VISHAY IRF9640 Channel MOSFET Transistor Instructions

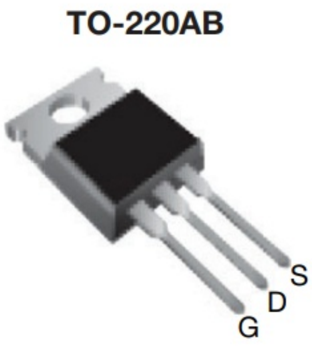
Contents

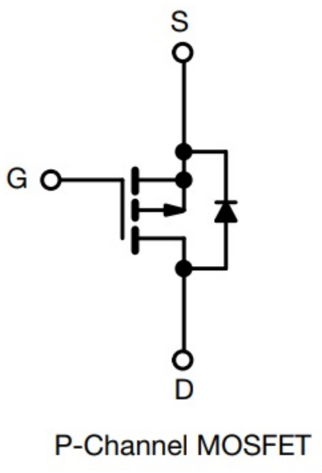
VISHAY IRF9640 Channel MOSFET Transistor

FEATURES

- Dynamic dV/dt rating
- Repetitive avalanche rated
- P-channel

- Fast switching
- Ease of paralleling
- Simple drive requirements
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912





PRODUCT SUMMARY		
V_{DS} (V)	-200	
RDS(on) (W)	V_{GS} = -10 V	0.50
Q_g max. (nC)	44	
Q_{gs} (nC)	7.1	
Q_{gd} (nC)	27	
Configuration	Single	

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 TO-220AB package is universally preferred for all commercial-industrial applications at power dissipation levels to approximately 50 W. The low thermal resistance and low package cost of the TO-220AB contribute to its wide acceptance throughout the industry.

ORDERING INFORMATION	
Package	TO-220AB
Lead (Pb)-free	IRF9640PbF
Lead (Pb)-free and halogen-free	IRF9640PbF-BE3

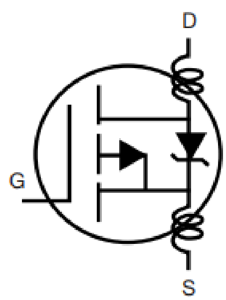
ABSOLUTE MAXIMUM RATINGS (T_C = 25 °C, unless otherwise noted)					
PARAMETER			**SYMBOL**	**LIMIT**	**UNIT**
Drain-source voltage			VDS	-200	V
Gate-source voltage			VGS	± 20	V
Continuous drain current	V_{GS} at 10 V	T_C = 25 °C	I_D	-11	A
		T_C = 100 °C		-6.8	
Pulsed drain current a			IDM	-44	
Linear derating factor				1.0	W/°C
Single pulse avalanche energy b			EAS	700	mJ
Repetitive avalanche current a			IAR	-11	A
Repetitive avalanche energy a			EAR	13	mJ
Maximum power dissipation	T_C = 25 °C		P_D	125	W
Peak diode recovery dV/dt c			dV/dt	-5.0	V/ns
Operating junction and storage temperature range			TJ, Tstg	-55 to +150	°C
Soldering recommendations (peak temperature) d	For 10 s			300	
Mounting torque	6-32 or M3 screw			10	lbf · in
				1.1	N · m

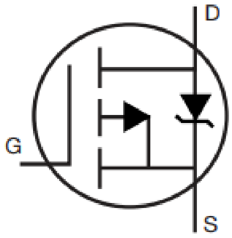
Notes

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11)
- VDD = -50 V, starting TJ = 25 °C, L = 8.7 mH, Rg = 25 Ω, IAS = -11 A (see fig. 12)
- ISD ≤ -11 A, dI/dt ≤ 150 A/µs, VDD ≤ VDS, TJ ≤ 150 °C
- 1.6 mm from case

THERMAL RESISTANCE RATINGS				
PARAMETER	**SYMBOL**	**TYP.**	**MAX.**	**UNIT**
Maximum junction-to-ambient	RthJA	–	62	°C/W
Case-to-sink, flat, greased surface	RthCS	0.50	–	
Maximum junction-to-case (drain)	RthJC	–	1.0	

SPECIFICATIONS

SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX .**	**UNI T**
Static						
Drain-source breakdown voltage	VDS	V_{GS} = 0 V, I_D = -250 μA	-200	–	–	V
V_{DS} temperature coefficient	DV_{DS}/T_J	Reference to 25 °C, I_D = -1 mA	–	-0.2	–	V/°C
Gate-source threshold voltage	VGS(th)	V_{DS} = V_{GS}, I_D = -250 μA	-2.0	–	-4.0	V
Gate-source leakage	IGSS	V_{GS} = ± 20 V	–	–	± 10 0	nA
Zero gate voltage drain current	IDSS	V_{DS} = -200 V, V_{GS} = 0 V	–	–	-100	μA
		V_{DS} = -160 V, V_{GS} = 0 V, T_J = 12 5 °C	–	–	-500	
Drain-source on-state resistance	RDS(on)	V_{GS} = -10 V; I_D = -6.6 A b	–	–	0.50	W
Forward transconductance	gfs	V_{DS} = -50 V, I_D = -6.6 A b	4.1	–	–	S
Dynamic						
Input capacitance	Ciss	V_{GS} = 0 V, V_{DS} = -25 V, f = 1.0 MHz, see fig. 5	–	1200	–	pF
Output capacitance	Coss		–	370	–	
Reverse transfer capacitance	Crss		–	81	–	
Total gate charge	Q_g	V_{GS} = -10 V; I_D = -11 A, V_{DS} = -1 60 V, see fig. 6 and 13 b	–	–	44	nC
Gate-source charge	Qgs		–	–	7.1	
Gate-drain charge	Qgd		–	–	27	
Turn-on delay time	td(on)	V_{DD} = -100 V, I_D = -11 A, R_g = 9.1 W, R_D = 8.6 W, see fig. 10 b	–	14	–	ns
Rise time	t_r		–	43	–	
Turn-off delay time	td(off)		–	39	–	
Fall time	t_f		–	38	–	
Gate input resistance	L_D		–	4.5	–	nH
Internal drain inductance	L_S		–	7.5	–	
Internal source inductance	R_g	f = 1 MHz, open drain	0.3	–	1.7	W
Drain-Source Body Diode Characteristics						

Continuous source-drain diode current	I_S		–	–	-11	A
Pulsed diode forward current a	ISM		–	–	-44	
Body diode voltage	VSD	T_J = 25 °C, I_S = -11 A, V_{GS} = 0 V b	–	–	-5	V
Body diode reverse recovery time	trr	T_J = 25 °C, I_F = -11 A, dI/dt = 100 A/μs b	–	250	300	ns
Body diode reverse recovery charge	Qrr		–	2.9	3.6	μC
Forward turn-on time	ton	Intrinsic turn-on time is negligible (turn-on is dominated by L_S and L_D)				

Notes

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11)
- Pulse width ≤ 300 μs; duty cycle ≤ 2 %

TYPICAL CHARACTERISTICS

(25 °C, unless otherwise noted)

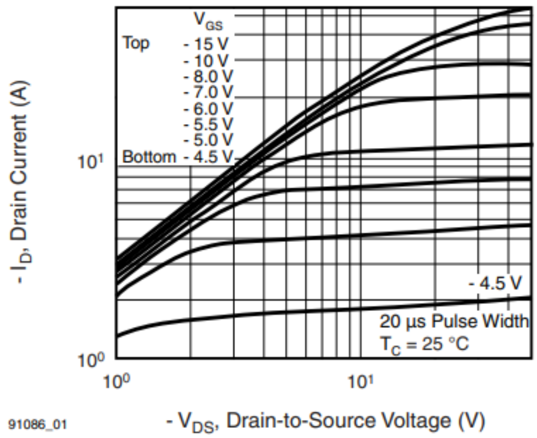


Fig. 1 - Typical Output Characteristics, T_C = 25 °C

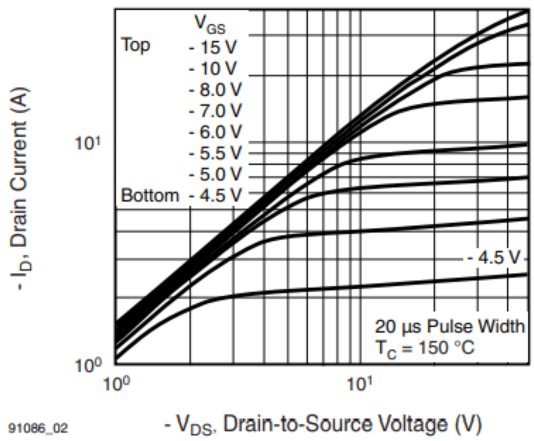


Fig. 2 - Typical Output Characteristics, T_C = 150 °C

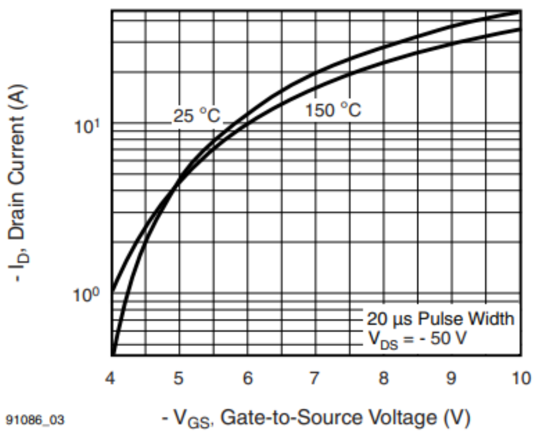


Fig. 3 - Typical Transfer Characteristics

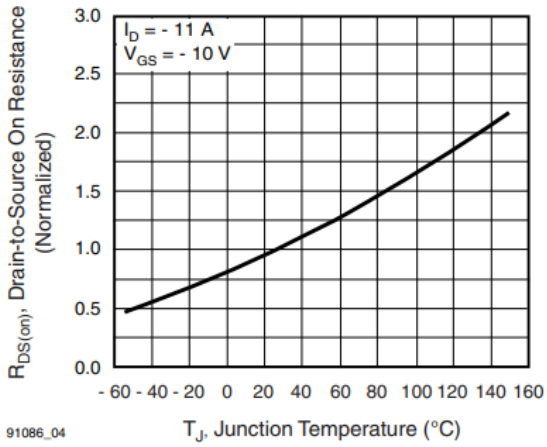


Fig. 4 - Normalized On-Resistance vs. Temperature

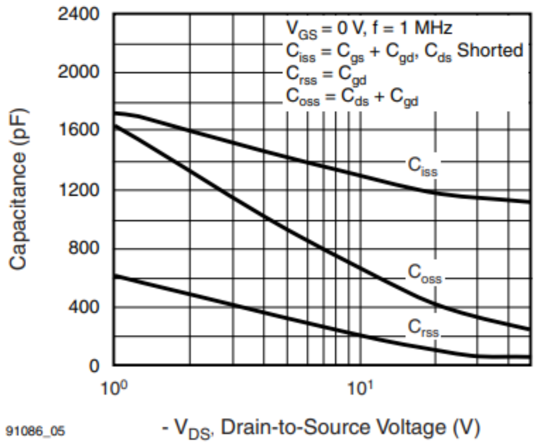


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

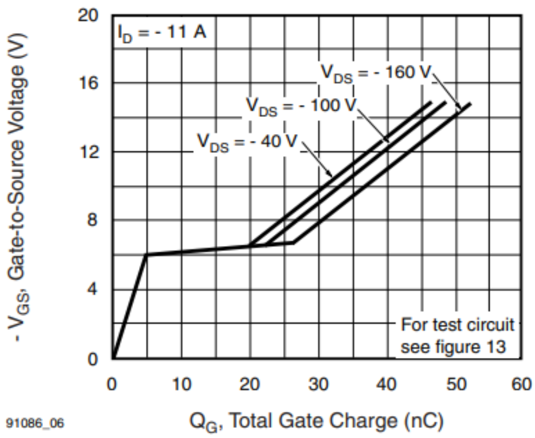


Fig. 6 - Typical Gate Charge vs. Drain-to-Source Voltage

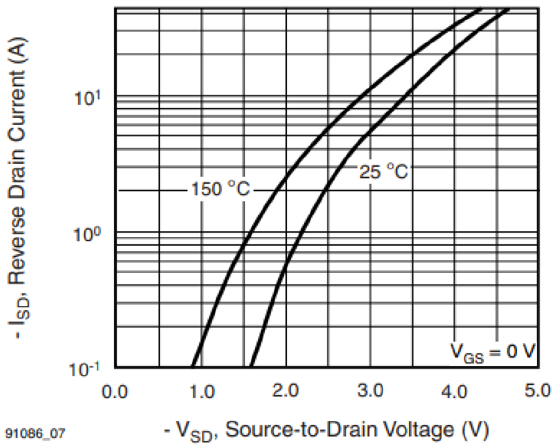


Fig. 7 - Typical Source-Drain Diode Forward Voltage

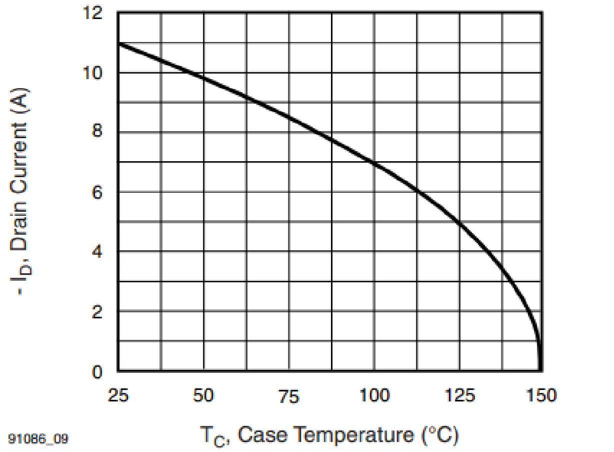


Fig. 9 - Maximum Drain Current vs. Case Temperature

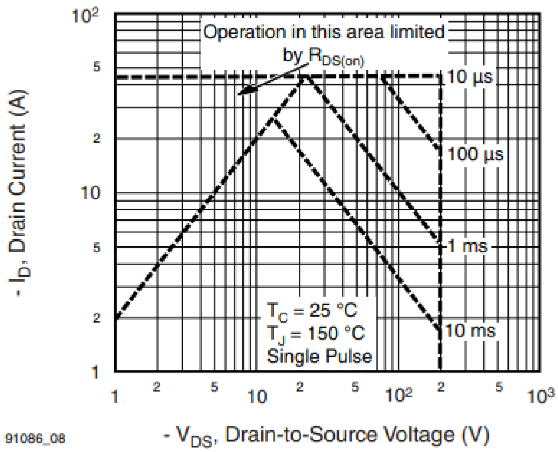


Fig. 8 - Maximum Safe Operating Area

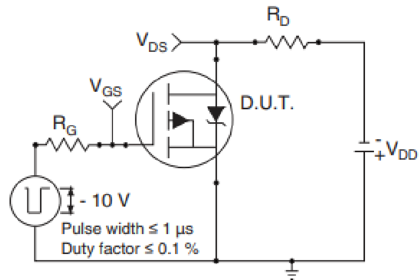


Fig. 10a - Switching Time Test Circuit

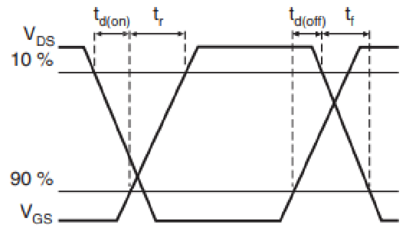


Fig. 10b - Switching Time Waveforms

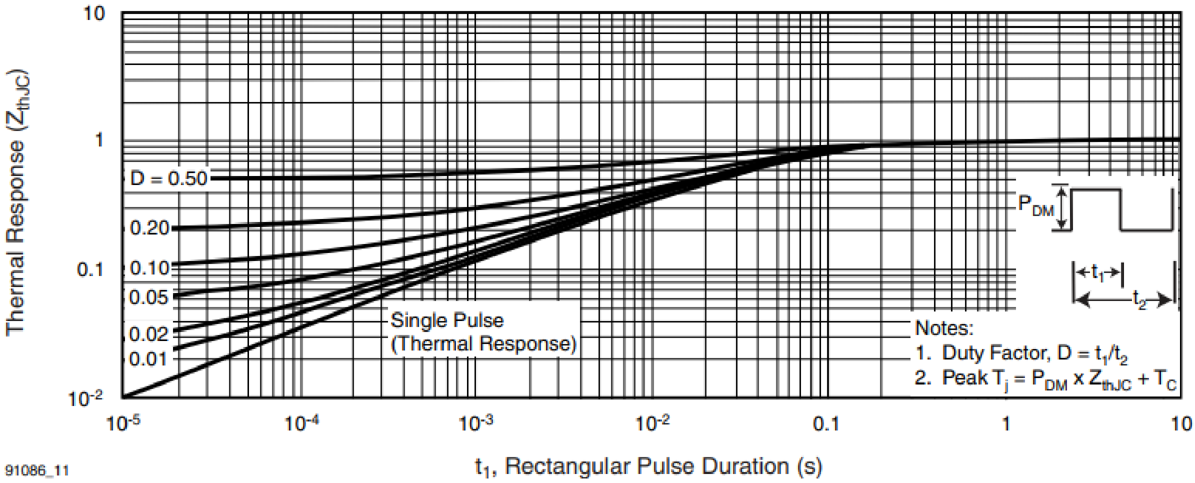


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

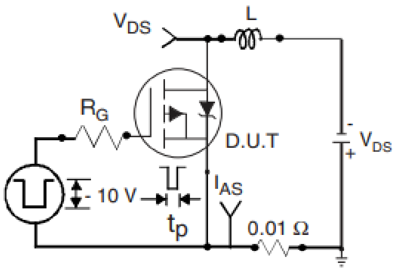


Fig. 12a - Unclamped Inductive Test Circuit

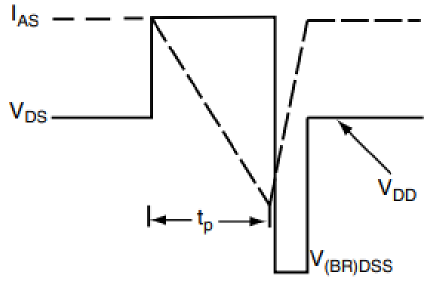


Fig. 12b - Unclamped Inductive Waveforms

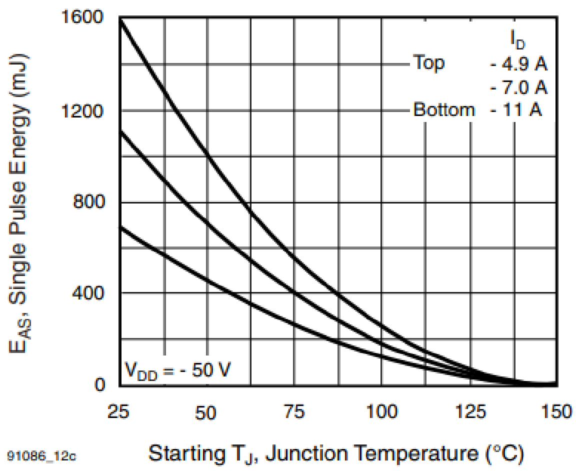


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

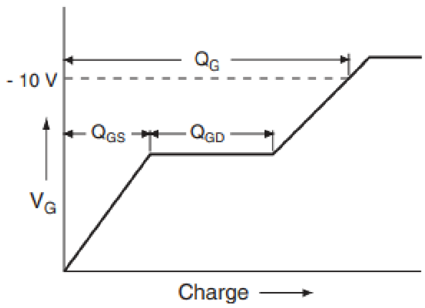


Fig. 13a - Basic Gate Charge Waveform

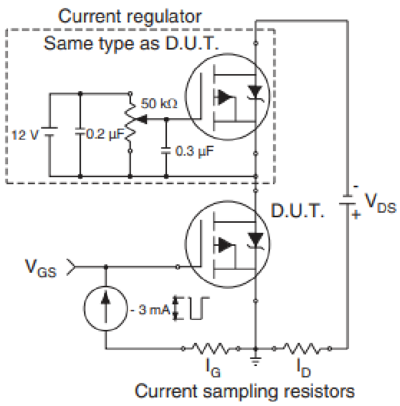
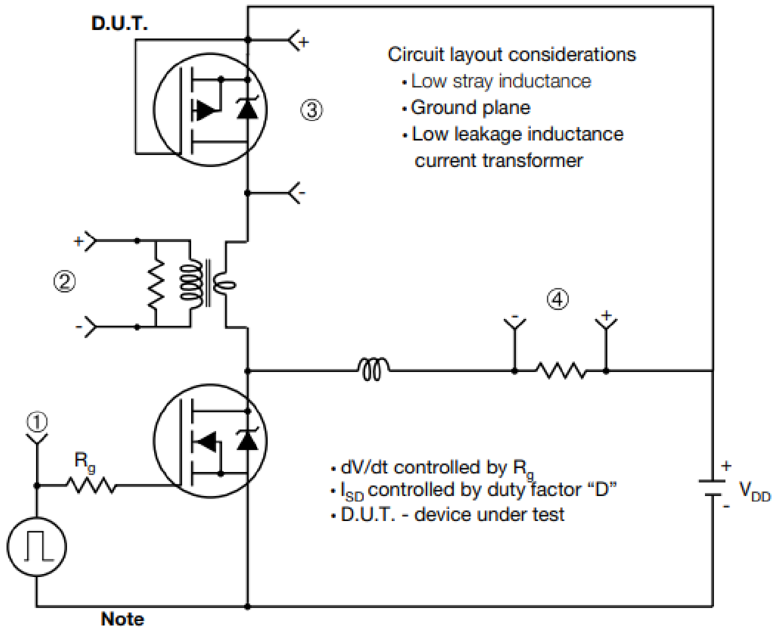
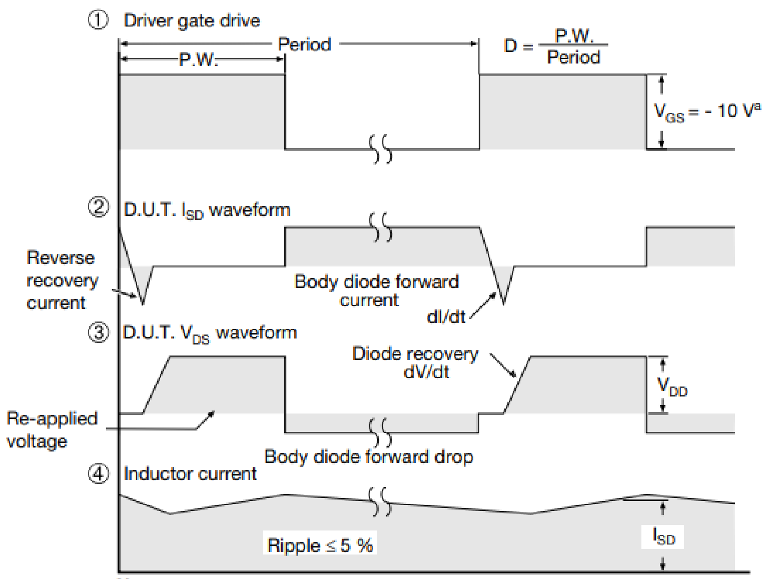


Fig. 13b - Gate Charge Test Circuit

Peak Diode Recovery dV/dt Test Circuit



Note
• Compliment N-Channel of D.U.T. for driver



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

Fig. 14 - For P-Channel

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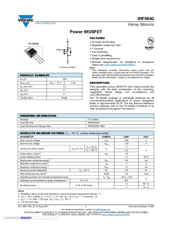
Documents / Resources

	VISHAY IRF9640 Channel MOSFET Transistor [pdf] Instructions IRF9640 Channel MOSFET Transistor, IRF9640, Channel MOSFET Transistor, MOSFET Transistor, Transistor

References

- Vishay Intertechnology: Passives & Discrete Semiconductors
- User Manual