

IGBT - Field Stop, Trench

1200 V, 25 A

FGH25N120FTDS

Description

Using advanced field stop trench technology, ON Semiconductor's 1200 V trench IGBTs offer the optimum performance for hard switching application such as solar inverter, UPS, welder and PFC applications.

Features

- High Speed Switching
- Low Saturation Voltage: $V_{CE(sat)} = 1.60 \text{ V @ } I_C = 25 \text{ A}$
- High Input Impedance
- These Device is Pb-Free and is RoHS Compliant

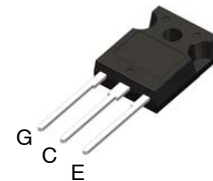
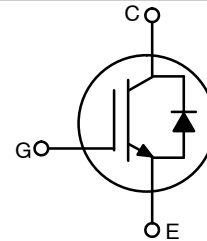
Applications

- Solar Inverter, UPS, Welder, PFC



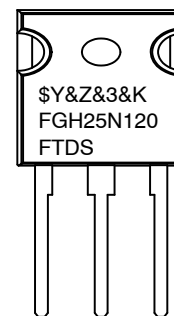
ON Semiconductor®

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TO-247-3
CASE 340CK

MARKING DIAGRAM



\$Y	= ON Semiconductor Logo
&Z	= Assembly Plant Code
&3	= Numeric Date Code
&K	= Lot Code
FGH25N120FTDS = Specific Device Code	

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

FGH25N120FTDS

ABSOLUTE MAXIMUM RATINGS (T_C = 25°C unless otherwise noted)

Description		Symbol	Rating	Unit
Collector to Emitter Voltage		V _{CES}	1200	V
Gate to Emitter Voltage		V _{GES}	±25	V
Collector Current	T _C = 25°C	I _C	50	A
Collector Current	T _C = 100°C		25	A
Pulsed Collector Current		I _{CM} (Note 1)	75	A
Diode Forward Current	T _C = 25°C	I _F	50	A
Diode Forward Current	T _C = 100°C		25	A
Diode Maximum Forward Current		I _{FM}	75	A
Maximum Power Dissipation	T _C = 25°C	P _D	313	W
Maximum Power Dissipation	T _C = 100°C		125	W
Operating Junction Temperature		T _J	-55 to +150	°C
Storage Temperature Range		T _{stg}	-55 to +150	°C
Maximum Lead Temp. for soldering Purposes, 1/8" from case for 5 seconds		T _L	300	°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. Repetitive rating: Pulse width limited by max. junction temperature.

THERMAL CHARACTERISTICS

Parameter	Symbol	Typ	Max	Unit
Thermal Resistance, Junction to Case	R _{θJC} (IGBT)	–	0.4	°C/W
Thermal Resistance, Junction to Case	R _{θJC} (Diode)	–	1.25	°C/W
Thermal Resistance, Junction to Ambient	R _{θJA}	–	40	°C/W

PACKAGE MARKING AND ORDERING INFORMATION

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FGH25N120FTDS	FGH25N120FTDS	TO-247 (Pb-Free)	Tube	N/A	N/A	30

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Collector to Emitter Breakdown Voltage	BV _{CES}	V _{GE} = 0 V, I _C = 250 μA	1200	–	–	V
Collector Cut-Off Current	I _{CES}	V _{CE} = V _{CES} , V _{GE} = 0 V	–	–	1	mA
G-E Leakage Current	I _{GES}	V _{GE} = V _{GES} , V _{CE} = 0 V	–	–	±250	nA

ON CHARACTERISTICS

G-E Threshold Voltage	V _{GE(th)}	I _C = 25 mA, V _{CE} = V _{GE}	3.5	6	7.5	V
Collector to Emitter Saturation Voltage	V _{CE(sat)}	I _C = 25 A, V _{GE} = 15 V	–	1.6	2	V
		I _C = 25 A, V _{GE} = 15 V, T _C = 125°C	–	1.92	–	V

FGH25N120FTDS

ELECTRICAL CHARACTERISTICS OF THE IGBT ($T_C = 25^\circ\text{C}$ unless otherwise noted) (continued)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
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DYNAMIC CHARACTERISTICS

Input Capacitance	C_{ies}	$V_{CE} = 30\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$	–	4090	–	pF
Output Capacitance	C_{oes}		–	135	–	pF
Reverse Transfer Capacitance	C_{res}		–	75	–	pF

SWITCHING CHARACTERISTICS

Turn-On Delay Time	$t_{d(on)}$	$V_{CC} = 600\text{ V}, I_C = 25\text{ A},$ $R_G = 10\ \Omega, V_{GE} = 15\text{ V},$ Inductive Load, $T_C = 25^\circ\text{C}$	–	26	35	ns
Rise Time	t_r		–	41	53	ns
Turn-Off Delay Time	$t_{d(off)}$		–	151	196	ns
Fall Time	t_f		–	102	132	ns
Turn-On Switching Loss	E_{on}		–	1.42	1.84	mJ
Turn-Off Switching Loss	E_{off}		–	1.16	1.5	mJ
Total Switching Loss	E_{ts}		–	2.58	3.34	mJ
Turn-On Delay Time	$t_{d(on)}$	$V_{CC} = 600\text{ V}, I_C = 25\text{ A},$ $R_G = 10\ \Omega, V_{GE} = 15\text{ V},$ Inductive Load, $T_C = 125^\circ\text{C}$	–	22	–	ns
Rise Time	t_r		–	41	–	ns
Turn-Off Delay Time	$t_{d(off)}$		–	163	–	ns
Fall Time	t_f		–	136	–	ns
Turn-On Switching Loss	E_{on}		–	2.04	–	mJ
Turn-Off Switching Loss	E_{off}		–	1.58	–	mJ
Total Switching Loss	E_{ts}		–	3.62	–	mJ
Total Gate Charge	Q_g	$V_{CE} = 600\text{ V}, I_C = 25\text{ A}, V_{GE} = 15\text{ V}$	–	169	225	nC
Gate to Emitter Charge	Q_{ge}		–	33	44	nC
Gate to Collector Charge	Q_{gc}		–	78	104	nC

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

Parametr	Symbol	Test Conditions		Min	Typ	Max	Unit
Diode Forward Voltage	V _{FM}	I _F = 25 A	T _C = 25°C	–	2.5	3.5	V
			T _C = 125°C	–	2.3	–	
Diode Reverse Recovery Time	t _{rr}	I _F = 25 A, di _F /dt = 200 A/μs	T _C = 25°C	–	411	535	ns
			T _C = 125°C	–	496	–	
Diode Peak Reverse Recovery Current	I _{rr}		T _C = 25°C	–	5.2	6.8	A
			T _C = 125°C	–	6.9	–	
Diode Reverse Recovery Charge	Q _{rr}		T _C = 25°C	–	1.1	1.82	μC
			T _C = 125°C	–	1.7	–	

TYPICAL PERFORMANCE CHARACTERISTICS

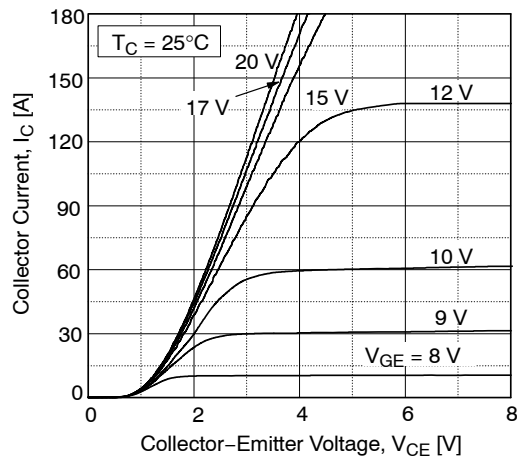


Figure 1. Typical Output Characteristics

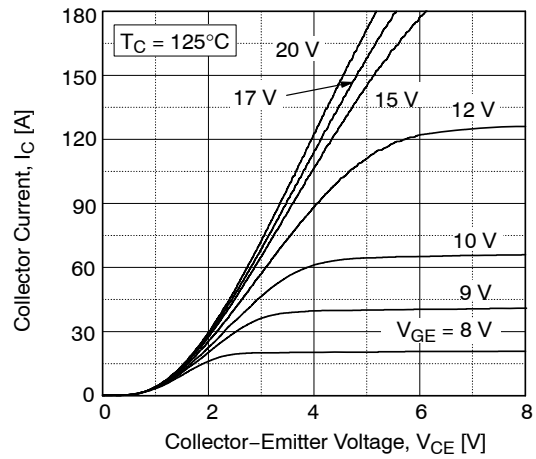


Figure 2. Typical Output Characteristics

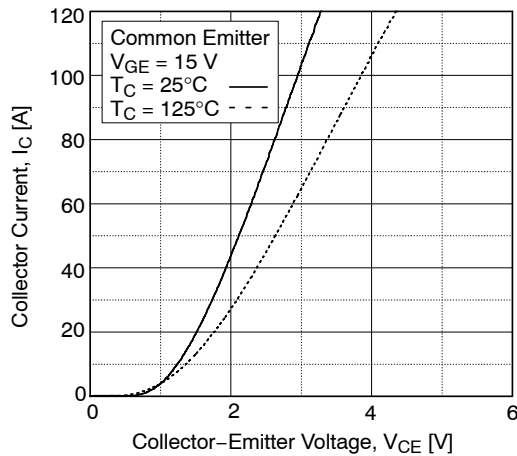


Figure 3. Typical Saturation Voltage Characteristics

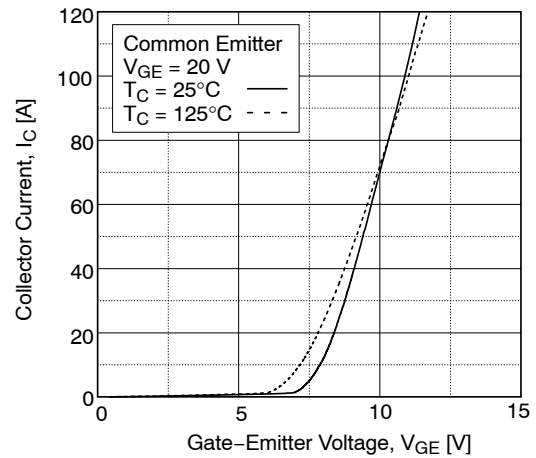


Figure 4. Transfer Characteristics

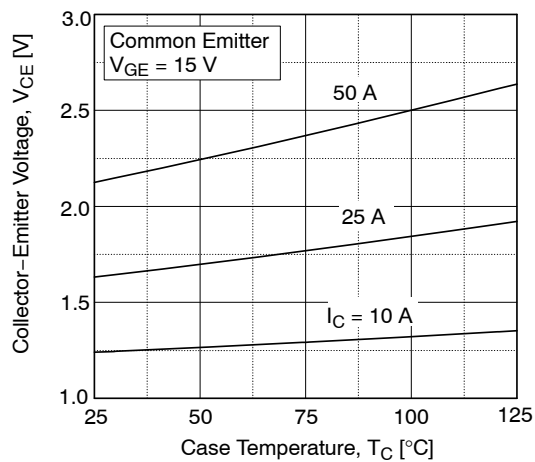


Figure 5. Saturation Voltage vs. Case Temperature at Variant Current Level

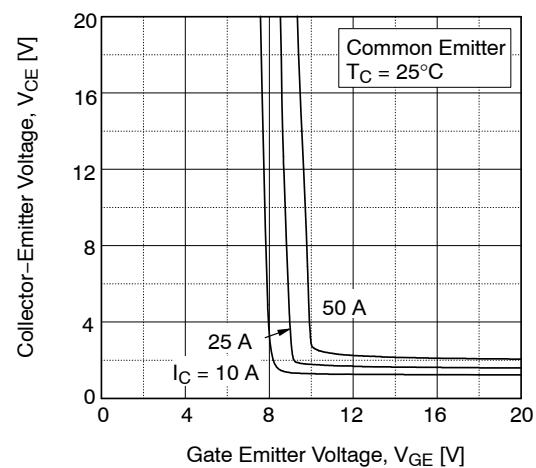


Figure 6. Saturation Voltage vs V_{GE}

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

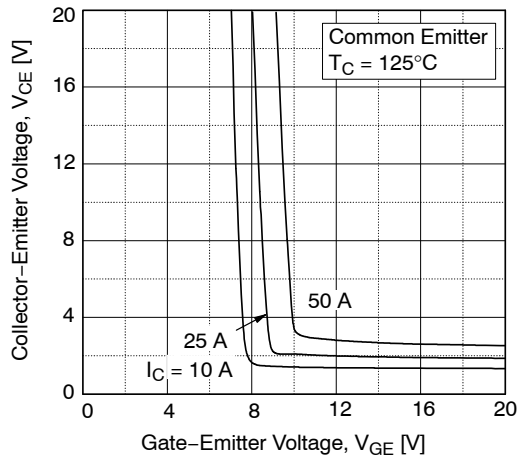


Figure 7. Saturation Voltage vs. V_{GE}

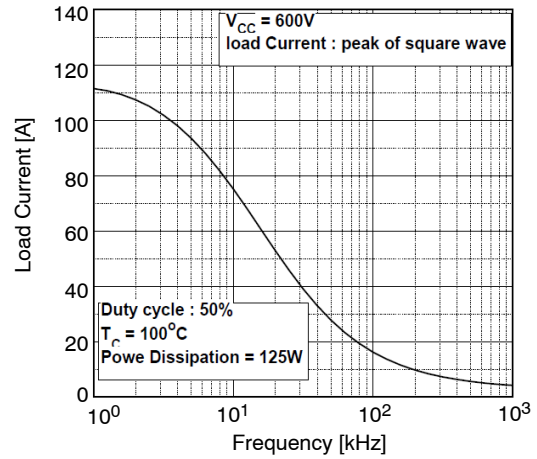


Figure 8. Load Current vs. Frequency

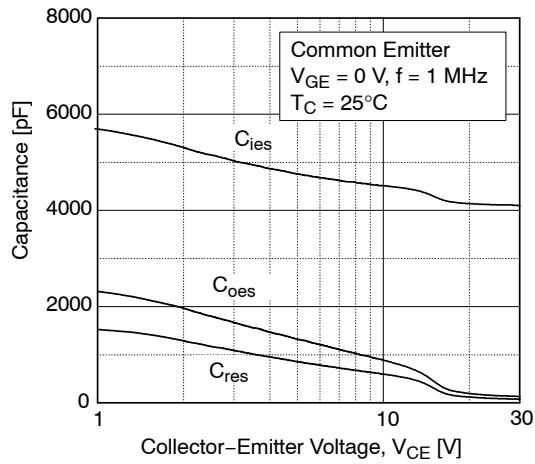


Figure 9. Capacitance Characteristics

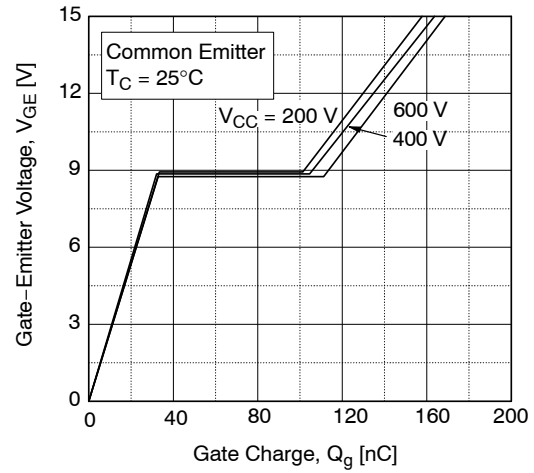


Figure 10. Gate Charge Characteristics

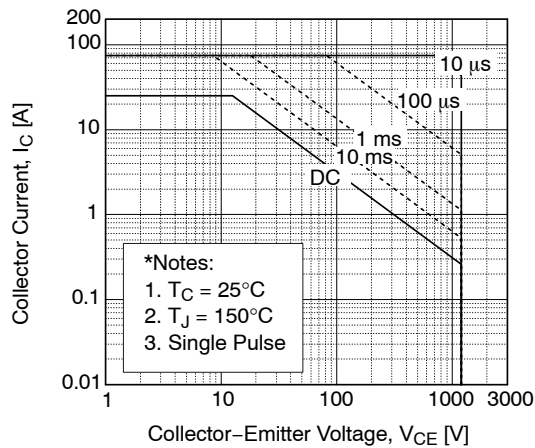


Figure 11. SOA Characteristics Gate Resistance

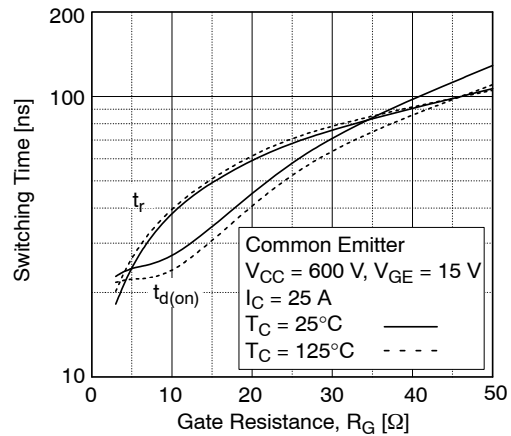


Figure 12. Turn-On Characteristics vs. Gate Resistance

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

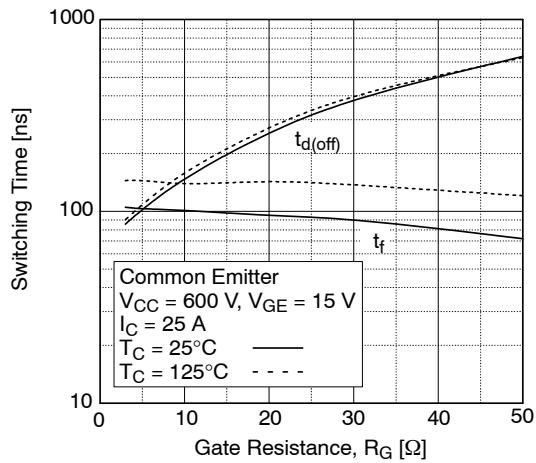


Figure 13. Turn-Off Characteristics vs. Gate Resistance

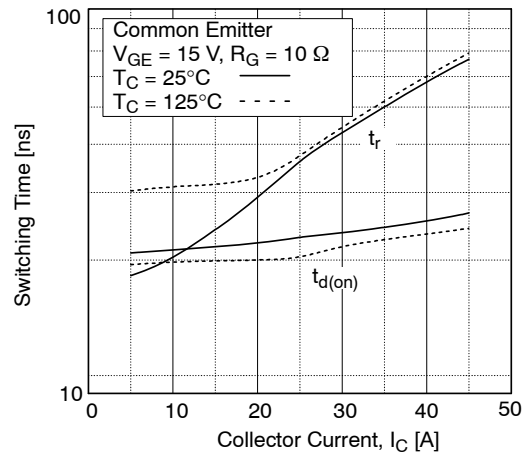


Figure 14. Turn-on Characteristics vs. Collector Current

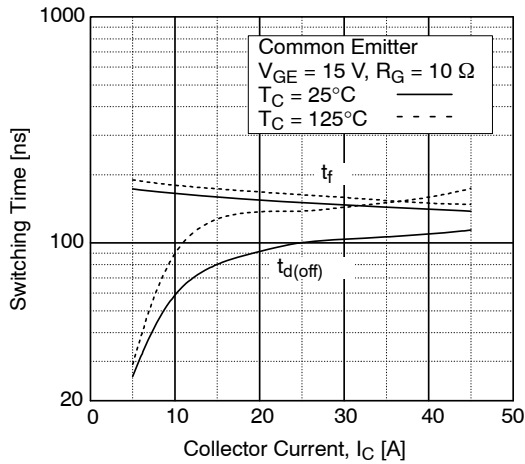


Figure 15. Turn-off Characteristics vs. Collector Current

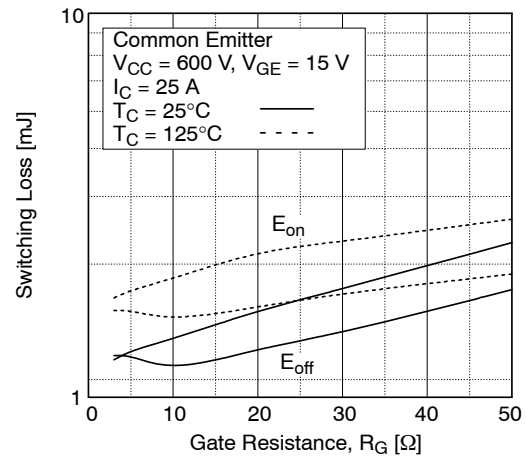


Figure 16. Switching Loss vs. Gate Resistance

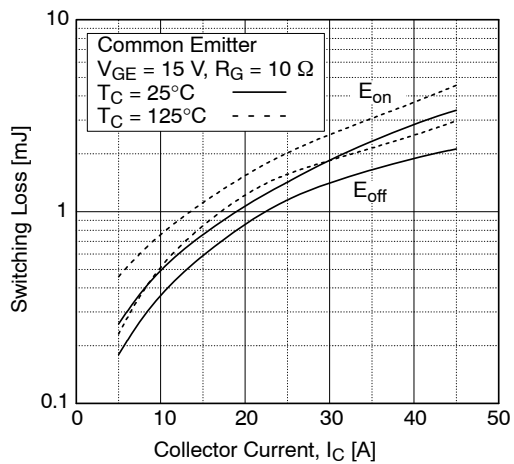


Figure 17. Switching Loss vs. Collector Current

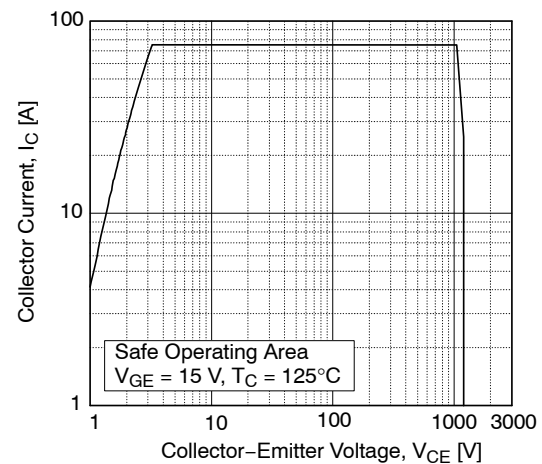


Figure 18. Turn-off Switching SOA Characteristics

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

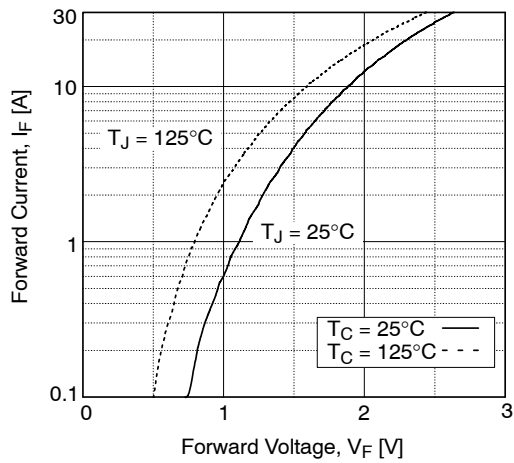


Figure 19. Forward Characteristics

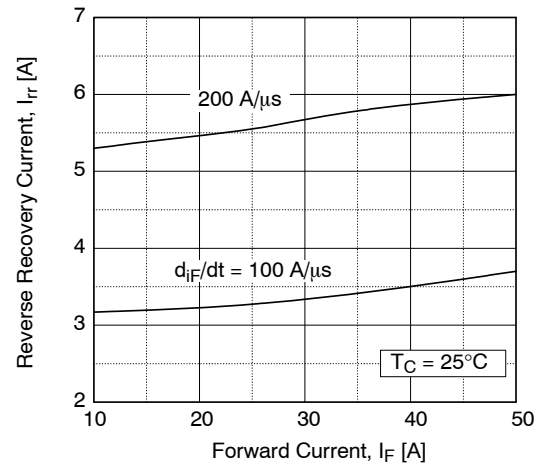


Figure 20. Reverse Recovery Current

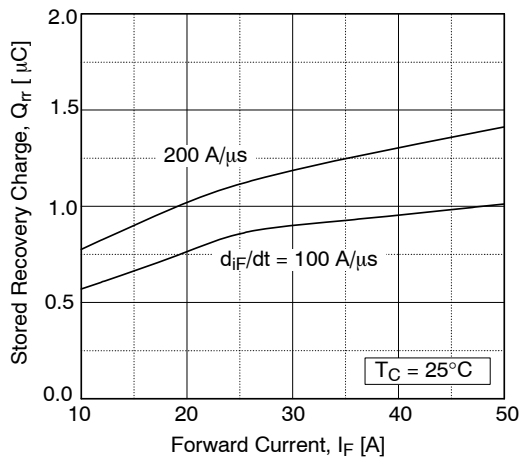


Figure 21. Stored Charge

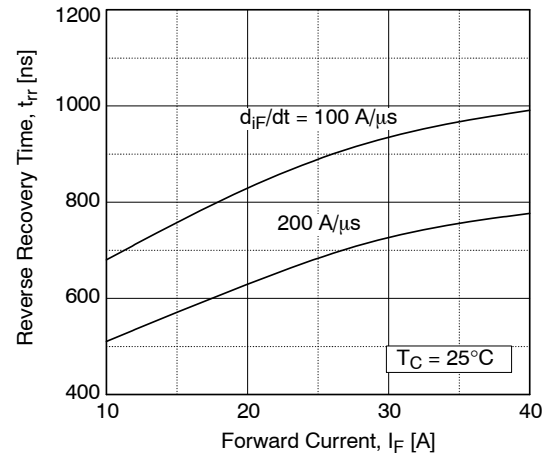


Figure 22. Reverse Recovery Time

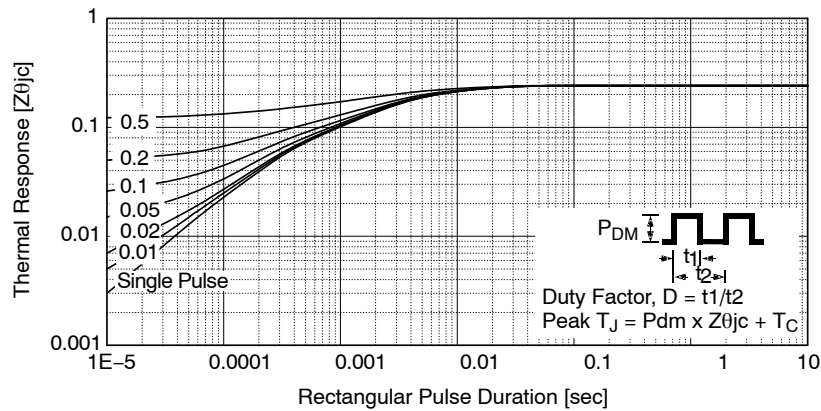
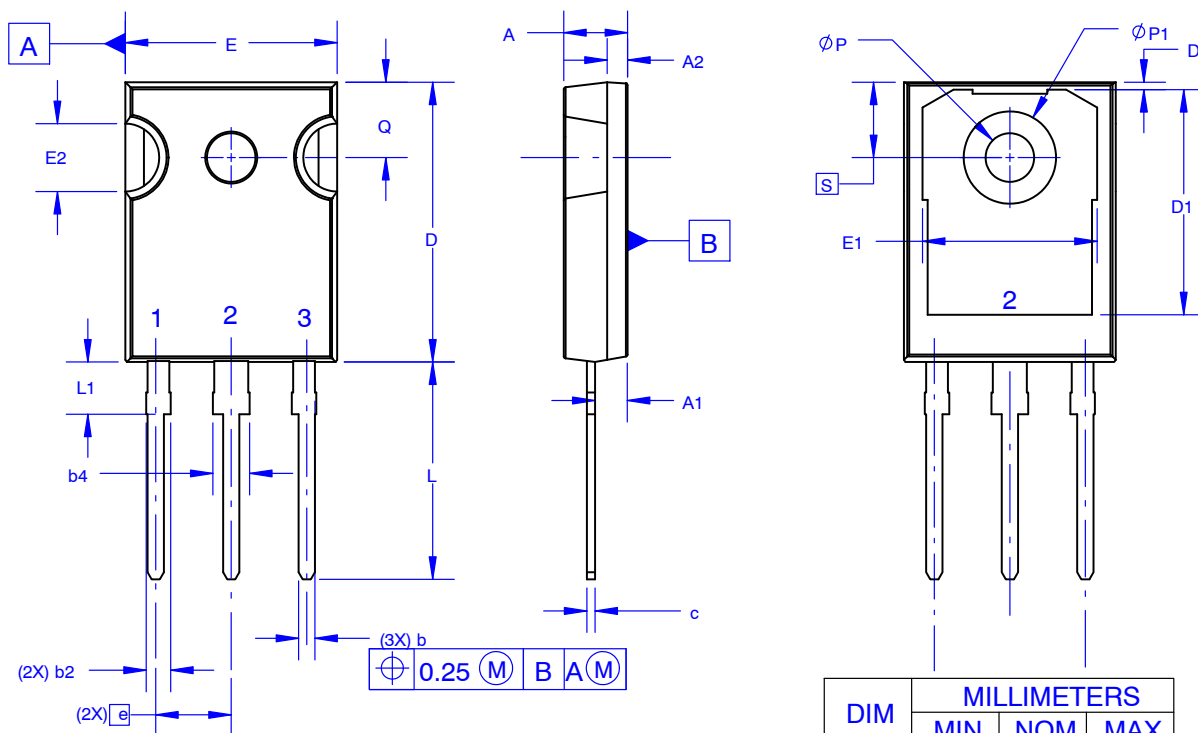


Figure 23. Transient Thermal Impedance of IGBT

TO-247-3LD SHORT LEAD CASE 340CK ISSUE A

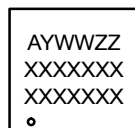
DATE 31 JAN 2019



NOTES: UNLESS OTHERWISE SPECIFIED.

- A. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
- B. ALL DIMENSIONS ARE IN MILLIMETERS.
- C. DRAWING CONFORMS TO ASME Y14.5 - 2009.
- D. DIMENSION A1 TO BE MEASURED IN THE REGION DEFINED BY L1.
- E. LEAD FINISH IS UNCONTROLLED IN THE REGION DEFINED BY L1.

GENERIC MARKING DIAGRAM*



XXXX = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
ZZ = Assembly Lot Code

*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.

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	4.58	4.70	4.82
A1	2.20	2.40	2.60
A2	1.40	1.50	1.60
b	1.17	1.26	1.35
b2	1.53	1.65	1.77
b4	2.42	2.54	2.66
c	0.51	0.61	0.71
D	20.32	20.57	20.82
D1	13.08	~	~
D2	0.51	0.93	1.35
E	15.37	15.62	15.87
E1	12.81	~	~
E2	4.96	5.08	5.20
e	~	5.56	~
L	15.75	16.00	16.25
L1	3.69	3.81	3.93
ϕP	3.51	3.58	3.65
$\phi P1$	6.60	6.80	7.00
Q	5.34	5.46	5.58
S	5.34	5.46	5.58

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DESCRIPTION:	TO-247-3LD SHORT LEAD	PAGE 1 OF 1

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