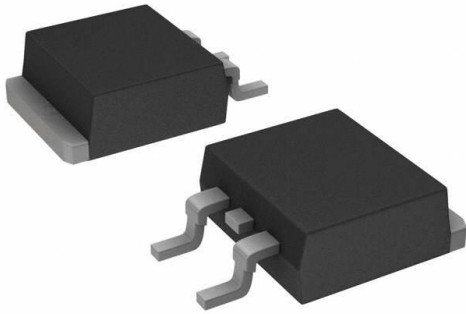


# IRF520STRL Datasheet

[www.digi-electronics.com](http://www.digi-electronics.com)



DiGi Electronics Part Number	IRF520STRL-DG
Manufacturer	<a href="#">Vishay Siliconix</a>
Manufacturer Product Number	IRF520STRL
Description	MOSFET N-CH 100V 9.2A D2PAK
Detailed Description	N-Channel 100 V 9.2A (Tc) 3.7W (Ta), 60W (Tc) Surface Mount TO-263 (D2PAK)

<https://www.DiGi-Electronics.com>



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## Purchase and inquiry

Manufacturer Product Number:

IRF520STRL

Series:

-

FET Type:

N-Channel

Drain to Source Voltage (Vdss):

100 V

Drive Voltage (Max Rds On, Min Rds On):

10V

Vgs(th) (Max) @ Id:

4V @ 250µA

Vgs (Max):

±20V

FET Feature:

-

Operating Temperature:

-55°C ~ 175°C (Tj)

Supplier Device Package:

TO-263 (D2PAK)

Base Product Number:

IRF520

Manufacturer:

Vishay Siliconix

Product Status:

Obsolete

Technology:

MOSFET (Metal Oxide)

Current - Continuous Drain (Id) @ 25°C:

9.2A (Tc)

Rds On (Max) @ Id, Vgs:

270mOhm @ 5.5A, 10V

Gate Charge (Qg) (Max) @ Vgs:

16 nC @ 10 V

Input Capacitance (Ciss) (Max) @ Vds:

360 pF @ 25 V

Power Dissipation (Max):

3.7W (Ta), 60W (Tc)

Mounting Type:

Surface Mount

Package / Case:

TO-263-3, D2PAK (2 Leads + Tab), TO-263AB

## Environmental & Export classification

RoHS Status:

RoHS non-compliant

REACH Status:

REACH Unaffected

HTSUS:

8541.29.0095

Moisture Sensitivity Level (MSL):

1 (Unlimited)

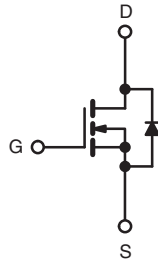
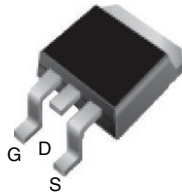
ECCN:

EAR99



## Power MOSFET

PRODUCT SUMMARY	
$V_{DS}$ (V)	100
$R_{DS(on)}$ ( $\Omega$ )	$V_{GS} = 10\text{ V}$ 0.27
$Q_g$ (Max.) (nC)	16
$Q_{gs}$ (nC)	4.4
$Q_{gd}$ (nC)	7.7
Configuration	Single

D<sup>2</sup>PAK (TO-263)

N-Channel MOSFET

### FEATURES

- Halogen-free According to IEC 61249-2-21 Definition
- Surface Mount
- Available in Tape and Reel
- Dynamic dV/dt Rating
- Repetitive Avalanche Rated
- 175 °C Operating Temperature
- Fast Switching
- Ease of Paralleling
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS\***  
Available  
**HALOGEN FREE**  
Available

### Note

\* This datasheet provides information about parts that are RoHS-compliant and / or parts that are non-RoHS-compliant. For example, parts with lead (Pb) terminations are not RoHS-compliant. Please see the information / tables in this datasheet for details.

### DESCRIPTION

Third generation Power MOSFETs from Vishay provide the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness.

The D<sup>2</sup>PAK (TO-263) is a surface mount power package capable of accommodating die size up to HEX-4. It provides the highest power capability and the lowest possible on-resistance in any existing surface mount package. The D<sup>2</sup>PAK (TO-263) is suitable for high current applications because of its low internal connection resistance and can dissipate up to 2.0 W in a typical surface mount application.

ORDERING INFORMATION	
Package	D <sup>2</sup> PAK (TO-263)
Lead (Pb)-free and Halogen-free	SiHF520S-GE3
	SiHF520STRR-GE3
	SiHF520STRL-GE3
Lead (Pb)-free	IRF520SPbF

ABSOLUTE MAXIMUM RATINGS ( $T_C = 25\text{ }^\circ\text{C}$ , unless otherwise noted)			
PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	$V_{DS}$	100	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current	$V_{GS}$ at 10 V	$T_C = 25\text{ }^\circ\text{C}$	9.2
		$T_C = 100\text{ }^\circ\text{C}$	6.5
Pulsed Drain Current <sup>a</sup>		37	A
Linear Derating Factor		0.40	W/°C
Linear Derating Factor (PCB Mount) <sup>e</sup>		0.025	W/°C
Single Pulse Avalanche Energy <sup>b</sup>	$E_{AS}$	200	mJ
Avalanche Currenta	$I_{AR}$	9.2	A
Repetitive Avalanche Energy <sup>a</sup>	$E_{AR}$	6.0	mJ
Maximum Power Dissipation	$P_D$	$T_C = 25\text{ }^\circ\text{C}$	60
		$T_A = 25\text{ }^\circ\text{C}$	3.7
Maximum Power Dissipation (PCB Mount) <sup>e</sup>		3.7	W
Peak Diode Recovery dV/dt <sup>c</sup>	dV/dt	5.5	V/ns
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to + 175	°C
Soldering Recommendations (Peak Temperature)	For 10 s	300 <sup>d</sup>	

### Notes

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- $V_{DD} = 25\text{ V}$ , starting  $T_J = 25\text{ }^\circ\text{C}$ ,  $L = 3.5\text{ mH}$ ,  $R_g = 25\text{ }\Omega$ ,  $I_{AS} = 9.2\text{ A}$  (see fig. 12).
- $I_{SD} \leq 9.2\text{ A}$ ,  $dI/dt \leq 110\text{ A}/\mu\text{s}$ ,  $V_{DD} \leq V_{DS}$ ,  $T_J \leq 175\text{ }^\circ\text{C}$ .
- 1.6 mm from case.
- When mounted on 1" square PCB (FR-4 or G-10 material).

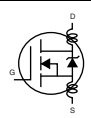

**THERMAL RESISTANCE RATINGS**

PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	$R_{thJA}$	-	62	°C/W
Maximum Junction-to-Ambient (PCB Mount) <sup>a</sup>	$R_{thJA}$	-	40	
Maximum Junction-to-Case (Drain)	$R_{thJC}$	-	2.5	

**Note**

a. When mounted on 1" square PCB (FR-4 or G-10 material).

**SPECIFICATIONS** ( $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted)

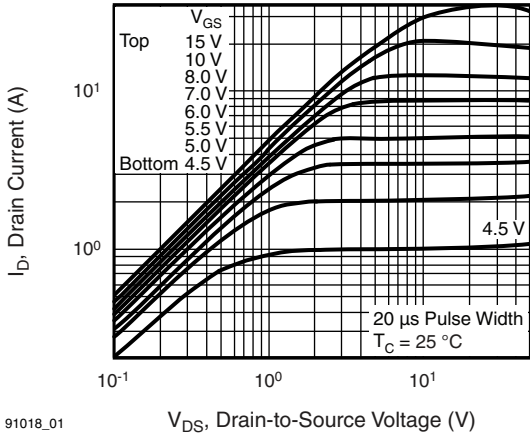
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0, I_D = 250\ \mu\text{A}$	100	-	-	V
$V_{DS}$ Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to $25\text{ }^\circ\text{C}$ , $I_D = 1\ \text{mA}$	-	0.13	-	V/°C
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	2.0	-	4.0	V
Gate-Source Leakage	$I_{GSS}$	$V_{GS} = \pm 20\ \text{V}$	-	-	$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 100\ \text{V}, V_{GS} = 0\ \text{V}$	-	-	25	$\mu\text{A}$
		$V_{DS} = 80\ \text{V}, V_{GS} = 0\ \text{V}, T_J = 150\text{ }^\circ\text{C}$	-	-	250	
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 10\ \text{V}, I_D = 5.5\ \text{A}^b$	-	-	0.27	$\Omega$
Forward Transconductance	$g_{fs}$	$V_{DS} = 50\ \text{V}, I_D = 5.5\ \text{A}^b$	2.7	-	-	S
<b>Dynamic</b>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0\ \text{V}, V_{DS} = 25\ \text{V}, f = 1.0\ \text{MHz}$ , see fig. 5	-	360	-	pF
Output Capacitance	$C_{oss}$		-	150	-	
Reverse Transfer Capacitance	$C_{riss}$		-	34	-	
Total Gate Charge	$Q_g$	$V_{GS} = 10\ \text{V}, I_D = 9.2\ \text{A}, V_{DS} = 80\ \text{V}$ , see fig. 6 and 13 <sup>b</sup>	-	-	16	nC
Gate-Source Charge	$Q_{gs}$		-	-	4.4	
Gate-Drain Charge	$Q_{gd}$		-	-	7.7	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 50\ \text{V}, I_D = 9.2\ \text{A}, R_g = 18\ \Omega, R_D = 5.2\ \Omega$ , see fig. 10 <sup>b</sup>	-	8.8	-	ns
Rise Time	$t_r$		-	30	-	
Turn-Off Delay Time	$t_{d(off)}$		-	19	-	
Fall Time	$t_f$		-	20	-	
Internal Drain Inductance	$L_D$	Between lead, 6 mm (0.25") from package and center of die contact 	-	4.5	-	nH
Internal Source Inductance	$L_S$		-	7.5	-	
<b>Drain-Source Body Diode Characteristics</b>						
Continuous Source-Drain Diode Current	$I_S$	MOSFET symbol showing the integral reverse p-n junction diode 	-	-	9.2	A
Pulsed Diode Forward Current <sup>a</sup>	$I_{SM}$		-	-	37	
Body Diode Voltage	$V_{SD}$	$T_J = 25\text{ }^\circ\text{C}, I_S = 9.2\ \text{A}, V_{GS} = 0\ \text{V}^b$	-	-	1.8	V
Body Diode Reverse Recovery Time	$t_{rr}$	$T_J = 25\text{ }^\circ\text{C}, I_F = 9.2\ \text{A}, dI/dt = 100\ \text{A}/\mu\text{s}^b$	-	110	260	ns
Body Diode Reverse Recovery Charge	$Q_{rr}$		-	0.53	1.3	$\mu\text{C}$
Forward Turn-On Time	$t_{on}$	Intrinsic turn-on time is negligible (turn-on is dominated by $L_S$ and $L_D$ )				

**Notes**

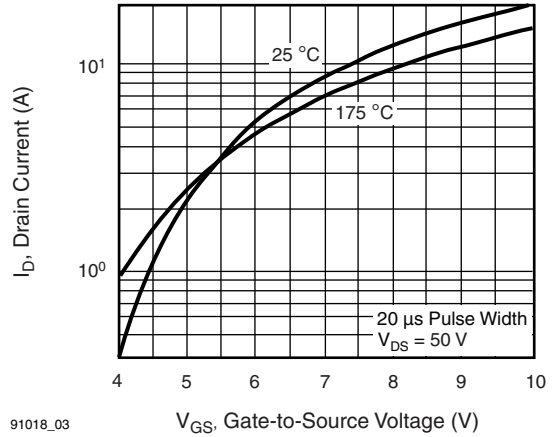
- a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).  
 b. Pulse width  $\leq 300\ \mu\text{s}$ ; duty cycle  $\leq 2\%$ .



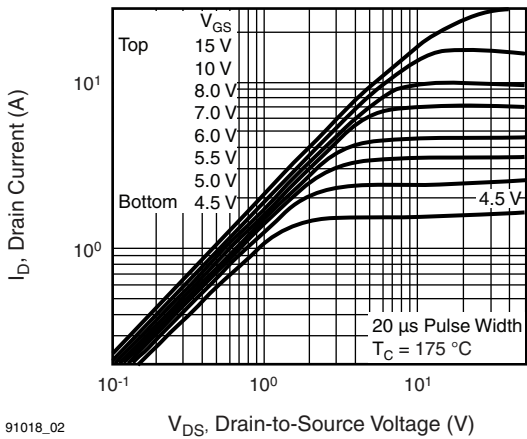
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



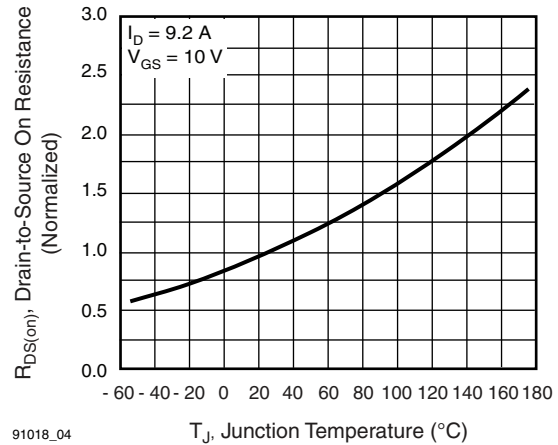
**Fig. 1 - Typical Output Characteristics,  $T_C = 25\text{ }^\circ\text{C}$**



**Fig. 3 - Typical Transfer Characteristics**



**Fig. 2 - Typical Output Characteristics,  $T_C = 175\text{ }^\circ\text{C}$**



**Fig. 4 - Normalized On-Resistance vs. Temperature**

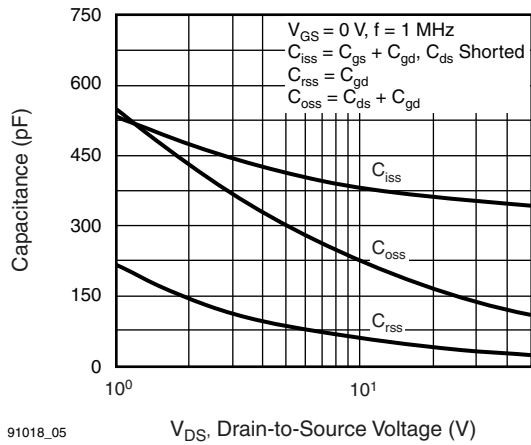


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

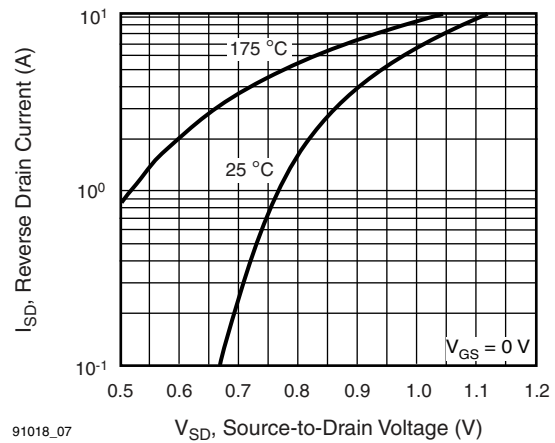


Fig. 7 - Typical Source-Drain Diode Forward Voltage

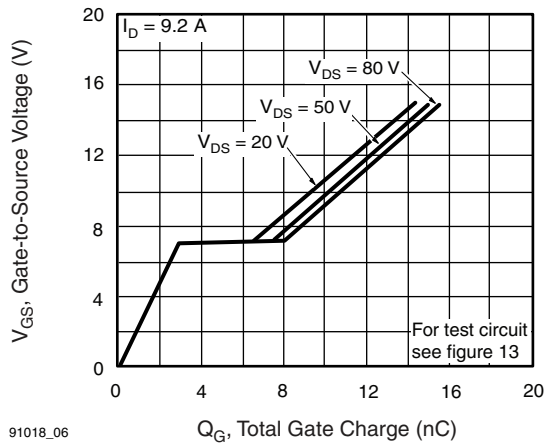


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

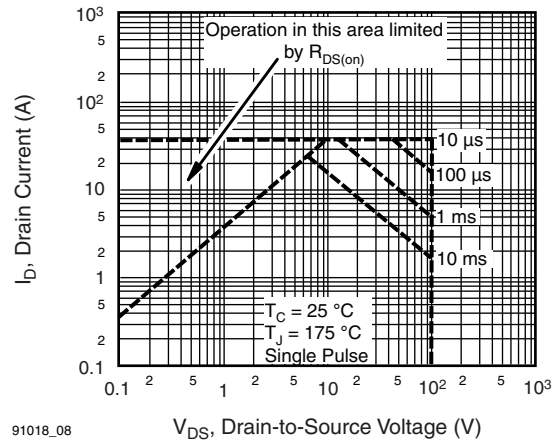
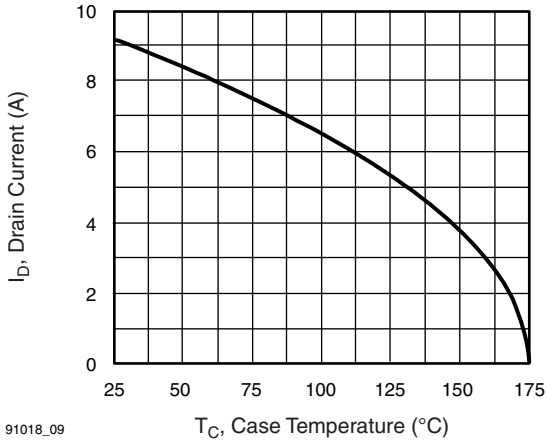


Fig. 8 - Maximum Safe Operating Area



91018\_09

Fig. 9 - Maximum Drain Current vs. Case Temperature

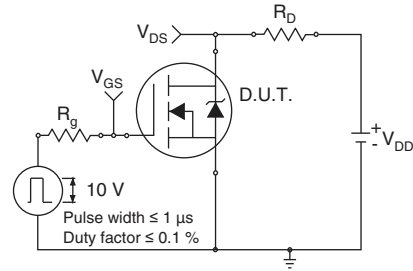


Fig. 10a - Switching Time Test Circuit

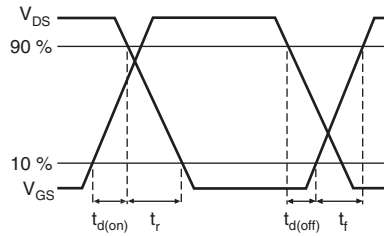
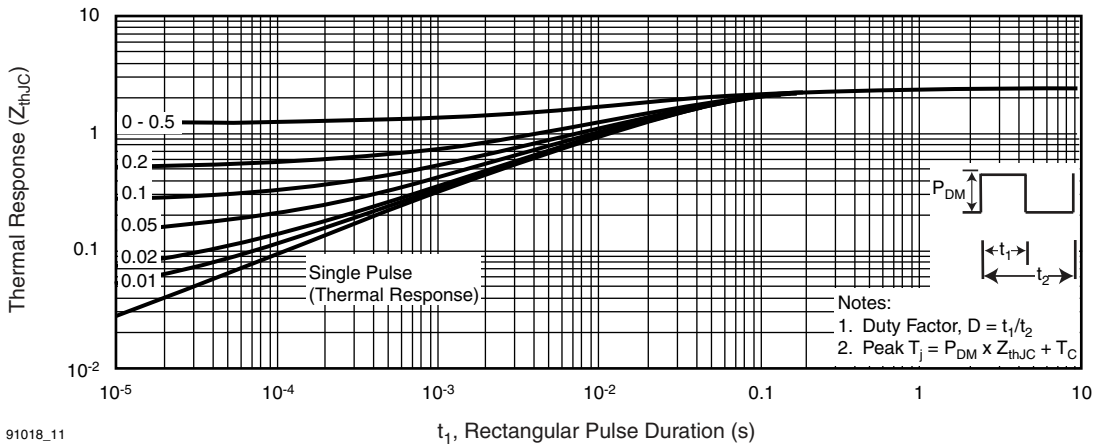


Fig. 10b - Switching Time Waveforms



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Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

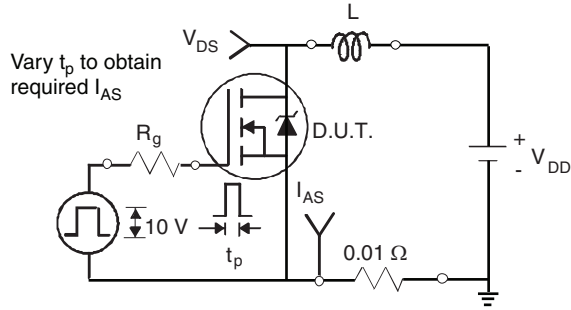


Fig. 12a - Unclamped Inductive Test Circuit

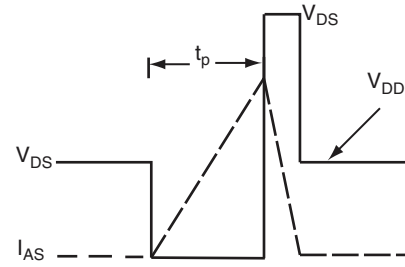


Fig. 12b - Unclamped Inductive Waveforms

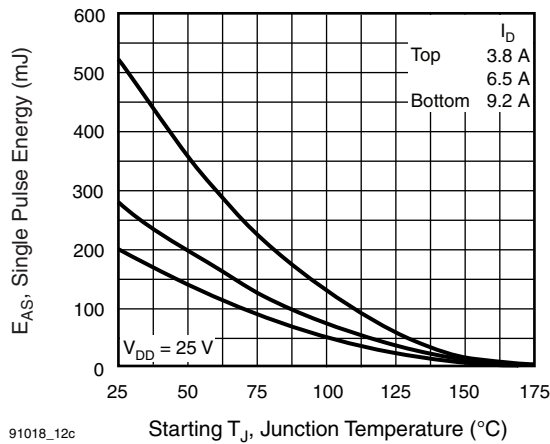


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

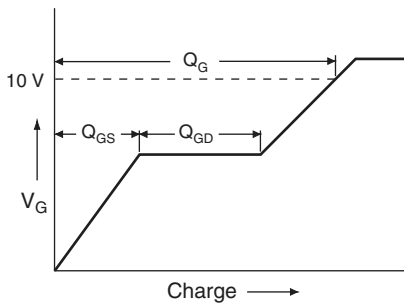


Fig. 13a - Basic Gate Charge Waveform

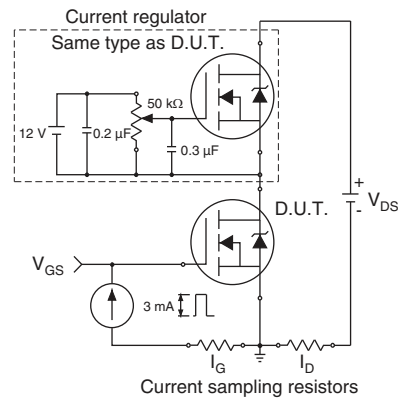
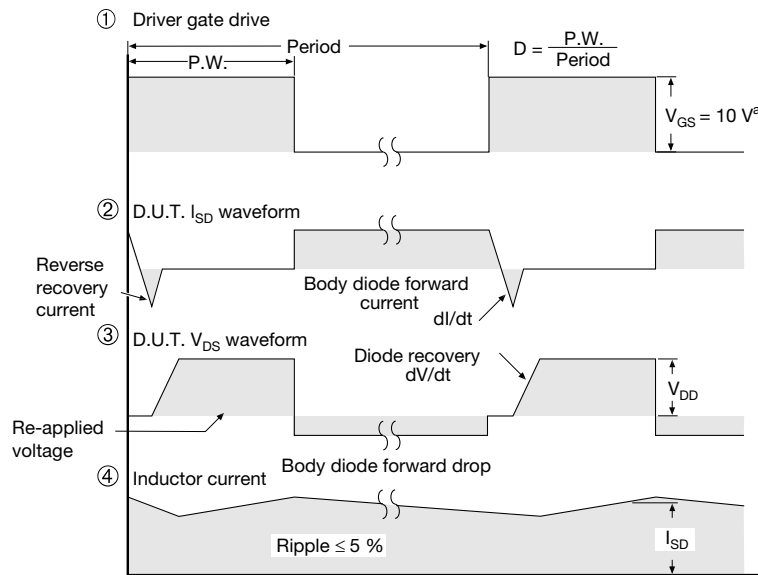
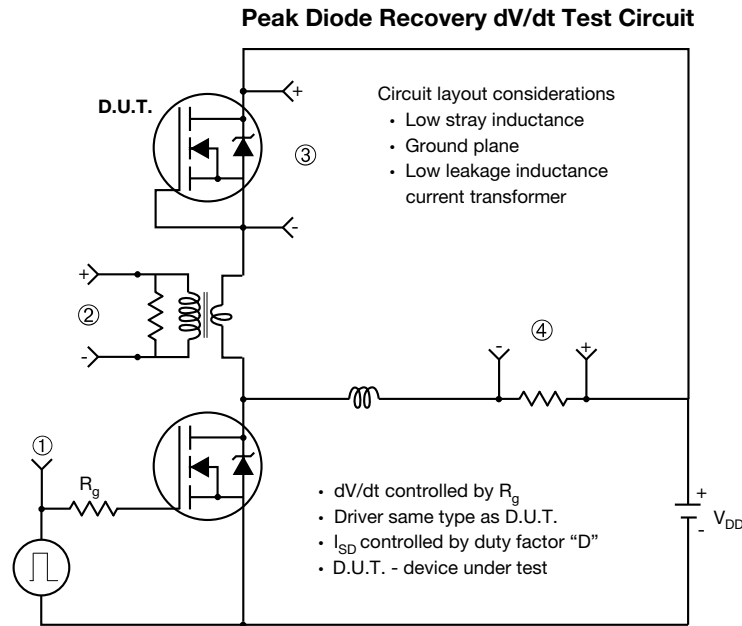


Fig. 13b - Gate Charge Test Circuit





**Note**

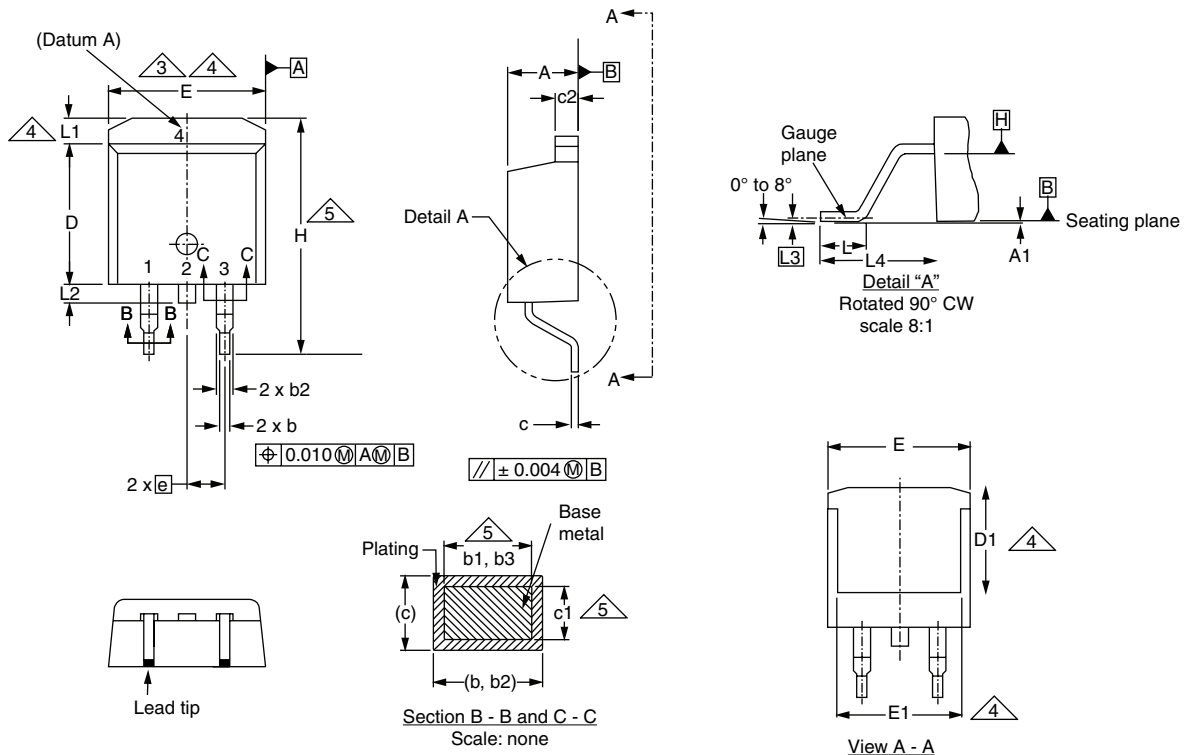
a.  $V_{GS} = 5 V$  for logic level devices

**Fig. 14 - For N-Channel**

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**TO-263AB (HIGH VOLTAGE)**



DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.06	4.83	0.160	0.190
A1	0.00	0.25	0.000	0.010
b	0.51	0.99	0.020	0.039
b1	0.51	0.89	0.020	0.035
b2	1.14	1.78	0.045	0.070
b3	1.14	1.73	0.045	0.068
c	0.38	0.74	0.015	0.029
c1	0.38	0.58	0.015	0.023
c2	1.14	1.65	0.045	0.065
D	8.38	9.65	0.330	0.380

DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
D1	6.86	-	0.270	-
E	9.65	10.67	0.380	0.420
E1	6.22	-	0.245	-
e	2.54 BSC		0.100 BSC	
H	14.61	15.88	0.575	0.625
L	1.78	2.79	0.070	0.110
L1	-	1.65	-	0.066
L2	-	1.78	-	0.070
L3	0.25 BSC		0.010 BSC	
L4	4.78	5.28	0.188	0.208

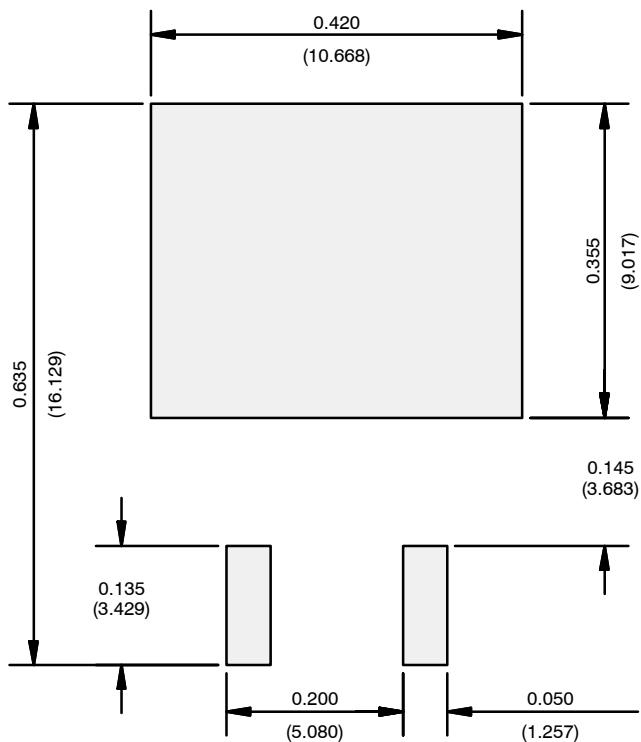
ECN: S-82110-Rev. A, 15-Sep-08  
 DWG: 5970

**Notes**

1. Dimensioning and tolerancing per ASME Y14.5M-1994.
2. Dimensions are shown in millimeters (inches).
3. Dimension D and E do not include mold flash. Mold flash shall not exceed 0.127 mm (0.005") per side. These dimensions are measured at the outmost extremes of the plastic body at datum A.
4. Thermal PAD contour optional within dimension E, L1, D1 and E1.
5. Dimension b1 and c1 apply to base metal only.
6. Datum A and B to be determined at datum plane H.
7. Outline conforms to JEDEC outline to TO-263AB.



**RECOMMENDED MINIMUM PADS FOR D<sup>2</sup>PAK: 3-Lead**



Recommended Minimum Pads  
 Dimensions in Inches/(mm)

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