IGBT - Power, Co-PAK N-Channel, Field Stop VII (FS7), Non-SCR, TO247-3L
1200 V, 1.7 V, 60 A
FGY60T120SWD

BV_{CES}	$V_{CE(SAT)}$	I_C
1200 V	1.7 V	60 A

Description

Using the novel field stop 7th generation IGBT technology and the Gen7 Diode in TO247 3−lead package, FGY60T120SWD offers the optimum performance with low switching and conduction losses for high−efficiency operations in various applications like Solar, UPS, and ESS.

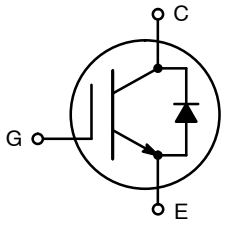
Features

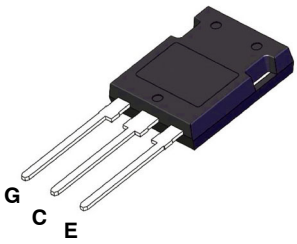
- Maximum Junction Temperature T_J = 175°C
- Positive Temperature Coefficient for Easy Parallel Operation
- High Current Capability
- Smooth and Optimized Switching
- Low Switching Loss
- RoHS Compliant

Applications

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

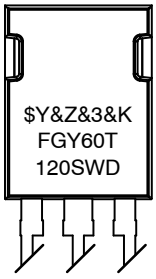
PIN CONNECTIONS





TO247−3LD
CASE 340CD

MARKING DIAGRAM



$Y = **onsemi** Logo
&Z = Assembly Plant Code
&3 = 3−Digit Date Code
&K = 2−Digit Lot Traceability Code
FGY60T120SWD = 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	V
Transient Gate−to−Emitter Voltage			±30	V
Collector Current	T_C = 25°C (Note 1)	I_C	105	A
	T_C = 100°C		60	
Power Dissipation	T_C = 25°C	P_D	635	W
	T_C = 100°C		317	
Pulsed Collector Current	T_C = 25°C, t_P = 10 μs (Note 2)	I_{CM}	240	A
Diode Forward Current	T_C = 25°C	I_F	120	A
	T_C = 100°C		600	
Pulsed Diode Maximum Forward Current	T_C = 25°C, t_P = 10 μs (Note 2)	I_{FM}	240	A
Operating Junction and Storage Temperature Range		T_J, T_{STG}	−55 to +175	°C
Lead Temperature for Soldering Purposes		T_L	260	°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. Value limit by bond wire
2. Repetitive rating: Pulse width limited by max. Junction temperature

ORDERING INFORMATION

Device	Package	Shipping
FGY60T120SWD	TO−247−3LD (Pb−Free)	30 Units / Tube

THERMAL CHARACTERISTICS

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction−to−Case for IGBT	$R_{\theta JC}$	0.24	°C/W
Thermal Resistance, Junction−to−Case for Diode		0.41	
Thermal Resistance, Junction−to−Ambient	$R_{\theta JA}$	40	

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Collector−to−Emitter Breakdown Voltage	BV_{CES}	V_{GE} = 0 V, I_C = 5 mA	1200			V
Collector−to−Emitter Breakdown Voltage Temperature Coefficient	$\Delta BV_{CES}/\Delta T_J$			1.5		V/°C
Zero Gate Voltage Collector 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 Threshold Voltage	$V_{GE(TH)}$	V_{GE} = V_{CE}, I_C = 60 mA	5.6	6.55	7.4	V
Collector−to−Emitter Saturation Voltage	$V_{CE(SAT)}$	V_{GE} = 15 V, I_C = 60 A, T_J = 25°C	1.35	1.68	2.0	
		V_{GE} = 15 V, I_C = 60 A, T_J = 175°C		2.25		
DYNAMIC CHARACTERISTICS						
Input Capacitance	C_{IES}	V_{GE} = 0 V, V_{CE} = 30 V, f = 1 MHz		5093		pF
Output Capacitance	C_{OES}			193		
Reverse Transfer Capacitance	C_{RES}			25.2		
Total Gate Charge	Q_G	V_{CE} = 600 V, V_{GE} = 15 V, I_C = 60 A		174		nC
Gate−to−Emitter Charge	Q_{GE}			43.4		
Gate−to−Collector Charge	Q_{GC}			65.1		
SWITCHING CHARACTERISTICS						
Turn−On Delay Time	$t_{d(on)}$	V_{CE} = 600 V, V_{GE} = 0/15 V, I_C = 30 A, R_G = 4.7 Ω, T_J = 25°C		30.4		ns
Turn−Off Delay Time	$t_{d(off)}$			146.4		
Rise Time	t_r			15.2		
Fall Time	t_f			68		
Turn−On Switching Loss	E_{on}			1.6		mJ
Turn−Off Switching Loss	E_{off}			0.9		
Total Switching Loss	E_{ts}			2.6		
Turn−On Delay Time	$t_{d(on)}$	V_{CE} = 600 V, V_{GE} = 0/15 V, I_C = 60 A, R_G = 4.7 Ω, T_J = 25°C		31.2		ns
Turn−Off Delay Time	$t_{d(off)}$			130		
Rise Time	t_r			40.8		
Fall Time	t_f			68.8		
Turn−On Switching Loss	E_{on}			4		mJ
Turn−Off Switching Loss	E_{off}			1.9		
Total Switching Loss	E_{ts}			5.8		

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Turn−On Delay Time	$t_{d(on)}$	V_{GE} = 0/15 V, I_C = 30 A, V_{CE} = 600 V, R_G = 4.7 Ω, T_J = 175°C		27.2		ns
Turn−Off Delay Time	$t_{d(off)}$			168		
Rise Time	t_r			16		
Fall Time	t_f			102.4		
Turn−On Switching Loss	E_{on}			2.6		mJ
Turn−Off Switching Loss	E_{off}			1.2		
Total Switching Loss	E_{ts}			3.8		
Turn−On Delay Time	$t_{d(on)}$	V_{GE} = 0/15 V, I_C = 60 A, V_{CE} = 600 V, R_G = 4.7 Ω, T_J = 175°C		28.8		ns
Turn−Off Delay Time	$t_{d(off)}$			153.6		
Rise Time	t_r			38.4		
Fall Time	t_f			120		
Turn−On Switching Loss	E_{on}			5.7		mJ
Turn−Off Switching Loss	E_{off}			2.8		
Total Switching Loss	E_{ts}			8.5		

DIODE CHARACTERISTICS

Forward Voltage	V_F	I_F = 60 A, T_J = 25°C	1.62	1.91	2.22	V
		I_F = 60 A, T_J = 175°C		2		

DIODE SWITCHING CHARACTERISTIC, INDUCTIVE LOAD

Reverse Recovery Time	t_{rr}	V_R = 600 V, I_F = 30 A, dI_F/dt = 1000 A/μs, T_J = 25°C		143		ns
Reverse Recovery Charge	Q_{rr}			2262		nC
Reverse Recovery Energy	E_{rec}			0.7		mJ
Peak Reverse Recovery Current	I_{RRM}			32		A
Reverse Recovery Time	t_{rr}	V_R = 600 V, I_F = 60 A, dI_F/dt = 1000 A/μs, T_J = 25°C		200		ns
Reverse Recovery Charge	Q_{rr}			3486		nC
Reverse Recovery Energy	E_{rec}			1.1		mJ
Peak Reverse Recovery Current	I_{RRM}			35		A
Reverse Recovery Time	t_{rr}	V_R = 600 V, I_F = 30 A, dI_F/dt = 1000 A/μs, T_J = 175°C		221		ns
Reverse Recovery Charge	Q_{rr}			4908		nC
Reverse Recovery Energy	E_{rec}			1.7		mJ
Peak Reverse Recovery Current	I_{RRM}			44		A
Reverse Recovery Time	t_{rr}	V_R = 600 V, I_F = 60 A, dI_F/dt = 1000 A/μs, T_J = 175°C		334		ns
Reverse Recovery Charge	Q_{rr}			8665		nC
Reverse Recovery Energy	E_{rec}			3.1		mJ
Peak Reverse Recovery Current	I_{RRM}			52		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

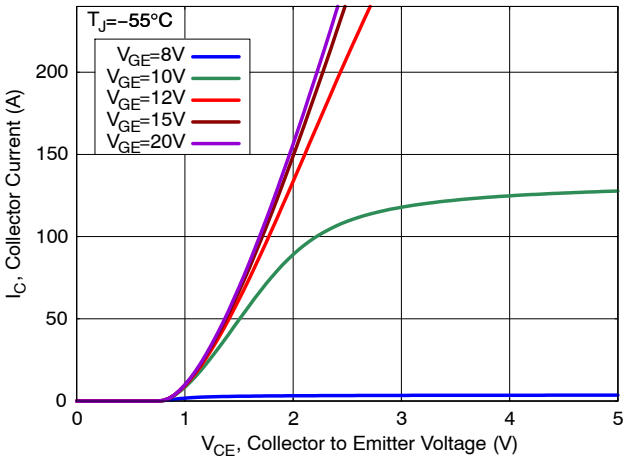


Figure 1. Output Characteristics

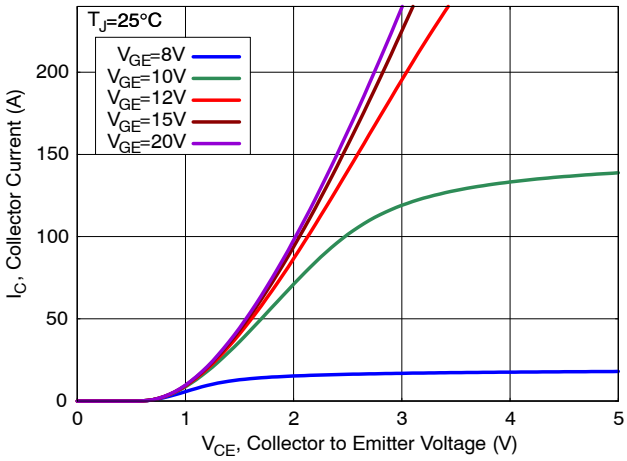


Figure 2. Output Characteristics

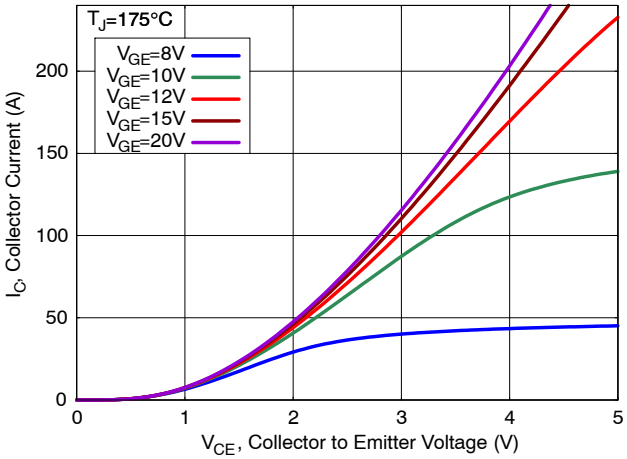


Figure 3. Output Characteristics

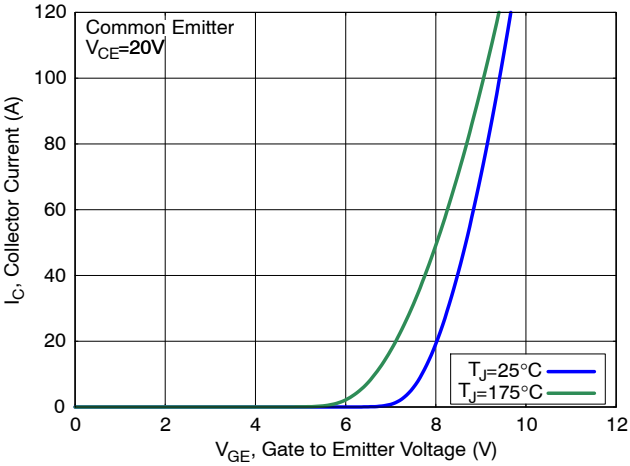


Figure 4. Transfer Characteristics

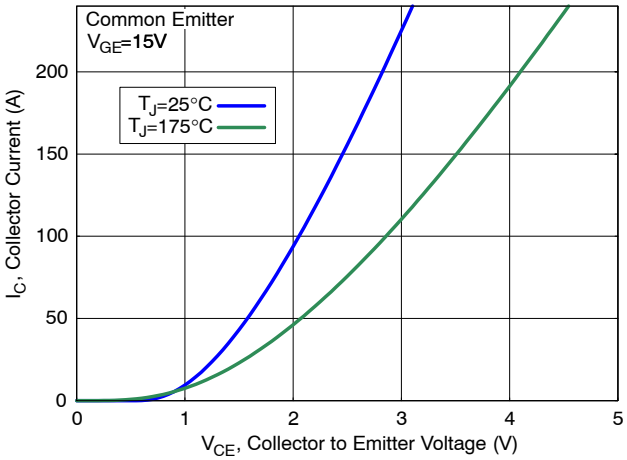


Figure 5. Saturation Characteristics

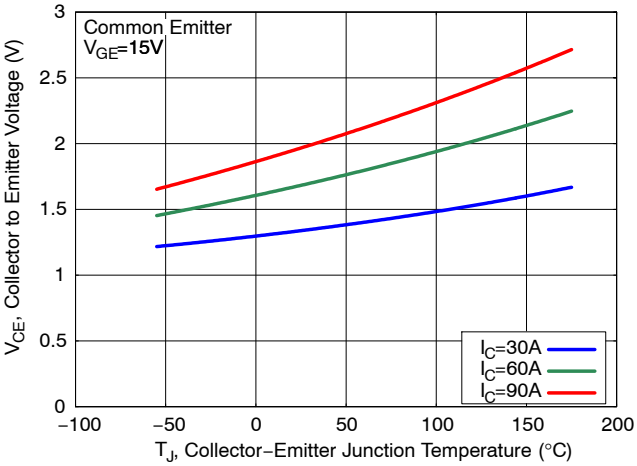


Figure 6. Saturation Voltage vs. Junction Temperature

TYPICAL CHARACTERISTICS

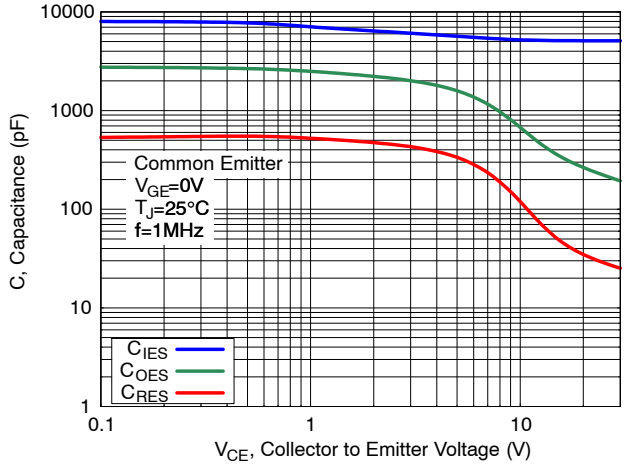


Figure 7. Capacitance Characteristics

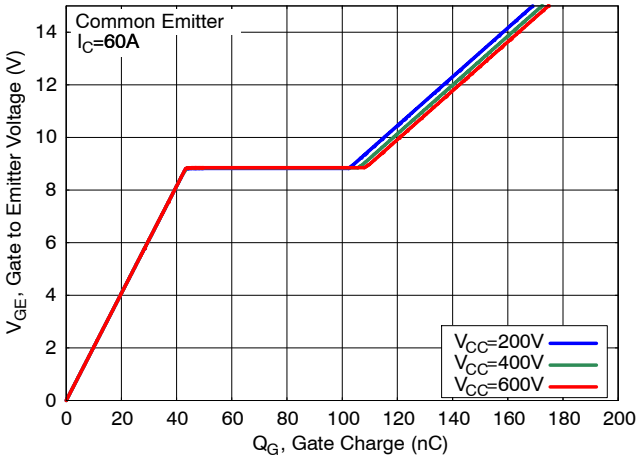


Figure 8. Gate Charge Characteristics

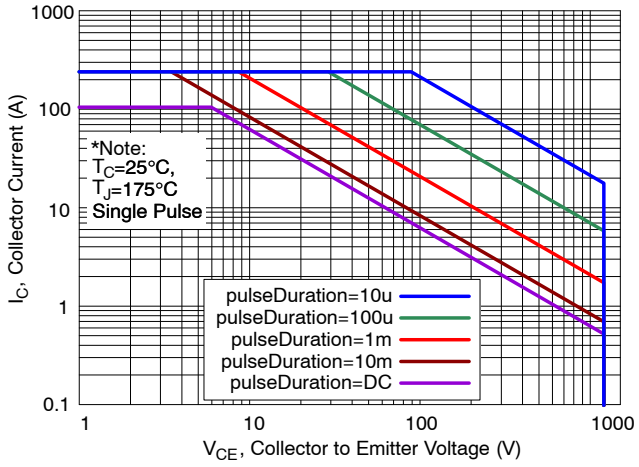


Figure 9. SOA Characteristics

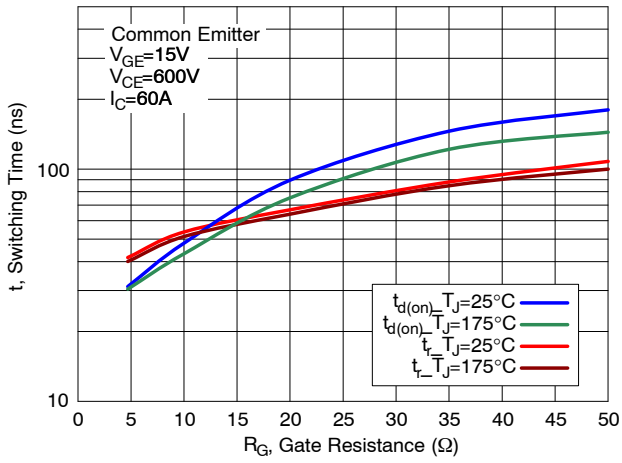


Figure 10. Turn−On Switching Time vs. Gate Resistance

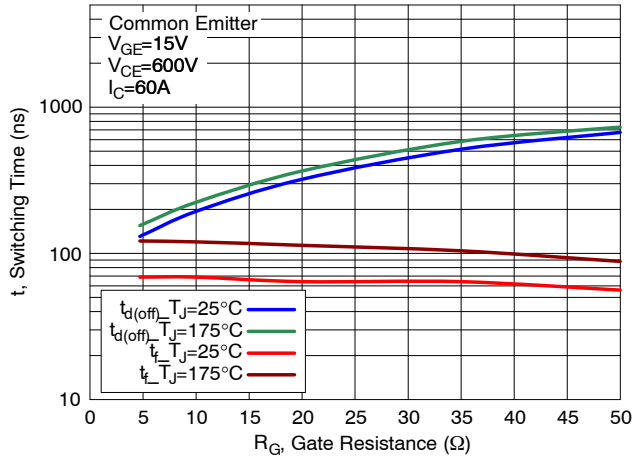


Figure 11. Turn−Off Switching Time vs. Gate Resistance

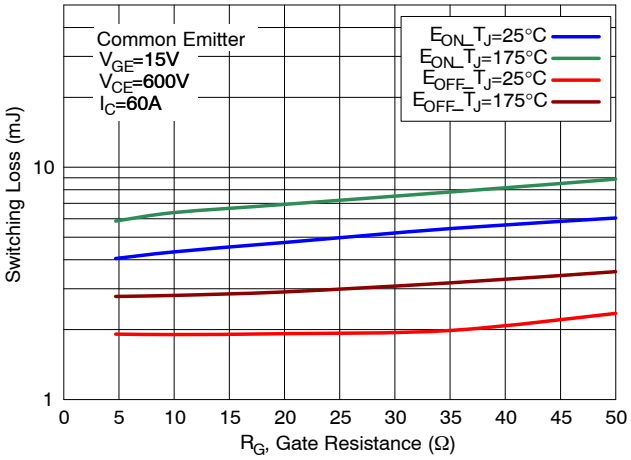


Figure 12. Switching Loss vs. Gate Resistance

TYPICAL CHARACTERISTICS

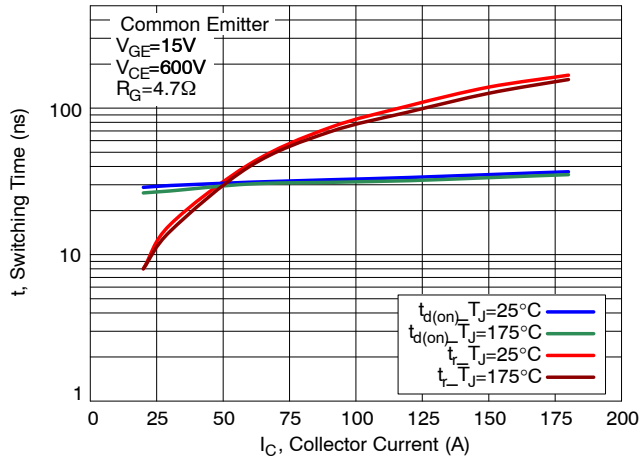


Figure 13. Turn−On Switching Time vs. Collector Current

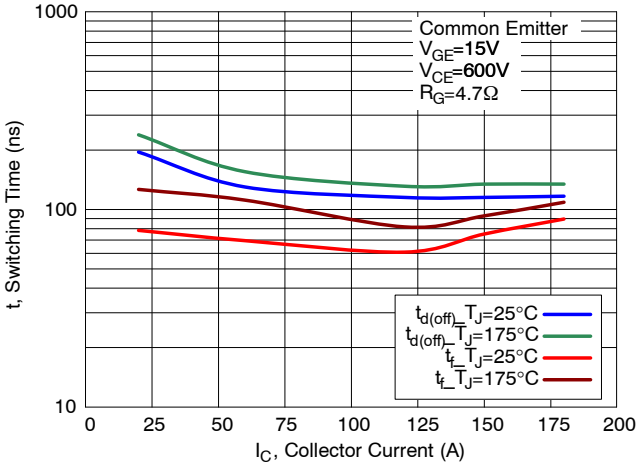


Figure 14. Turn−Off Switching Time vs. Collector Current

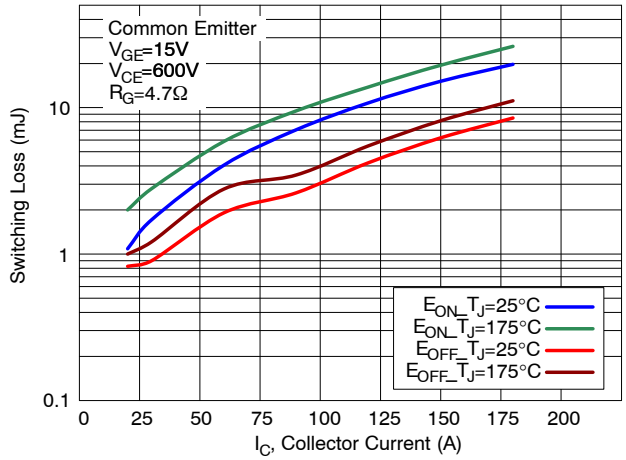


Figure 15. Switching Loss vs. Collector Current

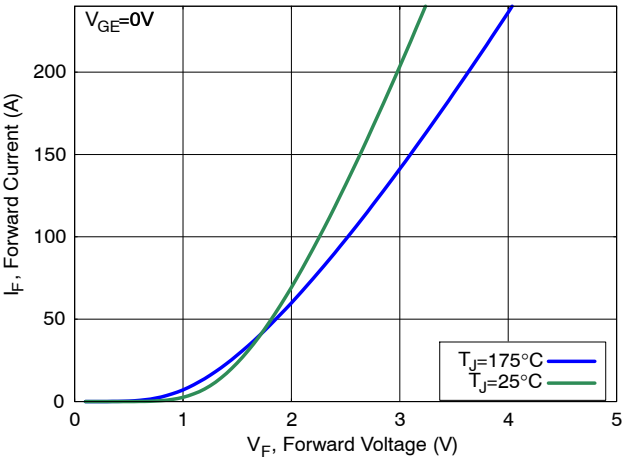


Figure 16. Diode Forward Characteristics

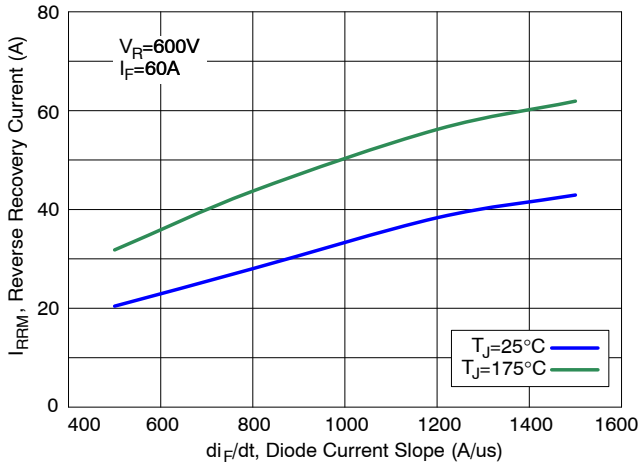


Figure 17. Diode Reverse Recovery Current

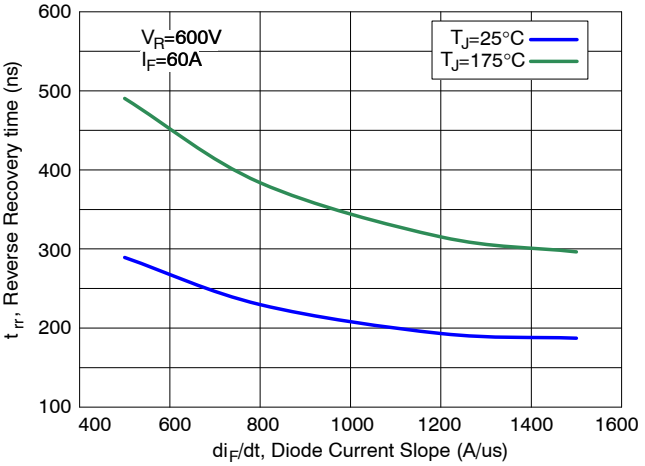


Figure 18. Diode Reverse Recovery Time

TYPICAL CHARACTERISTICS

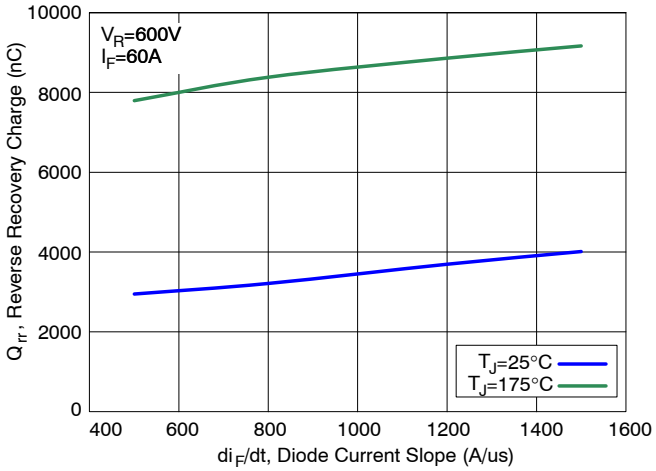


Figure 19. Diode Stored Charge Characteristics

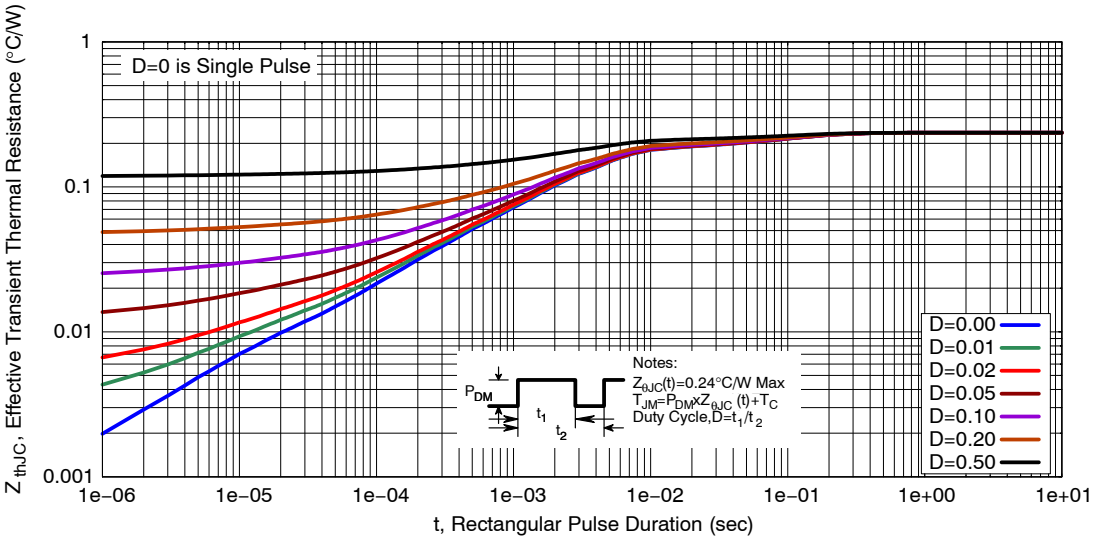


Figure 20. Transient Thermal Impedance of IGBT

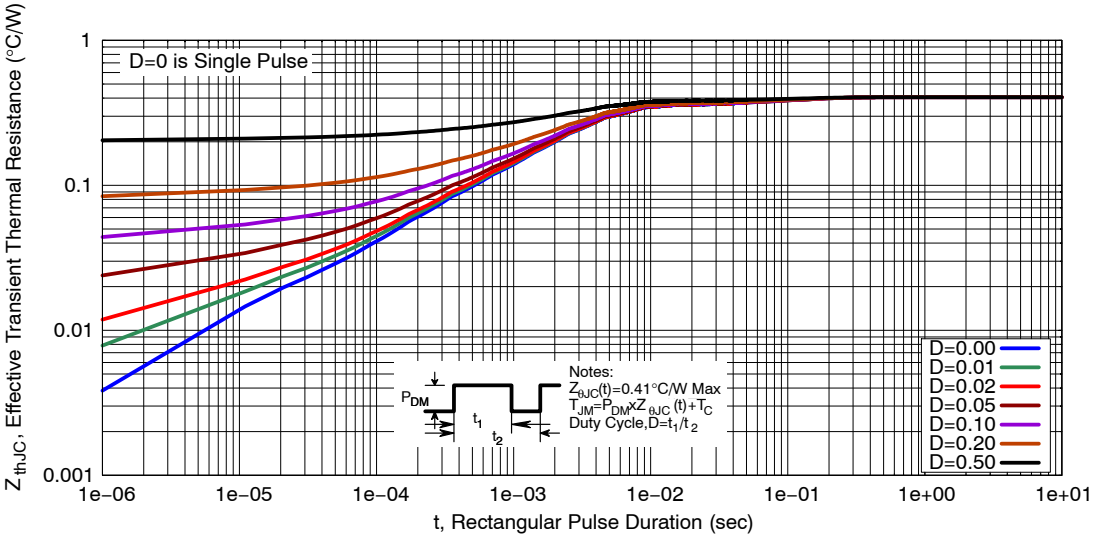


Figure 21. Transient Thermal Impedance of Diode

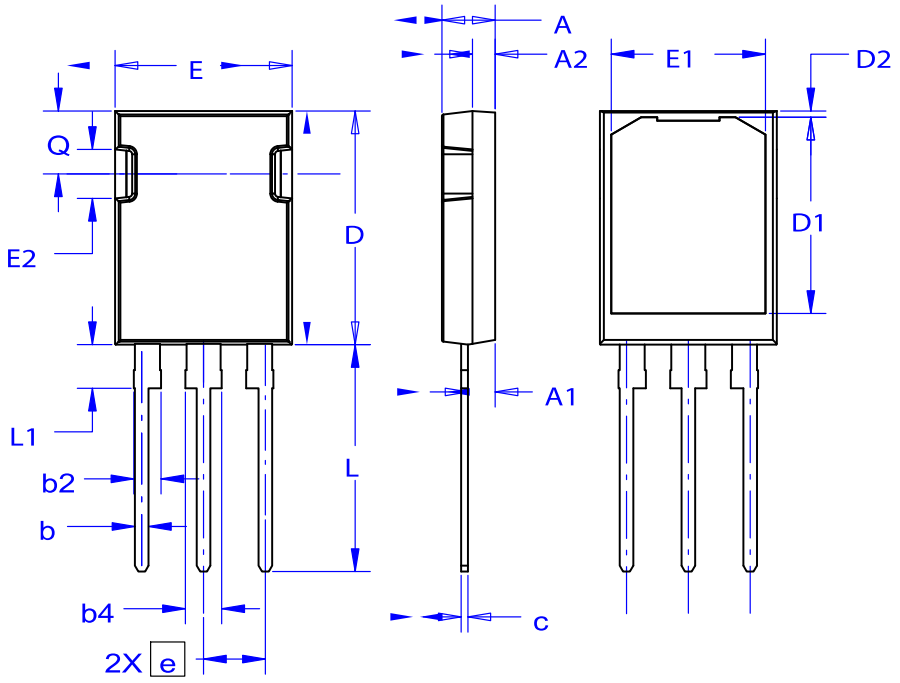
FGY60T120SWD

PACKAGE DIMENSIONS

TO−247−3LD
CASE 340CD
ISSUE A

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

PUBLICATION ORDERING INFORMATION

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