

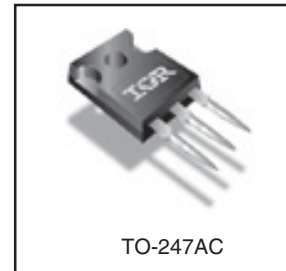
Applications

- Hard Switching Primary or PFS Switch
- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply
- High Speed Power Switching
- Motor Drive

V_{DSS}	R_{DS(on) typ.}	I_D
600V	240mΩ	22A

Benefits

- Low Gate Charge Qg results in Simple Drive Requirement
- Improved Gate, Avalanche and Dynamic dv/dt Ruggedness
- Fully Characterized Capacitance and Avalanche Voltage and Current
- Enhanced Body Diode dv/dt Capability



Absolute Maximum Ratings

	Parameter	Max.	Units
I _D @ T _C = 25°C	Continuous Drain Current, V _{GS} @ 10V	22	A
I _D @ T _C = 100°C	Continuous Drain Current, V _{GS} @ 10V	14	
I _{DM}	Pulsed Drain Current ①	88	
P _D @ T _C = 25°C	Power Dissipation	370	W
	Linear Derating Factor	2.9	W/°C
V _{GS}	Gate-to-Source Voltage	± 30	V
dv/dt	Peak Diode Recovery dv/dt ③	18	V/ns
T _J	Operating Junction and	-55 to + 150	
T _{STG}	Storage Temperature Range		
	Soldering Temperature, for 10 seconds (1.6mm from case)	300	°C

Avalanche Characteristics

Symbol	Parameter	Typ.	Max.	Units
E _{AS}	Single Pulse Avalanche Energy②	—	380	mJ
I _{AR}	Avalanche Current①	—	22	A
E _{AR}	Repetitive Avalanche Energy①	—	37	mJ

Thermal Resistance

Symbol	Parameter	Typ.	Max.	Units
R _{θJC}	Junction-to-Case④	—	0.34	°C/W
R _{θCS}	Case-to-Sink, Flat, Greased Surface	0.24	—	
R _{θJA}	Junction-to-Ambient④	—	40	

IRFP22N60K

International
IR Rectifier

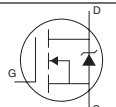
Static @ T_J = 25°C (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
V _{(BR)DSS}	Drain-to-Source Breakdown Voltage	600	—	—	V	V _{GS} = 0V, I _D = 250μA
ΔV _{(BR)DSS} /ΔT _J	Breakdown Voltage Temp. Coefficient	—	0.30	—	V/°C	Reference to 25°C, I _D = 1mA ^⑥
R _{DS(on)}	Static Drain-to-Source On-Resistance	—	240	280	mΩ	V _{GS} = 10V, I _D = 13A ^④
V _{GS(th)}	Gate Threshold Voltage	3.0	—	5.0	V	V _{DS} = V _{GS} , I _D = 250μA
I _{DSS}	Drain-to-Source Leakage Current	—	—	50	μA	V _{DS} = 600V, V _{GS} = 0V
		—	—	250	μA	V _{DS} = 480V, V _{GS} = 0V, T _J = 125°C
I _{GSS}	Gate-to-Source Forward Leakage	—	—	100	nA	V _{GS} = 30V
	Gate-to-Source Reverse Leakage	—	—	-100	nA	V _{GS} = -30V

Dynamic @ T_J = 25°C (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
g _{fs}	Forward Transconductance	11	—	—	S	V _{DS} = 50V, I _D = 13A
Q _g	Total Gate Charge	—	—	150	nC	I _D = 22A
Q _{gs}	Gate-to-Source Charge	—	—	45		V _{DS} = 480V
Q _{gd}	Gate-to-Drain ("Miller") Charge	—	—	76		V _{GS} = 10V ^④
t _{d(on)}	Turn-On Delay Time	—	26	—	ns	V _{DD} = 300V
t _r	Rise Time	—	99	—		I _D = 22A
t _{d(off)}	Turn-Off Delay Time	—	48	—		R _G = 6.2 Ω
t _f	Fall Time	—	37	—		V _{GS} = 10V ^④
C _{iss}	Input Capacitance	—	3570	—	pF	V _{GS} = 0V
C _{oss}	Output Capacitance	—	350	—		V _{DS} = 25V
C _{rss}	Reverse Transfer Capacitance	—	36	—		f = 1.0MHz
C _{oss}	Output Capacitance	—	4710	—		V _{GS} = 0V, V _{DS} = 1.0V, f = 1.0MHz
C _{oss}	Output Capacitance	—	92	—		V _{GS} = 0V, V _{DS} = 480V, f = 1.0MHz
C _{oss eff.}	Effective Output Capacitance	—	180	—		V _{GS} = 0V, V _{DS} = 0V to 480V ^⑤

Diode Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I _S	Continuous Source Current (Body Diode)	—	—	22	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I _{SM}	Pulsed Source Current (Body Diode) ^①	—	—	88		
V _{SD}	Diode Forward Voltage	—	—	1.5	V	T _J = 25°C, I _S = 22A, V _{GS} = 0V ^④
t _{rr}	Reverse Recovery Time	—	590	890	ns	T _J = 25°C I _F = 22A
		—	670	1010		T _J = 125°C di/dt = 100A/μs ^④
Q _{rr}	Reverse Recovery Charge	—	7.2	11	μC	T _J = 25°C
		—	8.5	13		T _J = 125°C
I _{RRM}	Reverse Recovery Current	—	26	39	A	T _J = 25°C
t _{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by L _S +L _D)				

Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Starting T_J = 25°C, L = 1.5mH, R_G = 25Ω, I_{AS} = 22A
- ③ I_{SD} ≤ 22A, di/dt ≤ 540 A/μs, V_{DD} ≤ V_{(BR)DSS}, T_J ≤ 150°C.
- ④ Pulse width ≤ 300μs; duty cycle ≤ 2%.
- ⑤ C_{oss eff.} is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 80% V_{DS}.
- ⑥ R_θ is measured at T_J approximately 90°C

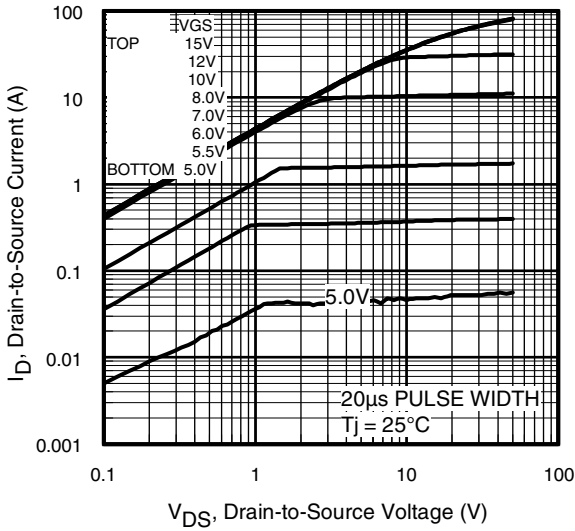


Fig 1. Typical Output Characteristics

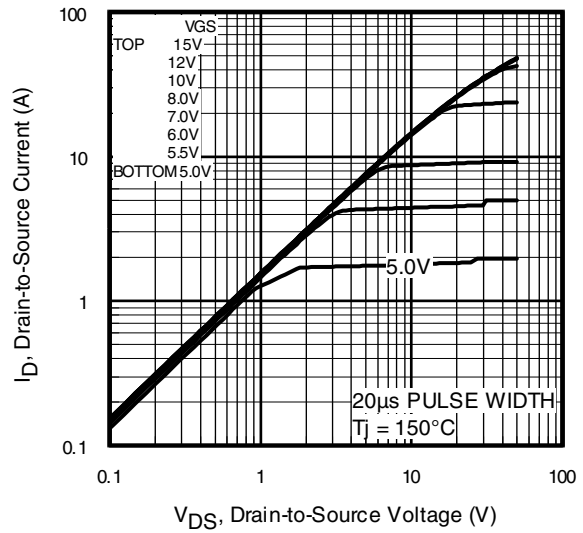


Fig 2. Typical Output Characteristics

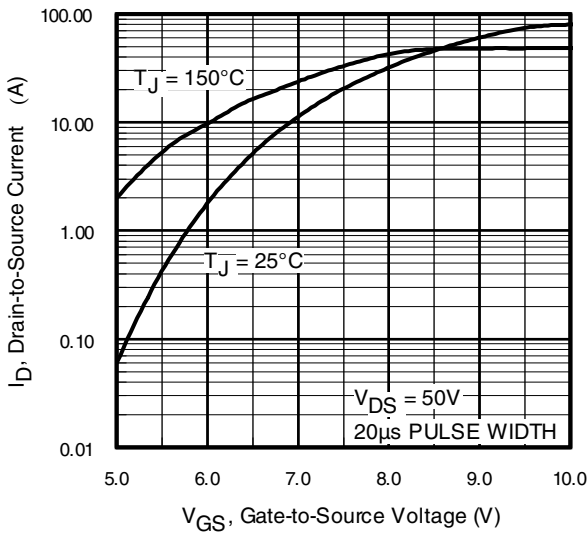


Fig 3. Typical Transfer Characteristics

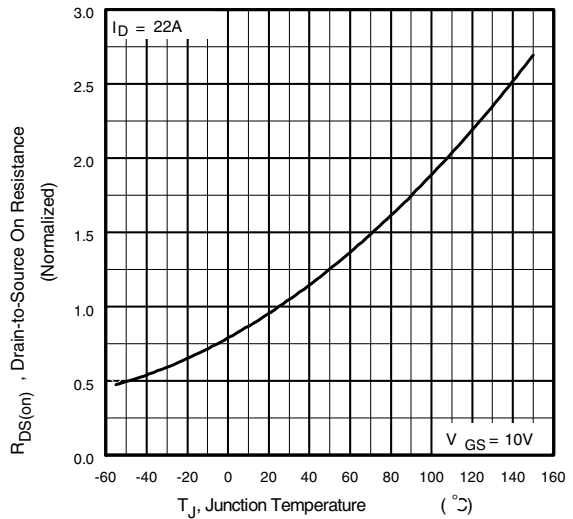


Fig 4. Normalized On-Resistance Vs. Temperature

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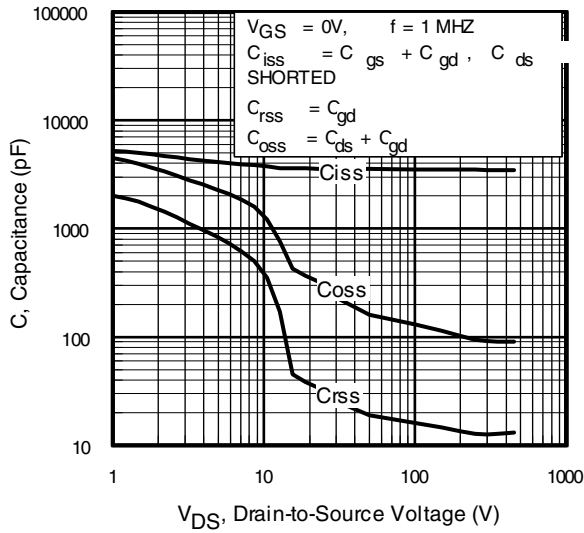


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

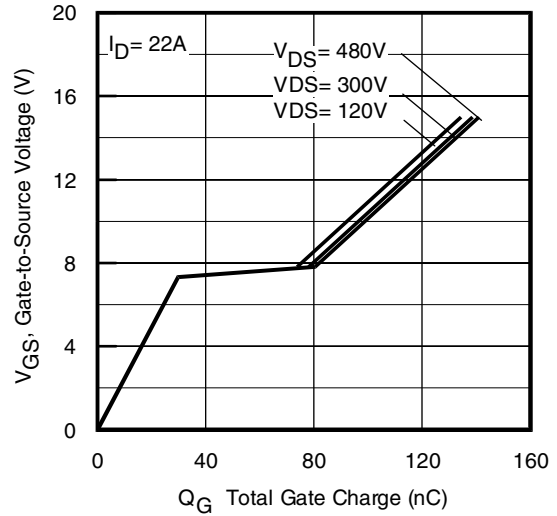


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

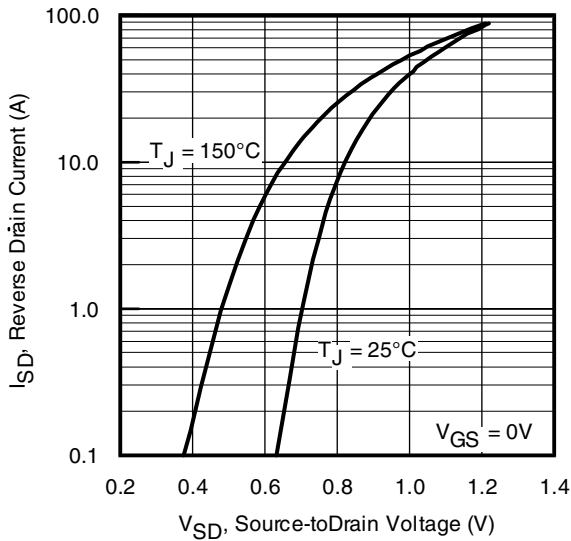


Fig 7. Typical Source-Drain Diode Forward Voltage

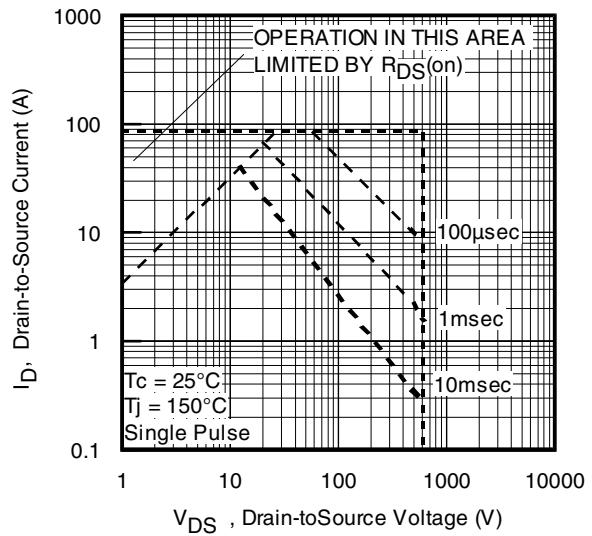


Fig 8. Maximum Safe Operating Area

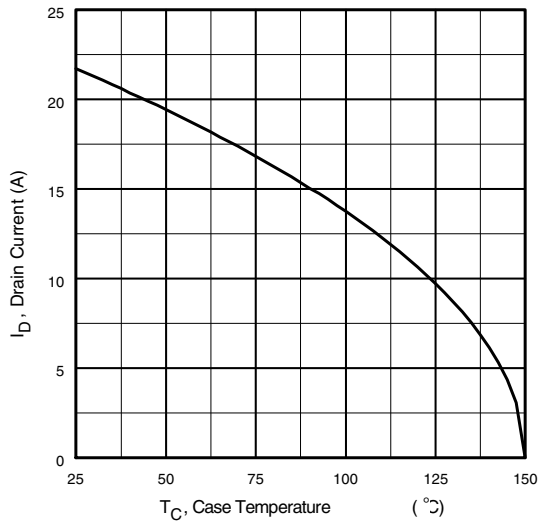


Fig 9. Maximum Drain Current Vs. Case Temperature

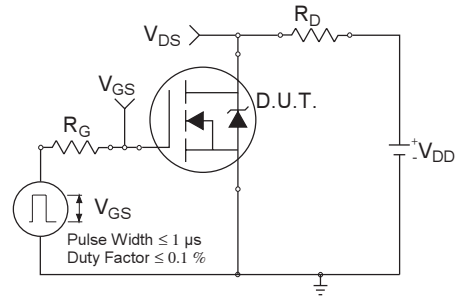


Fig 10a. Switching Time Test Circuit

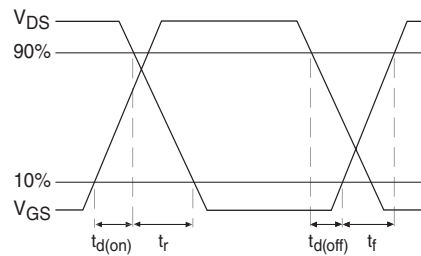


Fig 10b. Switching Time Waveforms

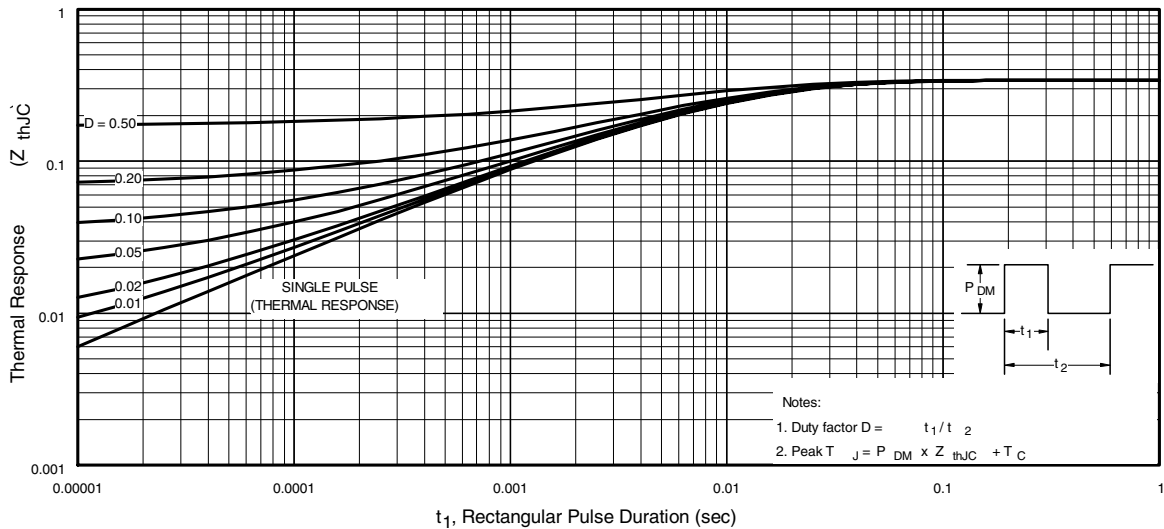


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

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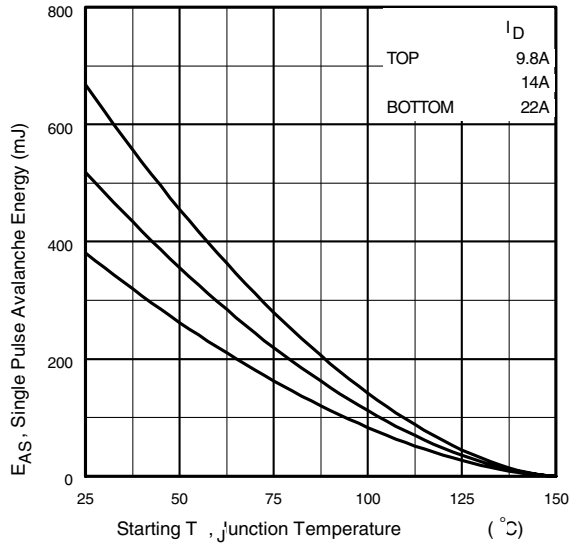


Fig 12a. Maximum Avalanche Energy Vs. Drain Current

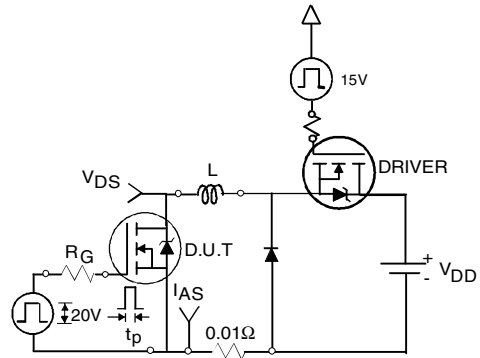


Fig 12c. Unclamped Inductive Test Circuit

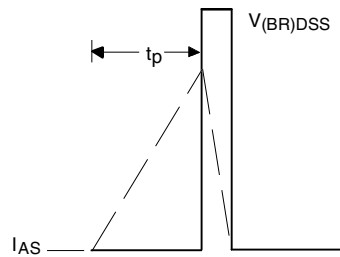


Fig 12d. Unclamped Inductive Waveforms

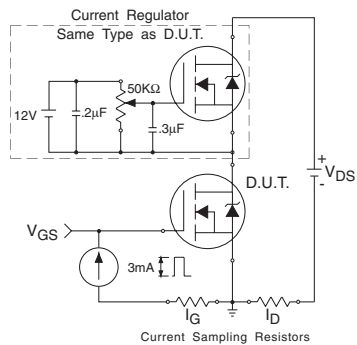


Fig 13a. Gate Charge Test Circuit

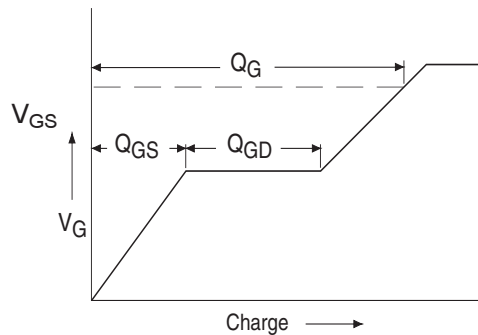
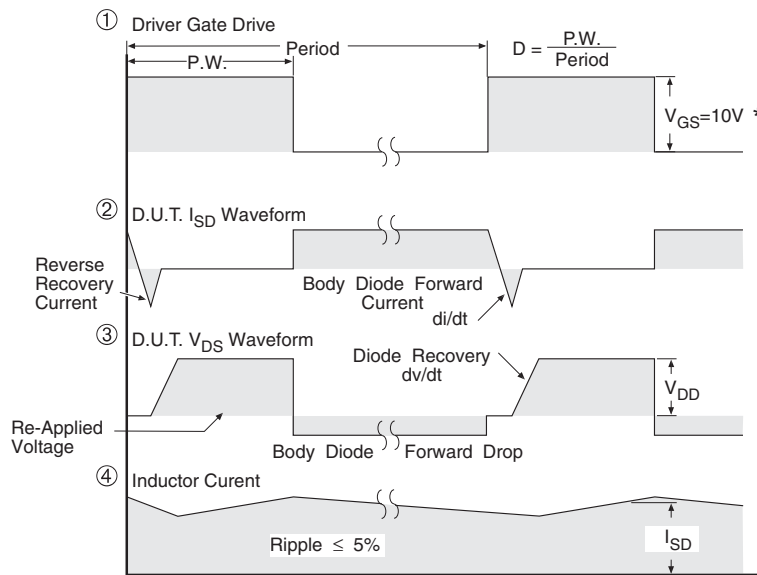
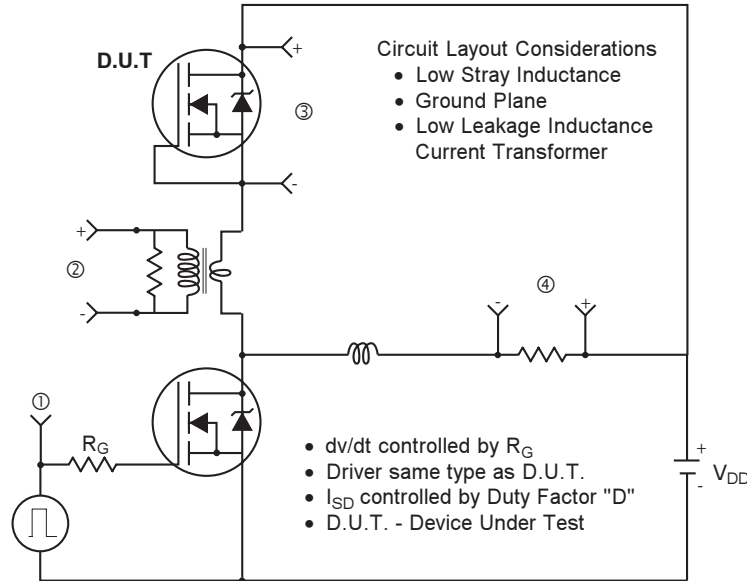


Fig 13b. Basic Gate Charge Waveform

Peak Diode Recovery dv/dt Test Circuit



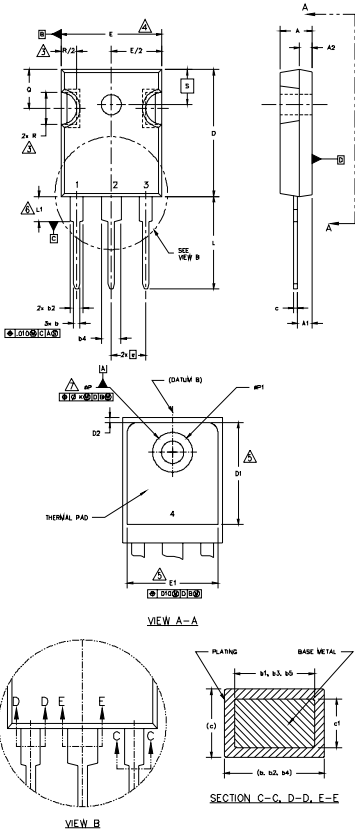
* $V_{GS} = 5V$ for Logic Level Devices

Fig 14. For N-Channel HEXFET® Power MOSFETs

IRFP22N60K



TO-247AC Package Outline Dimensions are shown in millimeters (inches)



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M 1994.
2. DIMENSIONS ARE SHOWN IN INCHES [MILLIMETERS]
3. CONTOUR OF SLOT OPTIONAL.
4. DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED .005" (0.127) PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
5. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS D1 & E1.
6. LEAD FINISH UNCONTROLLED IN L1.
7. ØP TO HAVE A MAXIMUM DRAFT ANGLE OF 1.5° TO THE TOP OF THE PART WITH A MAXIMUM HOLE DIAMETER OF .154" [3.91].
8. OUTLINE CONFORMS TO JEDEC OUTLINE TO-247 WITH THE EXCEPTION OF DIMENSION c.

SYMBOL	DIMENSIONS				NOTES
	INCHES		MILLIMETERS		
	MIN.	MAX.	MIN.	MAX.	
A	.183	.209	4.65	5.31	
A1	.087	.102	2.21	2.59	
A2	.059	.098	1.50	2.49	
b	.039	.055	0.99	1.40	
b1	.039	.053	0.99	1.35	
b2	.065	.094	1.65	2.39	
b3	.065	.092	1.65	2.37	
b4	.102	.135	2.59	3.43	
b5	.102	.133	2.59	3.38	
c	.015	.034	0.38	0.86	
c1	.015	.030	0.38	0.76	
D	.776	.815	19.71	20.70	4
D1	.515	-	13.08	-	5
D2	.020	.030	0.51	0.76	
E	.602	.625	15.29	15.87	4
E1	.540	-	13.72	-	
e	.215 BSC		5.46 BSC		
Øk	.010		2.54		
L	.559	.634	14.20	16.10	
L1	.146	.169	3.71	4.29	
N	3		7.62 BSC		
ØP	.140	.144	3.56	3.66	
ØP1	-	.275	-	6.98	
Q	.209	.224	5.31	5.69	
R	.178	.216	4.52	5.49	
S	.217 BSC		5.51 BSC		

LEAD ASSIGNMENTS

HEXFET

1. - GATE
2. - DRAIN
3. - SOURCE
4. - DRAIN

IGBTs, CoPACK

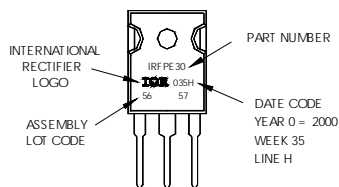
1. - GATE
2. - COLLECTOR
3. - EMITTER
4. - COLLECTOR

DIODES

1. - ANODE/OPEN
2. - CATHODE
3. - ANODE

TO-247AC Part Marking Information

EXAMPLE: THIS IS AN IRFPE30 WITH ASSEMBLY LOT CODE 5657 ASSEMBLED ON WW 35, 2000 IN THE ASSEMBLY LINE "H"
 Note: "P" in assembly line position indicates "Lead-Free"



Data and specifications subject to change without notice. This product has been designed and qualified for the Industrial market. Qualification Standards can be found on IR's Web site.



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08/04



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