An Infineon Technologies Company

IRF9140

REPETITIVE AVALANCHE AND dv/dt RATED HEXFET®TRANSISTORS THRU-HOLE (TO-204AA)

100V, P-CHANNEL

Product Summary

Part Number	BV_{DSS}	$R_{DS(on)}$	I_D
IRF9140	-100V	0.2Ω	-18A

TO-3 (TO-204AA)

Description

HEXFET® MOSFET technology is the key to IR Hirel advanced line of power MOSFET transistors. The efficient geometry and unique processing of this latest “State of the Art” design achieves: very low on-state resistance combined with high trans conductance; superior reverse energy and diode recovery dv/dt capability.
The HEXFET transistors also feature all of the well established advantages of MOSFETs such as voltage control, very fast switching and temperature stability of the electrical parameters.
They are well suited for applications such as switching power supplies, motor controls, inverters, choppers, audio amplifiers and high energy pulse circuits.

Features

- Repetitive Avalanche Ratings
- Dynamic dv/dt Rating
- Hermetically Sealed
- Simple Drive Requirements
- ESD Rating: Class 2 per MIL-STD-750, Method 1020

Absolute Maximum Ratings

Symbol	Parameter	Value	Units
I_{D1} @ V_{GS} = -10V, T_C = 25°C	Continuous Drain Current	-18	A
I_{D2} @ V_{GS} = -10V, T_C = 100°C	Continuous Drain Current	-11	
I_{DM} @ T_C = 25°C	Pulsed Drain Current ①	-72	
P_D @ T_C = 25°C	Maximum Power Dissipation	125	W
	Linear Derating Factor	1.0	W/°C
V_{GS}	Gate-to-Source Voltage	± 20	V
E_{AS}	Single Pulse Avalanche Energy ②	500	mJ
I_{AR}	Avalanche Current ①	-18	A
E_{AR}	Repetitive Avalanche Energy ①	12.5	mJ
dv/dt	Peak Diode Recovery ③	-5.5	V/ns
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 150	°C
	Lead Temperature	300 (0.063 in. (1.6mm) from case for 10s)	
	Weight	11.5 (Typical)	g

For footnotes refer to the page 2.

Electrical Characteristics @ Tj = 25°C (Unless Otherwise Specified)

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	-100	—	—	V	V_{GS} = 0V, I_D = -1.0mA
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	-0.087	—	V/°C	Reference to 25°C, I_D = -1.0mA
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	0.2	Ω	V_{GS} = -10V, I_{D2} = -11A ④
		—	—	0.23		V_{GS} = -10V, I_{D1} = -18A ④
$V_{GS(th)}$	Gate Threshold Voltage	-2.0	—	-4.0	V	V_{DS} = V_{GS}, I_D = -250µA
Gfs	Forward Transconductance	6.2	—	—	S	V_{DS} = -15V, I_{D2} = -11A ④
I_{DSS}	Zero Gate Voltage Drain Current	—	—	-25	µA	V_{DS} = -80V, V_{GS} = 0V
		—	—	-250		V_{DS} = -80V, V_{GS} = 0V, T_J = 125°C
I_{GSS}	Gate-to-Source Leakage Forward	—	—	-100	nA	V_{GS} = -20V
	Gate-to-Source Leakage Reverse	—	—	100		V_{GS} = 20V
Q_G	Total Gate Charge	31	—	60	nC	I_{D1} = -18A
Q_{GS}	Gate-to-Source Charge	3.7	—	13		V_{DS} = -50V
Q_{GD}	Gate-to-Drain ('Miller') Charge	7.0	—	35.2		V_{GS} = -10V
$t_{d(on)}$	Turn-On Delay Time	—	—	35	ns	V_{DD} = -50V
tr	Rise Time	—	—	85		I_{D1} = -18A
$t_{d(off)}$	Turn-Off Delay Time	—	—	85		R_G = 9.1Ω
t_f	Fall Time	—	—	65		V_{GS} = -10V
Ls +L_D	Total Inductance	—	6.1	—	nH	Measured from Drain lead (6mm / 0.25 in from package) to Source lead (6mm/ 0.25 in from package)
C_{iss}	Input Capacitance	—	1400	—	pF	V_{GS} = 0V
C_{oss}	Output Capacitance	—	600	—		V_{DS} = -25V
C_{rss}	Reverse Transfer Capacitance	—	200	—		f = 1.0MHz

Source-Drain Diode Ratings and Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
I_S	Continuous Source Current (Body Diode)	—	—	-18	A	
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	-72		
V_{SD}	Diode Forward Voltage	—	—	-5.0	V	T_J = 25°C, I_S = -18A, V_{GS} = 0V④
t_{rr}	Reverse Recovery Time	—	170	280	ns	T_J = 25°C, I_F = -18A, $V_{DD} \le -50V$
Q_{rr}	Reverse Recovery Charge	—	—	3.6	µC	di/dt = -100A/µs ④
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by L_S+L_D)				

Thermal Resistance

Symbol	Parameter	Min.	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	—	1.0	°C/W
$R_{\theta JA}$	Junction-to-Ambient (Typical socket mount)	—	—	30	

Footnotes:

① Repetitive Rating; Pulse width limited by maximum junction temperature.

② V_{DD} = -25V, starting T_J = 25°C, L= 3.09mH, Peak I_L = -18A, V_{GS} = -10V.

③ $I_{SD} \le$ -18A, di/dt $\le$ -100A/µs, $V_{DD} \le$ -100V, $T_J \le$ 150°C.

④ Pulse width $\le$ 300 µs; Duty Cycle $\le$ 2%

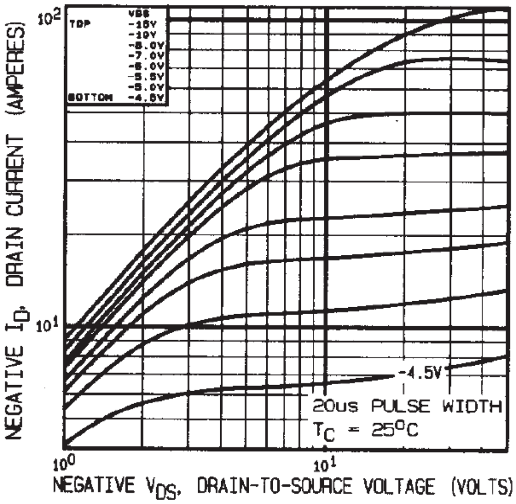


Fig 1. Typical Output Characteristics

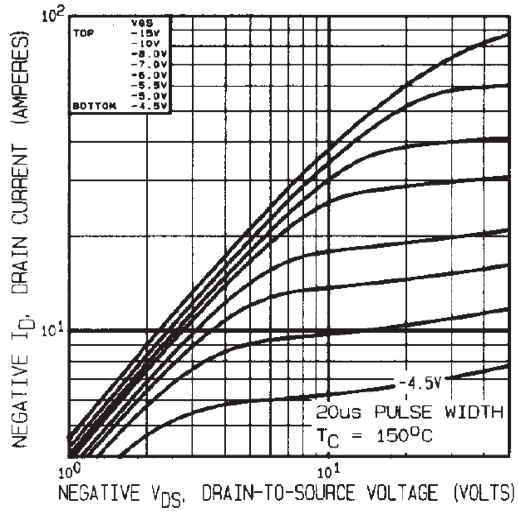


Fig 2. Typical Output Characteristics

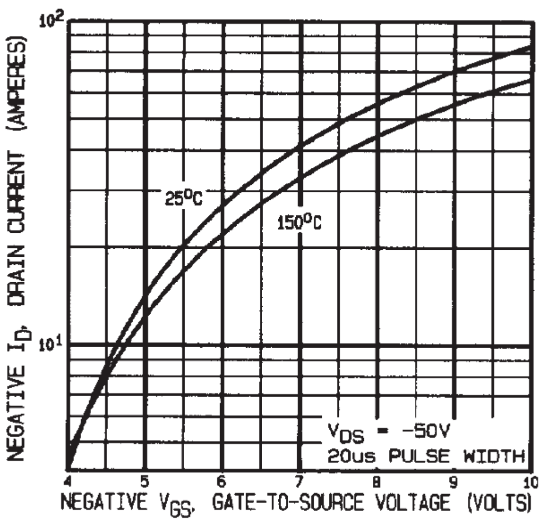


Fig 3. Typical Transfer Characteristics

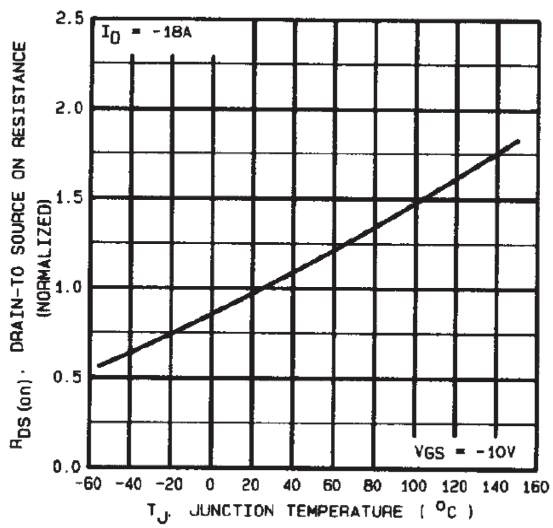


Fig 4. Normalized On-Resistance Vs. Temperature

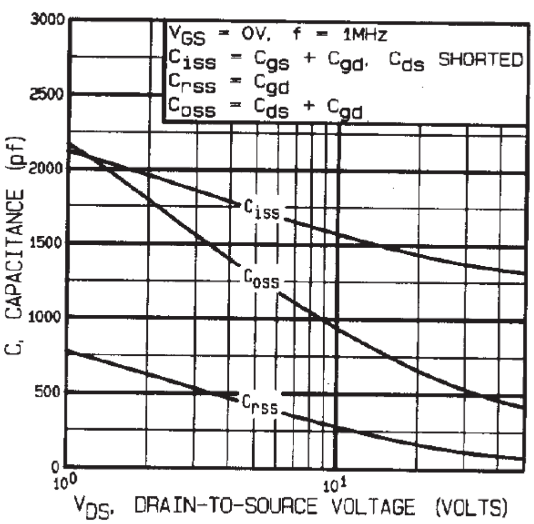


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

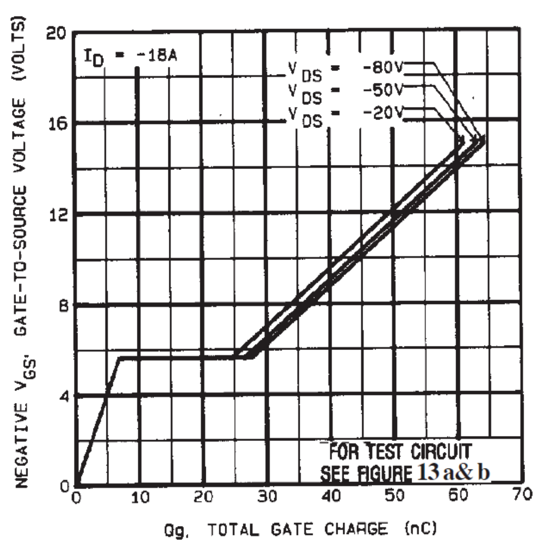


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

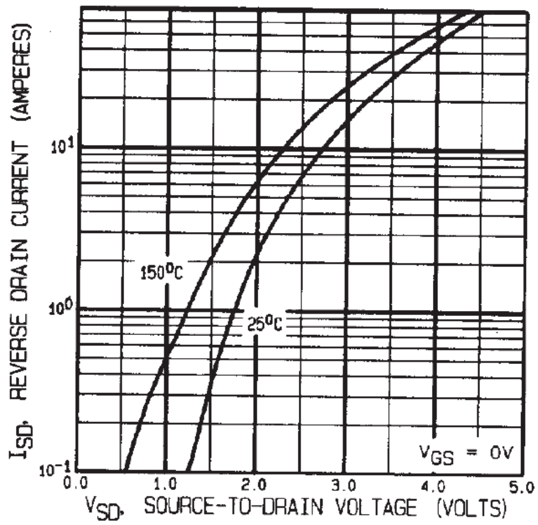


Fig 7. Typical Source-Drain Diode Forward Voltage

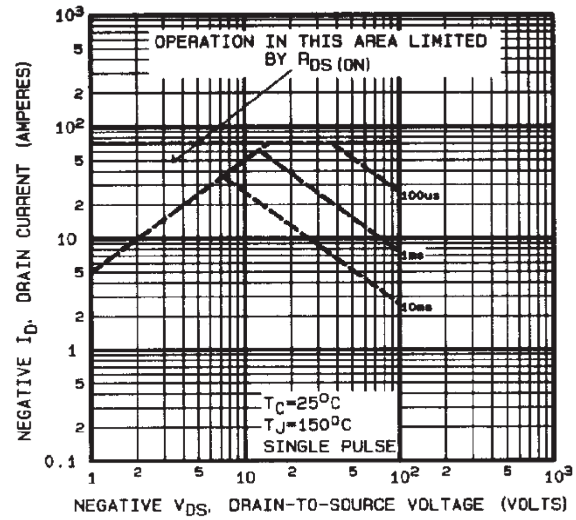


Fig 8. Maximum Safe Operating Area

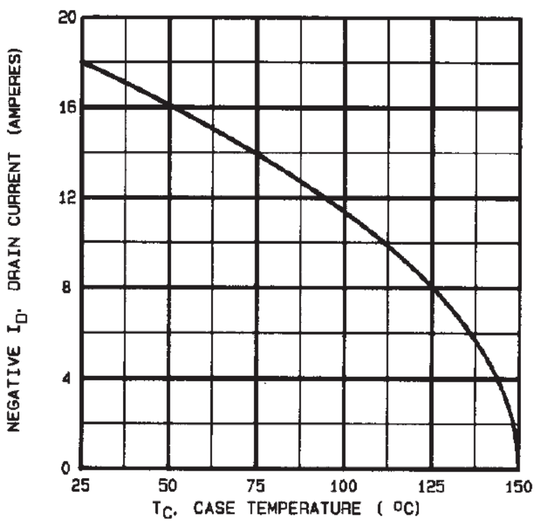


Fig 9. Maximum Drain Current Vs. Case Temperature

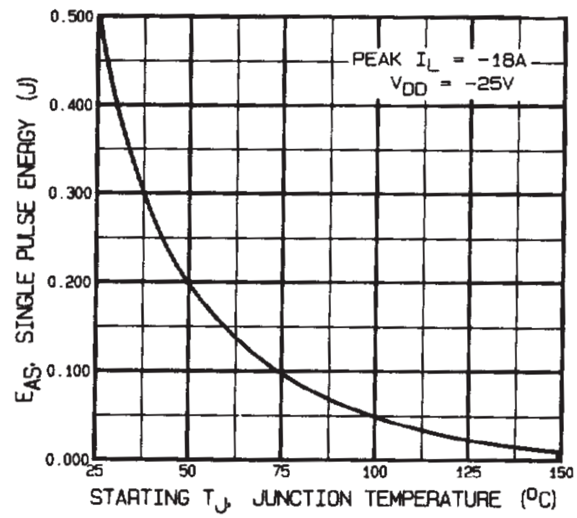


Fig 10. Maximum Avalanche Energy Vs. Drain Current

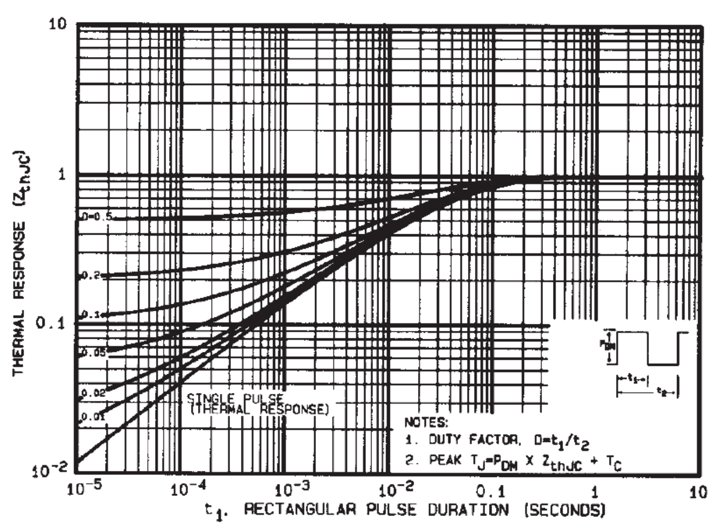


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

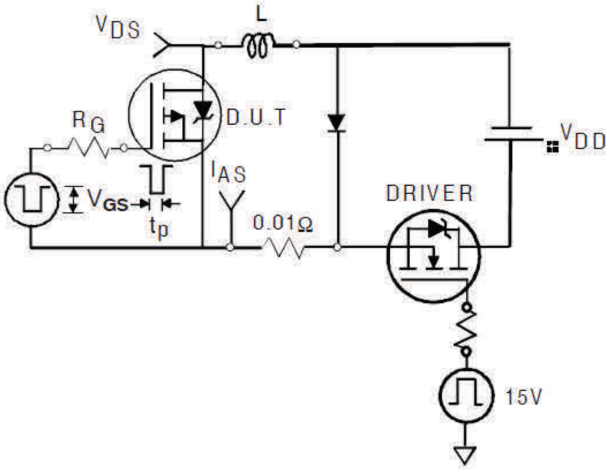


Fig 12a. Unclamped Inductive Test Circuit

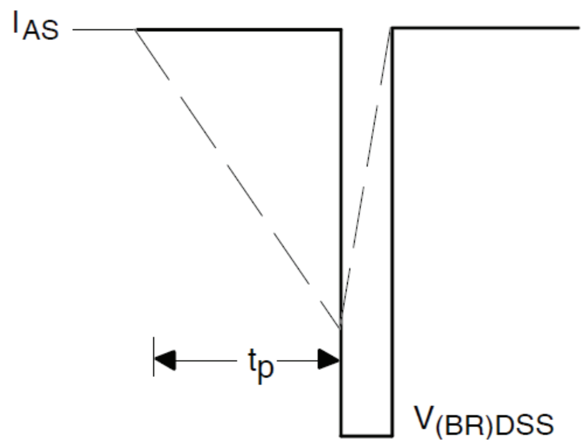


Fig 12b. Unclamped Inductive Waveforms

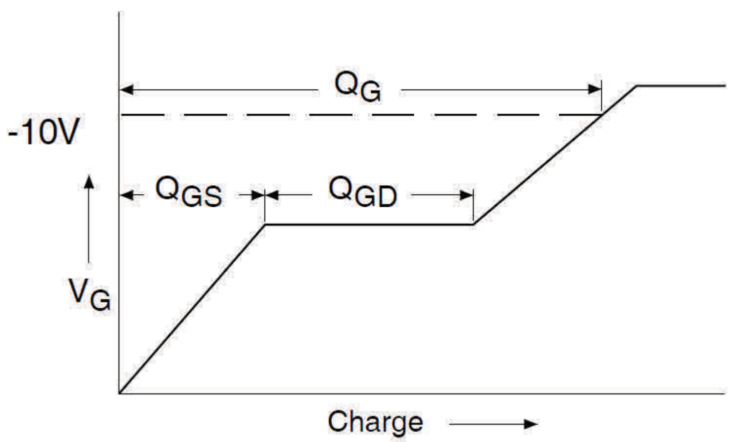


Fig 13a. Gate Charge Waveform

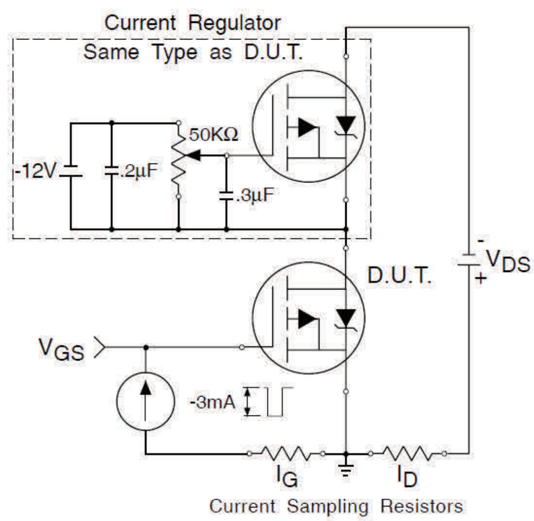


Fig 13b. Gate Charge Test Circuit

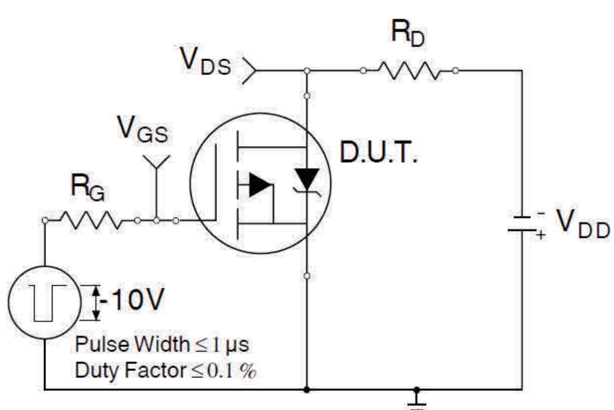


Fig 14a. Switching Time Test Circuit

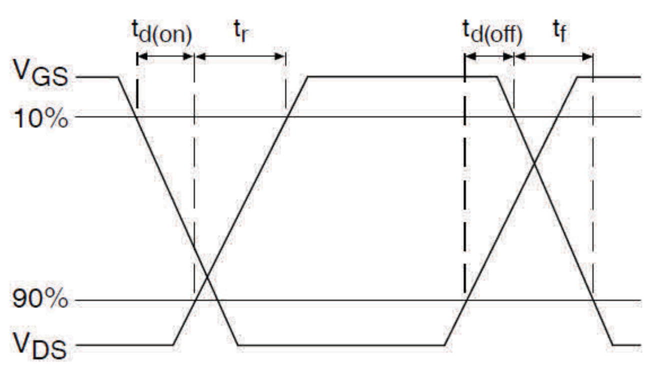
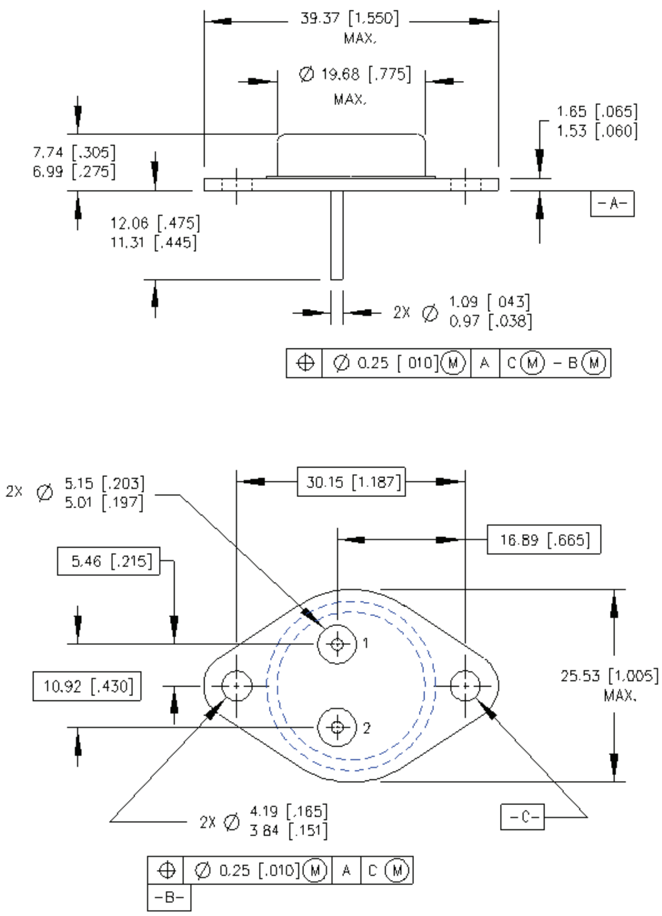


Fig 14b. Switching Time Waveforms

Case Outline and Dimensions - TO-204AA (Modified TO-3)



PIN ASSIGNMENTS

HEXFET	SCHOTTKY	IGBT
1 - SOURCE	1 - ANODE 1	1 - GATE
2 - GATE	2 - ANODE 2	2 - EMITTER
3 - DRAIN (CASE)	3 - COMMON CATHOD (CASE)	3 - COLLECTOR (CASE)

NOTES:
1. DIMENSIONING & TOLERANCING PER ANSI Y14.5M - 1982.
2. CONTROLLING DIMENSION : INCH.
3. DIMENSIONS ARE SHOWN IN MILIMETERS [INCHES]
4. OUTLINE CONFORMS TO JEDEC OUTLINE TO -204-AA.

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