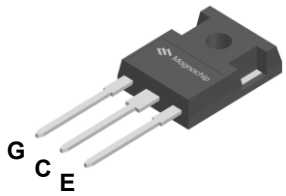
MBQ60T65S6FHTH

650V Field Stop IGBT

FEATURES

- Low conduction loss, $V_{CE(sat)}$ = 1.35V @ I_C = 60A
- $V_{CE(sat)}$ positive temperature coefficient
- Very soft, fast recovery anti-parallel diode
- Low EMI
- Maximum junction temperature 175°C

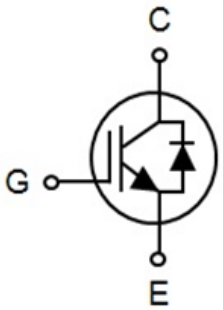
TO247-3L



Top View

APPLICATIONS

- PV Inverter
- UPS Power
- Welder



KEY PERFORMANCE PARAMETERS

V_{CE}	650	V
$V_{CE(sat)}$	1.30	V
V_F	1.60	V
Junction temperature.$_{max}$	175	°C

RoHS Compliant
HALOGEN-FREE

ORDERING INFORMATION

Type / Ordering Code	Marking	Temp. Range	Package	Packing	RoHS Status
MBQ60T65S6FHTH	60T65S6FH	-55~175°C	TO247-3L	Tube	Compliant

http://www.magnachip.com/

ABSOLUTE MAXIMUM RATINGS, at T_J = 25°C, unless otherwise specified

PARAMETER		SYMBOL	RATING	UNIT
Collector-emitter voltage		V_{CE}	650	V
DC collector current, limited by T_{vjmax}	T_C=25°C	I_C	127	A
	T_C=100°C		80	A
Pulsed collector current, t_p limited by T_{vjmax}		I_{Cpuls}	180	A
Diode forward current, limited by T_{vjmax}	T_C=25°C	I_F	90	A
	T_C=100°C		60	A
Diode pulsed current, t_p limited by T_{vjmax}		I_{Fpuls}	180	A
Gate-emitter voltage		V_{GE}	±20	V
Transient gate-emitter voltage (t_p≤10μs, D≤0.010)			±30	V
Power dissipation	T_C=25°C	P_D	294	W
	T_C=100°C		147	W
Operating Junction temperature range		T_{vj}	-40~175	°C
Storage temperature range		T_{stg}	-55~150	°C

THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	RATING	UNIT
Thermal resistance junction-to-ambient	$R_{th(j-a)}$	40	°C/W
Thermal resistance junction-to-case for IGBT	$R_{th(j-c)}$	0.51	°C/W
Thermal resistance junction-to-case for Diode	$R_{th(j-c)}$	0.77	°C/W

ELECTRICAL CHARACTERISTICS (T_{vj} = 25°C unless otherwise specified)

Static Characteristics

PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Collector-emitter breakdown voltage	BV_{CES}	I_C = 1mA, V_{GE} = 0 V		650	-	-	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	I_C = 60A, V_{GE} = 15 V	T_{vj} = 25°C	-	1.30	1.65	V
			T_{vj} = 175°C	-	1.58	-	
Diode forward voltage	V_F	V_{GE} = 0 V, I_F = 60 A	T_{vj} = 25°C	-	1.60		V
			T_{vj} = 175°C	-	1.57	-	
Gate-emitter threshold voltage	$V_{GE(th)}$	V_{CE} = V_{GE}, I_C = 60 mA		4.0	5.0	6.0	V
Zero gate voltage collector current	I_{CES}	V_{CE} = 650 V, V_{GE} = 0V, T_{vj} = 25°C		-	-	40	μA
Gate-emitter leakage current	I_{GES}	V_{GE} = 20 V, V_{CE} = 0V		-	-	±250	nA

Dynamic Characteristics

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Total gate charge	Q_G	V_{CE} = 520 V, I_C = 60 A, V_{GE} = 15 V	-	403	-	nC
Gate-emitter charge	Q_{GE}		-	54	-	
Gate-collector charge	Q_{GC}		-	118	-	
Input capacitance	C_{ies}	V_{CE} = 25 V, V_{GE} = 0 V, f = 1MHz	-	9612	-	pF
Output capacitance	C_{oes}		-	215	-	
Reverse transfer capacitance	C_{res}		-	104	-	

Switching Characteristics

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Turn-on delay time	$t_{d(on)}$	V_{GE} = 0/15 V, V_{CC} = 400 V I_C = 60 A, R_G = 10Ω, Inductive Load, T_{vj} = 25°C	-	58.3	-	ns
Rise time	t_r		-	49.0	-	
Turn-off delay time	$t_{d(off)}$		-	581	-	
Fall time	t_f		-	148	-	
Turn-on switching energy	E_{on}		-	1.93	-	mJ
Turn-off switching energy	E_{off}		-	1.78	-	
Total switching energy	E_{ts}		-	3.71	-	
Turn-on delay time	$t_{d(on)}$	V_{GE} = 0/15 V, V_{CC} = 400 V I_C = 60 A, R_G = 10Ω, Inductive Load, T_{vj} = 175°C	-	57.7	-	ns
Rise time	t_r		-	57.0	-	
Turn-off delay time	$t_{d(off)}$		-	702	-	
Fall time	t_f		-	134	-	
Turn-on switching energy	E_{on}		-	2.76	-	μJ
Turn-off switching energy	E_{off}		-	2.48	-	
Total switching energy	E_{ts}		-	5.24	-	
Reverse recovery time	t_{rr}	I_F = 60 A, di_F/dt = 800 A/μs, T_{vj} = 25°C	-	154	-	ns
Reverse recovery current	I_{rr}		-	20.8	-	A
Reverse recovery charge	Q_{rr}		-	1.77	-	μC
Reverse recovery time	t_{rr}	I_F = 60 A, di_F/dt = 800 A/μs, T_{vj} = 175°C	-	249	-	ns
Reverse recovery current	I_{rr}		-	27.9	-	A
Reverse recovery charge	Q_{rr}		-	3.85	-	μC

Electrical Characteristics Diagrams (25 ℃, unless otherwise noted)

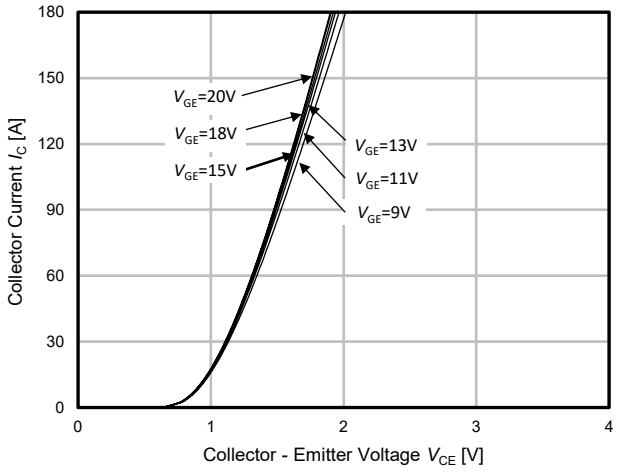


Fig.1. Typical output characteristics(T_{vj}=25℃)

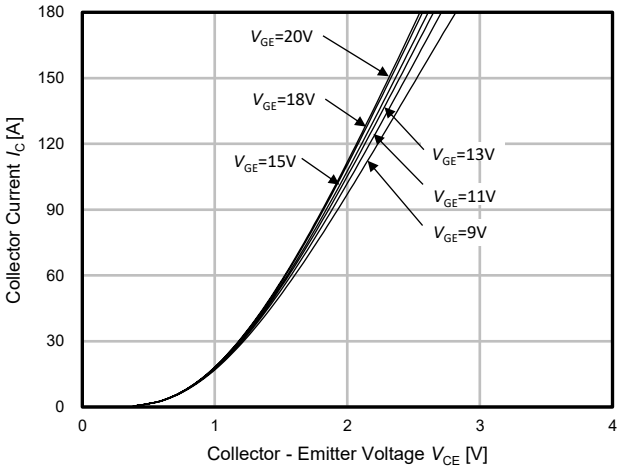


Fig.2. Typical output characteristics(T_{vj}=175℃)

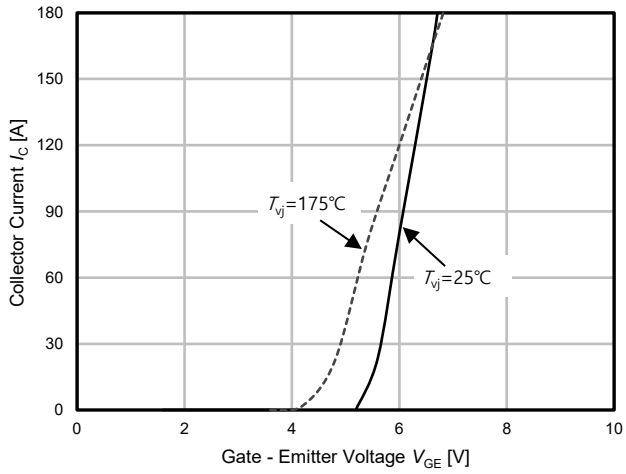


Fig.3. Typical transfer characteristics

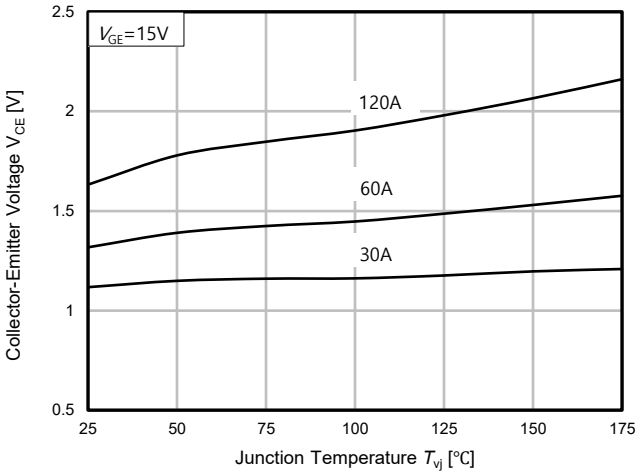


Fig.4. Typical collector emitter saturation voltage-junction temperature

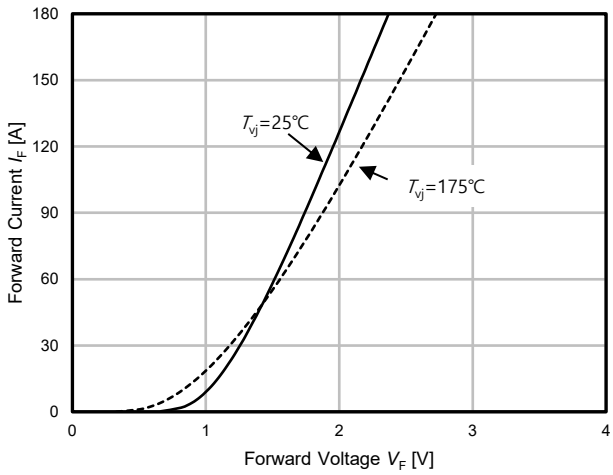


Fig. 5. Diode forward characteristics

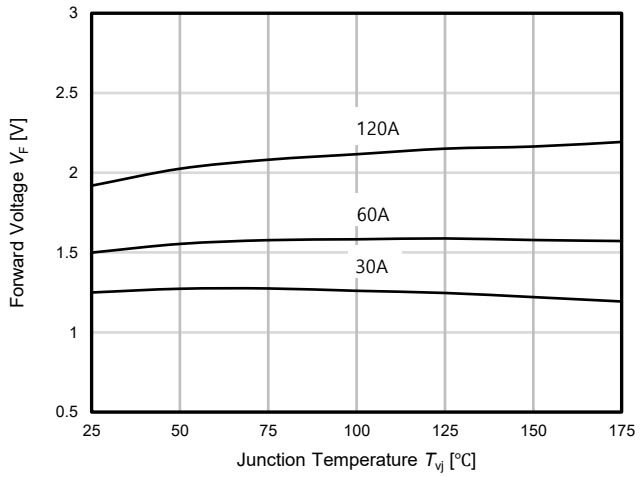


Fig. 6. Diode forward-junction temperature

Electrical Characteristics Diagrams (25 ℃, unless otherwise noted)

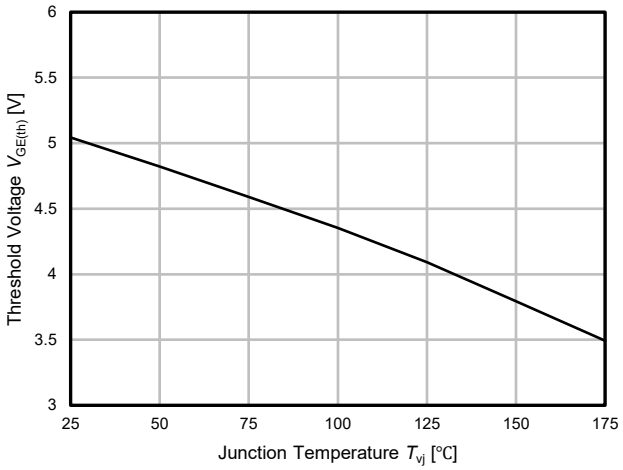


Fig.7. Threshold voltage-junction temperature

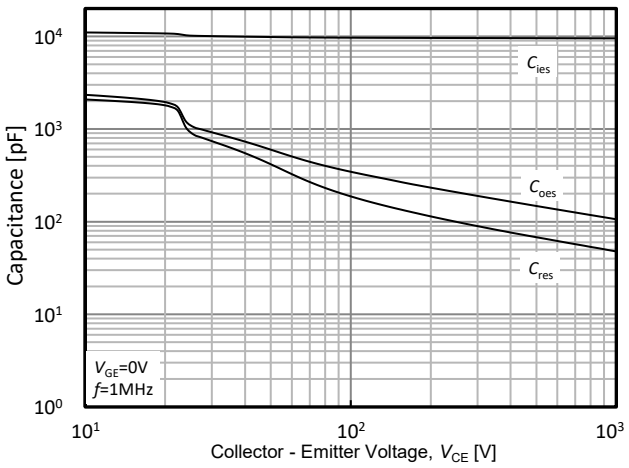


Fig.8. Typical capacitance

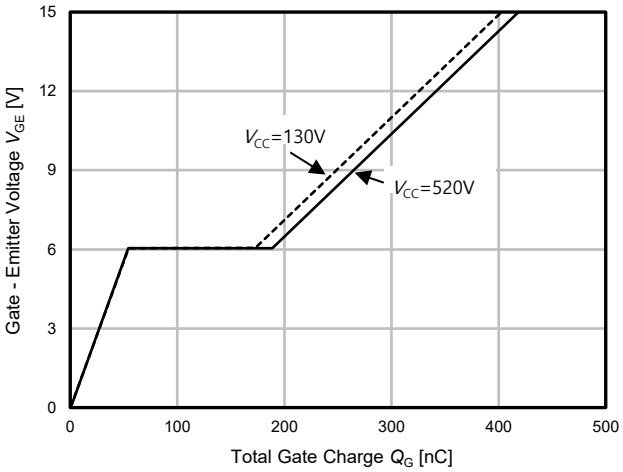


Fig.9. Typical gate charge

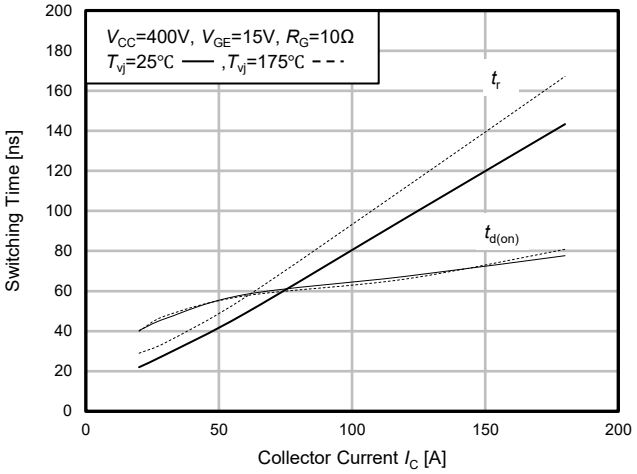


Fig.10. Typical turn on times-collector current

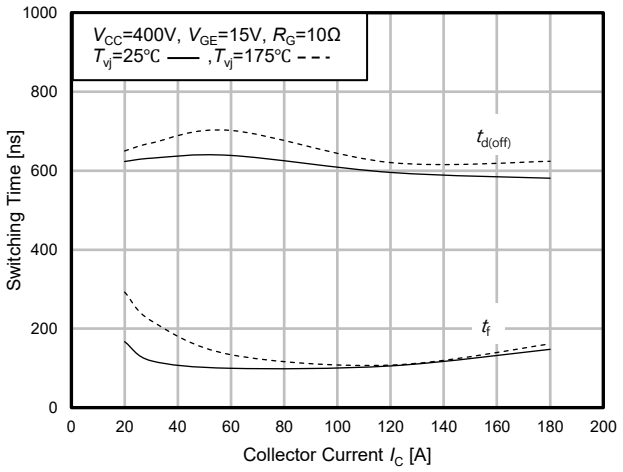


Fig.11. Typical turn off times-collector current

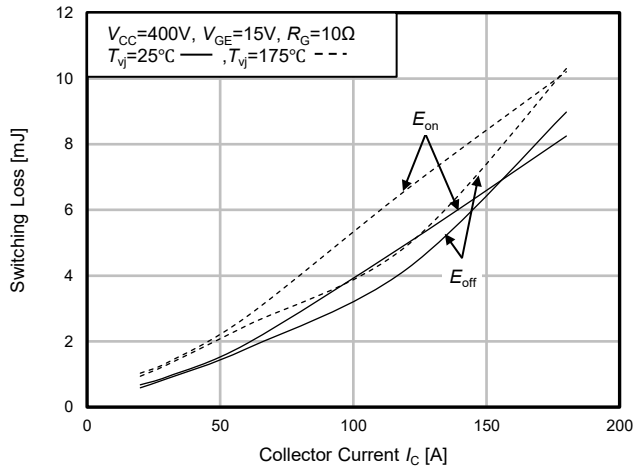


Fig.12. Switching losses-collector current

Electrical Characteristics Diagrams (25 ℃, unless otherwise noted)

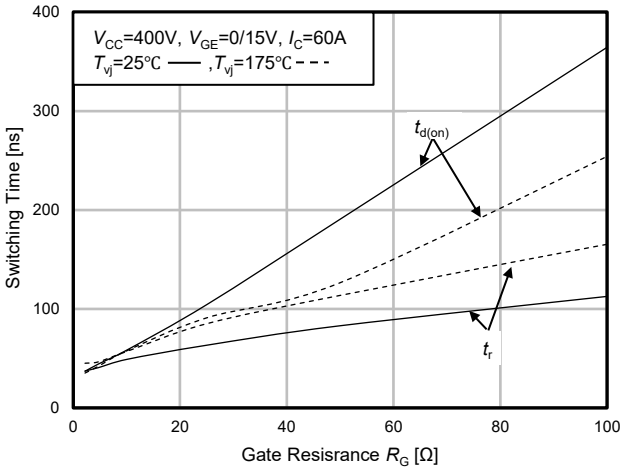


Fig.13. Typical turn on times-gate resistance

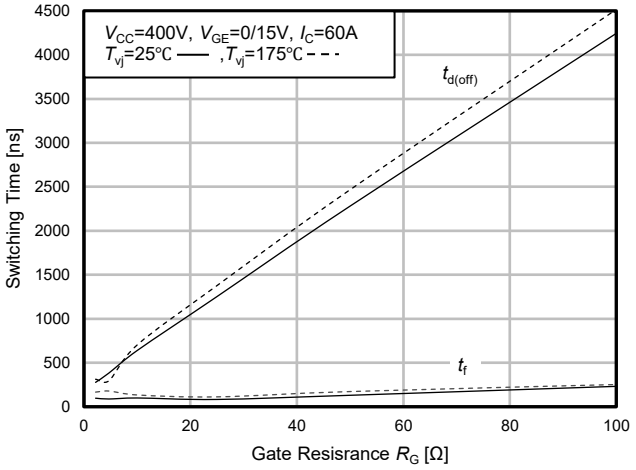


Fig.14. Typical turn off times-gate resistance

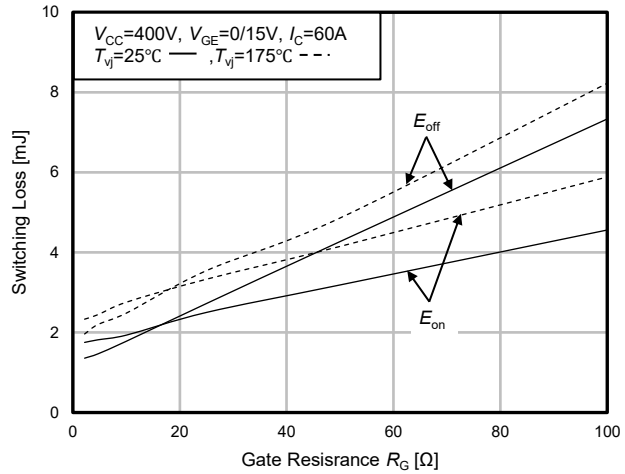


Fig.15. Switching losses-gate resistance

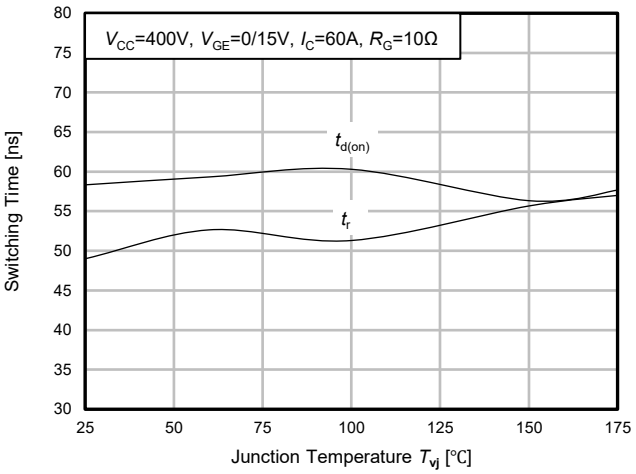


Fig.16. Typical turn on times-junction temperature

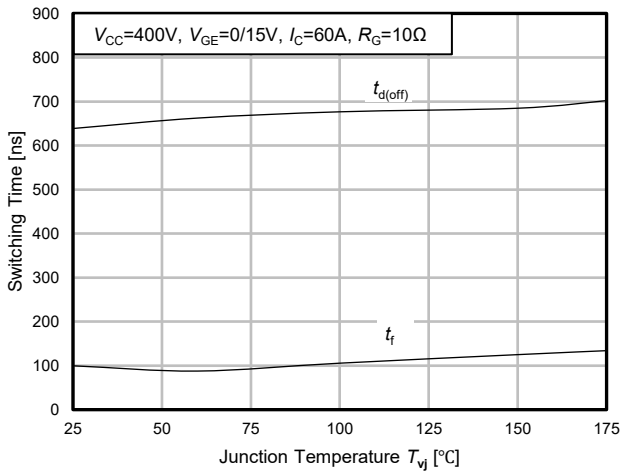


Fig.17. Typical turn off times-junction temperature

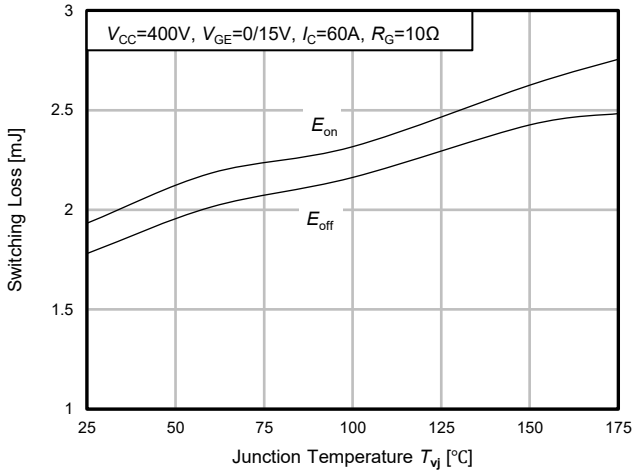


Fig.18. Switching losses-junction temperature

Electrical Characteristics Diagrams (25 ℃, unless otherwise noted)

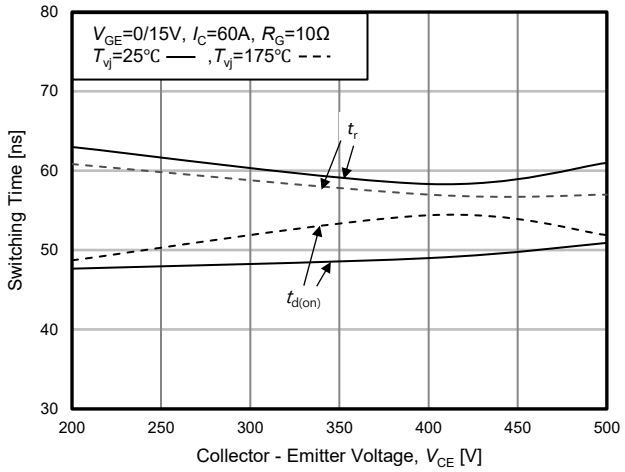


Fig.19. Typical turn on times-collector emitter voltage

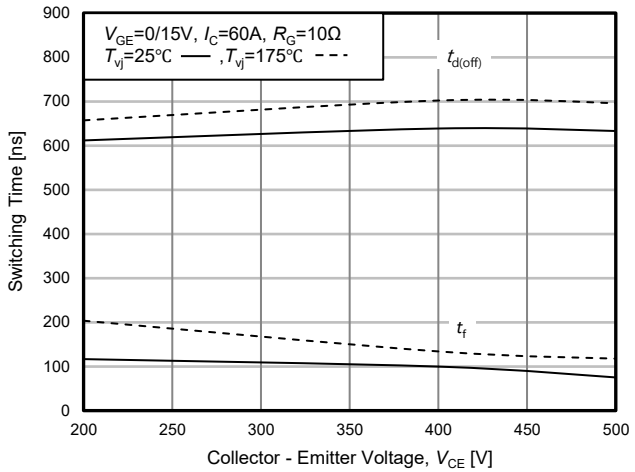


Fig.20. Typical turn off times-collector emitter voltage

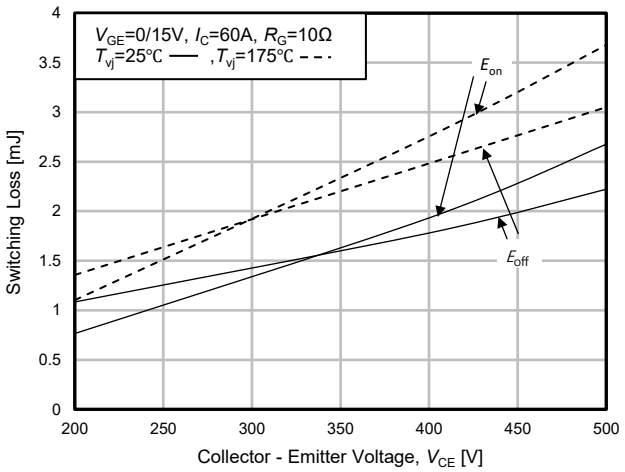


Fig.21. Switching losses-collector emitter voltage

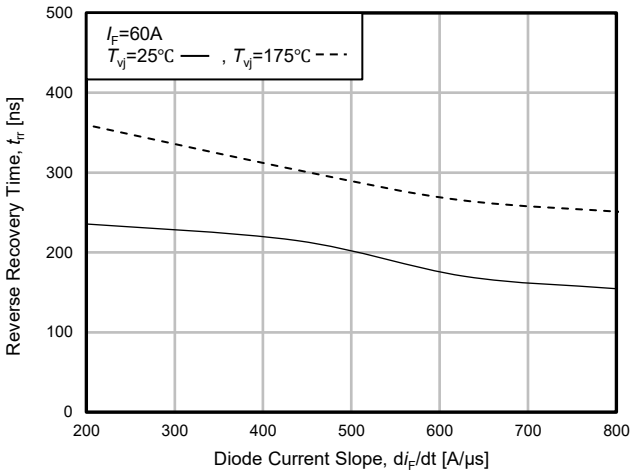


Fig.22. Reverse recovery time-diode current slope

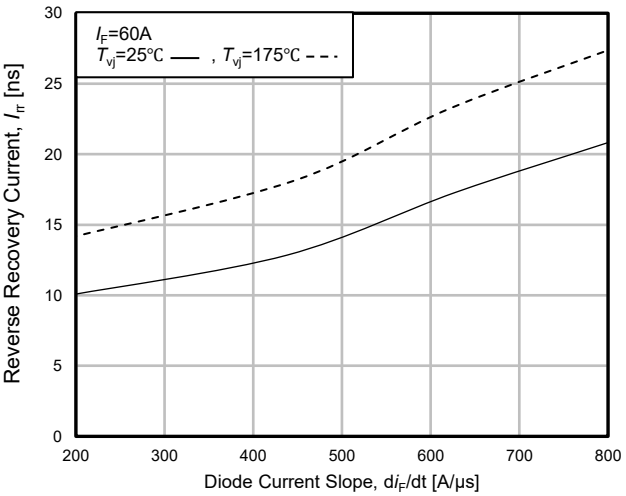


Fig.23. Reverse recovery current-diode current slope

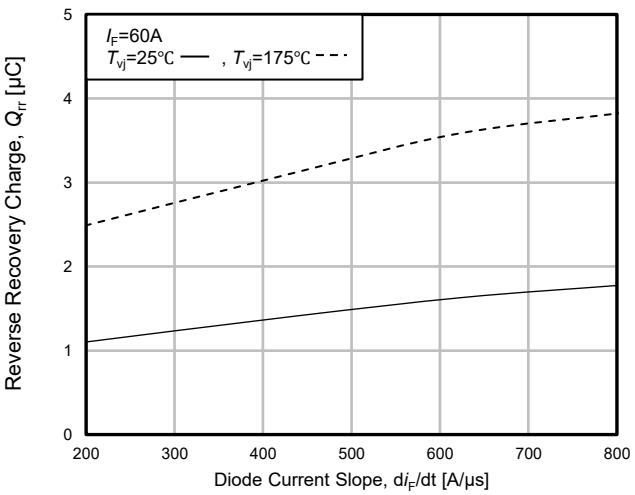


Fig.24. Reverse recovery charge-diode current slope

Electrical Characteristics Diagrams (25 ℃, unless otherwise noted)

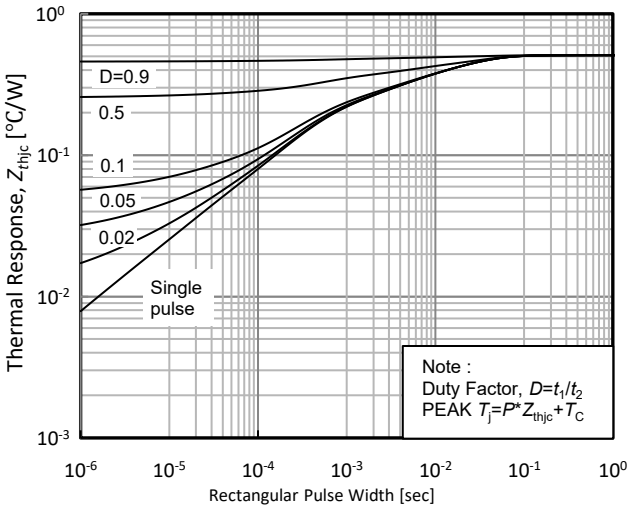


Fig.25. IGBT transient thermal impedance

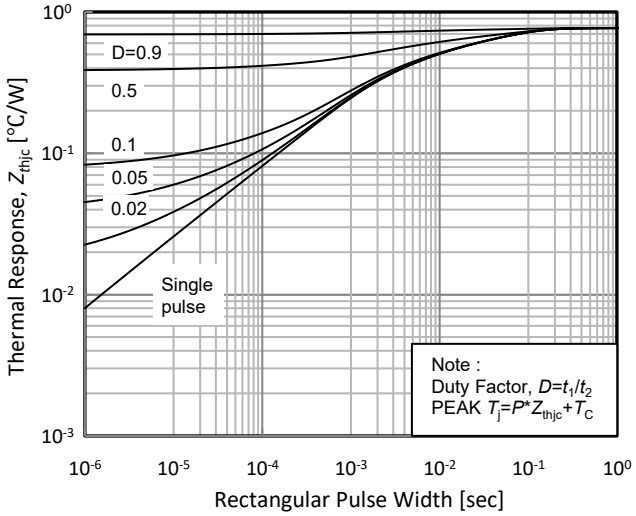


Fig.26. FRD transient thermal impedance

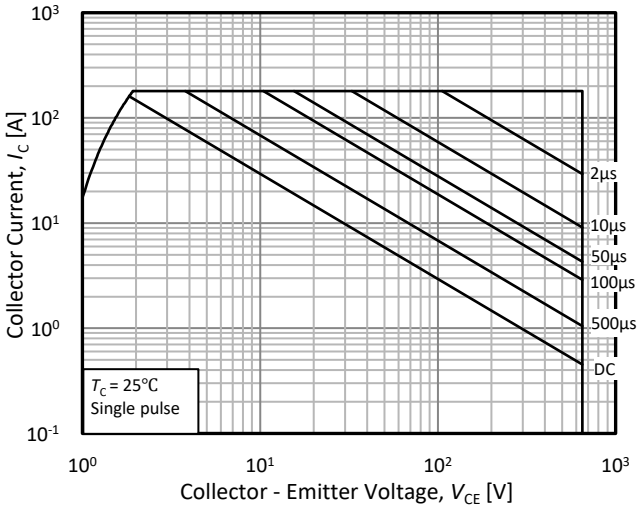


Fig.27. FBSOA

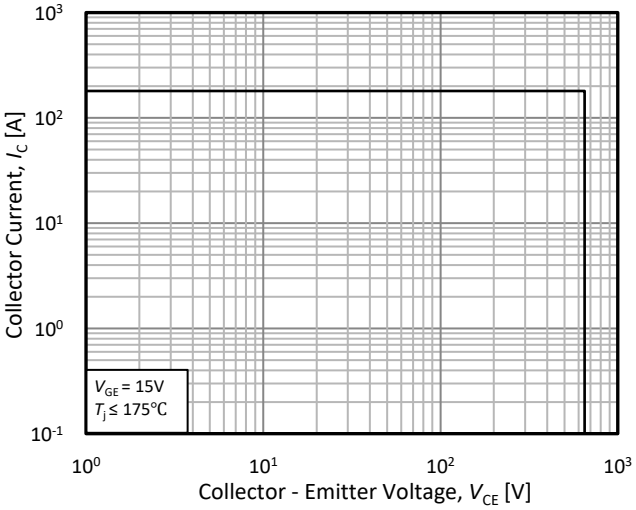
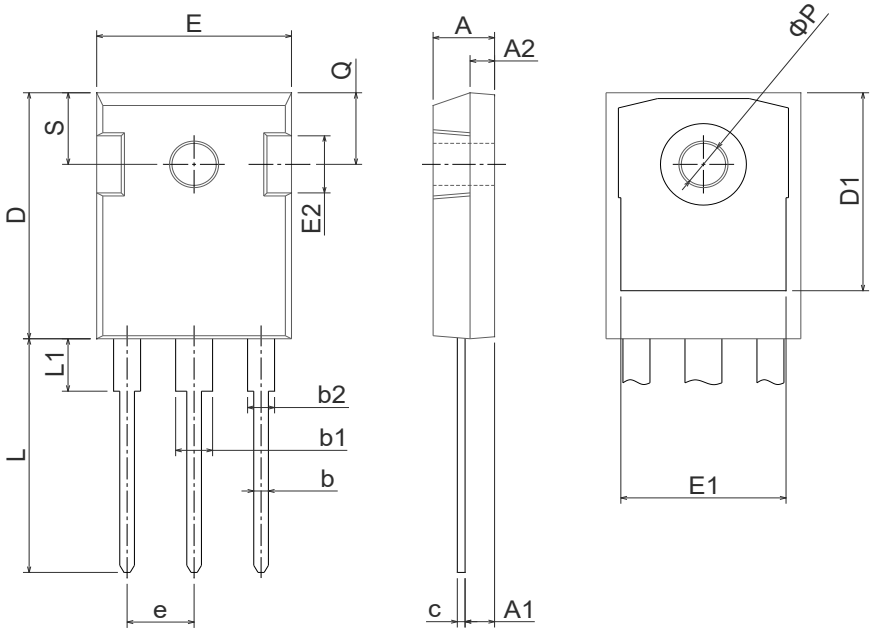


Fig.28. RBSOA

Physical Dimension

60T65S6FH



Dimension	Min(mm)	Max(mm)
A	4.70	5.31
A1	2.20	2.60
A2	1.50	2.49
b	0.99	1.40
b1	2.59	3.43
b2	1.65	2.39
c	0.38	0.89
D	20.30	21.46
D1	13.08	-
E	15.45	16.26
E1	13.06	14.02
E2	4.32	5.49
e	5.45BSC	
L	19.81	20.57
L1	-	4.50
ΦP	3.50	3.70
Q	5.38	6.20
S	6.15BSC	

Notes

Package body size, length and width do not include mold flash, protrusions and gate burrs.

DISCLAIMER :

The Products are not designed for use in hostile environments, including, without limitation, aircraft, nuclear power generation, medical appliances, and devices or systems in which malfunction of any Product can reasonably be expected to result in a personal injury. Seller's customers using or selling Seller's products for use in such applications do so at their own risk and agree to fully defend and indemnify Seller.