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

1200 V, 1.7 V, 40 A

Product Preview

FGH4L40T120SWD

Using the novel field stop 7th generation IGBT technology and the Gen7 Diode in TO247 4−lead package, FGH4L40T120SWD device 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

Typical Applications

- Boost and Inverter in Solar System
- 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	80	A
	T_C = 100°C		40	
Power Dissipation	T_C = 25°C	P_D	384	W
	T_C = 100°C		192	
Pulsed Collector Current	T_C = 25°C, t_p = 10 μs	I_{CM}	160	A
Diode Forward Current	T_C = 25°C (Note 1)	I_F	80	
	T_C = 100°C		40	
Pulsed Diode Maximum Forward Current	T_C = 25°C (Note 2), t_p = 10 μs	I_{FM}	160	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	−55 to +175	°C
Lead Temperature for Soldering Purposes		T_L	260	

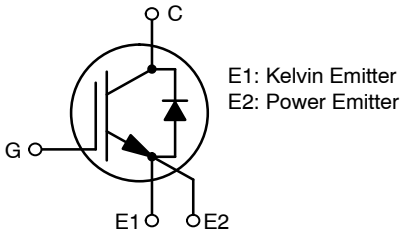
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

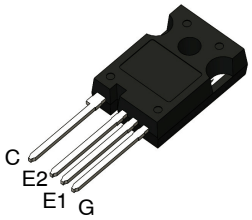
1. Value limit by bond wire
2. Repetitive rating − Pulse width limited by max. junction temperature

This document contains information on a product under development. **onsemi** reserves the right to change or discontinue this product without notice.

BV_{CES}	$V_{CE(SAT)}$ TYP	I_C MAX
1200 V	1.7 V	40 A

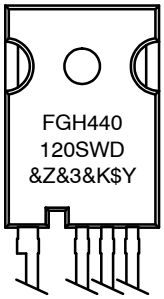
COPACK IGBT





TO−247−4LD
CASE 340CJ

MARKING DIAGRAM



FGH440120SWD	= Specific Device Code
$Y	= **onsemi** Logo
&Z	= Assembly Plant Code
&3	= 3−Digit Date Code
&K	= 2−Digit Lot Traceability Code

ORDERING INFORMATION

Device	Package	Shipping
FGH4L40T120SWD	TO−247−4L (Pb−Free)	30 Units / Rail

THERMAL CHARACTERISTICS

Parameter	Symbol	Value	Unit
Thermal Resistance Junction−to−Case for IGBT	$R_{\theta JC}$	0.39	°C/W
Thermal Resistance Junction−to−Case for Diode	$R_{\theta JCD}$	0.72	
Thermal Resistance Junction−to−Ambient	$R_{\theta JA}$	40	

ELECTRICAL CHARACTERISTICS OF IGBT

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
Collector−to−Emitter Breakdown Voltage Temperature Coefficient	$\Delta BV_{CES}/\Delta T_J$	V_{GE} = 0 V, I_C = 1 mA		1225		mV/°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 = 40 mA	5.78	6.55	7.35	V
Collector−to−Emitter Saturation Voltage	$V_{CE(sat)}$	V_{CE} = 15 V, I_C = 40 A, T_J = 25°C	1.45	1.65	1.98	
		V_{CE} = 15 V, I_C = 40 A, T_J = 175°C		2.3		
DYNAMIC CHARACTERISTICS						
Input Capacitance	C_{IES}	V_{CE} = 30 V, V_{GE} = 0 V, f = 1 MHz		3301		pF
Output Capacitance	C_{OES}			137		
Reverse Transfer Capacitance	C_{RES}			15.8		
Total Gate Charge	Q_G	V_{CE} = 600 V, I_C = 40 A, V_{GE} = 20 V		148		nC
Gate−to−Emitter Charge	Q_{GE}			28.2		
Gate−to−Collector Charge	Q_{GC}			46.4		
SWITCHING CHARACTERISTICS						
Turn−On Delay Time	$t_{d(on)}$	V_{GE} = 0/15 V, I_C = 20 A, V_{CE} = 600 V, R_G = 4.7 Ω, T_J = 25°C		22.6		ns
Turn−Off Delay Time	$t_{d(off)}$			168.6		
Rise Time	t_r			10.4		
Fall Time	t_f			85.2		
Turn−On Switching Loss	E_{ON}			0.93		mJ
Turn−Off Switching Loss	E_{OFF}			0.76		
Total Switching Loss	E_{ts}			1.69		
Turn−On Delay Time	$t_{d(on)}$	V_{GE} = 0/15 V, I_C = 40 A, V_{CE} = 600 V, R_G = 4.7 Ω, T_J = 25°C		26.8		ns
Turn−Off Delay Time	$t_{d(off)}$			121.6		
Rise Time	t_r			16.4		
Fall Time	t_f			73.2		
Turn−On Switching Loss	E_{ON}			1.52		mJ
Turn−Off Switching Loss	E_{OFF}			1.13		
Total Switching Loss	E_{ts}			2.65		

ELECTRICAL CHARACTERISTICS OF IGBT

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
SWITCHING CHARACTERISTICS						
Turn−On Delay Time	$t_{d(on)}$	V_{GE} = 0/15 V, I_C = 20 A, V_{CE} = 600 V, R_G = 4.7 Ω, T_J = 175°C		22		ns
Turn−Off Delay Time	$t_{d(off)}$			196.8		
Rise Time	t_r			12.4		
Fall Time	t_f			139.6		
Turn−On Switching Loss	E_{ON}			1.38		mJ
Turn−Off Switching Loss	E_{OFF}			1.14		
Total Switching Loss	E_{ts}			2.52		
Turn−On Delay Time	$t_{d(on)}$	V_{GE} = 0/15 V, I_C = 40 A, V_{CE} = 600 V, R_G = 4.7 Ω, T_J = 175°C		24		ns
Turn−Off Delay Time	$t_{d(off)}$			141		
Rise Time	t_r			24		
Fall Time	t_f			107		
Turn−On Switching Loss	E_{ON}			2.33		mJ
Turn−Off Switching Loss	E_{OFF}			1.45		
Total Switching Loss	E_{ts}			3.78		
DIODE CHARACTERISTICS						
Forward Voltage	V_F	I_F = 40 A, T_J = 25°C	1.62	1.94	2.2	V
		I_F = 40 A, T_J = 175°C		1.93		
DIODE SWITCHING CHARACTERISTIC, INDUCTIVE LOAD						
Reverse Recovery Time	T_{RR}	I_F = 20 A, dI_F/dt = 1000 A/μs V_R = 600 V, T_J = 25°C		116.68		nS
Reverse Recovery Charge	Q_{RR}			1291.71		nC
Reverse Recovery Energy	E_{REC}			0.38		mJ
Peak Reverse Recovery Current	I_{RRM}			26.2		A
Reverse Recovery Time	T_{RR}	I_F = 40 A, dI_F/dt = 1000 A/μs V_R = 600 V, T_J = 25°C		192.54		nS
Reverse Recovery Charge	Q_{RR}			2148.07		nC
Reverse Recovery Energy	E_{REC}			0.74		mJ
Peak Reverse Recovery Current	I_{RRM}			28.2		A
Reverse Recovery Time	T_{RR}	I_F = 20 A, dI_F/dt = 1000 A/μs V_R = 600 V, T_J = 175°C		238.9		nS
Reverse Recovery Charge	Q_{RR}			3472.74		nC
Reverse Recovery Energy	E_{REC}			1.35		mJ
Peak Reverse Recovery Current	I_{RRM}			37.8		A
Reverse Recovery Time	T_{RR}	I_F = 40 A, dI_F/dt = 1000 A/μs V_R = 600 V, T_J = 175°C		287.47		nS
Reverse Recovery Charge	Q_{RR}			4775.4		nC
Reverse Recovery Energy	E_{REC}			1.92		mJ
Peak Reverse Recovery Current	I_{RRM}			42.4		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

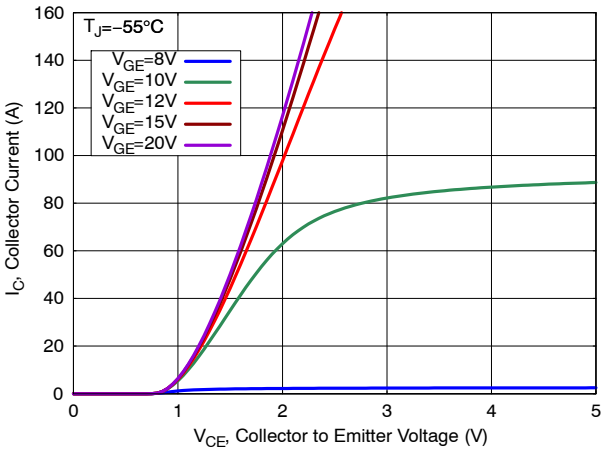


Figure 1. Output Characteristics

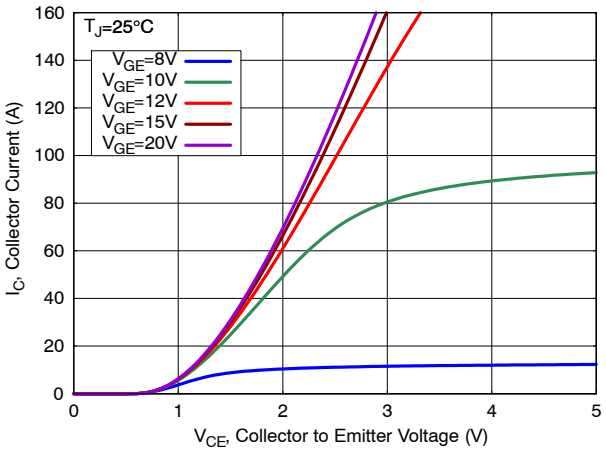


Figure 2. Output Characteristics

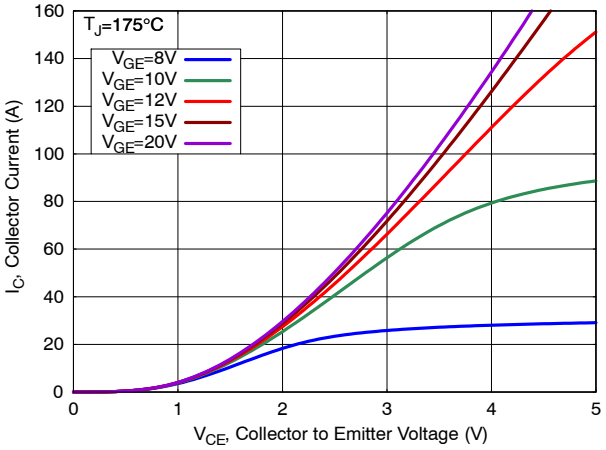


Figure 3. Output Characteristics

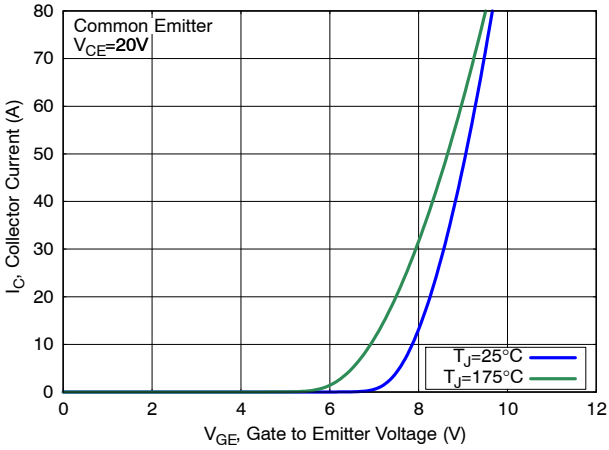


Figure 4. Transfer Characteristics

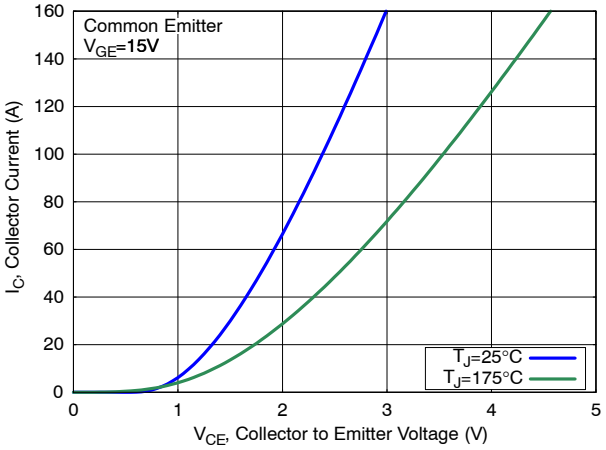


Figure 5. Saturation Characteristics

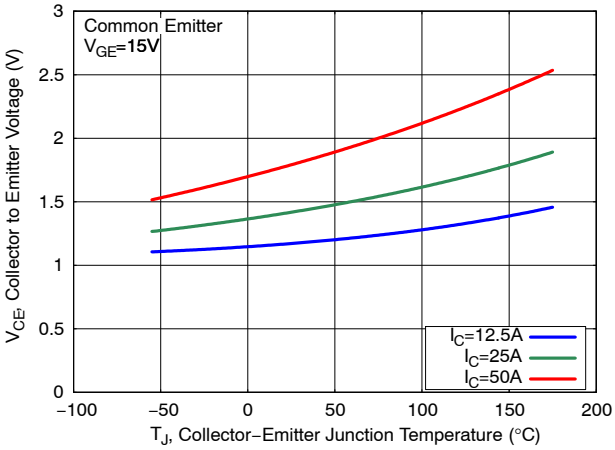


Figure 6. Saturation Voltage vs. Junction Temperature

TYPICAL CHARACTERISTICS

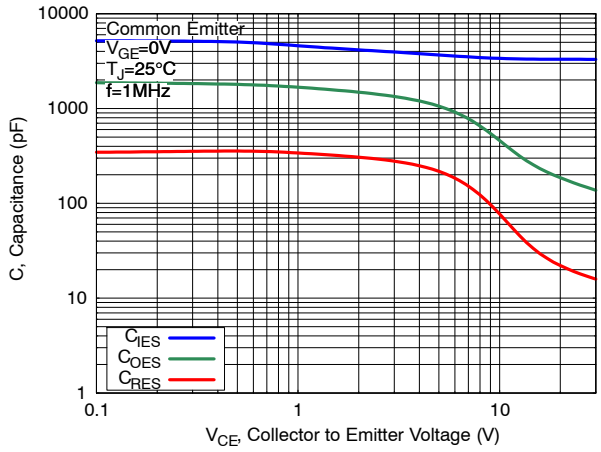


Figure 7. Capacitance Characteristics

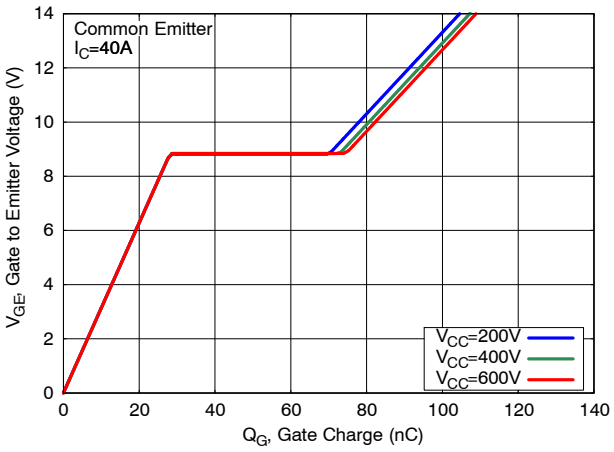


Figure 8. Gate Charge Characteristics

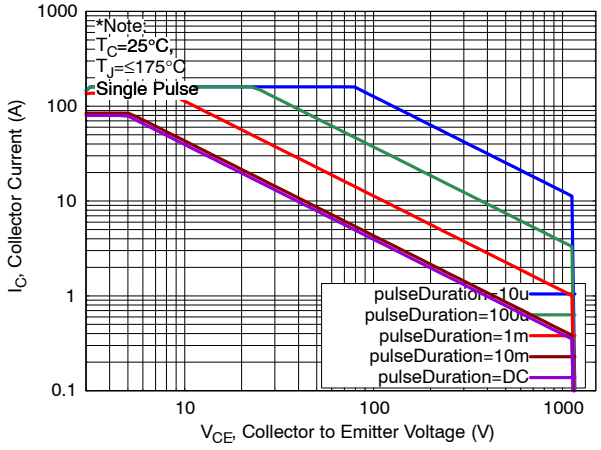


Figure 9. SOA Characteristics

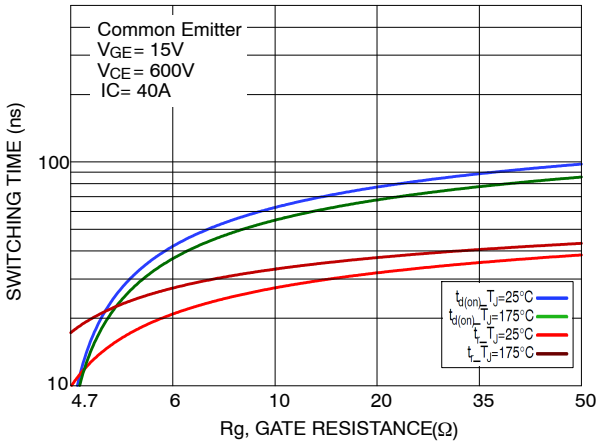


Figure 10. Turn−On Switching Time vs. Gate Resistance

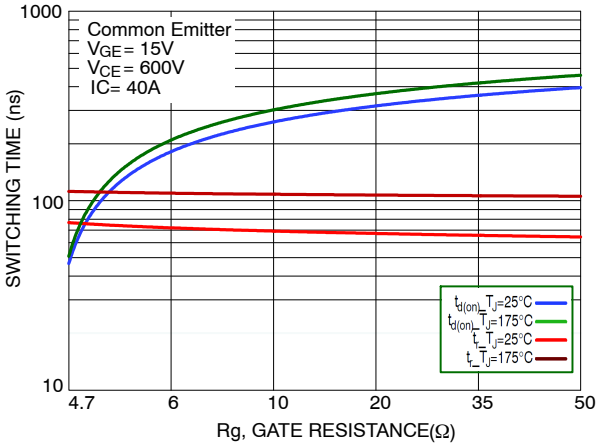


Figure 11. Turn−Off Switching Time vs. Gate Resistance

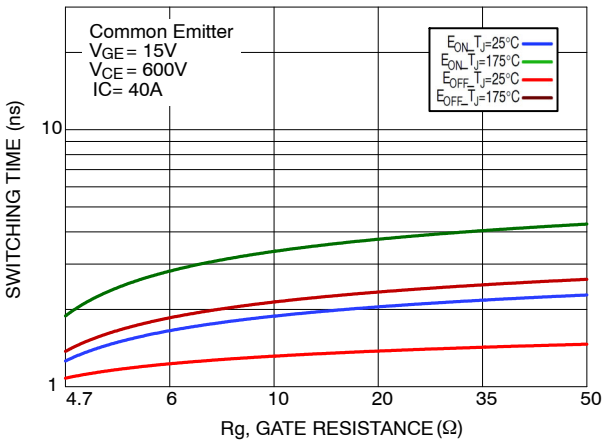


Figure 12. Switching Loss vs. Gate Resistance

TYPICAL CHARACTERISTICS

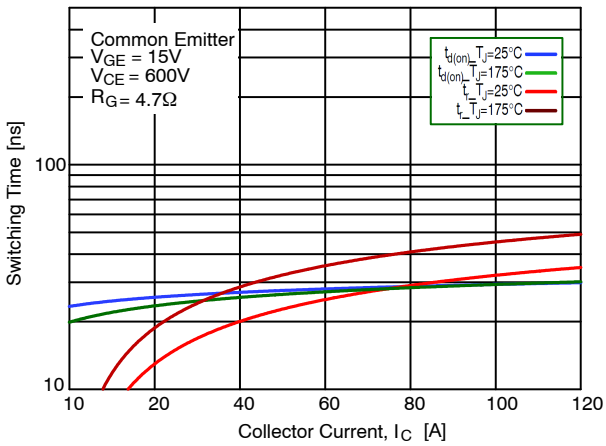


Figure 13. Turn−On Switching Time vs. Collector Current

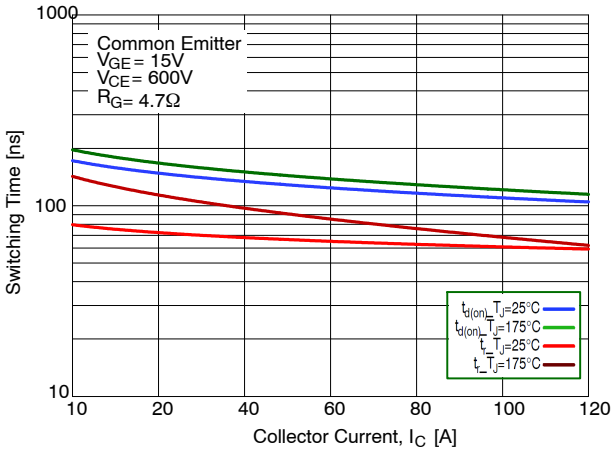


Figure 14. Turn−Off Switching Time vs. Collector Current

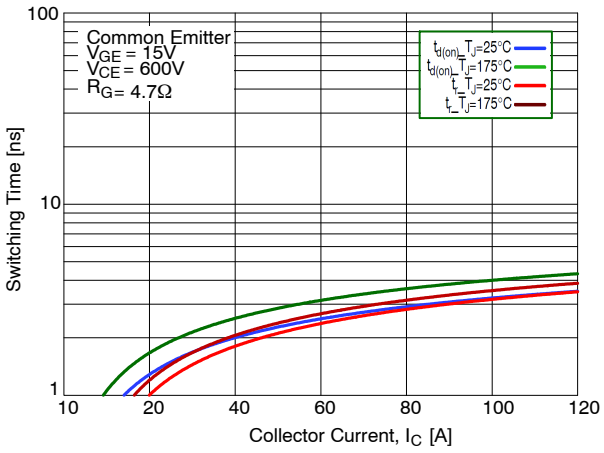


Figure 15. Switching Loss vs. Collector Current

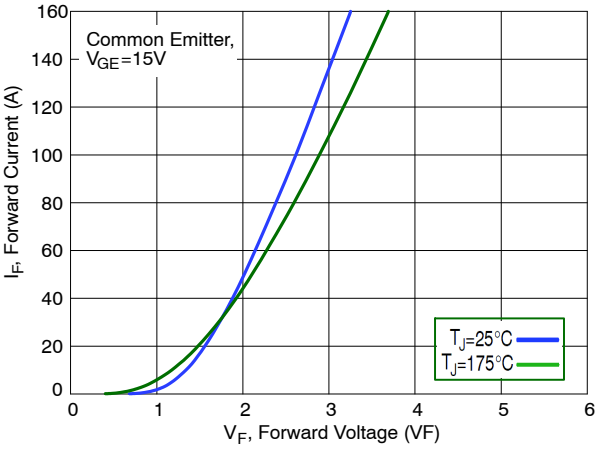


Figure 16. Diode Forward Characteristics

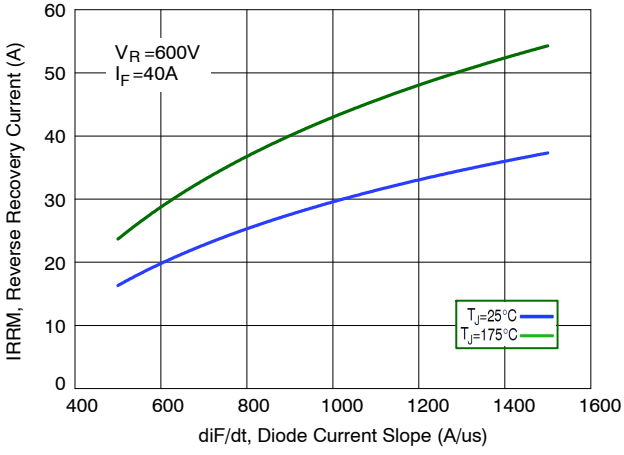


Figure 17. Diode Reverse Recovery Current

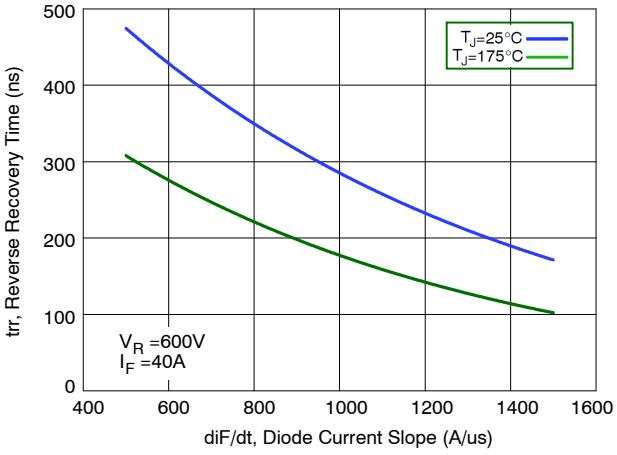


Figure 18. Diode Reverse Recovery Time

TYPICAL CHARACTERISTICS

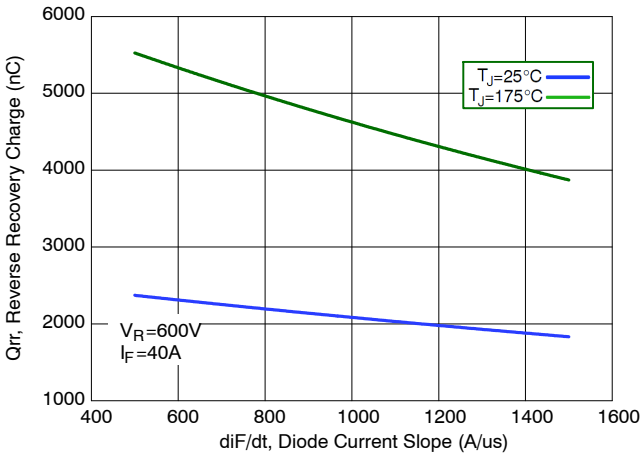


Figure 19. Diode Stored Charge Characteristics

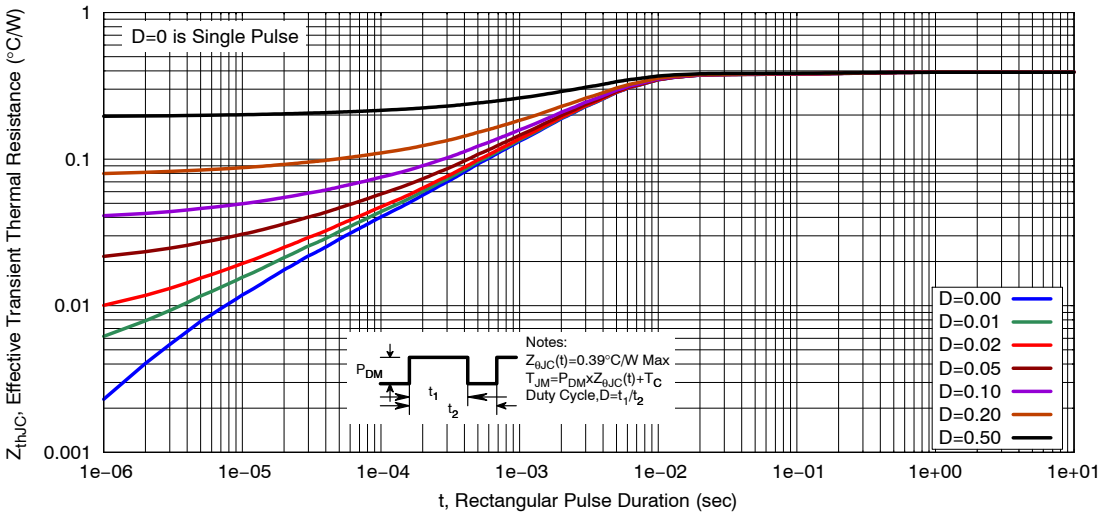


Figure 20. Transient Thermal Impedance of IGBT

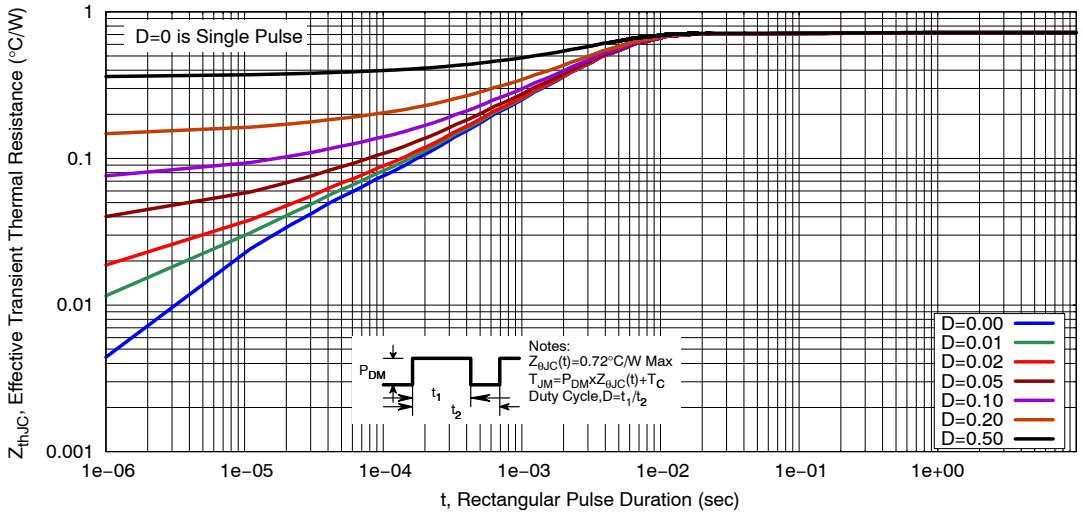
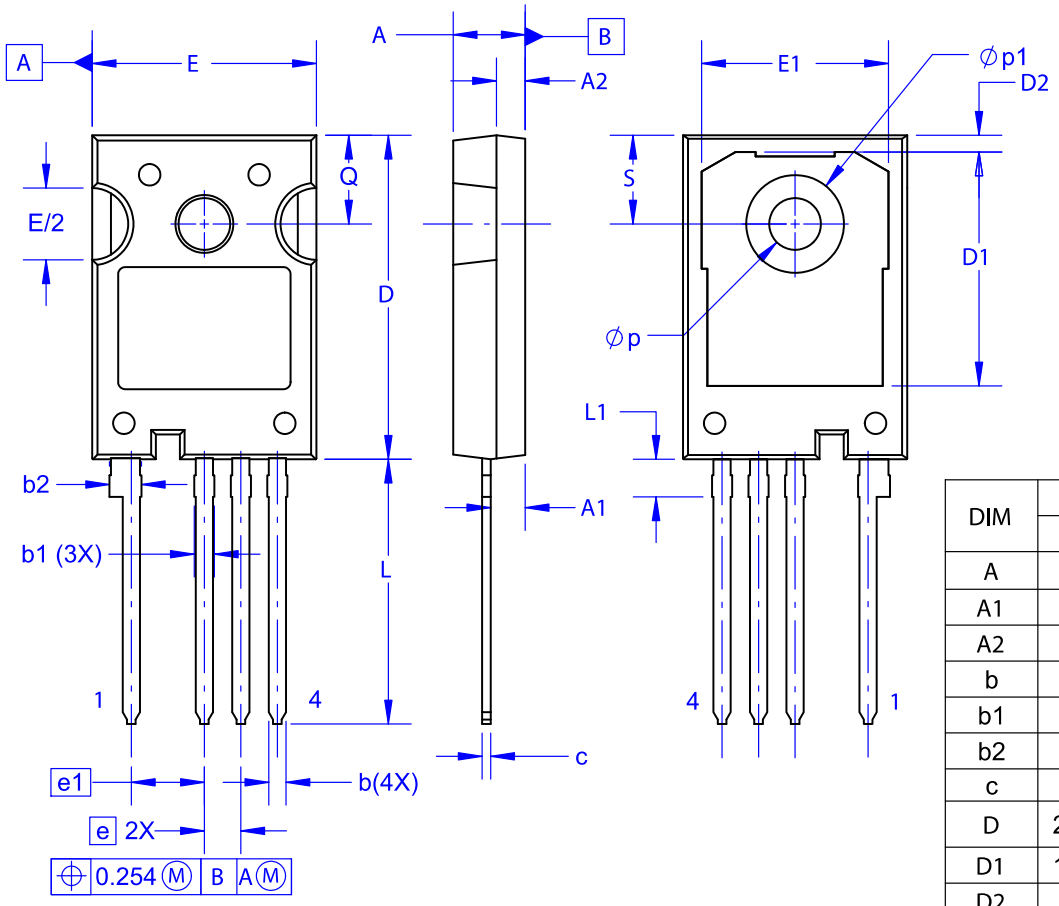


Figure 21. Transient Thermal Impedance of Diode

PACKAGE DIMENSIONS

TO−247−4LD
CASE 340CJ
ISSUE A



NOTES:

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

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.10	2.40	2.70
A2	1.80	2.00	2.20
b	1.07	1.20	1.33
b1	1.20	1.40	1.60
b2	2.02	2.22	2.42
c	0.50	0.60	0.70
D	22.34	22.54	22.74
D1	16.00	16.25	16.50
D2	0.97	1.17	1.37
e	2.54 BSC		
e1	5.08 BSC		
E	15.40	15.60	15.80
E1	12.80	13.00	13.20
E/2	4.80	5.00	5.20
L	18.22	18.42	18.62
L1	2.42	2.62	2.82
p	3.40	3.60	3.80
p1	6.60	6.80	7.00
Q	5.97	6.17	6.37
S	5.97	6.17	6.37

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:
Technical Library: www.onsemi.com/design/resources/technical−documentation
onsemi Website: www.onsemi.com

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