International
IOR Rectifier

PD - 91782

IRFE310
JANTX2N6786U
JANTXV2N6786U
[REF:MIL-PRF-19500/556]

REPETITIVE AVALANCHE AND dv/dt RATED
HEXFET® TRANSISTOR

N-CHANNEL

400Volt, 3.6Ω, HEXFET

The leadless chip carrier (LCC) package represents the logical next step in the continual evolution of surface mount technology. The LCC provides designers the extra flexibility they need to increase circuit board density. International Rectifier has engineered the LCC package to meet the specific needs of the power market by increasing the size of the bottom source pad, thereby enhancing the thermal and electrical performance. The lid of the package is grounded to the source to reduce RF interference.

HEXFET transistors also feature all of the well-established advantages of MOSFETs, such as voltage control, very fast switching, ease of paralleling and electrical parameter temperature stability. They are well-suited for applications such as switching power supplies, motor controls, inverters, choppers, audio amplifiers and high-energy pulse circuits, and virtually any application where high reliability is required.

Product Summary

Part Number	BV_{DSS}	$R_{DS(on)}$	I_D
IRFE310	400V	3.6Ω	1.25A

Features:

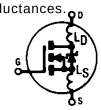
- Hermetically Sealed
- Simple Drive Requirements
- Ease of Paralleling
- Small footprint
- Surface Mount
- Lightweight

Absolute Maximum Ratings

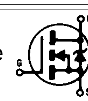
	Parameter	IRFE310, JANTX-, JANTXV-, 2N6786U	Units
I_D @ V_{GS} = 10V, T_C = 25°C	Continuous Drain Current	1.25	A
I_D @ V_{GS} = 10V, T_C = 100°C	Continuous Drain Current	0.80	
I_{DM}	Pulsed Drain Current ①	5.5	
P_D @ T_C = 25°C	Max. Power Dissipation	15	W
	Linear Derating Factor	0.12	W/°C
V_{GS}	Gate-to-Source Voltage	±20	V
E_{AS}	Single Pulse Avalanche Energy ②	34	mJ
dv/dt	Peak Diode Recovery dv/dt ③	2.8	V/ns
T_J T_{STG}	Operating Junction Storage Temperature Range	-55 to 150	°C
	Surface Temperature	300 (for 5 seconds)	
	Weight	0.42 (typical)	g

10/9/98

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

	Parameter	Min	Typ	Max	Units	Test Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	400	—	—	V	V_{GS} = 0V, I_D = 1.0mA
$\Delta BV_{DSS}/\Delta T_J$	Temperature Coefficient of Breakdown Voltage	—	0.37	—	V/°C	Reference to 25°C, I_D = 1.0mA
$R_{DS(on)}$	Static Drain-to-Source On-State Resistance	—	—	3.6	Ω	V_{GS} = 10V, I_D = 0.8A ④
		—	—	3.7		V_{GS} = 10V, I_D = 1.25A
$V_{GS(th)}$	Gate Threshold Voltage	2.0	—	4.0	V	V_{DS} = V_{GS}, I_D = 250µA
g_{fs}	Forward Transconductance	0.87	—	—	S (℧)	V_{DS} > 15V, I_{DS} = 0.8A ④
I_{DSS}	Zero Gate Voltage Drain Current	—	—	25	µA	V_{DS}= 0.8 x Max Rating,V_{GS}=0V
		—	—	250		V_{DS} = 0.8 x Max Rating V_{GS} = 0V, T_J = 125°C
I_{GSS}	Gate-to-Source Leakage Forward	—	—	100	nA	V_{GS} = 20V
I_{GSS}	Gate-to-Source Leakage Reverse	—	—	-100		V_{GS} = -20V
Q_g	Total Gate Charge	—	—	8.4	nC	V_{GS} = 10V, I_D = 1.25A V_{DS} = Max Rating x 0.5
Q_{gs}	Gate-to-Source Charge	—	—	1.6		
Q_{gd}	Gate-to-Drain ('Miller') Charge	—	—	5.0		
$t_{d(on)}$	Turn-On Delay Time	—	—	15	ns	V_{DD} = 15V, I_D = 1.25A, R_G = 7.5Ω
t_r	Rise Time	—	—	20		
$t_{d(off)}$	Turn-Off Delay Time	—	—	35		
t_f	Fall Time	—	—	30		
L_D	Internal Drain Inductance	—	5.0	—	nH	Measured from drain lead, 6mm (0.25 in) from package to center of die. / Modified MOSFET symbol showing the internal inductances. 
L_S	Internal Source Inductance	—	15	—		Measured from source lead, 6mm (0.25 in) from package to source bonding pad.
C_{iss}	Input Capacitance	—	190	—	pF	V_{GS} = 0V, V_{DS} = 25V f = 1.0MHz
C_{oss}	Output Capacitance	—	65	—		
C_{rss}	Reverse Transfer Capacitance	—	24	—		

Source-Drain Diode Ratings and Characteristics

	Parameter	Min	Typ	Max	Units	Test Conditions
I_S	Continuous Source Current (Body Diode)	—	—	1.25	A	Modified MOSFET symbol showing the integral reverse p-n junction rectifier. 
I_{SM}	Pulse Source Current (Body Diode) ①	—	—	5.5		
V_{SD}	Diode Forward Voltage	—	—	1.4	V	T_j = 25°C, I_S = 1.25A, V_{GS} = 0V ④
t_{rr}	Reverse Recovery Time	—	—	540	ns	T_j = 25°C, I_F = 1.25A, di/dt ≤ 100A/µs V_{DD} ≤ 50V ④
Q_{RR}	Reverse Recovery Charge	—	—	4.5	µC	
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible. Turn-on speed is substantially controlled by L_S + L_D.				

Thermal Resistance

	Parameter	Min	Typ	Max	Units	Test Conditions
R_{thJC}	Junction-to-Case	—	—	8.3	°C/W	
$R_{thJ-PCB}$	Junction-to-PC board	—	—	27		soldered to a copper-clad PC board

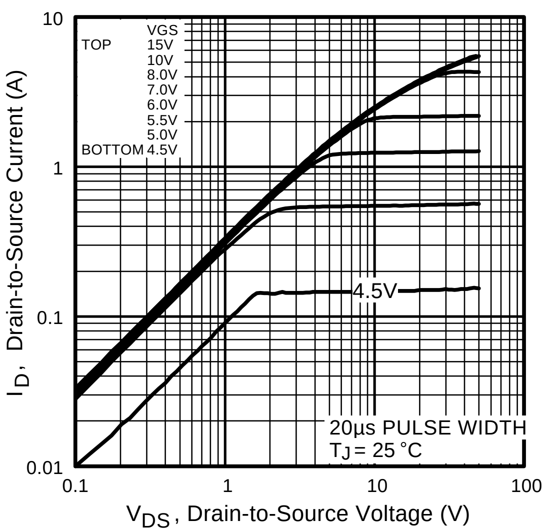


Fig 1. Typical Output Characteristics

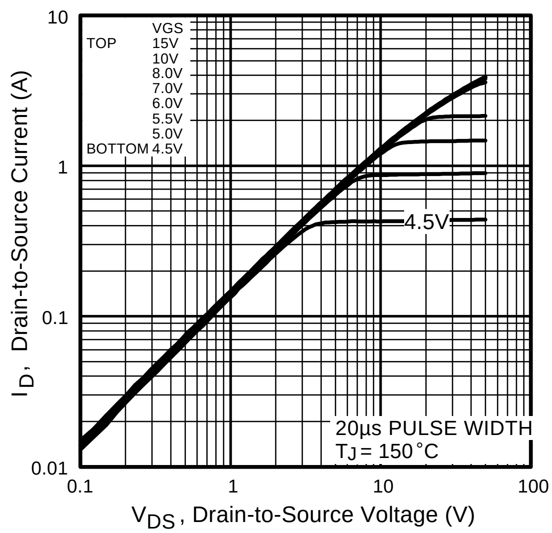


Fig 2. Typical Output Characteristics

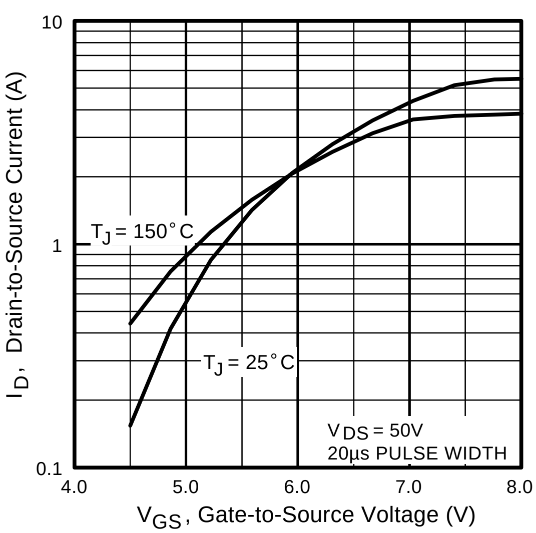


Fig 3. Typical Transfer Characteristics

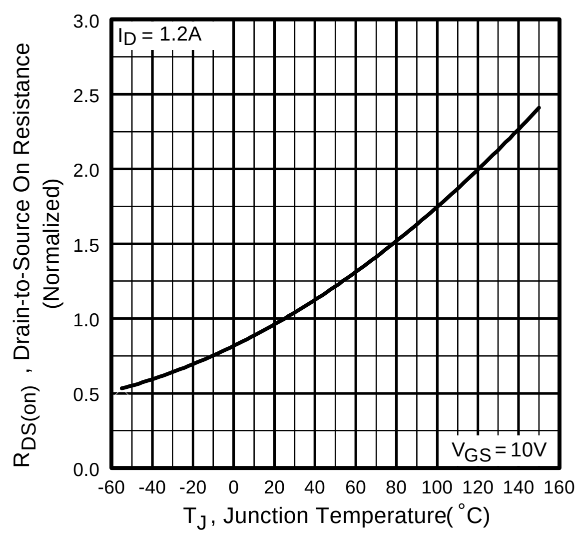


Fig 4. Normalized On-Resistance Vs. Temperature

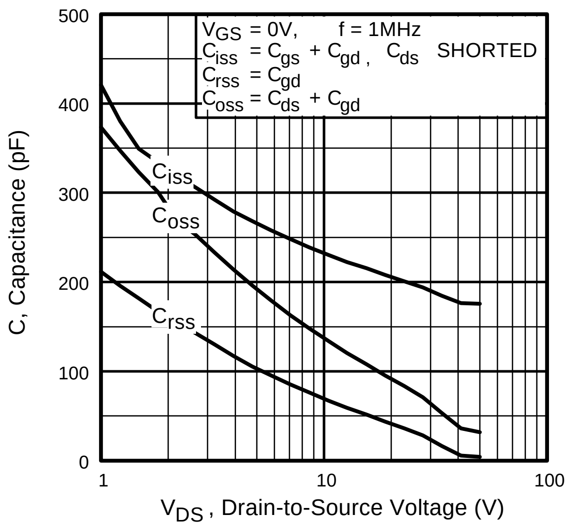


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

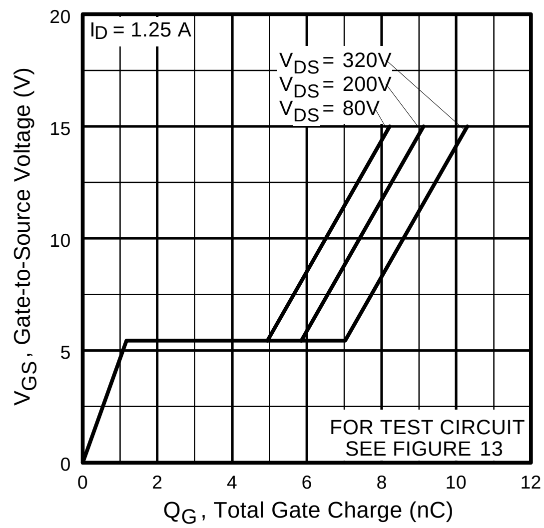


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

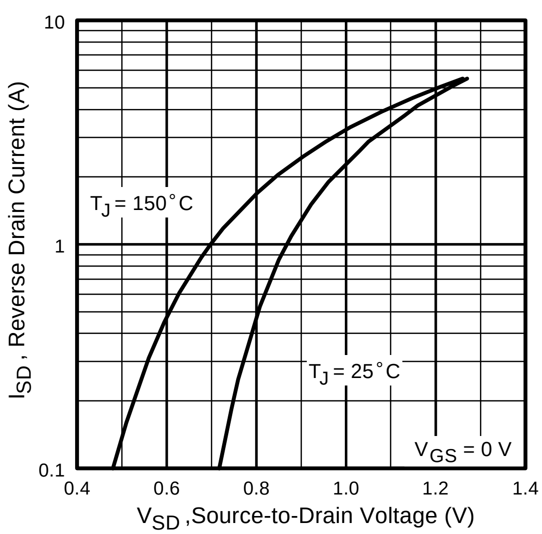


Fig 7. Typical Source-Drain Diode Forward Voltage

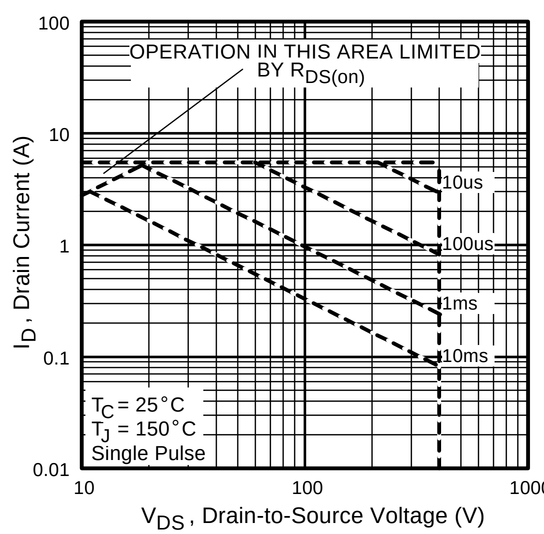


Fig 8. Maximum Safe Operating Area

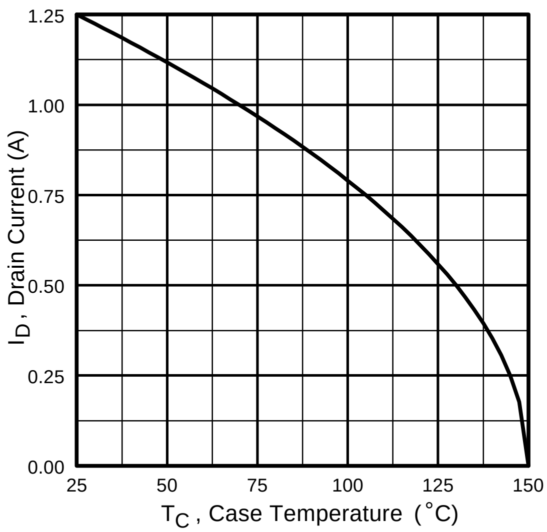


Fig 9. Maximum Drain Current Vs. Case Temperature

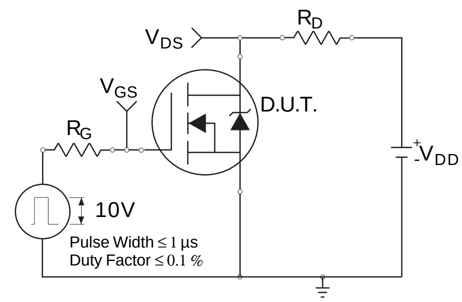


Fig 10a. Switching Time Test Circuit

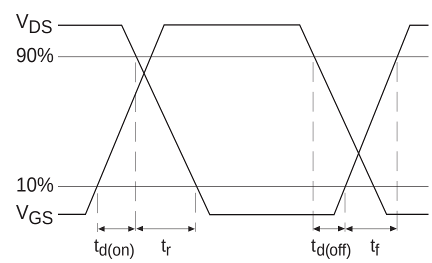


Fig 10b. Switching Time Waveforms

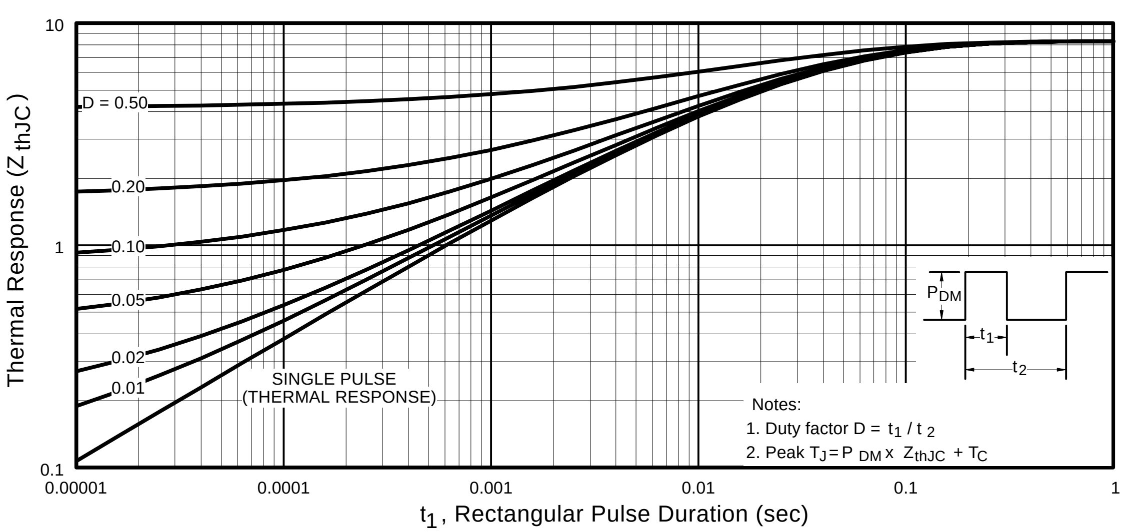


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

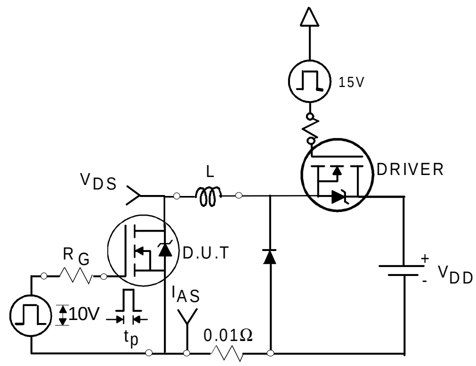


Fig 12a. Unclamped Inductive Test Circuit

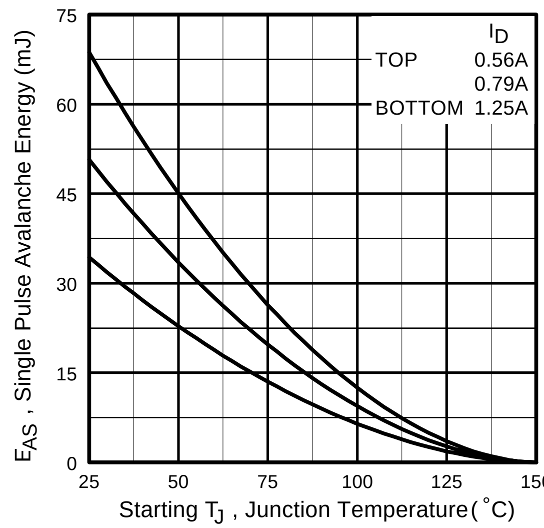


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

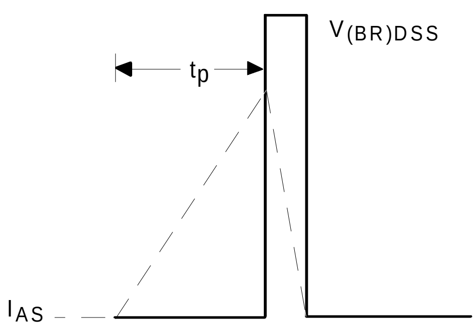


Fig 12b. Unclamped Inductive Waveforms

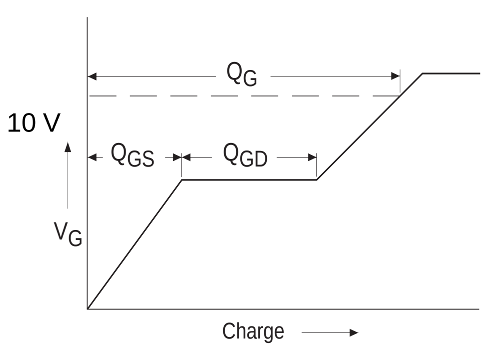


Fig 13a. Basic Gate Charge Waveform

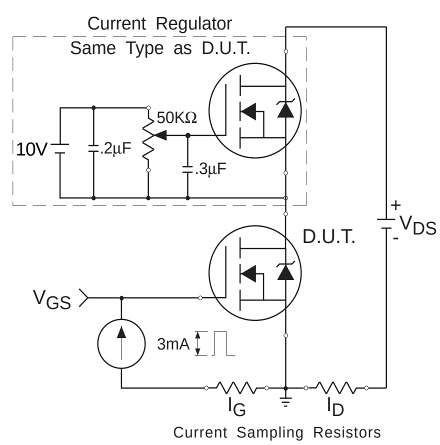


Fig 13b. Gate Charge Test Circuit

Notes:

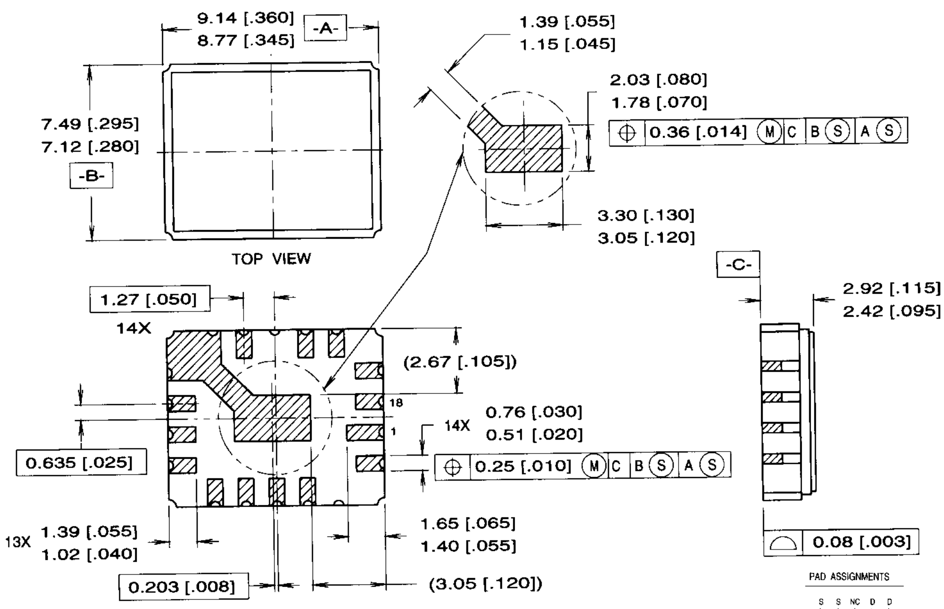
① Repetitive Rating; Pulse width limited by maximum junction temperature.
Refer to current HEXFET reliability report.

② @ V_{DD} = 50 V, Starting T_J = 25°C,
$E_{AS} = [0.5 * L * (I_L^2)]$
Peak I_L =1.25A, V_{GS} =10 V, 25 ≤ R_G ≤ 200Ω

③ I_{SD} ≤ 1.25A, di/dt ≤ 180 A/μs,
V_{DD} ≤ BV_{DSS}, T_J ≤ 150°C, Suggested R_G = 50Ω

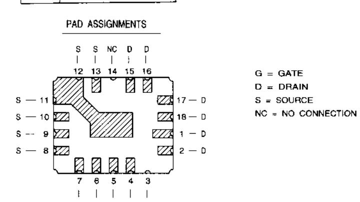
④ Pulse width ≤ 300 μs; Duty Cycle ≤ 2%

Case Outline and Dimensions — Leadless Chip Carrier (LCC) Package



NOTES:

1. DIMENSIONING & TOLERANCING PER ANSI Y14.5M-1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].



IR Case Style Leadless Chip Carrier (LCC)

International
IOR Rectifier

WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245, Tel: (310) 322 3331
IR GREAT BRITAIN: Hurst Green, Oxted, Surrey RH8 9BB, UK Tel: ++ 44 1883 732020
IR CANADA: 15 Lincoln Court, Brampton, Ontario L6T3Z2, Tel: (905) 453 2200
IR GERMANY: Saalburgstrasse 157, 61350 Bad Homburg Tel: ++ 49 6172 96590
IR ITALY: Via Liguria 49, 10071 Borgaro, Torino Tel: ++ 39 11 451 0111
IR FAR EAST: K&H Bldg., 2F, 30-4 Nishi-Ikebukuro 3-Chome, Toshima-Ku, Tokyo Japan 171 Tel: 81 3 3983 0086
IR SOUTHEAST ASIA: 1 Kim Seng Promenade, Great World City West Tower, 13-11, Singapore 237994 Tel: ++ 65 838 4630
IR TAIWAN:16 Fl. Suite D. 207, Sec. 2, Tun Haw South Road, Taipei, 10673, Taiwan Tel: 886-2-2377-9936
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