

## Description

The DGTD65T40S2PT is produced using advanced Field Stop Trench IGBT Technology, which provides excellent quality and high switching performance.

## Features

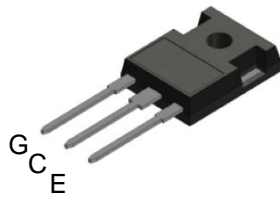
- High Speed Switching & Low Power Loss
- $V_{CE(SAT)} = 1.8V @ I_C = 40A$
- $t_{RR} = 60ns$  (Typ) @  $di_F/dt = 820A/\mu s$
- $E_{OFF} = 0.4mJ @ T_C = +25^\circ C$
- Maximum Junction Temperature  $+175^\circ C$
- **Lead-Free Finish & RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

## Applications

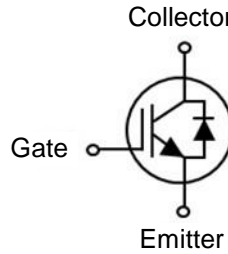
- UPS
- Welder
- Solar Inverter
- IH Cooker

## Mechanical Data

- Case: 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 <sup>Ⓔ</sup>
- Weight: 5.6 grams (Approximate)



TO247 (Type MC)



Device Symbol

## Ordering Information (Note 4)

Part Number	Marking	Quantity
DGTD65T40S2PT	DGTD65T40S2	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
- DGTD65T40S2 = Product Type Marking Code
- YY = Year (ex: 18 = 2018)
- LLLLL = Lot Code
- WW = Week (01 to 53)

**Absolute Maximum Ratings** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Collector-Emitter Voltage	V <sub>CE</sub>	650	V
DC Collector Current, Limited by T <sub>Jmax</sub>	I <sub>C</sub>	T <sub>C</sub> = +25°C	80
		T <sub>C</sub> = +100°C	40
Pulsed Collector Current, t <sub>p</sub> Limited by T <sub>Jmax</sub>	I <sub>Cpuls</sub>	120	A
Diode Forward Current Limited by T <sub>Jmax</sub>	I <sub>F</sub>	T <sub>C</sub> = +25°C	40
		T <sub>C</sub> = +100°C	20
Diode Pulsed Current, t <sub>p</sub> Limited by T <sub>Jmax</sub>	I <sub>Fpuls</sub>	120	A
Gate-Emitter Voltage	V <sub>GE</sub>	±20	V

**Thermal Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

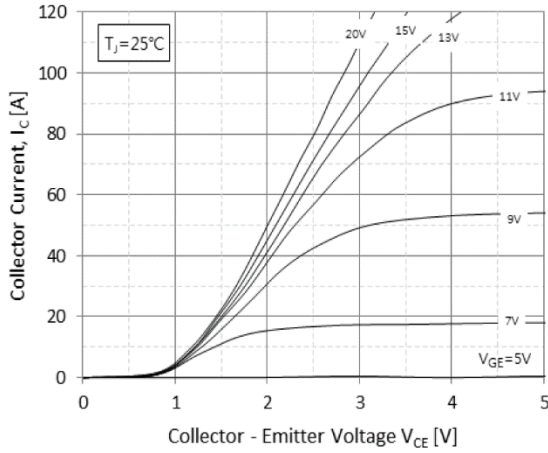
Characteristic	Symbol	Value	Unit
Power Dissipation Linear Derating Factor (Note 6)	P <sub>D</sub>	T <sub>C</sub> = +25°C	230
		T <sub>C</sub> = +100°C	115
Thermal Resistance, Junction to Ambient (Note 6)	R <sub>θJA</sub>	40	°C/W
Thermal Resistance, Junction to Case for IGBT (Note 6)	R <sub>θJC</sub>	0.65	
Thermal Resistance, Junction to Case for Diode (Note 6)	R <sub>θJC</sub>	1.75	
Operating Temperature	T <sub>J</sub>	-40 to +175	°C
Storage Temperature Range	T <sub>STG</sub>	-55 to +150	

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

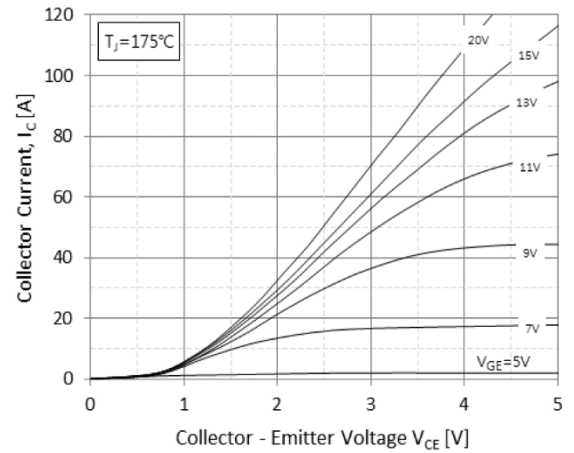
**Electrical Characteristics** (@T<sub>J</sub> = +25°C, unless otherwise specified.)

Parameter	Symbol	Min	Typ	Max	Unit	Condition	
<b>STATIC CHARACTERISTICS</b>							
Collector-Emitter Breakdown Voltage	BV <sub>CES</sub>	650	—	—	V	I <sub>C</sub> = 2mA, V <sub>GE</sub> = 0V	
Collector-Emitter Saturation Voltage	V <sub>CE(SAT)</sub>	T <sub>J</sub> = +25°C	—	1.8	2.30	V	I <sub>C</sub> = 40A, V <sub>GE</sub> = 15V
		T <sub>J</sub> = +175°C	—	2.30	—		
Diode Forward Voltage	V <sub>F</sub>	T <sub>J</sub> = +25°C	—	1.50	1.95	V	V <sub>GE</sub> = 0V, I <sub>F</sub> = 20A
		T <sub>J</sub> = +175°C	—	1.50	—		
Gate-Emitter Threshold Voltage	V <sub>GE(TH)</sub>	3.5	5.0	6.5	V	V <sub>CE</sub> = V <sub>GE</sub> , I <sub>C</sub> = 40mA	
Zero Gate Voltage Collector Current	I <sub>CES</sub>	—	—	40	μA	V <sub>CE</sub> = 650V, V <sub>GE</sub> = 0V	
Gate-Emitter Leakage Current	I <sub>GES</sub>	—	—	±100	nA	V <sub>GE</sub> = 20V, V <sub>CE</sub> = 0V	
<b>DYNAMIC CHARACTERISTICS</b>							
Total Gate Charge	Q <sub>g</sub>	—	60	—	nC	V <sub>CE</sub> = 520V, I <sub>C</sub> = 40A, V <sub>GE</sub> = 15V	
Gate-Emitter Charge	Q <sub>ge</sub>	—	13	—			
Gate-Collector Charge	Q <sub>gc</sub>	—	25	—			
Input Capacitance	C <sub>ies</sub>	—	1565	—	pF	V <sub>CE</sub> = 25V, V <sub>GE</sub> = 0V, f = 1MHz	
Reverse Transfer Capacitance	C <sub>res</sub>	—	37	—			
Output Capacitance	C <sub>oes</sub>	—	120	—			
<b>SWITCHING CHARACTERISTICS</b>							
Turn-on Delay Time	t <sub>D(ON)</sub>	—	6	—	ns	V <sub>GE</sub> = 15V, V <sub>CC</sub> = 400V, I <sub>C</sub> = 40A, R <sub>G</sub> = 10Ω, Inductive Load, T <sub>VJ</sub> = +25°C	
Rise Time	t <sub>r</sub>	—	36	—			
Turn-off Delay Time	t <sub>D(OFF)</sub>	—	55	—			
Fall Time	t <sub>f</sub>	—	64	—			
Turn-on Switching Energy	E <sub>ON</sub>	—	0.5	—	mJ	T <sub>VJ</sub> = +25°C	
Turn-off Switching Energy	E <sub>OFF</sub>	—	0.4	—			
Total Switching Energy	E <sub>TS</sub>	—	0.9	—			
Reverse Recovery Time	t <sub>RR</sub>	—	60	—	ns	I <sub>F</sub> = 20A, di <sub>F</sub> /dt = 820A/μs, T <sub>VJ</sub> = +25°C	
Reverse Recovery Current	I <sub>RR</sub>	—	18	—	A		
Reverse Recovery Charge	Q <sub>RR</sub>	—	696	—	nC		
Turn-on Delay Time	t <sub>D(ON)</sub>	—	7	—	ns	V <sub>GE</sub> = 15V, V <sub>CC</sub> = 400V, I <sub>C</sub> = 40A, R <sub>G</sub> = 10Ω, Inductive Load, T <sub>VJ</sub> = +175°C	
Rise Time	t <sub>r</sub>	—	41	—			
Turn-off Delay Time	t <sub>D(OFF)</sub>	—	60	—			
Fall Time	t <sub>f</sub>	—	102	—			
Turn-on Switching Energy	E <sub>ON</sub>	—	1.04	—	mJ	T <sub>VJ</sub> = +175°C	
Turn-off Switching Energy	E <sub>OFF</sub>	—	0.57	—			
Total Switching Energy	E <sub>TS</sub>	—	1.61	—			
Reverse Recovery Time	t <sub>RR</sub>	—	72	—	ns	I <sub>F</sub> = 20A, di <sub>F</sub> /dt = 820A/μs, T <sub>VJ</sub> = +175°C	
Reverse Recovery Current	I <sub>RR</sub>	—	22	—	A		
Reverse Recovery Charge	Q <sub>RR</sub>	—	864	—	nC		

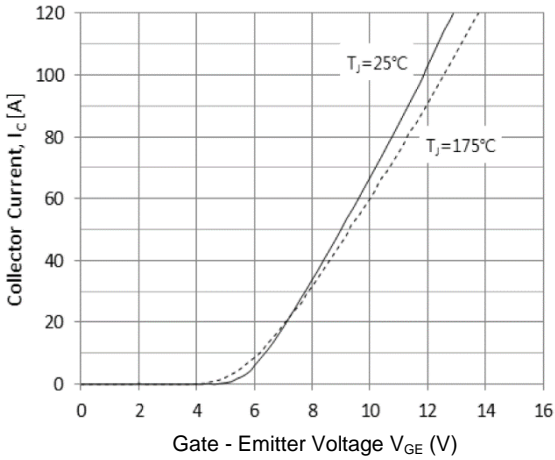
**Typical Performance Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)



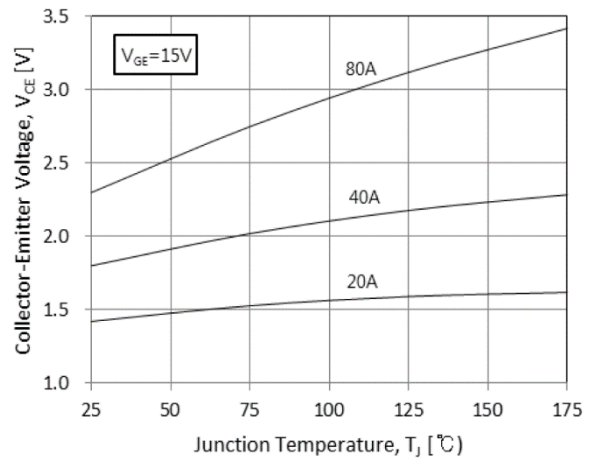
**Fig.1 Typical Output Characteristics ( $T_J = 25^\circ\text{C}$ )**



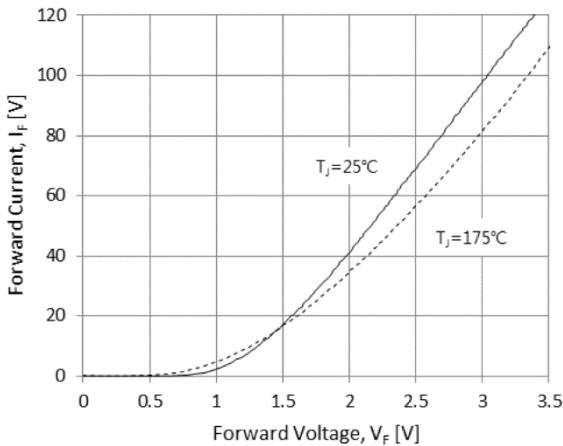
**Fig.2 Typical Output Characteristics ( $T_J = 175^\circ\text{C}$ )**



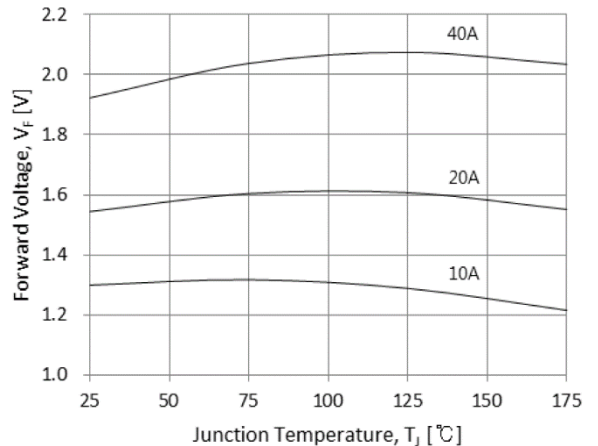
**Fig.3 Typical Transfer Characteristics**



**Fig.4 Typical Collector-Emmitter Saturation Voltage -Junction Temperature**

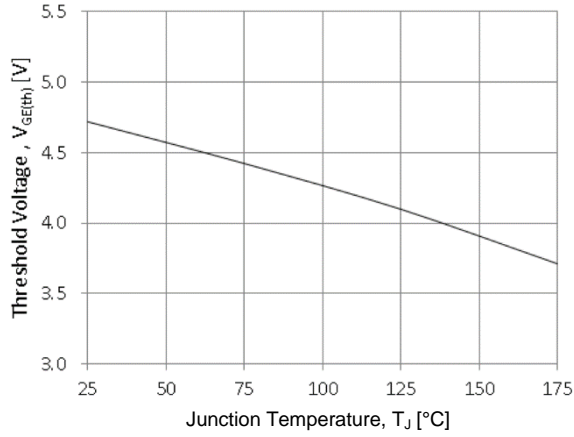


**Fig.5 Diode Forward Characteristics**

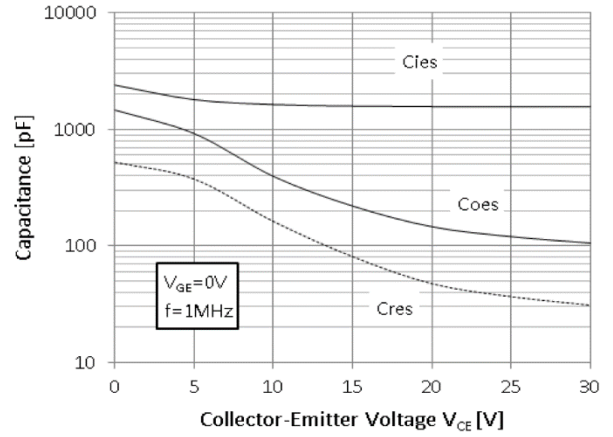


**Fig.6 Diode Forward-Junction Temperature**

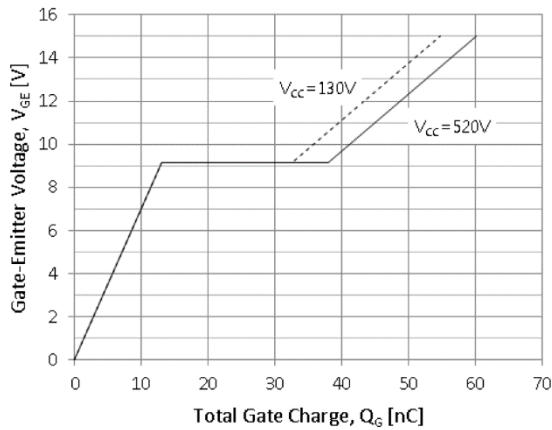
**Typical Performance Characteristics (Cont.)**



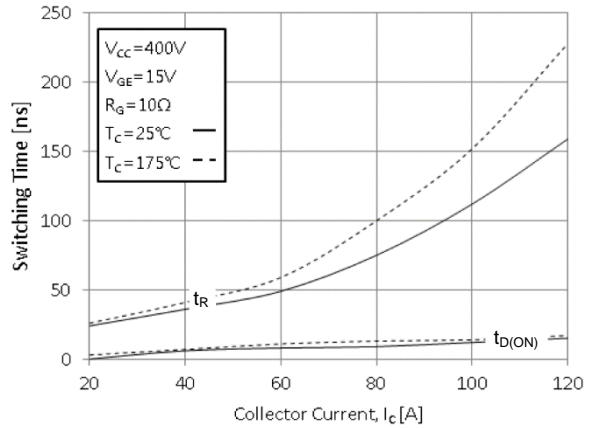
**Fig.7 Threshold Voltage-Junction Temperature**



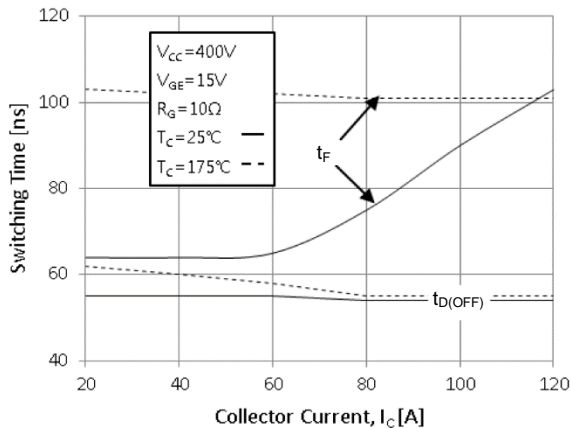
**Fig.8 Typical Capacitance**



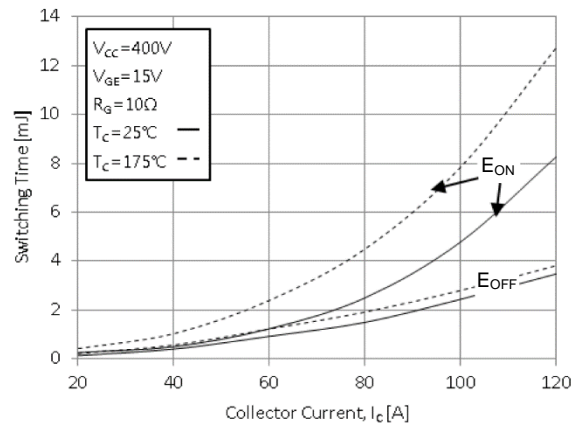
**Fig.9 Typical Gate Charge**



**Fig.10 Typical Turn on-Collector Current**

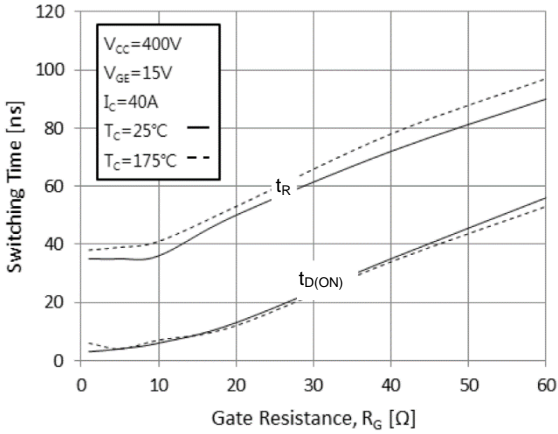


**Fig.11 Typical Turn off-Collector Current**

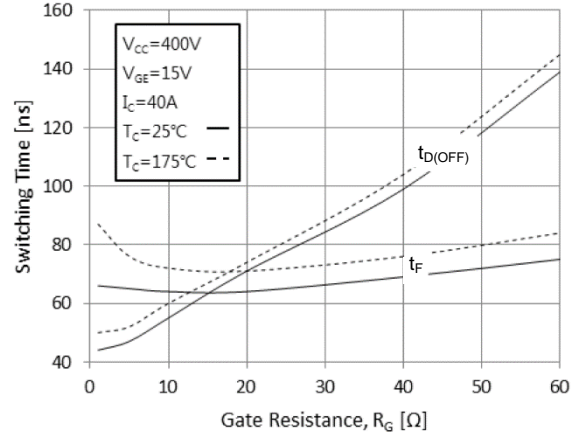


**Fig.12 Switching Loss-Collector Current**

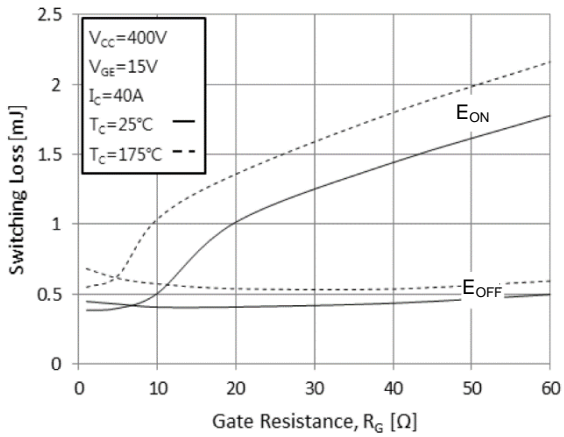
**Typical Performance Characteristics (Cont.)**



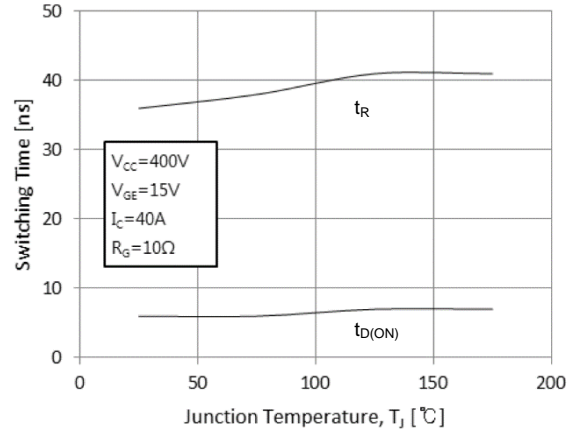
**Fig.13 Turn on Characteristics-Gate Resistance**



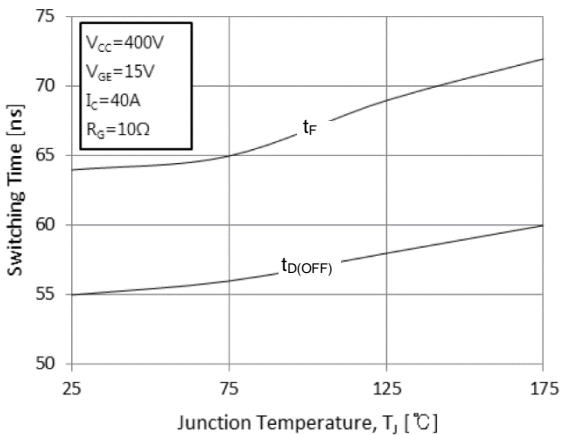
**Fig.14 Turn off Characteristics-Gate Resistance**



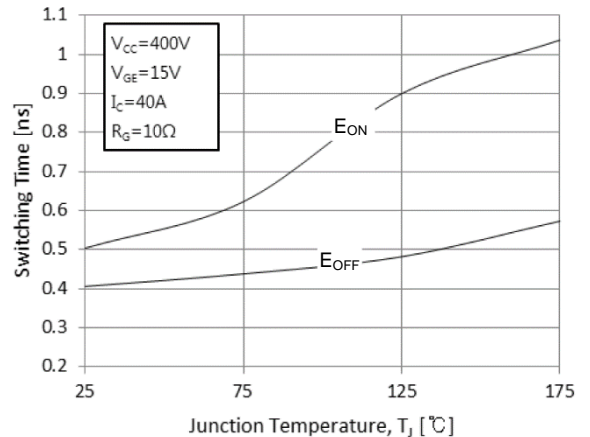
**Fig.15 Switching Loss-Gate Resistance**



**Fig.16 Turn on Characteristics-Junction Temperature**

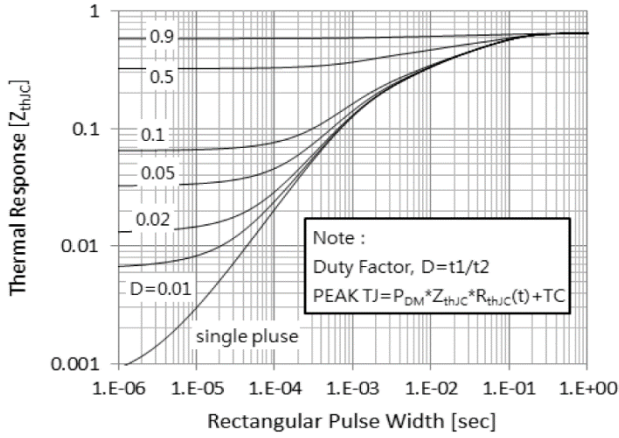


**Fig.17 Turn off Characteristics-Junction Temperature**

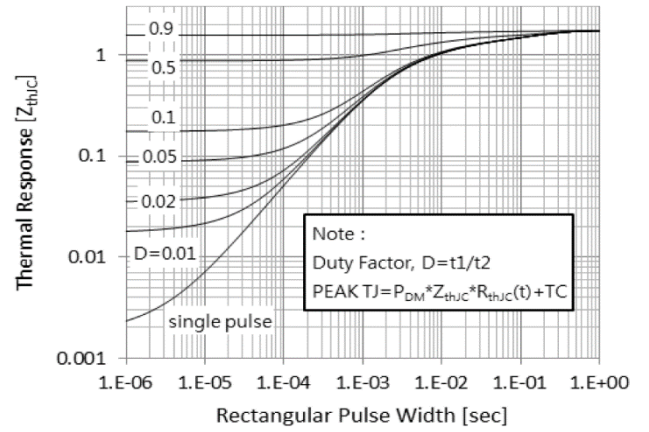


**Fig.18 Switching Loss-Junction Temperature**

**Typical Performance Characteristics (Cont.)**



**Fig.19 IGBT Transient Thermal Impedance**

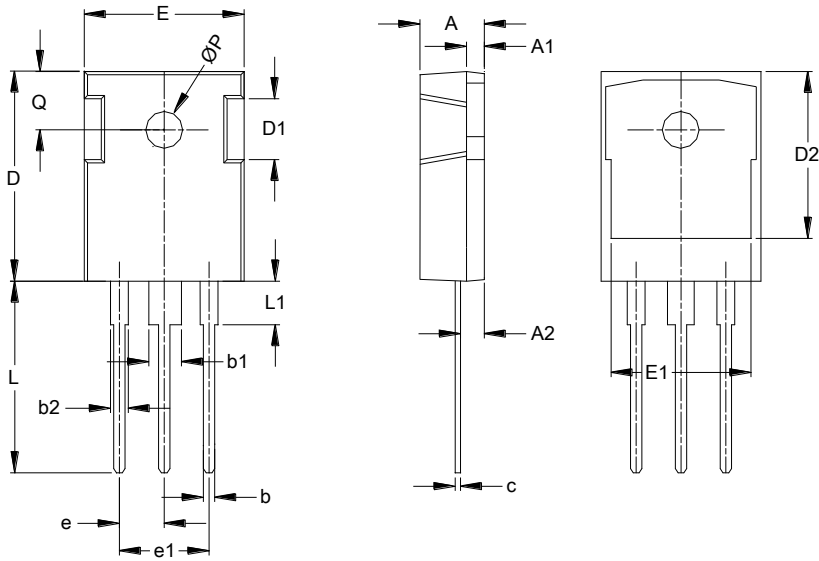


**Fig.20 FRD Transient Thermal Impedance**

**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	-
<b>All Dimensions in mm</b>			

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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