IGBT – Power, Co-PAK N-Channel, Field Stop VII (FS7), Non-SCR, TO247-3L
1200 V, 1.7 V, 140 A

FGY140T120SWD

BV_{CES}	$V_{CE(SAT)}$	I_C
1200 V	1.7 V	140 A

Description

Using the novel field stop 7th generation IGBT technology and the Gen7 Diode in TO247 3−lead package, FGY140T120SWD offers the optimum performance with low switching and conduction losses for high−efficiency operations in various applications like Solar, UPS, and ESS.

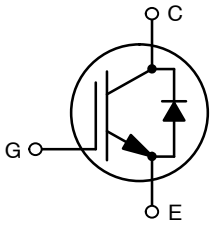
Features

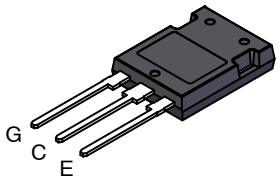
- Maximum Junction Temperature T_J = 175°C
- Positive Temperature Coefficient for Easy Parallel Operation
- High Current Capability
- Smooth and Optimized Switching
- Low Switching Loss
- RoHS Compliant

Applications

- Boost and Inverter in Solar System
- UPS
- Energy Storage System

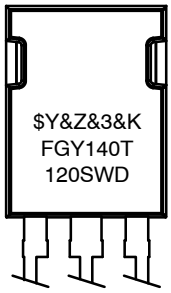
PIN CONNECTIONS





TO−247−3LD
CASE 340CD

MARKING DIAGRAM



$Y	= **onsemi** Logo
&Z	= Assembly Plant Code
&3	= 3−Digit Date Code
&K	= 2−Digit Lot Traceability Code
FGY140T120SWD	= Specific Device Code

MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

Parameter		Symbol	Value	Unit
Collector−to−Emitter Voltage		V_{CES}	1200	V
Gate−to−Emitter Voltage		V_{GES}	±20	
Transient Gate−to−Emitter Voltage			±30	
Collector Current	T_C = 25°C(Note 1)	I_C	280	A
	T_C = 100°C		140	
Power Dissipation	T_C = 25°C	P_D	1153	W
	T_C = 100°C		576	
Pulsed Collector Current	T_C = 25°C, t_p = 10 μs (Note 2)	I_{CM}	560	A
Diode Forward Current	T_C = 25°C	I_F	280	
	T_C = 100°C		140	
Pulsed Diode Forward Current	T_C = 25°C, t_p = 10 μs (Note 2)	I_{FM}	560	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	−55 to +175	°C
Lead Temperature for Soldering Purposes		T_L	260	

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. Value limited by bond wire
2. Repetitive rating: Pulse width limited by max. junction temperature.

ORDERING INFORMATION

Device	Package	Shipping
FGY140T120SWD	TO−247−3LD (Pb−Free)	30 Units / Tube

THERMAL CHARACTERISTICS

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction−to−Case for IGBT	$R_{\theta JC}$	0.13	°C/W
Thermal Resistance, Junction−to−Case for Diode		0.23	
Thermal Resistance, Junction−to−Ambient	$R_{\theta JA}$	40	

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Collector−to−Emitter Breakdown Voltage	BV_{CES}	V_{GE} = 0 V, I_C = 5 mA	1200	–	–	V
Breakdown Voltage Temperature Coefficient	$\frac{\Delta BV_{CES}}{\Delta T_J}$	V_{GE} = 0 V, I_C = 5 mA	–	1226	–	mV/°C
Collector−to−Emitter Cut−Off Current	I_{CES}	V_{GE} = 0 V, V_{CE} = V_{CES}	–	–	40	μA
Gate−to−Emitter Leakage Current	I_{GES}	V_{GE} = 20 V, V_{CE} = 0 V	–	–	±400	nA
ON CHARACTERISTICS						
Gate−to−Emitter Threshold Voltage	$V_{GE(th)}$	V_{GE} = V_{CE}, I_C = 140 mA, T_J = 25°C	5.60	6.54	7.40	V
Collector−to−Emitter Saturation Voltage	$V_{CE(sat)}$	V_{GE} = 15 V, I_C = 140 A, T_J = 25°C	1.35	1.7	2.0	
		V_{GE} = 15 V, I_C = 140 A, T_J = 175°C	–	2.25	–	
DYNAMIC CHARACTERISTICS						
Input Capacitance	C_{ies}	V_{CE} = 30 V, V_{GE} = 0 V, f = 1 MHz	–	13395.0	–	pF
Output Capacitance	C_{oes}		–	394	–	
Reverse Transfer Capacitance	C_{res}		–	55.4	–	
Total Gate Charge	Q_g	V_{CE} = 600 V, V_{GE} = 15 V, I_C = 140 A	–	415.4	–	nC
Gate−to−Emitter Charge	Q_{ge}		–	104.8	–	
Gate−to−Collector Charge	Q_{gc}		–	154.8	–	
SWITCHING CHARACTERISTICS						
Turn−on Delay Time	$t_{d(on)}$	V_{CE} = 600 V, V_{GE} = 15 V I_C = 70 A R_G = 4.7 Ω T_J = 25°C	–	55.2	–	ns
Turn−off Delay Time	$t_{d(off)}$		–	249.6	–	
Rise Time	t_r		–	43.2	–	
Fall Time	t_f		–	65.6	–	
Turn−on Switching Loss	E_{on}		–	4.7	–	mJ
Turn−off Switching Loss	E_{off}		–	2.3	–	
Total Switching Loss	E_{ts}		–	6.9	–	
Turn−on Delay Time	$t_{d(on)}$	V_{CE} = 600 V, V_{GE} = 15 V I_C = 140 A R_G = 4.7 Ω T_J = 25°C	–	59.2	–	ns
Turn−off Delay Time	$t_{d(off)}$		–	227.2	–	
Rise Time	t_r		–	97.6	–	
Fall Time	t_f		–	67.2	–	
Turn−on Switching Loss	E_{on}		–	12.5	–	mJ
Turn−off Switching Loss	E_{off}		–	5.1	–	
Total Switching Loss	E_{ts}		–	17.6	–	

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted) (continued)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
SWITCHING CHARACTERISTICS						
Turn–on Delay Time	$t_{d(on)}$	V_{CE} = 600 V, V_{GE} = 15 V I_C = 70 A R_G = 4.7 Ω T_J = 175°C	–	48.0	–	ns
Turn–off Delay Time	$t_{d(off)}$		–	284.8	–	
Rise Time	t_r		–	41.6	–	
Fall Time	t_f		–	96.0	–	
Turn–on Switching Loss	E_{on}		–	7.5	–	mJ
Turn–off Switching Loss	E_{off}		–	3.1	–	
Total Switching Loss	E_{ts}		–	10.6	–	
Turn–on Delay Time	$t_{d(on)}$	V_{CE} = 600 V, V_{GE} = 15 V I_C = 140 A R_G = 4.7 Ω T_J = 175°C	–	52.8	–	ns
Turn–off Delay Time	$t_{d(off)}$		–	264.0	–	
Rise Time	t_r		–	92.8	–	
Fall Time	t_f		–	113.6	–	
Turn–on Switching Loss	E_{on}		–	17.1	–	mJ
Turn–off Switching Loss	E_{off}		–	7.4	–	
Total Switching Loss	E_{ts}		–	24.5	–	
DIODE CHARACTERISTICS						
Forward Voltage	V_F	I_F = 140 A, T_J = 25°C	1.73	1.95	2.33	V
		I_F = 140 A, T_J = 175°C	–	2.15	–	
DIODE SWITCHING CHARACTERISTICS, INDUCTIVE LOAD						
Reverse Recovery Time	t_{rr}	V_R = 600 V, I_F = 70 A, dI_F/dt = 1000 A/μs, T_J = 25°C	–	219.4	–	ns
Reverse Recovery Charge	Q_{rr}		–	4507.9	–	nC
Reverse Recovery Energy	E_{REC}		–	1.6	–	mJ
Peak Reverse Recovery Current	I_{RRM}		–	41.1	–	A
Reverse Recovery Time	t_{rr}	V_R = 600 V, I_F = 140 A, dI_F/dt = 1000 A/μs, T_J = 25°C	–	307.3	–	ns
Reverse Recovery Charge	Q_{rr}		–	7047.2	–	nC
Reverse Recovery Energy	E_{REC}		–	2.7	–	mJ
Peak Reverse Recovery Current	I_{RRM}		–	45.9	–	A
Reverse Recovery Time	t_{rr}	V_R = 600 V, I_F = 70 A, dI_F/dt = 1000 A/μs, T_J = 175°C	–	425.3	–	ns
Reverse Recovery Charge	Q_{rr}		–	13076.8	–	nC
Reverse Recovery Energy	E_{REC}			5.5	–	mJ
Peak Reverse Recovery Current	I_{RRM}		–	61.5	–	A
Reverse Recovery Time	t_{rr}	V_R = 600 V, I_F = 140 A, dI_F/dt = 1000 A/μs, T_J = 175°C	–	516.5	–	ns
Reverse Recovery Charge	Q_{rr}		–	18736.9	–	nC
Reverse Recovery Energy	E_{REC}		–	7.6	–	mJ
Peak Reverse Recovery Current	I_{RRM}		–	72.6	–	A

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.

TYPICAL CHARACTERISTICS

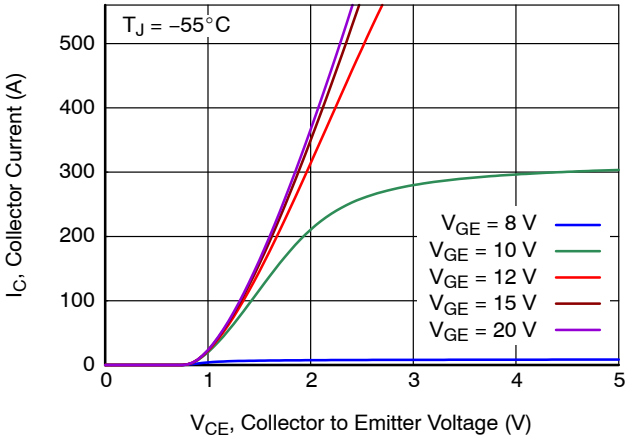


Figure 1. Output Characteristics

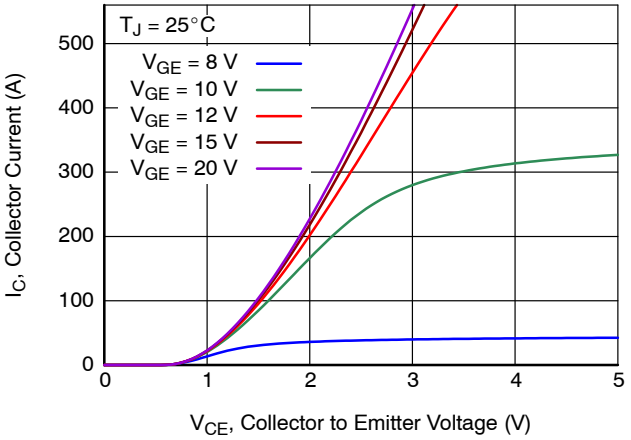


Figure 2. Output Characteristics

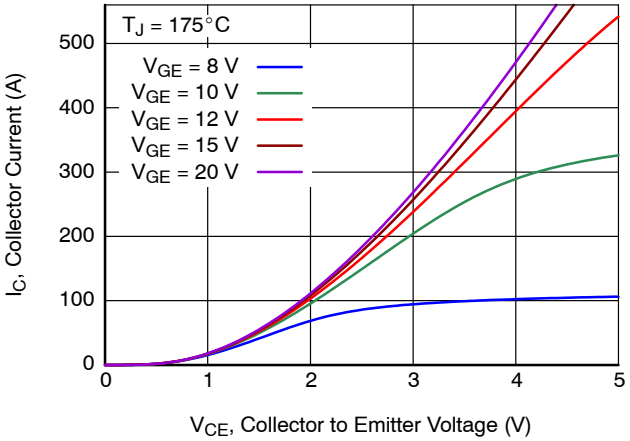


Figure 3. Output Characteristics

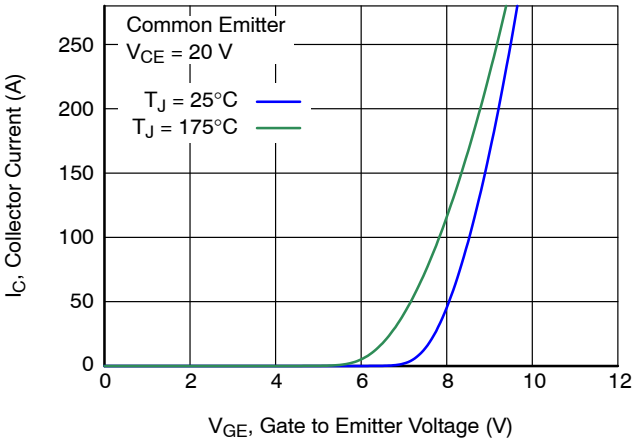


Figure 4. Transfer Characteristics

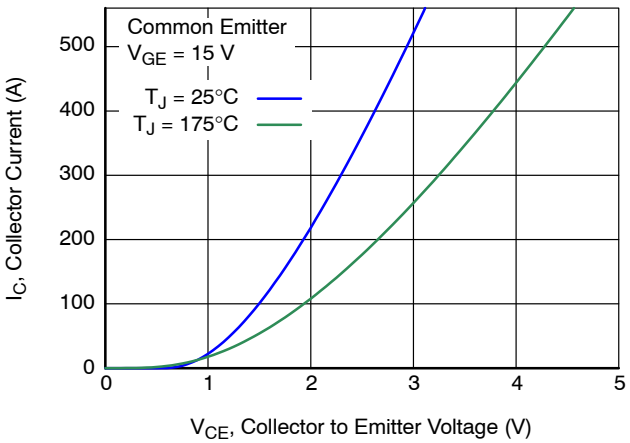


Figure 5. Saturation Characteristics

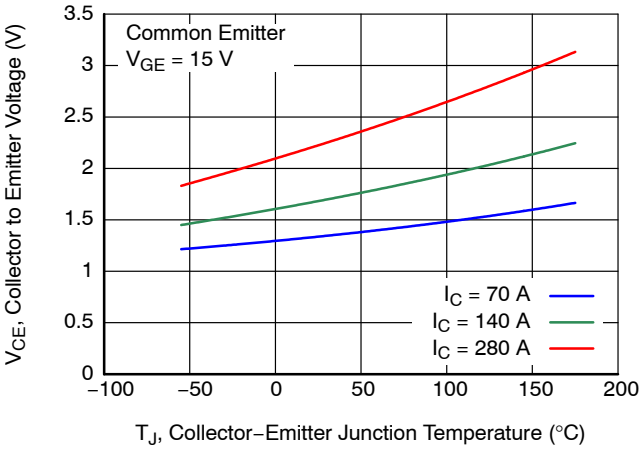


Figure 6. Saturation Voltage vs. Junction Temperature

TYPICAL CHARACTERISTICS

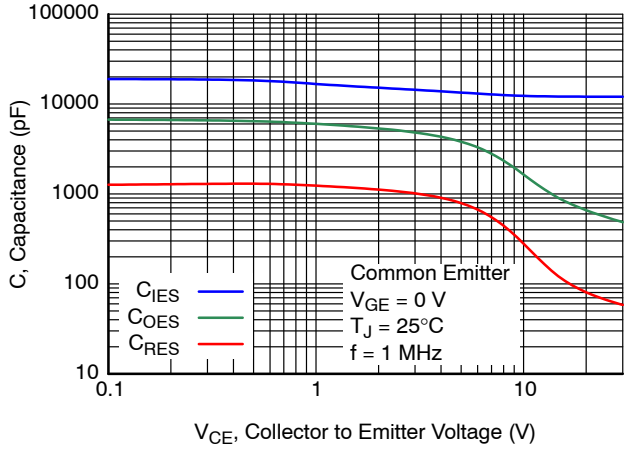


Figure 7. Capacitance Characteristics

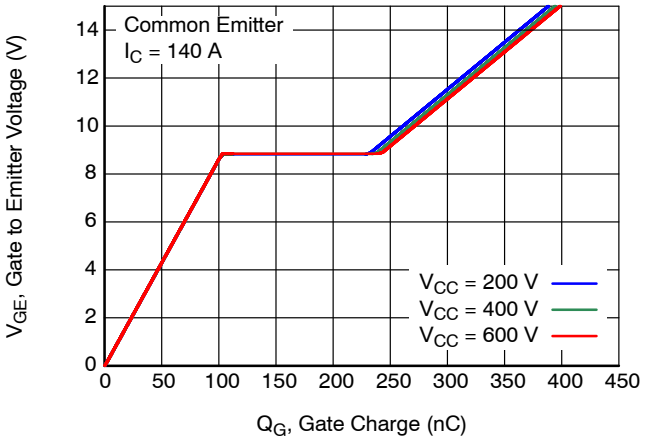


Figure 8. Gate Charge Characteristics

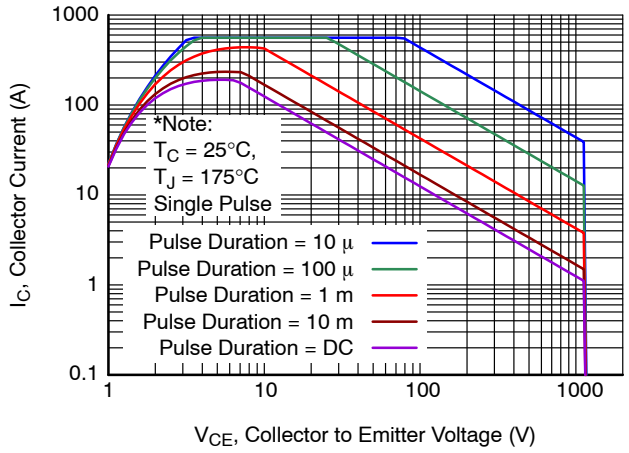


Figure 9. SOA Characteristics

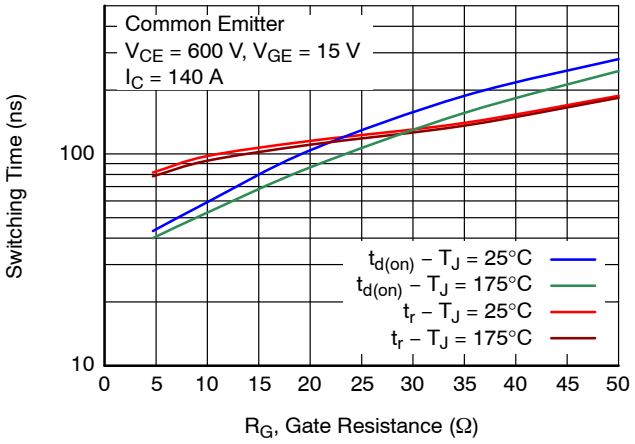


Figure 10. Turn−on Switching Time vs. Gate Resistance

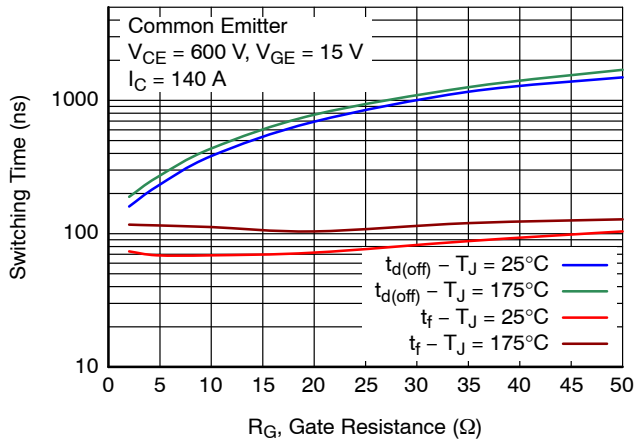


Figure 11. Turn−Off Switching Time vs. Gate Resistance

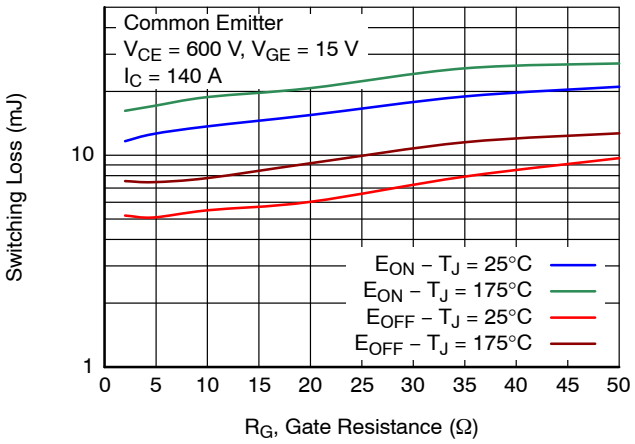


Figure 12. Switching Loss vs. Gate Resistance

TYPICAL CHARACTERISTICS

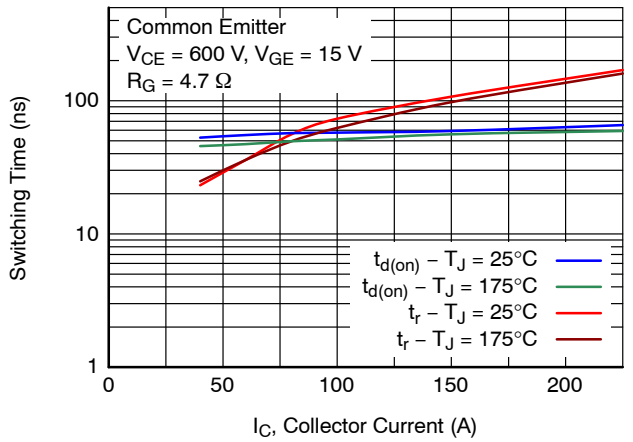


Figure 13. Turn−On Switching Time vs. Collector Current

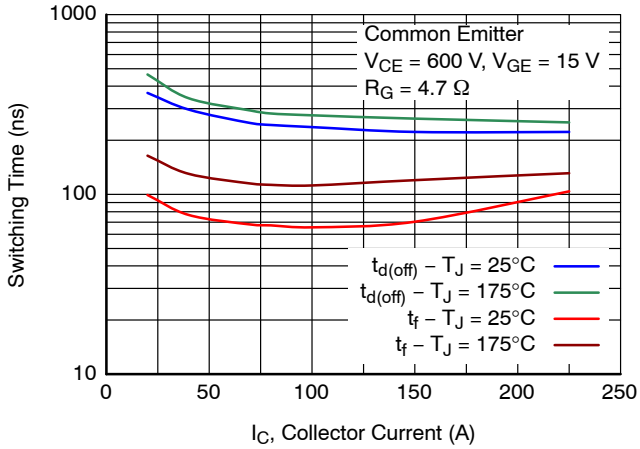


Figure 14. Turn−Off Switching Time vs. Collector Current

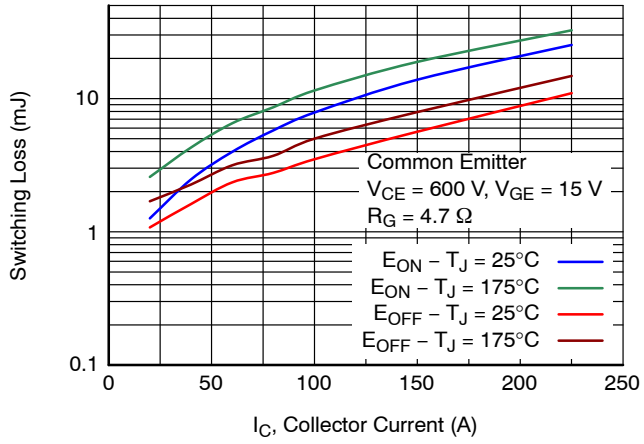


Figure 15. Turn−On Switching Loss vs. Collector Current

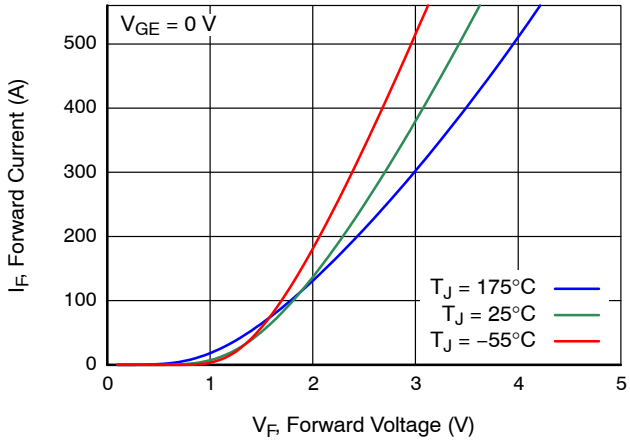


Figure 16. Diode Forward Characteristics

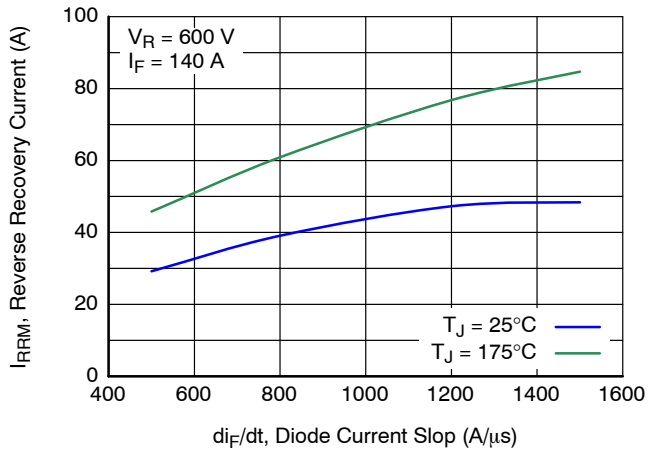


Figure 17. Diode Reverse Recovery Current

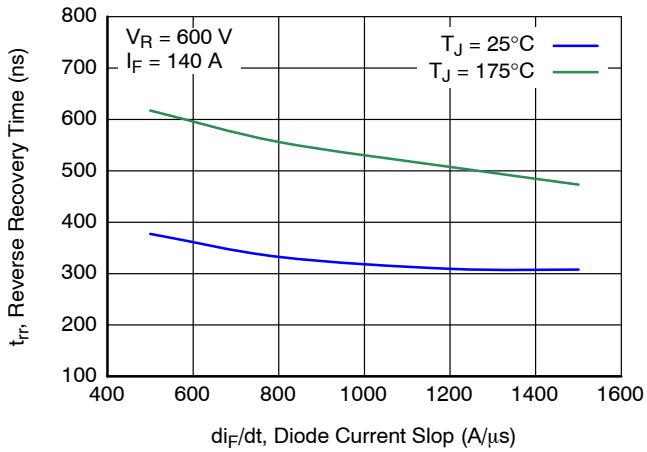


Figure 18. Diode Reverse Recovery Time

TYPICAL CHARACTERISTICS

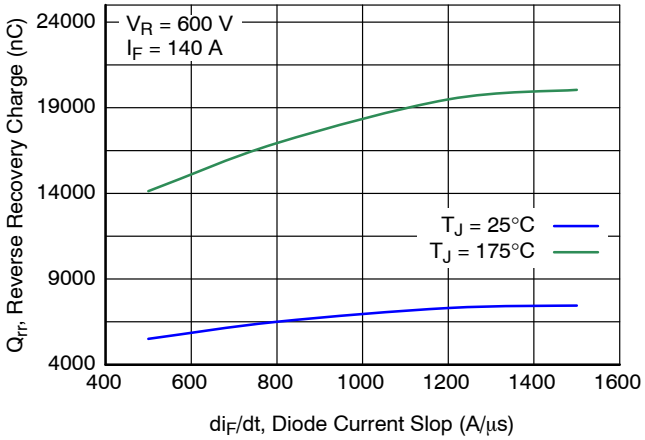


Figure 19. Diode Stored Charge Characteristics

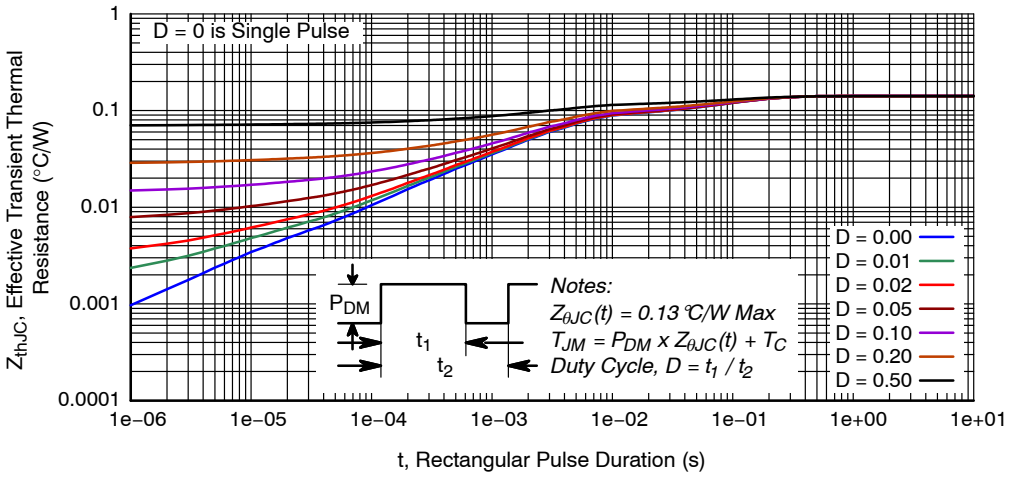


Figure 20. Transient Thermal Impedance of IGBT

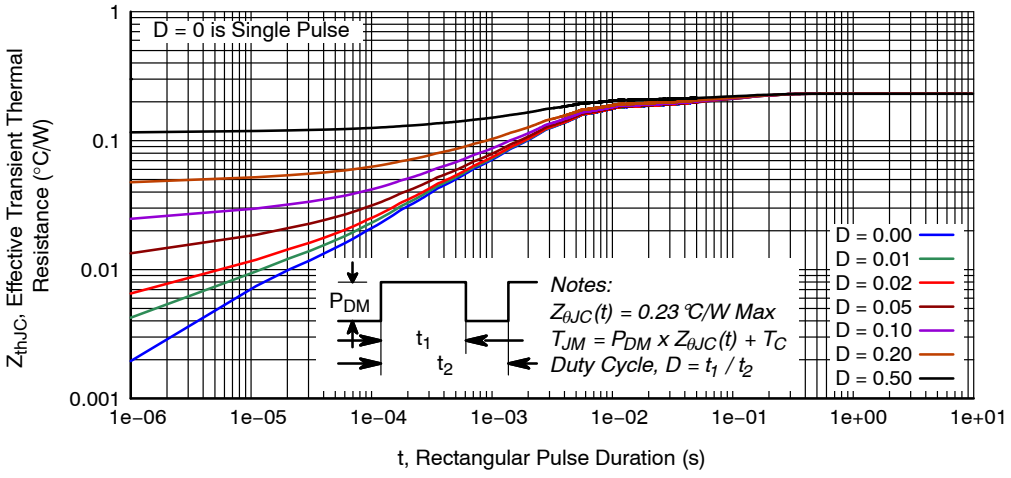
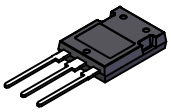


Figure 21. Transient Thermal Impedance of Diode

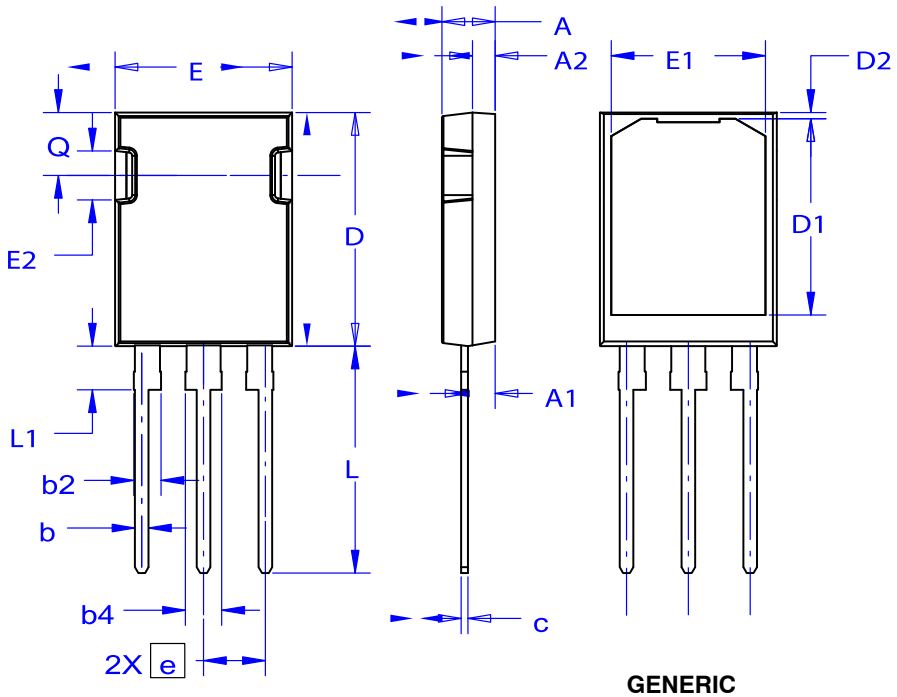


TO−247−3LD
CASE 340CD
ISSUE A

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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