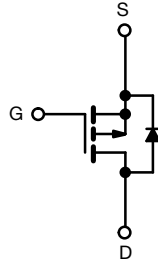
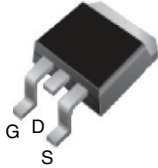


Power MOSFET

D²PAK (TO-263)


P-Channel MOSFET

FEATURES

- Surface-mount
- Available in tape and reel
- Dynamic dV/dt rating
- Repetitive avalanche rated
- P-channel
- 175 °C operating temperature
- Fast switching
- Material categorization: for definitions of compliance please see 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 D²PAK (TO-263) is a surface-mount power package capable of accommodating die sizes up to HEX-4. It provides the highest power capability and the lowest possible on-resistance in any existing surface-mount package. The D²PAK (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.

PRODUCT SUMMARY	
V _{DS} (V)	-100
R _{DS(on)} (Ω)	V _{GS} = -10 V 0.30
Q _g max. (nC)	38
Q _{gs} (nC)	6.8
Q _{gd} (nC)	21
Configuration	Single

ORDERING INFORMATION			
Package	D ² PAK (TO-263)	D ² PAK (TO-263)	D ² PAK (TO-263)
Lead (Pb)-free and Halogen-free	SiHF9530S-GE3	SiHF9530STRL-GE3 ^a	SiHF9530STRR-GE3 ^a
Lead (Pb)-free	IRF9530SPbF	IRF9530STRLPbF ^a	IRF9530STRRPbF ^a

Note

a. See device orientation

ABSOLUTE MAXIMUM RATINGS (T _C = 25 °C, unless otherwise noted)				
PARAMETER	SYMBOL	LIMIT	UNIT	
Drain-Source Voltage	V _{DS}	-100	V	
Gate-Source Voltage	V _{GS}	± 20		
Continuous Drain Current	V _{GS} at -10 V	T _C = 25 °C	-12	A
		T _C = 100 °C	-8.2	
Pulsed Drain Current ^a	I _{DM}	-48	W/°C	
Linear Derating Factor		0.59		
Linear Derating Factor (PCB mount) ^e		0.025		
Single Pulse Avalanche Energy ^b	E _{AS}	400	mJ	
Avalanche Current ^a	I _{AR}	-12	A	
Repetitive Avalanche Energy ^a	E _{AR}	8.8	mJ	
Maximum Power Dissipation	P _D	T _C = 25 °C	88	W
		T _A = 25 °C	3.7	
Peak Diode Recovery dV/dt ^c	dV/dt	- 5.5	V/ns	
Operating Junction and Storage Temperature Range	T _J , T _{stg}	-55 to +175	°C	
Soldering Recommendations (Peak temperature) ^d	For 10 s	300		

Notes

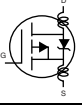
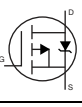
- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11)
- V_{DD} = -25 V, starting T_J = 25 °C, L = 4.2 mH, R_g = 25 Ω, I_{AS} = -12 A (see fig. 12)
- I_{SD} ≤ -12 A, di/dt ≤ 140 A/μs, V_{DD} ≤ V_{DS}, T_J ≤ 175 °C
- 1.6 mm from case
- When mounted on 1" square PCB (FR-4 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) ^a	R_{thJA}	-	40	
Maximum Junction-to-Case (Drain)	R_{thJC}	-	1.7	

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
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0, I_D = -250\text{ }\mu\text{A}$	-100	-	-	V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to $25\text{ }^\circ\text{C}$, $I_D = -1\text{ mA}$	-	-0.10	-	V/°C
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	-2.0	-	-4.0	V
Gate-Source Leakage	I_{GSS}	$V_{GS} = \pm 20\text{ V}$	-	-	± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -100\text{ V}, V_{GS} = 0\text{ V}$	-	-	-100	μA
		$V_{DS} = -80\text{ V}, V_{GS} = 0\text{ V}, T_J = 150\text{ }^\circ\text{C}$	-	-	-500	
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = -10\text{ V}, I_D = -7.2\text{ A}^b$	-	-	0.30	Ω
Forward Transconductance	g_{fs}	$V_{DS} = -50\text{ V}, I_D = -7.2\text{ A}^b$	3.7	-	-	S
Dynamic						
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}, V_{DS} = -25\text{ V}, f = 1.0\text{ MHz}$, see fig. 5	-	860	-	pF
Output Capacitance	C_{oss}		-	340	-	
Reverse Transfer Capacitance	C_{rss}		-	93	-	
Total Gate Charge	Q_g	$V_{GS} = -10\text{ V}, I_D = -12\text{ A}, V_{DS} = -80\text{ V}$, see fig. 6 and 13 ^b	-	-	38	nC
Gate-Source Charge	Q_{gs}		-	-	6.8	
Gate-Drain Charge	Q_{gd}		-	-	21	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -50\text{ V}, I_D = -12\text{ A}, R_G = 12\text{ }\Omega, R_D = 3.9\text{ }\Omega$, see fig. 10 ^b	-	12	-	ns
Rise Time	t_r		-	52	-	
Turn-Off Delay Time	$t_{d(off)}$		-	31	-	
Fall Time	t_f		-	39	-	
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	-	
Gate Input Resistance	R_g	$f = 1\text{ MHz}$, open drain	0.4	-	3.3	Ω
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	MOSFET symbol showing the integral reverse p-n junction diode 	-	-	-12	A
Pulsed Diode Forward Current ^a	I_{SM}		-	-	-48	
Body Diode Voltage	V_{SD}	$T_J = 25\text{ }^\circ\text{C}, I_S = -12\text{ A}, V_{GS} = 0\text{ V}^b$	-	-	-6.3	V
Body Diode Reverse Recovery Time	t_{rr}	$T_J = 25\text{ }^\circ\text{C}, I_F = -12\text{ A}, dI/dt = 100\text{ A}/\mu\text{s}^b$	-	120	240	ns
Body Diode Reverse Recovery Charge	Q_{rr}		-	0.46	0.92	μC
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 $\leq 300\text{ }\mu\text{s}$; duty cycle $\leq 2\%$

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

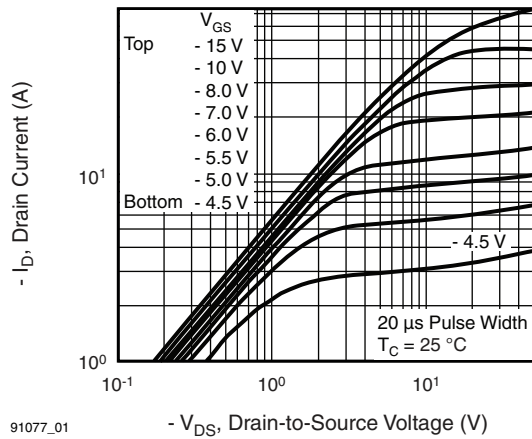


Fig. 1 - Typical Output Characteristics, $T_C = 25^\circ\text{C}$

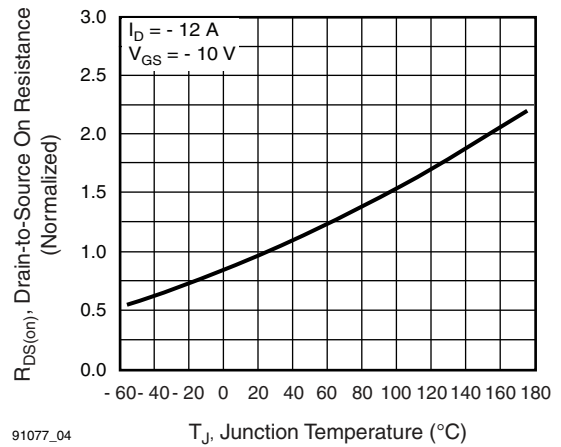


Fig. 4 - Normalized On-Resistance vs. Temperature

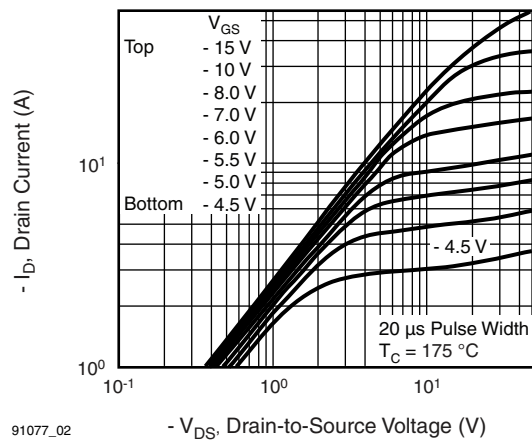


Fig. 2 - Typical Output Characteristics, $T_C = 175^\circ\text{C}$

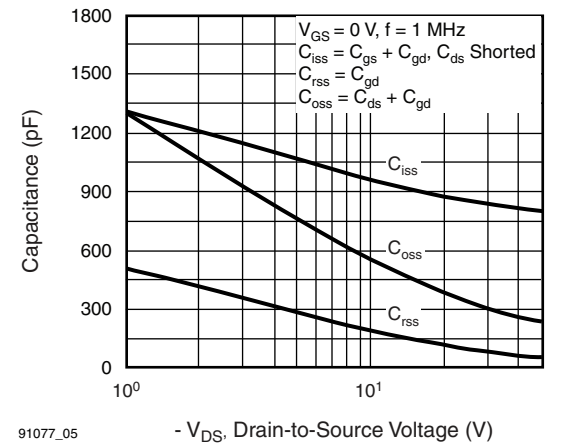


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

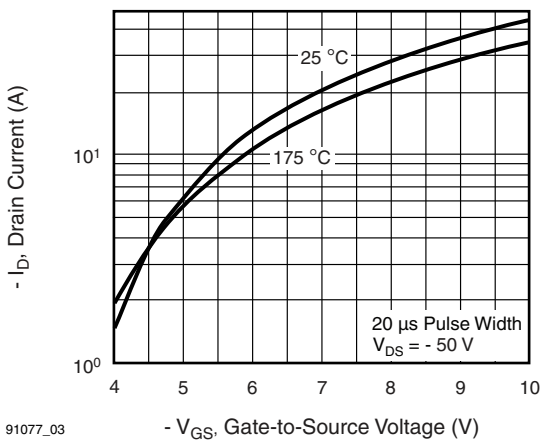


Fig. 3 - Typical Transfer Characteristics

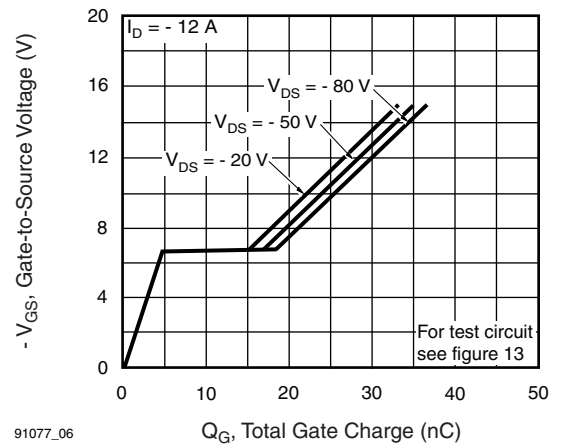
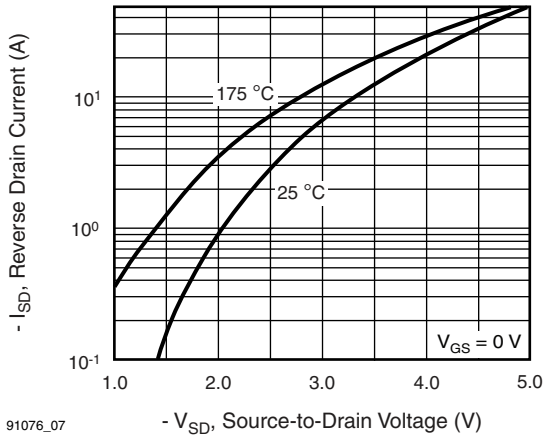
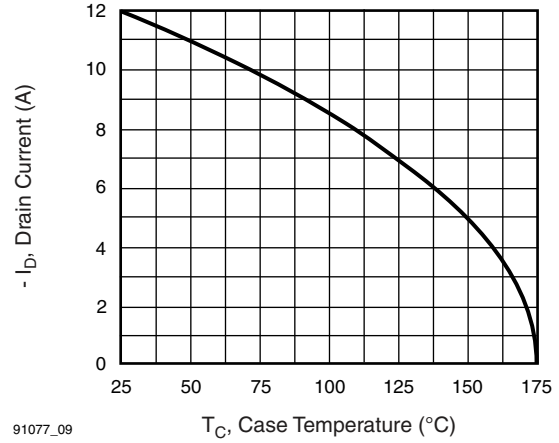


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage



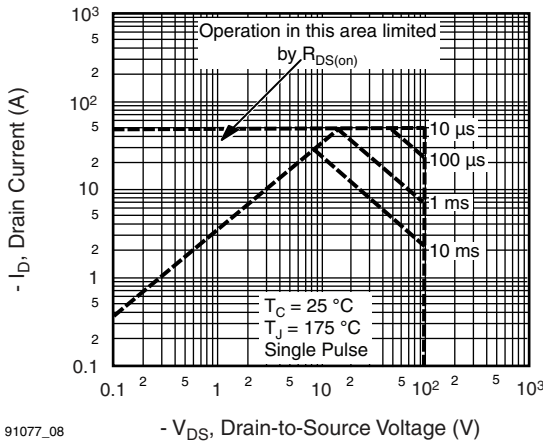
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Fig. 7 - Typical Source-Drain Diode Forward Voltage



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Fig. 9 - Maximum Drain Current vs. Case Temperature



91077_08

Fig. 8 - Maximum Safe Operating Area

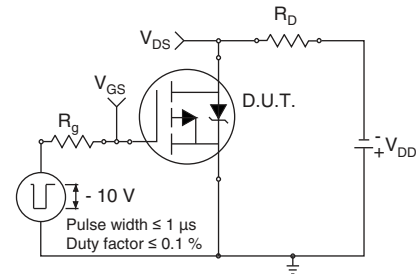


Fig. 10a - Switching Time Test Circuit

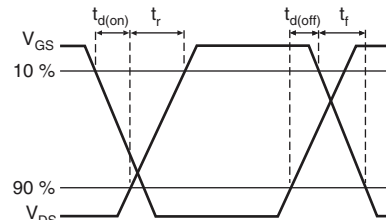
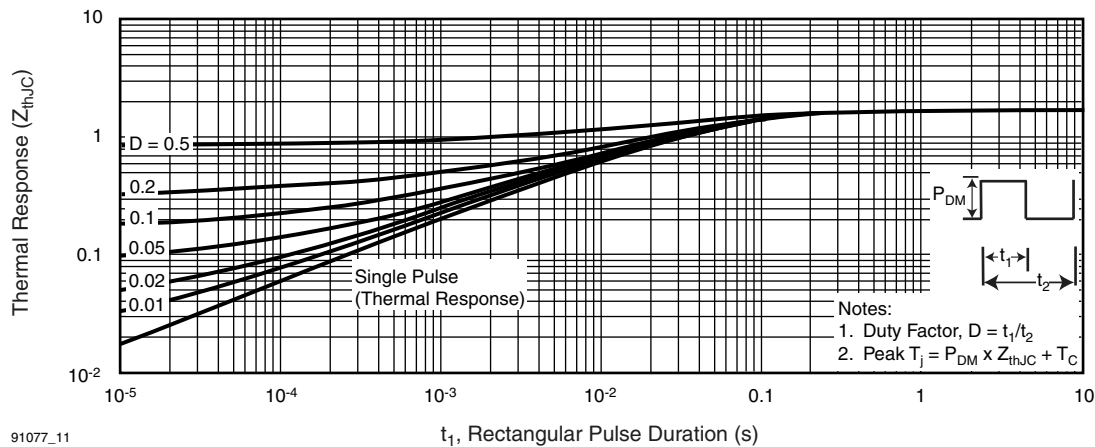


Fig. 10b - Switching Time Waveforms



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

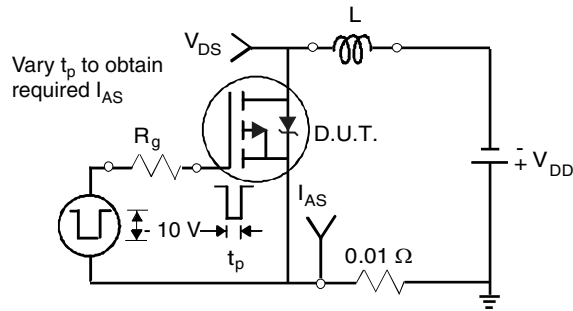


Fig. 12a - Unclamped Inductive Test Circuit

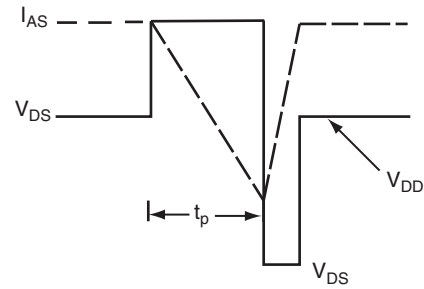


Fig. 12b - Unclamped Inductive Waveforms

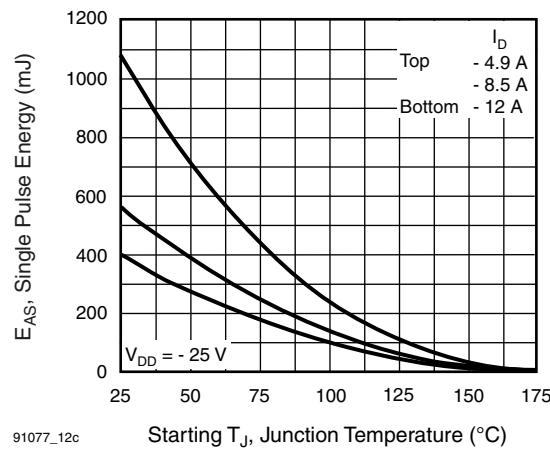


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

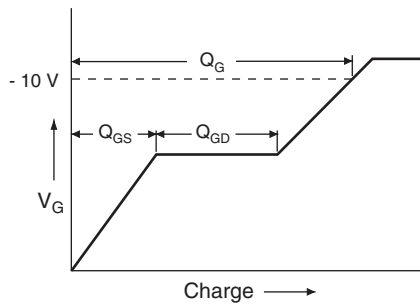


Fig. 13a - Basic Gate Charge Waveform

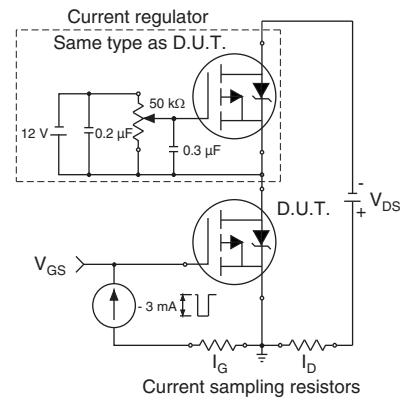
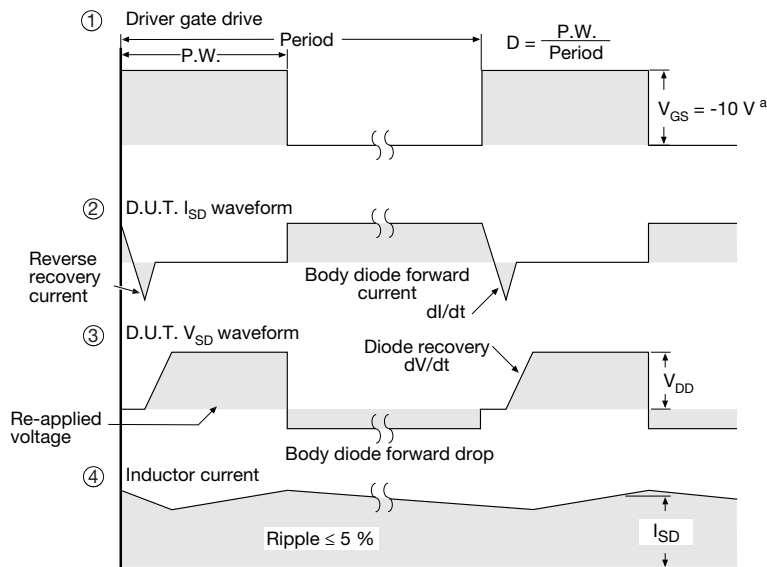
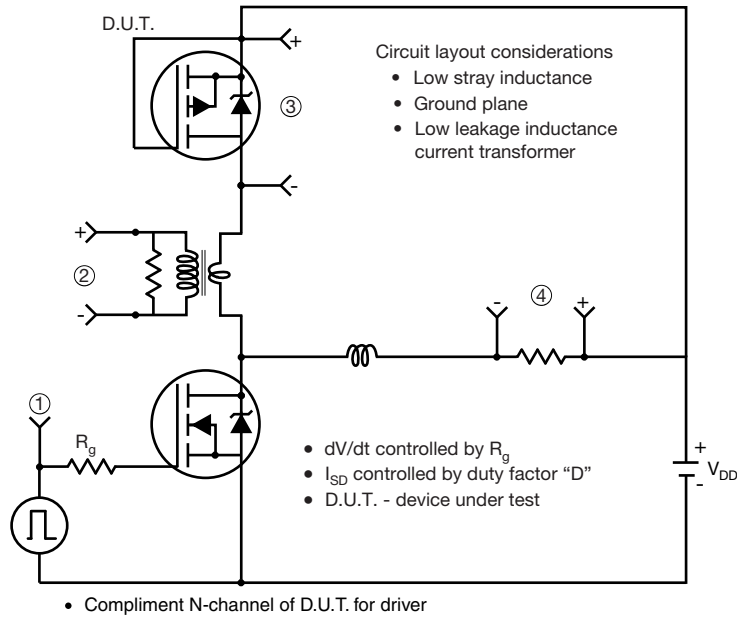


Fig. 13b - Gate Charge Test Circuit

Peak Diode Recovery dV/dt Test Circuit



Note

a. $V_{GS} = -5$ V for logic level and -3 V drive devices

Fig. 14 - For P-Channel

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RECOMMENDED MINIMUM PADS FOR D²PAK: 3-Lead



Recommended Minimum Pads
Dimensions in Inches/(mm)

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