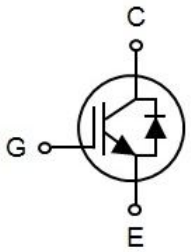
SL40T65FL

650V 40A IGBT



Features

- High Speed Switching & Low Power Loss
- $V_{CE(sat)}$ = 1.95V @ I_C = 40A
- E_{off} = 0.35mJ @ T_C = 25°C
- High Input Impedance
- t_{rr} = 80ns (typ.) @di_F/dt = 1000A/ µs
- Maximum junction temperature 175°C



TO-247

Applications

- PFC
- UPS
- PV Inverter
- Welder
- IH Cooker

Maximum Rating

Parameter		Symbol	Rating	Unit
Collector-emitter voltage		V_{CE}	650	V
DC collector current, limited by T_{vjmax}	T_C=25°C	I_C	80	A
	T_C=100°C		40	A
Pulsed collector current, t_p limited by T_{jvjmax}		I_{Cpuls}	160	A
Turn off safe operating area $V_{CE} \leq$ 600V, $T_{vj} \leq$ 175°C		-	160	A
Diode forward current limited by T_{vjmax}	T_C=25°C	I_F	40	A
	T_C=100°C		20	
Diode pulsed current, t_p limited by T_{vjmax}		I_{Fpuls}	160	A
Gate-emitter voltage		V_{GE}	±20	V
Power dissipation	T_C=25°C	P_D	375	W
	T_C=100°C		188	W
Short circuit withstand time $V_{CC} \leq$ 400V, V_{GE} = 15V, T_{vj} = 150°C Allowed number of short circuits < 1000 Time between short circuits $\geq$ 1.0s		tsc	5	µs
Operating Junction temperature range		T_{vj}	-40~175	°C
Storage temperature range		T_{stg}	-55~150	°C
Soldering temperature Wave soldering 1.6 mm (0.063 in.) from case for 10s			260	°C
Mounting torque, M3 screw Maximum of mounting processes: 3		M	0.6	Nm

Thermal Characteristic

Parameter	Symbol	Rating	Unit
Thermal resistance junction-to-ambient	$R_{\theta JA}$	40	°C/W
Thermal resistance junction-to-case for IGBT	$R_{\theta JC}$	0.4	
Thermal resistance junction-to-case for Diode	$R_{\theta JC}$	1.2	

Electrical Characteristic (T_{vj} = 25°C unless otherwise specified)

Parameter	Symbol	Conditions		Min	Typ	Max	Unit
Static Characteristic							
Collector-emitter breakdown voltage	BV_{CES}	I_C = 2mA, V_{GE} = 0V		650	-	-	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	I_C = 40A, V_{GE} = 15V, T_{vj} = 25°C			1.95	2.4	V
		I_C = 40A, V_{GE} = 15V, T_{vj} = 175°C			2.3		
Diode forward voltage	V_F	V_{GE} = 0V, I_F = 20A	T_{vj} = 25°C		1.3	1.9	V
			T_{vj} = 125°C		1.15		
			T_{vj} = 175°C		1.1		
Gate-emitter threshold voltage	$V_{GE(th)}$	V_{CE} = V_{GE}, I_C = 0.58mA		4.0	5.0	6.0	V
Zero gate voltage collector current	I_{CES}	V_{CE} = 650V, V_{GE} = 0V	T_{vj} = 25°C	-	-	40	μA
			T_{vj} = 175°C	-	-	1000	
Gate-emitter leakage current	I_{GES}	V_{GE} = 20V, V_{CE} = 0V		-	-	±100	nA
Transconductance	g_{fs}	V_{CE} = 20V, I_C = 40A,			17.0		S
Dynamic Characteristic							
Total gate charge	Q_g	V_{CE} = 520V, I_C = 40A, V_{GE} = 15V		-	219		nC
Gate-emitter charge	Q_{ge}			-	26		
Gate-collector charge	Q_{gc}			-	115		
Input capacitance	C_{ies}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		-	2818	-	pF
Reverse transfer capacitance	C_{res}			-	131	-	
Output capacitance	C_{oes}			-	209	-	
Internal emitter inductance measured 5mm (0.197 in.) from case	L_E			-	13.0	-	nH
Short circuit collector current Max. 1000 short circuits Time between short circuits: ≥ 1.0s	$I_{C(SC)}$	V_{GE} = 15V, V_{CC} = 400V, t_{SC} ≤ 5μs, T_{vj} = 150°C		-	180	-	A
Switching Characteristic							
Turn-on delay time	$t_{d(on)}$	V_{GE} = 15V, V_{CC} = 400V, I_C = 40A, R_G = 7.9Ω, Inductive Load, T_{vj} = 25°C		-	58	-	ns
Rise time	t_r			-	54	-	
Turn-off delay time	$t_{d(off)}$			-	245	-	
Fall time	t_f			-	40	-	
Turn-on switching energy	E_{on}			-	1.15	-	mJ
Turn-off switching energy	E_{off}			-	0.35	-	
Total switching energy	E_{ts}			-	1.50	-	
Reverse recovery time	t_{rr}	I_F = 20A, di_F/dt = 1000A/ μs, T_{vj} = 25°C		-	80	-	ns
Reverse recovery current	I_{rr}			-	25	-	A
Reverse recovery charge	Q_{rr}			-	1.0	-	μC
Rate of fall of reverse recovery current during t_b	di_{rr}/dt			-	-950	-	A/μs

Switching Characteristic

Turn-on delay time	$t_{d(on)}$	V_{GE} = 15V, V_{CC} = 400V, I_C = 40A, R_G = 7.9Ω, Inductive Load, T_{vj} = 175°C	-	61	-	ns
Rise time	t_r		-	60	-	
Turn-off delay time	$t_{d(off)}$		-	260	-	
Fall time	t_f		-	38	-	
Turn-on switching energy	E_{on}		-	1.80	-	mJ
Turn-off switching energy	E_{off}		-	0.38	-	
Total switching energy	E_{ts}		-	2.18	-	
Reverse recovery time	t_{rr}	I_F = 20A, di_F/dt = 1000A/ μs, T_{vj} = 175°C	-	145	-	ns
Reverse recovery current	I_{rr}		-	44	-	A
Reverse recovery charge	Q_{rr}		-	3.2	-	nC
Rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	-680	-	A/μs

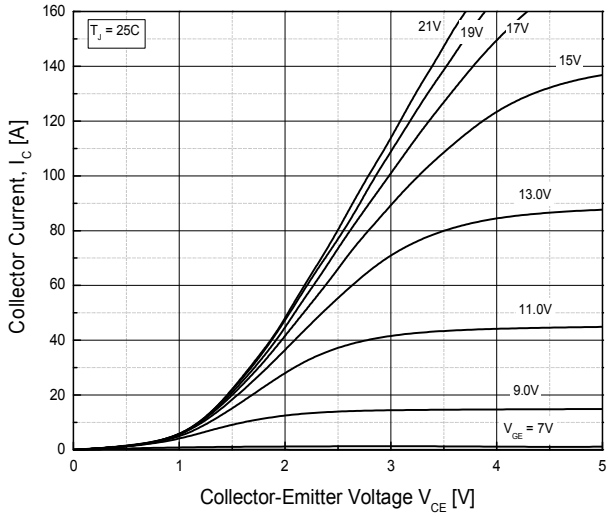


Fig.1 Typical Output Characteristics(T_J=25℃)

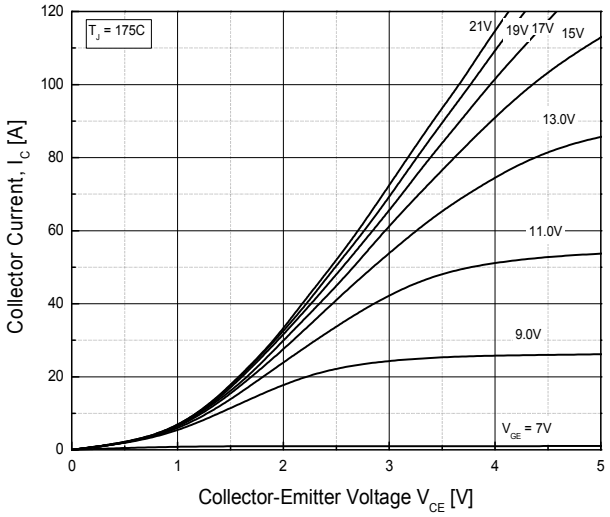


Fig.2 Typical Output Characteristics(T_J=175℃)

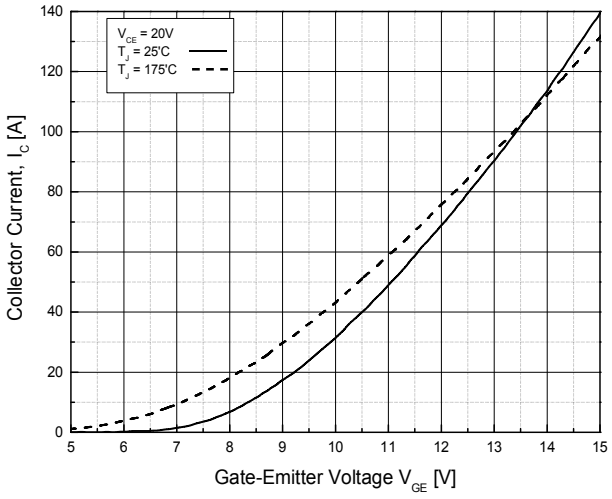


Fig.3 Typical Transfer Characteristics

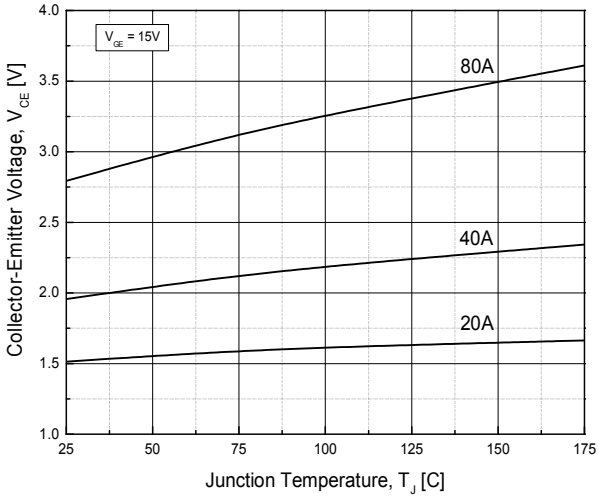


Fig.4 Typical Collector-Emitter Saturation Voltage -Junction Temperature

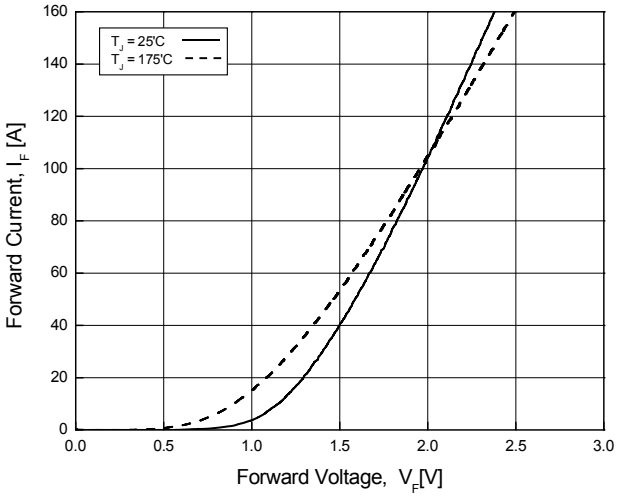


Fig.5 Diode Forward Characteristics

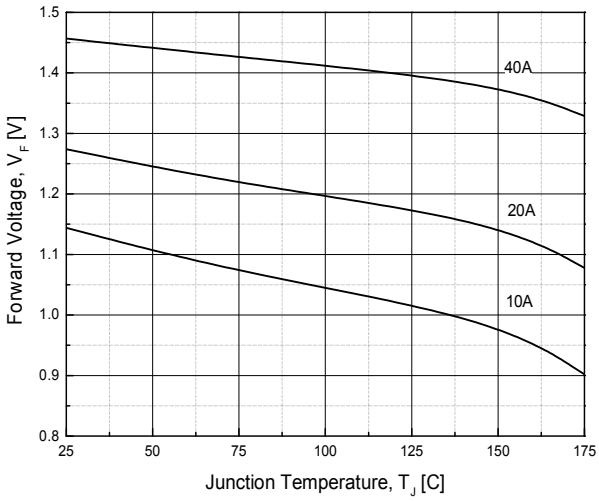


Fig.6 Diode Forward-Junction Temperature

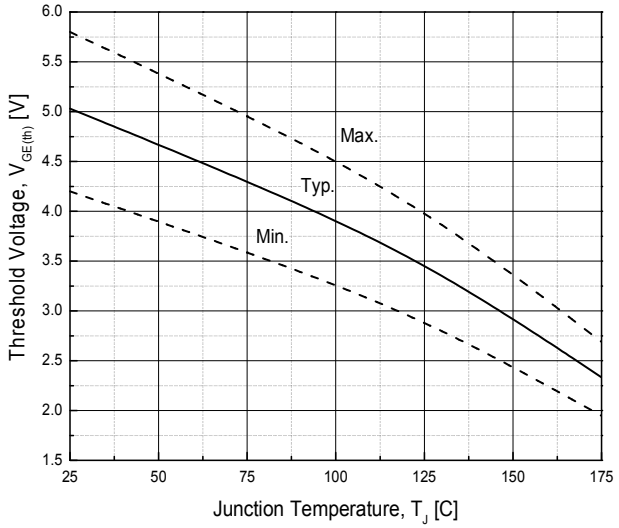


Fig.7 Threshold Voltage-Junction Temperature

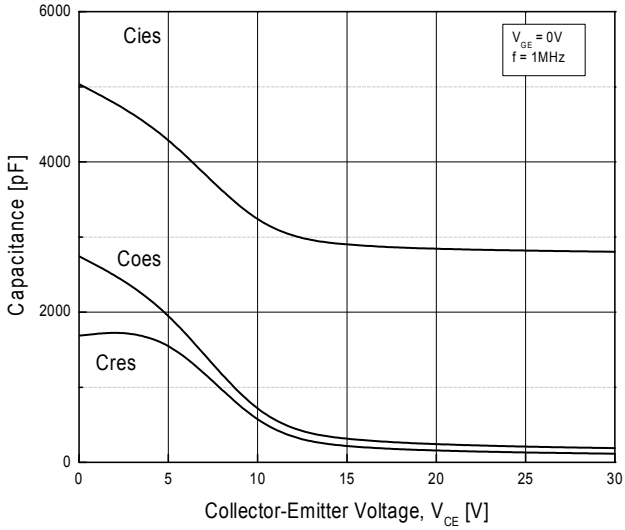


Fig.8 Typical Capacitance

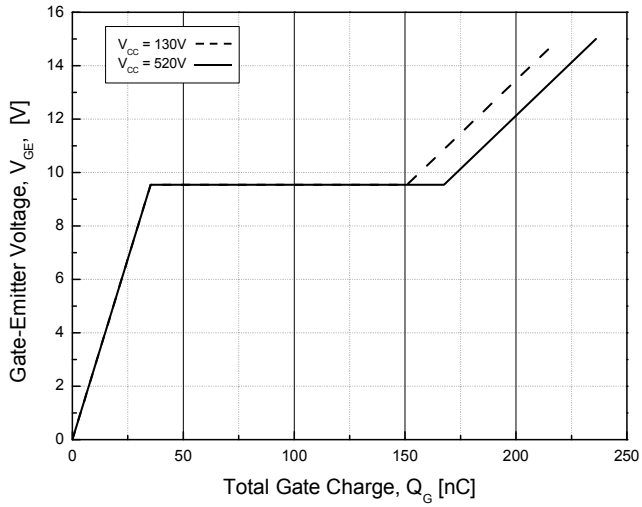


Fig.9 Typical Gate Charge

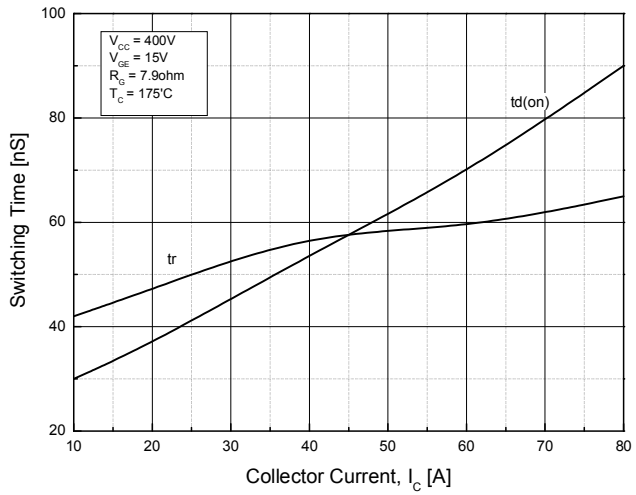


Fig.10 Typical Turn on-Collector Current

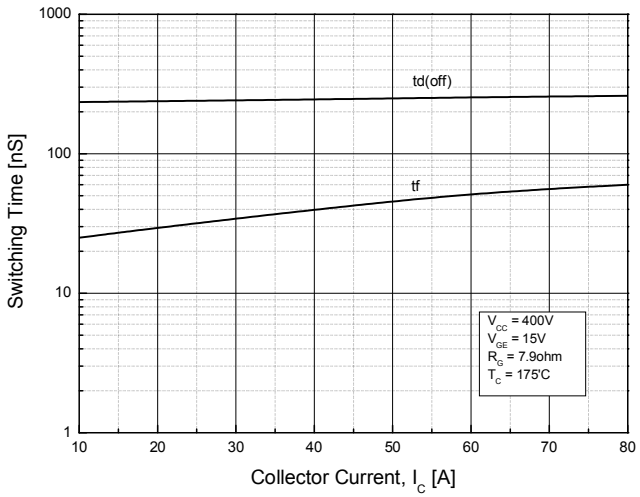


Fig.11 Typical Turn off-Collector Current

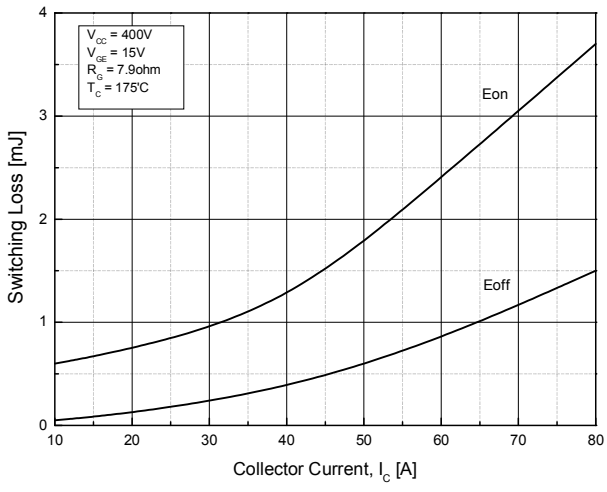


Fig.12 Switching Loss-Collector Current

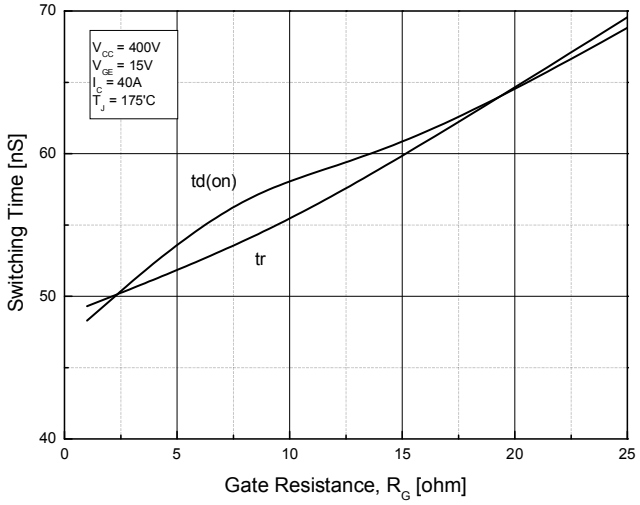


Fig.13 Turn on Characteristics-Gate Resistance

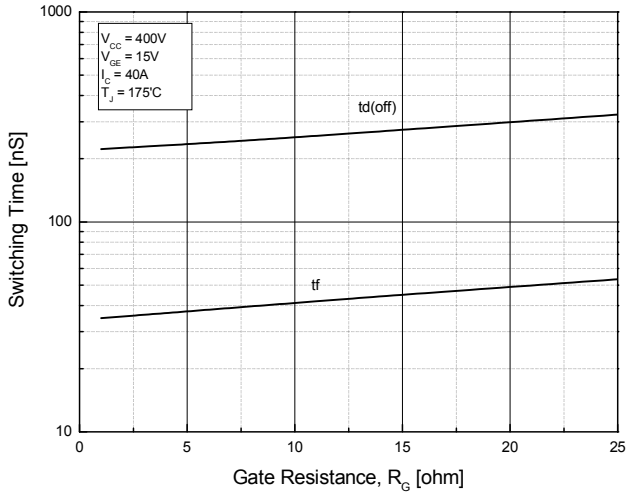


Fig.14 Turn off Characteristics-Gate Resistance

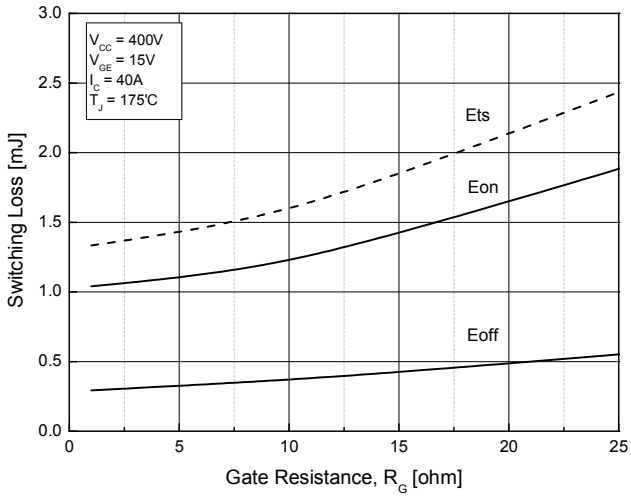


Fig.15 Switching Loss-Gate Resistance

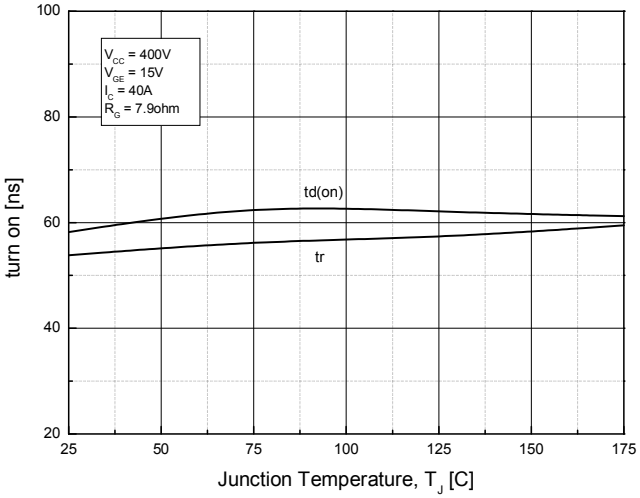


Fig.16 Turn on Characteristics -Junction Temperature

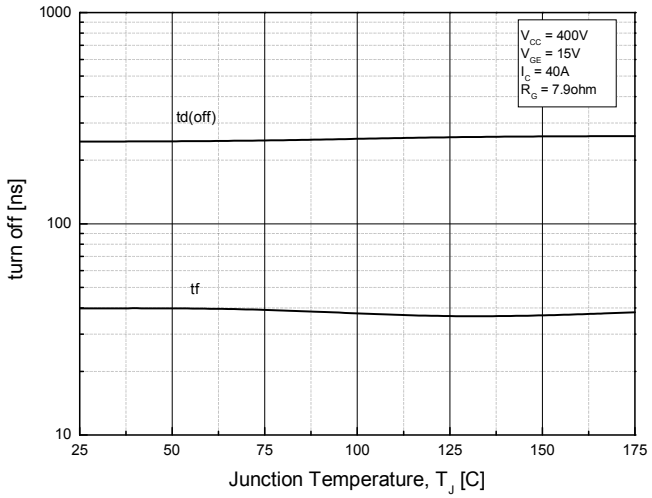


Fig.17 Turn off Characteristics Junction Temperature

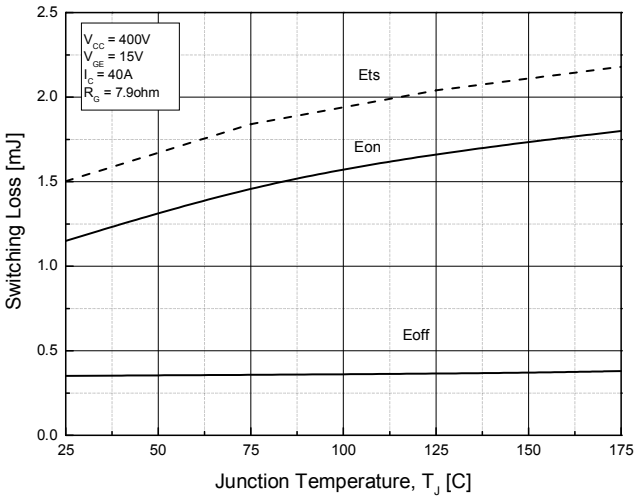


Fig.18 Switching Loss-Junction Temperature

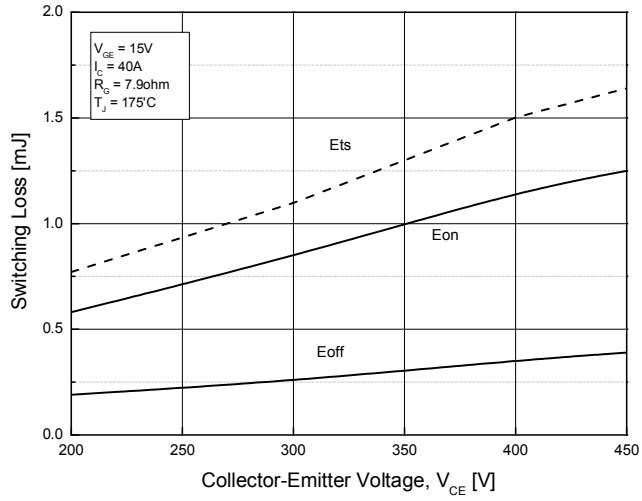


Fig.19 Switching Loss-Collector Emitter Voltage

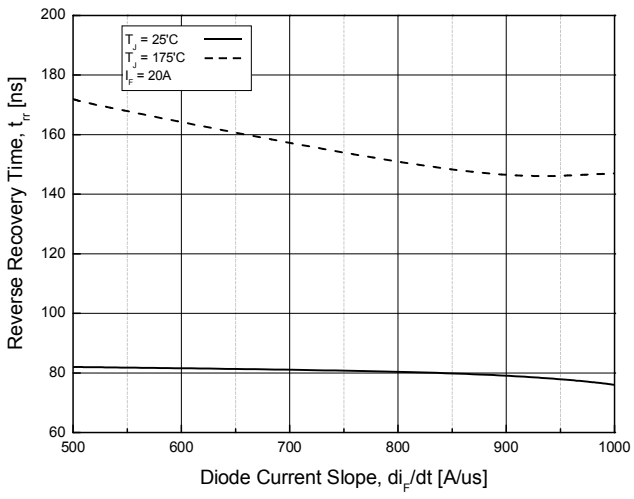


Fig.20 Reverse Recovery Time -Diode current slope

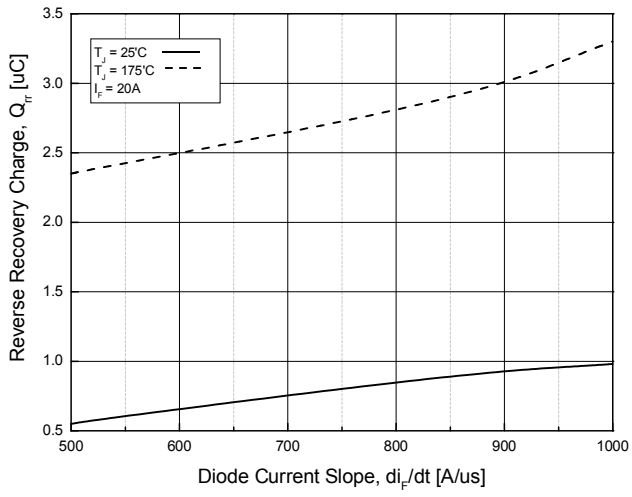


Fig.21 Reverse Recovery Charge -Diode Current Slope

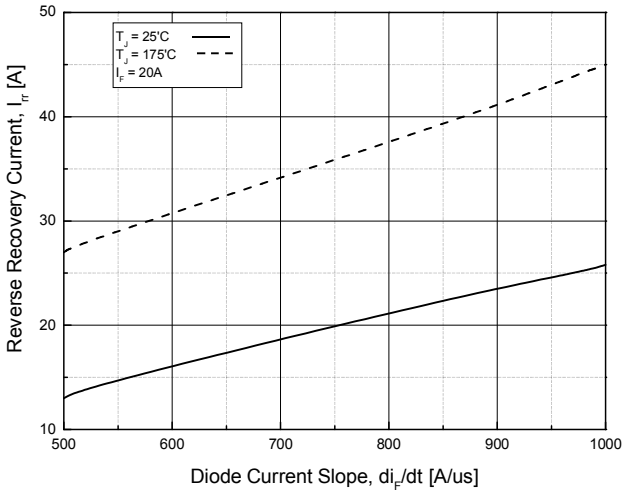


Fig.22 Reverse Recovery Current -Diode current slope

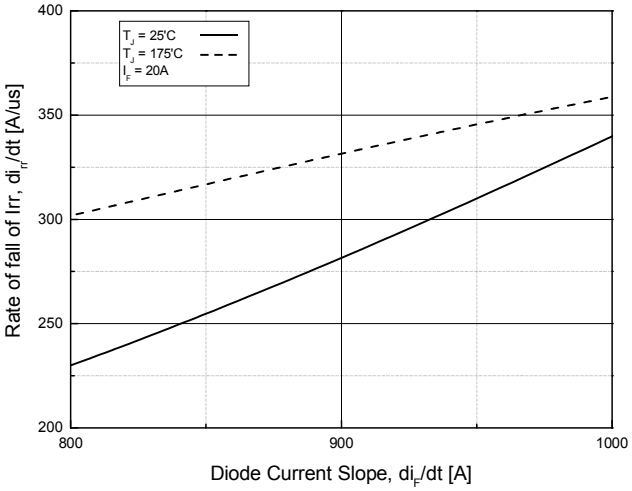


Fig.23 Rate of fall of reverse recovery current -Diode Current Slope

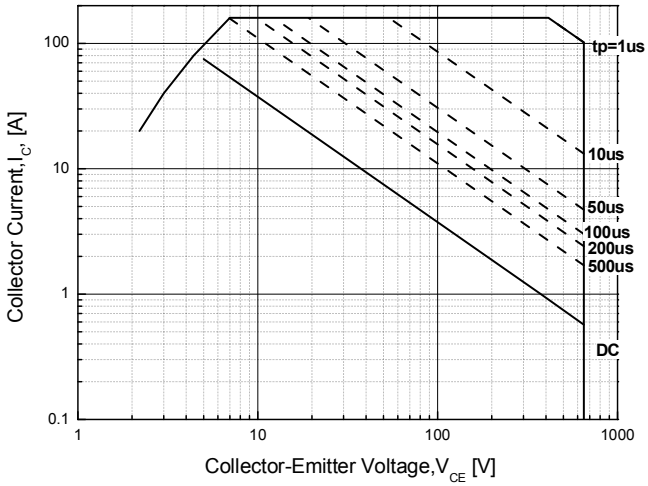


Fig.24 Forward Bias Safe Operating Area

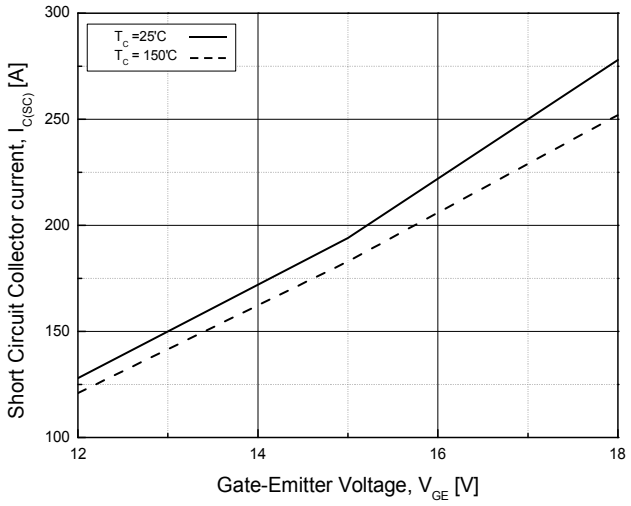


Fig.25 Typical Short Circuit Collector Current

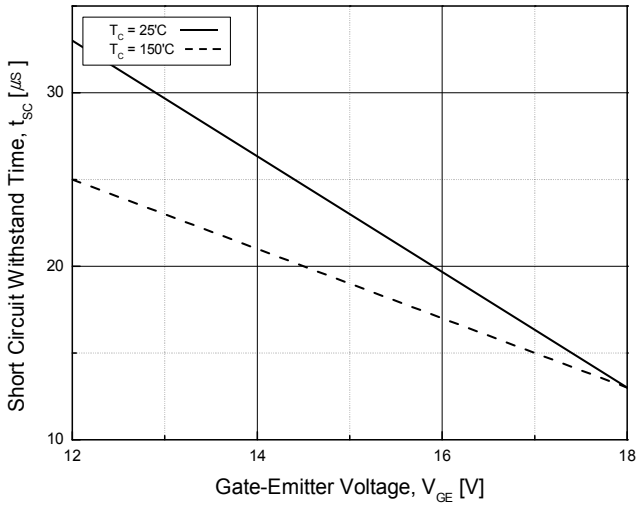


Fig.26 Typical Short Circuit Withstand Time

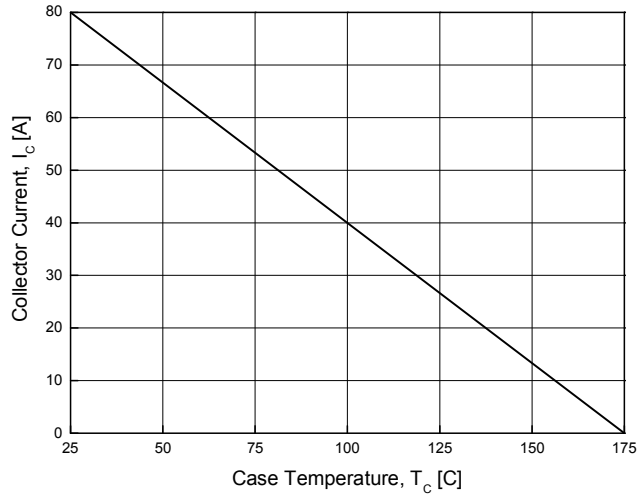


Fig.27 Case Temperature-Collector Current

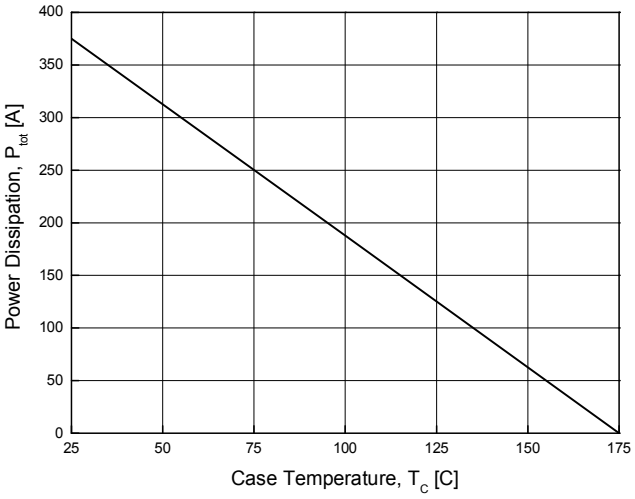


Fig.28 Power Dissipation-Case Temperature

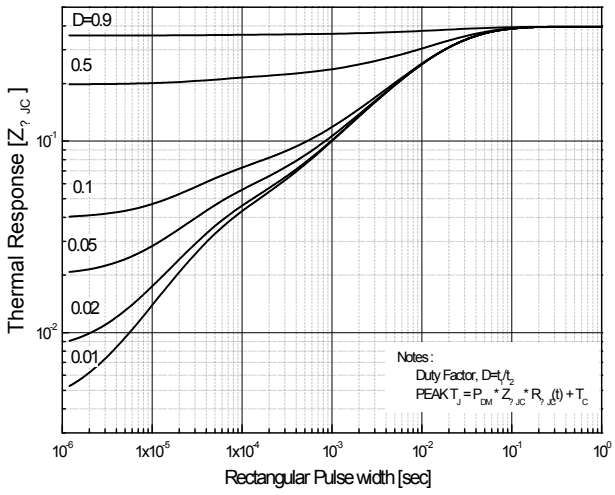


Fig.29 IGBT Transient Thermal Impedance

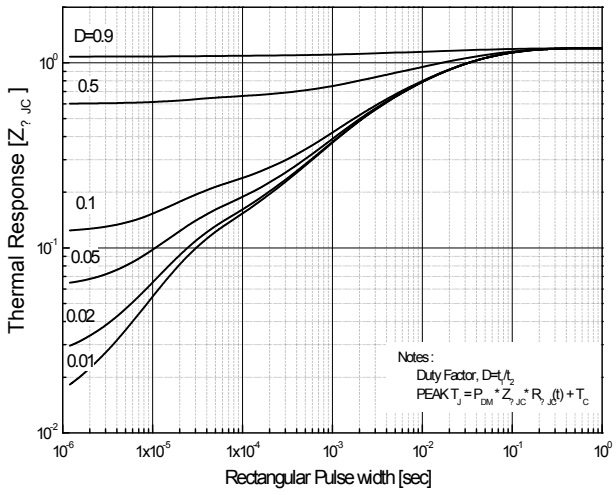
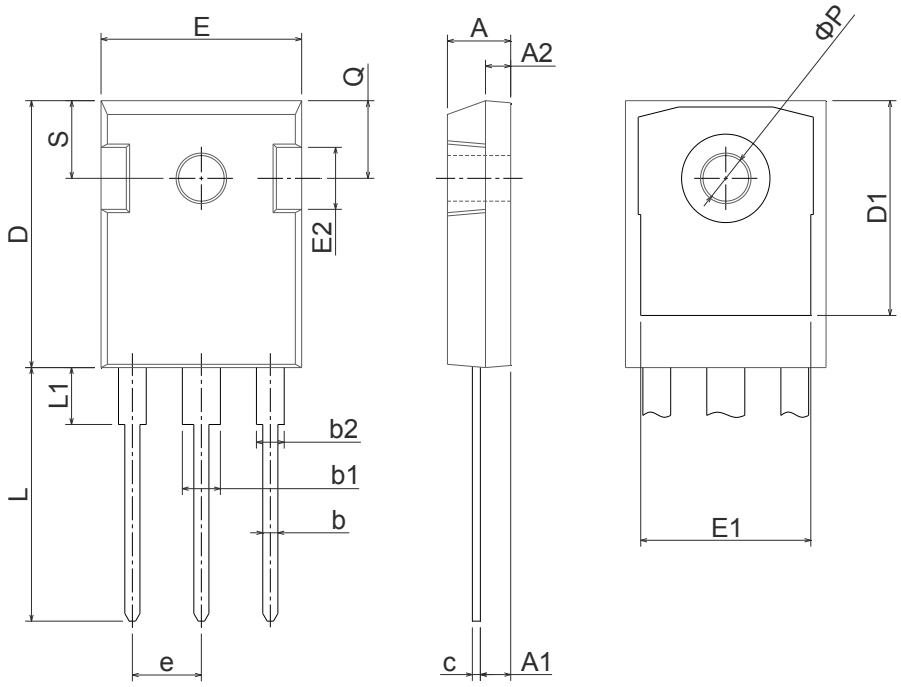


Fig.30 FRD Transient Thermal Impedance

TO-247



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	

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