

F9531-VB Datasheet

P-Channel 60-V (D-S) MOSFET

PRODUCT SUMMARY

V_{DS}	-60	V
$R_{DS(on)}$ $V_{GS} = 10\text{ V}$	62	$m\Omega$
$R_{DS(on)}$ $V_{GS} = 4.5\text{ V}$	74	$m\Omega$
I_D	-40	A
Configuration	Single	

FEATURES

- Trench Power MOSFET
- 100 % UIS Tested

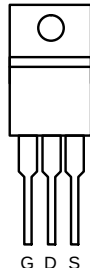
APPLICATIONS

- Load Switch

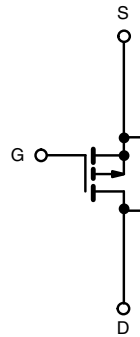


RoHS
COMPLIANT

TO-220AB



Top View



P-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS $T_C = 25\text{ }^\circ\text{C}$, unless otherwise noted

Parameter	Symbol	Limit	Unit
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current ($T_J = 175\text{ }^\circ\text{C}$)	I_D	$T_C = 25\text{ }^\circ\text{C}$	-40
		$T_C = 100\text{ }^\circ\text{C}$	-30
Pulsed Drain Current	I_{DM}	- 90	A
Continuing Source Current (Diode Conduction)	I_S	- 30	
Avalanche Current	I_{AS}	- 28	
Single Pulse Avalanche Energy	E_{AS}	7.2	
Maximum Power Dissipation	P_D	$L = 0.1\text{ mH}$	mJ
		$T_C = 25\text{ }^\circ\text{C}$	60 ^a
Operating Junction and Storage Temperature Range	T_J, T_{stg}	$T_A = 25\text{ }^\circ\text{C}$	2 ^b
			- 55 to 175

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typical	Maximum	Unit
Junction-to-Ambient ^b	R_{thJA}	$t \leq 10\text{ sec}$	20	$^\circ\text{C/W}$
		Steady State	62	
Junction-to-Case	R_{thJC}	5	6	

Notes:

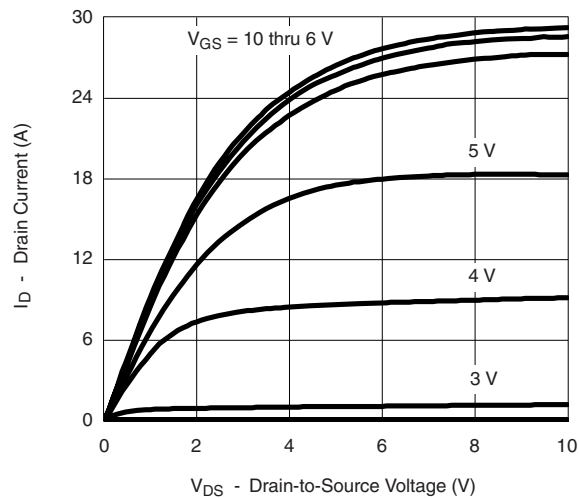
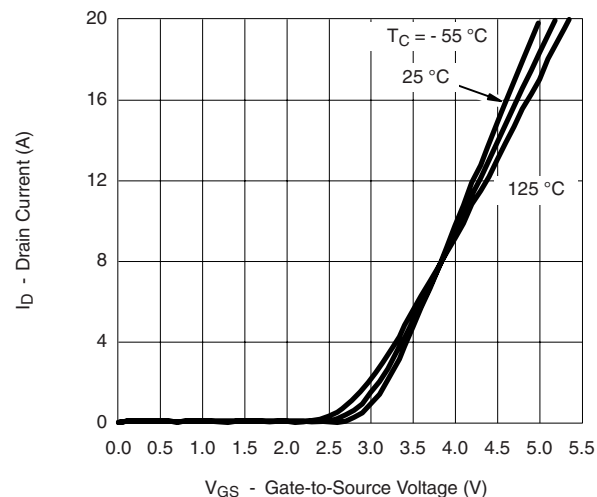
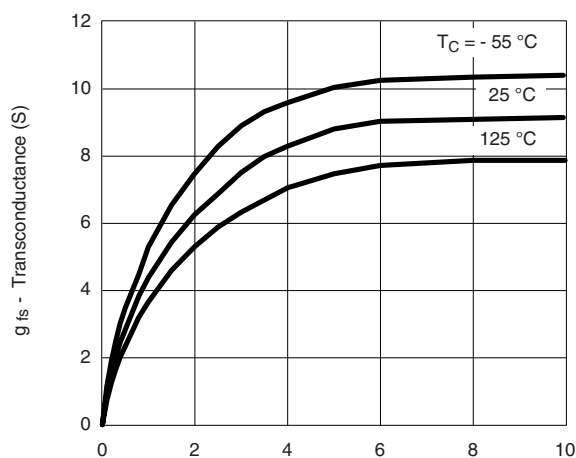
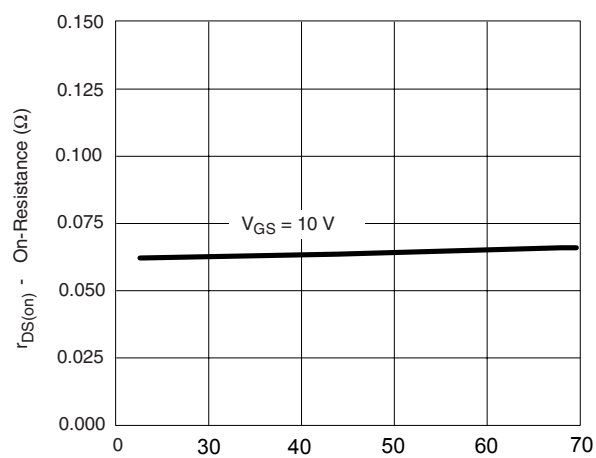
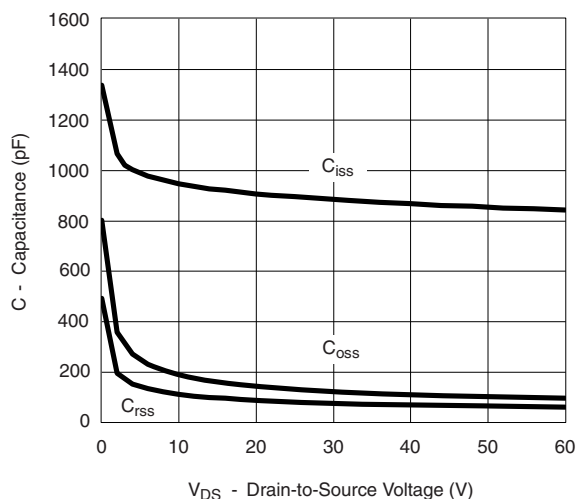
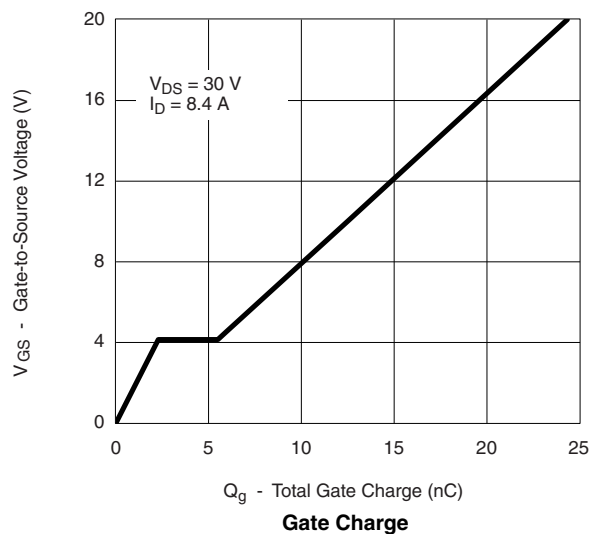
- a. See SOA curve for voltage derating.
b. Surface Mounted on 1" x 1" FR-4 board.

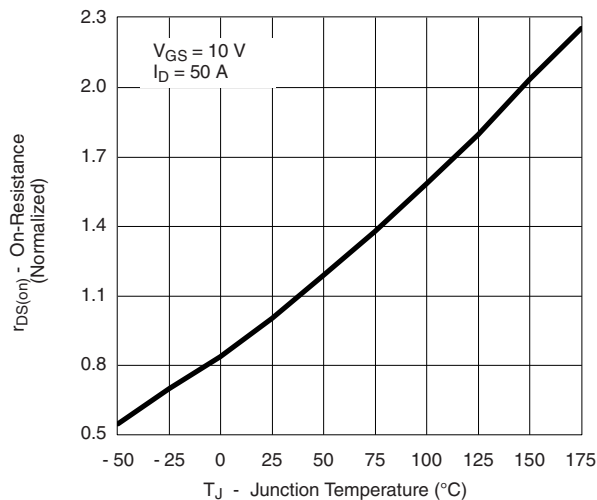
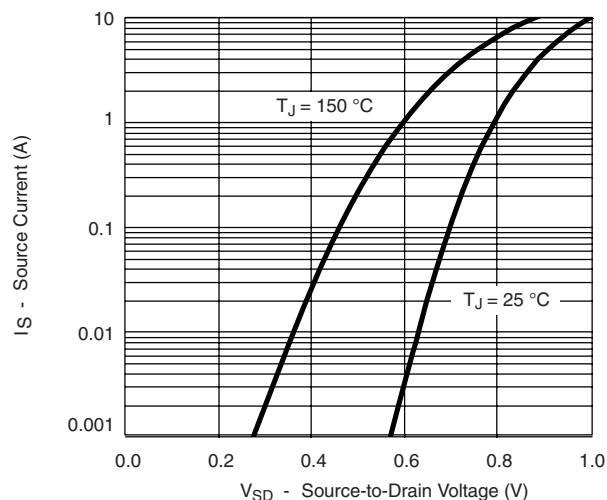
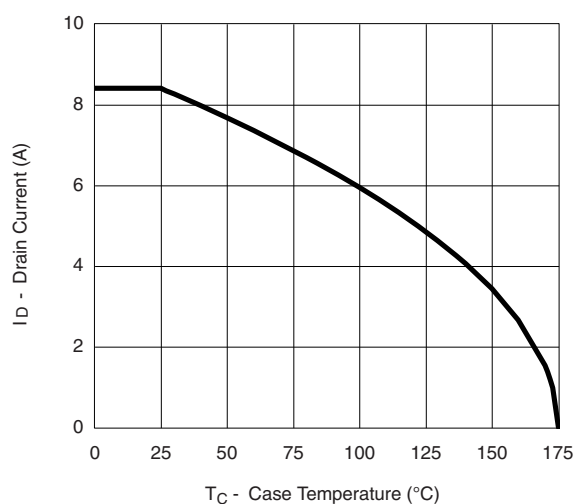
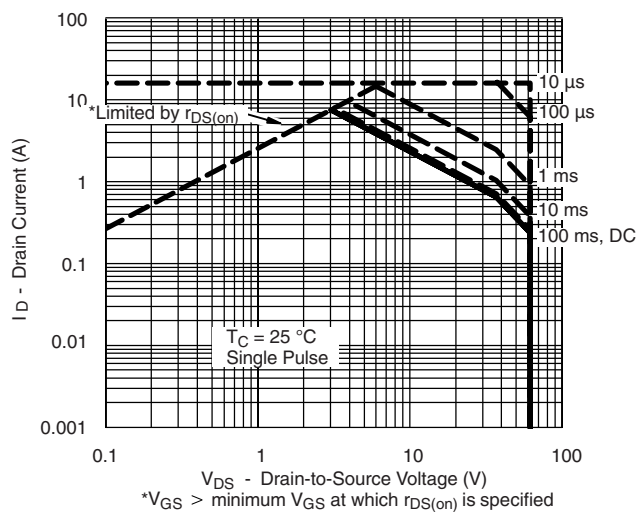
SPECIFICATIONS $T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min	Typ ^a	Max	Unit
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}$, $I_D = -250\text{ }\mu\text{A}$	- 60			V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = -250\text{ }\mu\text{A}$	- 1.0		- 3.0	
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 20\text{ V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -60\text{ V}$, $V_{GS} = 0\text{ V}$			- 1	μA
		$V_{DS} = -60\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 125\text{ }^{\circ}\text{C}$			- 50	
		$V_{DS} = -60\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 175\text{ }^{\circ}\text{C}$			- 150	
On-State Drain Current ^b	$I_{D(on)}$	$V_{DS} = -5\text{ V}$, $V_{GS} = -10\text{ V}$	- 10			A
Drain-Source On-State Resistance ^b	$r_{DS(on)}$	$V_{GS} = -10\text{ V}$, $I_D = -5\text{ A}$		62		m Ω
		$V_{GS} = -10\text{ V}$, $I_D = -5\text{ A}$, $T_J = 125\text{ }^{\circ}\text{C}$		80		
		$V_{GS} = -10\text{ V}$, $I_D = -5\text{ A}$, $T_J = 175\text{ }^{\circ}\text{C}$		110		
		$V_{GS} = -4.5\text{ V}$, $I_D = -2\text{ A}$		74		
Forward Transconductance ^b	g_{fs}	$V_{DS} = -15\text{ V}$, $I_D = -5\text{ A}$		8		S
Dynamic						
Input Capacitance	C_{iss}	$V_{DS} = -25\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$		1300		pF
Output Capacitance	C_{oss}			120		
Reverse Transfer Capacitance	C_{rss}			90		
Total Gate Charge	Q_g	$V_{DS} = -30\text{ V}$, $V_{GS} = -10\text{ V}$, $I_D = -8.4\text{ A}$		13		nC
Gate-Source Charge	Q_{gs}			2.3		
Gate-Drain Charge	Q_{gd}			3.2		
Gate Resistance	R_g	$f = 1\text{ MHz}$		8.0		Ω
Turn-On Delay Time ^c	$t_{d(on)}$	$V_{DD} = -30\text{ V}$, $R_L = 3.57\text{ }\Omega$ $I_D \cong -8.4\text{ A}$, $V_{GEN} = -10\text{ V}$, $R_G = 2.5\text{ }\Omega$		5	10	ns
Rise Time ^c	t_r			14	25	
Turn-Off Delay Time ^c	$t_{d(off)}$			15	25	
Fall Time ^c	t_f			7	12	
Source-Drain Diode Ratings and Characteristics ($T_C = 25\text{ }^{\circ}\text{C}$) ^b						
Pulsed Current	I_{SM}			- 20		A
Forward Voltage ^b	V_{SD}	$I_F = -2\text{ A}$, $V_{GS} = 0\text{ V}$		- 0.9	- 1.3	V
Reverse Recovery Time	t_{rr}	$I_F = -8\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$		50	80	ns
Reverse Recovery Time	Q_{rr}			80	120	nC

Notes:

- a. Guaranteed by design, not subject to production testing.
 b. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
 c. Independent of operating temperature.

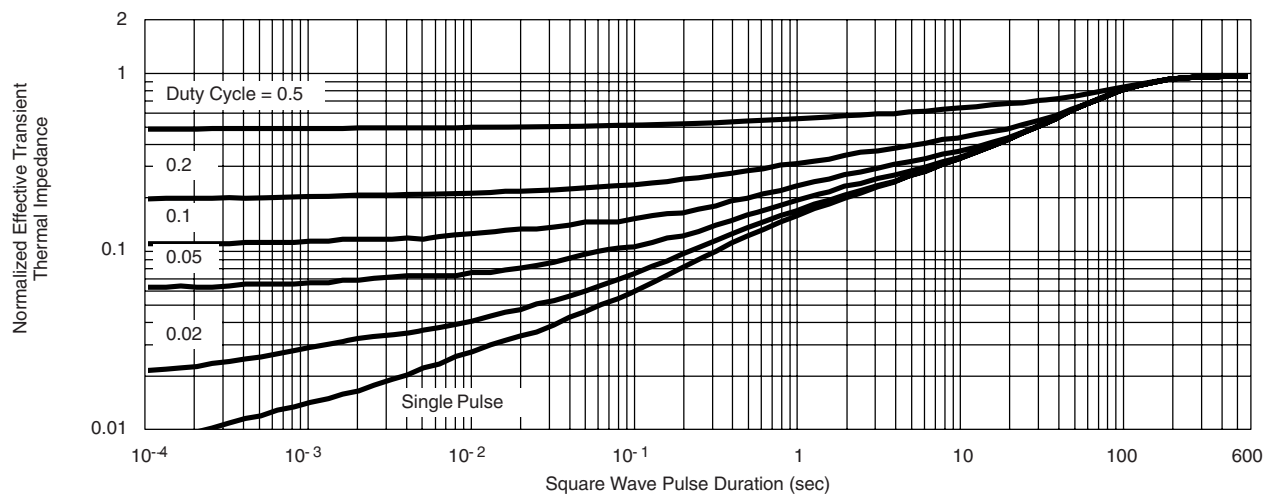
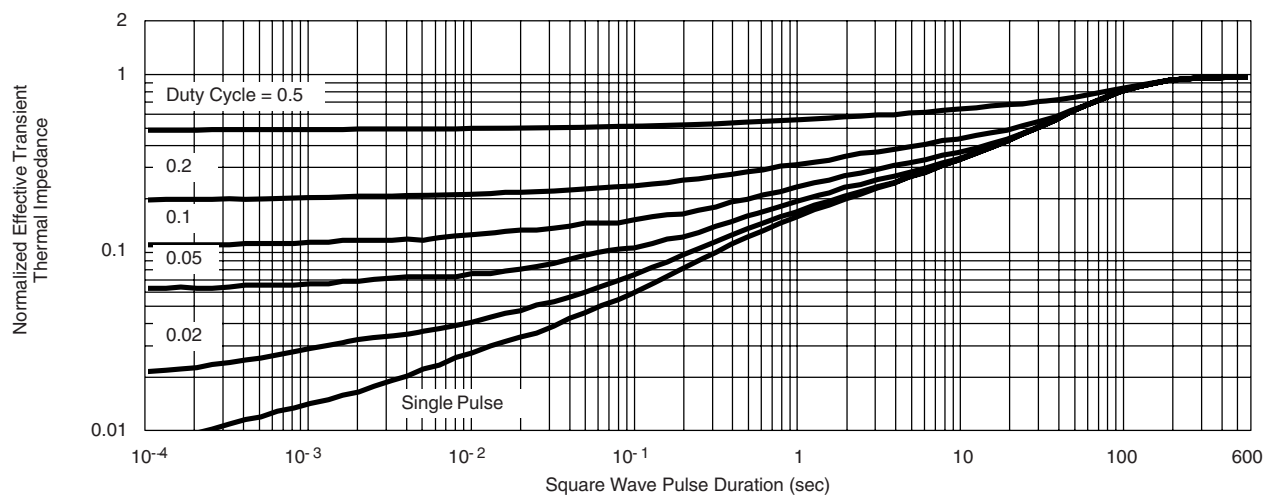
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

TYPICAL CHARACTERISTICS 25 °C unless noted

Output Characteristics

Transfer Characteristics

Transconductance

On-Resistance vs. Drain Current

Capacitance

Gate Charge

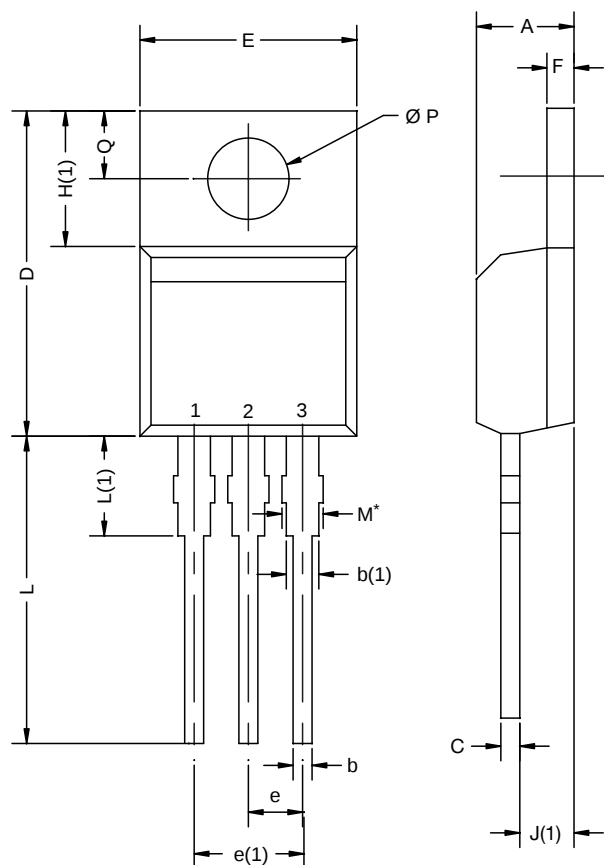
TYPICAL CHARACTERISTICS 25 °C unless noted

On-Resistance vs. Junction Temperature

Source-Drain Diode Forward Voltage
THERMAL RATINGS

Drain Current vs. Case Temperature


* $V_{GS} >$ minimum V_{GS} at which $r_{DS(on)}$ is specified

Safe Operating Area

THERMAL RATINGS**Normalized Thermal Transient Impedance, Junction-to-Ambient****Normalized Thermal Transient Impedance, Junction-to-Case**

TO-220AB



DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.25	4.65	0.167	0.183
b	0.69	1.01	0.027	0.040
b(1)	1.20	1.73	0.047	0.068
c	0.36	0.61	0.014	0.024
D	14.85	15.49	0.585	0.610
E	10.04	10.51	0.395	0.414
e	2.41	2.67	0.095	0.105
e(1)	4.88	5.28	0.192	0.208
F	1.14	1.40	0.045	0.055
H(1)	6.09	6.48	0.240	0.255
J(1)	2.41	2.92	0.095	0.115
L	13.35	14.02	0.526	0.552
L(1)	3.32	3.82	0.131	0.150
Ø P	3.54	3.94	0.139	0.155
Q	2.60	3.00	0.102	0.118
ECN: X12-0208-Rev. N, 08-Oct-12 DWG: 5471				

Notes

* M = 1.32 mm to 1.62 mm (dimension including protrusion)
Heatsink hole for HVM

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