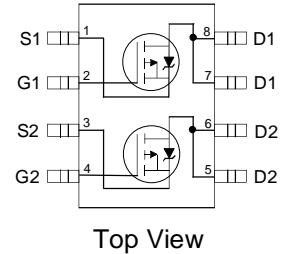## Benefits

- $V_{DS (V)} = -30V$

- $I_D = -2.3A$

- $R_{DS(ON)} < 250m\Omega$ ($V_{GS} = -10V$)

- $R_{DS(ON)} < 400m\Omega$ ($V_{GS} = -4.5V$)

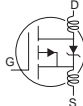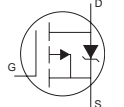- Ultra Low On-resistance

- Fast Switching

- Lead-free

Top View

Absolute Maximum Ratings

|	Parameter	Max.	Units
I_D @ T_A = 25°C	Continuous Drain Current, V_{GS} @ 10V	-2.3	A
I_D @ T_A = 70°C	Continuous Drain Current, V_{GS} @ 10V	-1.8	
I_{DM}	Pulsed Drain Current ①	-10	
P_D @ T_C = 25°C	Power Dissipation	2.0	W
	Linear Derating Factor	0.016	W/°C
V_{GS}	Gate-to-Source Voltage	± 12	V
dv/dt	Peak Diode Recovery dv/dt ②	-3.0	V/nS
T_J, T_{STG}	Junction and Storage Temperature Range	-55 to + 150	°C

Thermal Resistance Ratings

	Parameter	Min.	Typ.	Max.	Units
$R_{\theta JA}$	Maximum Junction-to-Ambient ④			62.5	°C/W

Electrical Characteristics T_A = 25°C unless otherwise noted

|	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	-30			V	V_{GS} = 0V, I_D = -250µA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	——	-0.015	——	V/°C	Reference to 25°C, I_D = -1mA
$R_{DS(ON)}$	Static Drain-to-Source On-Resistance		190	250	mΩ	V_{GS} = -10V, I_D = -1.0A ③
			300	400		V_{GS} = -4.5V, I_D = -0.50A ③
$V_{GS(th)}$	Gate Threshold Voltage	-1.0	——	-3.0	V	V_{DS} = V_{GS}, I_D = -250µA
g_{fs}	Forward Transconductance	——	2.5	——	S	V_{DS} = -15V, I_D = -2.3A ③
I_{DSS}	Drain-to-Source Leakage Current	——	——	-2.0	µA	V_{DS} = -16V, V_{GS} = 0V
		——	——	-25		V_{DS} = -16V, V_{GS} = 0V, T_J = 55 °C
I_{GSS}	Gate-to-Source Forward Leakage	——	——	-100	nA	V_{GS} = -12V
	Gate-to-Source Reverse Leakage	——	——	100		V_{GS} = 12V
Q_g	Total Gate Charge	——	9.3	25	nC	I_D = -2.3A
Q_{gs}	Gate-to-Source Charge	——	1.6	——		V_{DS} = -10V
Q_{gd}	Gate-to-Drain ("Miller") Charge	——	3.0	——		V_{GS} = -10V ③
$t_{d(on)}$	Turn-On Delay Time	——	12	40	ns	V_{DD} = -10V
t_r	Rise Time	——	16	40		I_D = -1.0A
$t_{d(off)}$	Turn-Off Delay Time	——	42	90		R_G = 6.0Ω
t_f	Fall Time	——	30	50		R_D = 10Ω ③
L_D	Internal Drain Inductance	——	4.0	——	nH	Between lead,6mm(0.25in.) from package and center of die contact
L_S	Internal Source Inductance	——	6.0	——		
C_{iss}	Input Capacitance	——	290	——	pF	V_{GS} = 0V
C_{oss}	Output Capacitance	——	210	——		V_{DS} = -15V
C_{rss}	Reverse Transfer Capacitance	——	67	——		ƒ = 1.0MHz
I_S	Continuous Source Current (Body Diode)	——	——	-2.0	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{SM}	Pulsed Source Current (Body Diode) ①	——	——	-9.2		
V_{SD}	Diode Forward Voltage	——	——	-1.2	V	T_J = 25°C, I_S = -1.25A, V_{GS} = 0V ③
t_{rr}	Reverse Recovery Time	——	69	100	ns	T_J = 25°C, I_F = -1.25A
Q_{rr}	Reverse Recovery Charge	——	90	140	nC	di/dt = 100A/µs ③
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 I_{SD} ≤ -2.3A, di/dt ≤ 100A/µs, V_{DD} ≤ $V_{(BR)DSS}$, T_J ≤ 150°C

③ Pulse width ≤ 300µs; duty cycle ≤ 2%.

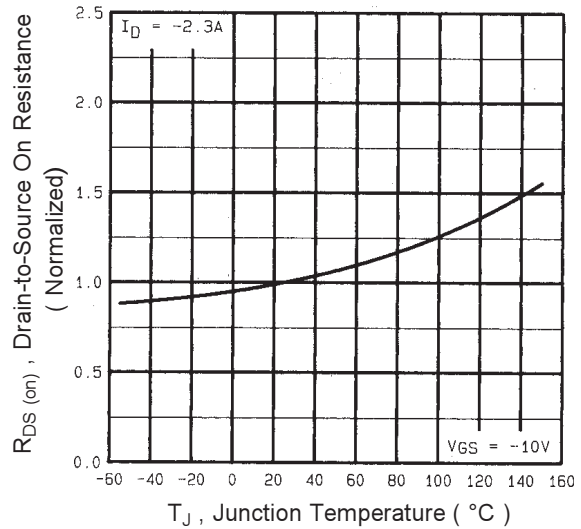④ Surface mounted on FR-4 board, t ≤ 10sec.
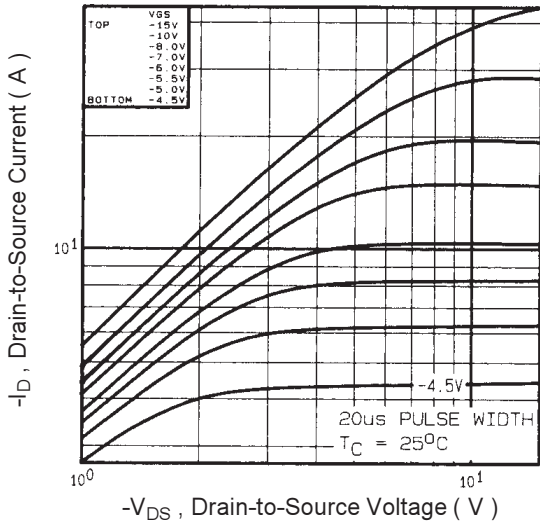
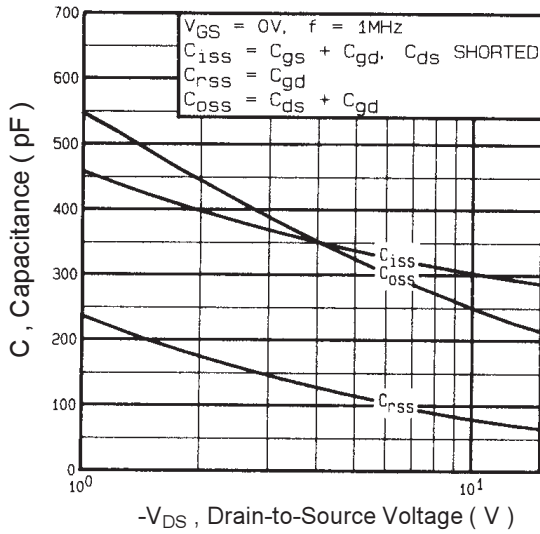**Fig 1.** Typical Output Characteristics
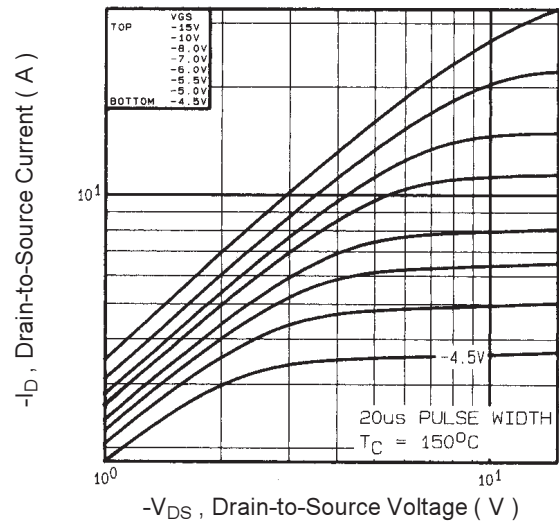
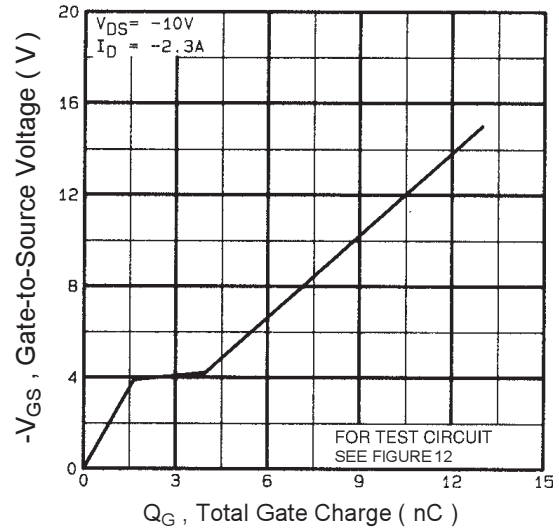**Fig 2.** Typical Output Characteristics
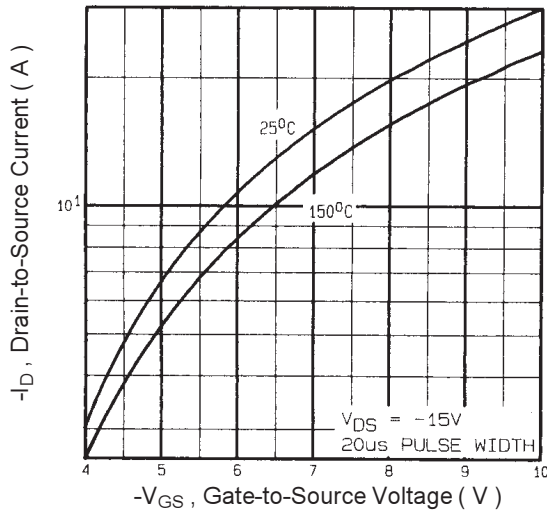
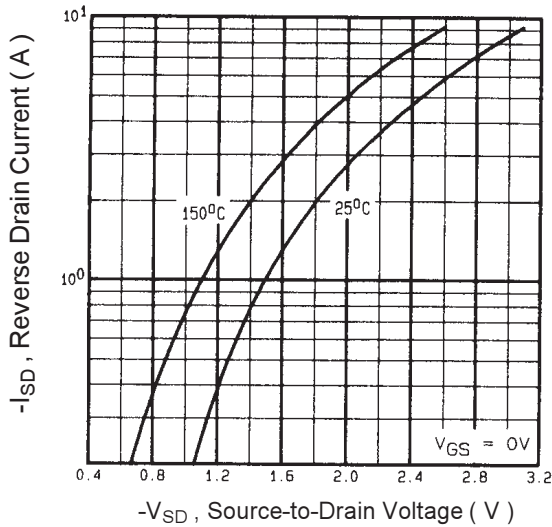**Fig 3.** Typical Transfer Characteristics

Fig 4. Normalized On-Resistance
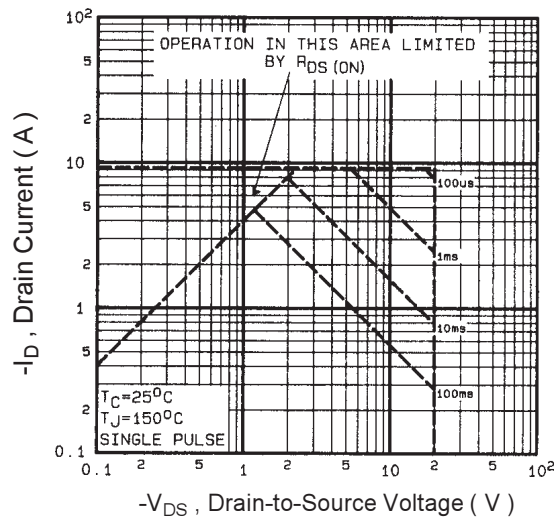Vs. Temperature

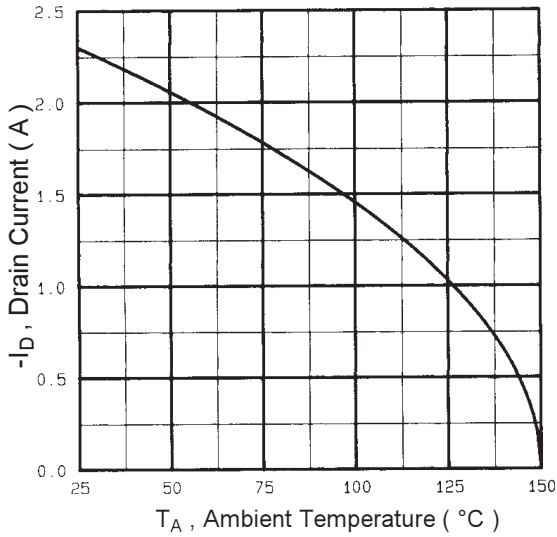**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage

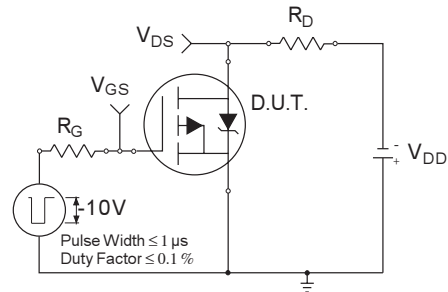**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage

Fig 7. Typical Source-Drain Diode Forward Voltage
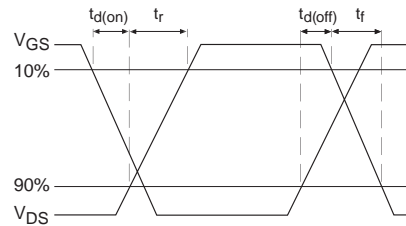

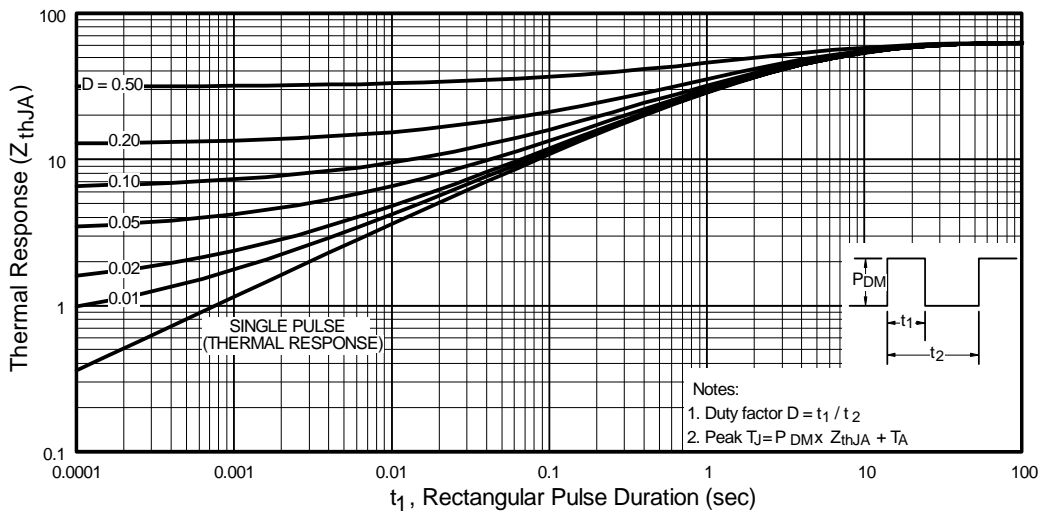**Fig 8.** Maximum Safe Operating Area

Fig 9. Maximum Drain Current Vs. Ambient Temperature

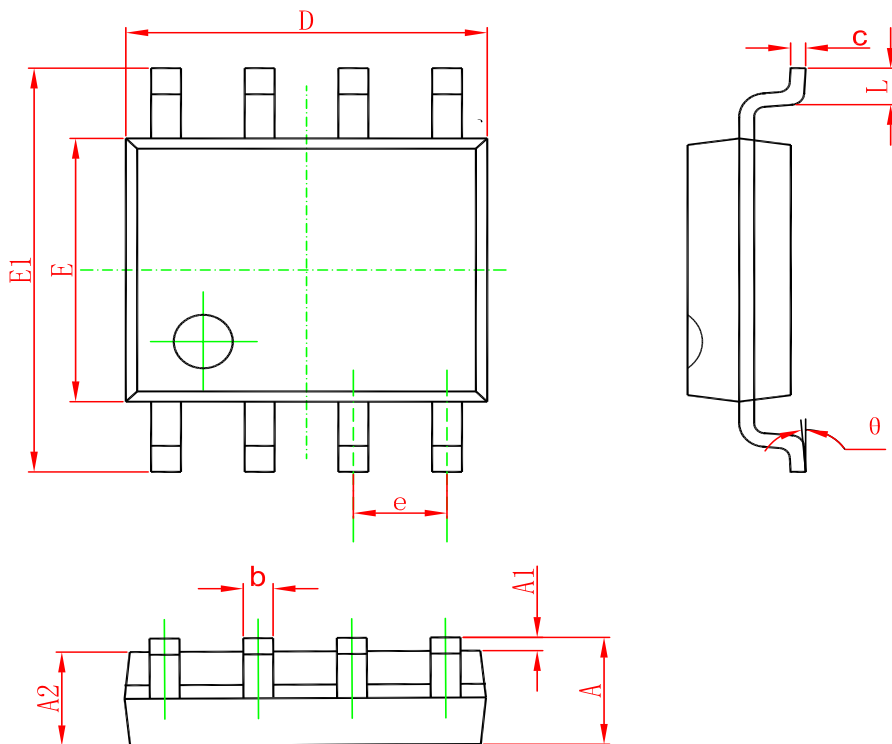**Fig 10a.** Switching Time Test Circuit

Fig 10b. Switching Time Waveforms

Notes:
1. Duty factor $D = t_1 / t_2$
2. Peak $T_J = P_{DM} \times Z_{thJA} + T_A$

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

PACKAGE OUTLINE DIMENSIONS

SOP-8

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

Marking
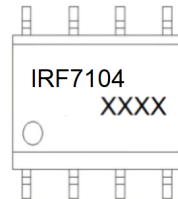
Ordering information

Order code	Package	Baseqty	Deliverymode
IRF7104	SOP-8	3000	Tape and reel