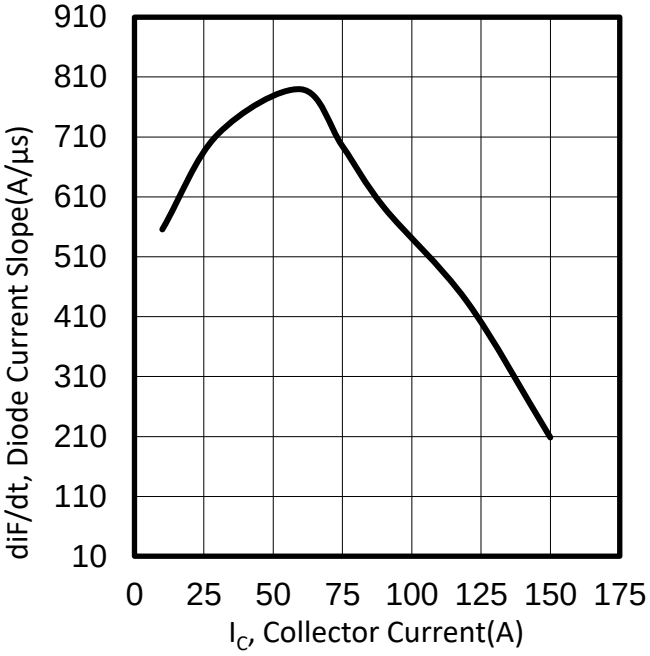


Figure 26. Typical diode current slope as a function of collector current
(inductive load, T_{vj}=25℃
V_{CE}=600V, V_{GE}=0/15V, R_G=10Ω)

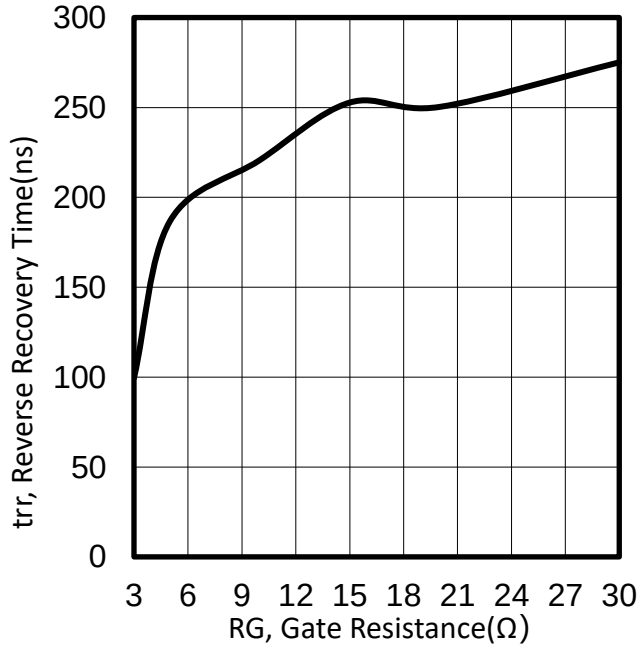


Figure 27. Typical reverse recovery time as a function of gate resistor
(inductive load, T_{vj}=25℃
V_{CE}=600V, V_{GE}=0/15V, I_C=75A)

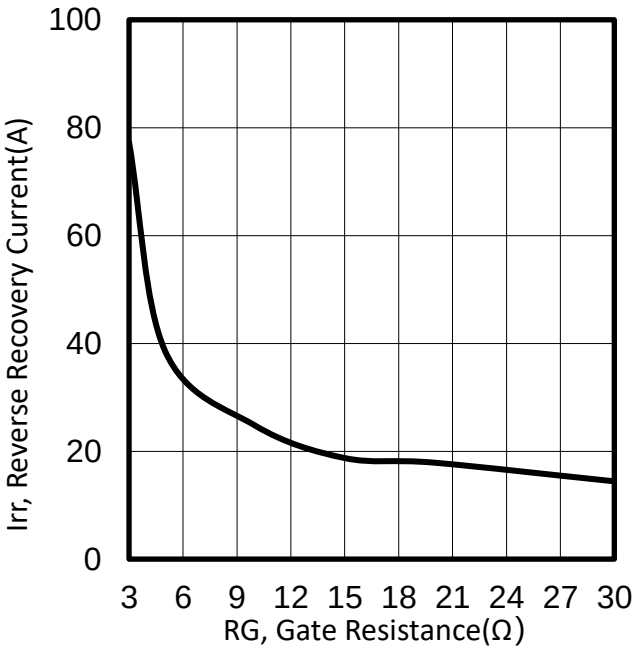


Figure 28. Typical reverse recovery current as a function of gate resistor
(inductive load, T_{vj}=25℃
V_{CE}=600V, V_{GE}=0/15V, I_C=75A)

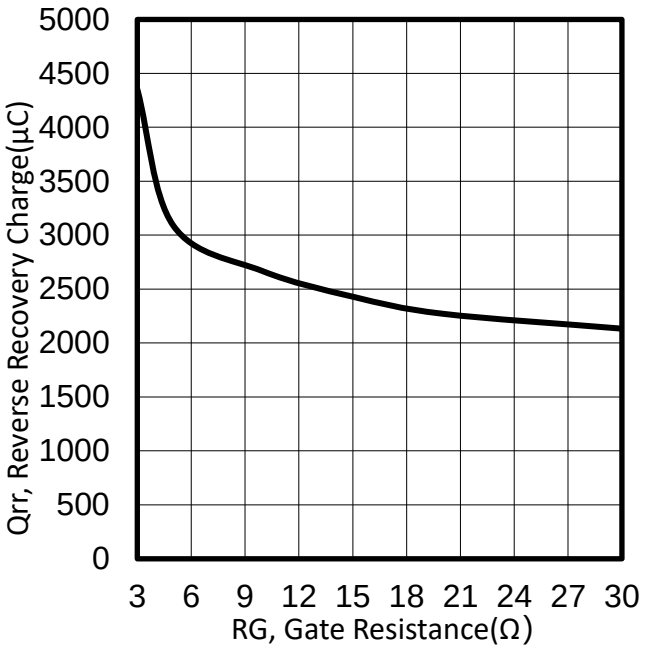


Figure 29. Typical reverse recovery charge as a function of gate resistor
(inductive load, T_{vj}=25℃
V_{CE}=600V, V_{GE}=0/15V, I_C=75A)

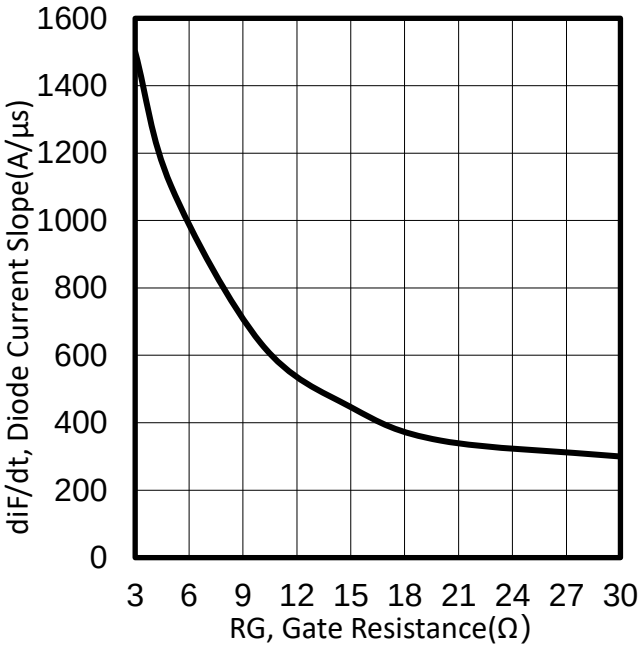


Figure 30. Typical diode current slope as a function of gate resistor
(inductive load, T_{vj}=25℃
V_{CE}=600V, V_{GE}=0/15V, I_C=75A)

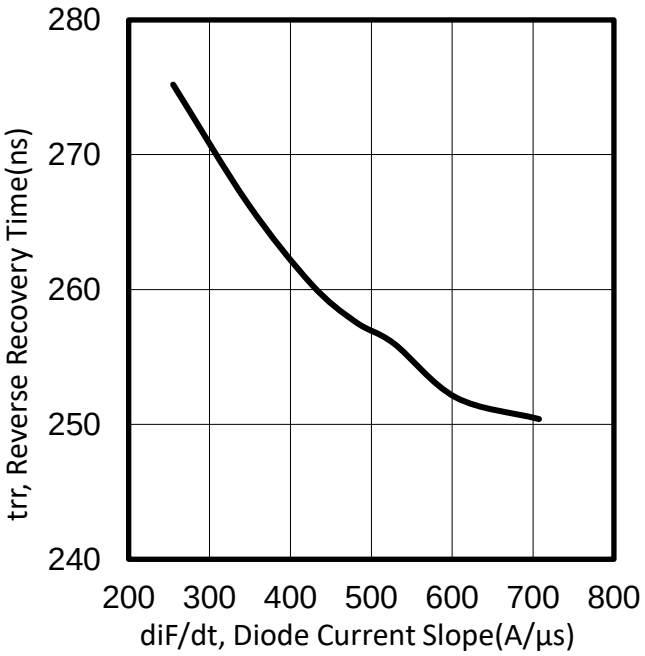


Figure 31. Typical reverse recovery time as a function of diode current slope
(V_R=600V， I_F=75A T_{vj}=25℃)

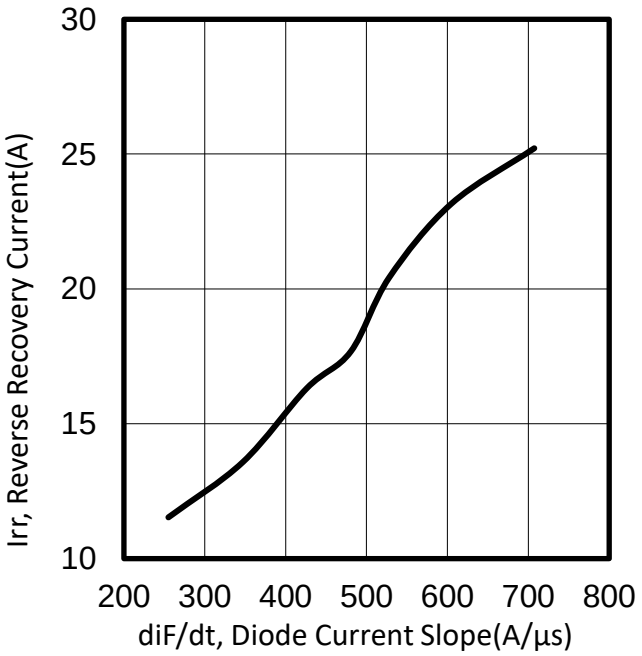


Figure 32. Typical reverse recovery current as a function of diode current slope
(V_R=600V， I_F=75A T_{vj}=25℃)

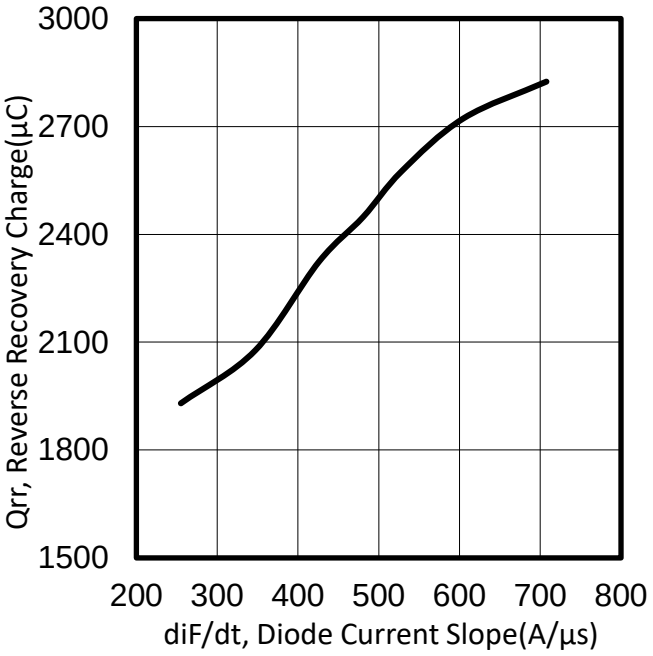


Figure 33. Typical reverse recovery charge as a function of diode current slope
(V_R=600V， I_F=75A T_{vj}=25℃)

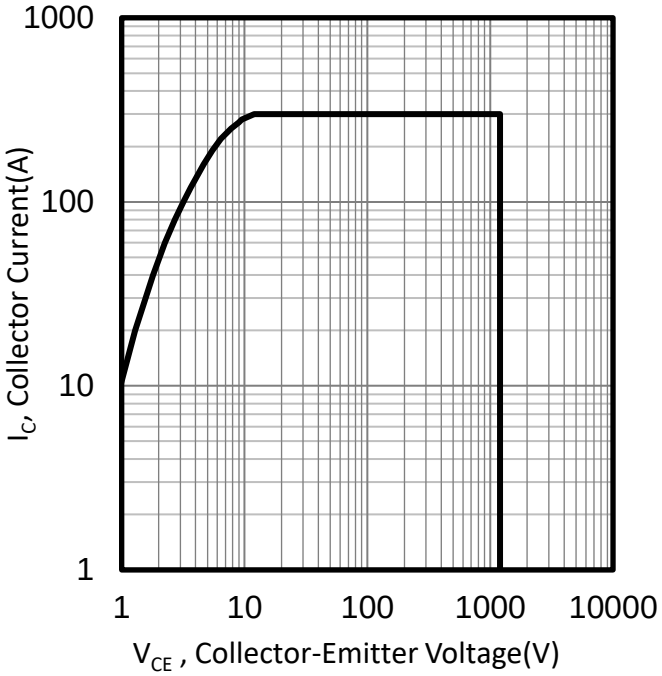


Figure 34. IGBT reverse bias safe operating area
(T_{vj}≤175℃,V_{GE}=15V)

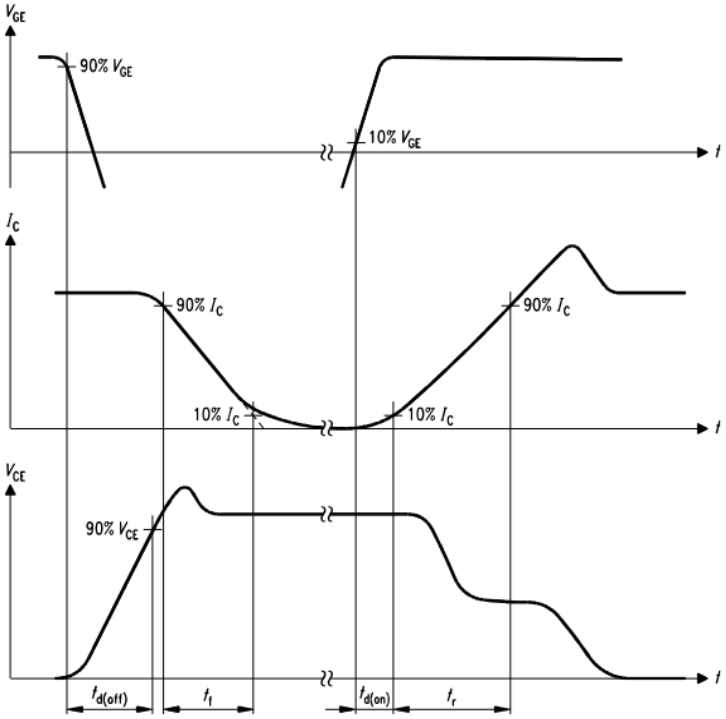


Figure A. Definition of switching times

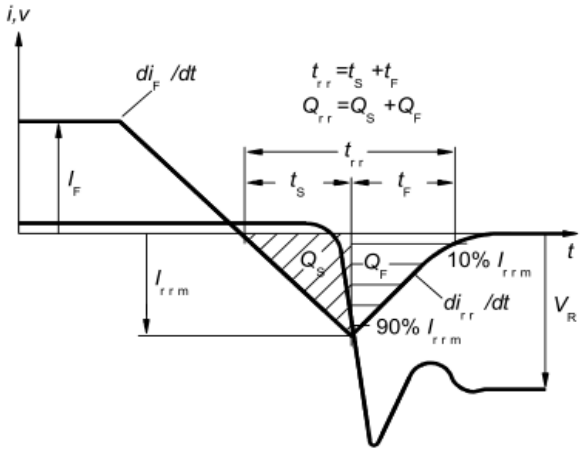


Figure C. Definition of diodes switching characteristics

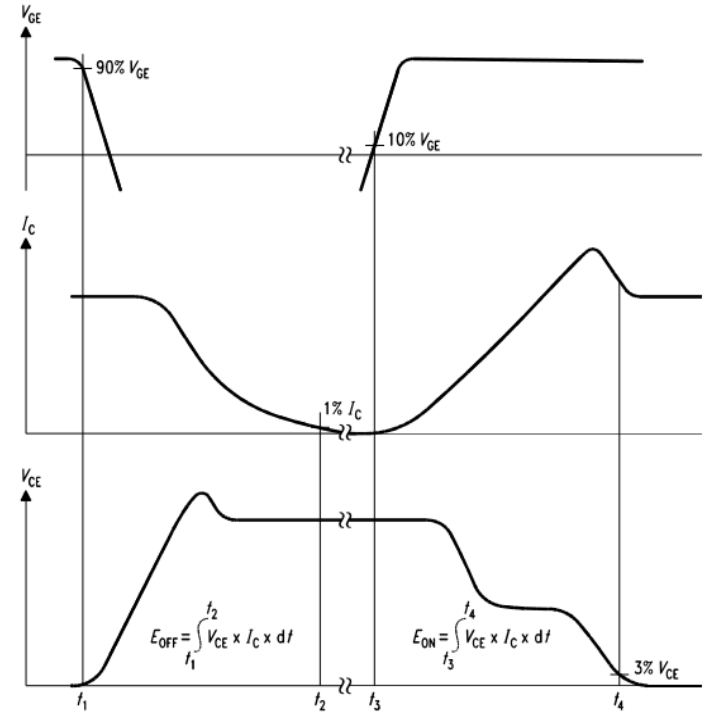


Figure B. Definition of switching losses

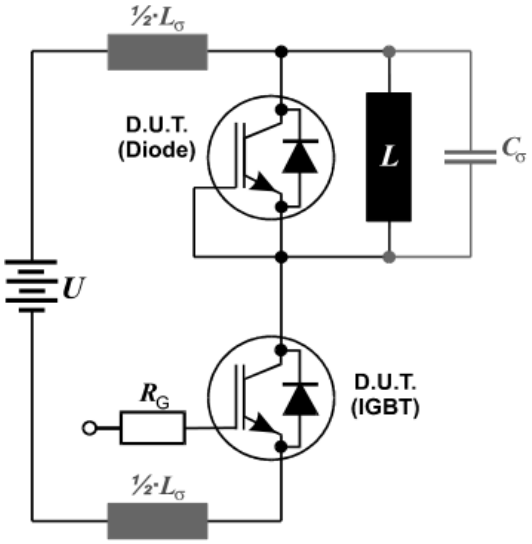
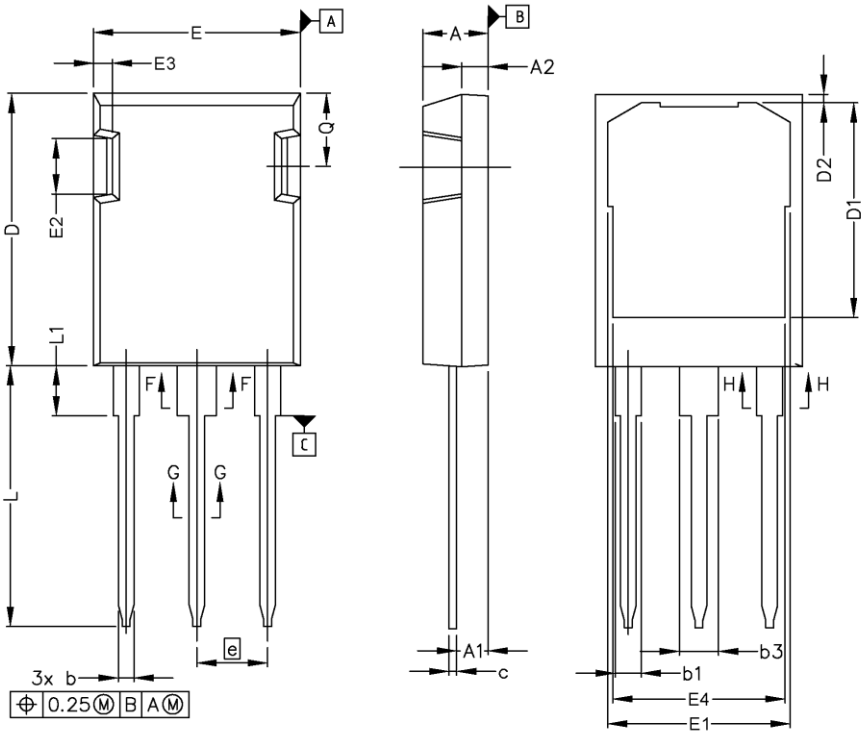


Figure D. Switching test circuit

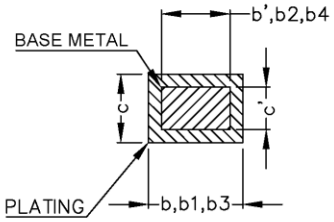
TO-247-3L Plus



SYMBOL	MIN	MAX
A	4.83	5.21
A1	2.29	2.54
A2	1.91	2.16
b'	1.07	1.28
b	1.07	1.33
b1	1.91	2.41
b2	1.91	2.16
b3	2.87	3.38
b4	2.87	3.13
c'	0.55	0.65
c	0.55	0.68
D	20.80	21.10
D1	16.25	17.65
D2	0.50	0.80
E	15.75	16.13
E1	13.10	14.15
E2	3.68	5.10
E3	1.00	1.90
E4	12.38	13.43
e	5.44 BSC	
N	3	
L	19.81	20.32
L1	3.70	4.00
Q	5.49	6.00

NOTE ;
1. ALL METAL SURFACES: TIN PLATED,EXCEPT AREA OF CUT
2. DIMENSIONING & TOLERANCEING CONFIRM TO ASME Y14.5M-1994.
3. ALL DIMENSIONS ARE IN MILLIMETERS. ANGLES ARE IN DEGREES.
4. THIS DRAWING WILL MEET ALL DIMENSIONS REQUIREMENT OF JEDEC outlines TO-247 AD.

1 - GATE
2 - DRAIN (COLLECTOR)
3 - SOURCE (EMITTER)
4 - DRAIN (COLLECTOR)



SECTION "F-F", "G-G" AND "H-H"
SCALE: NONE

Revision History

Revision	Subjects (major changes since last revision)	Date
1.0	Initial version	2022.5

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