Description

The DGTD120T25S1PT is produced using advanced Field Stop Trench IGBT Technology, which provides low $V_{CE(sat)}$, excellent quality and high-switching performance.

Features

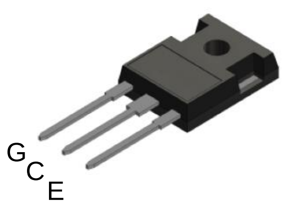
- High Speed Switching & Low $V_{CE(sat)}$ Loss
- $V_{CE(sat)}$ = 2.0V @ I_C = 25A
- High Input Impedance
- t_{rr} = 100ns (typ) @ di_F/dt = 500A/µs
- Ultra-Soft, Fast Recovery Anti-parallel Diode
- Ultra Narrowed VF Distribution Control
- Positive Temperature Coefficient For Easy Parallelling
- Maximum Junction Temperature 175°C
- **Lead-Free Finish & RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. “Green” Device (Note 3)**

Applications

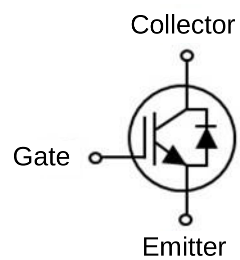
- Motor Drive
- UPS
- Welder
- Solar Inverter
- IH Cooker

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
DGTD120T25S1PT	DGTD120T25S1	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 http://www.diodes.com/quality/lead_free.html 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
DGTD120T25S1 = 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}	1,200	V
DC Collector Current, limited by T_{vjmax}	T_C = 25°C	I_C	50	A
	T_C = 100°C		25	A
Pulsed Collector Current, t_p limited by T_{vjmax}		I_{Cpuls}	100	A
Turn Off Safe Operating Area $V_{CE} \le$ 1200V, T_{vj} = 175°C		-	100	A
Diode Forward Current limited by T_{vjmax}	T_C = 25°C	I_F	25	A
	T_C = 100°C		12.5	A
Diode Pulsed Current, t_p limited by T_{vjmax}		I_{Fpuls}	100	A
Gate-Emitter Voltage		V_{GE}	±20	V
Short Circuit Withstand Time $V_{CC} \le$ 600V, V_{GE} = 15V, T_{vj} = 175°C Allowed Number of Short Circuits < 1000 Time Between Short Circuits ≥ 1.0s		tsc	10	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	348	W
	T_C = 100°C		174	
Thermal Resistance, Junction to Ambient (Note 6)		$R_{\theta JA}$	40	°C/W
Thermal Resistance, Junction to Case for IBGT (Note 6)		$R_{\theta JC}$	0.43	
Thermal Resistance, Junction to Case for Diode (Note 6)		$R_{\theta JC}$	1.55	
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}	1200	–	–	V	I_C = 500µA, V_{GE} = 0V
Collector-Emitter Saturation Voltage	T_{vj} = 25°C	$V_{CE(sat)}$	–	2.00	2.40	V	I_C = 25A, V_{GE} = 15V
	T_{vj} = 150°C		–	2.40	–		
	T_{vj} = 175°C		–	2.50	–		
Diode Forward Voltage	T_{vj} = 25°C	V_F	–	2.10	2.60	V	V_{GE} = 0V, I_F = 12.5A
	T_{vj} = 175°C		–	1.90	–		
Diode Forward Voltage	T_{vj} = 25°C	V_F	–	2.50	3.00	V	V_{GE} = 0V, I_F = 25A
	T_{vj} = 150°C		–	2.55	–		
	T_{vj} = 175°C		–	2.45	–		
Gate-Emitter Threshold Voltage		$V_{GE(th)}$	5.0	6.0	7.0	V	V_{CE} = V_{GE}, I_C = 0.85mA
Zero Gate Voltage Collector Current	T_{vj} = 25°C	I_{CES}	–	–	250	µA	V_{CE} = 1200V, V_{GE} = 0V
	T_{vj} = 175°C		–	–	2500		
Gate-Emitter Leakage Current		I_{GES}	–	–	±250	nA	V_{GE} = 20V, V_{CE} = 0V
Transconductance		g_{fs}	–	16	–	S	V_{CE} = 20V, I_C = 25A
DYNAMIC CHARACTERISTICS							
Total Gate Charge		Q_g	–	204	–	nC	V_{CE} = 960V, I_C = 25A, V_{GE} = 15V
Gate-Emitter Charge		Q_{ge}	–	34	–		
Gate-Collector Charge		Q_{gc}	–	94	–		
Input Capacitance		C_{ies}	–	3942	–	pF	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz
Reverse Transfer Capacitance		C_{res}	–	72	–		
Output Capacitance		C_{oes}	–	142	–		
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		$I_{C(SC)}$	–	121	–	A	V_{GE} = 15V, V_{CC} = 600V, t_{SC} ≤ 10µs, T_{vj} = 175°C
SWITCHING CHARACTERISTICS							
Turn-on Delay Time		$t_{d(on)}$	–	73	–	ns	V_{GE} = 15V, V_{CC} = 600V, I_C = 25A, R_G = 23Ω, Inductive Load, T_{vj} = 25°C
Rise time		t_r	–	41	–		
Turn-off Delay Time		$t_{d(off)}$	–	269	–		
Fall Time		t_f	–	39	–		
Turn-on Switching Energy		E_{on}	–	1.44	–	mJ	
Turn-off Switching Energy		E_{off}	–	0.55	–		
Total Switching Energy		E_{ts}	–	1.99	–		
Reverse Recovery Time		t_{rr}	–	100	–	ns	I_F = 25A, di_F/dt = 500A/µs, V_R = 600V, T_{vj} = 25°C
Reverse Recovery Current		I_{rr}	–	17	–	A	
Reverse Recovery Charge		Q_{rr}	–	0.85	–	µC	
Rate Of Fall Of Reverse Current During t_b		di_{rr}/dt	–	-376	–	A/µs	
Turn-on Delay Time		$t_{d(on)}$	–	65	–	ns	V_{GE} = 15V, V_{CC} = 600V, I_C = 25A, R_G = 23Ω, Inductive Load, T_{vj} = 175°C
Rise time		t_r	–	45	–		
Turn-off Delay Time		$t_{d(off)}$	–	292	–		
Fall Time		t_f	–	75	–		
Turn-on Switching Energy		E_{on}	–	2.43	–	mJ	
Turn-off Switching Energy		E_{off}	–	1.09	–		
Total Switching Energy		E_{ts}	–	3.52	–		
Reverse Recovery Time		t_{rr}	–	150	–	ns	I_F = 25A, di_F/dt = 500A/µs, V_R = 600V, T_{vj} = 175°C
Reverse Recovery Current		I_{rr}	–	25	–	A	
Reverse Recovery Charge		Q_{rr}	–	1.85	–	µC	
Rate Of Fall Of Reverse Current During t_b		di_{rr}/dt	–	-374	–	A/µs	

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

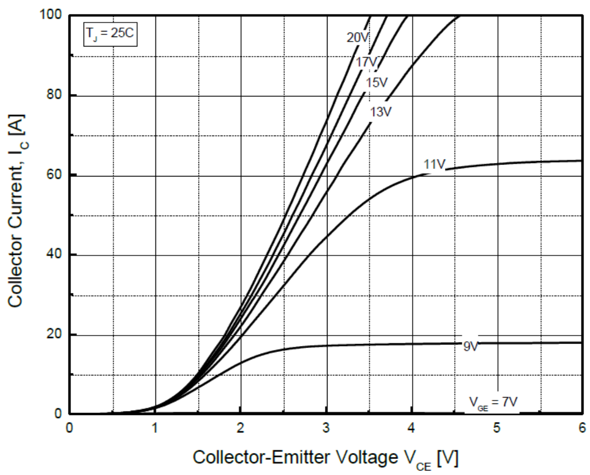


Fig.1 Typical Output Characteristic(T_J=25℃)

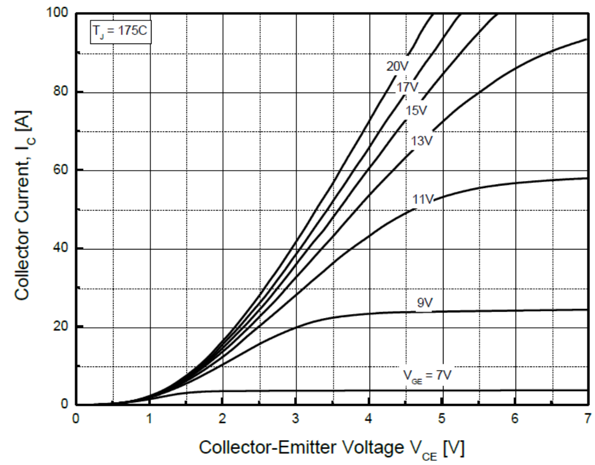


Fig.2 Typical Output Characteristic(T_J=175℃)

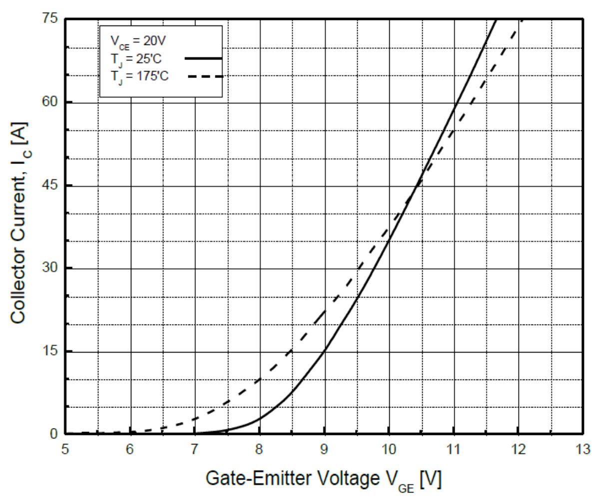


Fig.3 Typical Transfer Characteristic

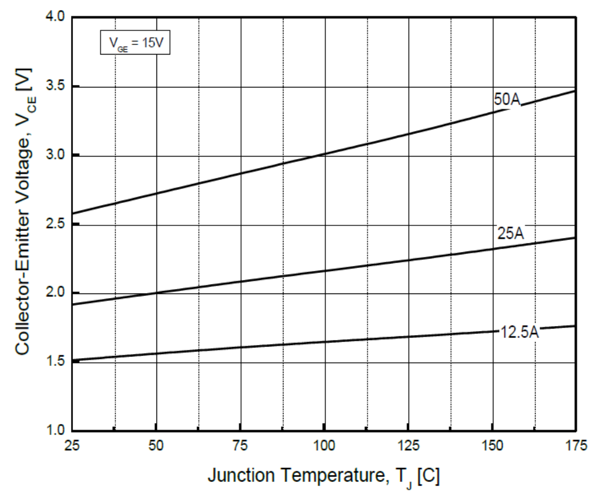


Fig.4 Typical Collector-Emitter Saturation Voltage -Junction Temperature

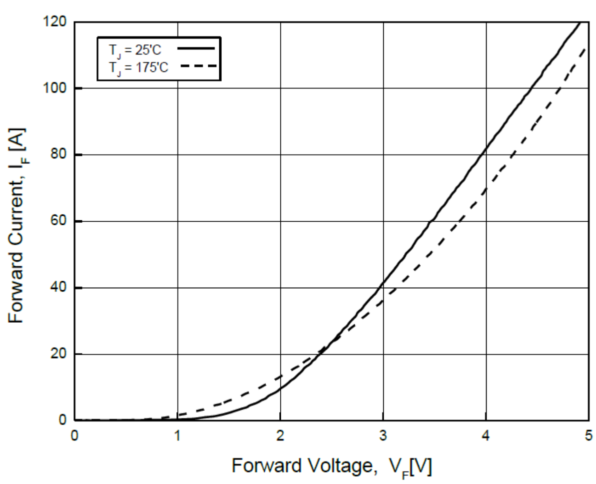


Fig.5 Diode Forward Characteristic

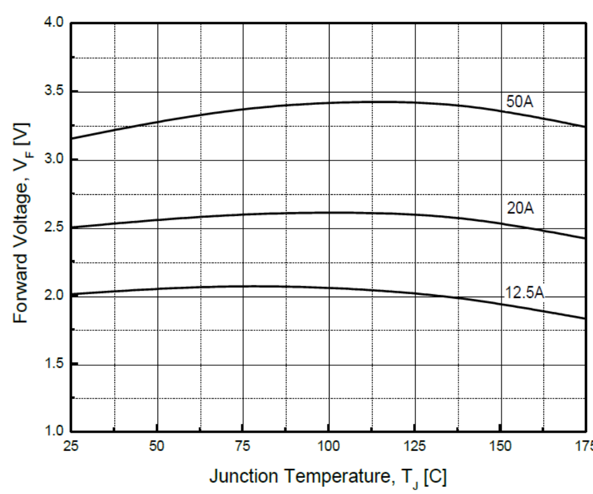


Fig.6 Diode Forward-Junction Temperature

Typical Performance Characteristics (continued)

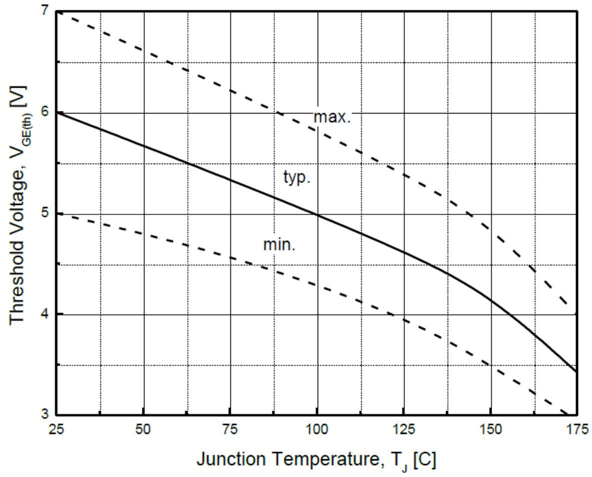


Fig.7 Threshold Voltage-Junction Temperature

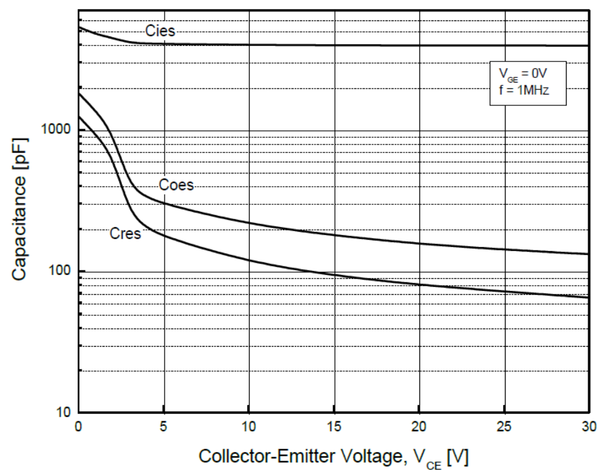


Fig.8 Typical Capacitance

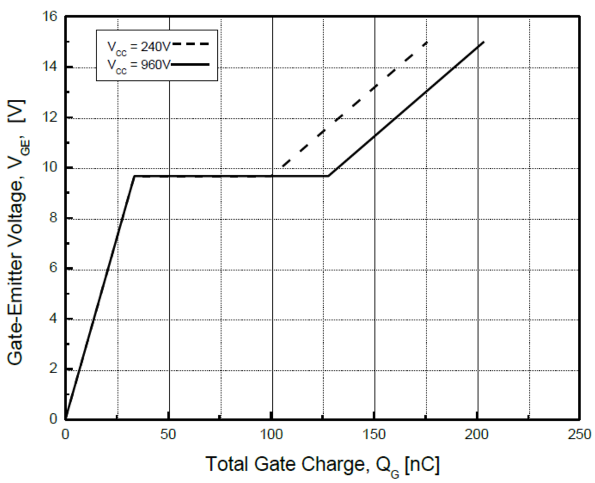


Fig.9 Typical Gate Charge

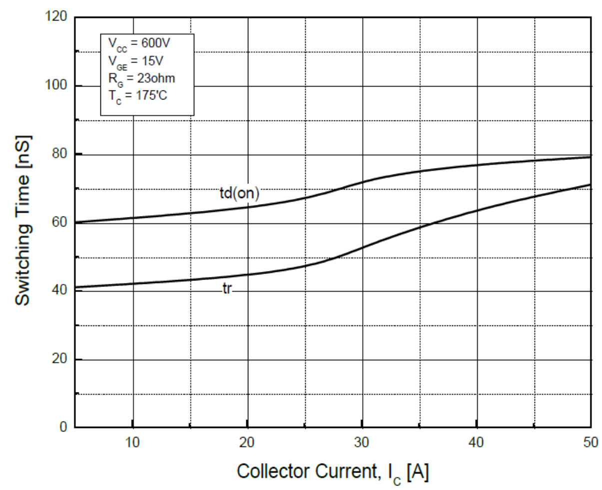


Fig.10 Typical Turn on-Collector Current

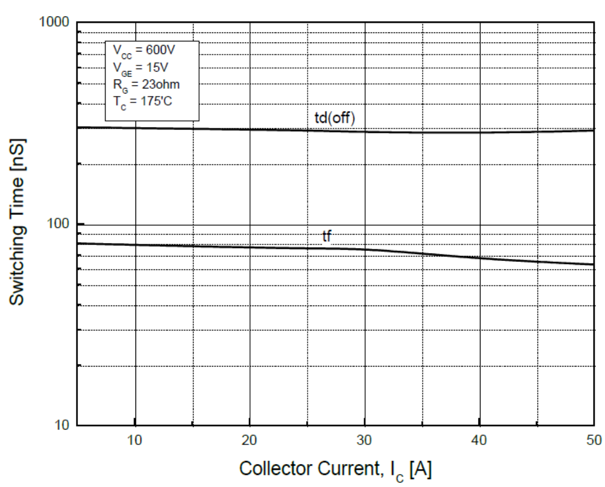


Fig.11 Typical Turn off-Collector Current

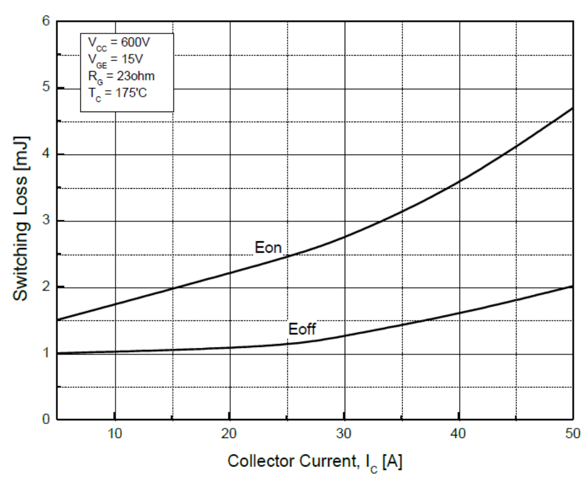


Fig.12 Switching Loss-Collector Current

Typical Performance Characteristics (cont.)

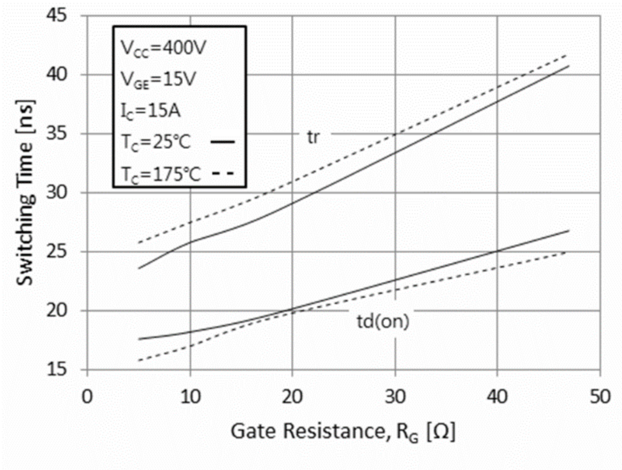


Fig.13 Turn on Characteristics-Gate Resistance

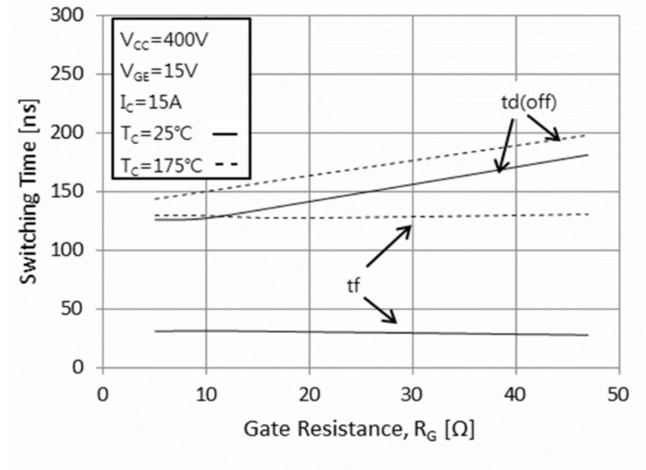


Fig.14 Turn off Characteristics-Gate Resistance

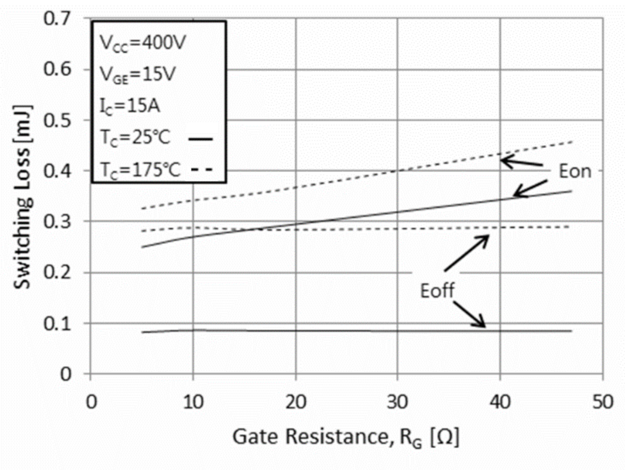


Fig.15 Switching Loss-Gate Resistance

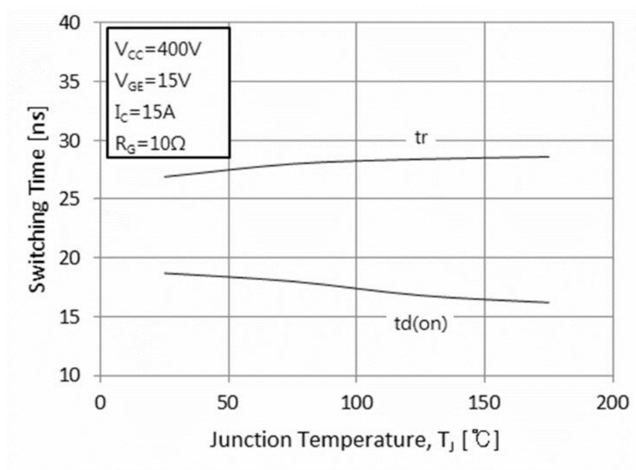


Fig.16 Turn on Characteristics-Junction Temperature

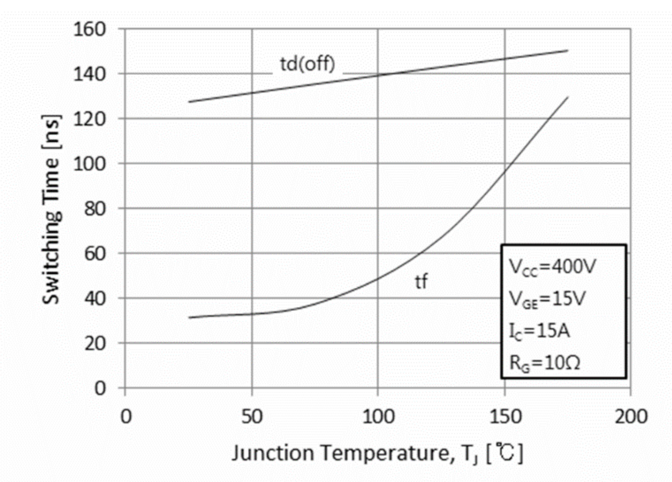


Fig.17 Turn off Characteristics-Junction Temperature

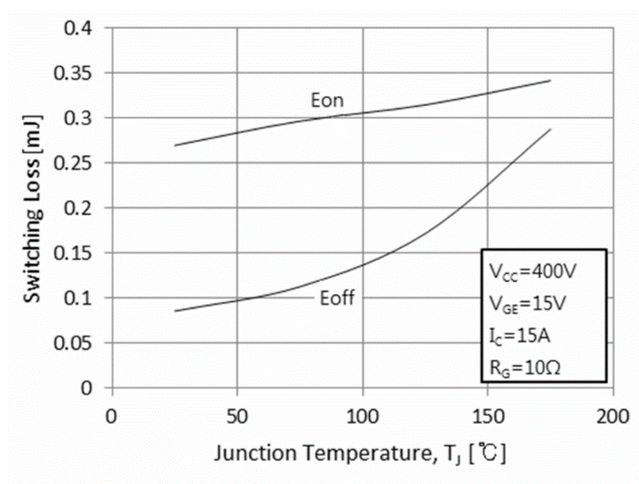


Fig.18 Switching Loss-Junction Temperature

Typical Performance Characteristics (cont.)

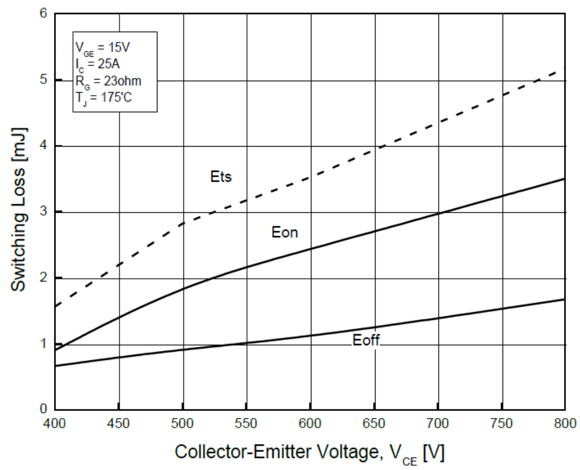


Fig.19 Switching Loss-Collector Emitter Voltage

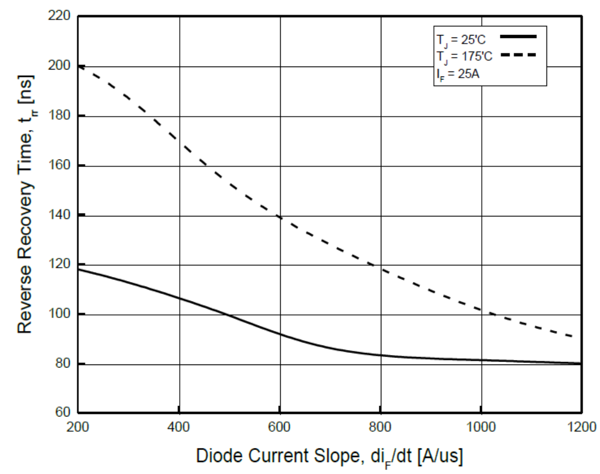


Fig.20 Reverse Recovery Time -Diode current slope

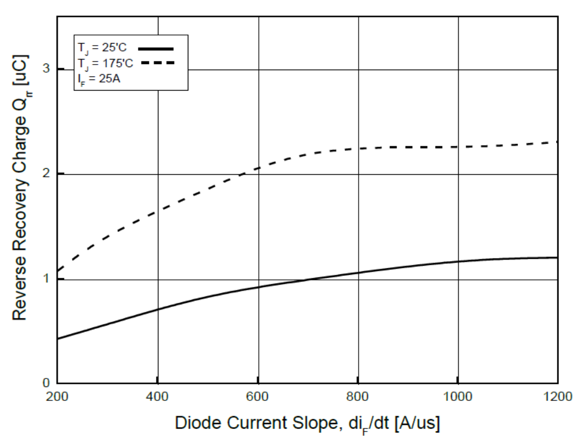


Fig.21 Reverse Recovery Charge -Diode Current Slope

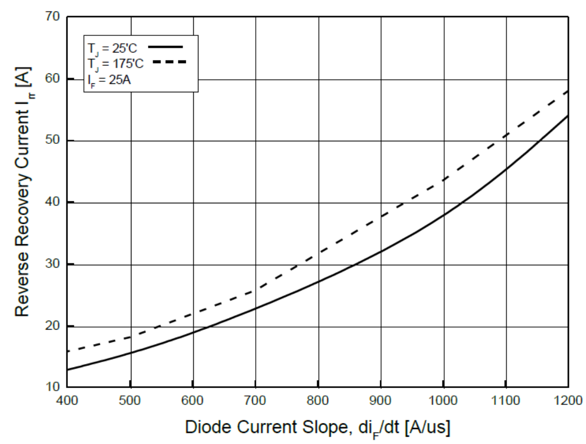


Fig.22 Reverse Recovery Current -Diode current slope

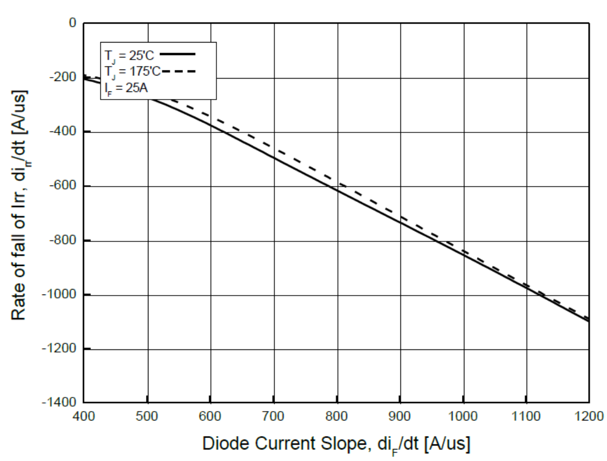


Fig.23 Rate of fall of reverse recovery current -Diode Current Slope

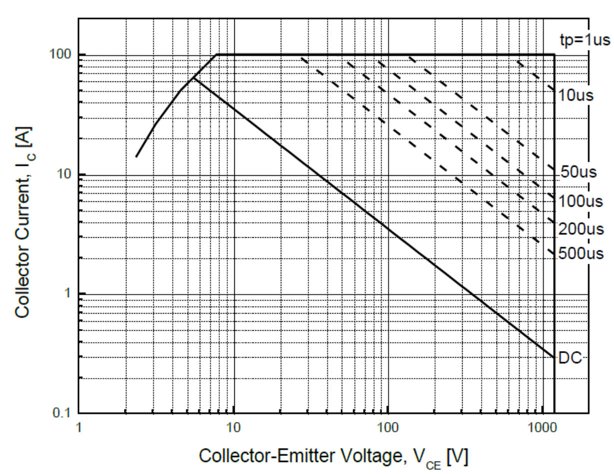


Fig.24 Forward Bias Safe Operating Area

Typical Performance Characteristics (cont.)

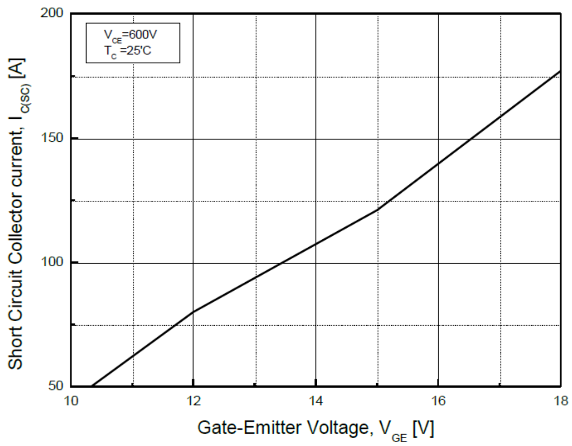


Fig.25 Typical Short Circuit Collector Current

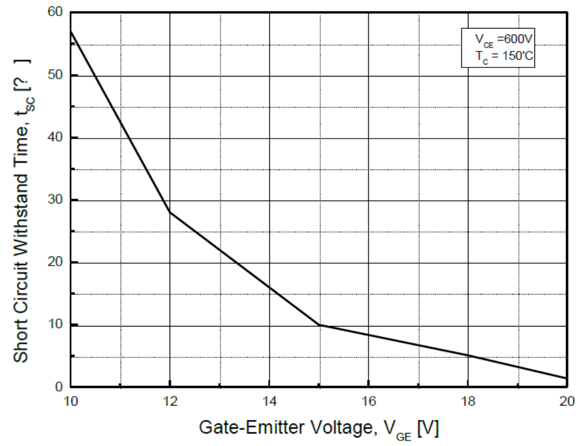


Fig.26 Typical Short Circuit Withstand Time

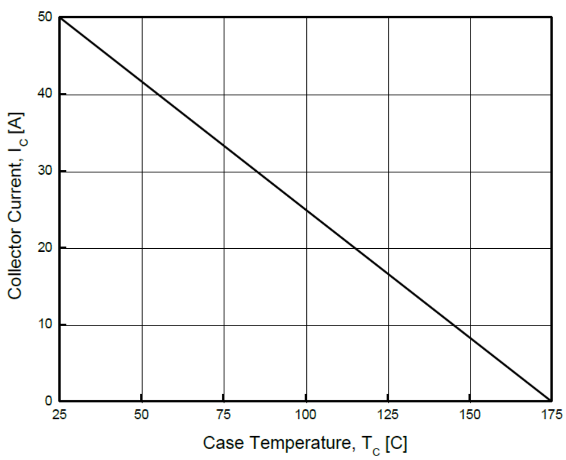


Fig.27 Case Temperature-Collector Current

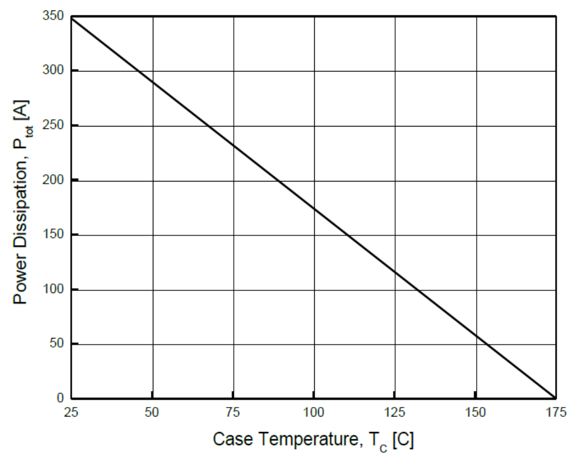


Fig.28 Power Dissipation-Case Temperature

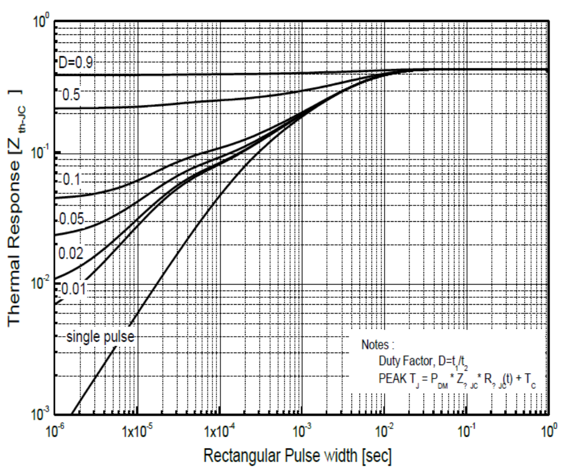


Fig.29 IGBT Transient Thermal Impedance

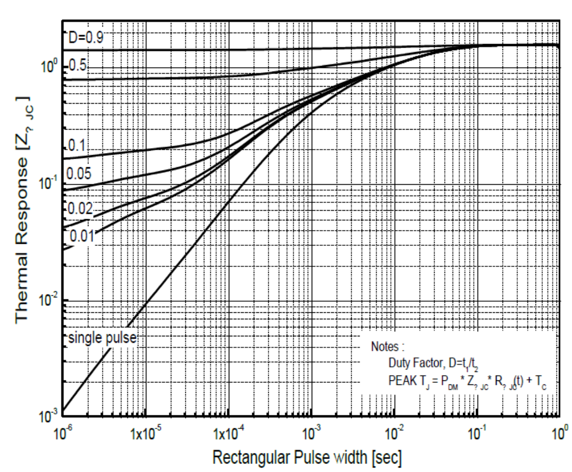
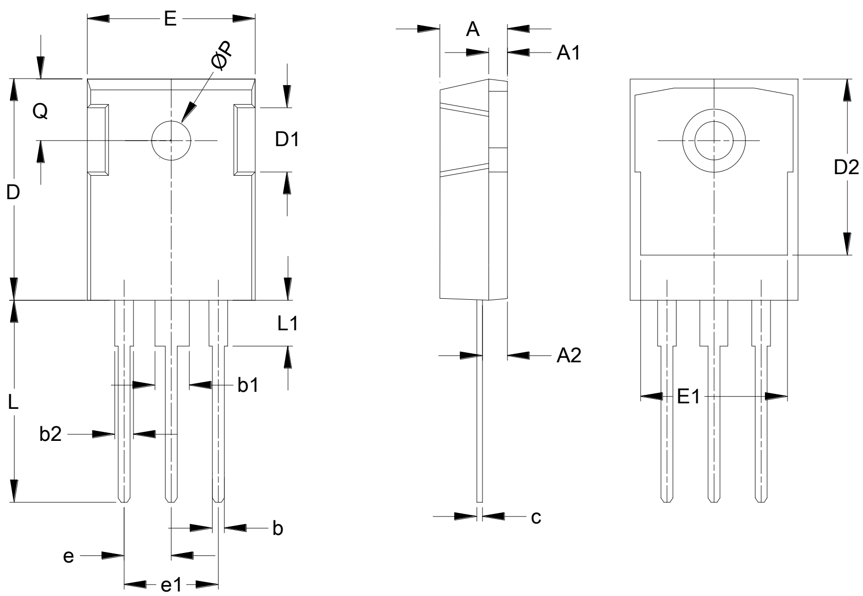


Fig.30 FRD Transient Thermal Impedance

Package Outline Dimensions

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

TO-247 (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.