OBSOLETE
USE DGTD65T40S2PT

DGTD65T40S1PT

650V FIELD STOP IGBT IN TO-247

Description

The DGTD65T40S1PT is produced using advanced field stop trench IGBT technology, which provides excellent quality and high-switching performance.

Features

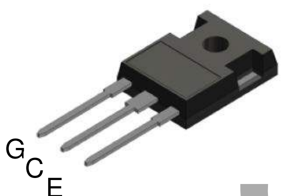
- High Speed Switching & Low Power Loss
- $V_{CE(sat)}$ = 1.95V @ I_C = 40A
- High Input Impedance
- t_{rr} = 80ns (typ) @ di_F/dt = 1000A/µs
- E_{off} = 0.3mJ @ T_C=25°C
- Maximum Junction Temperature 175°C
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

Applications

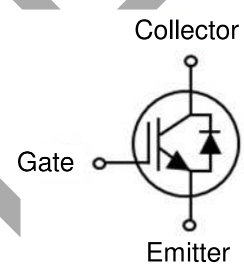
- UPS
- Welder
- Solar Inverter
- IH Cooker

Mechanical Data

- Case: TO-247 (Type MC)
- Case Material: Molded Plastic. "Green" Molding Compound.
- UL Flammability Classification Rating 94V-0
- Terminals: Finish—Matte Tin Plated Leads. Solderable per MIL-STD-202, Method 208 e3
- Weight: 5.6 grams (Approximate)



TO-247



Device Symbol

Ordering Information (Note 4)

Product	Marking	Quantity
DGTD65T40S1PT	DGTD65T40S1	450 per Box in Tubes (Note 5)

Notes:
1. EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant. All applicable RoHS exemptions applied.
2. See https://www.diodes.com/quality/lead-free/ for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
4. For packaging details, go to our website at https://www.diodes.com/design/support/packaging/diodes-packaging/.
5. 30 devices per tube.

Marking Information

= Manufacturer's Marking
DGTD65T40S1 = Product Type Marking Code
YY = Year (ex: 18 = 2018)
LLLLL = Lot Code
WW = Week (01 to 53)

Absolute Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

Characteristic		Symbol	Value	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_{vjmax}		I_{Cpuls}	160	A
Turn Off Safe Operating Area $V_{CE} \leq$ 600V, T_{vj} = 175°C		—	160	A
Diode Forward Current limited by T_{vjmax}	T_C = 25°C	I_F	40	A
	T_C = 100°C		20	A
Diode Pulsed Current, t_p limited by T_{vjmax}		I_{Fpuls}	160	A
Gate-Emitter Voltage		V_{GE}	±20	V
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 ≥ 1.0s		tsc	5	µs

Thermal Characteristics (@T_A = +25°C, unless otherwise specified.)

Characteristic		Symbol	Value	Unit
Power Dissipation Linear Derating Factor (Note 6)	T_C = 25°C	P_D	341	W
	T_C = 100°C		170	
Thermal Resistance, Junction to Ambient (Note 6)		$R_{\theta JA}$	40	°C/W
Thermal Resistance, Junction to Case for IBGT (Note 6)		$R_{\theta JC}$	0.44	
Thermal Resistance, Junction to Case for Diode (Note 6)		$R_{\theta JC}$	1.20	
Operating Temperature		T_{vj}	-40 to +175	°C
Storage Temperature Range		T_{STG}	-55 to +150	

Note: 6. When mounted on a standard JEDEC 2-layer FR-4 board.

Electrical Characteristics (@T_{vj} = +25°C, unless otherwise specified.)

Parameter		Symbol	Min	Typ	Max	Unit	Condition
STATIC CHARACTERISTICS							
Collector-Emitter Breakdown Voltage		BV_{CES}	650	—	—	V	I_C = 2mA, V_{GE} = 0V
Collector-Emitter Saturation Voltage	T_{vj} = 25°C	$V_{CE(sat)}$	—	1.95	2.40	V	I_C = 40A, V_{GE} = 15V
	T_{vj} = 175°C		—	2.30	—		
Diode Forward Voltage	T_{vj} = 25°C	V_F	—	1.30	1.90	V	V_{GE} = 0V, I_F = 20A
	T_{vj} = 125°C		—	1.15	—		
	T_{vj} = 175°C		—	1.10	—		
Gate-Emitter Threshold Voltage		$V_{GE(th)}$	4.0	5.0	6.0	V	V_{CE} = V_{GE}, I_C = 0.58mA
Zero Gate Voltage Collector Current	T_{vj} = 25°C	I_{CES}	—	—	40	µA	V_{CE} = 650V, V_{GE} = 0V
	T_{vj} = 175°C		—	—	1000		
Gate-Emitter Leakage Current		I_{GES}	—	—	±100	nA	V_{GE} = 20V, V_{CE} = 0V
Transconductance		g_{FS}	—	17.0	—	S	V_{CE} = 20V, I_C = 40A
DYNAMIC CHARACTERISTICS							
Total Gate Charge		Q_g	—	219	—	nC	V_{CE} = 520V, I_C = 40A, V_{GE} = 15V
Gate-Emitter Charge		Q_{ge}	—	26	—		
Gate-Collector Charge		Q_{gc}	—	115	—		
Input Capacitance		C_{ies}	—	2818	—	pF	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz
Reverse Transfer Capacitance		C_{res}	—	131	—		
Output Capacitance		C_{oes}	—	209	—		
Internal Emitter Inductance Measured 5mm (0.197") From Case		L_E	—	13	—	nH	—
Short Circuit Collector Current Max. 1000 Short Circuits. Time Between Short Circuits ≥ 1.0s		$I_{C(SC)}$	—	180	—	A	V_{GE} = 15V, V_{CC} = 400V, t_{SC} ≤ 5µs, T_{vj} = 150°C
SWITCHING CHARACTERISTICS							
Turn-on Delay Time		$t_{d(on)}$	—	58	—	ns	V_{GE} = 15V, V_{CC} = 400V, I_C = 40A, R_G = 7.9Ω, Inductive Load, T_{vj} = 25°C
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}	—	80	—	ns	I_F = 20A, di_F/dt = 1000A/µs, T_{vj} = 25°C
Reverse Recovery Current		I_{rr}	—	25	—	A	
Reverse Recovery Charge		Q_{rr}	—	1.0	—	µC	
Rate of Fall of Reverse Crecovery Current during t_b		di_{rr}/dt	—	-950	—	A/µs	
Turn-on Delay Time		$t_{d(on)}$	—	61	—	ns	V_{GE} = 15V, V_{CC} = 400V, I_C = 40A, R_G = 7.9Ω , Inductive Load, T_{vj} = 175°C
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}	—	145	—	ns	I_F = 20A, di_F/dt = 1000A/µs, T_{vj} = 175°C
Reverse Recovery Current		I_{rr}	—	44	—	A	
Reverse Recovery Charge		Q_{rr}	—	3.2	—	µC	
Rate of Fall of Reverse Crecovery Current during t_b		di_{rr}/dt	—	-680	—	A/µs	

Typical Performance Characteristics (@T_A = +25°C, unless otherwise specified.)

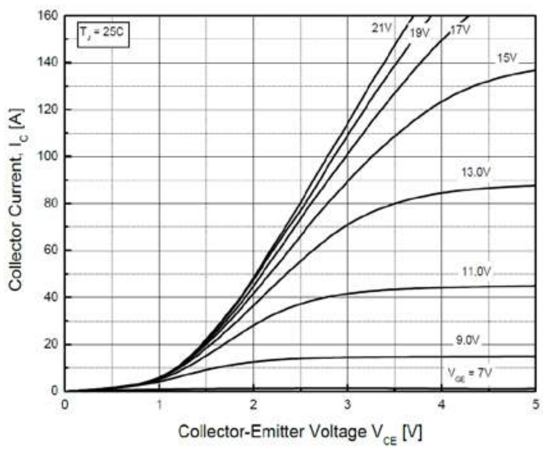


Fig.1 Typical Output Characteristics(T_J=25℃)

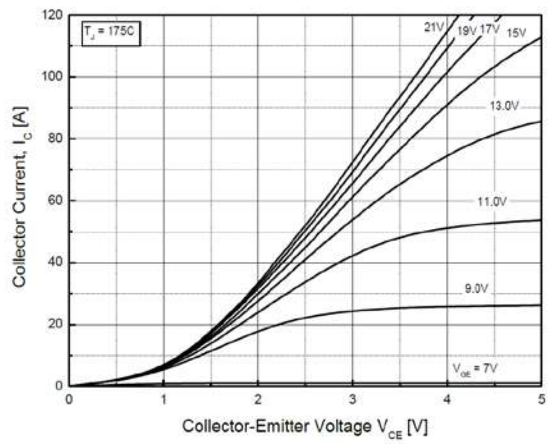


Fig.2 Typical Output Characteristics(T_J=175℃)

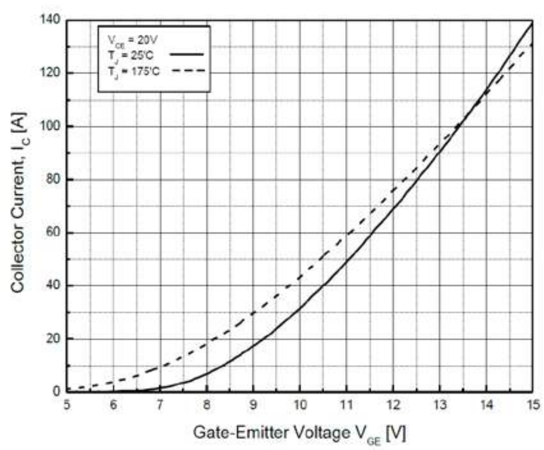


Fig.3 Typical Transfer Characteristics

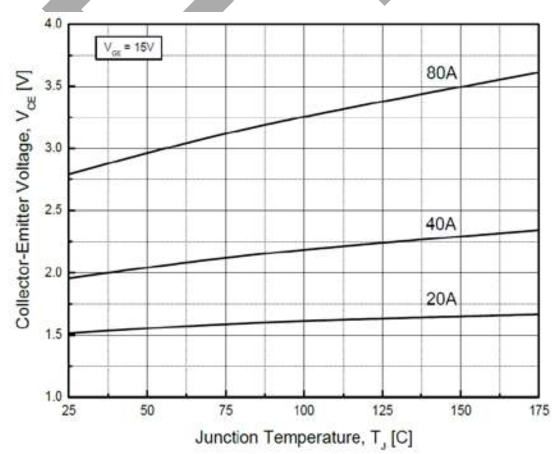


Fig.4 Typical Collector-Emitter Saturation Voltage -Junction Temperature

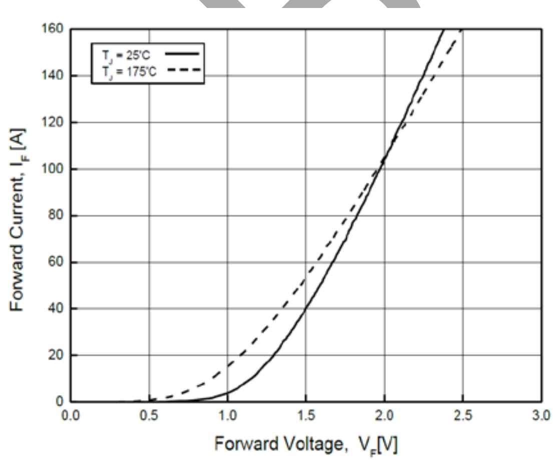


Fig.5 Diode Forward Characteristics

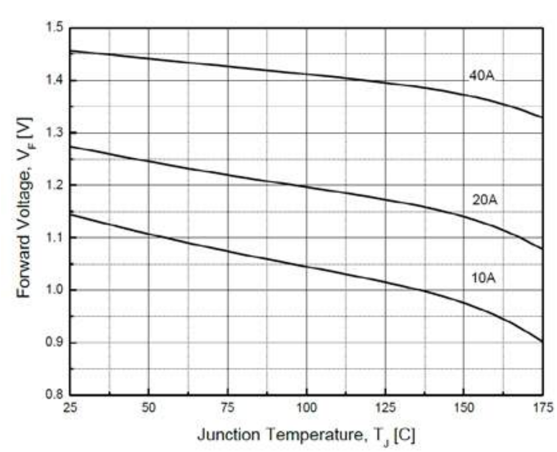


Fig.6 Diode Forward-Junction Temperature

Typical Performance Characteristics (continued)

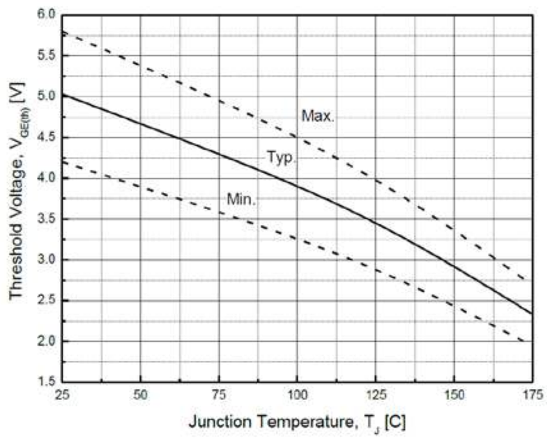


Fig.7 Threshold Voltage-Junction Temperature

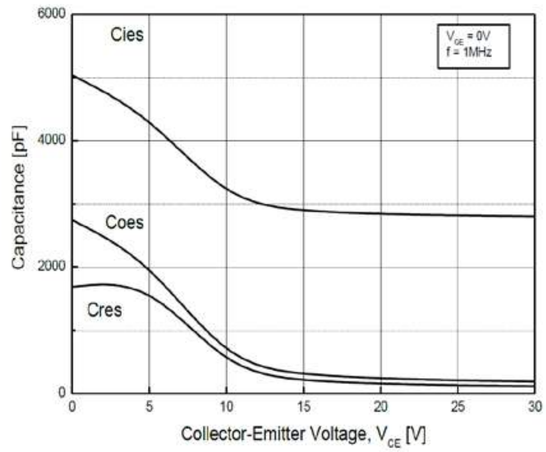


Fig.8 Typical Capacitance

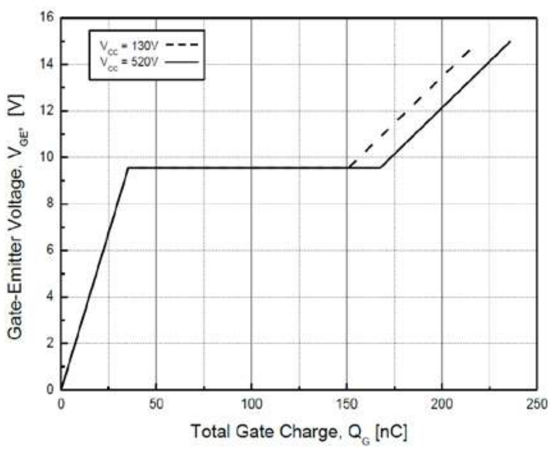


Fig.9 Typical Gate Charge

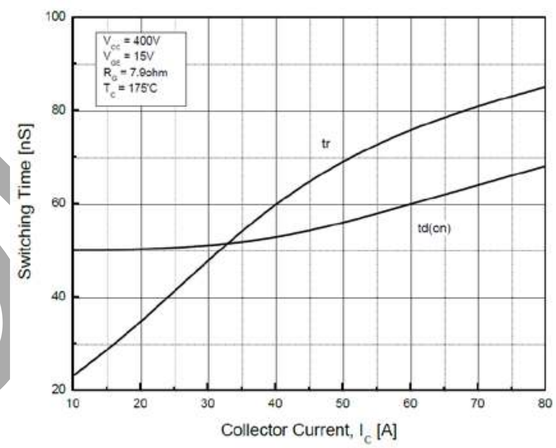


Fig.10 Typical Turn on-Collector Current

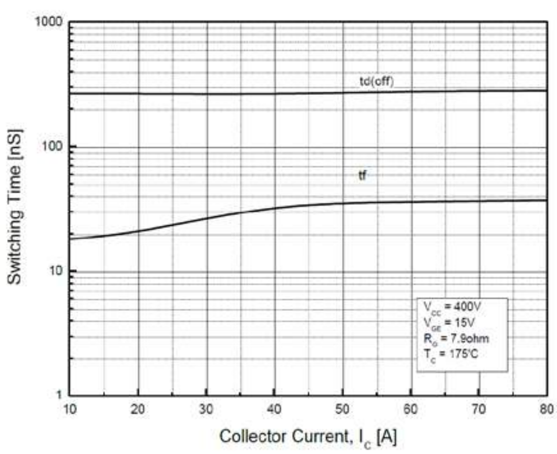


Fig.11 Typical Turn off-Collector Current

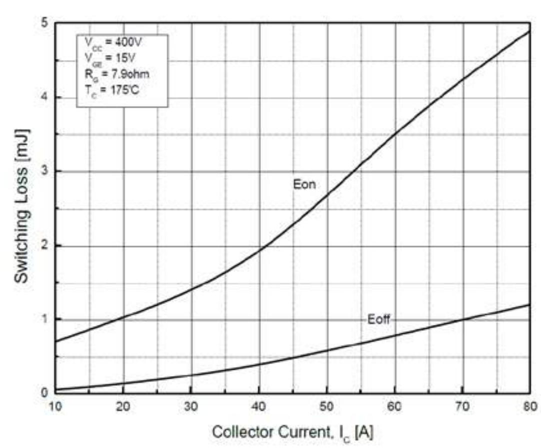


Fig.12 Switching Loss-Collector Current

Typical Performance Characteristics (continued)

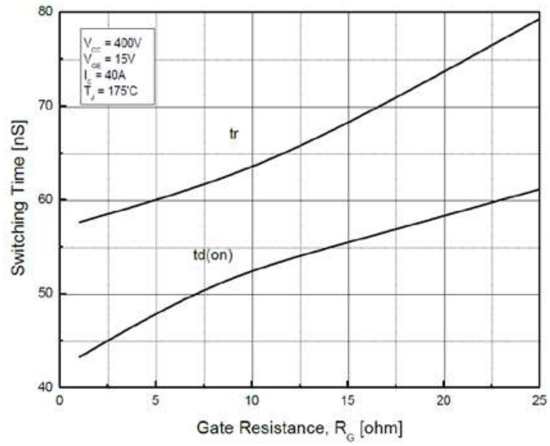


Fig.13 Turn on Characteristics-Gate Resistance

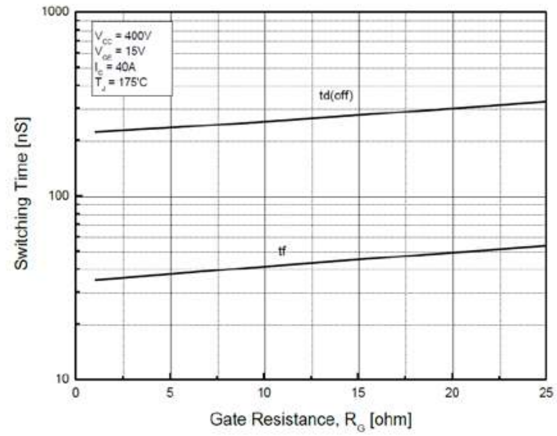


Fig.14 Turn off Characteristics-Gate Resistance

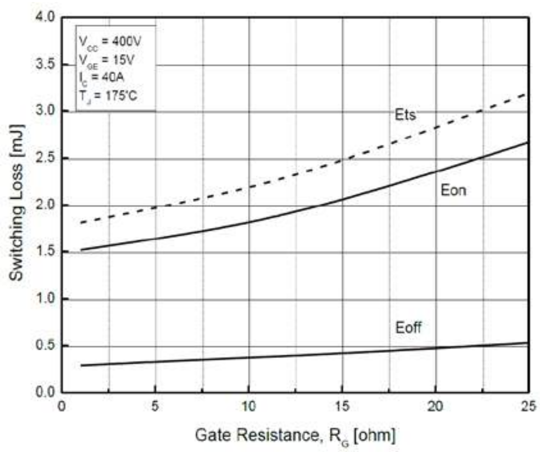


Fig.15 Switching Loss-Gate Resistance

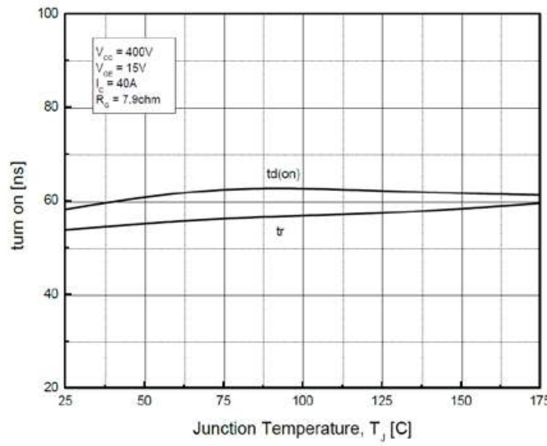


Fig.16 Turn on Characteristics -Junction Temperature

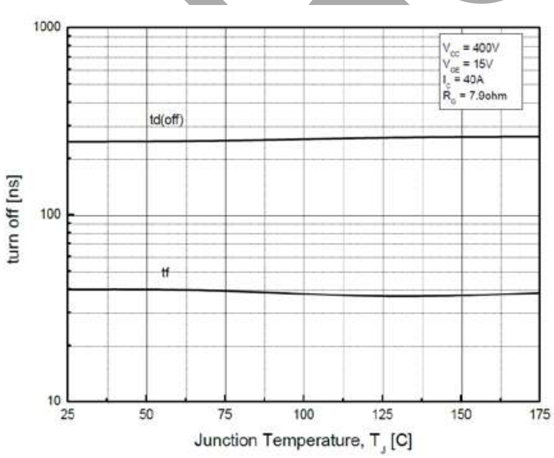


Fig.17 Turn off Characteristics -Junction Temperature

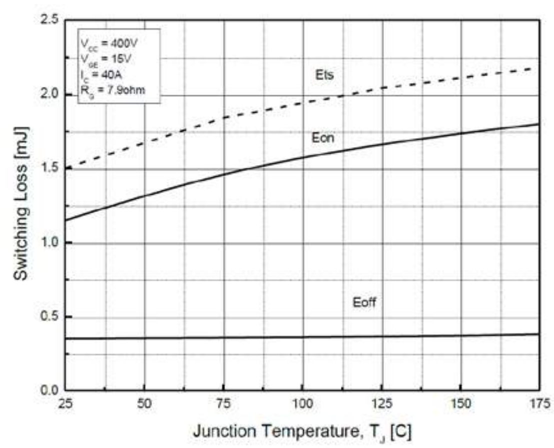


Fig.18 Switching Loss-Junction Temperature

Typical Performance Characteristics (continued)

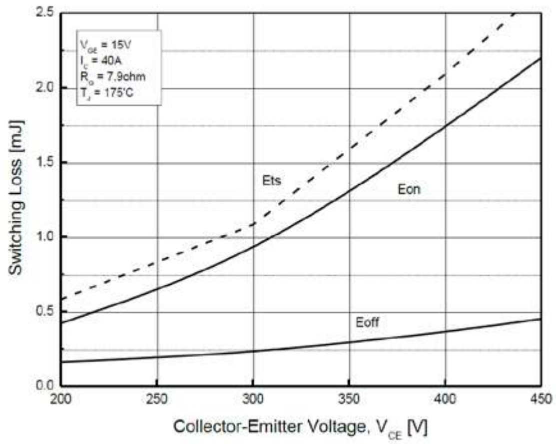


Fig.19 Switching Loss-Collector Emitter Voltage

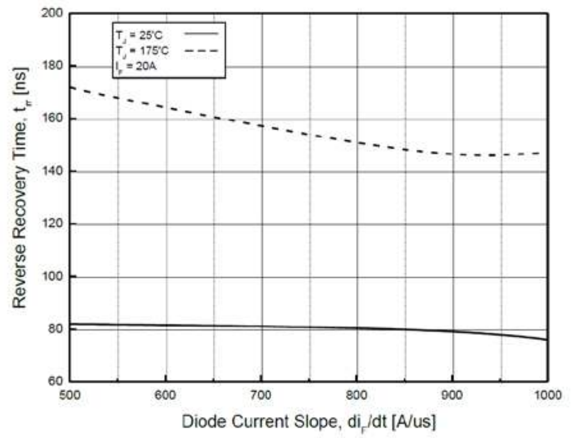


Fig.20 Reverse Recovery Time -Diode current slope

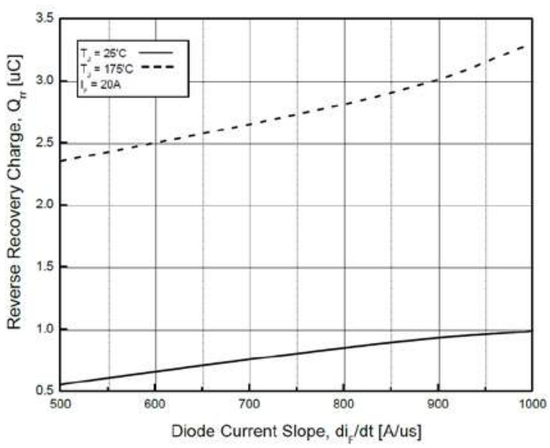


Fig.21 Reverse Recovery Charge -Diode Current Slope

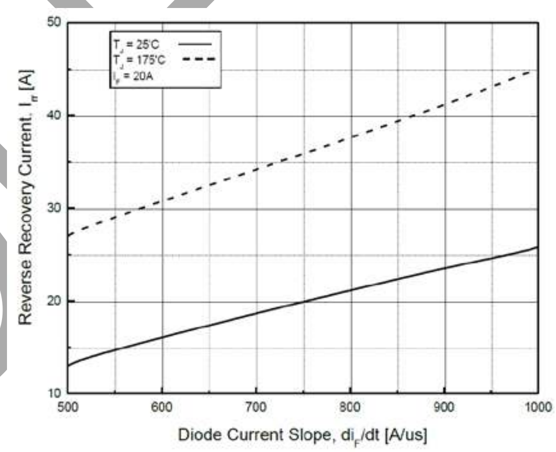


Fig.22 Reverse Recovery Current -Diode current slope

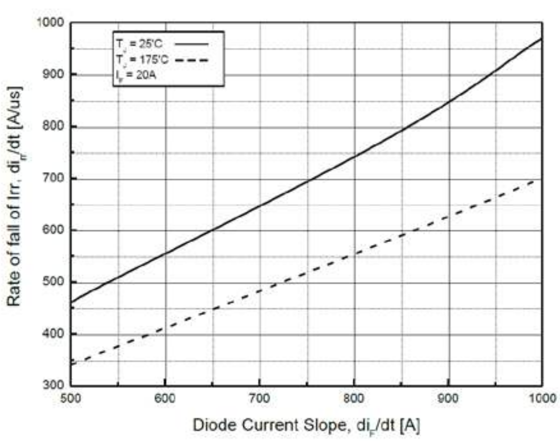


Fig.23 Rate of fall of reverse recovery current -Diode Current Slope

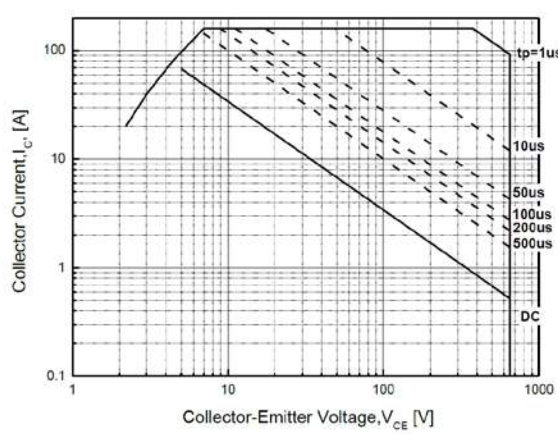


Fig.24 Forward Bias Safe Operating Area

Typical Performance Characteristics (contined)

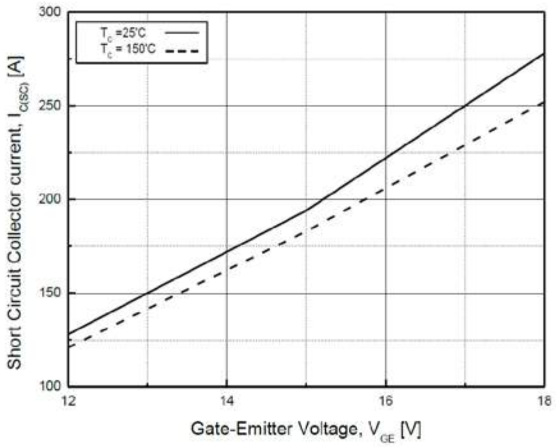


Fig.25 Typical Short Circuit Collector Current

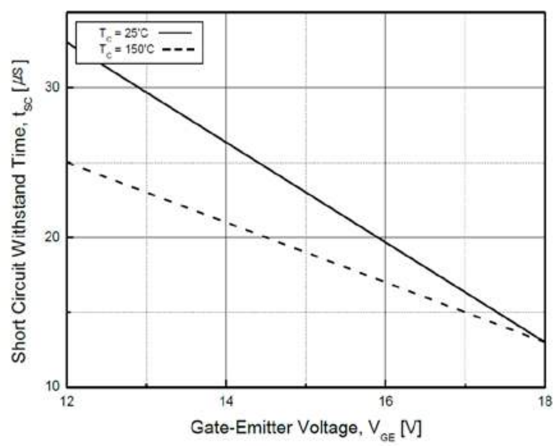


Fig.26 Typical Short Circuit Withstand Time

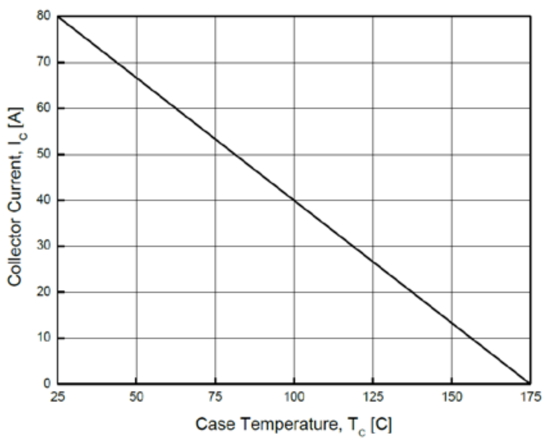


Fig.27 Case Temperature-Collector Current

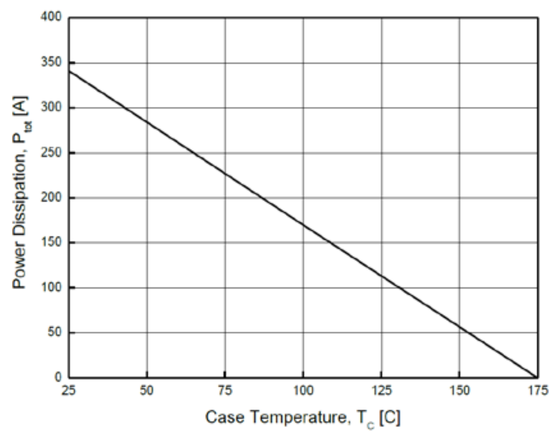


Fig.28 Power Dissipation-Case Temperature

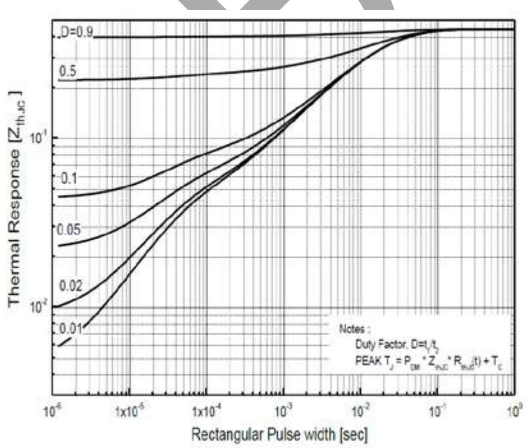


Fig.29 IGBT Transient Thermal Impedance

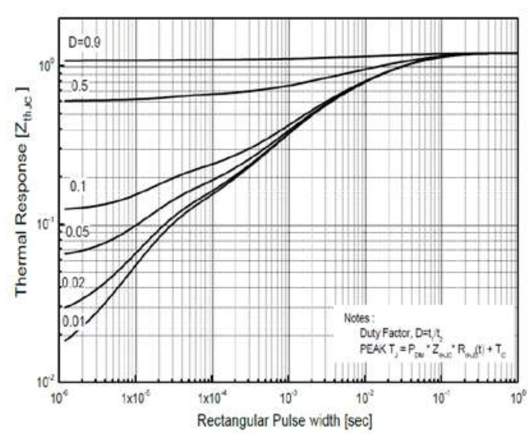
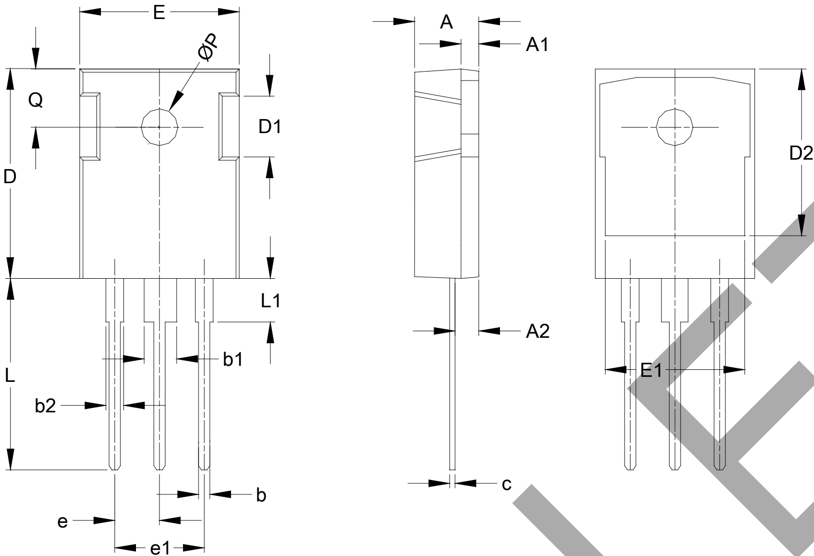


Fig.30 FRD Transient Thermal Impedance

Package Outline Dimensions

Please see http://www.diodes.com/package-outlines.html for the latest version.

TO247 (Type MC)



TO-247 (Type MC)			
Dim	**Min**	**Max**	**Typ**
A	4.700	5.310	—
A1	1.500	2.490	—
A2	2.200	2.600	—
b	0.990	1.400	—
b1	2.590	3.430	—
b2	1.650	2.390	—
c	0.380	0.890	—
D	20.30	21.46	—
D1	4.320	5.490	—
D2	13.08	—	—
E	15.45	16.26	—
E1	13.06	14.02	—
e	5.450		
e1	10.90		
L	19.81	20.57	—
L1	—	4.500	—
Q	5.380	6.200	—
øP	3.500	3.700	—
All Dimensions in mm			

Note : For high-voltage applications, the appropriate industry sector guidelines should be considered with regards to creepage and clearance distances between device terminals and PCB tracking.

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2. support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in significant injury to the user.

B. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or to affect its safety or effectiveness.

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