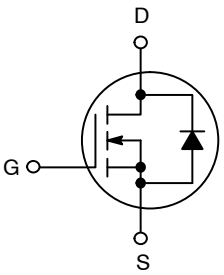
N-Channel PowerTrench® MOSFET

60 V, 110 A, 2.7 mΩ

NTBS2D7N06M7

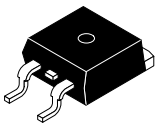


Features

- Typical $R_{DS(on)}$ = 2.2 mΩ at V_{GS} = 10 V, I_D = 80 A
- Typical $Q_{g(tot)}$ = 80 nC at V_{GS} = 10 V, I_D = 80 A
- UIS Capability
- These Devices are Pb−Free and are RoHS Compliant

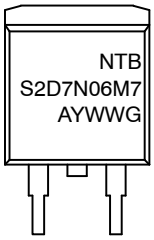
Applications

- Industrial Motor Drive
- Industrial Power Supply
- Industrial Automation
- Battery Operated Tools
- Battery Protection
- Solar Inverters
- UPS and Energy Inverters
- Energy Storage
- Load Switch



D²PAK−3
TO−263
CASE 418AJ

MARKING DIAGRAM



NTBS2D7N06M7 = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
G = Pb−Free Package

ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

ABSOLUTE MAXIMUM RATINGS (T_J = 25°C, Unless otherwise noted)

Rating	Symbol	Value	Unit
Drain−to−Source Voltage	V_{DSS}	60	V
Gate−to−Source Voltage	V_{GS}	±20	V
Drain Current − Continuous (T_C = 25°C) (V_{GS} = 10) (Note 1)	I_D	110	A
Pulsed Drain Current (T_C = 25°C)		See Figure 4	
Single Pulse Avalanche Energy (Note 2)	E_{AS}	193	mJ
Power Dissipation	P_D	176	W
Derate Above 25°C		1.2	W/°C
Operating and Storage Temperature Range	T_J, T_{STG}	−55 to +175	°C
Thermal Resistance, Junction to Case	$R_{\theta JC}$	0.85	°C/W
Maximum Thermal Resistance, Junction to Ambient (Note 3)	$R_{\theta JA}$	43	°C/W

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. Current is limited by bondwire configuration.
2. Starting T_J = 25°C, L = 50 μH, I_{AS} = 88 A, V_{DD} = 60 V during inductor charging and V_{DD} = 0 V during time in avalanche.
3. $R_{\theta JA}$ is the sum of the junction−to−case and case−to−ambient thermal resistance, where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design, while $R_{\theta JA}$ is determined by the board design. The maximum rating presented here is based on mounting on a 1 in^2 pad of 2oz copper.

PACKAGE MARKING AND ORDERING INFORMATION

Device	Device Marking	Package	Reel Size	Tape Width	Quantity
NTBS2D7N06M7	NTBS2D7N	D^2PAK (TO−263)	330 mm	24 mm	800 Units

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

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
BV_{DSS}	Drain−to−Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 μA	60	–	–	V
I_{DSS}	Drain−to−Source Leakage Current	V_{DS} = 60 V, V_{GS} = 0 V, T_J = 25°C	–	–	1	μA
		V_{DS} = 60 V, V_{GS} = 0 V, T_J = 175°C (Note 4)	–	–	1	mA
I_{GSS}	Gate−to−Source Leakage Current	V_{GS} = ±20 V	–	–	±100	nA
ON CHARACTERISTICS						
$V_{GS(th)}$	Gate−to−Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 μA	2.0	3.2	4.0	V
$R_{DS(on)}$	Drain−to−Source On Resistance	V_{GS} = 10 V, I_D = 80 A, T_J = 25°C	–	2.2	2.7	mΩ
		V_{GS} = 10 V, I_D = 80 A, T_J = 175°C (Note 4)	–	4.1	5.0	mΩ
DYNAMIC CHARACTERISTICS						
C_{iss}	Input Capacitance	V_{DS} = 30 V, V_{GS} = 0 V, f = 1 MHz	–	6655	–	pF
C_{oss}	Output Capacitance		–	1745	–	pF
C_{rss}	Reverse Transfer Capacitance		–	57	–	pF
R_g	Gate Resistance	f = 1 MHz	–	2.2	–	Ω
$Q_{g(tot)}$	Total Gate Charge at 10 V	V_{DD} = 30 V, I_D = 80 A, V_{GS} = 0 to 10 V	–	80	110	nC
$Q_{g(th)}$	Threshold Gate Charge	V_{DD} = 30 V, I_D = 80 A, V_{GS} = 0 to 2 V	–	12	–	nC
Q_{gs}	Gate−to−Source Gate Charge	V_{DD} = 30 V, I_D = 80 A	–	35	–	nC
Q_{gd}	Gate−to−Drain “Miller” Charge	V_{DD} = 30 V, I_D = 80 A	–	10	–	nC
SWITCHING CHARACTERISTICS						
$t_{(on)}$	Turn−On Time	V_{DD} = 30 V, I_D = 80 A, V_{GS} = 10 V, R_{GEN} = 6 Ω	–	–	115	ns
$t_{d(on)}$	Turn−On Delay		–	36	–	ns
t_r	Rise Time		–	52	–	ns
$t_{d(off)}$	Turn−Off Delay		–	36	–	ns
t_f	Fall Time		–	13	–	ns
t_{off}	Turn−Off Time		–	–	64	ns
DRAIN−SOURCE DIODE CHARACTERISTICS						
V_{SD}	Source−to−Drain Diode Voltage	V_{GS} = 0 V, I_{SD} = 80 A	–	–	1.25	V
		V_{GS} = 0 V, I_{SD} = 40 A	–	–	1.2	V
t_{rr}	Reverse−Recovery Time	V_{DD} = 48 V, I_F = 80 A, dI_{SD}/dt = 100 A/μs	–	78	102	ns
Q_{rr}	Reverse−Recovery Charge		–	100	130	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.

4. The maximum value is specified by design at T_J = 175°C. Product is not tested to this condition in production.

TYPICAL PERFORMANCE CHARACTERISTICS

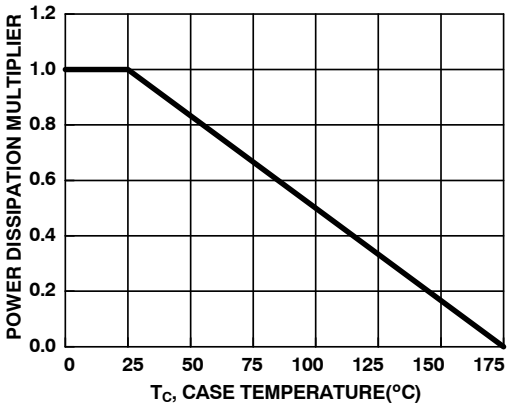


Figure 1. Normalized Power Dissipation vs. Case Temperature

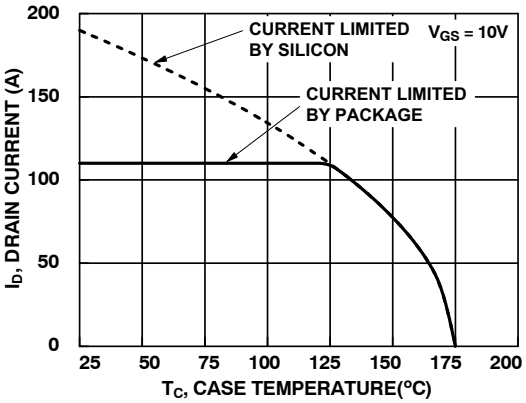


Figure 2. Maximum Continuous Drain Current vs. Case Temperature

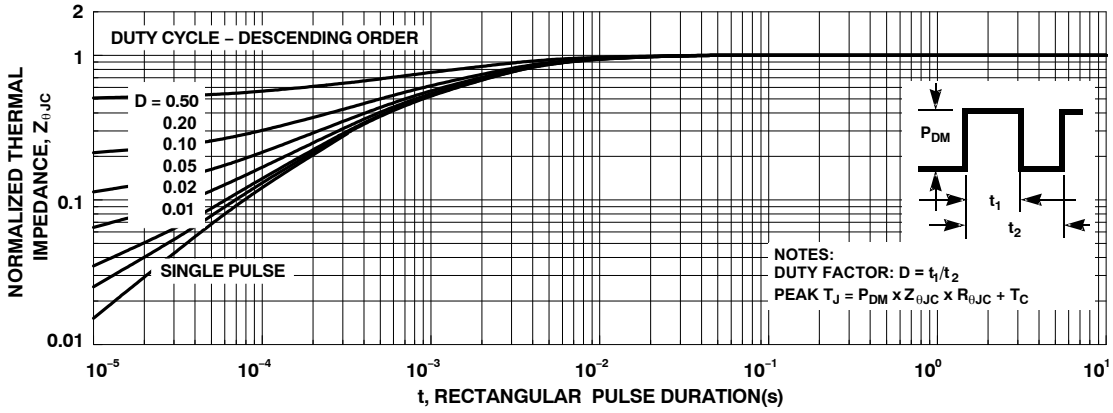


Figure 3. Normalized Maximum Transient Thermal Impedance

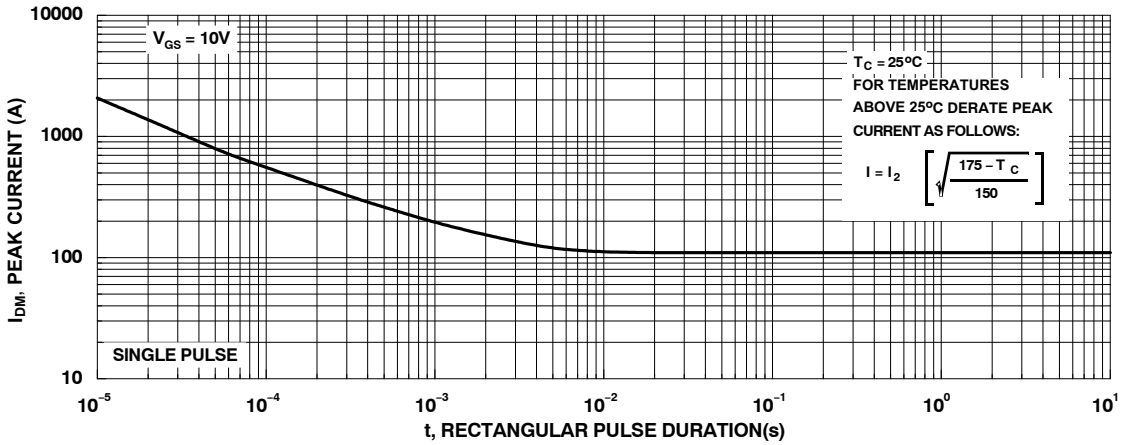


Figure 4. Peak Current Capability

TYPICAL PERFORMANCE CHARACTERISTICS

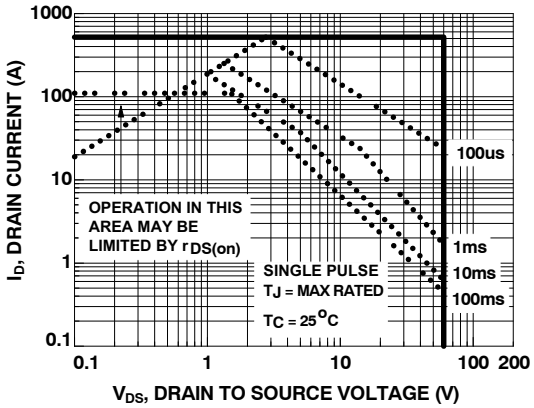
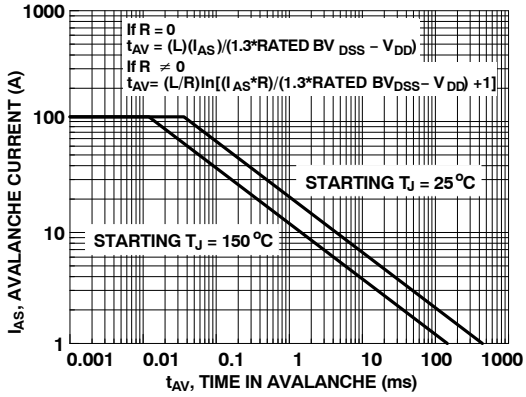


Figure 5. Forward Bias Safe Operating Area



NOTE: Refer to ON Semiconductor Application Notes AN7514 and AN7515

Figure 6. Unclamped Inductive Switching Capability

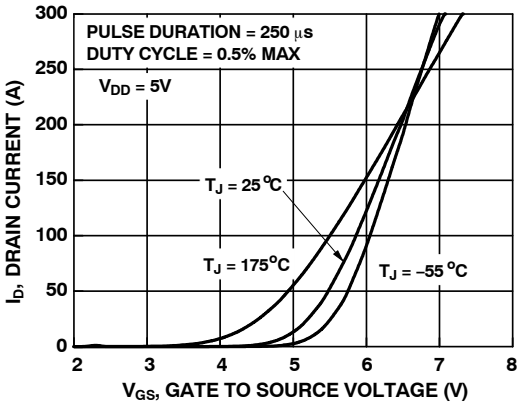


Figure 7. Transfer Characteristics

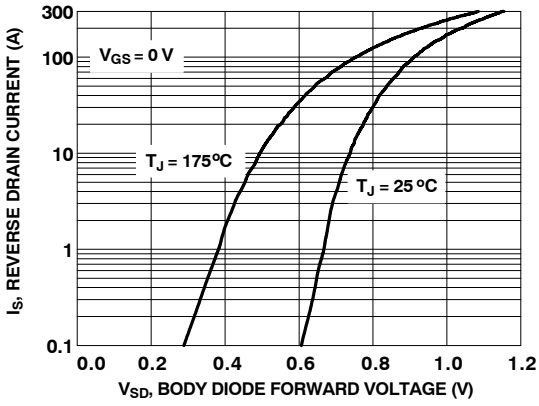


Figure 8. Forward Diode Characteristics

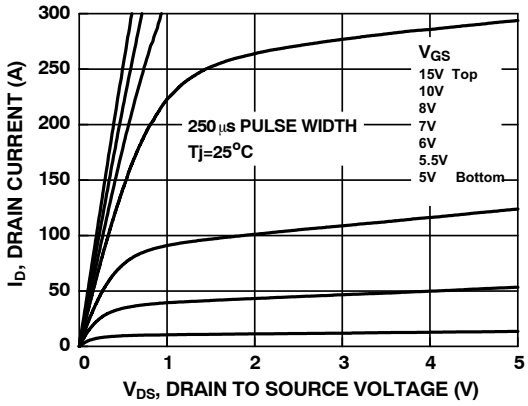


Figure 9. Saturation Characteristics

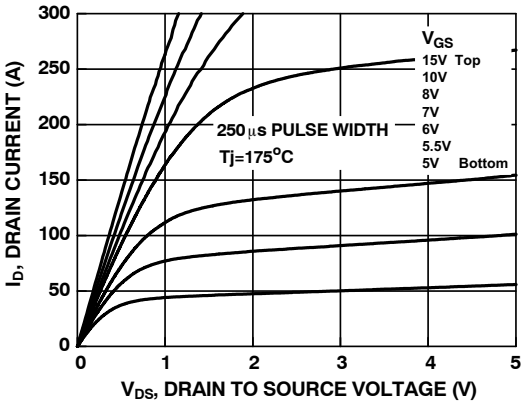


Figure 10. Saturation Characteristics

TYPICAL PERFORMANCE CHARACTERISTICS

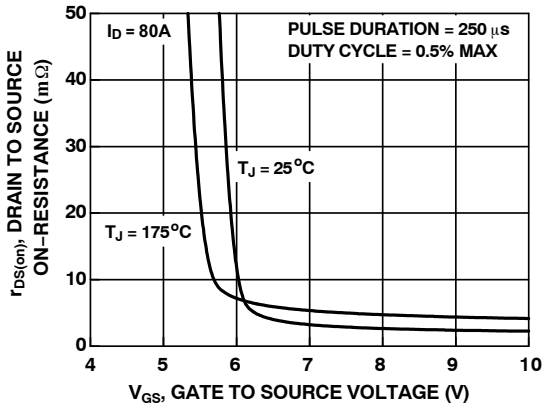


Figure 11. $R_{DS(on)}$ vs. Gate Voltage

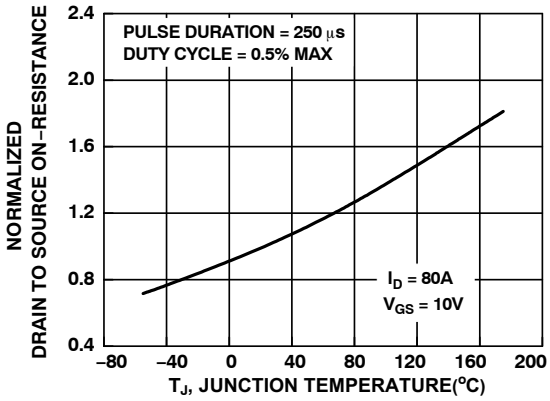


Figure 12. Normalized $R_{DS(on)}$ vs. Junction Temperature

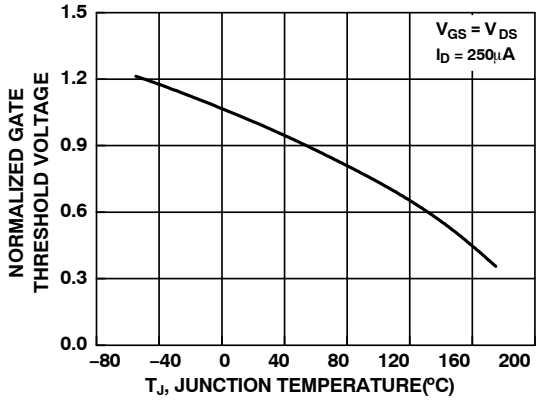


Figure 13. Normalized Gate Threshold Voltage vs. Temperature

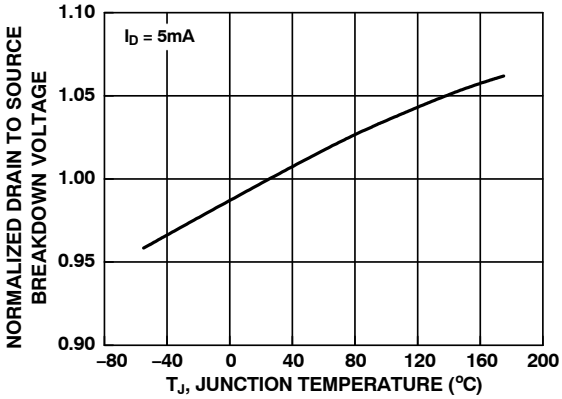


Figure 14. Normalized Drain−to−Source Breakdown Voltage vs. Junction Temperature

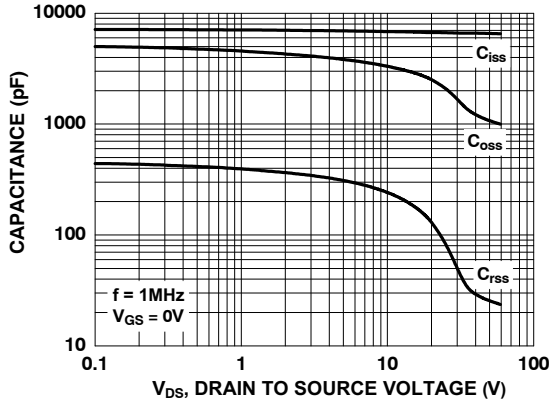


Figure 15. Capacitance vs. Drain−to−Source Voltage

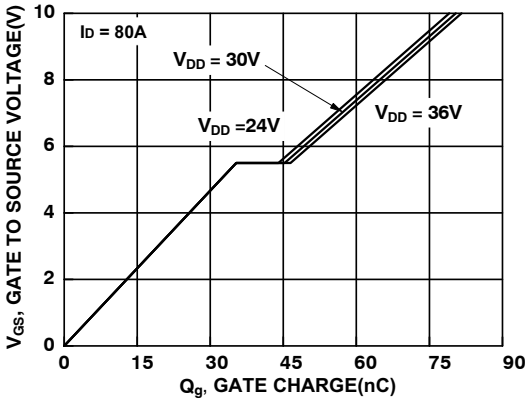
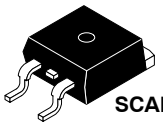


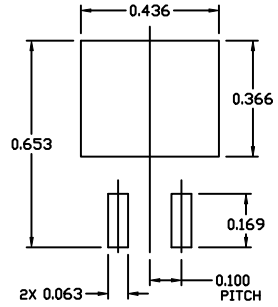
Figure 16. Gate Charge vs. Gate−to−Source Voltage



SCALE 1:1

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

DATE 11 MAR 2021



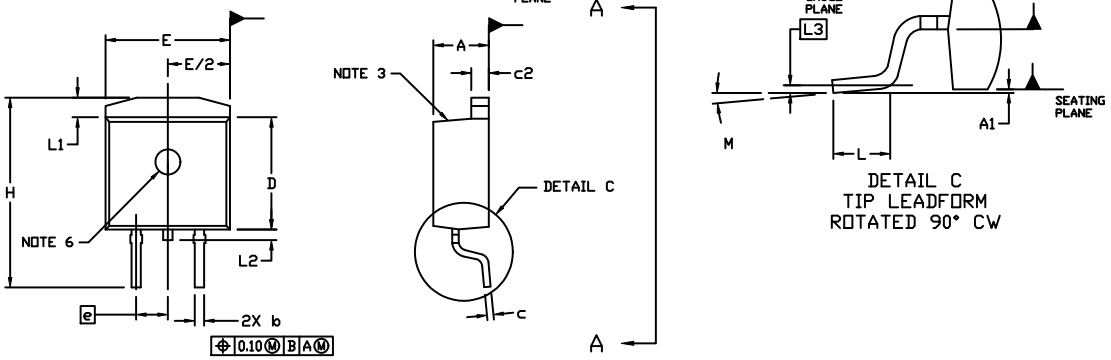
RECOMMENDED
MOUNTING FOOTPRINT

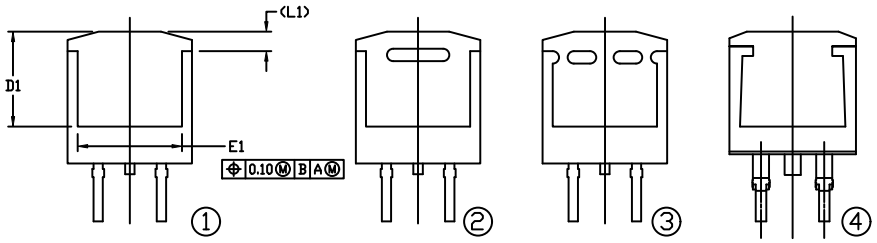
* For additional information on our Pb–Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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°

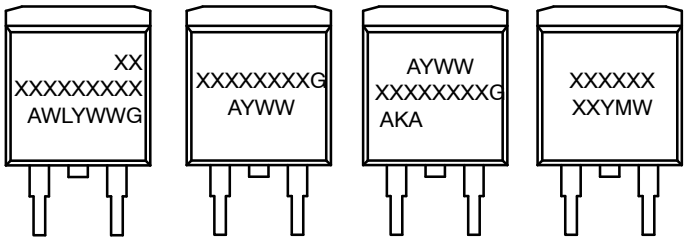




VIEW A–A

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.

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DESCRIPTION:	**D²PAK–3 (TO–263, 3–LEAD)**	**PAGE 1 OF 1**

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