## Features

- $V_{DS\,(V)} = 30V$
- $R_{DS(ON)} < 27m\Omega$ ($V_{GS} = 10V$)
- $R_{DS(ON)} < 40m\Omega$ ($V_{GS} = 4.5V$)
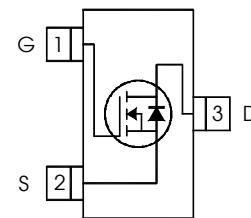
Benefits

- Lower switching losses
- Multi-vendor compatibility
- Easier manufacturing
- Environmentally friendly
- Increased reliability

SOT－23

1. GATE
2. SOURCE
3. DRAIN

Absolute Maximum Ratings

Symbol	Parameter	Max.	Units
V_{DS}	Drain-Source Voltage	30	V
I_D @ $T_A = 25°C$	Continuous Drain Current, V_{GS} @ 10V	5.3	A
I_D @ $T_A = 70°C$	Continuous Drain Current, V_{GS} @ 10V	4.3	
I_{DM}	Pulsed Drain Current	21	
P_D @$T_A = 25°C$	Maximum Power Dissipation	1.3	W
P_D @$T_A = 70°C$	Maximum Power Dissipation	0.8	
	Linear Derating Factor	0.01	W/°C
V_{GS}	Gate-to-Source Voltage	± 20	V
T_J, T_{STG}	Junction and Storage Temperature Range	-55 to + 150	°C

Thermal Resistance

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JA}$	Junction-to-Ambient ③	――	100	°C/W
$R_{\theta JA}$	Junction-to-Ambient (t<10s) ④	――	99	

Notes:

① Repetitive rating; pulse width limited by max. junction temperature.

② Pulse width ≤ 400μs; duty cycle ≤ 2%.

③ Surface mounted on 1 in square Cu board
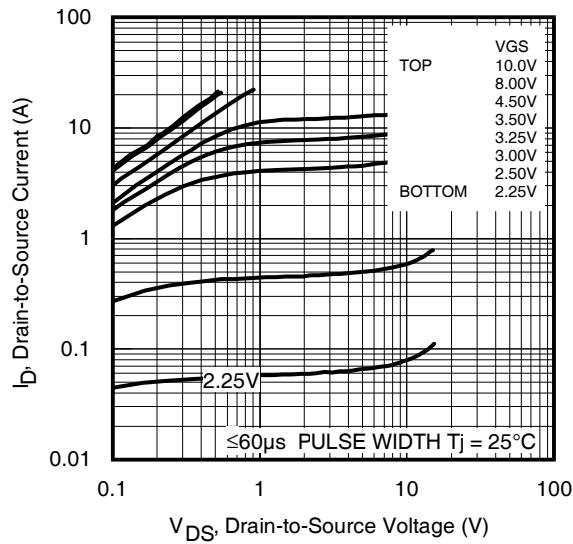
Electric Characteristics @ T_J = 25°C (unless otherwise specified)

Symbol	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	——	0.02	——	V/°C	Reference to 25°C, I_D = 1mA
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	——	33	40	mΩ	V_{GS} = 4.5V, I_D = 4.2A ②
		——	22	27		V_{GS} = 10V, I_D = 5.2A ②
$V_{GS(th)}$	Gate Threshold Voltage	1.3	1.7	2.3	V	V_{DS} = V_{GS}, I_D = 25μA
I_{DSS}	Drain-to-Source Leakage Current	——	——	1	μA	V_{DS} =24V, V_{GS} = 0V
		——	——	150		V_{DS} = 24V, V_{GS} = 0V, T_J = 125°C
I_{GSS}	Gate-to-Source Forward Leakage	——	——	100	nA	V_{GS} = 20V
	Gate-to-Source Reverse Leakage	——	——	-100		V_{GS} = -20V
R_G	Internal Gate Resistance	——	2.3	——	Ω	
gfs	Forward Transconductance	9.5	——	——	S	V_{DS} = 10V, I_D = 5.2A
Q_g	Total Gate Charge	——	2.6	——	nC	I_D = 5.2A
Q_{gs}	Gate-to-Source Charge	——	0.8	——		V_{DS} =15V
Q_{gd}	Gate-to-Drain ("Miller") Charge	——	1.1	——		V_{GS} = 4.5V ②
$t_{d(on)}$	Turn-On Delay Time	——	5.2	——	ns	V_{DD} =15V②
t_r	Rise Time	——	4.4	——		I_D = 1.0A
$t_{d(off)}$	Turn-Off Delay Time	——	7.4	——		R_G = 6.8Ω
t_f	Fall Time	——	4.4	——		V_{GS} = 4.5V
C_{iss}	Input Capacitance	——	382	——	pF	V_{GS} = 0V
C_{oss}	Output Capacitance	——	84	——		V_{DS} = 15V
C_{rss}	Reverse Transfer Capacitance	——	39	——		ƒ = 1.0MHz
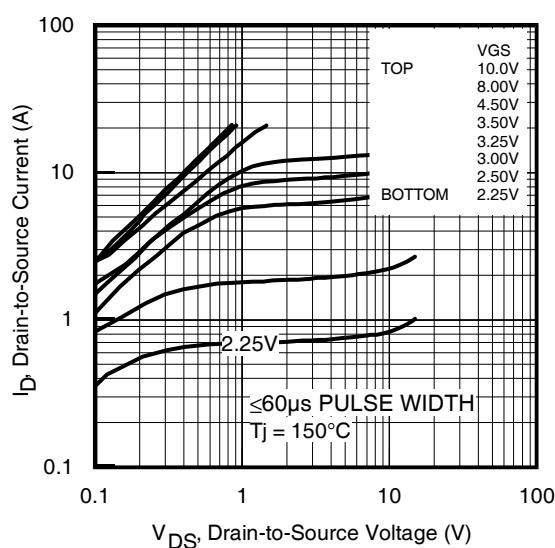
Source - Drain Ratings and Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	
I_S	Continuous Source Current (Body Diode)	——	——	1.6	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{SM}	Pulsed Source Current (Body Diode) ①	——	——	21		
V_{SD}	Diode Forward Voltage	——	——	1.0	V	T_J = 25°C, I_S = 1.6A, V_{GS} = 0V ②
t_{rr}	Reverse Recovery Time	——	11	17	ns	T_J = 25°C, V_R = 15V, I_F=1.6A
Q_{rr}	Reverse Recovery Charge	——	4.0	6.0	nC	di/dt = 100A/μs ②
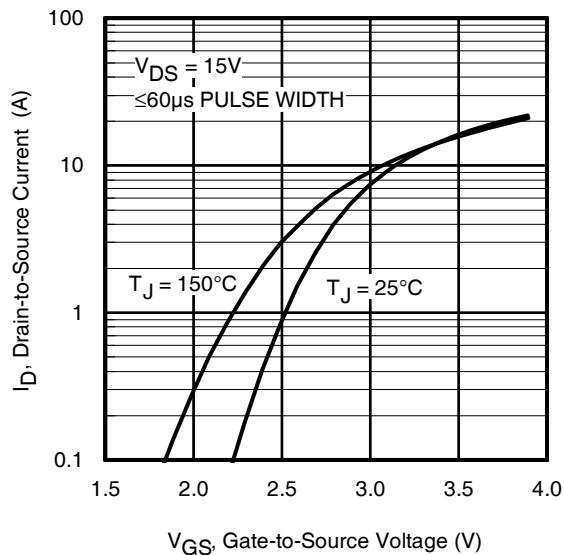
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted
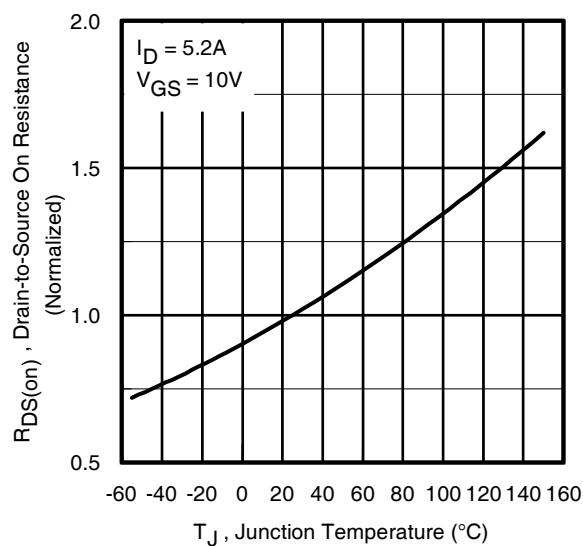

**Fig 1.** Typical Output Characteristics
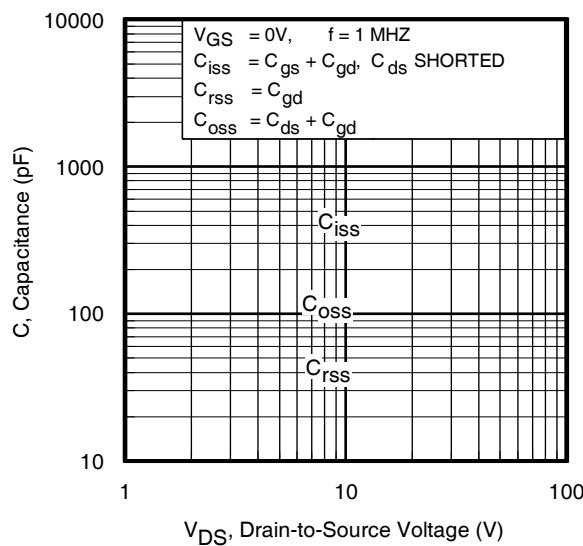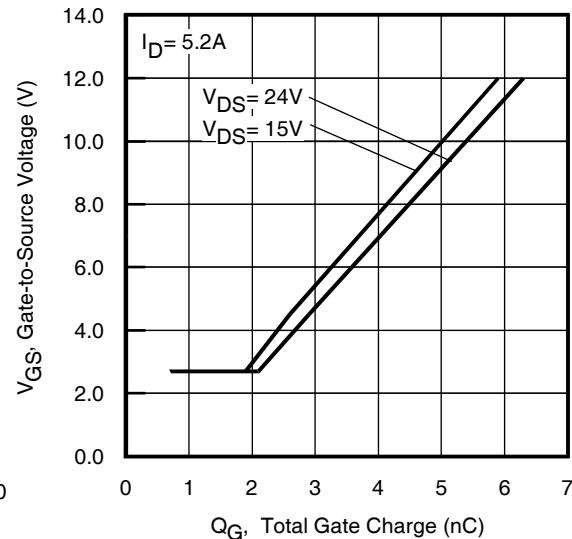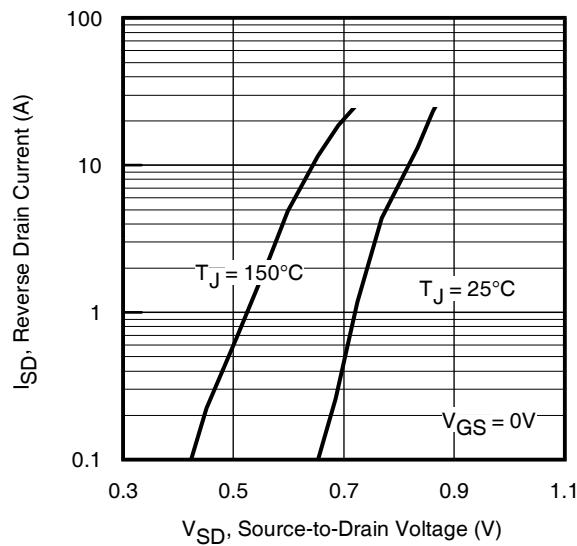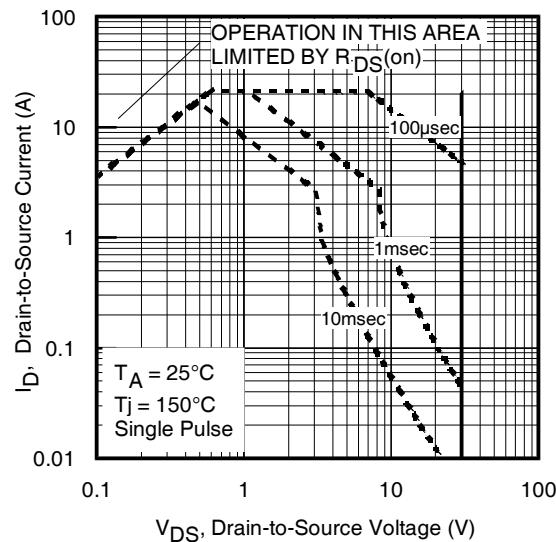
**Fig 2.** Typical Output Characteristics
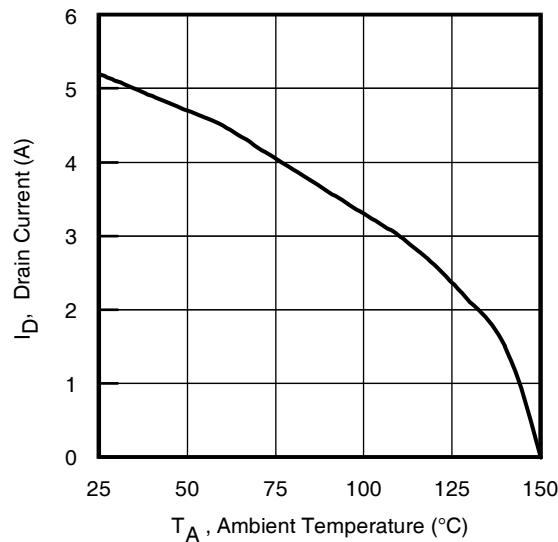
Fig 3. Typical Transfer Characteristics
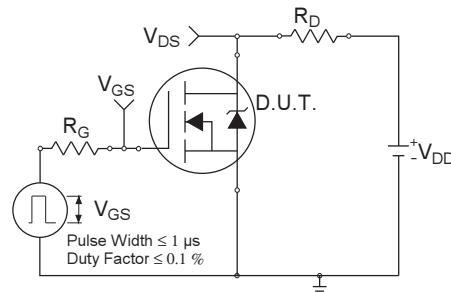
Fig 4. Normalized On-Resistance
Vs. Temperature

**TYPICAL CHARACTERISTICS**   25 °C, unless otherwise noted

V$_{GS}$ = 0V,   f = 1 MHZ
C$_{iss}$ = C$_{gs}$ + C$_{gd}$, C$_{ds}$ SHORTED
C$_{rss}$ = C$_{gd}$
C$_{oss}$ = C$_{ds}$ + C$_{gd}$

C$_{iss}$
C$_{oss}$
C$_{rss}$
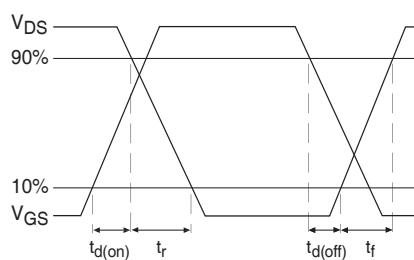
C, Capacitance (pF)

V$_{DS}$, Drain-to-Source Voltage (V)

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

I$_D$= 5.2A

V$_{DS}$= 24V
V$_{DS}$= 15V

V$_{GS}$, Gate-to-Source Voltage (V)

Q$_G$, Total Gate Charge (nC)

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

T$_J$ = 150°C   T$_J$ = 25°C

V$_{GS}$ = 0V

I$_{SD}$, Reverse Drain Current (A)

V$_{SD}$, Source-to-Drain Voltage (V)

Fig 7. Typical Source-Drain Diode
Forward Voltage

OPERATION IN THIS AREA
LIMITED BY R$_{DS}$(on)

100μsec
1msec
10msec

T$_A$ = 25°C
Tj = 150°C
Single Pulse

I$_D$, Drain-to-Source Current (A)

V$_{DS}$, Drain-to-Source Voltage (V)

Fig 8. Maximum Safe Operating Area
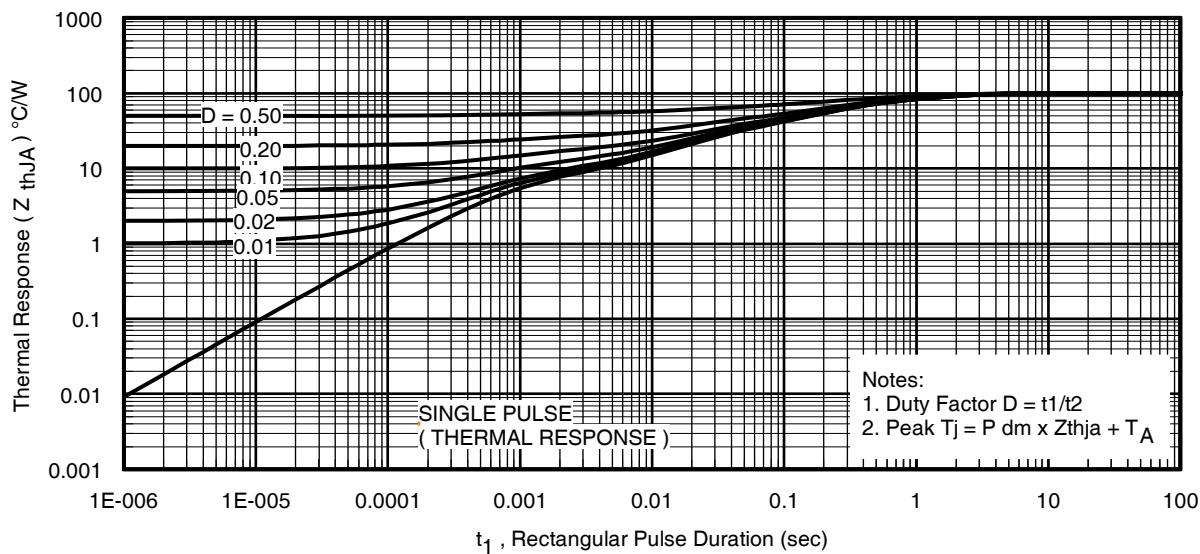
Fig 9. Maximum Drain Current Vs. Ambient Temperature
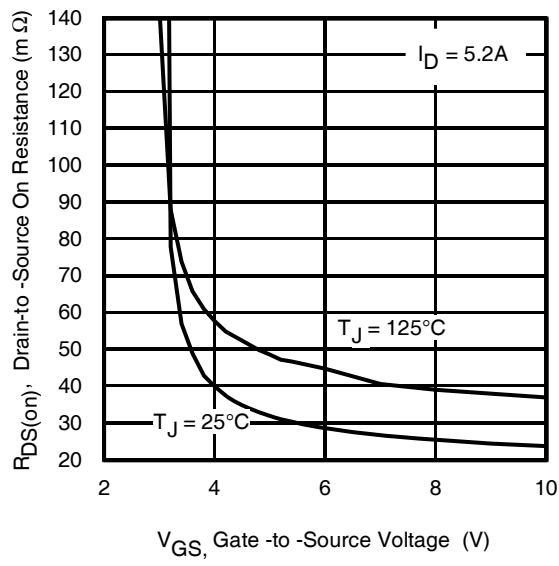
Fig 10a. Switching Time Test Circuit
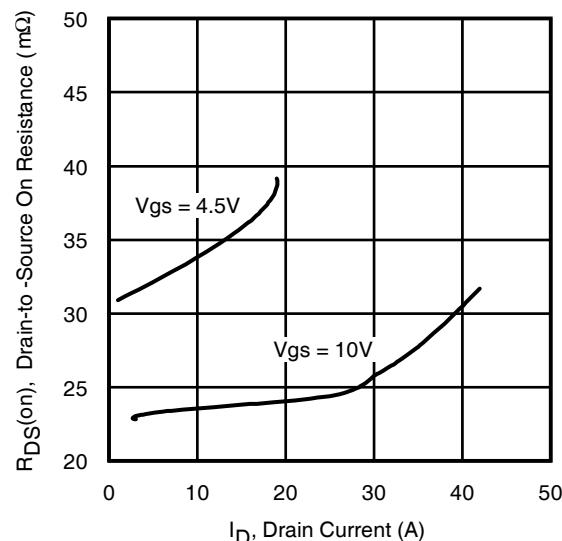
**Fig 10b.** Switching Time Waveforms

Notes:
1. Duty Factor D = t1/t2
2. Peak Tj = P dm x Zthja + T_A
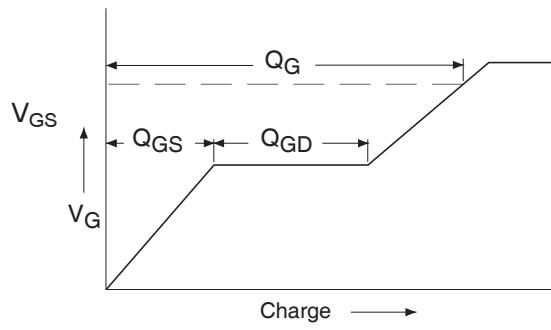
Fig 11. Typical Effective Transient Thermal Impedance, Junction-to-Ambient
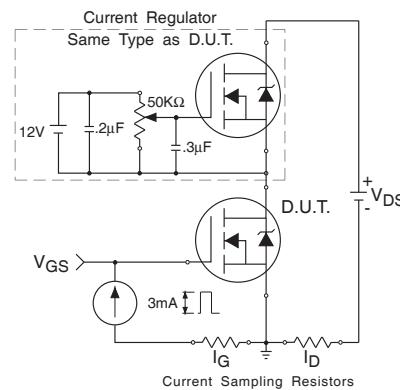
Fig 12. Typical On-Resistance Vs. Gate Voltage
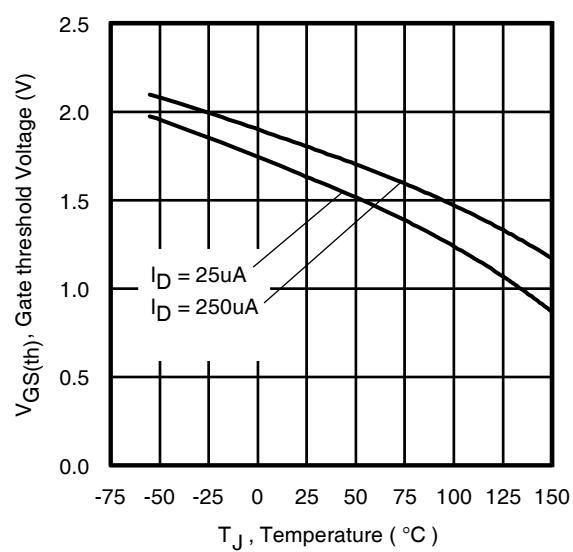
**Fig 13.** Typical On-Resistance Vs. Drain Current
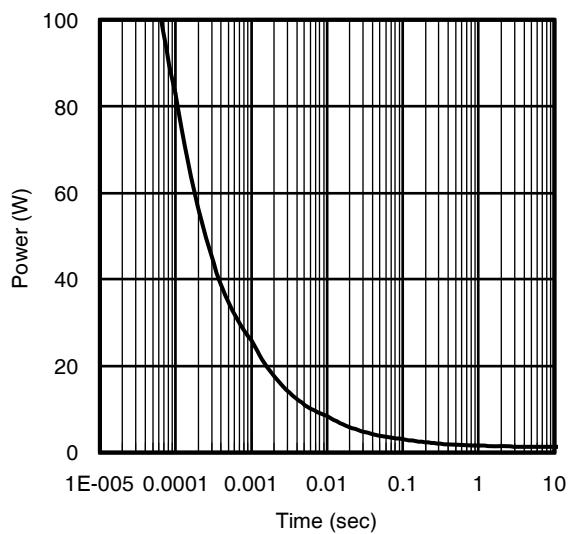
**Fig 14a.** Basic Gate Charge Waveform


Fig 14b. Gate Charge Test Circuit
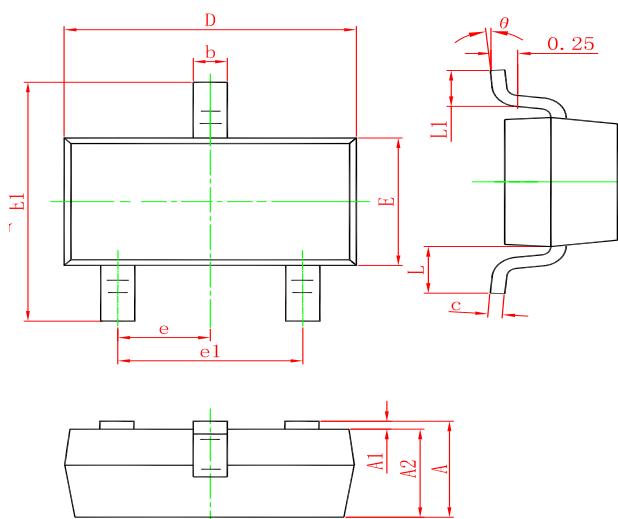
**Fig 15.** Typical Threshold Voltage Vs. Junction Temperature
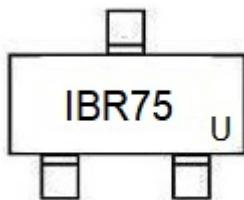
**Fig 16.** Typical Power Vs. Time

SOT-23 PACKAGE OUTLINE DIMENSIONS

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950 TYP.		0.037 TYP.	
e1	1.800	2.000	0.071	0.079
L	0.550 REF.		0.022 REF.	
L1	0.300	0.500	0.012	0.020
θ	0°	8°	0°	8°

Marking

IBR75 U

Ordering information

Order code	Package	Baseqty	Deliverymode
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STF5N65M6 IRF40H233XTMA1 STU5N65M6 DMN6022SSD-13 DMN13M9UCA6-7 DMTH10H4M6SPS-13 IPS60R360PFD7SAKMA1

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