FAIRCHILD SEMICONDUCTOR®

May 2013

FDB86135

N-Channel Shielded Gate PowerTrench® MOSFET

100V, 176A, 3.5mΩ

Features

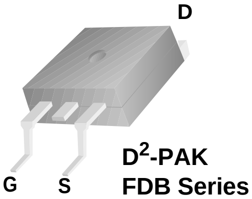
- Shielded Gate MOSFET Technology
- Max $R_{DS(on)}$ = 3.5mΩ at V_{GS} = 10V, I_D = 75A
- Fast Switching Speed
- Low Gate Charge
- High Performance Trench Technology for Extremely Low $R_{DS(on)}$
- High Power and Current Handling Capability
- RoHS Compliant

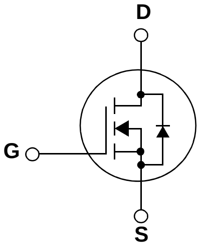
General Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench® process that incorporates Shielded Gate technology. This process has been optimized for the on-state resistance and yet maintain superior switching performance.

Applications

- DC-DC primary bridge
- DC-DC Synchronous rectification
- Hot swap





MOSFET Maximum Ratings T_C = 25°C unless otherwise noted

Symbol	Parameter		Ratings	Units
V_{DSS}	Drain to Source Voltage		100	V
V_{GSS}	Gate to Source Voltage		±20	V
I_D	Drain Curren - Continuous (Silicon Limited)	T_C = 25°C	176	A
	- Continuous(Package Limited)	T_C = 25°C	120	
	- Continuous	T_C = 25°C(Note 1a)	75	
	- Pulsed		704	A
E_{AS}	Single Pulsed Avalanche Energy	(Note 3)	658	mJ
P_D	Power Dissipation	- T_C = 25°C (Note 1a)	227	W
		- T_A = 25°C (Note 1b)	2.4	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +175	°C

Thermal Characteristics

Symbol	Parameter		Ratings	Units
$R_{\theta JC}$	Thermal Resistance, Junction to Case	(Note 1)	0.66	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1a)	62.5	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDB86135	FDB86135	D2-PAK	330mm	24mm	800

Electrical Characteristics $T_C = 25^oC$ unless otherwise noted

Off Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 250\mu A$, $V_{GS} = 0V$, $T_C = 25^oC$	100	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu A$, Referenced to 25^oC	-	0.07	-	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 80V$, $V_{GS} = 0V$	-	-	1	μA
I_{GSS}	Gate to Body Leakage Current	$V_{GS} = \pm 20V$, $V_{DS} = 0V$	-	-	±100	nA

On Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = 250\mu A$	2.0	-	4.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10V$, $I_D = 75A$	-	3.0	3.5	mΩ
g_{FS}	Forward Transconductance	$V_{DS} = 10V$, $I_D = 75A$	-	167	-	S

Dynamic Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
C_{iss}	Input Capacitance	$V_{DS} = 25V$, $V_{GS} = 0V$ f = 1MHz	-	5485	7295	pF
C_{oss}	Output Capacitance		-	2430	3230	pF
C_{rss}	Reverse Transfer Capacitance		-	210	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{DS} = 80V$, $I_D = 75A$ $V_{GS} = 10V$	-	89	116	nC
Q_{gs}	Gate to Source Gate Charge		-	24	-	nC
Q_{gs2}	Gate Charge Threshold to Plateau		-	8	-	nC
Q_{gd}	Gate to Drain “Miller” Charge		-	25	-	nC

Switching Characteristics

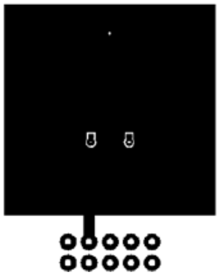
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 50V$, $I_D = 75A$ $V_{GS} = 10V$, $R_{GEN} = 4.7\Omega$	-	22	54	ns
t_r	Turn-On Rise Time		-	54	118	ns
$t_{d(off)}$	Turn-Off Delay Time		-	37	84	ns
t_f	Turn-Off Fall Time		-	11	32	ns

Drain-Source Diode Characteristics

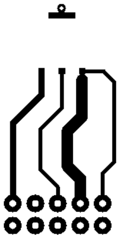
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_{SD}	Drain to Source Diode Forward Voltage	$V_{GS} = 0V$, $I_{SD} = 75A$ (Note 2)	-	-	1.25	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0V$, $I_{SD} = 75A$, $V_{DD} = 80V$ $dI_F/dt = 100A/\mu s$	-	72	-	ns
Q_{rr}	Reverse Recovery Charge		-	129	-	nC

NOTES:

1. $R_{\theta JA}$ is determined with the device mounted on a 1 in^2 pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a) 40 °C/W when mounted on a 1 in^2 pad of 2 oz copper



b) 62.5 °C/W when mounted on a minimum pad of 2 oz copper

2. Pulse Test: Pulse Width < 300 μs, Duty cycle < 2.0 %.
3. Starting $T_J = 25$ °C, L = 1 mH, $I_{AS} = 36.3$ A, $V_{DD} = 100$ V, $V_{GS} = 10$ V.

Typical Performance Characteristics

Figure 1. On-Region Characteristics

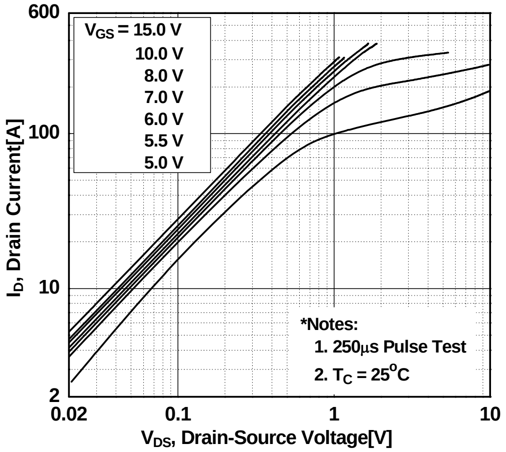


Figure 2. Transfer Characteristics

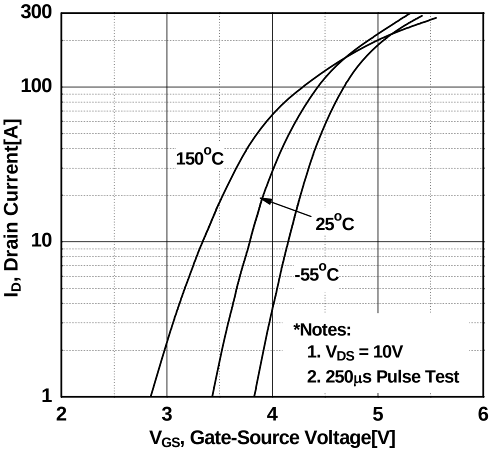


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

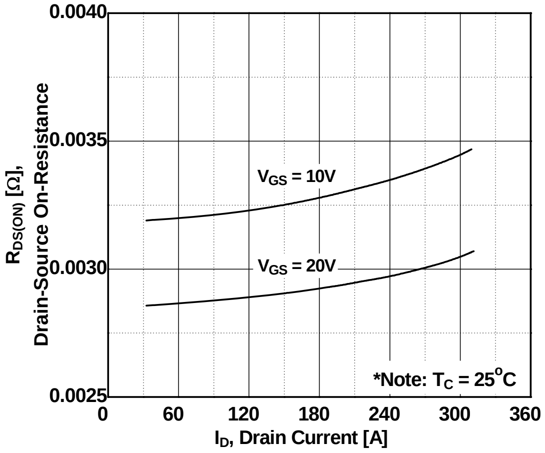


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

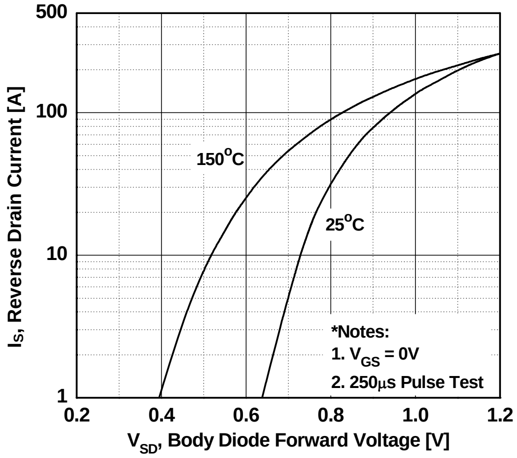


Figure 5. Capacitance Characteristics

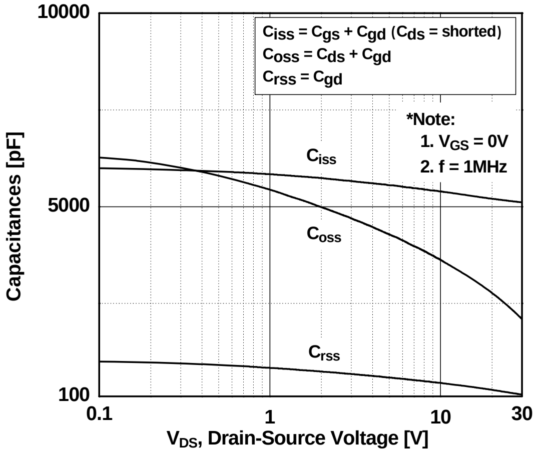
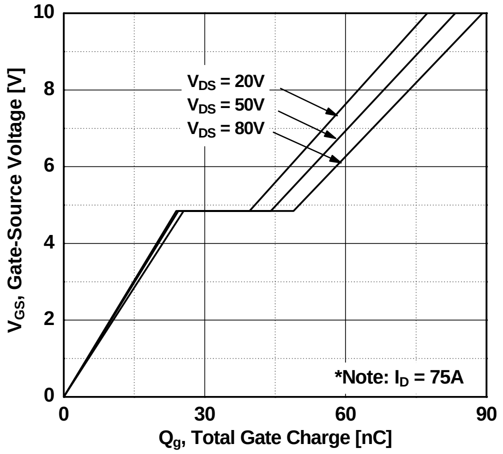


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics

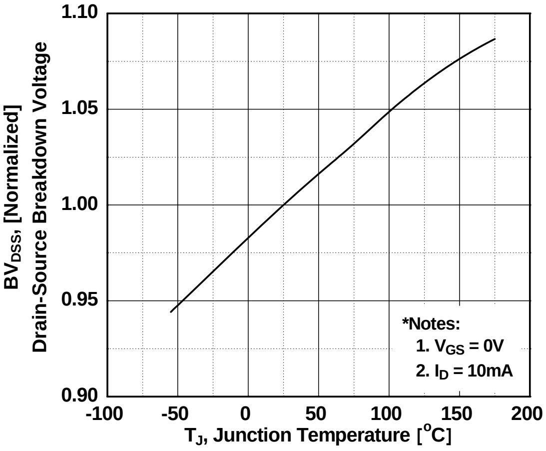


Figure 7. Breakdown Voltage Variation vs. Temperature

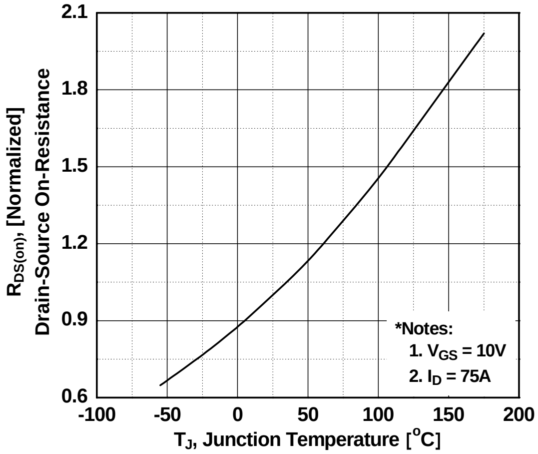


Figure 8. On-Resistance Variation vs. Temperature

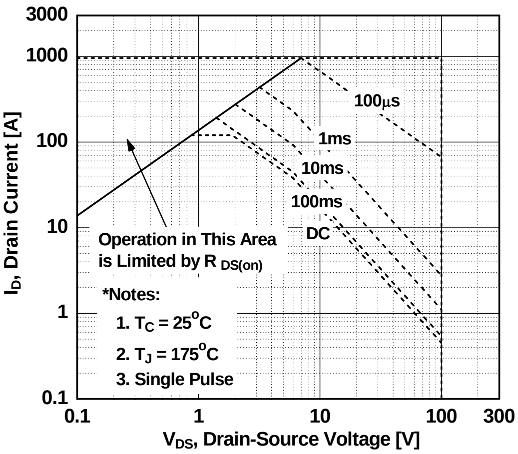


Figure 9. Maximum Safe Operating Area

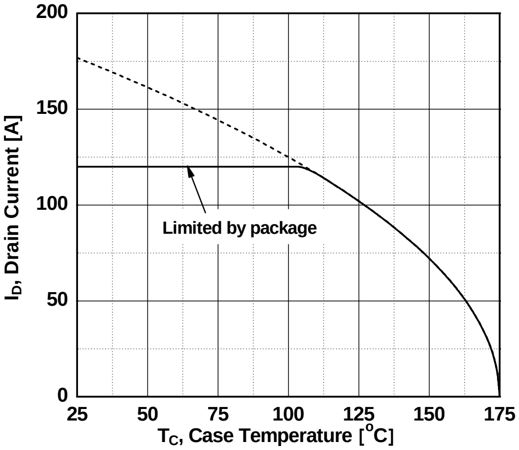


Figure 10. Maximum Drain Current vs. Case Temperature

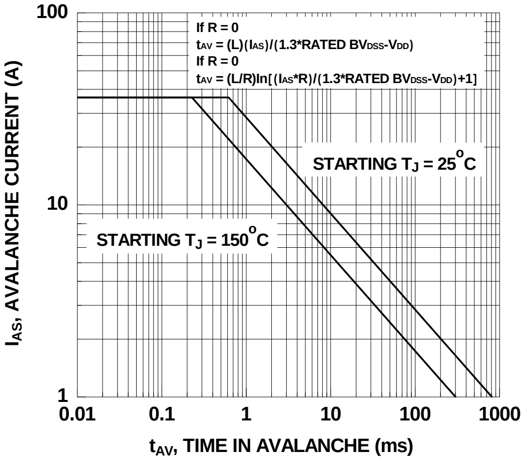


Figure 11. Unclamped Inductive Switching Capability

Typical Performance Characteristics

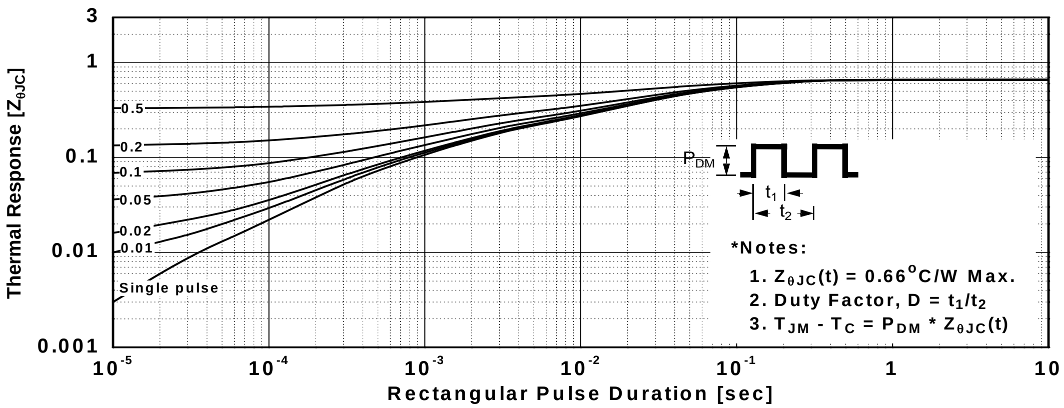
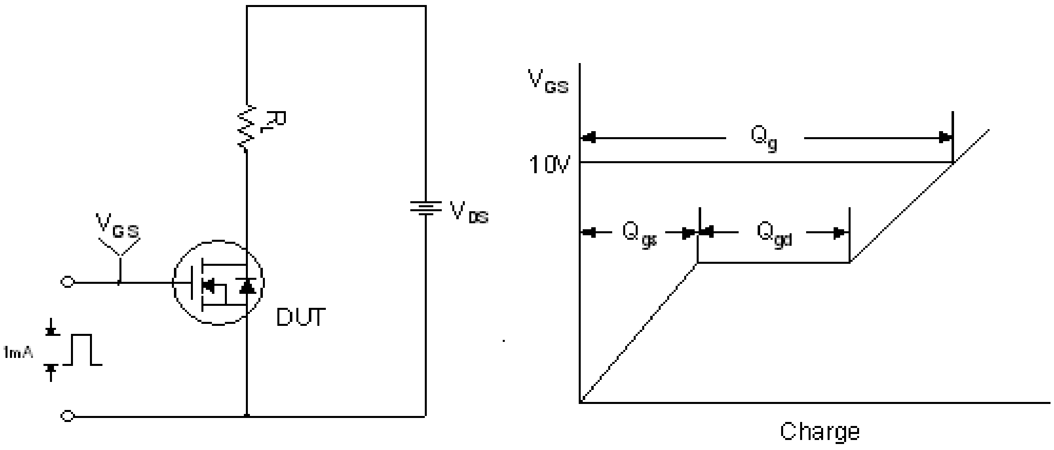
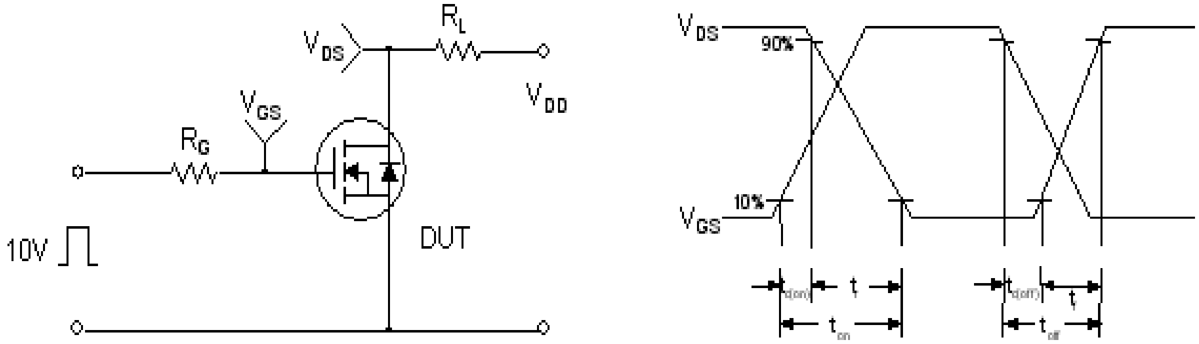


Figure 12. Transient Thermal Response Curve

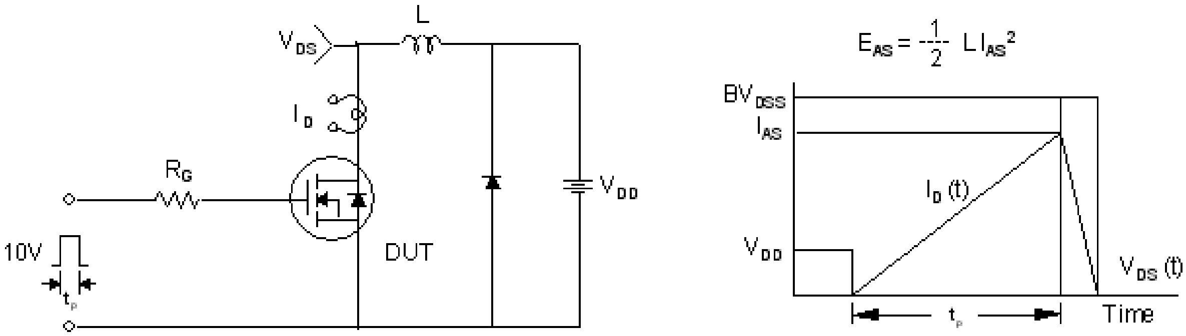
Gate Charge Test Circuit & Waveform



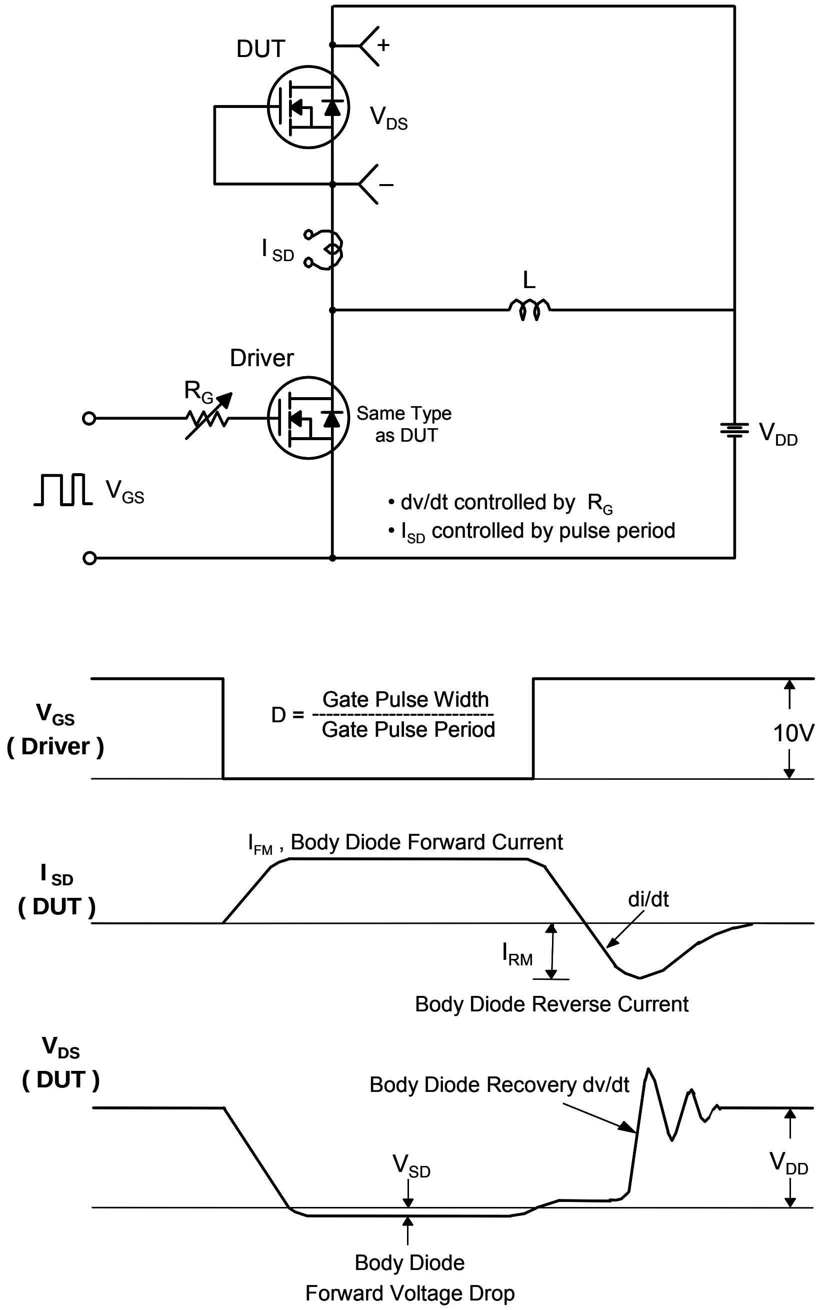
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

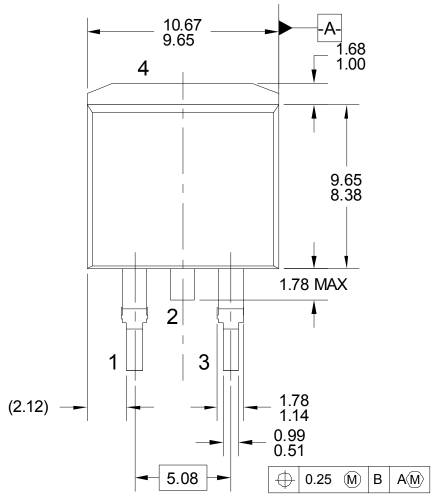


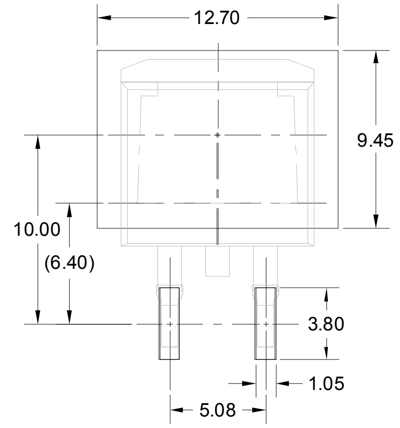
Peak Diode Recovery dv/dt Test Circuit & Waveforms



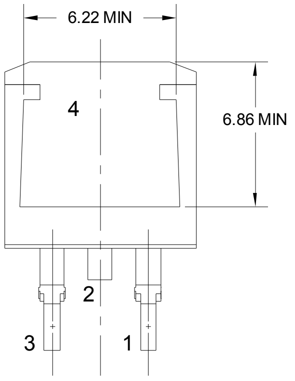
Mechanical Dimensions

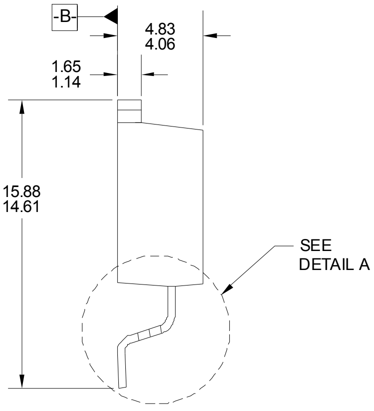
D2-PAK



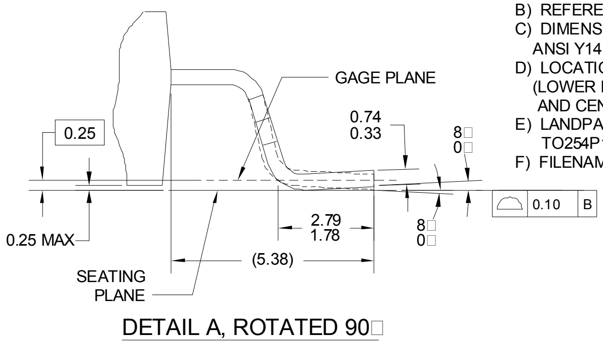


LAND PATTERN RECOMMENDATION
UNLESS NOTED, ALL DIMS TYPICAL





NOTES: UNLESS OTHERWISE SPECIFIED
- A) ALL DIMENSIONS ARE IN MILLIMETERS.
- B) REFERENCE JEDEC, TO-263, VARIATION AB.
- C) DIMENSIONING AND TOLERANCING PER ANSI Y14.5M - 1994.
- D) LOCATION OF THE PIN HOLE MAY VARY (LOWER LEFT CORNER, LOWER CENTER AND CENTER OF THE PACKAGE).
- E) LANDPATTERN RECOMMENDATION PER IPC TO254P1524X482-3N
- F) FILENAME: TO263A02REV6



DETAIL A, ROTATED 90°
SCALE: 2X

Dimensions in Millimeters

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Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

Rev. I64

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Components Supply Platform

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Address :

401 Building No.5, JiuGe Business Center, Lane 2301, Yishan Rd
Minhang District, Shanghai , China

Sales :

Direct	+86 (21) 6401-6692
Email	amall@ameya360.com
QQ	800077892
Skype	ameyasales1 ameyasales2

Customer Service :

Email	service@ameya360.com

Partnership :

Tel	+86 (21) 64016692-8333
Email	mkt@ameya360.com