

# IGBT - Field Stop, Trench

75 A, 950 V

## Product Preview

### FGY75T95LQDT

Trench Field Stop 4<sup>th</sup> generation Low Vcesat IGBT co-packaged with full current rated diode.

#### Features

- Maximum Junction Temperature :  $T_J = 175^{\circ}\text{C}$
- Positive Temperature Co-efficient for Easy Parallel Operating
- High Current Capability
- Low Saturation Voltage:  $V_{CE(Sat)} = 1.31\text{ V (Typ.) @ } I_C = 75\text{ A}$
- Fast Switching
- Tighten Parameter Distribution
- These Devices are Pb-Free and are RoHS Compliant

#### Applications

- Solar Inverter

#### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector to Emitter Voltage	$V_{CES}$	950	V
Gate to Emitter Voltage Transient Gate to Emitter Voltage	$V_{GES}$	$\pm 20$ $\pm 30$	V
Collector Current @ $T_C = 25^{\circ}\text{C}$ @ $T_C = 100^{\circ}\text{C}$	$I_C$	150 75	A
Pulsed Collector Current (Note 1)	$I_{LM}$	225	A
Pulsed Collector Current (Note 2)	$I_{CM}$	225	A
Diode Forward Current @ $T_C = 25^{\circ}\text{C}$ @ $T_C = 100^{\circ}\text{C}$	$I_F$	150 75	A
Pulsed Diode Forward Current (Note 2)	$I_{FM}$	225	A
Maximum Power Dissipation @ $T_C = 25^{\circ}\text{C}$ @ $T_C = 100^{\circ}\text{C}$	PD	453 226	W
Operating Junction / Storage Temperature Range	$T_J, T_{STG}$	-55 to +175	$^{\circ}\text{C}$
Maximum Lead Temp. for Soldering Purposes, 1/8" from case for 5 seconds	$T_L$	300	$^{\circ}\text{C}$

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1.  $V_{CC} = 700\text{ V}$ ,  $V_{GE} = 15\text{ V}$ ,  $I_C = 225\text{ A}$ ,  $R_G = 26\ \Omega$ , Inductive Load, 100% Tested
2. Pulse width limited by max Junction temperature. Defined by design. Not subject to production test

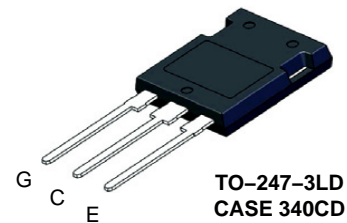
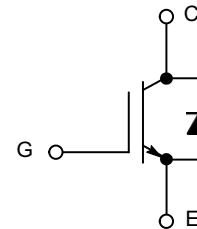
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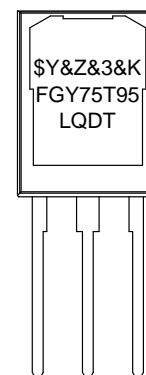
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75 A, 950 V  
 $V_{CESat} = 1.31\text{ V (Typ.)}$



#### MARKING DIAGRAM



$\$Y$  = ON Semiconductor Logo  
&Z = Assembly Plant Code  
&3 = Numeric Date Code  
&K = 2-Digit Lot Traceability Code  
FGY75T95LQDT = Specific Device Code

#### ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

# FGY75T95LQDT

## ORDERING INFORMATION

Part Number	Top Marking	Package	Shipping
FGY75T95LQDT	FGY75T95LQDT	TO-247-3LD (Pb-Free)	30 Units / Rail

## THERMAL CHARACTERISTICS

Rating	Symbol	Value	Unit
Thermal resistance junction-to-case, for IGBT	$R_{\theta JC}$	0.33	°C/W
Thermal resistance junction-to-case, for Diode	$R_{\theta JC}$	0.23	°C/W
Thermal resistance junction-to-ambient	$R_{\theta JA}$	40	°C/W

## ELECTRICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Collector-emitter breakdown voltage, gate-emitter short-circuited	$V_{GE} = 0\text{ V}, I_C = 1\text{ mA}$	$BV_{CES}$	950			V
Temperature Coefficient of Breakdown Voltage	$V_{GE} = 0\text{ V}, I_C = 1\text{ mA}$	$\frac{\Delta BV_{CES}}{\Delta T_J}$		0.96		V/°C
Collector-emitter cut-off current, gate-emitter short-circuited	$V_{GE} = 0\text{ V}, V_{CE} = 950\text{ V}$	$I_{CES}$			250	μA
Gate leakage current, collector-emitter short-circuited	$V_{GE} = 20\text{ V}, V_{CE} = 0\text{ V}$	$I_{GES}$			±400	nA

### ON CHARACTERISTICS

Gate-emitter threshold voltage	$V_{GE} = V_{CE}, I_C = 75\text{ mA}$	$V_{GE(th)}$	3.4	4.57	6.4	V
Collector-emitter saturation voltage	$V_{GE} = 15\text{ V}, I_C = 75\text{ A}$ $V_{GE} = 15\text{ V}, I_C = 75\text{ A}, T_J = 175^\circ\text{C}$	$V_{CE(sat)}$		1.31 1.52	1.69	V

### DYNAMIC CHARACTERISTICS

Input capacitance	$V_{CE} = 30\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$	$C_{ies}$		15400		pF
Output capacitance		$C_{oes}$		266		
Reverse transfer capacitance		$C_{res}$		85.3		
Gate charge total	$V_{CE} = 600\text{ V}, I_C = 75\text{ V}, V_{GE} = 15\text{ V}$	$Q_g$		663.3		nC
Gate to emitter charge		$Q_{ge}$		76.1		
Gate to collector charge		$Q_{gc}$		218.6		

### SWITCHING CHARACTERISTICS, INDUCTIVE LOAD

Turn-on delay time	$T_J = 25^\circ\text{C}$ $V_{CC} = 600\text{ V}, I_C = 37.5\text{ A}$ $R_g = 4.7\ \Omega$ $V_{GE} = 15\text{ V}$ Inductive Load	$t_{d(on)}$		52.0		ns
Rise time		$t_r$		24.0		
Turn-off delay time		$t_{d(off)}$		496.0		
Fall time		$t_f$		108.0		
Turn-on switching loss		$E_{on}$		2.0		mJ
Turn-off switching loss		$E_{off}$		1.8		
Total switching loss		$E_{ts}$		3.7		

# FGY75T95LQDT

## ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C unless otherwise noted)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
Turn-on delay time	T <sub>J</sub> = 25°C V <sub>CC</sub> = 600 V, I <sub>C</sub> = 75 A R <sub>g</sub> = 4.7 Ω V <sub>GE</sub> = 15 V Inductive Load	td(on)		52.0		ns
Rise time		t <sub>r</sub>		52.0		
Turn-off delay time		td(off)		476.0		
Fall time		t <sub>f</sub>		76.0		
Turn-on switching loss		E <sub>on</sub>		4.8		mJ
Turn-off switching loss		E <sub>off</sub>		3.3		
Total switching loss		E <sub>ts</sub>		8.1		
Turn-on delay time	T <sub>J</sub> = 175°C V <sub>CC</sub> = 600 V, I <sub>C</sub> = 37.5 A R <sub>g</sub> = 4.7 Ω V <sub>GE</sub> = 15 V Inductive Load	td(on)		44.0		ns
Rise time		t <sub>r</sub>		30.0		
Turn-off delay time		td(off)		580.0		
Fall time		t <sub>f</sub>		144.0		
Turn-on switching loss		E <sub>on</sub>		3.8		mJ
Turn-off switching loss		E <sub>off</sub>		2.7		
Total switching loss		E <sub>ts</sub>		6.5		
Turn-on delay time	T <sub>J</sub> = 175°C V <sub>CC</sub> = 600 V, I <sub>C</sub> = 75 A R <sub>g</sub> = 4.7 Ω V <sub>GE</sub> = 15 V Inductive Load	td(on)		48.0		ns
Rise time		t <sub>r</sub>		54.0		
Turn-off delay time		td(off)		548.0		
Fall time		t <sub>f</sub>		118.0		
Turn-on switching loss		E <sub>on</sub>		7.6		mJ
Turn-off switching loss		E <sub>off</sub>		5.1		
Total switching loss		E <sub>ts</sub>		12.7		

## DIODE CHARACTERISTICS

Forward voltage	I <sub>F</sub> = 75 A I <sub>F</sub> = 75 A, T <sub>J</sub> = 175°C	V <sub>F</sub>		2.03 1.76	2.51	V
Reverse Recovery Energy	T <sub>J</sub> = 25°C V <sub>R</sub> = 600 V, I <sub>F</sub> = 37.5 A dI <sub>F</sub> /dt = 1000 A/μs	E <sub>rec</sub>		314		μJ
Reverse Recovery Time		t <sub>rr</sub>		105		ns
Reverse Recovery Charge		Q <sub>rr</sub>		1635		nC
Reverse Recovery Energy	T <sub>J</sub> = 25°C V <sub>R</sub> = 600 V, I <sub>F</sub> = 75 A dI <sub>F</sub> /dt = 1000 A/μs	E <sub>rec</sub>		2390		μJ
Reverse Recovery Time		t <sub>rr</sub>		259		ns
Reverse Recovery Charge		Q <sub>rr</sub>		7515		nC
Reverse Recovery Energy	T <sub>J</sub> = 175°C V <sub>R</sub> = 600 V, I <sub>F</sub> = 37.5 A dI <sub>F</sub> /dt = 1000 A/μs	E <sub>rec</sub>		454		μJ
Reverse Recovery Time		t <sub>rr</sub>		148		ns
Reverse Recovery Charge		Q <sub>rr</sub>		2436		nC

# FGY75T95LQDT

## ELECTRICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
Reverse Recovery Energy	$T_J = 175^\circ\text{C}$ $V_R = 600\text{ V}$ , $I_F = 75\text{ A}$ $dI_F/dt = 1000\text{ A}/\mu\text{s}$	$E_{rec}$		2790		$\mu\text{J}$
Reverse Recovery Time		$t_{rr}$		294		ns
Reverse Recovery Charge		$Q_{rr}$		9175		nC

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

# FGY75T95LQDT

## TYPICAL CHARACTERISTICS

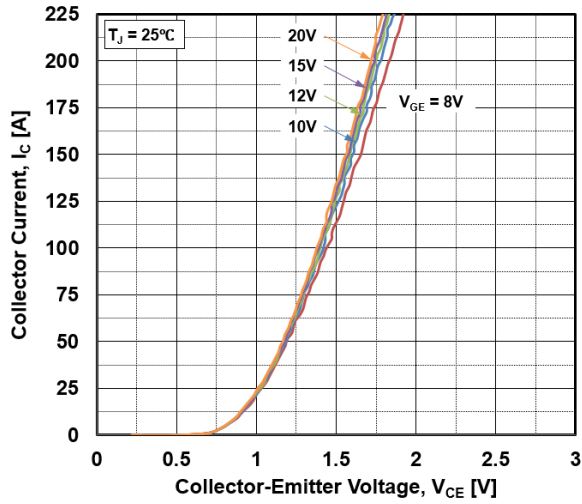


Figure 1. Typical Output Characteristics ( $T_J = 25^\circ\text{C}$ )

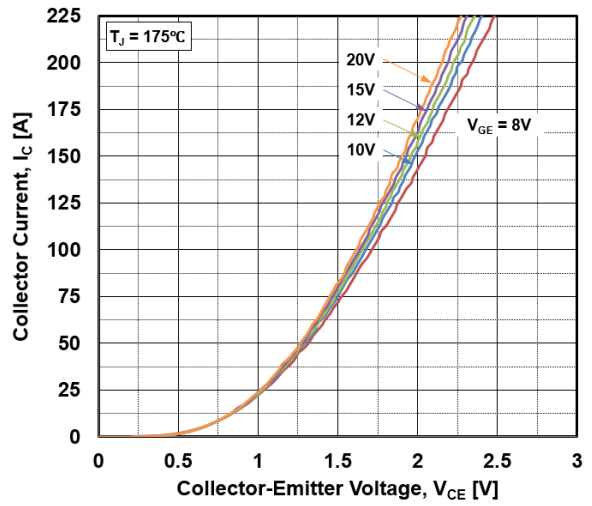


Figure 2. Typical Output Characteristics ( $T_J = 175^\circ\text{C}$ )

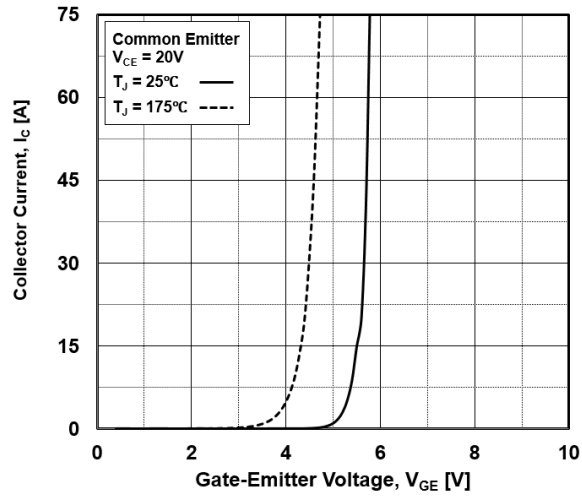


Figure 3. Transfer Characteristics

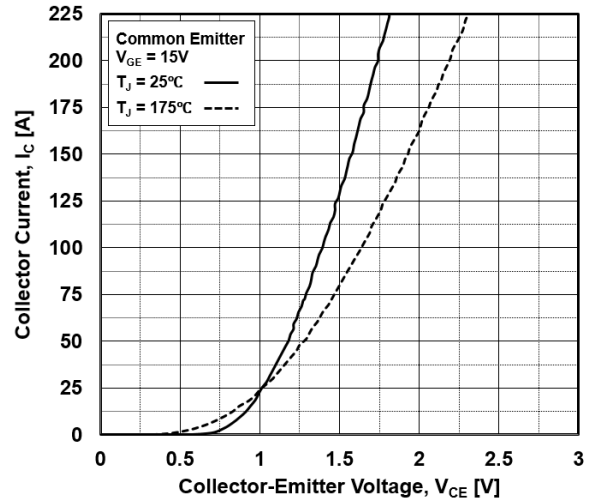


Figure 4. Typical Saturation Voltage Characteristics

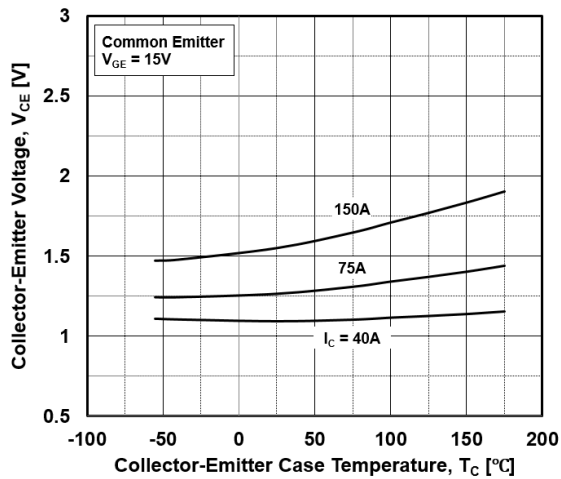


Figure 5. Saturation Voltage vs Case Temperature at Variant Current Level

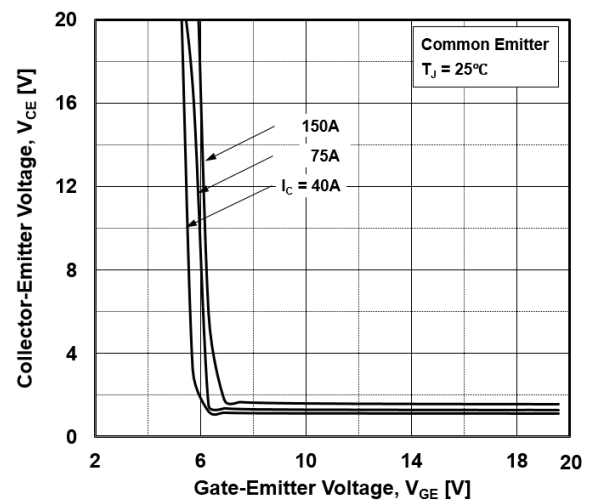


Figure 6. Saturation Voltage vs.  $V_{GE}$  ( $T_J = 25^\circ\text{C}$ )

# FGY75T95LQDT

## TYPICAL CHARACTERISTICS

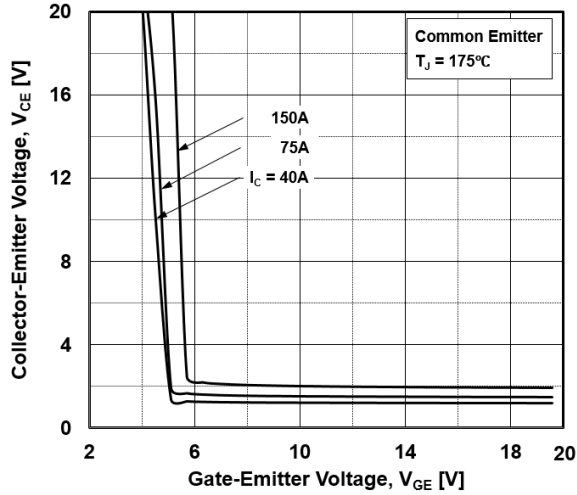


Figure 7. Saturation Voltage vs.  $V_{GE}$  ( $T_J = 175^\circ\text{C}$ )

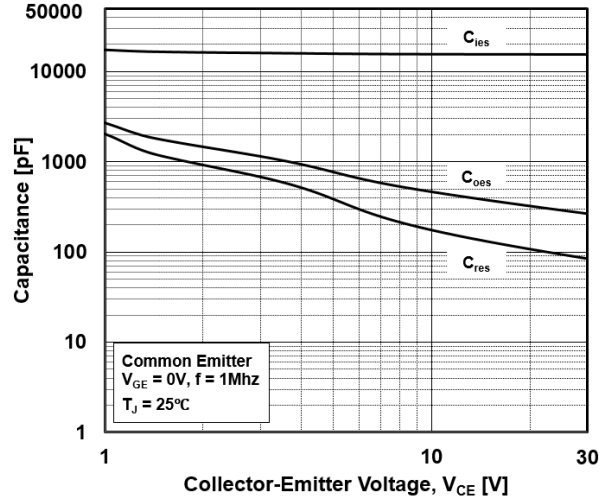


Figure 8. Capacitance Characteristics

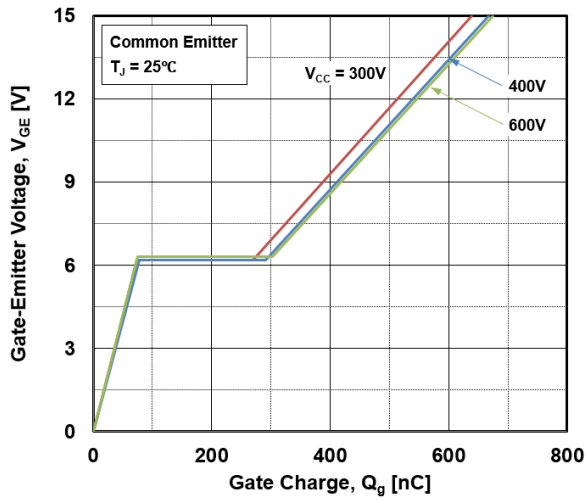


Figure 9. Gate Charge Characteristics ( $T_J = 25^\circ\text{C}$ )

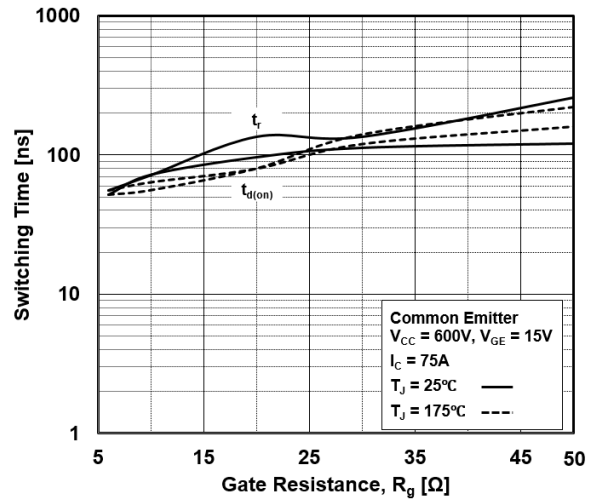


Figure 10. Turn-on Characteristics vs. Gate Resistance

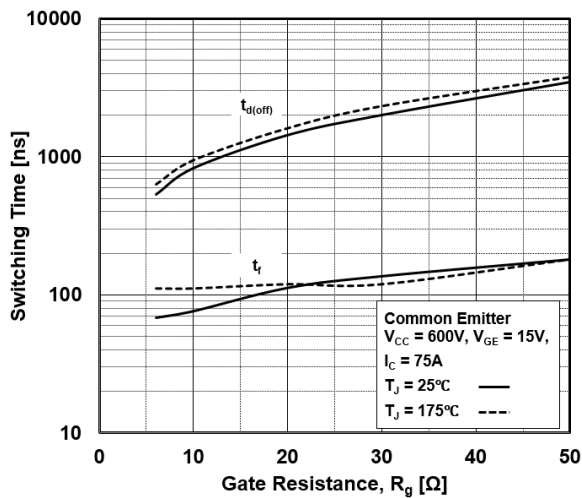


Figure 11. Turn-off Characteristics vs. Gate Resistance

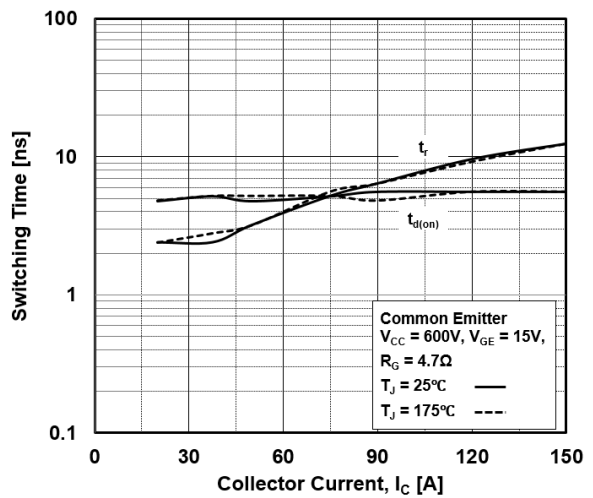


Figure 12. Turn-on Characteristics vs. Collector Current

# FGY75T95LQDT

## TYPICAL CHARACTERISTICS

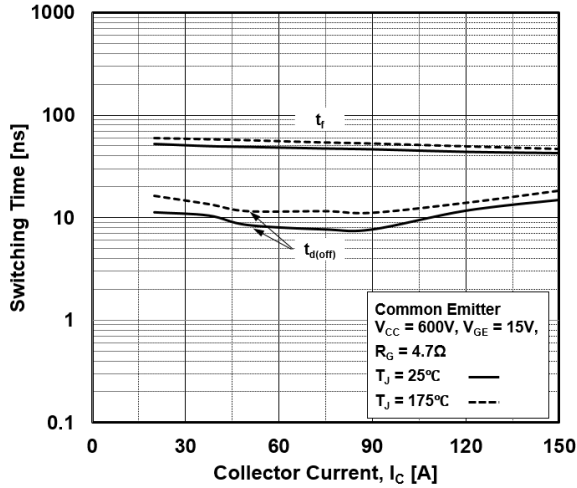


Figure 13. Turn-off Characteristics vs. Collector Current

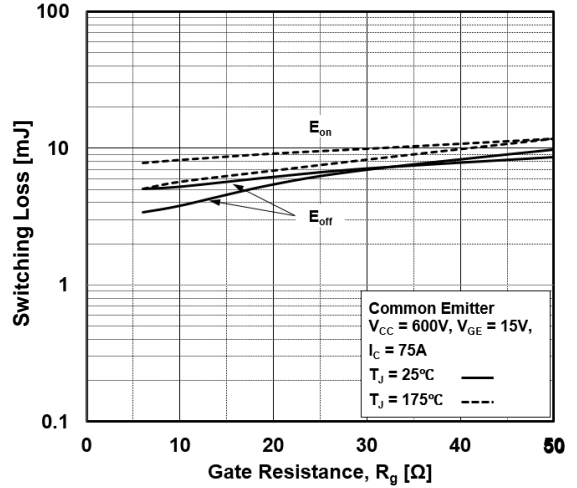


Figure 14. Switching Loss vs. Gate Resistance

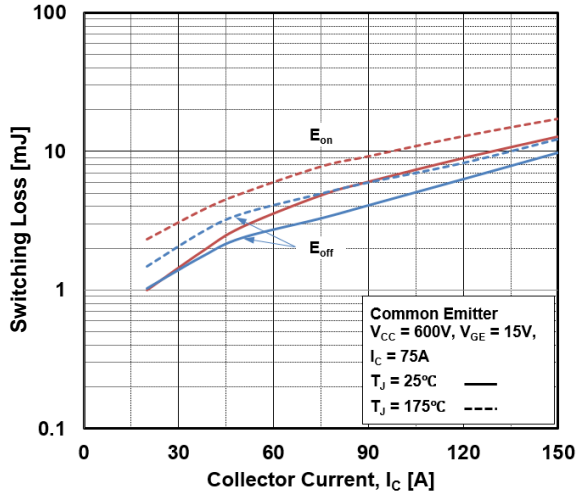


Figure 15. Switching Loss vs. Collector Current

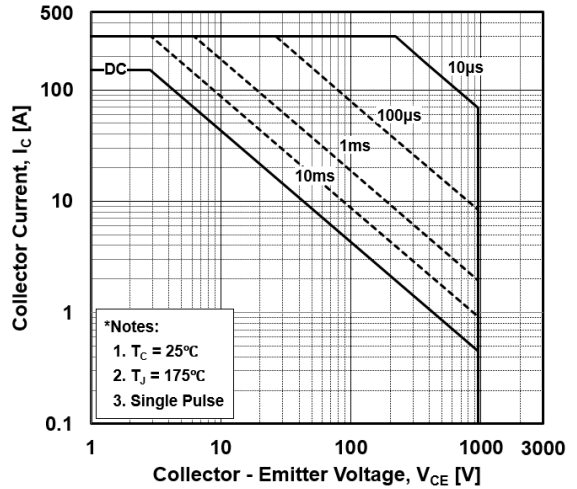


Figure 16. SOA Characteristics (FBSOA)

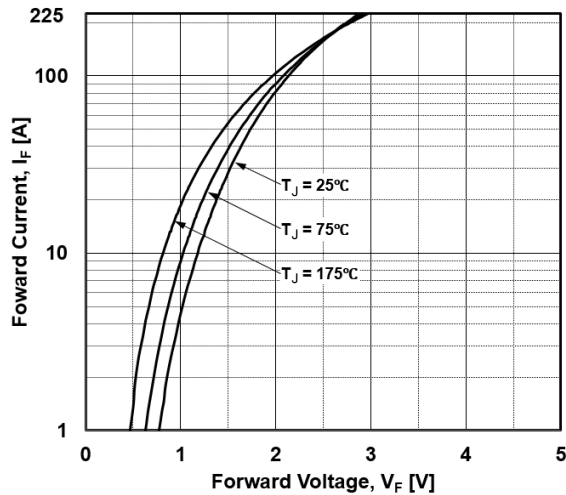


Figure 17. (Diode) Forward Characteristics vs (Normal I-V)

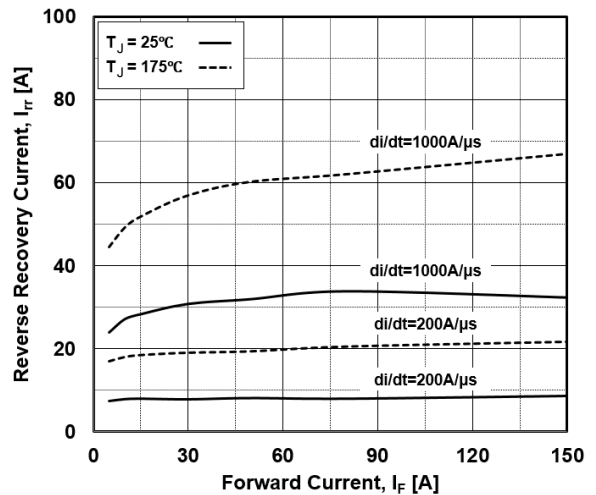


Figure 18. (Diode) Reverse Recovery Current

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## TYPICAL CHARACTERISTICS

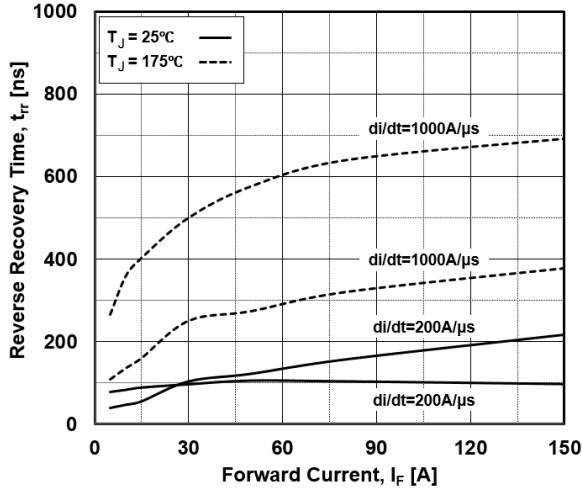


Figure 19. (Diode) Reverse Recovery Time

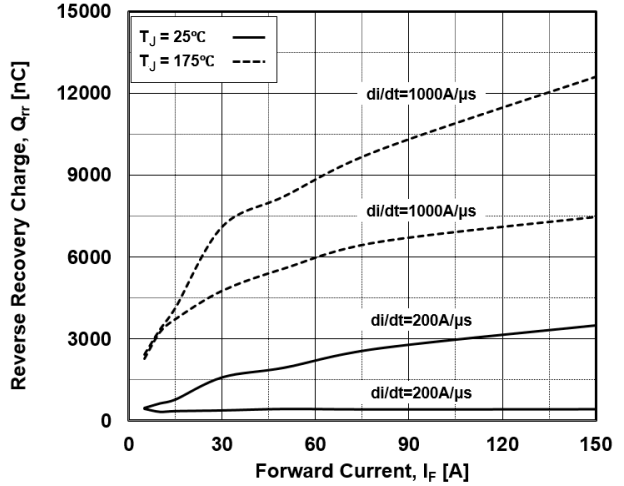


Figure 20. (Diode) Stored Charge

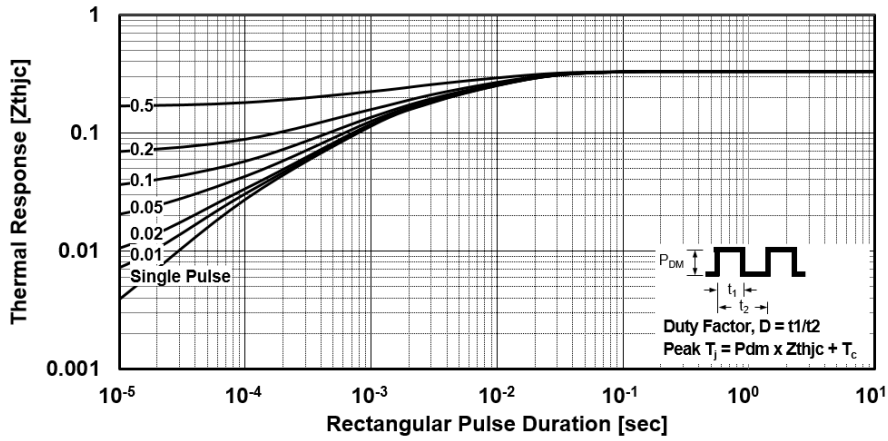


Figure 21. Transient Thermal Impedance of IGBT

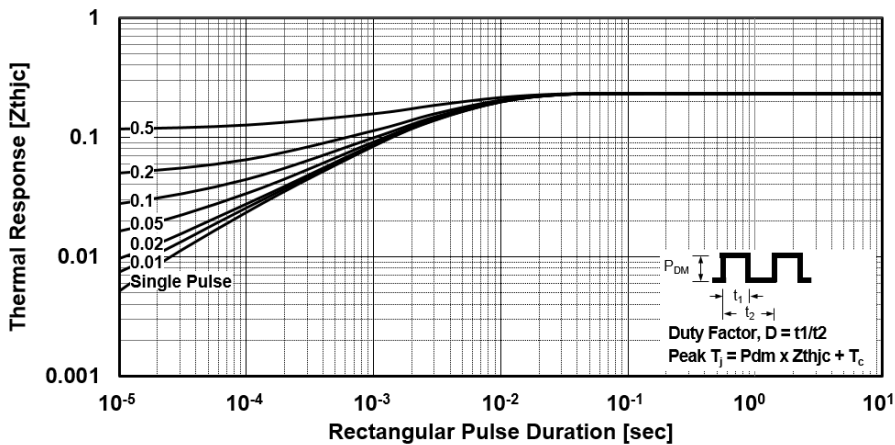


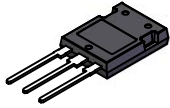
Figure 22. Transient Thermal Impedance of Diode



# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

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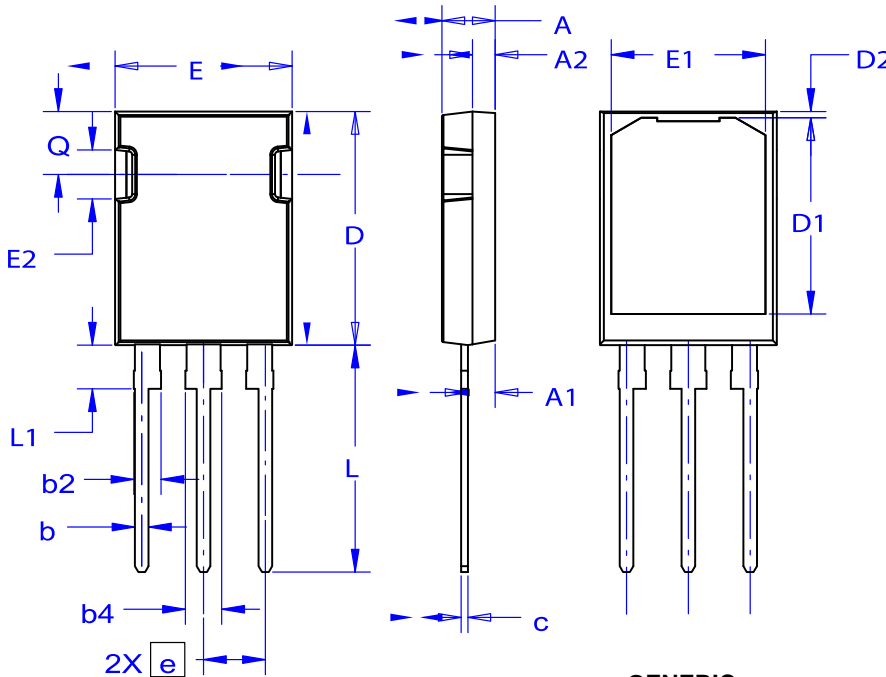


TO-247-3LD  
CASE 340CD  
ISSUE A

DATE 18 SEP 2018

**NOTES:**

- A. THIS PACKAGE DOES NOT CONFORM TO ANY STANDARDS.
- B. ALL DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS.
- D. DIMENSION AND TOLERANCE AS PER ASME Y14.5-2009.



DIM	MILLIMETERS		
	MIN	NOM	MAX
A	4.58	4.70	4.82
A1	2.20	2.40	2.60
A2	1.80	2.00	2.20
D	20.32	20.57	20.82
E	15.37	15.62	15.87
E2	4.12	4.32	4.52
e	~	5.45	~
L	19.90	20.00	20.10
L1	3.69	3.81	3.93
Q	5.34	5.46	5.58
b	1.10	1.20	1.30
b2	2.10	2.24	2.39
b4	2.87	3.04	3.20
c	0.51	0.61	0.71
D1	16.63	16.83	17.03
D2	0.51	0.93	1.35
E1	13.40	13.60	13.80

**GENERIC MARKING DIAGRAM\***



- XXXX = Specific Device Code
- A = Assembly Location
- Y = Year
- WW = Work Week
- G = Pb-Free Package

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.

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[IHW20N65R5XKSA1](#) [IDW40E65D2FKSA1](#)