

NPN Silicon Power Darlington Transistors

MJB5742T4G

The Darlington transistors are designed for high-voltage power switching in inductive circuits.

Features

- These Devices are Pb-Free and are RoHS Compliant

Applications

- Small Engine Ignition
- Switching Regulators
- Inverters
- Solenoid and Relay Drivers
- Motor Controls

MAXIMUM RATINGS

Symbol	Rating	Value	Unit
$V_{CEO(sus)}$	Collector-Emitter Voltage	400	Vdc
V_{CEV}	Collector-Emitter Voltage	800	Vdc
V_{EB}	Emitter-Base Voltage	8	Vdc
I_C I_{CM}	Collector Current – Continuous – Peak (Note 1)	8 16	Adc
I_B I_{BM}	Base Current – Continuous – Peak (Note 1)	2.5 5	Adc
P_D	Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C	2 0.016	W W/ $^\circ\text{C}$
P_D	Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	100 0.8	W W/ $^\circ\text{C}$
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-65 to +150	$^\circ\text{C}$

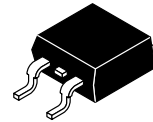
THERMAL CHARACTERISTICS

Symbol	Characteristics	Max	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	1.25	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62.5	$^\circ\text{C/W}$
T_L	Maximum Lead Temperature for Soldering Purposes 1/8" from Case for 5 Seconds	275	$^\circ\text{C}$

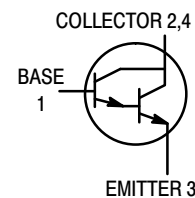
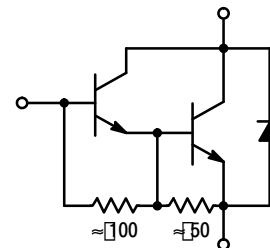
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Pulse Test: Pulse Width = 5 ms, Duty Cycle $\leq 10\%$.

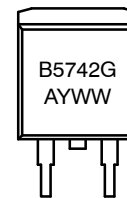
POWER DARLINGTON TRANSISTORS 8 AMPERES, 400 VOLTS 100 WATTS



D²PAK
CASE 418B
STYLE 1



MARKING DIAGRAM



B5742 = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
G = Pb-Free Package

ORDERING INFORMATION

Device	Package	Shipping [†]
MJB5742T4G	D ² PAK (Pb-Free)	800 / 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](#).

MJB5742T4G

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

Symbol	Characteristic	Min	Typ	Max	Unit
--------	----------------	-----	-----	-----	------

OFF CHARACTERISTICS (Note 2)

$V_{CEO(sus)}$	Collector–Emitter Sustaining Voltage ($I_C = 50\text{ mA}$, $I_B = 0$)	400	–	–	Vdc
I_{CEV}	Collector Cutoff Current ($V_{CEV} = \text{Rated Value}$, $V_{BE(off)} = 1.5\text{ Vdc}$) ($V_{CEV} = \text{Rated Value}$, $V_{BE(off)} = 1.5\text{ Vdc}$, $T_C = 100^\circ\text{C}$)	– –	– –	1 5	mAdc
I_{EBO}	Emitter Cutoff Current ($V_{EB} = 8\text{ Vdc}$, $I_C = 0$)	–	–	75	mAdc

SECOND BREAKDOWN

$I_{S/b}$	Second Breakdown Collector Current with Base Forward Biased	See Figure 6			
RBSOA	Clamped Inductive SOA with Base Reverse Biased	See Figure 7			

ON CHARACTERISTICS (Note 2)

h_{FE}	DC Current Gain ($I_C = 0.5\text{ Adc}$, $V_{CE} = 5\text{ Vdc}$) ($I_C = 4\text{ Adc}$, $V_{CE} = 5\text{ Vdc}$)	50 200	100 400	– –	–
$V_{CE(sat)}$	Collector–Emitter Saturation Voltage ($I_C = 4\text{ Adc}$, $I_B = 0.2\text{ Adc}$) ($I_C = 8\text{ Adc}$, $I_B = 0.4\text{ Adc}$) ($I_C = 4\text{ Adc}$, $I_B = 0.2\text{ Adc}$, $T_C = 100^\circ\text{C}$)	– – –	– – –	2 3 2.2	Vdc
$V_{BE(sat)}$	Base–Emitter Saturation Voltage ($I_C = 4\text{ Adc}$, $I_B = 0.2\text{ Adc}$) ($I_C = 8\text{ Adc}$, $I_B = 0.4\text{ Adc}$) ($I_C = 4\text{ Adc}$, $I_B = 0.2\text{ Adc}$, $T_C = 100^\circ\text{C}$)	– – –	– – –	2.5 3.5 2.4	Vdc
V_f	Diode Forward Voltage (Note 3) ($I_F = 5\text{ Adc}$)	–	–	2.5	Vdc

SWITCHING CHARACTERISTICS

Typical Resistive Load (Table 1)						
t _d	Delay Time	(V _{CC} = 250 Vdc, I _{C(pk)} = 6 A I _{B1} = I _{B2} = 0.25 A, t _p = 25 μs, Duty Cycle ≤ 1%)	–	0.04	–	μs
t _r	Rise Time		–	0.5	–	μs
t _s	Storage Time		–	8	–	μs
t _f	Fall Time		–	2	–	μs
Inductive Load, Clamped (Table 1)						
t _{sv}	Voltage Storage Time	(I _{C(pk)} = 6 A, V _{CE(pk)} = 250 Vdc I _{B1} = 0.06 A, V _{BE(off)} = 5 Vdc)	–	4	–	μs
t _c	Crossover Time		–	2	–	μs

2. Pulse Test: Pulse Width 300 μs , Duty Cycle = 2%.

3. The internal Collector–to–Emitter diode can eliminate the need for an external diode to clamp inductive loads. Tests have shown that the Forward Recovery Voltage (V_f) of this diode is comparable to that of typical fast recovery rectifiers.

TYPICAL CHARACTERISTICS

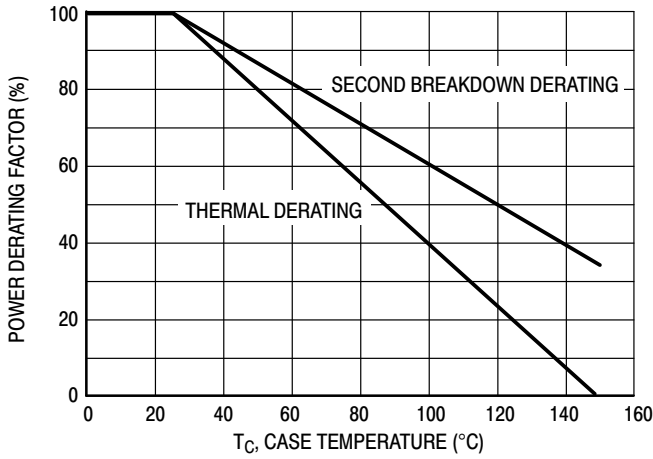


Figure 1. Power Derating

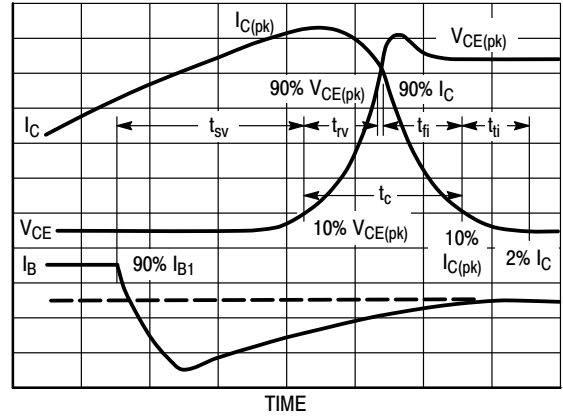


Figure 2. Inductive Switching Measurements

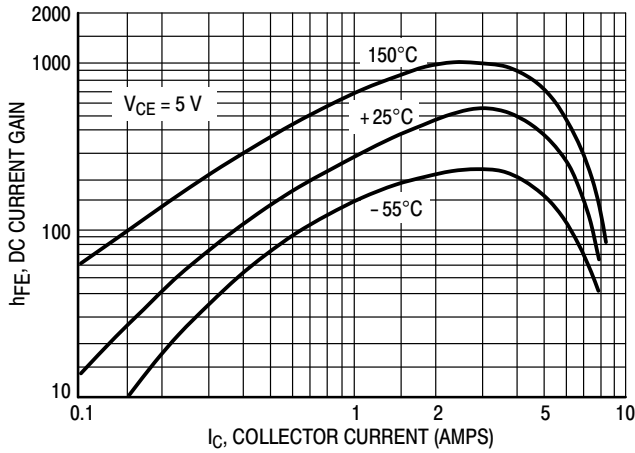


Figure 3. DC Current Gain

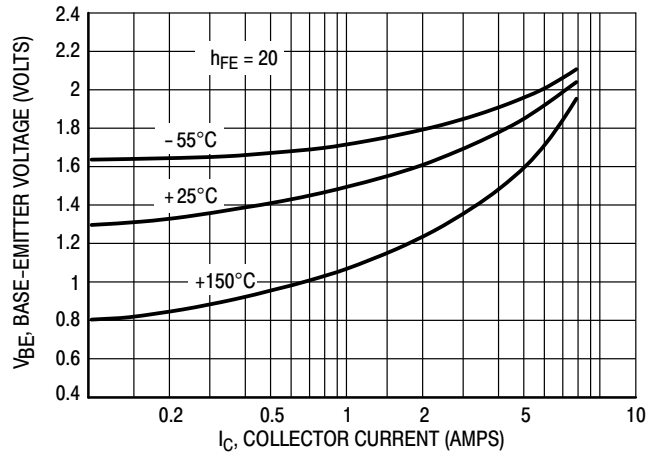


Figure 4. Base-Emitter Voltage

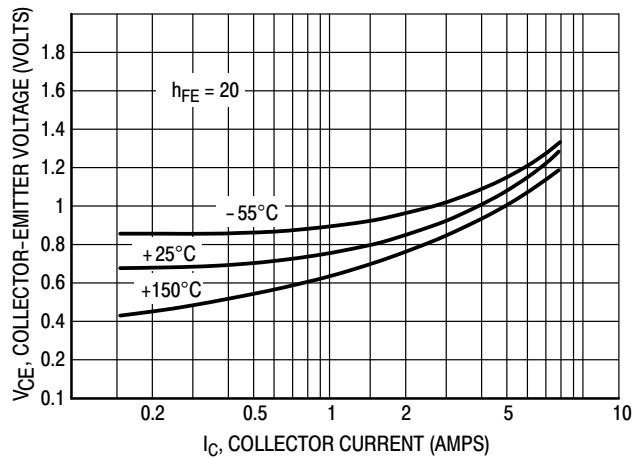
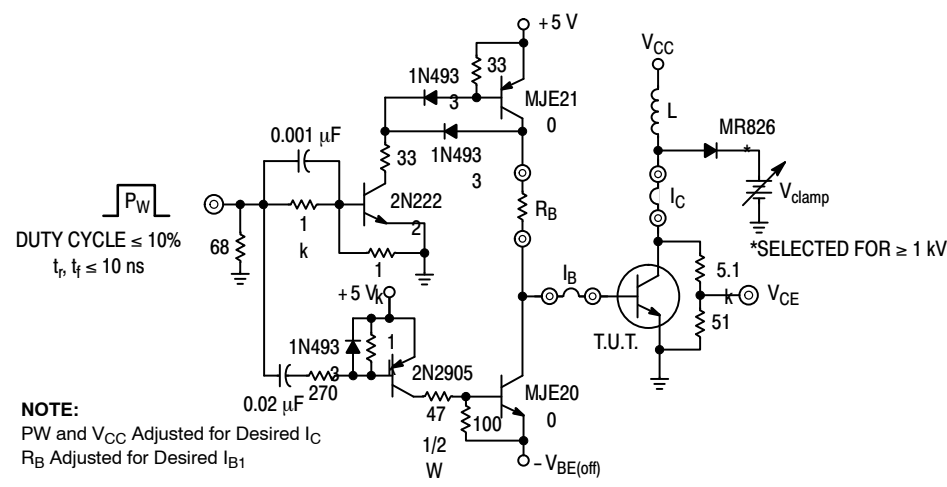
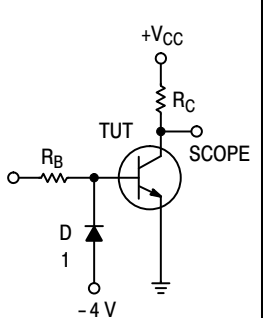
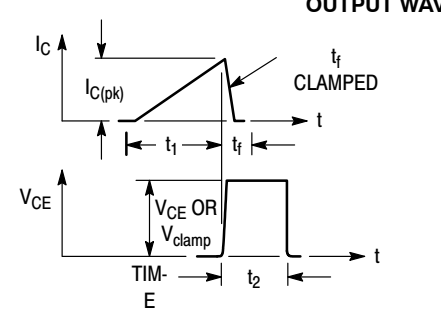
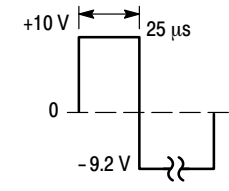


Figure 5. Collector-Emitter Saturation Voltage

MJB5742T4G

Table 1. Test Conditions for Dynamic Performance

REVERSE BIAS SAFE OPERATING AREA AND INDUCTIVE SWITCHING			RESISTIVE SWITCHING
TEST CIRCUITS	 DUTY CYCLE $\leq 10\%$ $t_r, t_f \leq 10 \text{ ns}$ NOTE: PW and V_{CC} Adjusted for Desired I_C R_B Adjusted for Desired I_{B1}		
CIRCUIT VALUES	COIL DATA: FERROXCUBE CORE #6656 FULL BOBBIN (~16 TURNS) #16 GAP FOR 200 $\mu\text{H}/20 \text{ A}$ $L_{\text{coil}} = 200 \mu\text{H}$ $V_{CC} = 30 \text{ V}$ $V_{CE(pk)} = 250 \text{ Vdc}$ $I_{C(pk)} = 6 \text{ A}$		$V_{CC} = 250 \text{ V}$ $D1 = 1\text{N5820 OR EQUIV.}$
TEST WAVEFORMS	OUTPUT WAVEFORMS  t_1 ADJUSTED TO OBTAIN I_C $t_1 \approx \frac{L_{\text{coil}} (I_{C(pk)})}{V_{CC}}$ $t_2 \approx \frac{L_{\text{coil}} (I_{C(pk)})}{V_{\text{clamp}}}$ TEST EQUIPMENT SCOPE-TEKTRONICS 475 OR EQUIVALENT		 $t_r, t_f < 10 \text{ ns}$ DUTY CYCLE = 1% R_B AND R_C ADJUSTED FOR DESIRED I_B AND I_C

SAFE OPERATING AREA INFORMATION

FORWARD BIAS

There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate $I_C - V_{CE}$ limits of the transistor that must be observed for reliable operation; i.e., the transistor must not be subjected to greater dissipation than the curves indicate.

The data of Figure 6 is based on $T_C = 25^\circ\text{C}$; $T_{J(pk)}$ is variable depending on power level. Second breakdown pulse limits are valid for duty cycles to 10% but must be derated when $T_C \geq 25^\circ\text{C}$. Second breakdown limitations do not derate the same as thermal limitations. Allowable current at the voltages shown on Figure 6 may be found at any case temperature by using the appropriate curve on Figure 1.

The Safe Operating Area figures shown in Figures 6 and 7 are specified ratings for these devices under the test conditions shown.

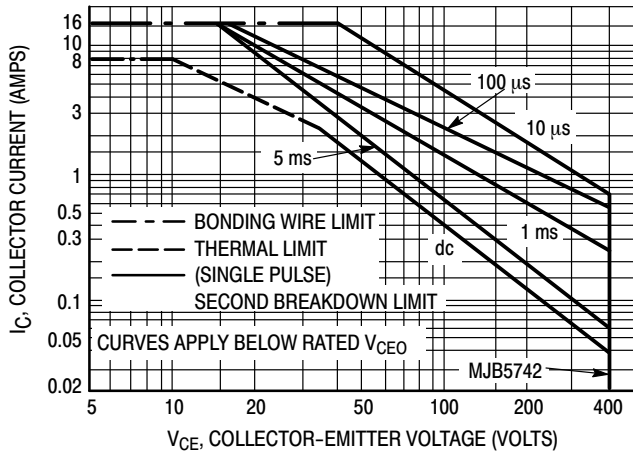


Figure 6. Forward Bias Safe Operating Area

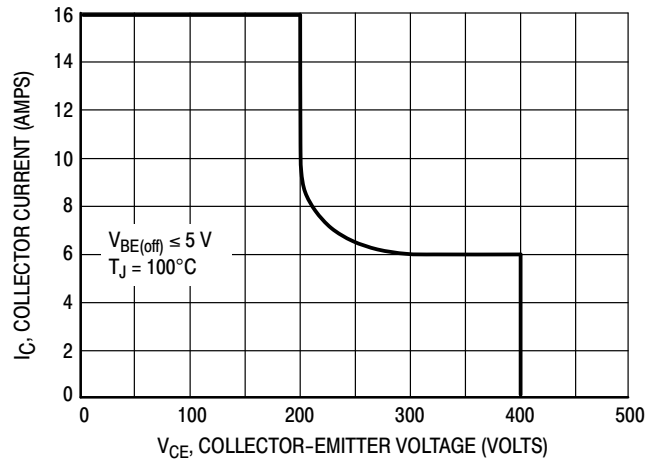


Figure 7. Reverse Bias Safe Operating Area

RESISTIVE SWITCHING PERFORMANCE

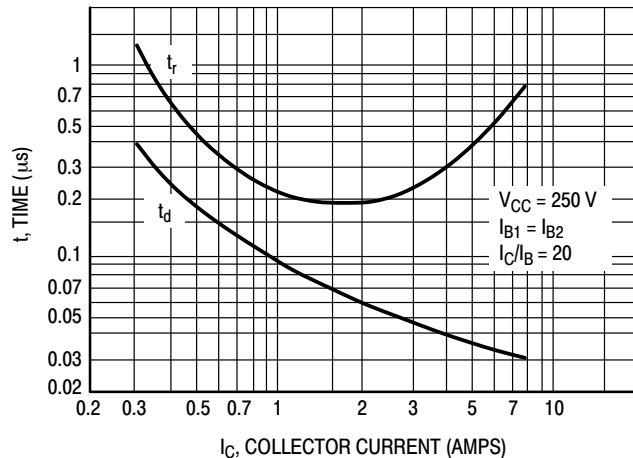


Figure 8. Turn-On Time

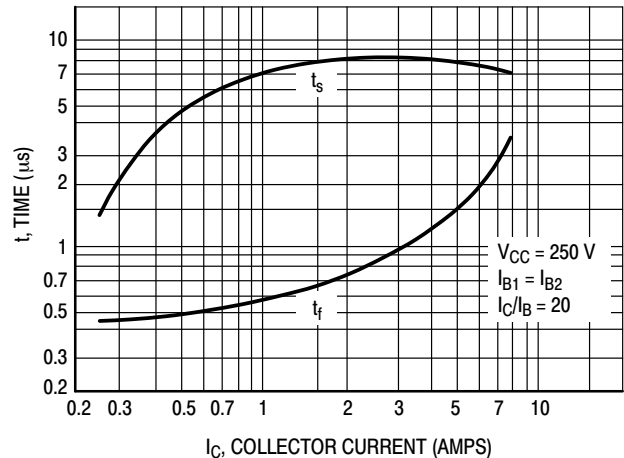
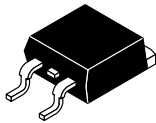


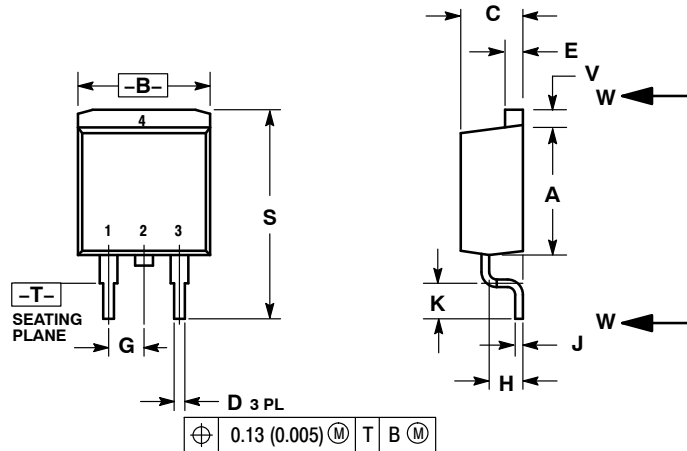
Figure 9. Turn-Off Time



D²PAK 3
CASE 418B-04
ISSUE L

DATE 17 FEB 2015

SCALE 1:1

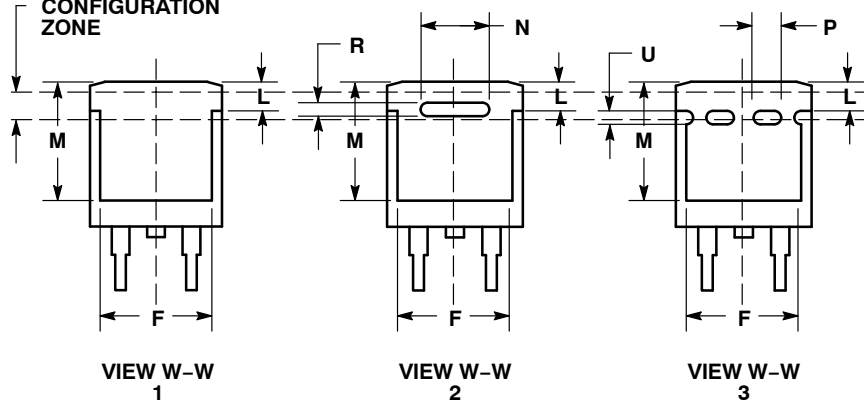


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 418B-01 THRU 418B-03 OBSOLETE, NEW STANDARD 418B-04.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.340	0.380	8.64	9.65
B	0.380	0.405	9.65	10.29
C	0.160	0.190	4.06	4.83
D	0.020	0.035	0.51	0.89
E	0.045	0.055	1.14	1.40
F	0.310	0.350	7.87	8.89
G	0.100	BSC	2.54	BSC
H	0.080	0.110	2.03	2.79
J	0.018	0.025	0.46	0.64
K	0.090	0.110	2.29	2.79
L	0.052	0.072	1.32	1.83
M	0.280	0.320	7.11	8.13
N	0.197	REF	5.00	REF
P	0.079	REF	2.00	REF
R	0.039	REF	0.99	REF
S	0.575	0.625	14.60	15.88
V	0.045	0.055	1.14	1.40

VARIABLE
CONFIGURATION
ZONE



STYLE 1:

- PIN 1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

STYLE 2:

- PIN 1. GATE
2. DRAIN
3. SOURCE
4. DRAIN

STYLE 3:

- PIN 1. ANODE
2. CATHODE
3. ANODE
4. CATHODE

STYLE 4:

- PIN 1. GATE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

STYLE 5:

- PIN 1. CATHODE
2. ANODE
3. CATHODE
4. ANODE

STYLE 6:

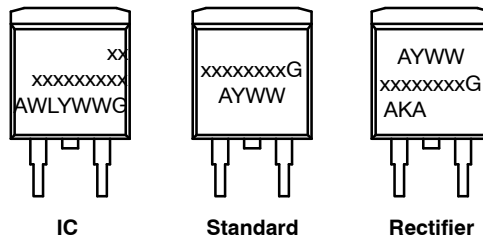
- PIN 1. NO CONNECT
2. CATHODE
3. ANODE
4. CATHODE

MARKING INFORMATION AND FOOTPRINT ON PAGE 2

DOCUMENT NUMBER:	98ASB42761B	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	D ² PAK 3	PAGE 1 OF 2

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.

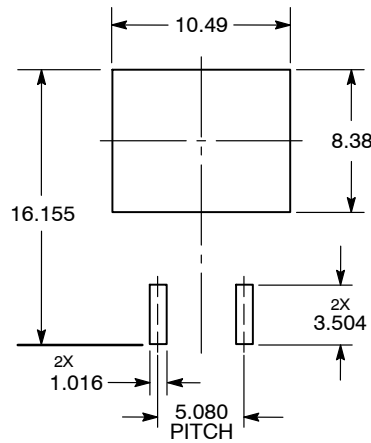
**GENERIC
MARKING DIAGRAM***



xx = Specific Device Code
A = Assembly Location
WL = Wafer Lot
Y = Year
WW = Work Week
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.

SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

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

DOCUMENT NUMBER:	98ASB42761B	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	PAGE 2 OF 2

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.

onsemi, **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