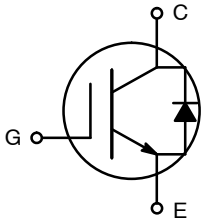
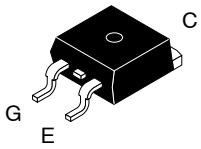
IGBT for Automotive Applications, 650 V, 40 A, D²PAK

AFGB40T65SQDN

BV_{CES}	$V_{CE(sat)}$ TYP	I_C MAX
650 V	1.6 V	160 A





D²PAK–3
CASE 418AJ

Features

- Maximum Junction Temperature: T_J = 175°C
- High Speed Switching Series
- $V_{CE(sat)}$ = 1.6 V (Typ.) @ I_C = 40 A
- 100% of the Part are Dynamically Tested (Note 1)
- AEC–Q101 Qualified
- These Devices are Pb–Free and are RoHS Compliant

Typical Applications

- Automotive On Board Charger
- Automotive DC/DC Converter for HEV

ABSOLUTE MAXIMUM RATINGS

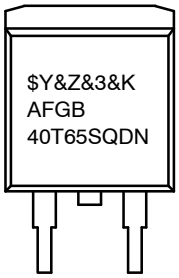
(T_J = 25°C unless otherwise stated)

Parameter	Symbol	Value	Unit
Collector to Emitter Voltage	V_{CES}	650	V
Gate-to-Emitter Voltage	V_{GES}	±20	V
Transient Gate-to-Emitter Voltage	V_{GES}	±30	V
Collector Current – T_C = 25°C	I_C	80	A
Collector Current – T_C = 100°C		40	A
Pulsed Collector Current (Note 2)	I_{CM}	160	A
Diode Forward Current – T_C = 25°C	I_F	40	A
Diode Forward Current – T_C = 100°C		20	A
Pulsed Diode Maximum Forward Current (Note 2)	I_{FM}	160	A
Maximum Power Dissipation – T_C = 25°C	P_D	238	W
Maximum Power Dissipation – T_C = 100°C		119	W
Operating Junction and Storage Temperature	T_J, T_{stg}	–55 to 175	°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. V_{CC} = 400 V, V_{GE} = 15 V, I_C = 120A, R_G = 100 Ω, Inductive Load.
2. Repetitive rating: pulse width limited by max. Junction temperature.
3. Surface–mounted on FR4 board using 1 in^2 pad size, 1 oz Cu pad.
4. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.

MARKING DIAGRAM



$Y = **onsemi** Logo
&Z = Assembly Plant Code
&3 = 3-Digit Data Code
&K = 2-Digit Lot Traceability Code
AFGB40T65SQDN = Specific Device Code

ORDERING INFORMATION

Device	Package	Shipping†
AFGB40T65SQDN	D²PAK	800 Units / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

© Semiconductor Components Industries, LLC, 2018

THERMAL CHARACTERISTICS

Parameter	Symbol	Max	Unit
Thermal Resistance Junction-to-Case, for IGBT	$R_{\theta JC}$	0.63	°C/W
Thermal Resistance Junction-to-Case, for Diode	$R_{\theta JC}$	1.55	
Thermal Resistance Junction-to-Ambient	$R_{\theta JA}$	40	

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise stated)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Collector to Emitter Breakdown Voltage	BV_{CES}	V_{GE} = 0 V, I_C = 1 mA	650	–	–	V
Temperature Coefficient of Breakdown Voltage	$\Delta V_{CES}/\Delta T_J$	I_C = 1 mA, Reference to 25°C	–	0.6	–	V/°C
Collector Cut-Off Current	I_{CES}	V_{CE} = V_{CES}, V_{GE} = 0 V	–	–	250	μA
G–E Leakage Current	I_{GES}	V_{GE} = V_{GES}, V_{CE} = 0 V	–	–	±400	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GE(th)}$	V_{GE} = V_{CE}, I_C = 40 mA	2.6	4.5	6.4	V
Collector to Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 40 A, V_{GE} = 15 V, T_C = 25°C	–	1.6	2.1	V
		I_C = 40 A, V_{GE} = 15 V, T_C = 175°C	–	1.92	–	V
DYNAMIC CHARACTERISTIC						
Input Capacitance	C_{ies}	V_{CE} = 30 V, V_{GE} = 0 V, f = 1 MHz	–	2495	–	pF
Output Capacitance	C_{oes}		–	50	–	
Reverse Transfer Capacitance	C_{res}		–	9	–	
SWITCHING CHARACTERISTIC						
Turn-On Delay Time	$t_{d(on)}$	V_{CC}= 400 V, I_C = 40 A, R_G = 6 Ω, V_{GE} = 15 V, Inductive Load, T_C = 25°C	–	17.6	–	ns
Rise Time	t_r		–	19.2	–	ns
Turn-Off Delay Time	$t_{d(off)}$		–	75.2	–	ns
Fall Time	t_f		–	9.6	–	ns
Turn-On Switching Loss	E_{on}		–	0.858	–	mJ
Turn-Off Switching Loss	E_{off}		–	0.229	–	mJ
Total Switching Loss	E_{ts}		–	1.087	–	mJ
Turn-On Delay Time	$t_{d(on)}$	V_{CC}= 400 V, I_C = 40 A, R_G = 6 Ω, V_{GE} = 15 V, Inductive Load, T_C = 175°C	–	16	–	ns
Rise Time	t_r		–	22.4	–	ns
Turn-Off Delay Time	$t_{d(off)}$		–	81.6	–	ns
Fall Time	t_f		–	20.8	–	ns
Turn-On Switching Loss	E_{on}		–	1.14	–	mJ
Turn-Off Switching Loss	E_{off}		–	0.484	–	mJ
Total Switching Loss	E_{ts}		–	1.624	–	mJ
Total Gate Charge	Qg	V_{CE} = 400 V, I_C = 40 A, V_{GE} = 15 V	–	76	–	nC
Gate to Emitter Charge	Qge		–	14	–	nC
Gate to Collector Charge	Qgc		–	17	–	nC

ELECTRICAL CHARACTERISTIC OF THE DIODE (T_J = 25°C unless otherwise stated)

Diode Forward Voltage	VFM	I_F = 20 A	–	1.5	2.1	V

Share Feedback
Your Opinion Matters

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise stated) (continued)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
ELECTRICAL CHARACTERISTIC OF THE DIODE (T_J = 25°C unless otherwise stated)						
Reverse Recovery Energy	E_{rec}	I_F = 20 A dIF/dt = 200 A/μs, T_C = 25°C	–	22.3	–	μJ
Diode Reverse Recovery Time	t_{rr}		–	131	–	ns
Diode Reverse Recovery Charge	Q_{rr}		–	348	–	nC
Reverse Recovery Energy	E_{rec}	I_F = 20 A dIF/dt = 200A/μs, T_C = 175°C	–	100	–	μJ
Diode Reverse Recovery Time	t_{rr}		–	245	–	ns
Diode Reverse Recovery Charge	Q_{rr}		–	961	–	nC

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.

Share Feedback
Your Opinion Matters

TYPICAL CHARACTERISTICS

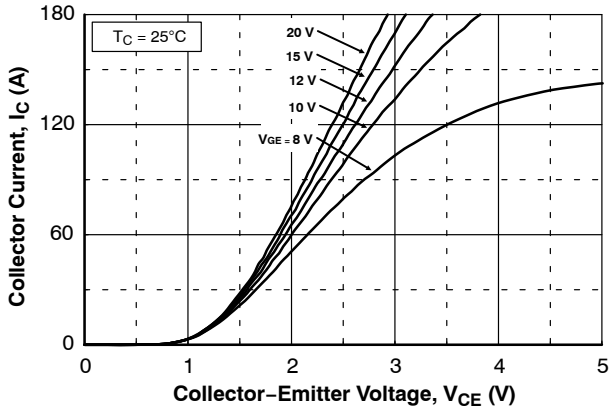


Figure 1. Typical Output Characteristics (25°C)

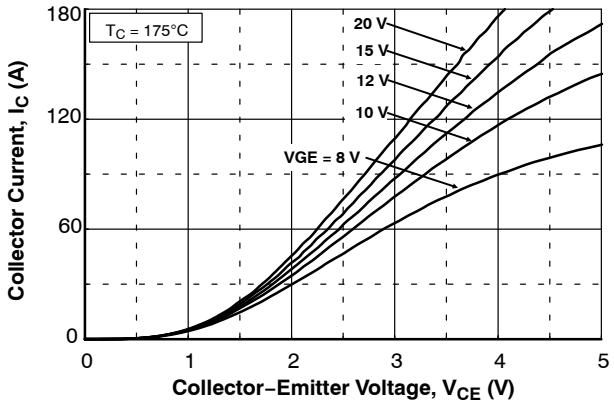


Figure 2. Typical Output Characteristics (175°C)

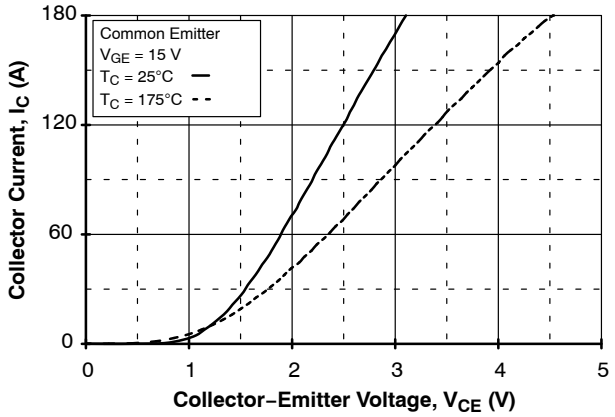


Figure 3. Typical Saturation Voltage Characteristics

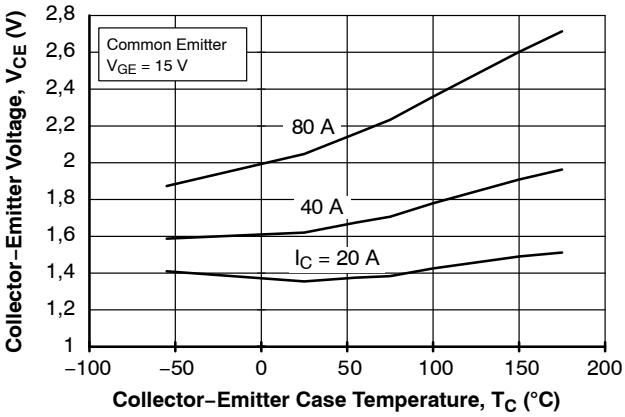


Figure 4. Saturation Voltage vs Case Temperature at Variant Current Level

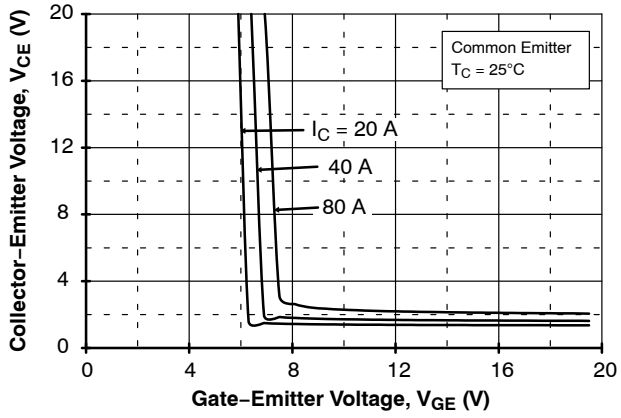


Figure 5. Saturation Voltage vs V_{GE} (25°C)

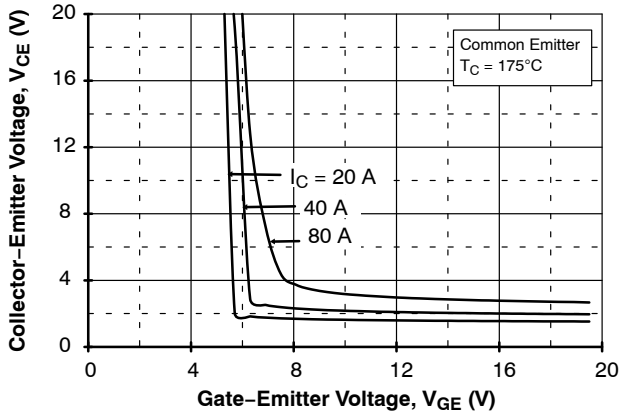


Figure 6. Saturation Voltage vs V_{GE} (175°C)

Share Feedback
Your Opinion Matters

TYPICAL CHARACTERISTICS

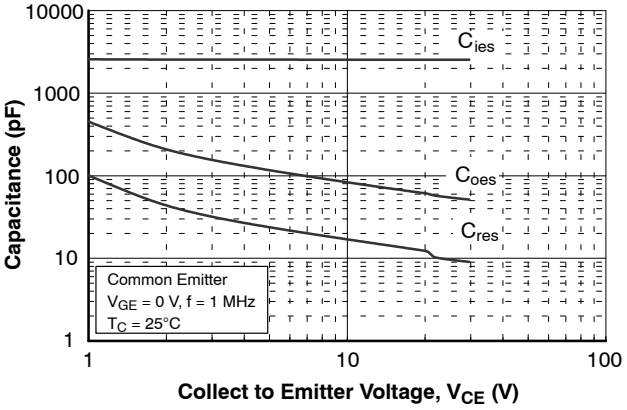


Figure 7. Capacitance Characteristics

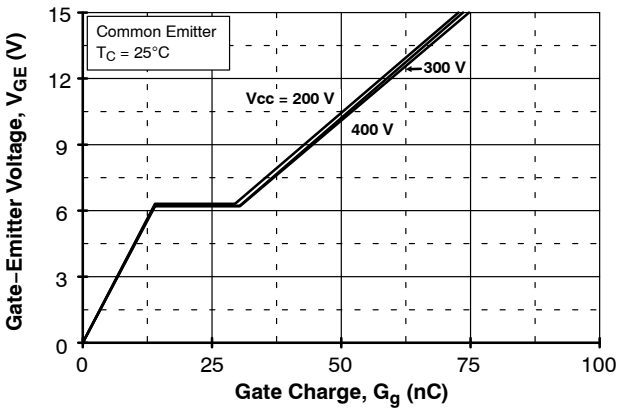


Figure 8. Gate Charge Characteristics

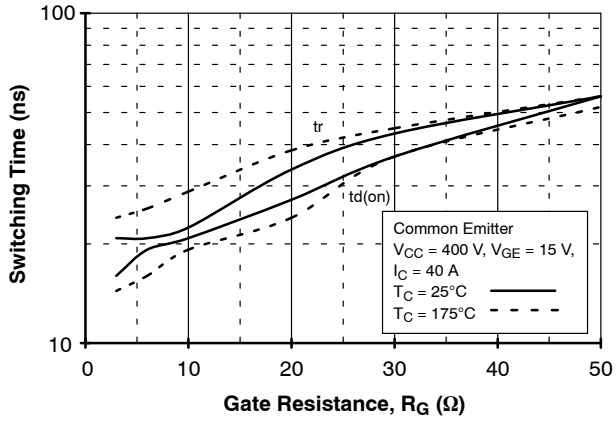


Figure 9. Turn−On Characteristics vs Gate Resistance

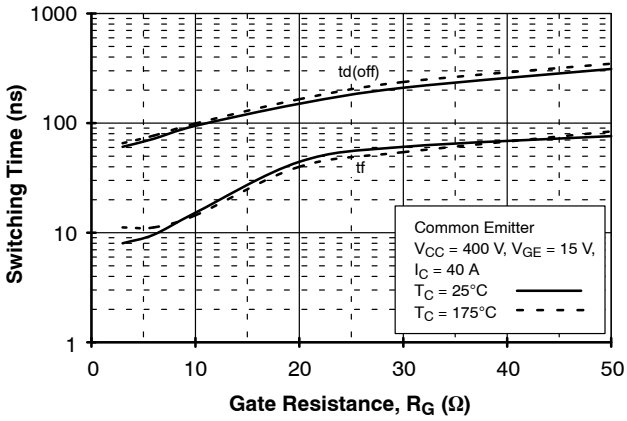


Figure 10. Turn−Off Characteristics vs Gate Resistance

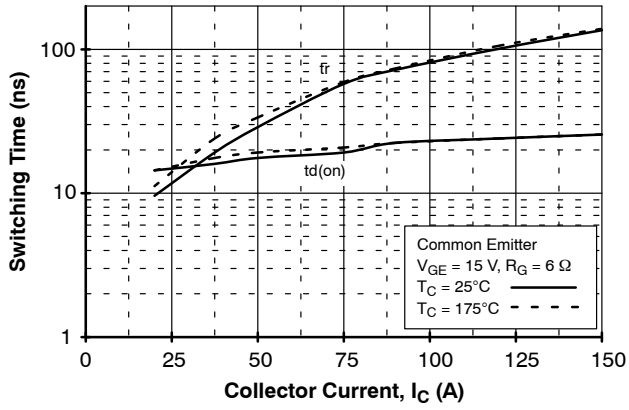


Figure 11. Turn−On Characteristics vs Collector Current

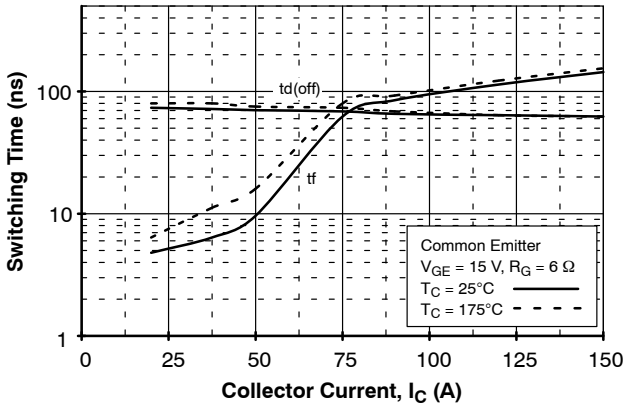


Figure 12. Turn−Off Characteristics vs Collector Current

Share Feedback
Your Opinion Matters

TYPICAL CHARACTERISTICS

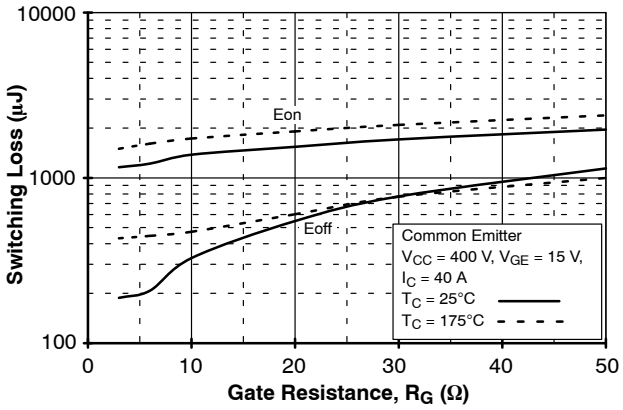


Figure 13. Switching Loss vs Gate Resistance

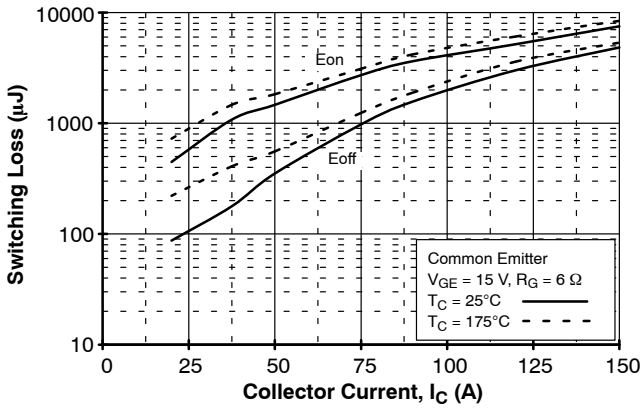


Figure 14. Switching Loss vs Collector Current

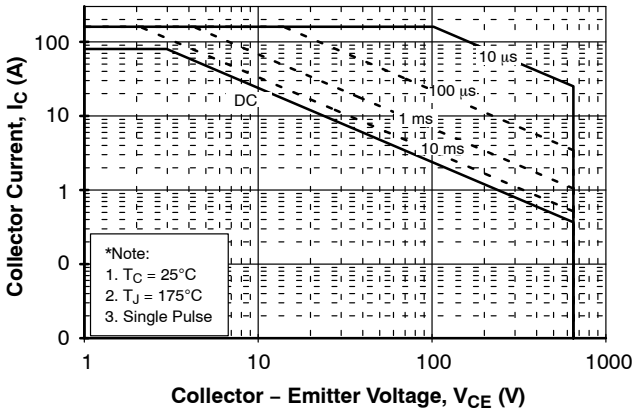


Figure 15. SOA Characteristics

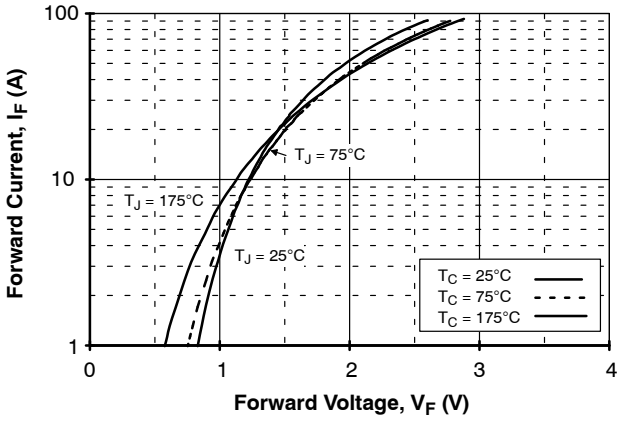


Figure 16. Forward Characteristics

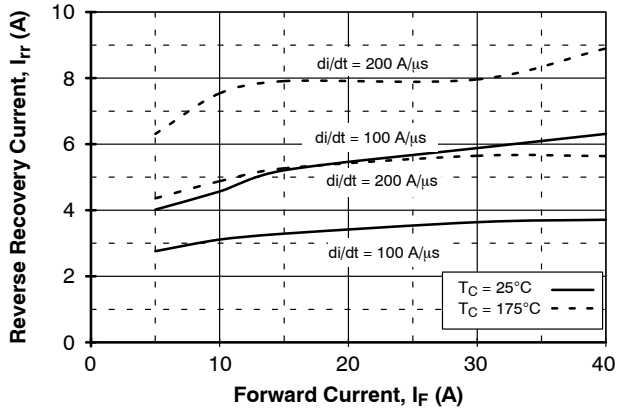


Figure 17. Reverse Recovery Current

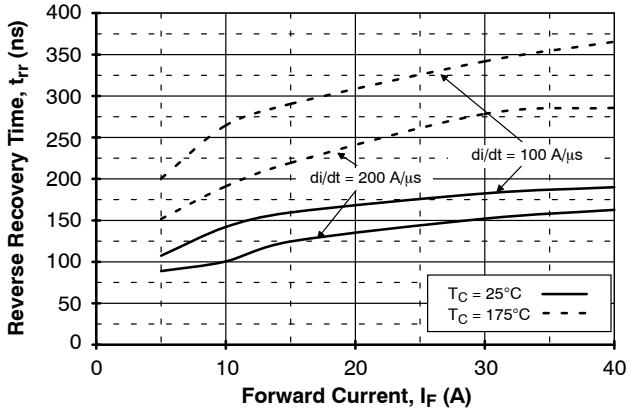


Figure 18. Reverse Recovery Time

Share Feedback
Your Opinion Matters

TYPICAL CHARACTERISTICS

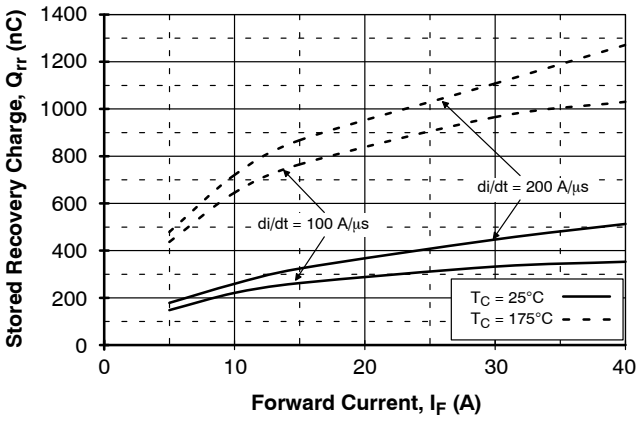


Figure 19. Stored Charge

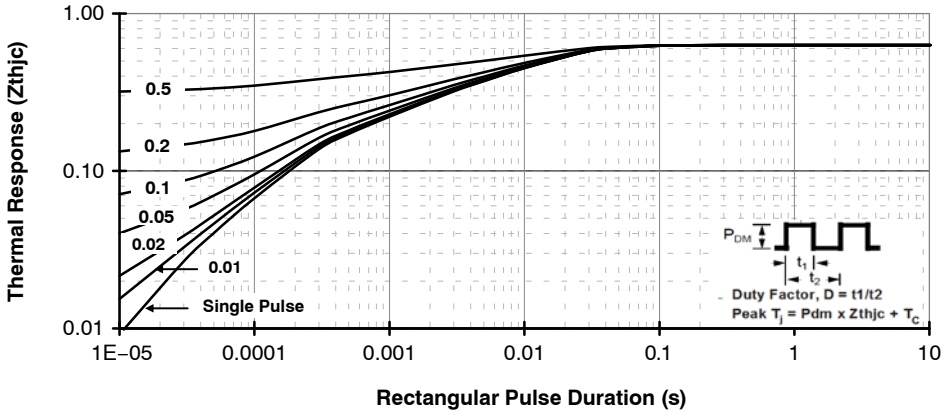


Figure 20. Transient Thermal Impedance of IGBT

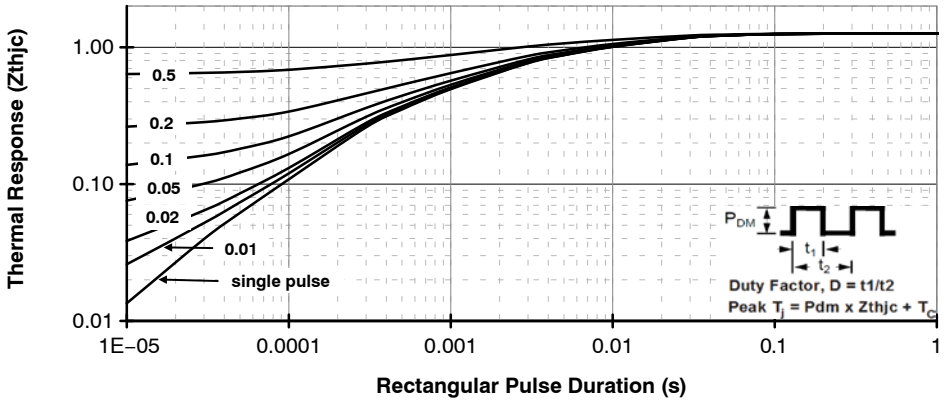
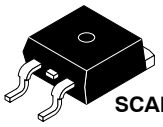


Figure 21. Transient Thermal Impedance of Diode

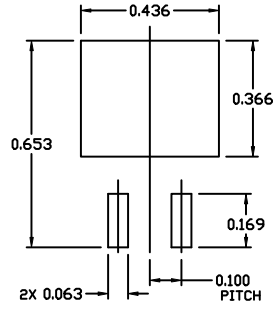
Share Feedback
Your Opinion Matters

D²PAK–3 (TO–263, 3–LEAD)
CASE 418AJ
ISSUE F

DATE 11 MAR 2021



SCALE 1:1



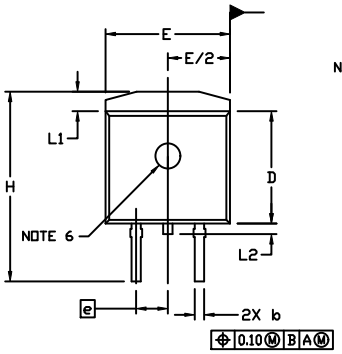
RECOMMENDED
MOUNTING FOOTPRINT

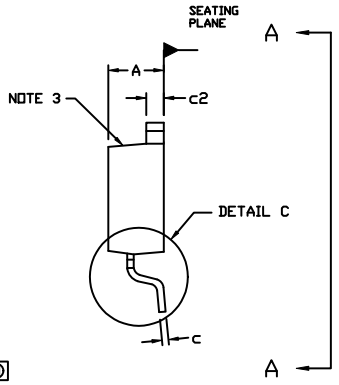
* For additional information on our Pb–Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

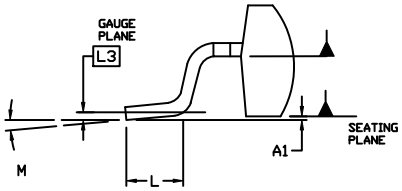
NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: INCHES
3. CHAMFER OPTIONAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.005 PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY AT DATUM H.
5. THERMAL PAD CONTOUR IS OPTIONAL WITHIN DIMENSIONS E, L1, D1, AND E1.
6. OPTIONAL MOLD FEATURE.
7. ①, ② … OPTIONAL CONSTRUCTION FEATURE CALL OUTS.

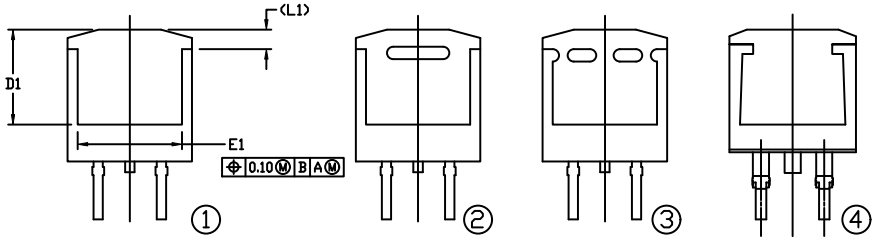
	INCHES		MILLIMETERS	
DIM	MIN.	MAX.	MIN.	MAX.
A	0.160	0.190	4.06	4.83
A1	0.000	0.010	0.00	0.25
b	0.020	0.039	0.51	0.99
c	0.012	0.029	0.30	0.74
c2	0.045	0.065	1.14	1.65
D	0.330	0.380	8.38	9.65
D1	0.260	---	6.60	---
E	0.380	0.420	9.65	10.67
E1	0.245	---	6.22	---
e	0.100 BSC		2.54 BSC	
H	0.575	0.625	14.60	15.88
L	0.070	0.110	1.78	2.79
L1	---	0.066	---	1.68
L2	---	0.070	---	1.78
L3	0.010 BSC		0.25 BSC	
M	0°	8°	0°	8°







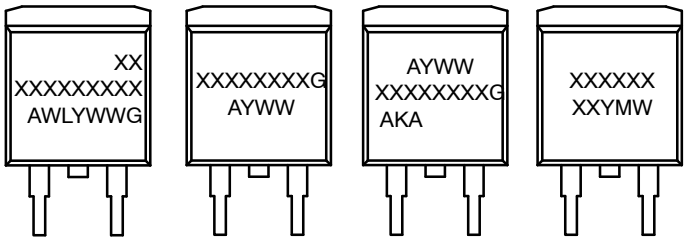
DETAIL C
TIP LEADFORM
ROTATED 90° CW



VIEW A–A

VIEW A–A
OPTIONAL CONSTRUCTIONS

GENERIC MARKING DIAGRAMS*



IC **Standard** **Rectifier** **SSG**

XXXXXX = Specific Device Code
A = Assembly Location
WL = Wafer Lot
Y = Year
WW = Work Week
W = Week Code (SSG)
M = Month Code (SSG)
G = Pb–Free Package
AKA = Polarity Indicator

*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.

DOCUMENT NUMBER:	**98AON56370E**	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped “CONTROLLED COPY” in red.
DESCRIPTION:	**D²PAK–3 (TO–263, 3–LEAD)**	**PAGE 1 OF 1**

onsemi and ONSEMI are trademarks of Semiconductor Components Industries, LLC dba **onsemi** or its subsidiaries in the United States and/or other countries. **onsemi** reserves the right to make changes without further notice to any products herein. **onsemi** makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. **onsemi** does not convey any license under its patent rights nor the rights of others.

© Semiconductor Components Industries, LLC, 2011

onsemi, , and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent−Marking.pdf. **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as−is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

ADDITIONAL INFORMATION

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

ONLINE SUPPORT: www.onsemi.com/support
For additional information, please contact your local Sales Representative at www.onsemi.com/support/sales

ENTEGRECİ

Bu belge www.entegreci.com üzerinden sunulmaktadır.

Elektronik komponent tedarikinde Entegreci

Entegreci, Eskişehir merkezli, Türkiye geneline satış yapan bir elektronik komponent mağazasıdır. Entegreler (IC), mikrodenetleyiciler, transistörler, diyotlar, pasif elemanlar, konnektörler, modüller ve geliştirme kartları tek adetten seri üretim adetlerine kadar satılır. Ürün sayfalarında güncel stok durumunu, fiyatı ve datasheet bağlantısını bulabilirsiniz.

Parça koduyla arama

Üretici parça numarasını yazın; stok ve fiyatı hemen görün.

www.entegreci.com

Ürün kategorileri

Entegreden kapasitöre tüm elektronik komponent kategorileri.

Kategorilere göz atın

Üreticiler

Aradığınız üreticinin ürünlerini tek sayfada inceleyin.

Üreticileri görün

Toplu alım ve teklif

Listede olmayan ya da yüksek adetli parçalar için teklif isteyin.

Teklif isteyin

www.entegreci.com | **destek@entegreci.com** | **0850 305 90 34**

Entegreci is an online electronic components store based in Türkiye. Search by manufacturer part number to see stock, prices and datasheets for integrated circuits, microcontrollers, transistors, passive components and connectors, or request a quote for parts that are not listed.

Bu sayfa Entegreci tarafından eklenmiştir. Belgenin önceki sayfaları asıl yayıncısına aittir ve içeriği değiştirilmemiştir; en güncel sürüm için belgenin yayıncısına başvurun.