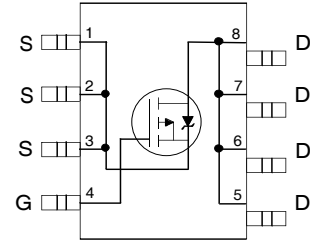


### FEATURES

- Low On-Resistance
- P-Channel Mosfet
- Surface Mount
- dv/dt Rating
- Fast Switching



Top View

### Absolute Maximum Ratings

	Parameter	Max.	Units
$I_D @ T_A = 25^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ -10\text{V}$	-10	A
$I_D @ T_A = 70^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ -10\text{V}$	-7.1	
$I_{DM}$	Pulsed Drain Current ①	-45	
$P_D @ T_A = 25^\circ\text{C}$	Power Dissipation	2.5	W
	Linear Derating Factor	0.02	W/°C
$V_{GS}$	Gate-to-Source Voltage	$\pm 20$	V
$E_{AS}$	Single Pulse Avalanche Energy ②	370	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 +150	°C

### Thermal Resistance

	Parameter	Max.	Units
$R_{\theta JA}$	Junction-to-Ambient ④	50	°C/W

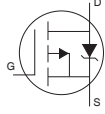
### Static Electrical Characteristics @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	-30	—	—	V	$V_{GS} = 0\text{V}, I_D = -250\mu\text{A}$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	-0.024	—	V/°C	Reference to $25^\circ\text{C}, I_D = -1\text{mA}$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	20	mΩ	$V_{GS} = -10\text{V}, I_D = -5.6\text{A}$ ④
		—	—	35		$V_{GS} = -4.5\text{V}, I_D = -2.8\text{A}$ ④
$V_{GS(th)}$	Gate Threshold Voltage	-1.0	—	-2.04	V	$V_{DS} = V_{GS}, I_D = -250\mu\text{A}$
gfs	Forward Transconductance	5.6	—	—	S	$V_{DS} = -10\text{V}, I_D = -2.8\text{A}$
$I_{DSS}$	Drain-to-Source Leakage Current	—	—	-1.0	μA	$V_{DS} = -24\text{V}, V_{GS} = 0\text{V}$
		—	—	-25		$V_{DS} = -24\text{V}, V_{GS} = 0\text{V}, T_J = 125^\circ\text{C}$
$I_{GSS}$	Gate-to-Source Forward Leakage	—	—	-100	nA	$V_{GS} = -20\text{V}$
	Gate-to-Source Reverse Leakage	—	—	100		$V_{GS} = 20\text{V}$

**Dynamic Electrical Characteristics @  $T_J = 25^\circ\text{C}$  (unless otherwise specified)**

	Parameter	Min.	Typ.	Max.	Units	Conditions
$Q_g$	Total Gate Charge	—	61	92	nC	$I_D = -5.6\text{A}$ $V_{DS} = -24\text{V}$ $V_{GS} = -10\text{V}$ , See Fig. 6 & 9 ④
$Q_{gs}$	Gate-to-Source Charge	—	8.0	12		
$Q_{gd}$	Gate-to-Drain ("Miller") Charge	—	22	32		
$t_{d(on)}$	Turn-On Delay Time	—	18	—	ns	$V_{DD} = -15\text{V}$ $I_D = -5.6\text{A}$ $R_G = 6.2\Omega$ $R_D = 2.7\Omega$ , See Fig. 10 ④
$t_r$	Rise Time	—	49	—		
$t_{d(off)}$	Turn-Off Delay Time	—	59	—		
$t_f$	Fall Time	—	60	—		
$C_{iss}$	Input Capacitance	—	1700	—	pF	$V_{GS} = 0\text{V}$ $V_{DS} = -25\text{V}$ $f = 1.0\text{MHz}$ , See Fig. 5
$C_{oss}$	Output Capacitance	—	890	—		
$C_{rss}$	Reverse Transfer Capacitance	—	410	—		

**Diode Characteristics**

	Parameter	Min.	Typ.	Max.	Units	Conditions
$I_S$	Continuous Source Current (Body Diode)	—	—	-3.1	A	MOSFET symbol showing the integral reverse p-n junction diode. 
$I_{SM}$	Pulsed Source Current (Body Diode) ①	—	—	-45		
$V_{SD}$	Diode Forward Voltage	—	—	-1.0	V	$T_J = 25^\circ\text{C}$ , $I_S = -5.6\text{A}$ , $V_{GS} = 0\text{V}$ ③
$t_{rr}$	Reverse Recovery Time	—	56	85	ns	$T_J = 25^\circ\text{C}$ , $I_F = -5.6\text{A}$
$Q_{rr}$	Reverse Recovery Charge	—	99	150	nC	$di/dt = 100\text{A}/\mu\text{s}$ ③

**Notes:**

- ① Repetitive rating; pulse width limited by max. junction temperature. ( See fig. 11 )
- ② Starting  $T_J = 25^\circ\text{C}$ ,  $L = 25\text{mH}$   
 $R_G = 25\Omega$ ,  $I_{AS} = -5.6\text{A}$ . (See Figure 12)
- ③  $I_{SD} \leq -5.6\text{A}$ ,  $di/dt \leq 100\text{A}/\mu\text{s}$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  
 $T_J \leq 150^\circ\text{C}$
- ④ Pulse width  $\leq 300\mu\text{s}$ ; duty cycle  $\leq 2\%$ .
- ⑤ Surface mounted on FR-4 board,  $t \leq 10\text{sec}$ .

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

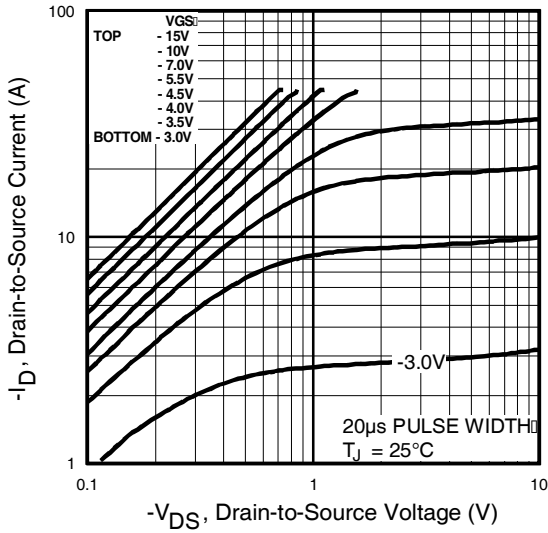


Fig 1. Typical Output Characteristics

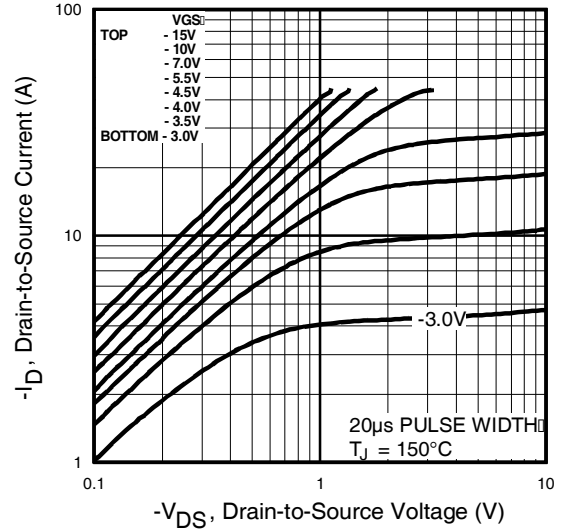


Fig 2. Typical Output Characteristics

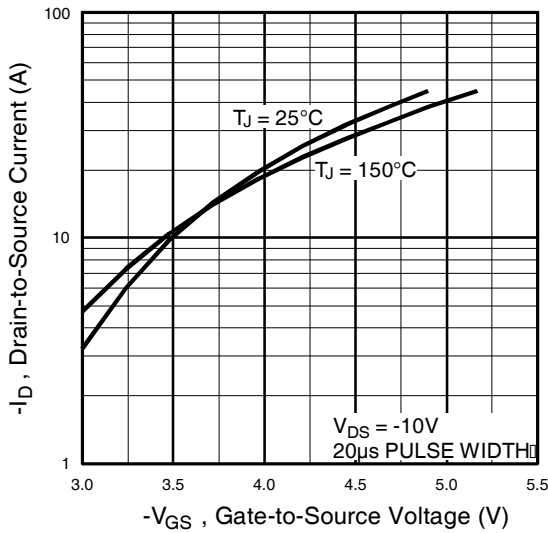


Fig 3. Typical Transfer Characteristics

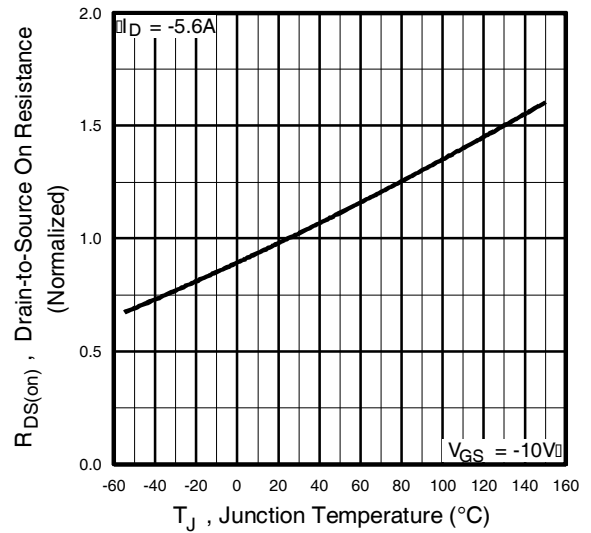


Fig 4. Normalized On-Resistance Vs. Temperature

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

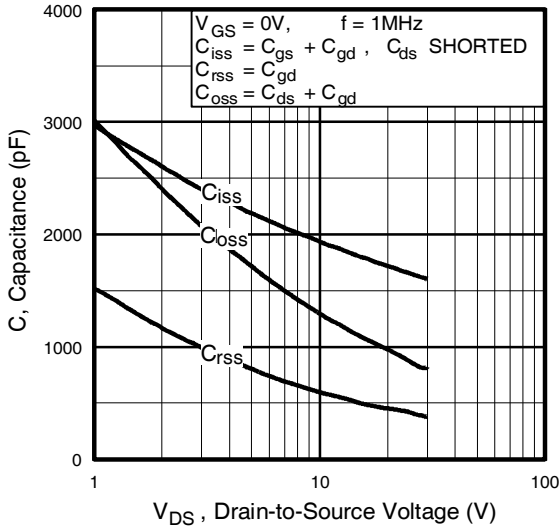


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

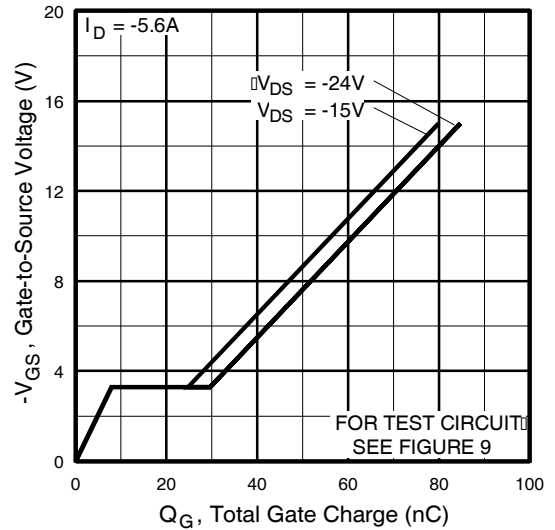


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

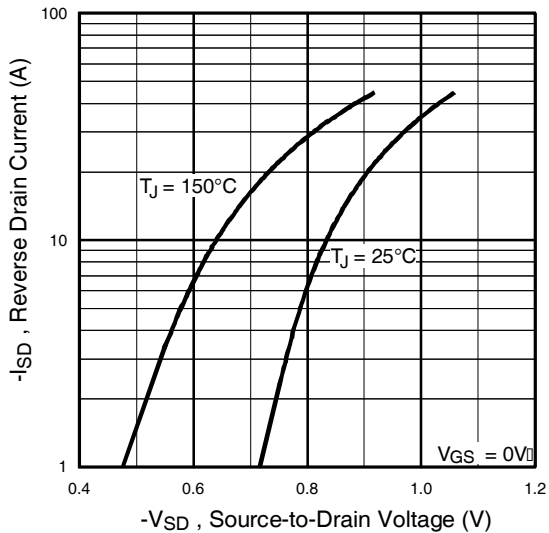


Fig 7. Typical Source-Drain Diode Forward Voltage

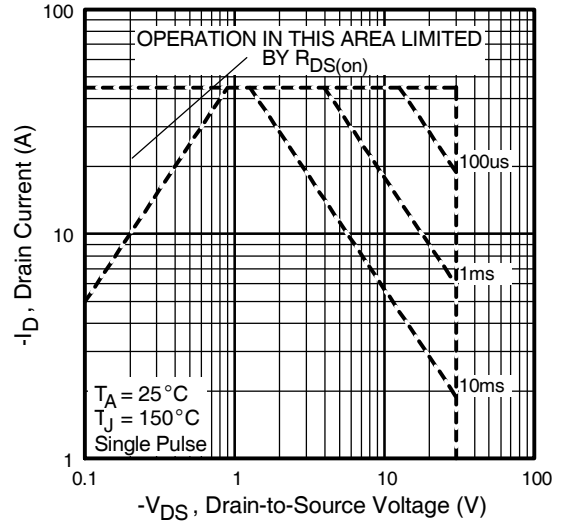


Fig 8. Maximum Safe Operating Area

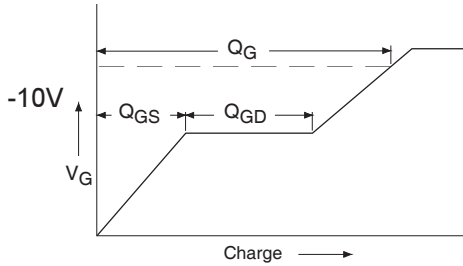


Fig 9a. Basic Gate Charge Waveform

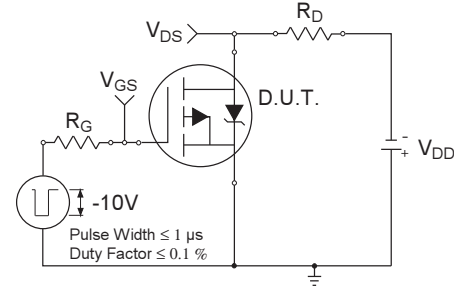


Fig 10a. Switching Time Test Circuit

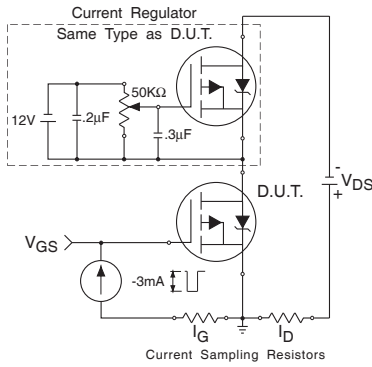


Fig 9b. Gate Charge Test Circuit

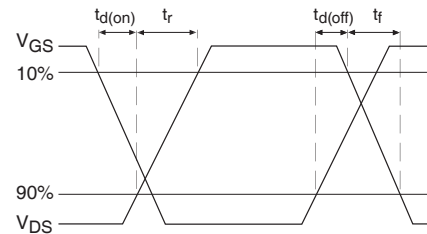


Fig 10b. Switching Time Waveforms

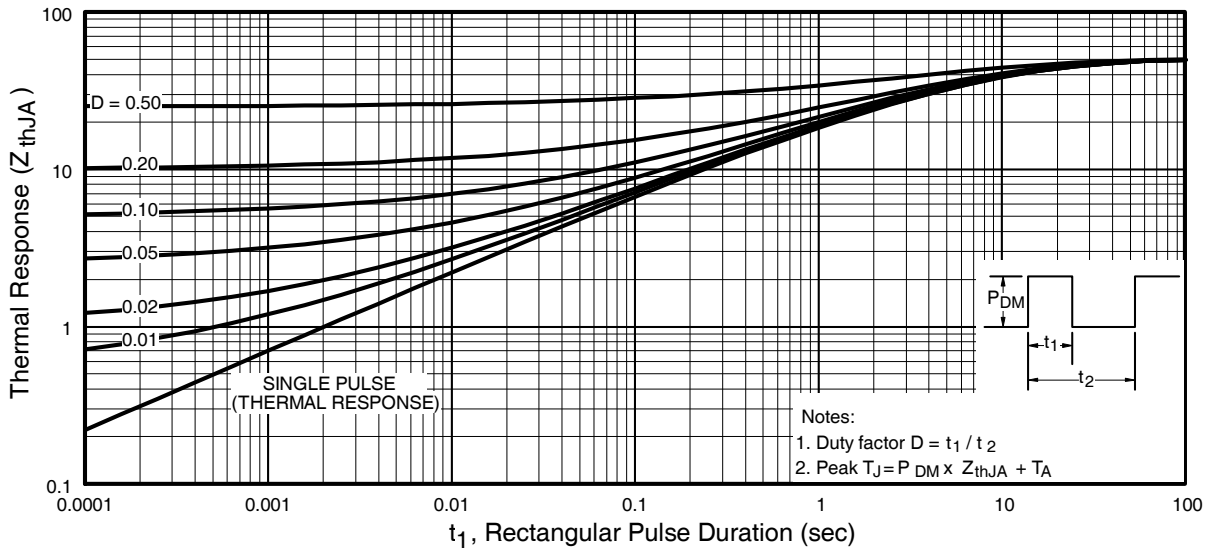


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

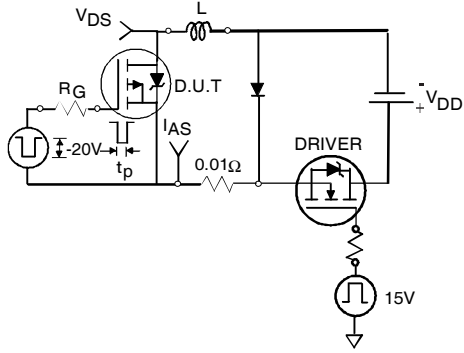


Fig 12a. Unclamped Inductive Test Circuit

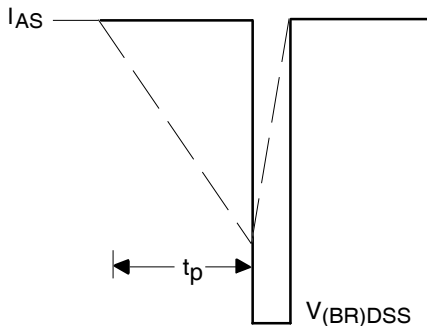


Fig 12b. Unclamped Inductive Waveforms

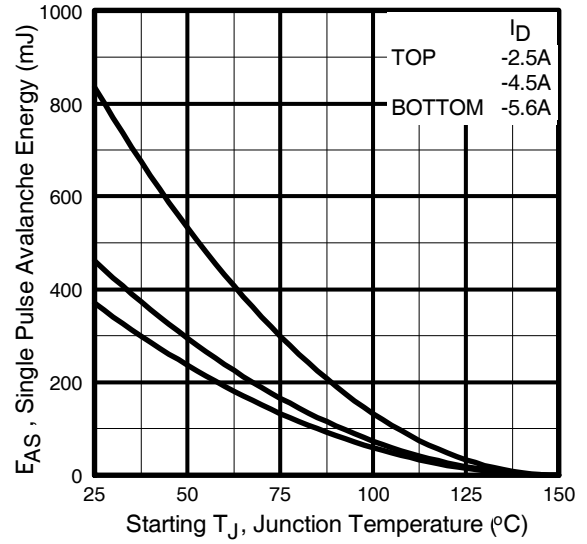
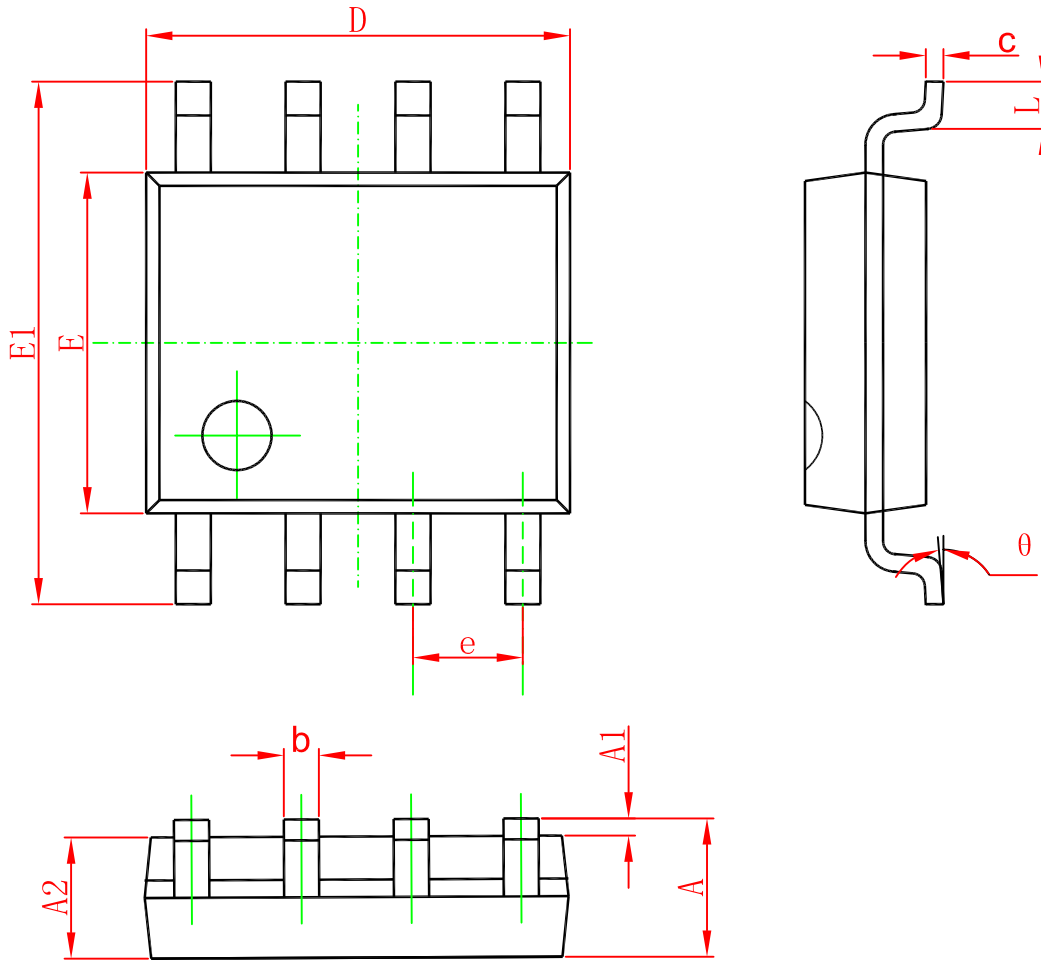


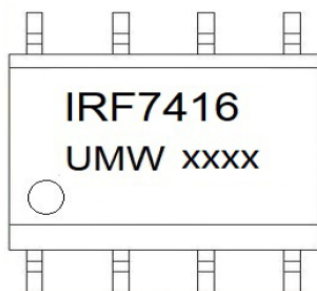
Fig 12c. Maximum Avalanche Energy Vs. Drain Current

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
UMW IRF7416TR	SOP-8	3000	Tape and reel