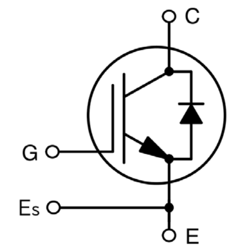
IGBT – Power, Co-PAK N-Channel, Field Stop VII (FS7), TO247-4L

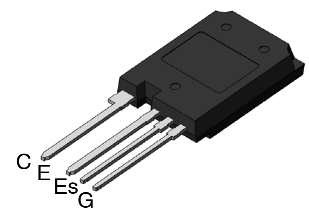
1200 V, 1.7 V, 100 A

FGY4L100T120SWD

BV_{CES}	$V_{CE(SAT)\_TYP}$	I_C
1200 V	1.7 V	100 A

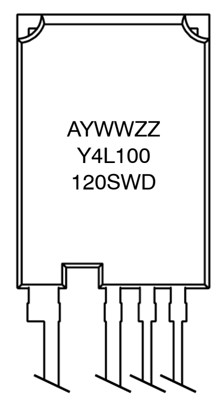
PIN CONNECTIONS





TO−247−4LD
CASE 340BW

MARKING DIAGRAM



A	=	Assembly Location
YWW	=	Date code (Year & week)
ZZ	=	Assembly Lot
Y4L100120SWD	=	Specific Device Code

Description

Using the novel field stop 7th generation IGBT technology and the Gen7 Diode in TO247 4−lead package, FGY4L100T120SWD offers the optimum performance with low switching and conduction losses for high−efficiency operations in various applications like Solar Inverter, 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

- Solar Inverter
- UPS
- Energy Storage System

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

Parameter		Symbol	Value	Unit
Collector−to−Emitter Voltage		V_{CE}	1200	V
Gate−to−Emitter Voltage		V_{GE}	±20	
Transient Gate−to−Emitter Voltage			±30	
Collector Current	T_C = 25°C (Note 1)	I_C	200	A
	T_C = 100°C		100	
Power Dissipation	T_C = 25°C	P_D	1071	W
	T_C = 100°C		536	
Pulsed Collector Current	T_C = 25°C, t_p = 10 μs (Note 2)	I_{CM}	400	A
Diode Forward Current	T_C = 25°C (Note 1)	I_F	200	
	T_C = 100°C		100	
Pulsed Diode Forward Current	T_C = 25°C, t_p = 10 μs (Note 2)	I_{FM}	400	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	−55 to +175	°C
Lead Temperature for Soldering Purposes		T_L	265	

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
FGY4L100T120SWD	TO−247−4LD (Pb−Free)	30 Units / Tube

March, 2024 − Rev. 2

Publication Order Number:
FGY4L100T120SWD/D

THERMAL CHARACTERISTICS

Parameter	Symbol	Value			Unit
		Min	Typ	Max	
Thermal Resistance, Junction−to−Case for IGBT	$R_{\theta JC}$	–	0.11	0.14	°C/W
Thermal Resistance, Junction−to−Case for Diode	$R_{\theta JCD}$	–	0.22	0.29	
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 = 1 mA	1200	–	–	V
Breakdown Voltage Temperature Coefficient	$\frac{\Delta BV_{CES}}{\Delta T_J}$	V_{GE} = 0 V, I_C = 9.99 mA	–	1220	–	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 = 100 mA	5.6	6.5	7.4	V
Collector−to−Emitter Saturation Voltage	$V_{CE(sat)}$	V_{GE} = 15 V, I_C = 100 A, T_J = 25°C	–	1.7	2.0	
		V_{GE} = 15 V, I_C = 100 A, T_J = 175°C	–	2.4	–	
DYNAMIC CHARACTERISTICS						
Input Capacitance	C_{ies}	V_{CE} = 30 V, V_{GE} = 0 V, f = 1 MHz	–	9640	–	pF
Output Capacitance	C_{oes}		–	287	–	
Reverse Transfer Capacitance	C_{res}		–	40.1	–	
Total Gate Charge	Q_g	V_{CE} = 600 V, V_{GE} = 15 V, I_C = 100 A	–	308	–	nC
Gate−to−Emitter Charge	Q_{ge}		–	86	–	
Gate−to−Collector Charge	Q_{gc}		–	110	–	
SWITCHING CHARACTERISTIC, INDUCTIVE LOAD						
Turn−on Delay Time	$t_{d(on)}$	V_{CE} = 600 V, V_{GE} = 15 V I_C = 50 A R_G = 7 Ω T_J = 25°C	–	56	–	ns
Rise Time	t_r		–	17.6	–	
Turn−off Delay Time	$t_{d(off)}$		–	272.4	–	
Fall Time	t_f		–	80	–	
Turn−on Switching Loss	E_{on}		–	1.7	–	mJ
Turn−off Switching Loss	E_{off}		–	1.9	–	
Total Switching Loss	E_{ts}		–	3.6	–	
Turn−on Delay Time	$t_{d(on)}$	V_{CE} = 600 V, V_{GE} = 15 V I_C = 100 A R_G = 7 Ω T_J = 25°C	–	59.2	–	ns
Rise Time	t_r		–	25.6	–	
Turn−off Delay Time	$t_{d(off)}$		–	232.4	–	
Fall Time	t_f		–	73.6	–	
Turn−on Switching Loss	E_{on}		–	2.8	–	mJ
Turn−off Switching Loss	E_{off}		–	3.5	–	
Total Switching Loss	E_{ts}		–	6.3	–	

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
SWITCHING CHARACTERISTIC, INDUCTIVE LOAD						
Turn−on Delay Time	$t_{d(on)}$	V_{CE} = 600 V, V_{GE} = 15 V I_C = 50 A R_G = 7 Ω T_J = 175°C	–	44.8	–	ns
Rise Time	t_r		–	22.4	–	
Turn−off Delay Time	$t_{d(off)}$		–	324.8	–	
Fall Time	t_f		–	147.2	–	
Turn−on Switching Loss	E_{on}		–	3.6	–	mJ
Turn−off Switching Loss	E_{off}		–	3.1	–	
Total Switching Loss	E_{ts}		–	6.7	–	
Turn−on Delay Time	$t_{d(on)}$	V_{CE} = 600 V, V_{GE} = 15 V I_C = 100 A R_G = 7 Ω T_J = 175°C	–	49.6	–	ns
Rise Time	t_r		–	32	–	
Turn−off Delay Time	$t_{d(off)}$		–	276.8	–	
Fall Time	t_f		–	128	–	
Turn−on Switching Loss	E_{on}		–	6.1	–	mJ
Turn−off Switching Loss	E_{off}		–	5.1	–	
Total Switching Loss	E_{ts}		–	11.2	–	
DIODE CHARACTERISTICS						
Forward Voltage	V_F	I_F = 100 A, T_J = 25°C	1.74	2.04	2.34	V
		I_F = 100 A, T_J = 175°C	–	2.2	–	
DIODE SWITCHING CHARACTERISTICS, INDUCTIVE LOAD						
Reverse Recovery Time	t_{rr}	V_R = 600 V, I_F = 50 A, dI_F/dt = 1000 A/μs, T_J = 25°C	–	167.2	–	ns
Reverse Recovery Charge	Q_{rr}		–	3.2	–	μC
Reverse Recovery Energy	E_{REC}		–	1.0	–	mJ
Peak Reverse Recovery Current	I_{RRM}		–	38.7	–	A
Reverse Recovery Time	t_{rr}	V_R = 600 V, I_F = 100 A, dI_F/dt = 1000 A/μs, T_J = 25°C	–	249.4	–	ns
Reverse Recovery Charge	Q_{rr}		–	5.5	–	μC
Reverse Recovery Energy	E_{REC}		–	1.8	–	mJ
Peak Reverse Recovery Current	I_{RRM}		–	43.8	–	A
Reverse Recovery Time	t_{rr}	V_R = 600 V, I_F = 50 A, dI_F/dt = 1000 A/μs, T_J = 175°C	–	281.4	–	ns
Reverse Recovery Charge	Q_{rr}		–	7.8	–	μC
Reverse Recovery Energy	E_{REC}		–	2.8	–	mJ
Peak Reverse Recovery Current	I_{RRM}		–	55.5	–	A
Reverse Recovery Time	t_{rr}	V_R = 600 V, I_F = 100 A, dI_F/dt = 1000 A/μs, T_J = 175°C	–	413.4	–	ns
Reverse Recovery Charge	Q_{rr}		–	12.2	–	μC
Reverse Recovery Energy	E_{REC}		–	4.5	–	mJ
Peak Reverse Recovery Current	I_{RRM}		–	58.9	–	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

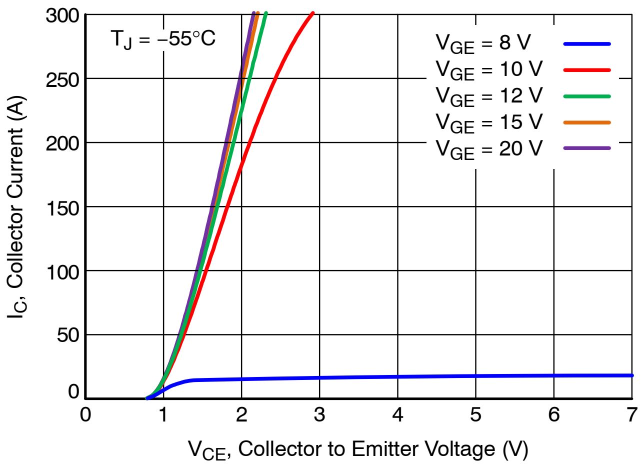


Figure 1. Output Characteristics

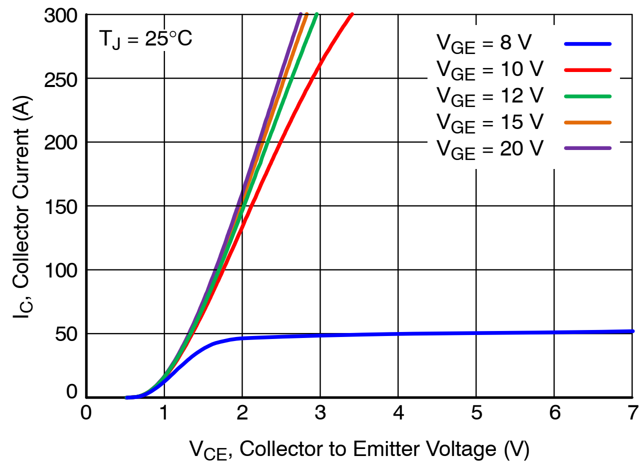


Figure 2. Output Characteristics

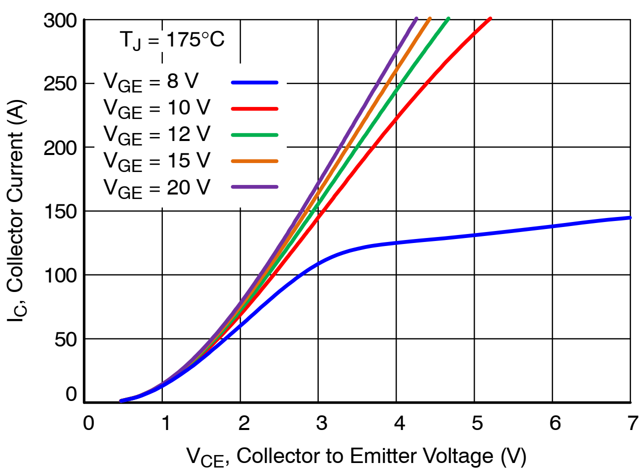


Figure 3. Output Characteristics

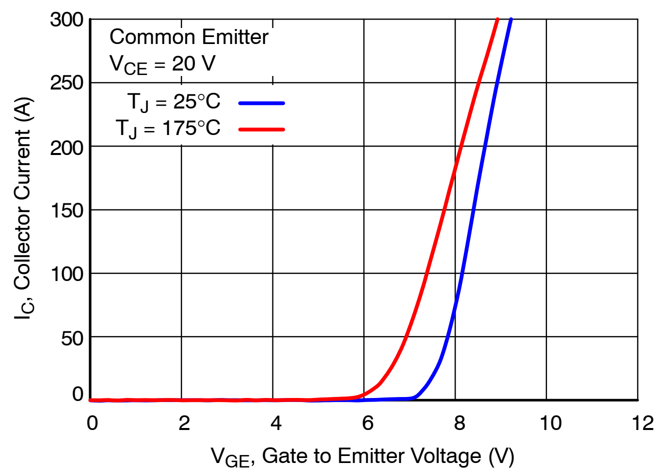


Figure 4. Transfer Characteristics

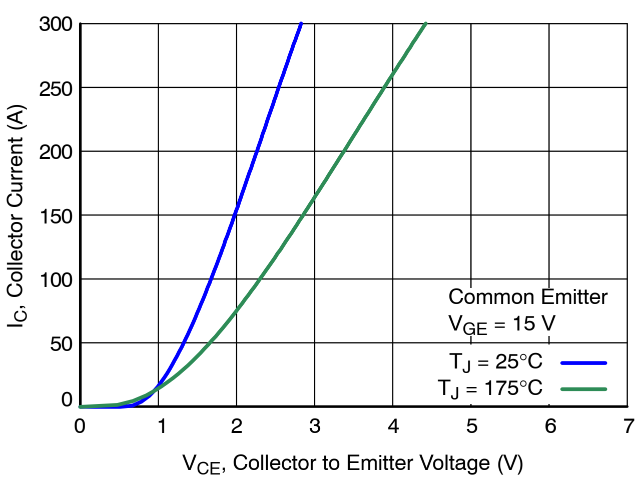


Figure 5. Saturation Characteristics

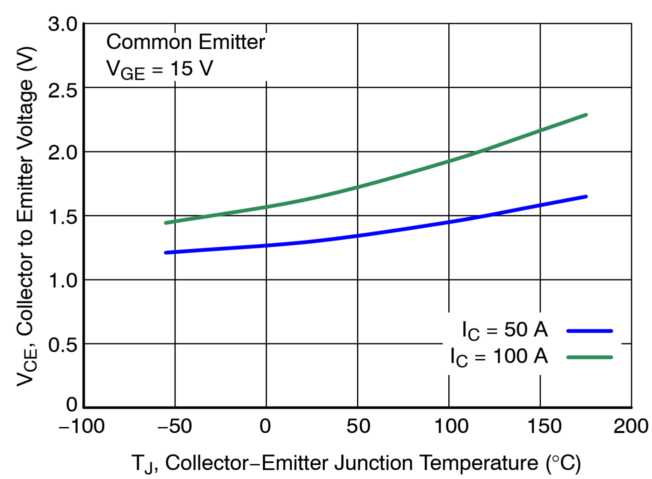


Figure 6. Saturation Voltage vs. Junction Temperature

TYPICAL CHARACTERISTICS

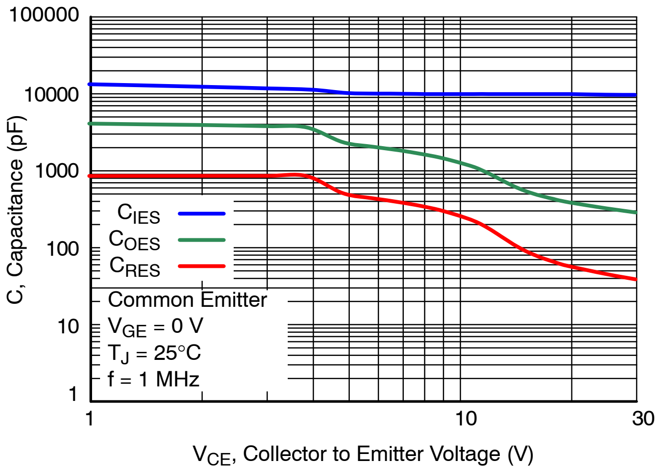


Figure 7. Capacitance Characteristics

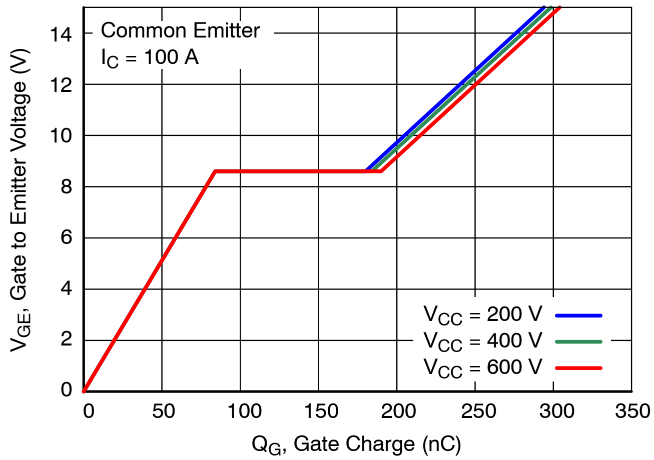


Figure 8. Gate Charge Characteristics

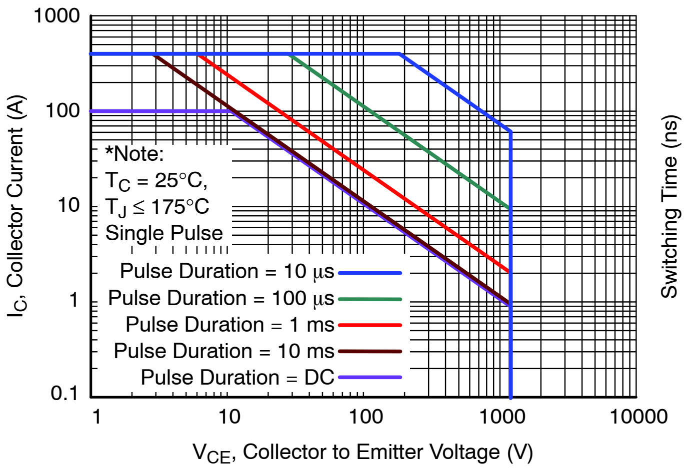


Figure 9. SOA Characteristics

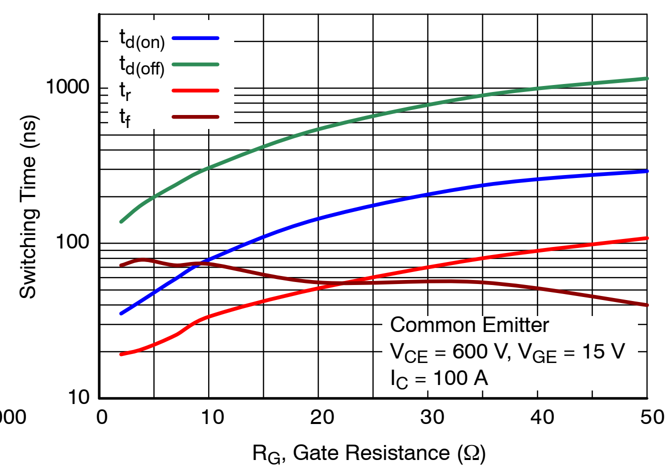


Figure 10. Switching Time vs. Gate Resistance (T_J = 25°C)

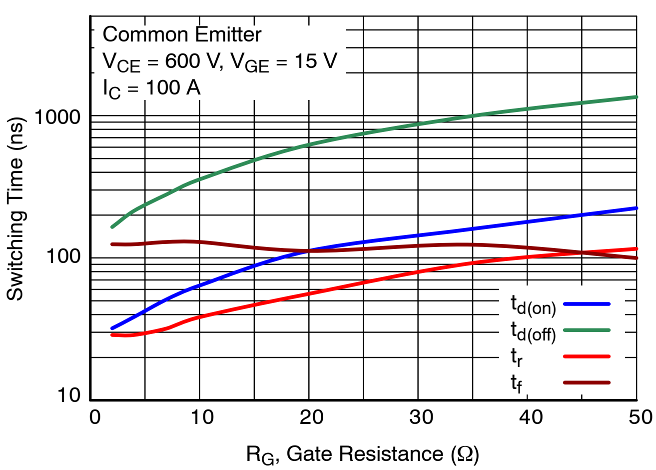


Figure 11. Switching Time vs. Gate Resistance (T_J = 175°C)

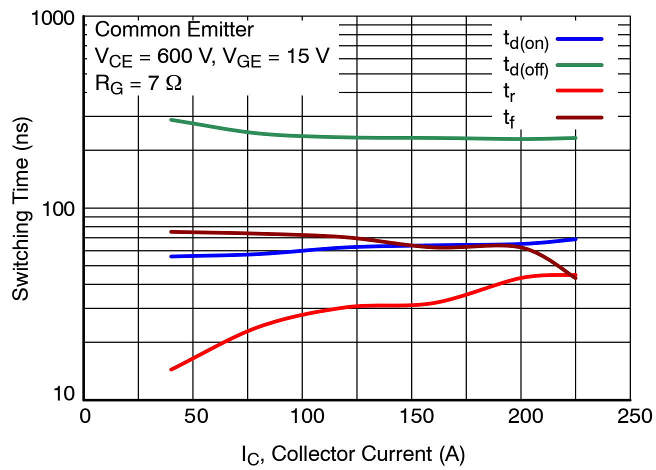


Figure 12. Switching Time vs. Collector Current (T_J = 25°C)

TYPICAL CHARACTERISTICS

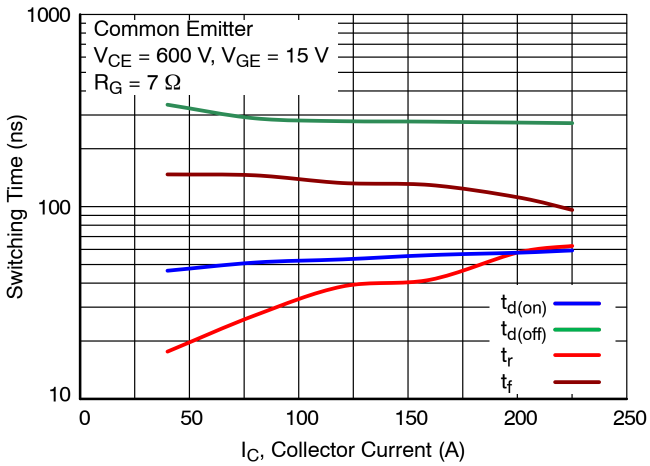


Figure 13. Switching Time vs. Collector Current (T_J = 175°C)

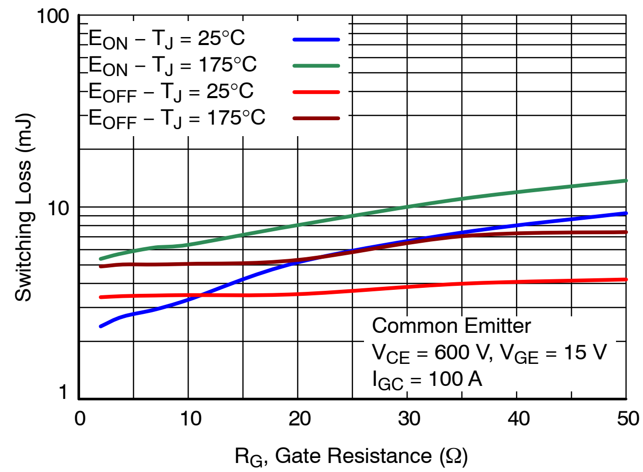


Figure 14. Switching Loss vs Gate Resistance

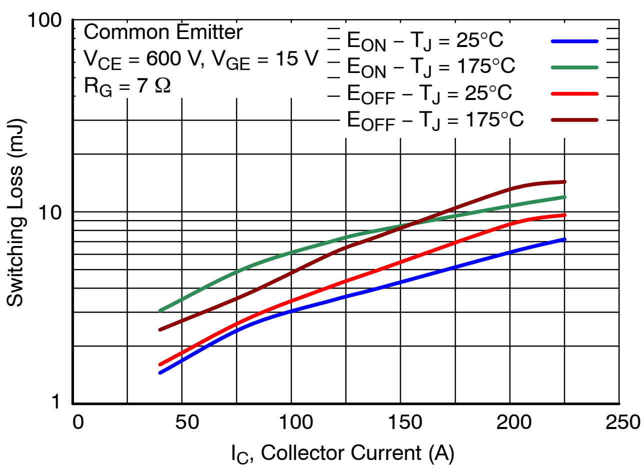


Figure 15. Switching Loss vs. Collector Current

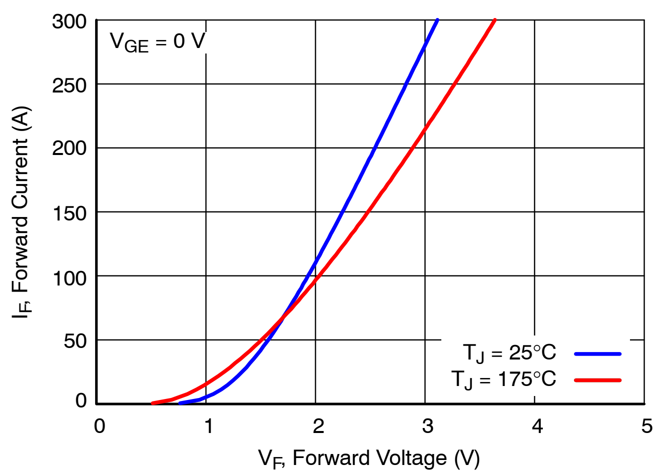


Figure 16. Diode Forward Characteristics

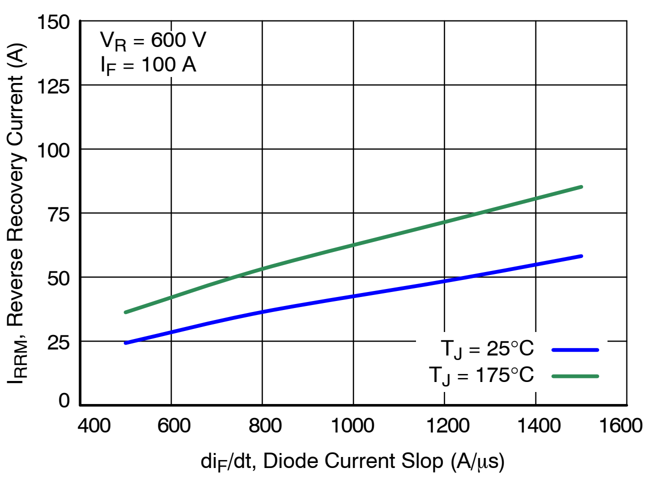


Figure 17. Diode Reverse Recovery Current

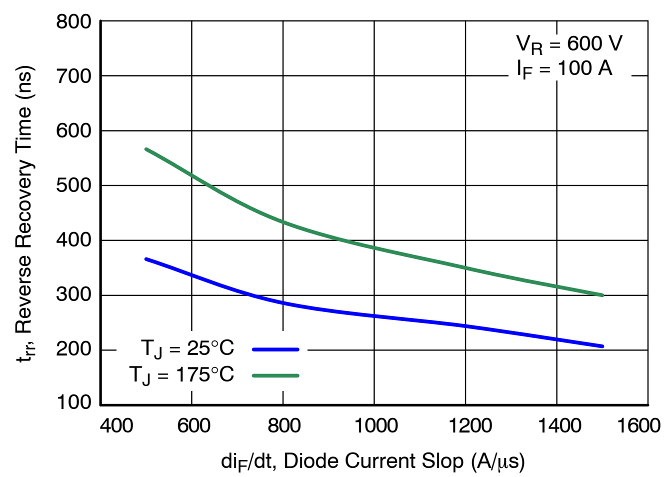


Figure 18. Diode Reverse Recovery Time

TYPICAL CHARACTERISTICS

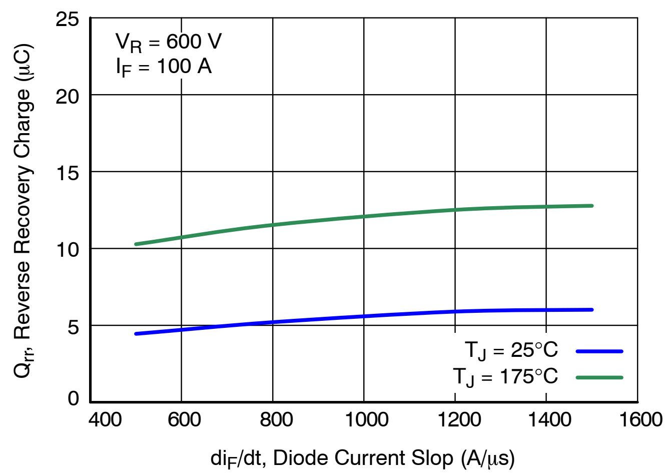
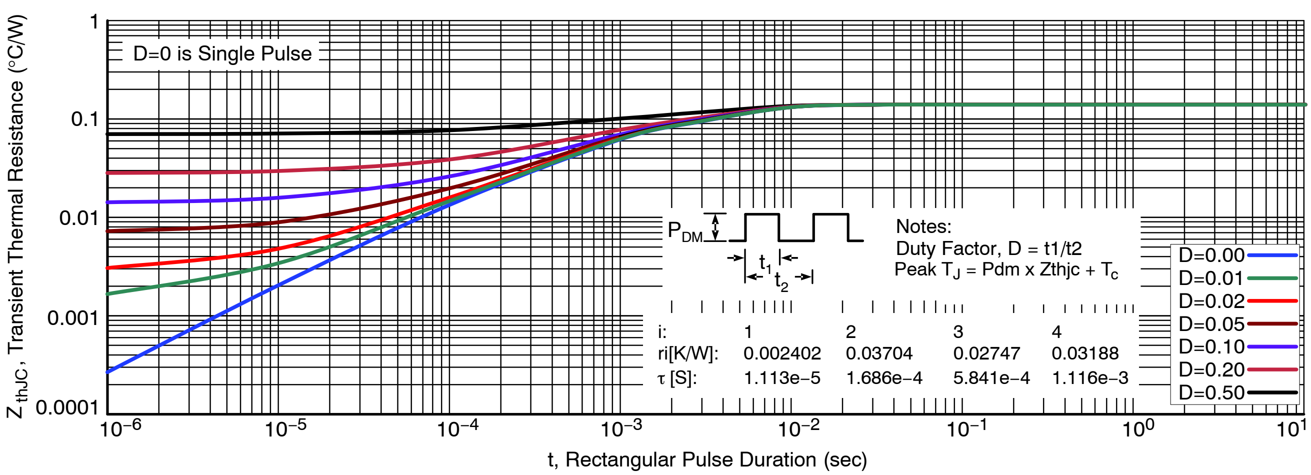
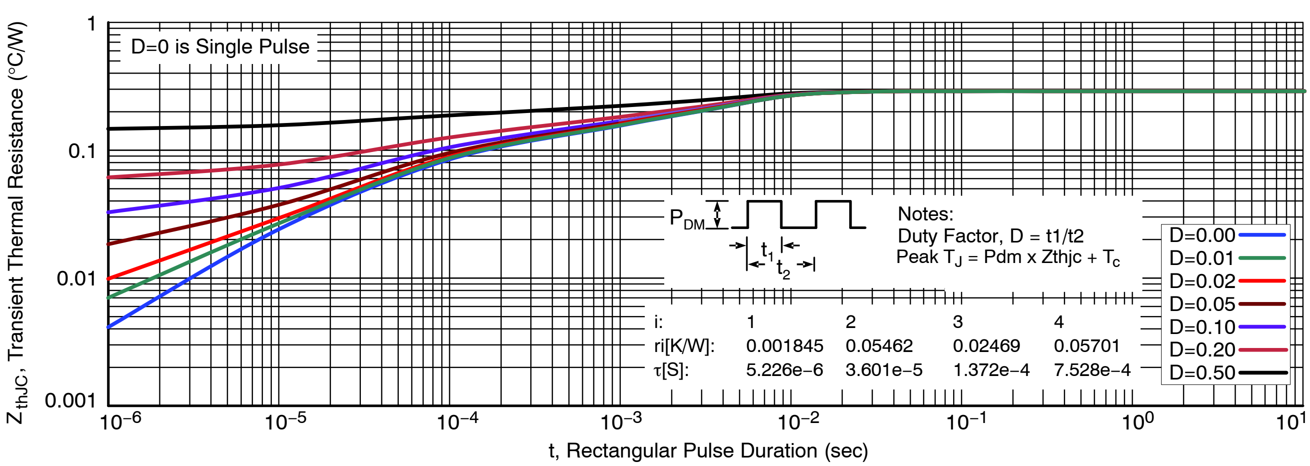


Figure 19. Diode Stored Charge



i:	1	2	3	4
ri[K/W]:	0.002402	0.03704	0.02747	0.03188
τ [S]:	1.113e−5	1.686e−4	5.841e−4	1.116e−3

Figure 20. Max Transient Thermal Impedance of IGBT

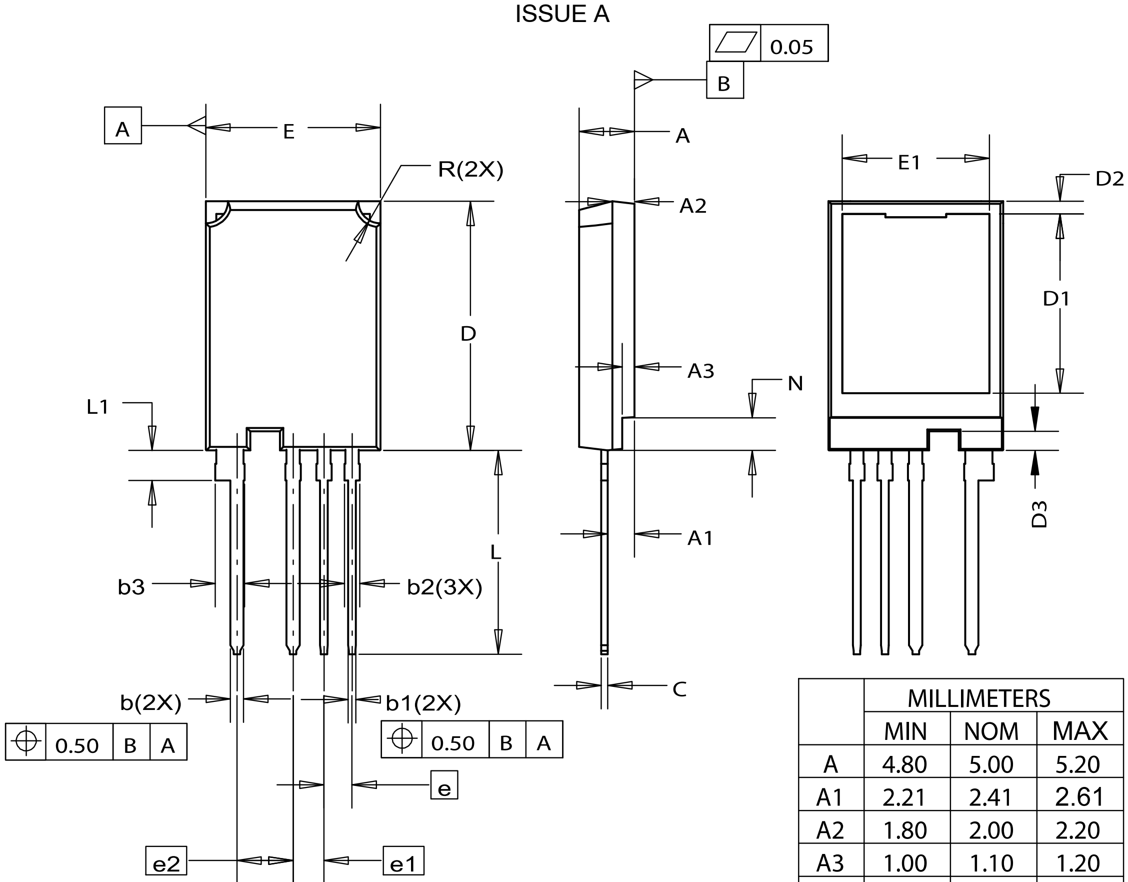


i:	1	2	3	4
ri[K/W]:	0.001845	0.05462	0.02469	0.05701
τ[S]:	5.226e−6	3.601e−5	1.372e−4	7.528e−4

Figure 21. Max Transient Thermal Impedance of Diode

PACKAGE DIMENSIONS

TO−247−PLUS−4L 15.80x22.54x5.00, 2.54P
CASE 340BW
ISSUE A



	MILLIMETERS		
	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.21	2.41	2.61
A2	1.80	2.00	2.20
A3	1.00	1.10	1.20
b	1.07	1.20	1.33
b1	0.57	0.70	0.83
b2	1.20	1.40	1.60
b3	2.47	2.67	2.87
c	0.50	0.60	0.70
D	22.34	22.54	22.74
D1	16.00	16.20	16.40
D2	0.96	1.16	1.36
D3	1.52	1.72	1.92
e	2.54BSC		
e1	2.79BSC		
e2	5.08BSC		
E	15.60	15.80	16.00
E1	13.10	13.30	13.50
L	18.12	18.42	18.72
L1	2.52	2.72	2.92
R	1.90	2.00	2.10
N	2.75	2.95	3.15

NOTES:
A. NO INDUSTRY STANDARDS APPLIES TO THIS PACKAGE.
B. ALL DIMENSIONS ARE IN MILLIMETERS.
C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS.
D. DRAWING CONFORMS TO ASME Y14.5-2009.

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:
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