

### General Description

This IGBT is produced using advanced Magnachip's Field Stop Trench IGBT Technology, which provides low  $V_{CE(sat)}$ , high switching performance and excellent quality.

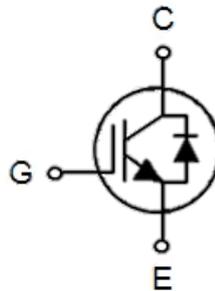
### Features

- High Speed Switching & Low Power Loss
- $V_{CE(sat)} = 1.75V @ I_C = 100A$
- High Input Impedance
- Ultra-Soft, fast recovery anti-parallel diode
- Ultra-narrowed  $V_F$  distribution control
- Positive Temperature coefficient for easy paralleling

### Applications

- PV inverter, UPS

### TO-247-PLUS



- G : Gate
- C : Collector
- E : Emitter

Package outline and symbol

### Absolute Maximum Ratings

Characteristics		Symbol	Rating	Unit
Collector-emitter voltage		$V_{CES}$	1200	V
Gate-emitter voltage		$V_{GE}$	$\pm 20$	V
DC collector current <sup>1)</sup>	$T_C=25^\circ C$	$I_C$	200	A
	$T_C=100^\circ C$		100	A
Pulsed collector current, $t_p$ limited by $T_{vjmax}$		$I_{Cpuls}$	300	A
Diode forward current <sup>1)</sup>	$T_C=25^\circ C$	$I_F$	200	A
	$T_C=100^\circ C$		100	A
Diode pulsed current, Pulse time limited by $T_{vjmax}$		$I_{Fpuls}$	300	A
Power dissipation	$T_C=25^\circ C$	$P_{tot}$	1071	W
	$T_C=100^\circ C$		536	W
Operating Junction temperature range		$T_{vj}$	-40~175	$^\circ C$
Storage temperature range		$T_{stg}$	-55~150	$^\circ C$

Note 1) Current is limited by junction temperature & bondwires.

### Thermal Characteristics

Characteristics	Symbol	Rating	Unit
Thermal resistance junction-to-ambient	$R_{th(j-a)}$	40	$^\circ C/W$
Thermal resistance junction-to-case for IGBT	$R_{th(j-c)}$	0.14	
Thermal resistance junction-to-case for FRD	$R_{th(j-c)}$	0.28	

**Ordering Information**

Part Number	Marking	Temp. Range	Package	Packing	RoHS Status
MBQA100T120RFS	100T120RFS	-55~175°C	TO-247-PLUS	Tube	Compliant

**Electrical Characteristics ( $T_{vj} = 25^{\circ}\text{C}$  unless otherwise specified)**

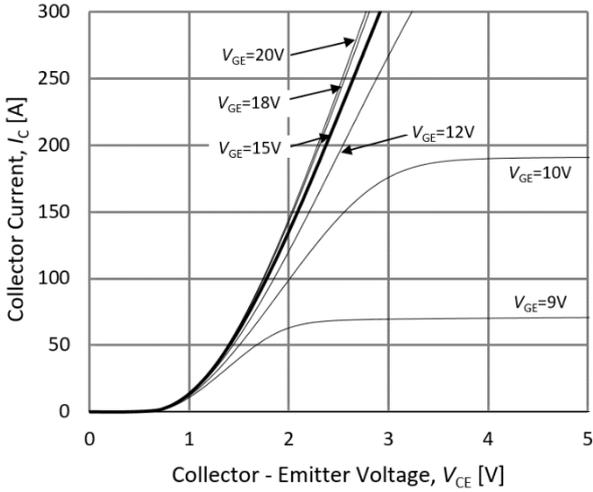
Characteristics	Symbol	Conditions	Min	Typ	Max	Unit	
<b>Static Characteristics</b>							
Collector-emitter breakdown voltage	$BV_{CES}$	$I_C = 1\text{mA}, V_{GE} = 0\text{V}$	1200	-	-	V	
Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_C = 100\text{A}, V_{GE} = 15\text{V}$	$T_{vj} = 25^{\circ}\text{C}$	-	1.75	2.25	V
			$T_{vj} = 175^{\circ}\text{C}$	-	2.50		
Diode forward voltage	$V_F$	$V_{GE} = 0\text{V}, I_F = 100\text{A}$	$T_{vj} = 25^{\circ}\text{C}$	-	1.90	2.50	V
			$T_{vj} = 175^{\circ}\text{C}$	-	2.00	-	
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}, I_C = 100\text{mA}$	5.5	6.5	7.5	V	
Zero gate voltage collector current	$I_{CES}$	$V_{CE} = 1200\text{V}, V_{GE} = 0\text{V}$	-	-	1	mA	
Gate-emitter leakage current	$I_{GES}$	$V_{GE} = 25\text{V}, V_{CE} = 0\text{V}$	-	-	±250	nA	

**Dynamic Characteristics**

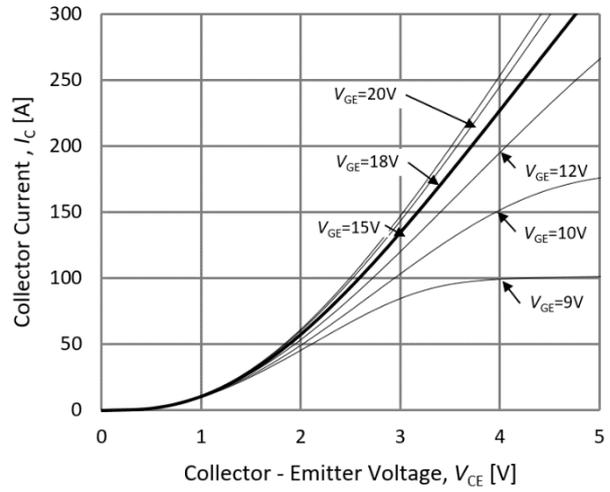
Total gate charge	$Q_G$	$V_{CE} = 960\text{V}, I_C = 100\text{A}, V_{GE} = 15\text{V}$	-	484	-	nC
Gate-emitter charge	$Q_{GE}$		-	103	-	
Gate-collector charge	$Q_{GC}$		-	209	-	
Input capacitance	$C_{ies}$	$V_{CE} = 30\text{V}, V_{GE} = 0\text{V}, f = 500\text{KHZ}$	-	12689	-	pF
Output capacitance	$C_{oes}$		-	384	-	
Reverse transfer capacitance	$C_{res}$		-	100	-	

**Switching Characteristics**

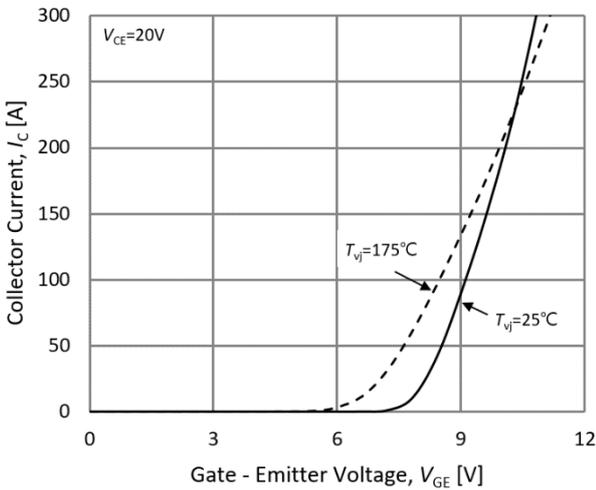
Turn-on delay time	$t_{d(on)}$	$V_{GE} = 0/15\text{V}, V_{CC} = 600\text{V}, I_C = 100\text{A}, R_G = 10\Omega,$ Inductive Load, $T_{vj} = 25^{\circ}\text{C}$	-	145.3		ns	
Rise time	$t_r$		-	130.6			
Turn-off delay time	$t_{d(off)}$		-	536.1			
Fall time	$t_f$			-	34.6		mJ
Turn-on switching energy	$E_{on}$			-	11.44		
Turn-off switching energy	$E_{off}$			-	3.45		
Total switching energy	$E_{ts}$			-	14.89		
Turn-on delay time	$t_{d(on)}$	$V_{GE} = 0/15\text{V}, V_{CC} = 600\text{V}, I_C = 100\text{A}, R_G = 10\Omega,$ Inductive Load, $T_{vj} = 175^{\circ}\text{C}$	-	120.1		ns	
Rise time	$t_r$		-	141.6			
Turn-off delay time	$t_{d(off)}$		-	558.4			
Fall time	$t_f$			-	45.9		mJ
Turn-on switching energy	$E_{on}$			-	18.17		
Turn-off switching energy	$E_{off}$			-	4.30		
Total switching energy	$E_{ts}$			-	22.47		
Reverse recovery time	$t_{rr}$	$I_F = 100\text{A}, di_F/dt = 1000\text{A}/\mu\text{s}, T_{vj} = 25^{\circ}\text{C}$	-	146.1	-	ns	
Reverse recovery current	$I_{rr}$		-	42.1	-	A	
Reverse recovery charge	$Q_{rr}$		-	3.71	-	$\mu\text{C}$	
Reverse recovery time	$t_{rr}$	$I_F = 100\text{A}, di_F/dt = 1000\text{A}/\mu\text{s}, T_{vj} = 175^{\circ}\text{C}$	-	284.5	-	ns	
Reverse recovery current	$I_{rr}$		-	56.5	-	A	
Reverse recovery charge	$Q_{rr}$		-	8.00	-	$\mu\text{C}$	



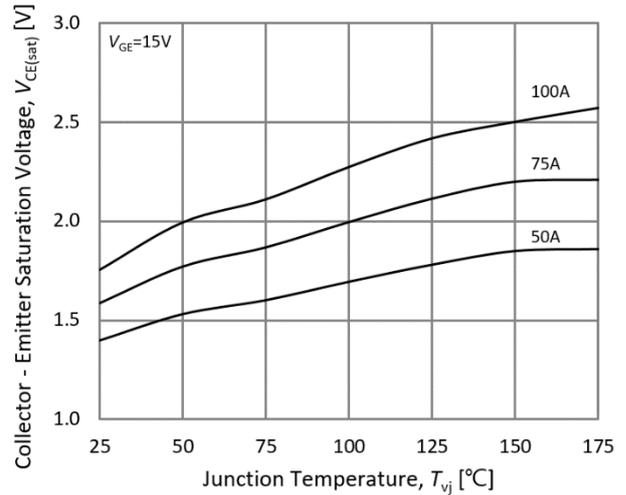
**Fig.1. Typical output characteristics ( $T_{vj}=25^{\circ}\text{C}$ )**



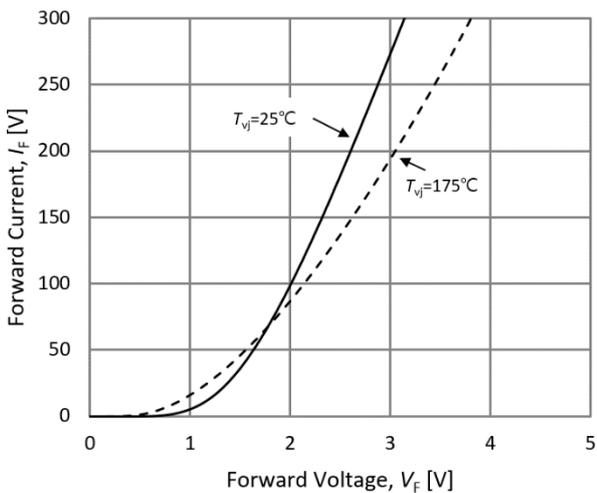
**Fig.2. Typical output characteristics ( $T_{vj}=175^{\circ}\text{C}$ )**



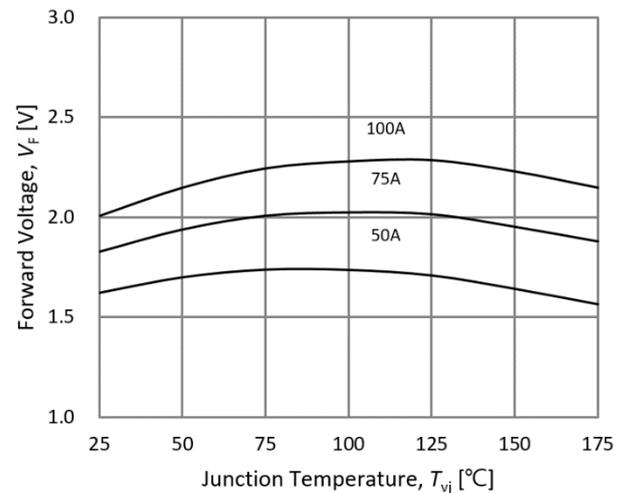
**Fig.3. Typical transfer characteristics**



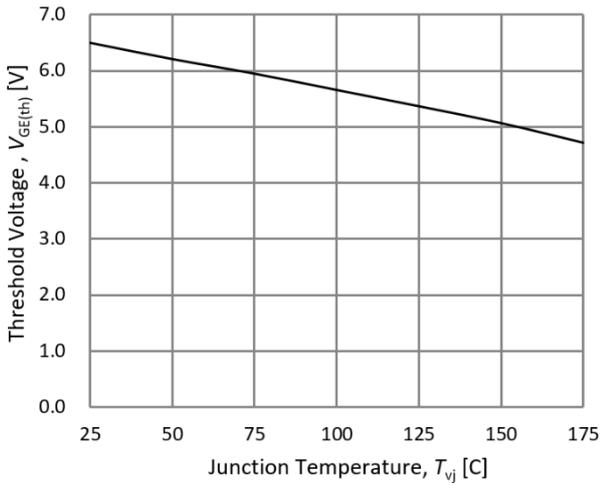
**Fig.4. Typical collector emitter saturation voltage-junction temperature**



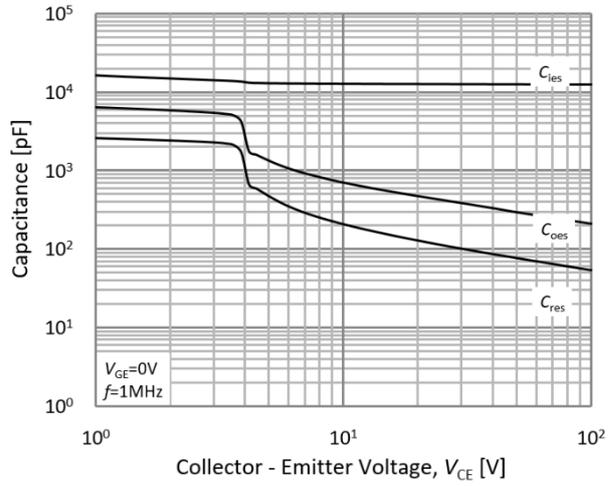
**Fig.5. Diode Forward Characteristics**



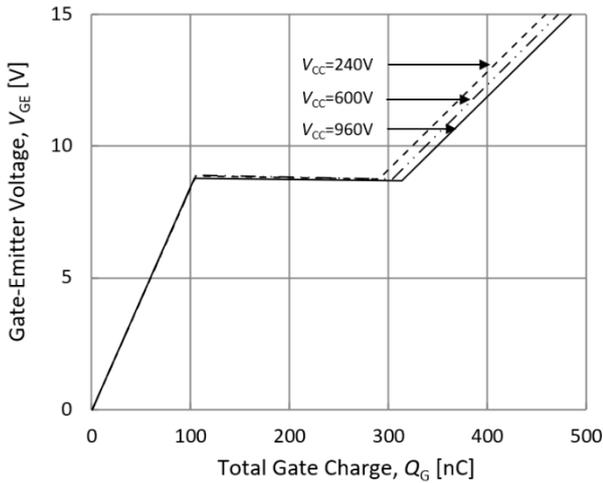
**Fig.6. Diode Forward-Junction Temperature**



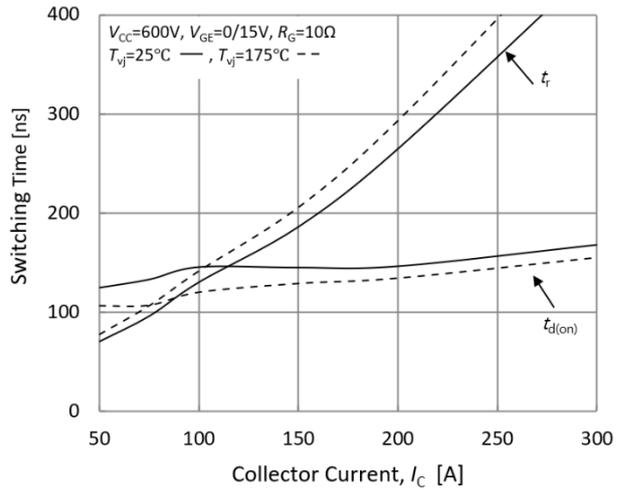
**Fig.7. Threshold voltage-junction temperature**



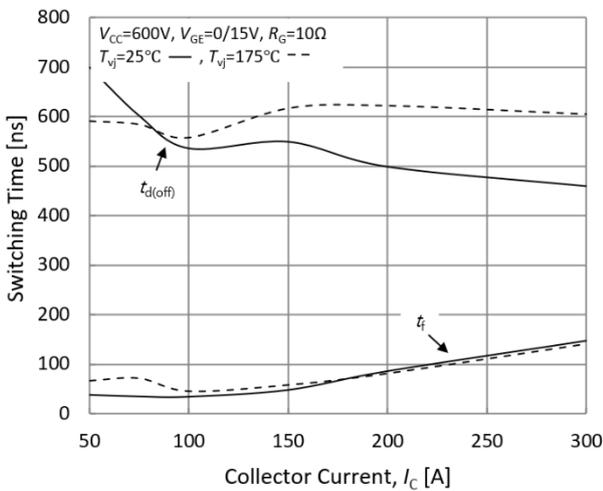
**Fig.8. Typical capacitance**



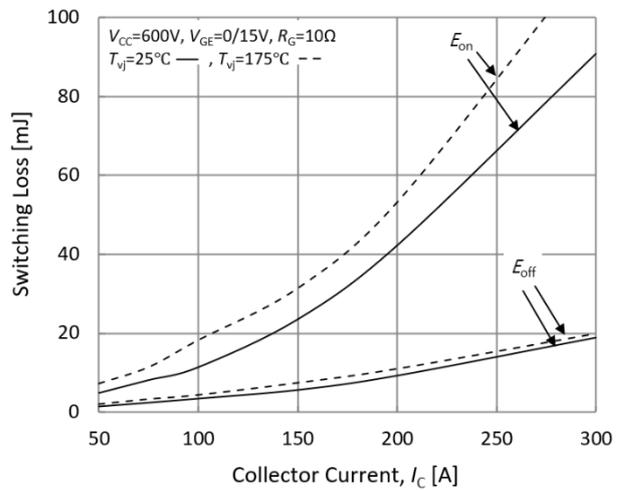
**Fig.9. Typical gate charge**



**Fig.10. Typical turn on times-collector current**



**Fig.11. Typical turn off times-collector current**



**Fig.12. Switching losses-collector current**

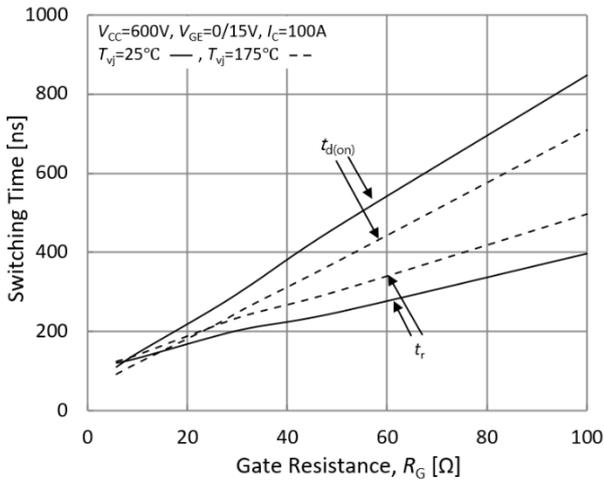


Fig.13. Typical turn on times-gate resistance

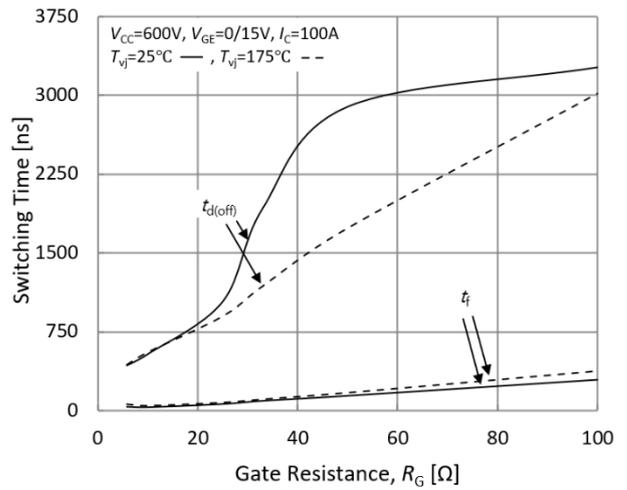


Fig.14. Typical turn off times-gate resistance

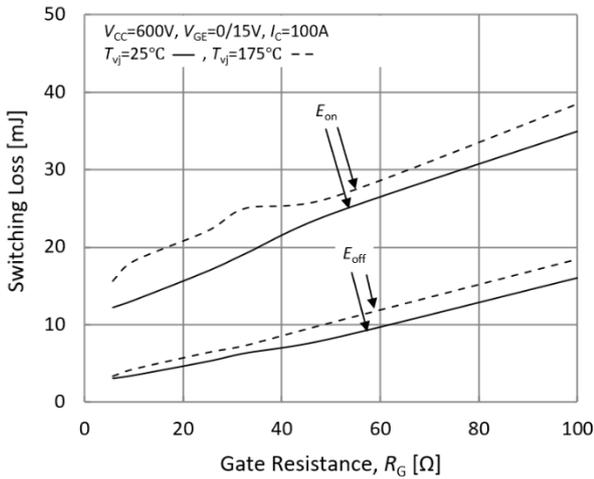


Fig.15. Switching losses-gate resistance

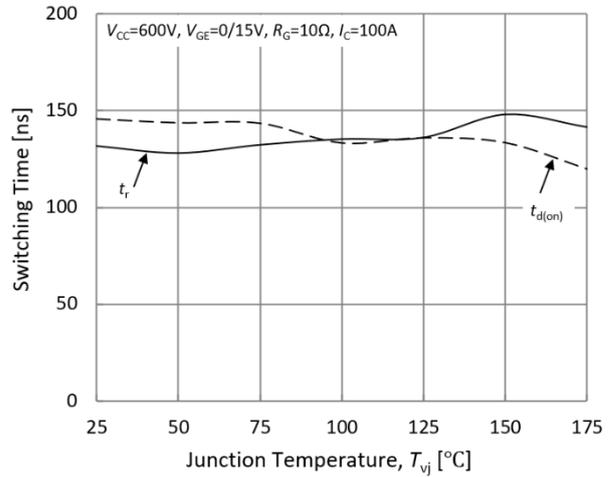


Fig.16. Typical turn on times-junction temperature

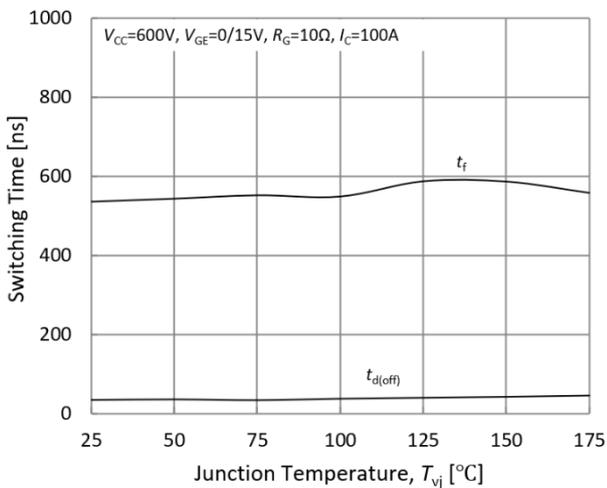


Fig.17. Typical turn off times-junction temperature

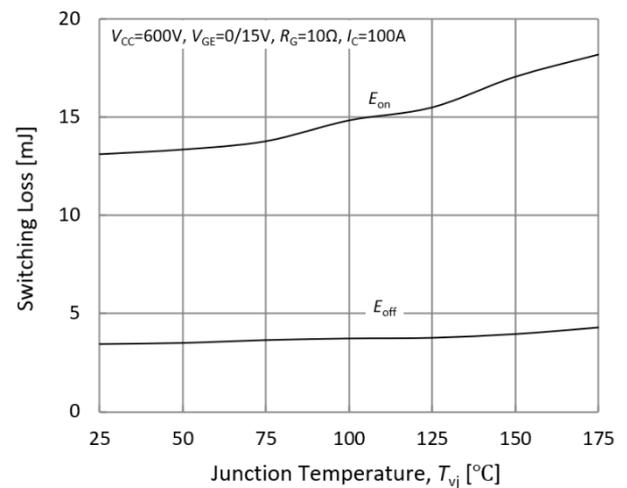


Fig.18. Switching losses-junction temperature

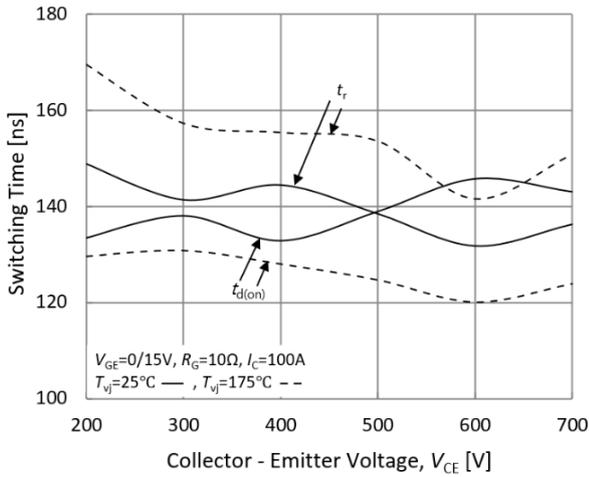


Fig.19. Typical turn on times-collector emitter voltage

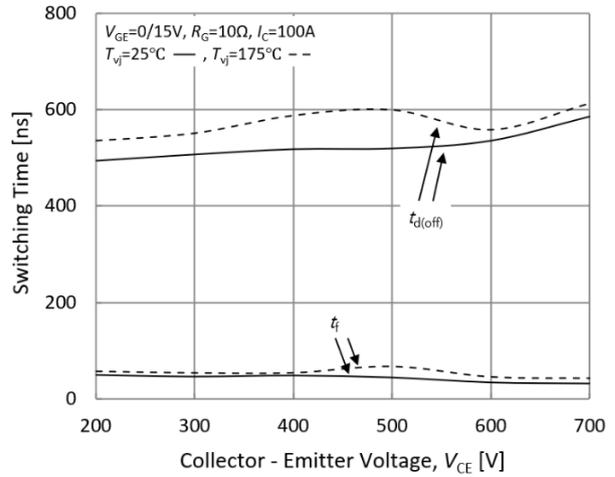


Fig.20. Typical turn off times-collector emitter voltage

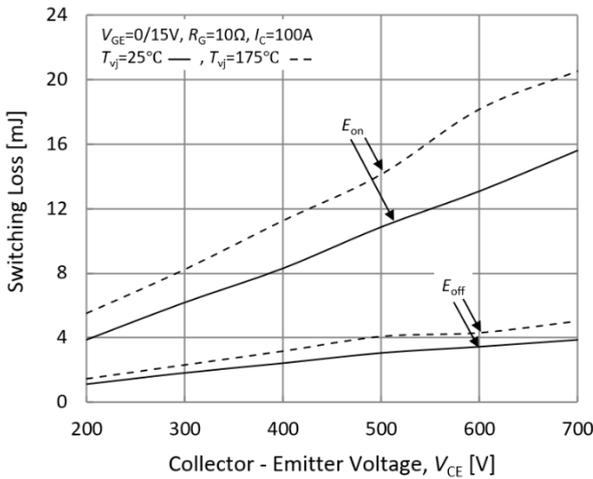


Fig.21. Switching losses-collector emitter voltage

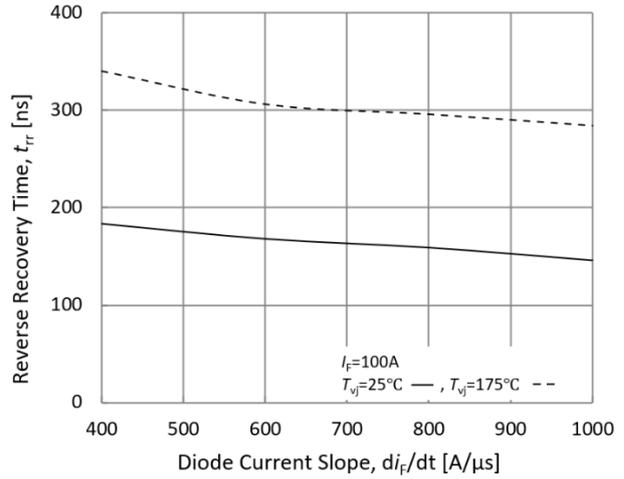


Fig.22. Reverse recovery time-diode current slope

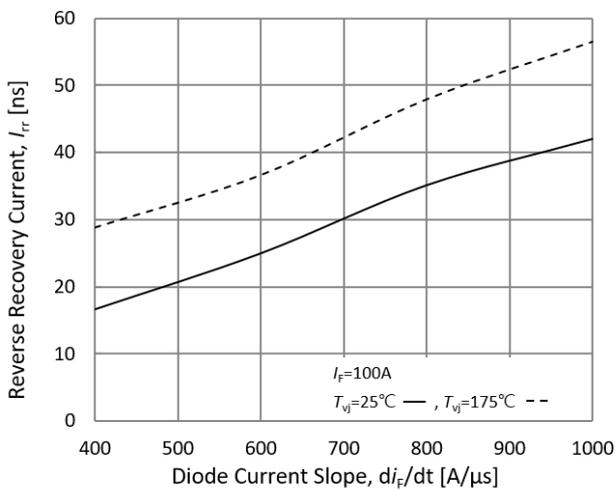


Fig.23. Reverse recovery current-diode current slope

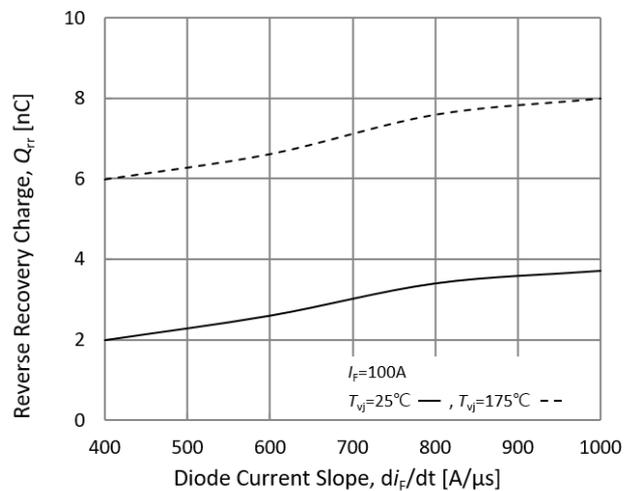


Fig.24. Reverse recovery charge-diode current slope

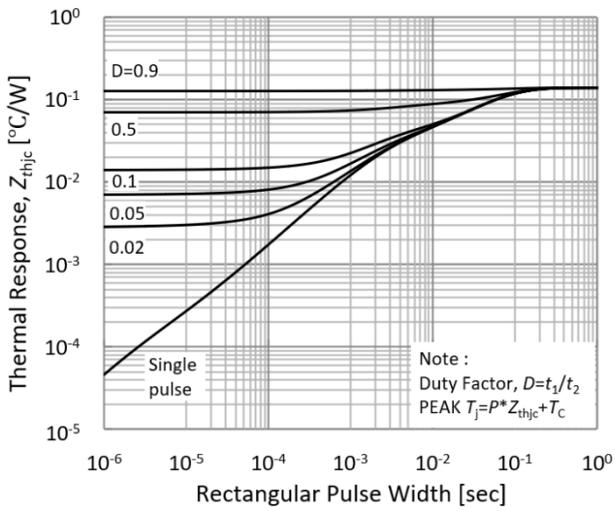


Fig.25. IGBT transient thermal impedance

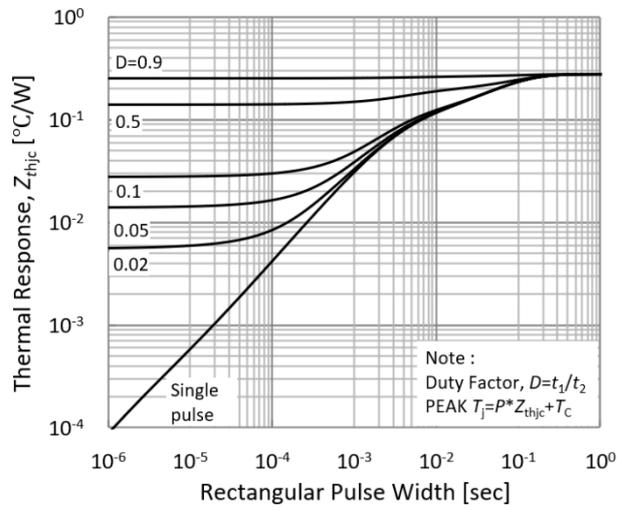


Fig.26. FRD transient thermal impedance

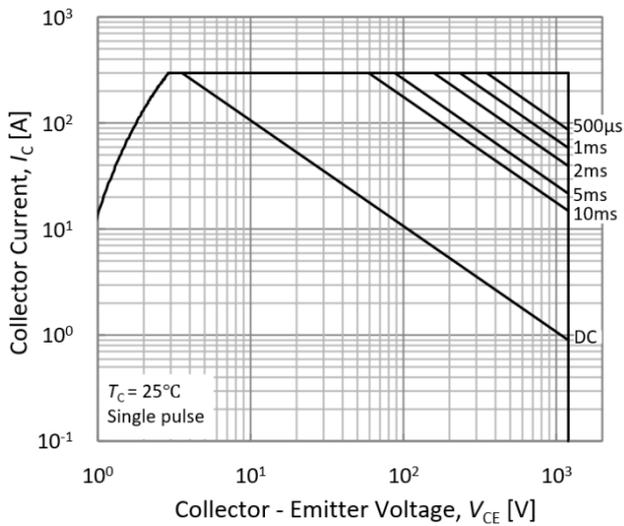


Fig.27. FBSOA

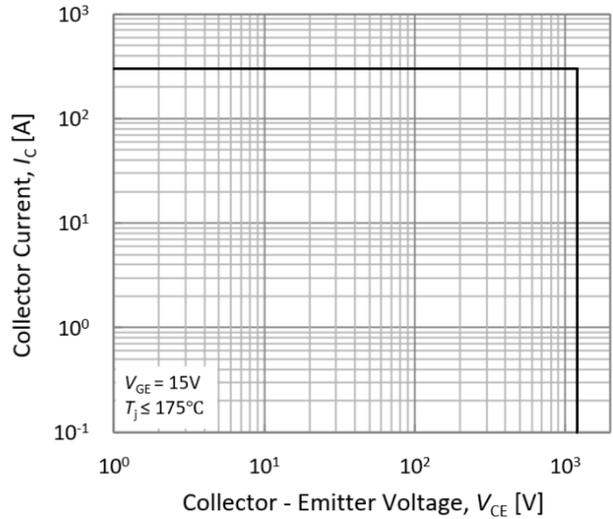
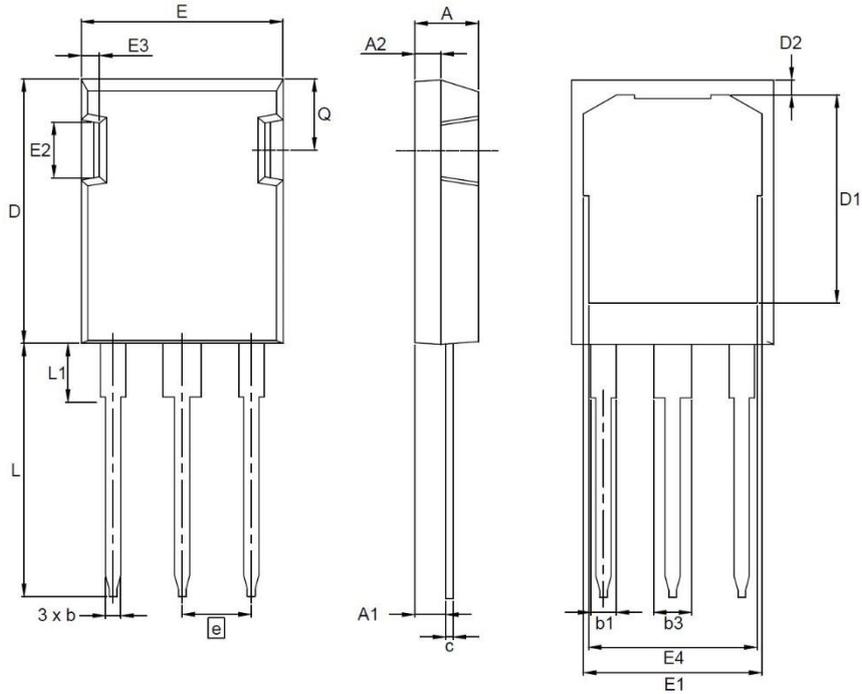


Fig.28. RBSOA

## Physical Dimension

### TO-247-PLUS

Dimensions are in millimeters, unless otherwise specified



Dimension	Min(mm)	Max(mm)
A	4.83	5.21
A1	2.29	2.54
A2	1.91	2.16
b	1.07	1.33
b1	1.91	2.41
b3	2.87	3.38
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	
L	19.81	20.32
L1	3.70	4.00
Q	5.49	6.00

Note: 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.

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