Description

The DGTD120T40S1PT is produced using advanced Field Stop Trench IGBT Technology, which provides low $V_{CE(sat)}$, excellent quality and high switching performance.

Features

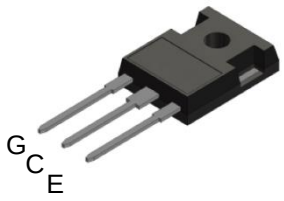
- High-Speed Switching & Low Power Loss
- $V_{CE(sat)}$ = 2.0V @ I_C = 40A
- High Input Impedance
- t_{rr} = 100ns (typ) @ di_F/dt = 200A/µs
- Ultra Soft, Fast Recovery Anti-parallel Diode
- Ultra Narrowed V_F Distribution Control
- **Lead-Free Finish & RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please contact us or your local Diodes representative. https://www.diodes.com/quality/product-definitions/**

Applications

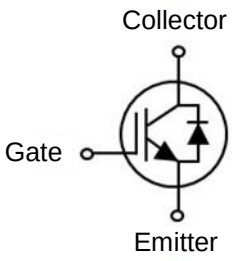
- Motor Drive
- UPS
- Solar Inverter
- IH Cooker

Mechanical Data

- Case: TO247 (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)



TO247



Device Symbol

Ordering Information (Note 4)

Part Number	Marking	Quantity
DGTD120T40S1PT	DGTD120T40S1	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
DGTD120T40S1 = Product Type Marking Code
YY = Year (ex: 20 = 2020)
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}	1200	V
DC Collector Current	T_C = +25°C	I_C	80	A
	T_C = +100°C		40	A
Pulsed Collector Current, t_p Limited by T_{vjmax}		I_{CM}	160	A
Diode Forward Current	T_C = +25°C	I_F	80	A
	T_C = +100°C		40	A
Diode Pulsed Current, t_p Limited by T_{vjmax}		I_{FM}	160	A
Gate-Emitter Voltage		V_{GES}	±20	V
Short Circuit Withstand Time $V_{CC} \leq$ 600V, V_{GE} = 15V, T_{vj} = +150°C Allowed Number of Short Circuits < 1000 Time Between Short Circuits ≥ 1.0s		t_{sc}	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	357	W
	T_C = +100°C		142	
Thermal Resistance, Junction to Ambient (Note 6)		$R_{\theta JA}$	40	°C/W
Thermal Resistance, Junction to Case for IBGT (Note 6)		$R_{\theta JC}$	0.35	
Thermal Resistance, Junction to Case for Diode (Note 6)		$R_{\theta JC}$	0.80	
Operating Temperature		T_{vj}	-55 to +150	°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}	1,200	—	—	V	I_C = 1mA, V_{GE} = 0V
Collector-Emitter Saturation Voltage	T_{vj} = +25°C	$V_{CE(sat)}$	—	2.00	2.40	V	I_C = 40A, V_{GE} = 15V
	T_{vj} = +150°C		—	2.45	—		
Diode Forward Voltage	T_{vj} = +25°C	V_F	—	2.40	3.00	V	I_F = 40A
	T_{vj} = +150°C		—	2.45	—		
Gate-Emitter Threshold Voltage		$V_{GE(th)}$	4.5	5.5	6.5	V	V_{CE} = V_{GE}, I_C = 1mA
Zero Gate Voltage Collector Current		I_{CES}	—	—	1.0	mA	V_{CE} = 1200V, V_{GE} = 0V
Gate-Emitter Leakage Current		I_{GES}	—	—	±250	nA	V_{GE} = 20V, V_{CE} = 0V
DYNAMIC CHARACTERISTICS							
Total Gate Charge		Q_g	—	341	—	nC	V_{CE} = 600V, I_C = 40A, V_{GE} = 15V
Gate-Emitter Charge		Q_{ge}	—	52	—		
Gate-Collector Charge		Q_{gc}	—	126	—		
Input Capacitance		C_{ies}	—	6,030	—	pF	V_{CE} = 30V, V_{GE} = 0V, f = 1MHz
Reverse Transfer Capacitance		C_{res}	—	107	—		
Output Capacitance		C_{oes}	—	206	—		
SWITCHING CHARACTERISTICS							
Turn-on Delay Time		$t_{d(on)}$	—	65	—	ns	V_{GE} = 15V, V_{CC} = 600V, I_C = 40A, R_G = 10Ω, Inductive Load, T_{vj} = +25°C
Rise Time		t_r	—	55	—		
Turn-off Delay Time		$t_{d(off)}$	—	308	—		
Fall Time		t_f	—	40	—		
Turn-on Switching Energy		E_{on}	—	1.96	—	mJ	
Turn-off Switching Energy		E_{off}	—	0.54	—		
Total Switching Energy		E_{ts}	—	2.50	—		
Reverse Recovery Time		t_{rr}	—	100	—	ns	I_F = 40A, di_F/dt = 200A/µs, T_{vj} = +25°C
Reverse Recovery Current		I_{rr}	—	7	—	A	
Reverse Recovery Charge		Q_{rr}	—	350	—	nC	
Turn-on Delay Time		$t_{d(on)}$	—	70	—	ns	V_{GE} = 15V, V_{CC} = 600V, I_C = 40A, R_G = 10Ω, Inductive Load, T_{vj} = +150°C
Rise Time		t_r	—	62	—		
Turn-off Delay Time		$t_{d(off)}$	—	325	—		
Fall Time		t_f	—	62	—		
Turn-on Switching Energy		E_{on}	—	2.35	—	mJ	
Turn-off Switching Energy		E_{off}	—	1.61	—		
Total Switching Energy		E_{ts}	—	3.96	—		
Reverse Recovery Time		t_{rr}	—	180	—	ns	I_F = 40A, di_F/dt = 200A/µs, T_{vj} = +150°C
Reverse Recovery Current		I_{rr}	—	10	—	A	
Reverse Recovery Charge		Q_{rr}	—	900	—	nC	

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

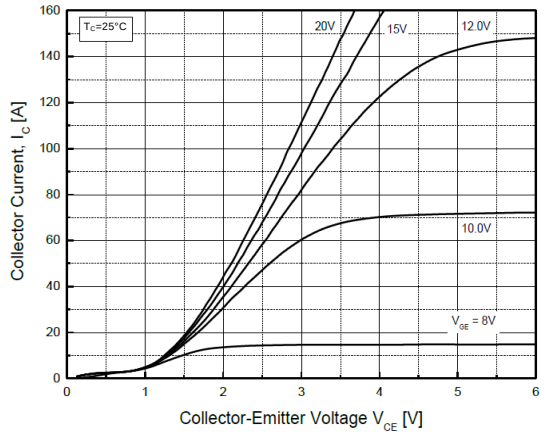


Fig.1 Typical Output Characteristics

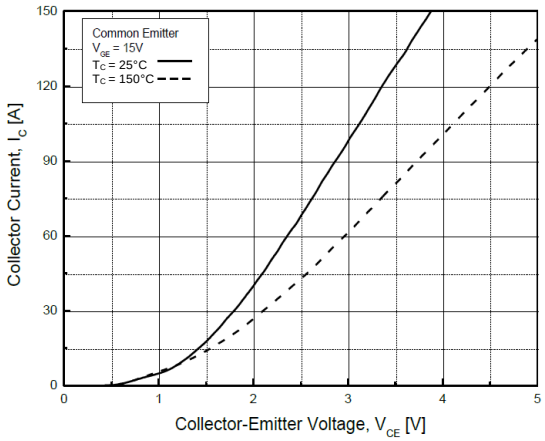


Fig.2 Typical Collector-Emitter Saturation Voltage

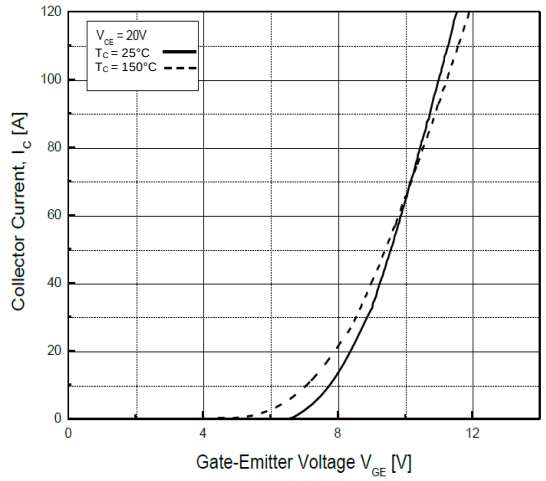


Fig.3 Typical Transfer Characteristics

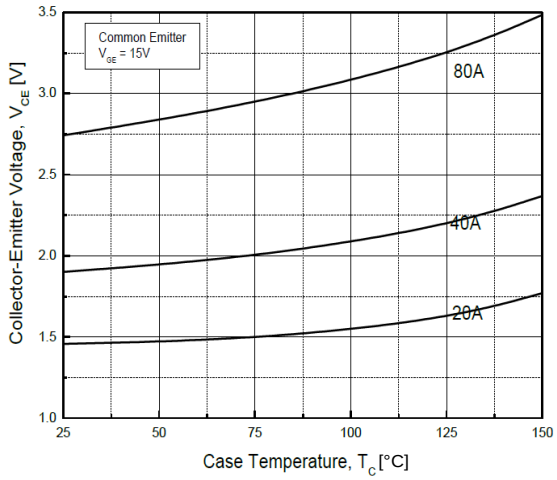


Fig.4 Typical Collector-Emitter Saturation Voltage at Case Temperature

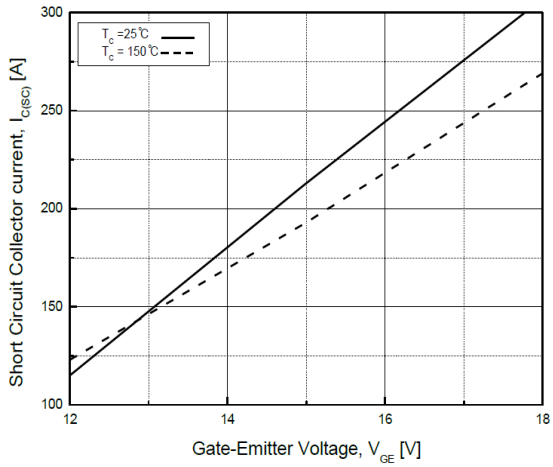


Fig.5 Typical Short Circuit Collector Current

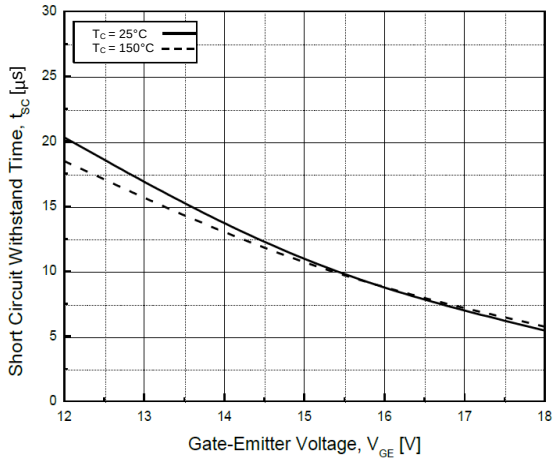


Fig.6 Typical Short Circuit Withstand Time

Typical Performance Characteristics (continued)

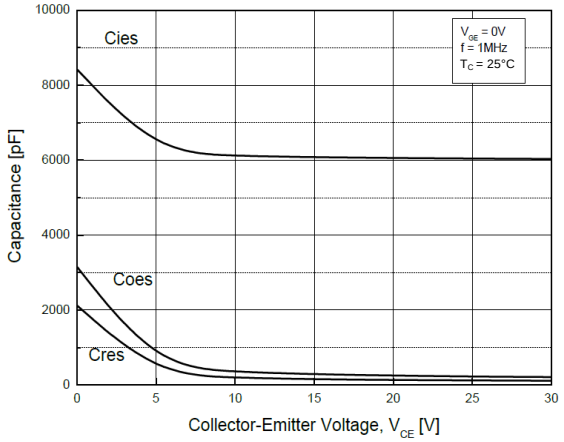


Fig.7 Typical Capacitance

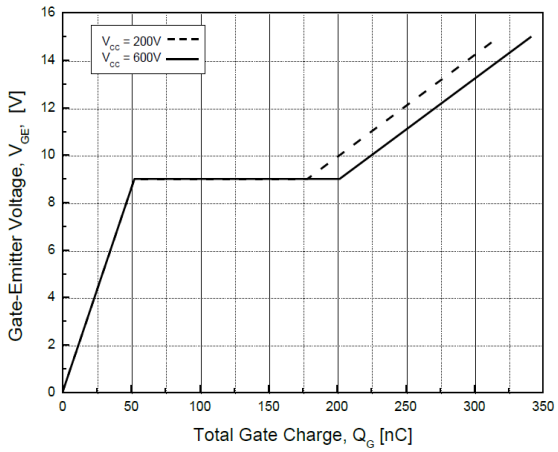


Fig.8 Typical Gate Charge

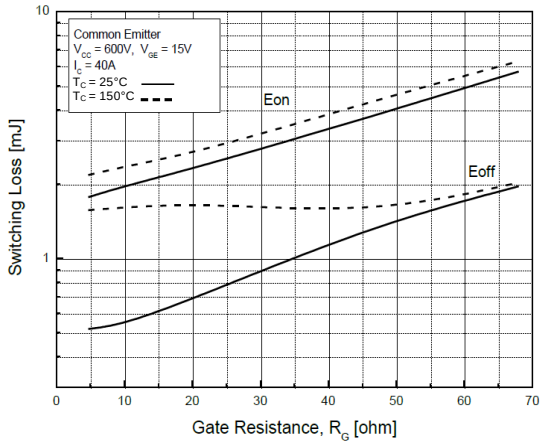


Fig.9 Switching Loss-Gate Resistance

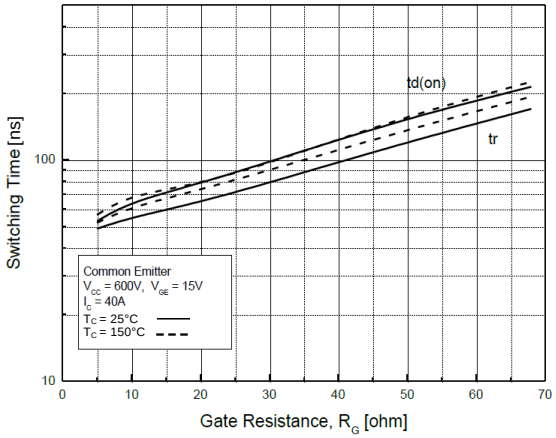


Fig.10 Turn on Characteristics-Gate Resistance

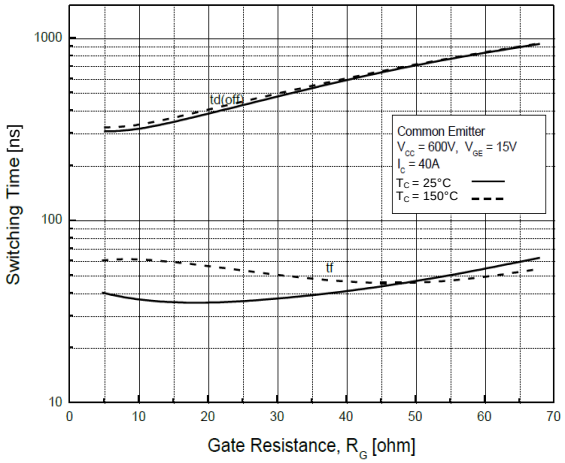


Fig.11 Turn off Characteristics-Gate Resistance

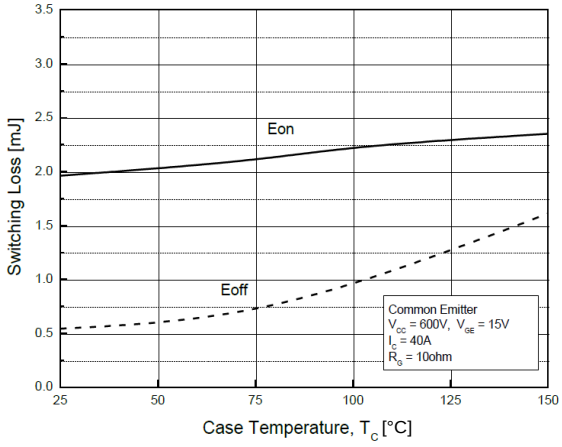


Fig.12 Switching Loss-Case Temperature

Typical Performance Characteristics (continued)

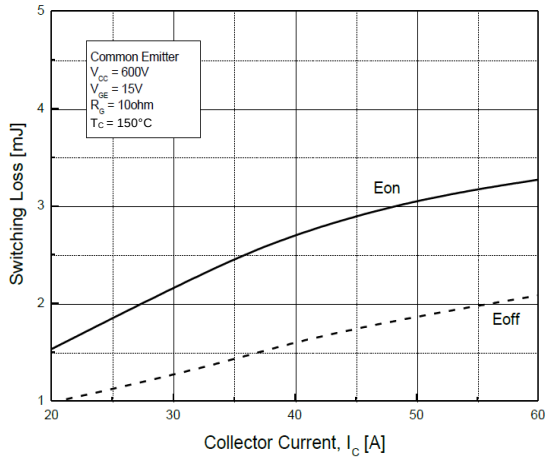


Fig.13 Switching Loss-Collector Current

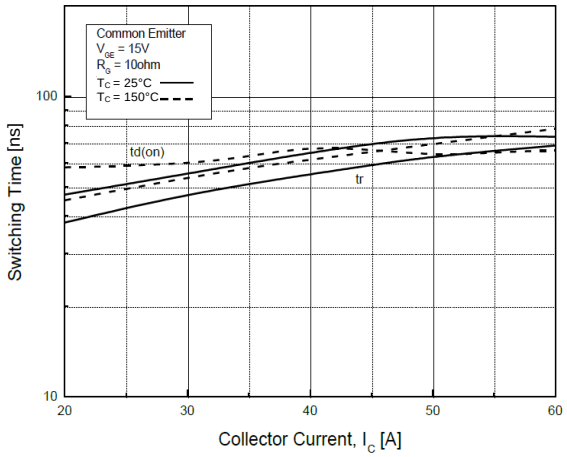


Fig.14 Typical Turn on-Collector Current

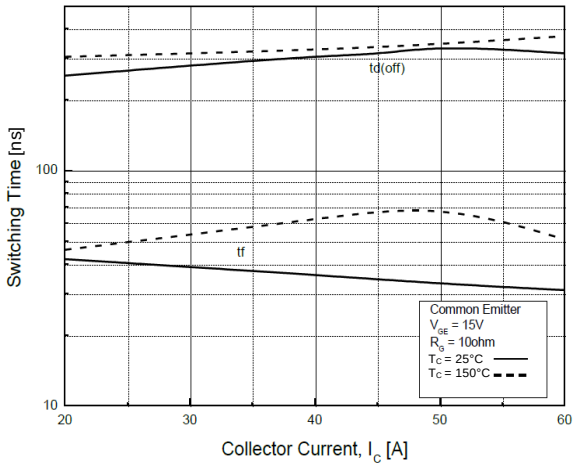


Fig.15 Typical Turn off-Collector Current

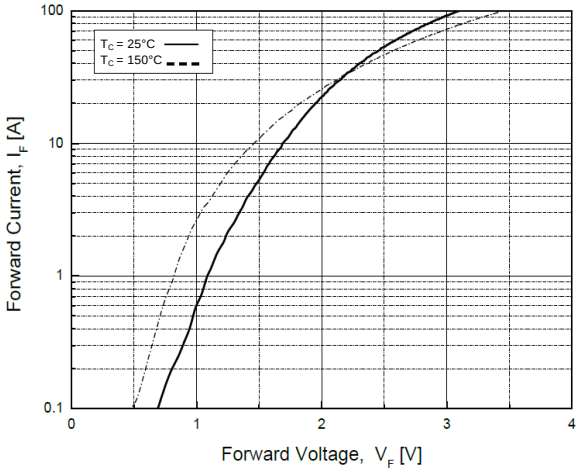


Fig.16 Diode Forward Characteristics

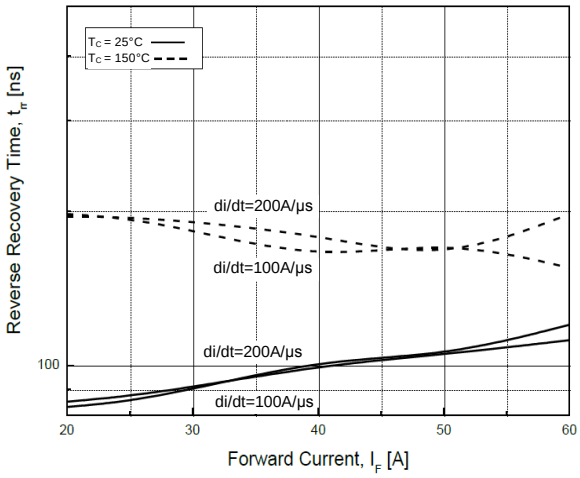


Fig.17 Typical Turn off-Collector Current

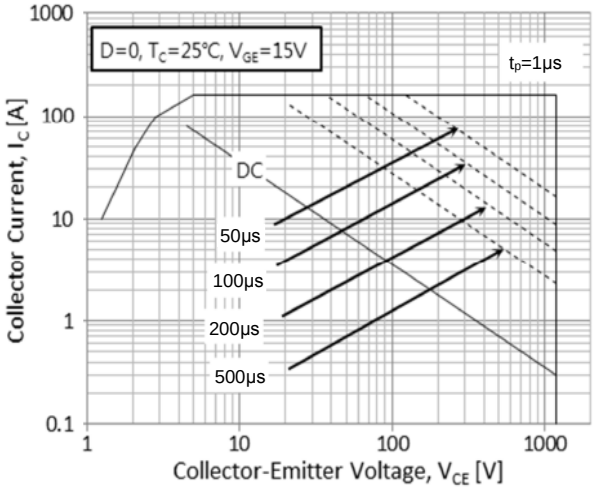


Fig.18 Forward Bias Safe Operating Area

Typical Performance Characteristics (continued)

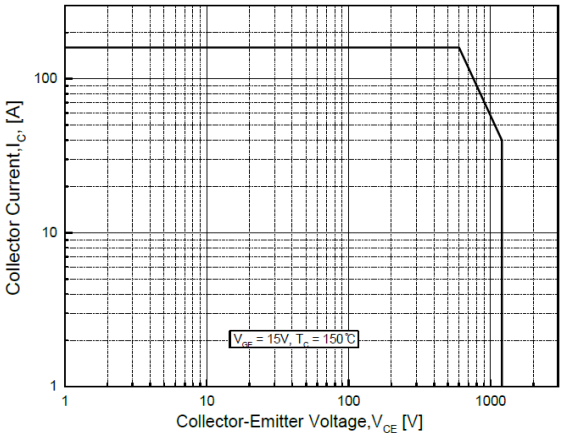


Fig.19 Reverse Bias Safe Operating Area

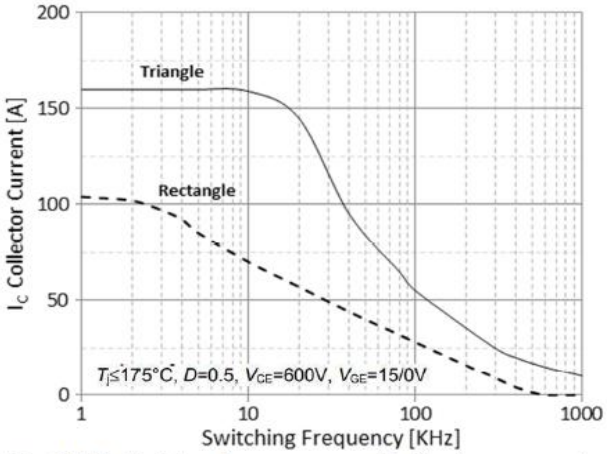


Fig.20 Switching frequency – Collector current

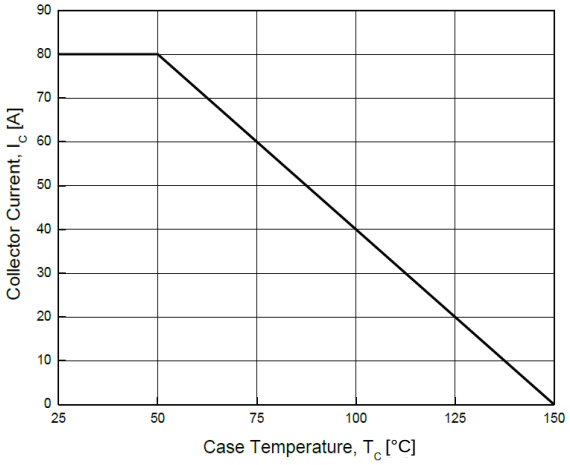


Fig.21 Case Temperature – Collector Current

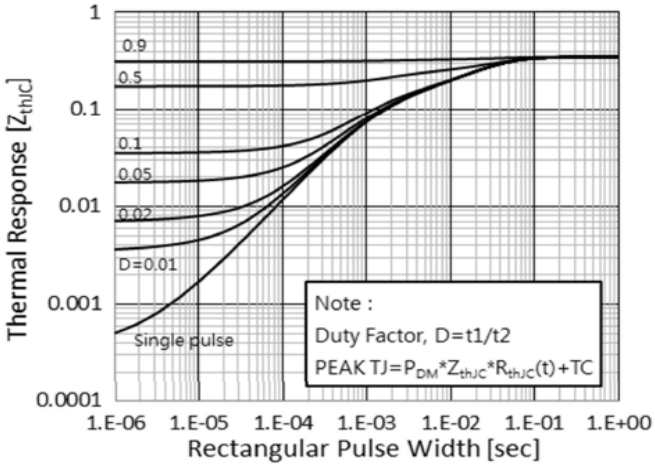
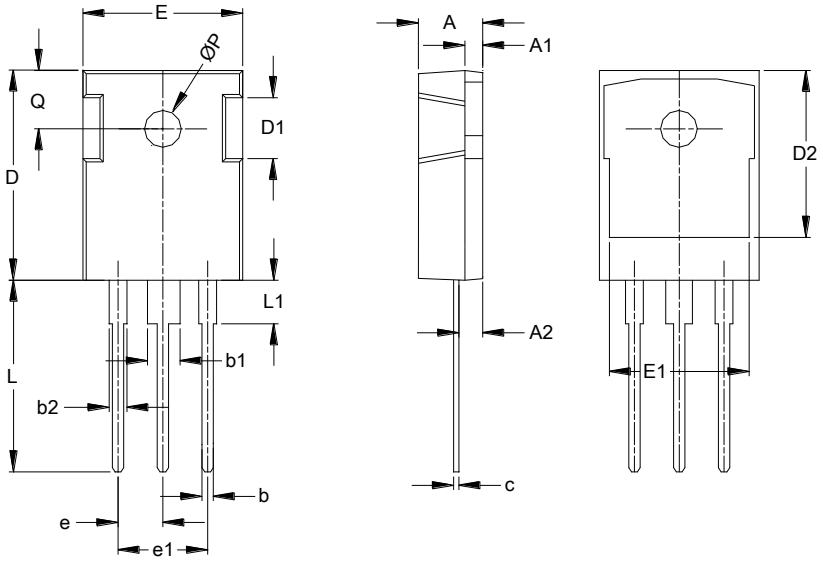


Fig.22 IGBT Transient Thermal Impedance

Package Outline Dimensions

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

TO247 (Type MC)



TO247 (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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