

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

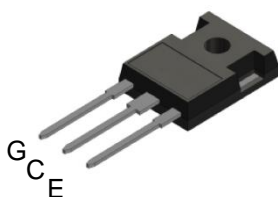
- High Speed Switching & Low $V_{CE(sat)}$ Loss
- $V_{CE(sat)} = 2.0V @ I_C = 25A$
- High Input Impedance
- $t_{rr} = 100ns$ (typ) @ $di_f/dt = 500A/\mu s$
- Ultra-Soft, Fast Recovery Anti-parallel Diode
- Ultra Narrowed VF Distribution Control
- Positive Temperature Coefficient For Easy Paralleling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

Applications

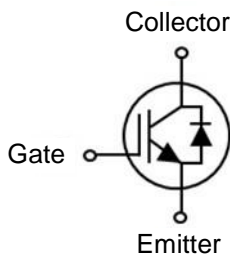
- Motor Drive
- UPS
- Welder
- Solar Inverter
- IH Cooker

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
- 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}	I _C	T _C = 25°C	50
		T _C = 100°C	25
Pulsed Collector Current, t _p limited by T _{vjmax}	I _{Cpuls}	100	A
Turn Off Safe Operating Area V _{CE} ≤ 1200V, T _{vj} = 175°C	-	100	A
Diode Forward Current limited by T _{vjmax}	I _F	T _C = 25°C	25
		T _C = 100°C	12.5
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} ≤ 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)	P _D	T _C = 25°C	348
		T _C = 100°C	174
Thermal Resistance, Junction to Ambient (Note 6)	R _{θJA}	40	°C/W
Thermal Resistance, Junction to Case for IGBT (Note 6)	R _{θJC}	0.43	
Thermal Resistance, Junction to Case for Diode (Note 6)	R _{θJC}	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 (@ $T_{vj} = +25^{\circ}\text{C}$, unless otherwise specified.)

Parameter	Symbol	Min	Typ	Max	Unit	Condition	
STATIC CHARACTERISTICS							
Collector-Emitter Breakdown Voltage	BV_{CES}	1200	–	–	V	$I_C = 500\mu\text{A}$, $V_{GE} = 0\text{V}$	
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$T_{vj} = 25^{\circ}\text{C}$	–	2.00	2.40	V	$I_C = 25\text{A}$, $V_{GE} = 15\text{V}$
		$T_{vj} = 150^{\circ}\text{C}$	–	2.40	–		
		$T_{vj} = 175^{\circ}\text{C}$	–	2.50	–		
Diode Forward Voltage	V_F	$T_{vj} = 25^{\circ}\text{C}$	–	2.10	2.60	V	$V_{GE} = 0\text{V}$, $I_F = 12.5\text{A}$
		$T_{vj} = 175^{\circ}\text{C}$	–	1.90	–		
Diode Forward Voltage	V_F	$T_{vj} = 25^{\circ}\text{C}$	–	2.50	3.00	V	$V_{GE} = 0\text{V}$, $I_F = 25\text{A}$
		$T_{vj} = 150^{\circ}\text{C}$	–	2.55	–		
		$T_{vj} = 175^{\circ}\text{C}$	–	2.45	–		
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	5.0	6.0	7.0	V	$V_{CE} = V_{GE}$, $I_C = 0.85\text{mA}$	
Zero Gate Voltage Collector Current	I_{CES}	$T_{vj} = 25^{\circ}\text{C}$	–	–	250	μA	$V_{CE} = 1200\text{V}$, $V_{GE} = 0\text{V}$
		$T_{vj} = 175^{\circ}\text{C}$	–	–	2500		
Gate-Emitter Leakage Current	I_{GES}	–	–	± 250	nA	$V_{GE} = 20\text{V}$, $V_{CE} = 0\text{V}$	
Transconductance	g_{fs}	–	16	–	S	$V_{CE} = 20\text{V}$, $I_C = 25\text{A}$	
DYNAMIC CHARACTERISTICS							
Total Gate Charge	Q_g	–	204	–	nC	$V_{CE} = 960\text{V}$, $I_C = 25\text{A}$, $V_{GE} = 15\text{V}$	
Gate-Emitter Charge	Q_{ge}	–	34	–			
Gate-Collector Charge	Q_{gc}	–	94	–			
Input Capacitance	C_{ies}	–	3942	–	pF	$V_{CE} = 25\text{V}$, $V_{GE} = 0\text{V}$, $f = 1\text{MHz}$	
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 $\geq 1.0\text{s}$	$I_{C(SC)}$	–	121	–	A	$V_{GE} = 15\text{V}$, $V_{CC} = 600\text{V}$, $t_{SC} \leq 10\mu\text{s}$, $T_{vj} = 175^{\circ}\text{C}$	
SWITCHING CHARACTERISTICS							
Turn-on Delay Time	$t_{d(on)}$	–	73	–	ns	$V_{GE} = 15\text{V}$, $V_{CC} = 600\text{V}$, $I_C = 25\text{A}$, $R_G = 23\Omega$, Inductive Load, $T_{vj} = 25^{\circ}\text{C}$	
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		
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	$V_{GE} = 15\text{V}$, $V_{CC} = 600\text{V}$, $I_C = 25\text{A}$, $R_G = 23\Omega$, Inductive Load, $T_{vj} = 175^{\circ}\text{C}$	
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		
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 (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

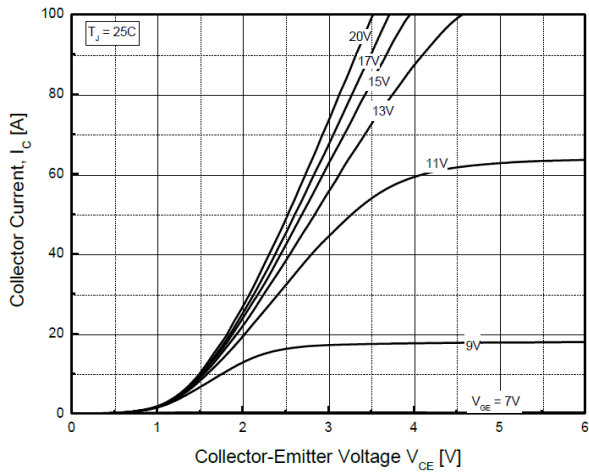


Fig.1 Typical Output Characteristic($T_j=25^\circ\text{C}$)

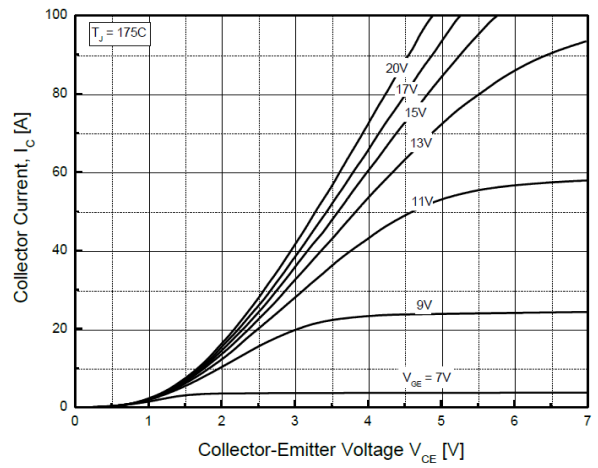


Fig.2 Typical Output Characteristic($T_j=175^\circ\text{C}$)

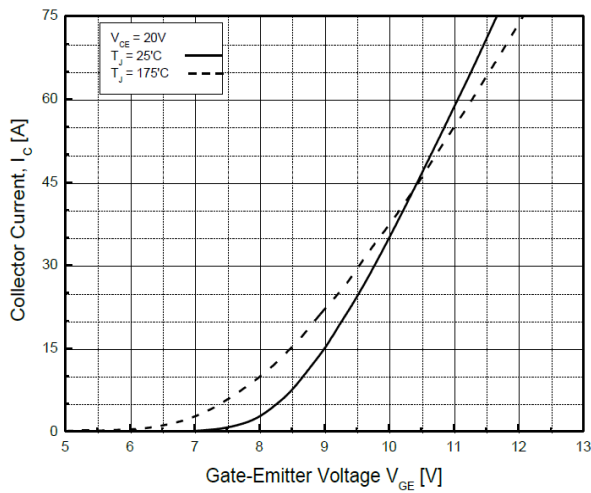


Fig.3 Typical Transfer Characteristic

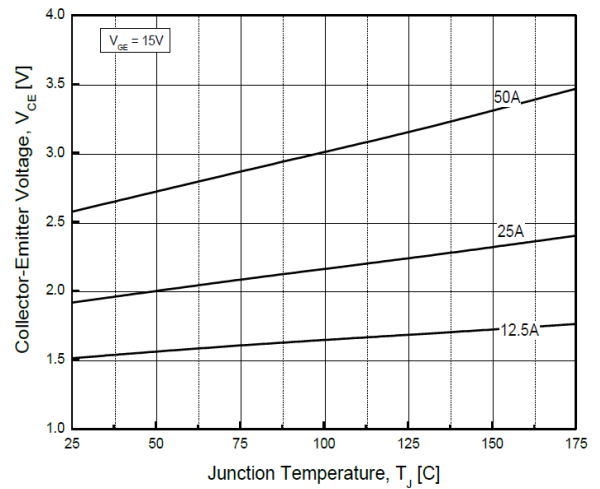


Fig.4 Typical Collector-Emitter Saturation Voltage -Junction Temperature

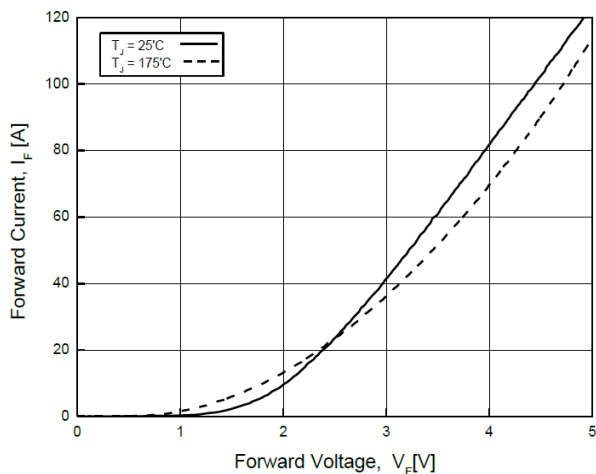


Fig.5 Diode Forward Characteristic

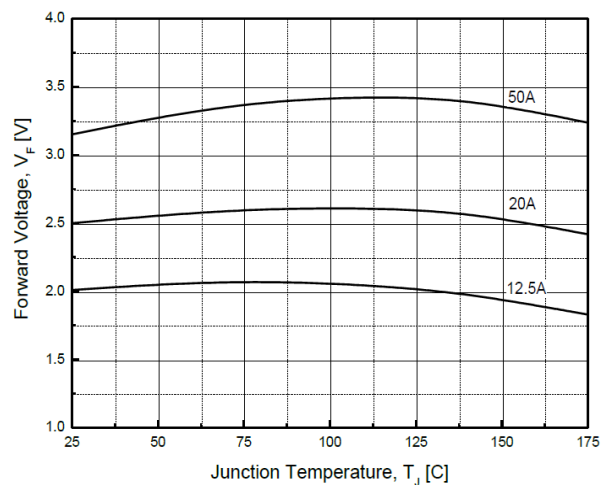


Fig.6 Diode Forward-Junction Temperature

Typical Performance Characteristics (continued)

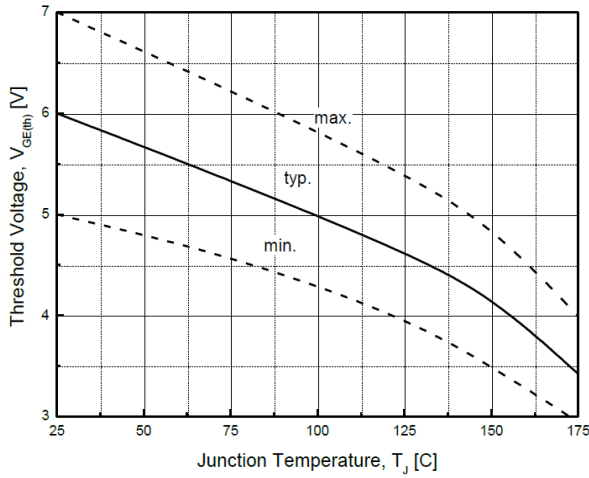


Fig.7 Threshold Voltage-Junction Temperature

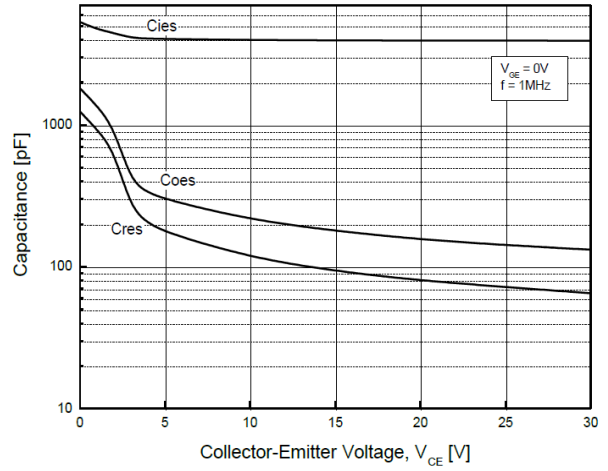


Fig.8 Typical Capacitance

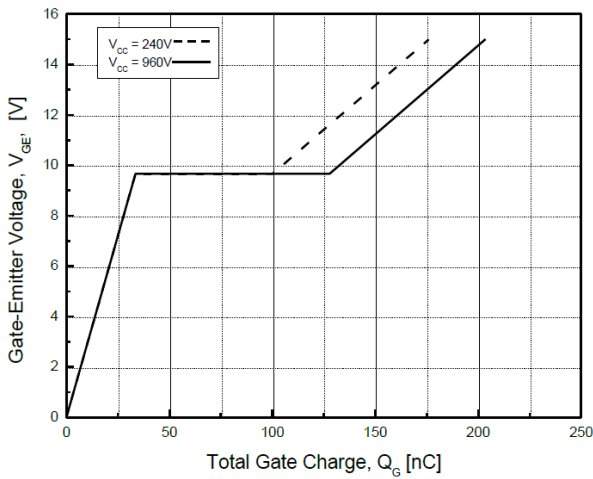


Fig.9 Typical Gate Charge

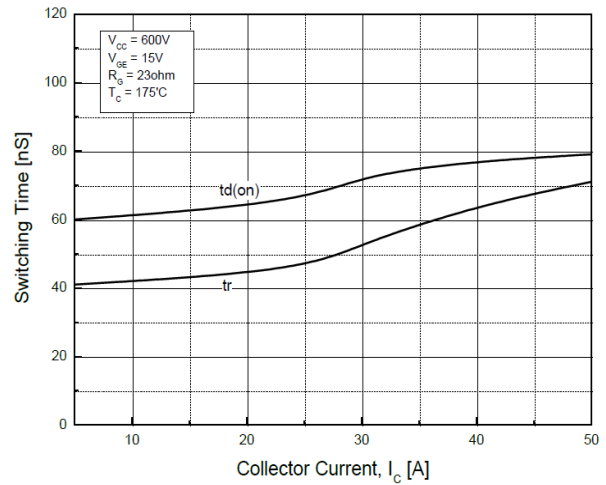


Fig.10 Typical Turn on-Collector Current

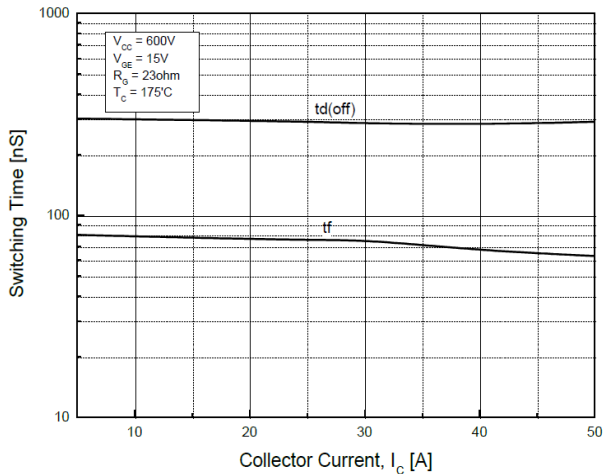


Fig.11 Typical Turn off-Collector Current

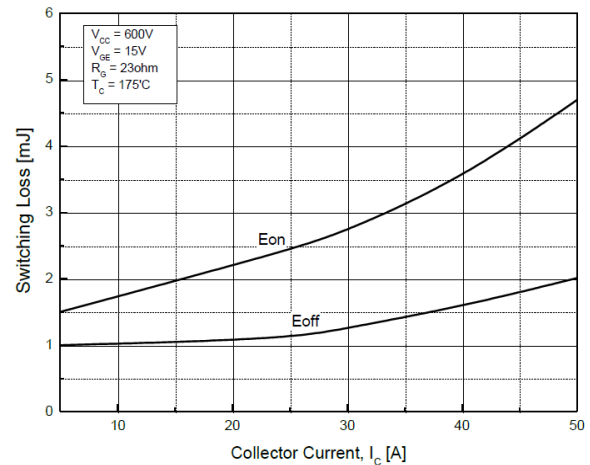


Fig.12 Switching Loss-Collector Current

Typical Performance Characteristics (cont.)

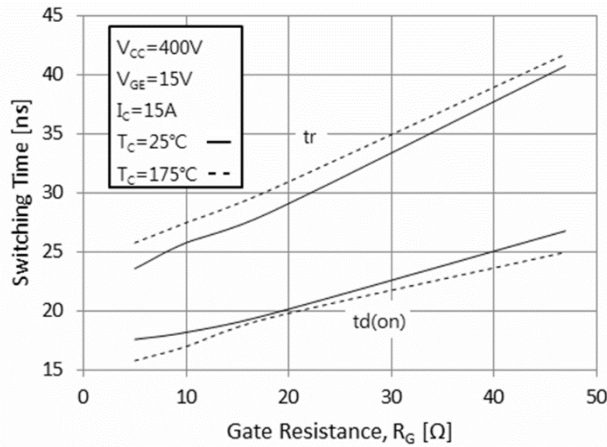


Fig.13 Turn on Characteristics-Gate Resistance

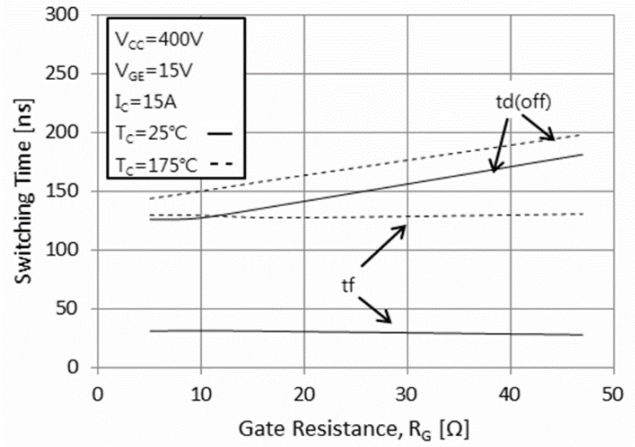


Fig.14 Turn off Characteristics-Gate Resistance

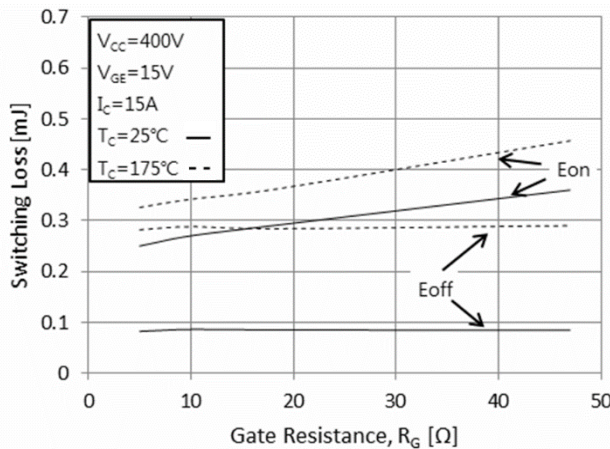


Fig.15 Switching Loss-Gate Resistance

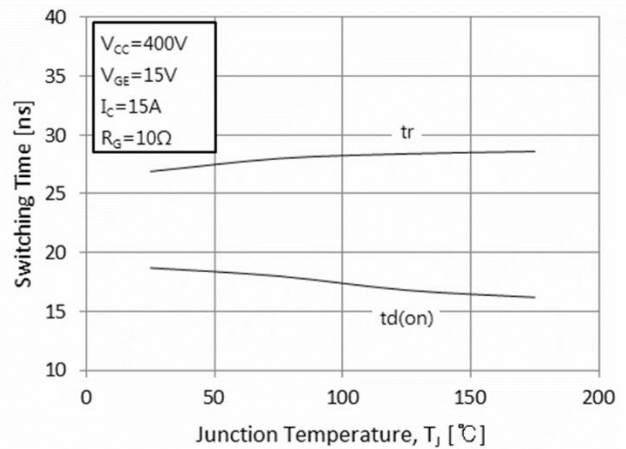


Fig.16 Turn on Characteristics-Junction Temperature

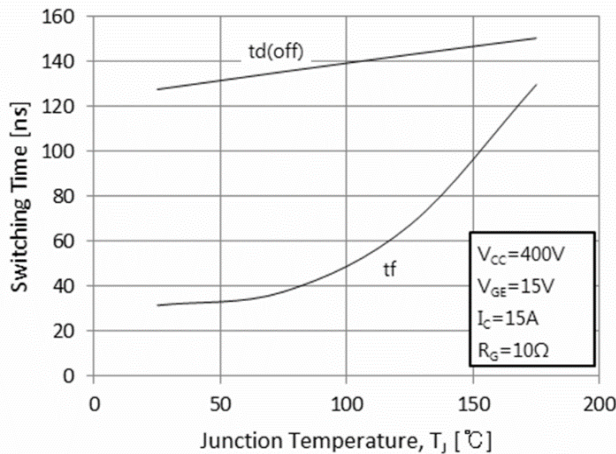


Fig.17 Turn off Characteristics-Junction Temperature

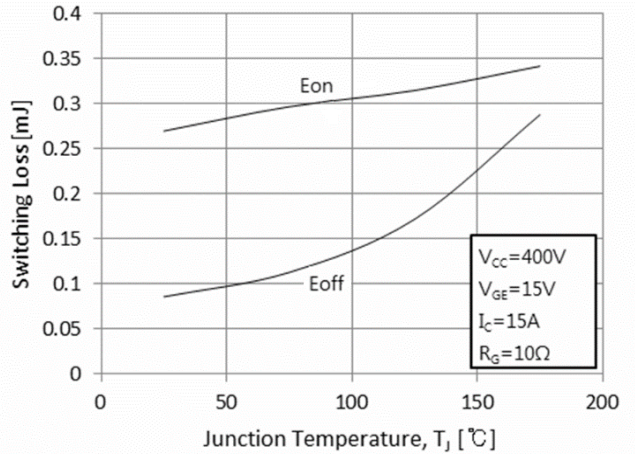


Fig.18 Switching Loss-Junction Temperature

Typical Performance Characteristics (cont.)

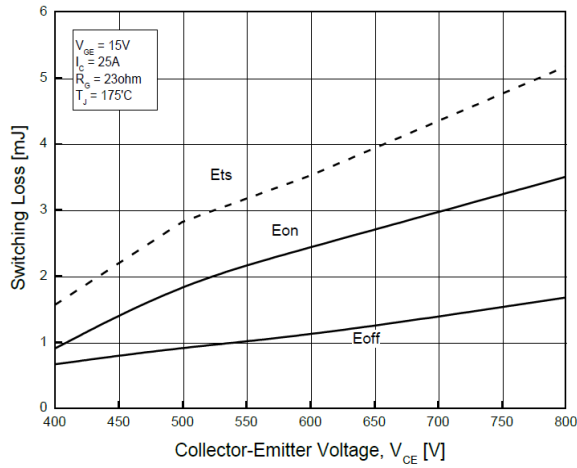


Fig.19 Switching Loss-Collector Emitter Voltage

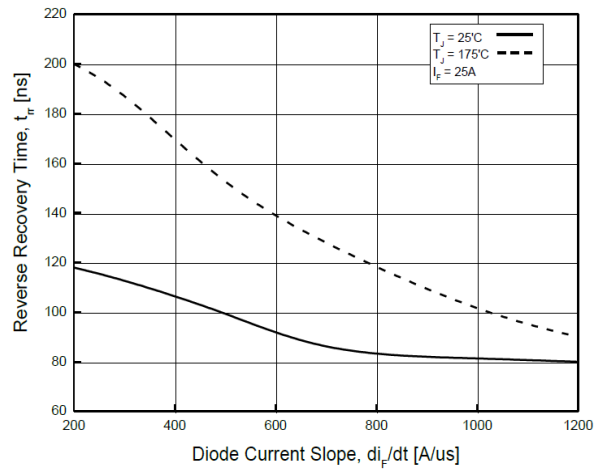


Fig.20 Reverse Recovery Time -Diode current slope

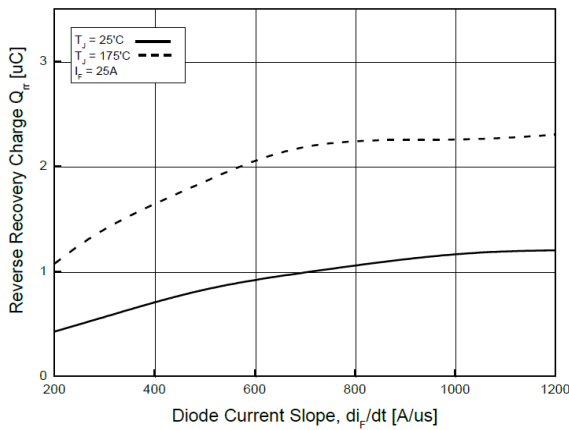


Fig.21 Reverse Recovery Charge -Diode Current Slope

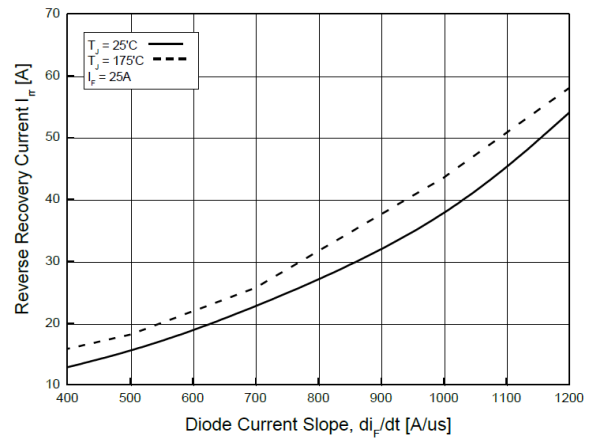


Fig.22 Reverse Recovery Current -Diode current slope

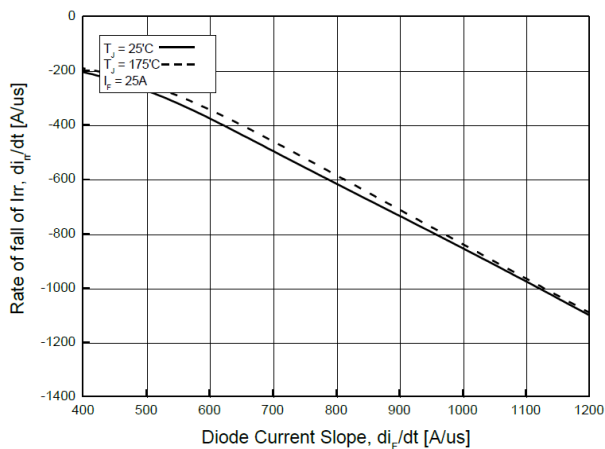


Fig.23 Rate of fall of reverse recovery current -Diode Current Slope

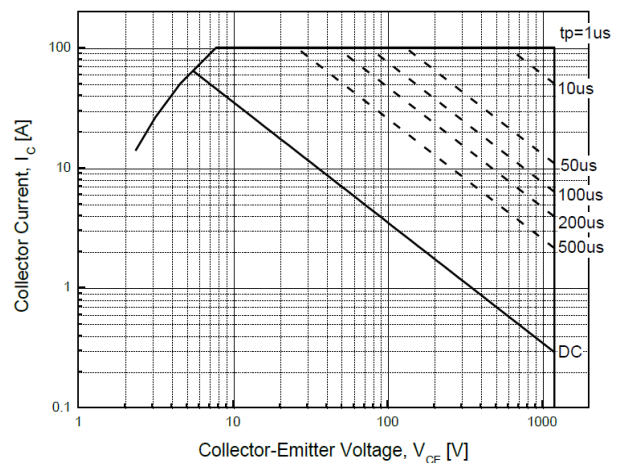


Fig.24 Forward Bias Safe Operating Area

Typical Performance Characteristics (cont.)

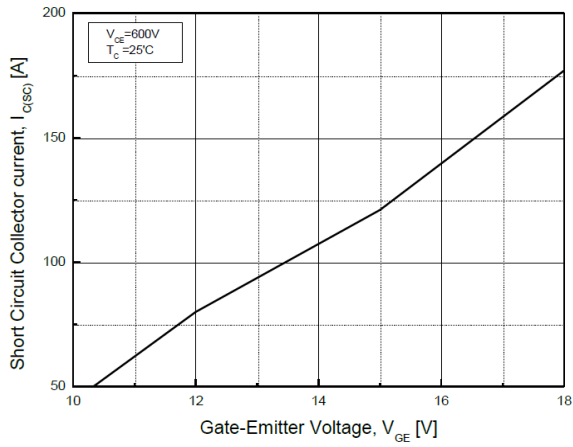


Fig.25 Typical Short Circuit Collector Current

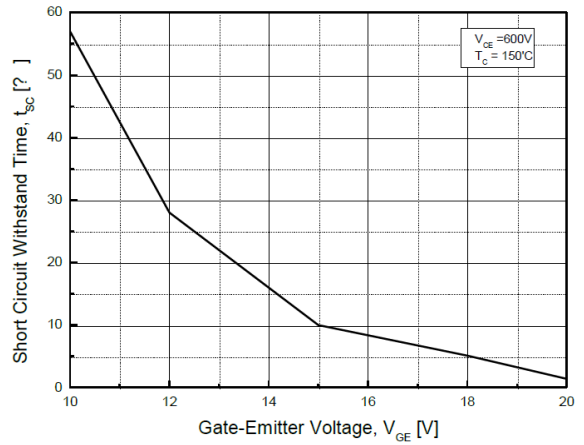


Fig.26 Typical Short Circuit Withstand Time

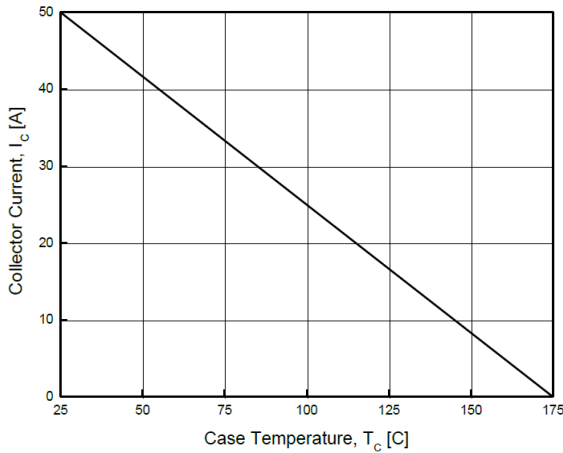


Fig.27 Case Temperature-Collector Current

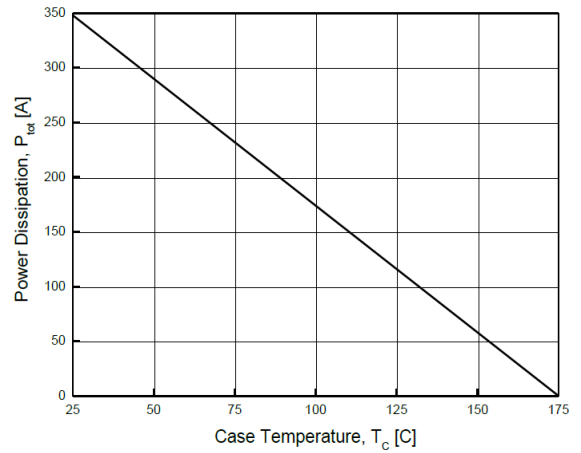


Fig.28 Power Dissipation-Case Temperature

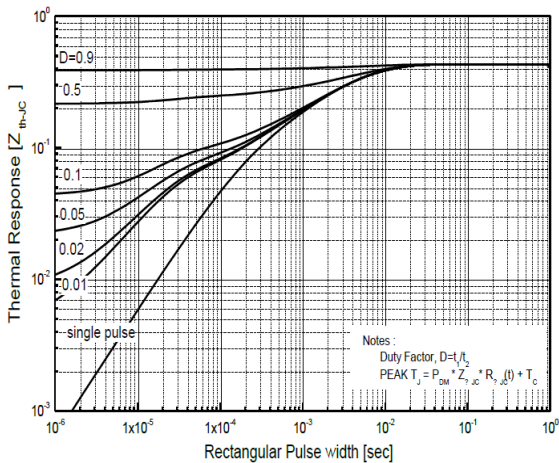


Fig.29 IGBT Transient Thermal Impedance

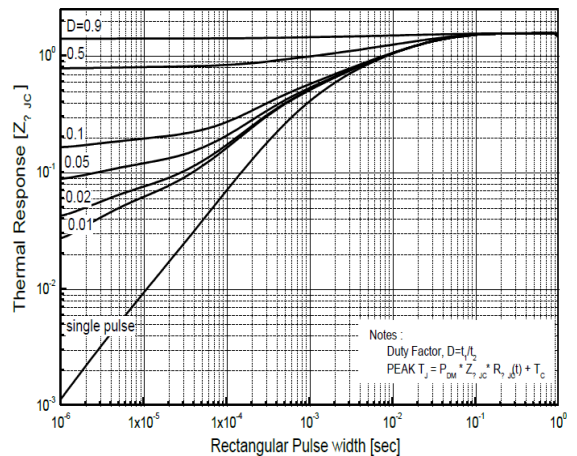
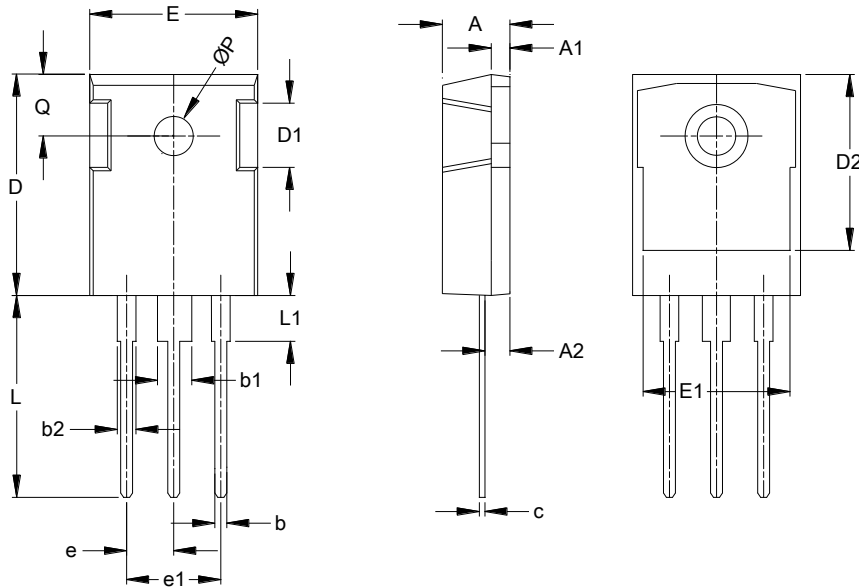


Fig.30 FRD Transient Thermal Impedance

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.

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