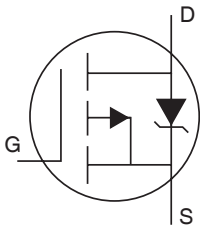
IRF5305

-60V P-Channel MOSFET

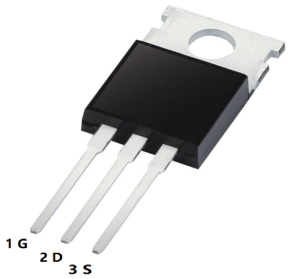
Description

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



Features

- V_{DS} (V) = -60V
- I_D = -31A (V_{GS} = -10V)
- $R_{DS(ON)}$ < 60mΩ (V_{GS} = -10V)
- Advanced Process Technology
- Dynamic dv/dt Rating
- 175°C Operating Temperature
- Fast Switching
- Fully Avalanche Rated Lead-Free



Absolute Maximum Ratings

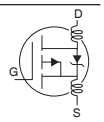
	Parameter	Max.	Units
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ -10V	-31	A
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS} @ -10V	-22	
I_{DM}	Pulsed Drain Current ①	-110	
P_D @T_C = 25°C	Power Dissipation	110	W
	Linear Derating Factor	0.71	W/°C
V_{GS}	Gate-to-Source Voltage	± 20	V
E_{AS}	Single Pulse Avalanche Energy②	280	mJ
I_{AR}	Avalanche Current①	-16	A
E_{AR}	Repetitive Avalanche Energy①	11	mJ
dv/dt	Peak Diode Recovery dv/dt ③	-5.0	V/ns
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 175	°C
	Soldering Temperature, for 10 seconds	300 (1.6mm from case)	
	Mounting torque, 6-32 or M3 srew	10 lbf•in (1.1N•m)	

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case		1.4	°C/W
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface	0.50		
$R_{\theta JA}$	Junction-to-Ambient		62	

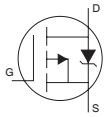
Electrical Characteristics @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	-60			V	V_{GS} = 0V, I_D = -250μA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient		-0.034		V/°C	Reference to 25°C, I_D = -1mA
$R_{DS(on)}$	Static Drain-to-Source On-Resistance			60	mΩ	V_{GS} = -10V, I_D = -16A ④
$V_{GS(th)}$	Gate Threshold Voltage	-1.1	-2	-3.0	V	V_{DS} = V_{GS}, I_D = -250μA
g_{fs}	Forward Transconductance	8.0			S	V_{DS} = -25V, I_D = -16A
I_{DSS}	Drain-to-Source Leakage Current			-25	μA	V_{DS} = -55V, V_{GS} = 0V
				-250		V_{DS} = -44V, V_{GS} = 0V, T_J = 150°C
I_{GSS}	Gate-to-Source Forward Leakage			100	nA	V_{GS} = 20V
	Gate-to-Source Reverse Leakage			-100		V_{GS} = -20V
Q_g	Total Gate Charge			63	nC	I_D = -16A
Q_{gs}	Gate-to-Source Charge			13		V_{DS} = -44V
Q_{gd}	Gate-to-Drain ("Miller") Charge			29		V_{GS} = -10V, See Fig. 6 and 13 ④
$t_{d(on)}$	Turn-On Delay Time		14		ns	V_{DD} = -28V
t_r	Rise Time		66			I_D = -16A
$t_{d(off)}$	Turn-Off Delay Time		39			R_G = 6.8Ω
t_f	Fall Time		63			R_D = 1.6Ω, See Fig. 10 ④
L_D	Internal Drain Inductance		4.5		nH	Between lead, 6mm (0.25in.)
L_S	Internal Source Inductance		7.5			from package and center of die contact
C_{iss}	Input Capacitance		1200		pF	V_{GS} = 0V
C_{oss}	Output Capacitance		520			V_{DS} = -25V
C_{rss}	Reverse Transfer Capacitance		250			f = 1.0MHz, See Fig. 5



Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)			-31	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{SM}	Pulsed Source Current (Body Diode) ①			-110		
V_{SD}	Diode Forward Voltage			-1.3	V	T_J = 25°C, I_S = -16A, V_{GS} = 0V ④
t_{rr}	Reverse Recovery Time		71	110	ns	T_J = 25°C, I_F = -16A
Q_{rr}	Reverse RecoveryCharge		170	250	nC	di/dt = -100A/μs ④



Notes:

① Repetitive rating; pulse width limited by max. junction temperature. (See fig. 11)

② V_{DD} = -25V, starting T_J = 25°C, L = 2.1mH R_G = 25Ω, I_{AS} = -16A. (See Figure 12)

③ I_{SD} ≤ -16A, di/dt ≤ -280A/μs, V_{DD} ≤ $V_{(BR)DSS}$, T_J ≤ 175°C

④ Pulse width ≤ 300μs; duty cycle ≤ 2%.

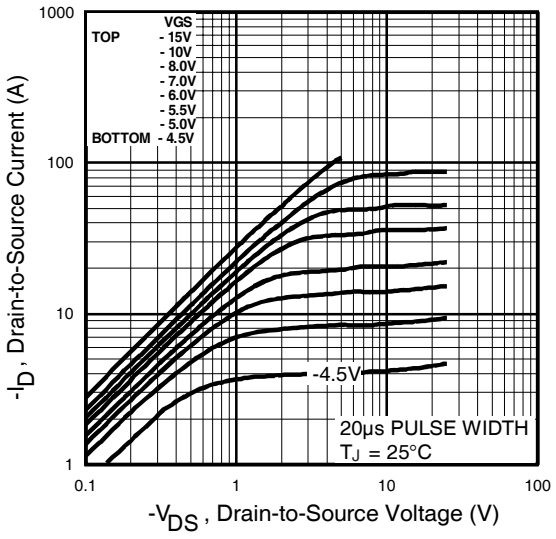


Fig 1. Typical Output Characteristics

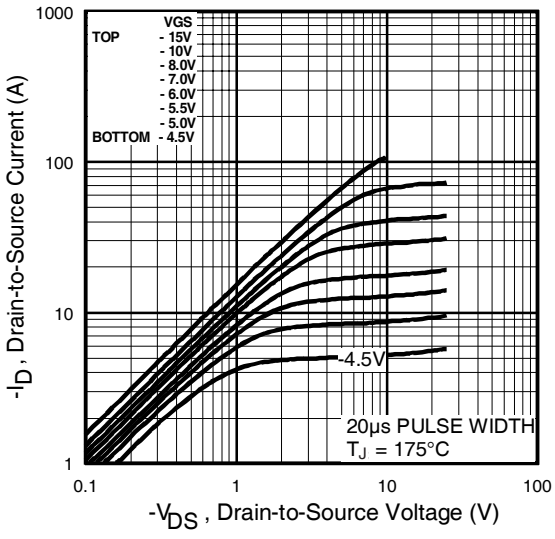


Fig 2. Typical Output Characteristics

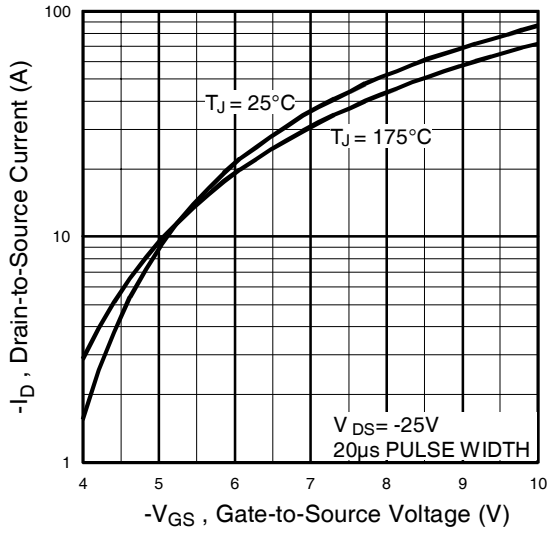


Fig 3. Typical Transfer Characteristics

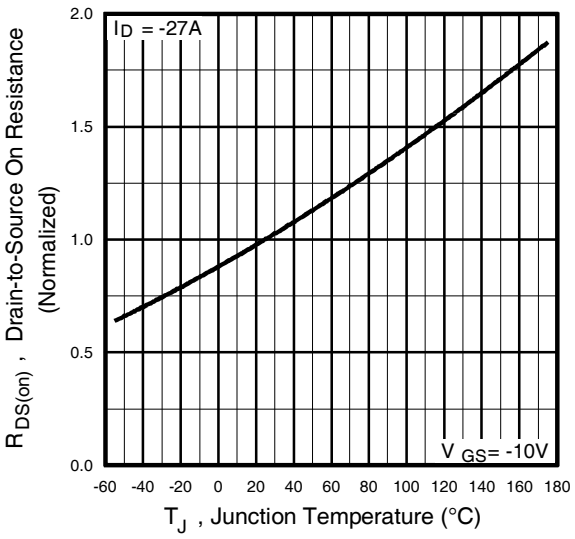


Fig 4. Normalized On-Resistance Vs. Temperature

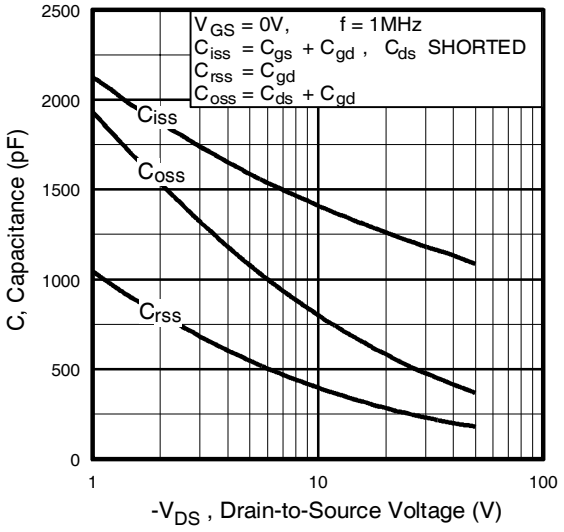


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

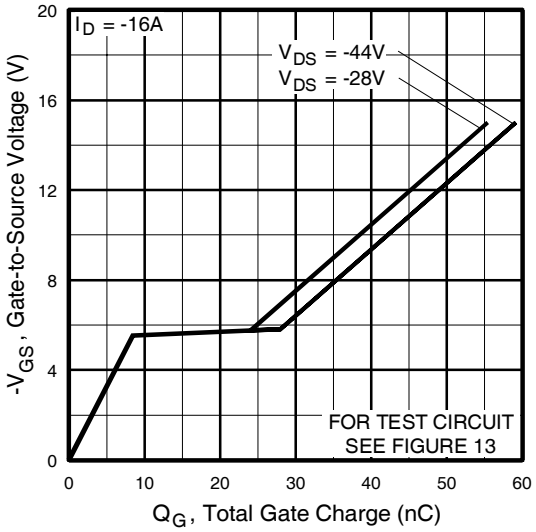


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

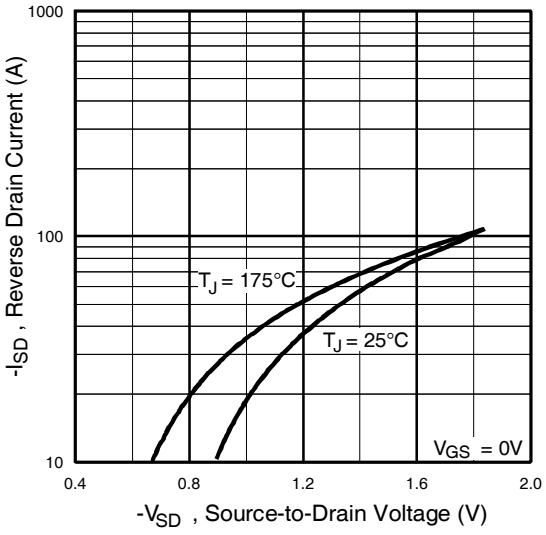


Fig 7. Typical Source-Drain Diode Forward Voltage

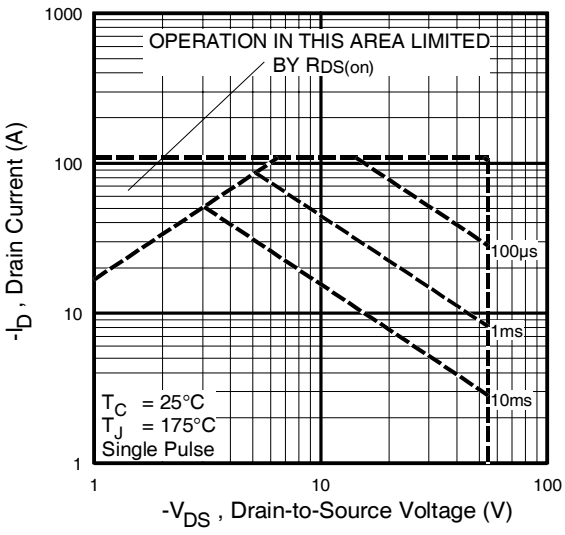


Fig 8. Maximum Safe Operating Area

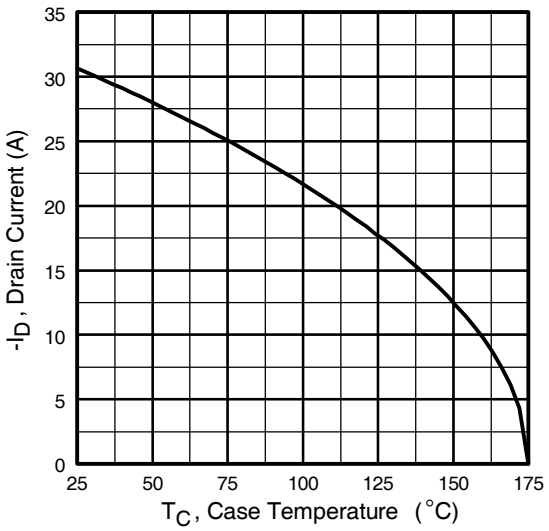


Fig 9. Maximum Drain Current Vs. Case Temperature

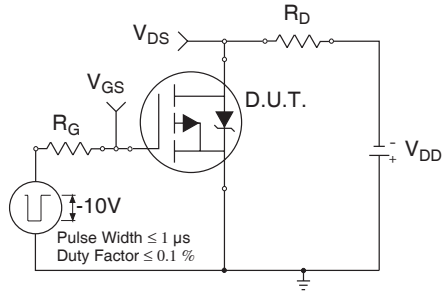


Fig 10a. Switching Time Test Circuit

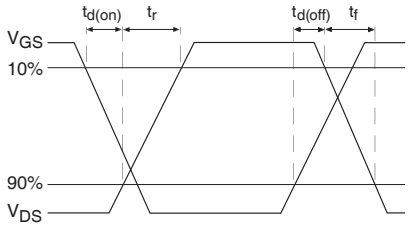


Fig 10b. Switching Time Waveforms

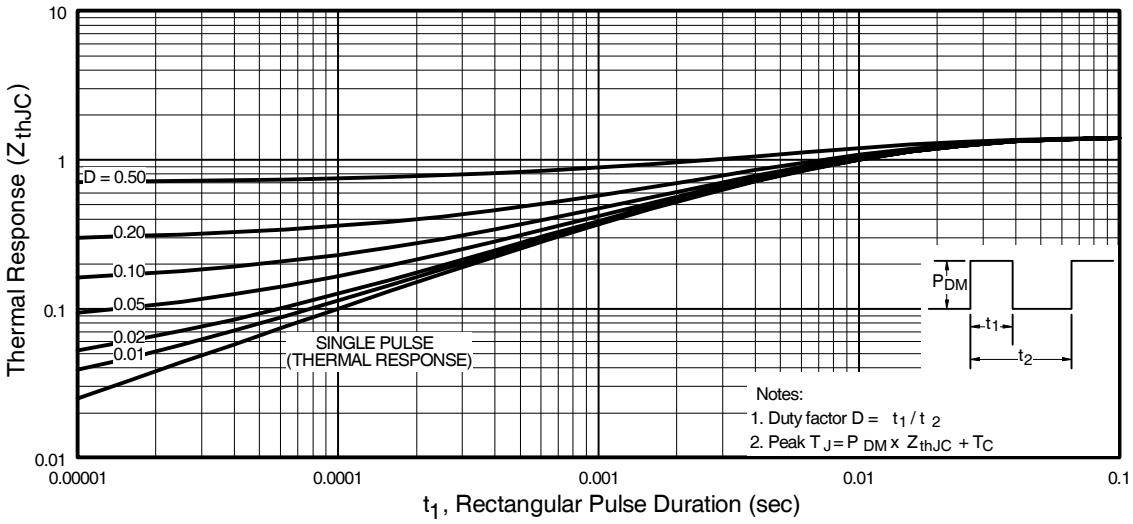


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

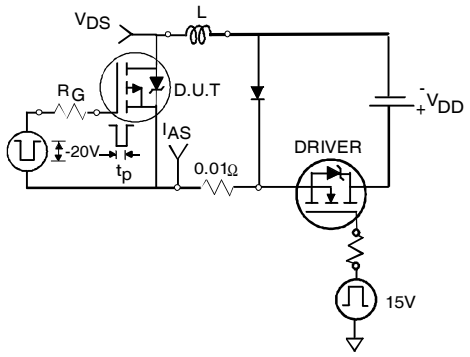


Fig 12a. Unclamped Inductive Test Circuit

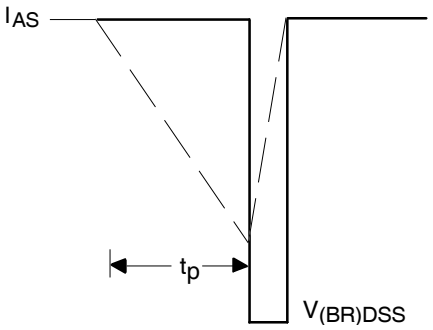


Fig 12b. Unclamped Inductive Waveforms

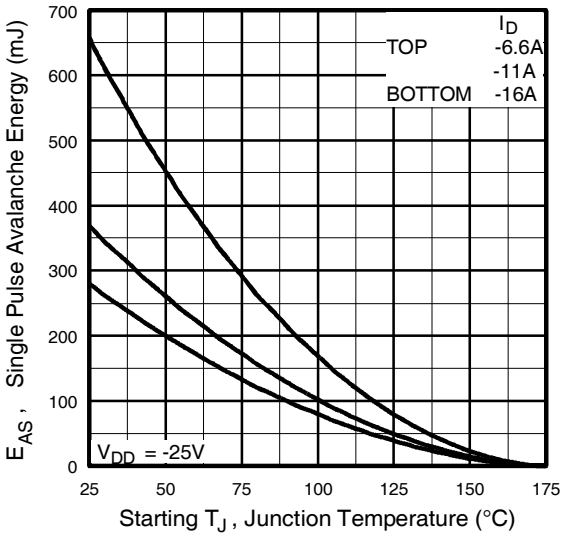


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

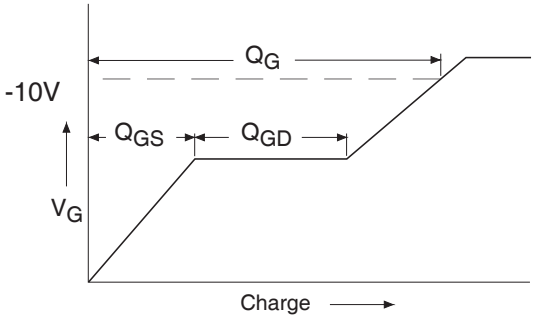


Fig 13a. Basic Gate Charge Waveform

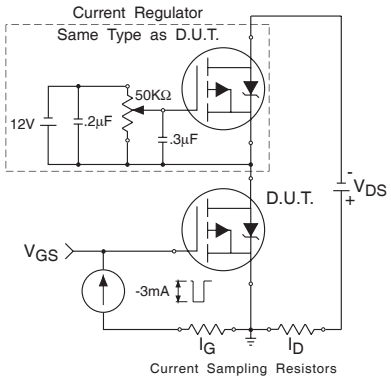
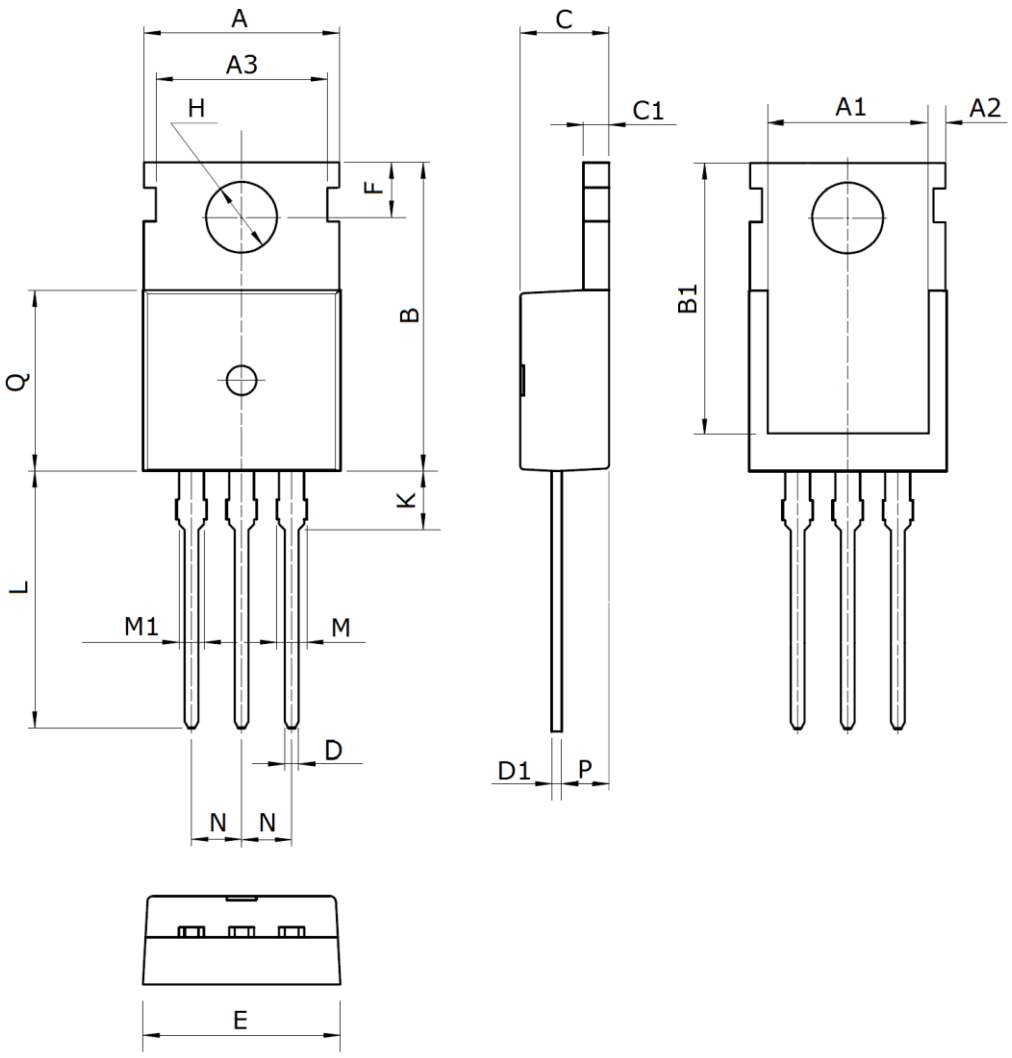


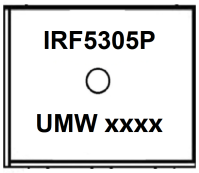
Fig 13b. Gate Charge Test Circuit

Package Mechanical Data TO-220



Symbol	Dimensions （mm）	Symbol	Dimensions (mm)	Symbol	Dimensions (mm)
A	10.0±0.3	C1	1.3±0.2	L	13.2±0.4
A1	8.0±0.2	D	0.8±0.2	M	1.38±0.1
A2	0.94±0.1	D1	0.5±0.1	M1	1.28±0.1
A3	8.7±0.1	E	10.0±0.3	N	2.54(typ)
B	15.6±0.4	F	2.8 ±0.1	P	2.4±0.3
B1	13.2 ±0.2	H	3.6±0.1	Q	9.15±0. 25
C	4.5±0. 2	K	3.1±0.2		

Marking



Ordering information

Order code	Package	Baseqty	Deliverymode
UMW IRF5305PBF	TO-220	1000	Tape and reel

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