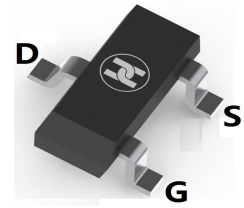
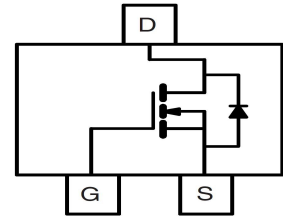


**N-Channel Power MOSFET**
**FEATURES**

- Ultra low on-resistance:  $V_{DS}=30V, R_{DS(ON)} \leq 63m\Omega @ V_{GS}=4.5V, I_D=3.4A$
- For PWM application
- For Load switch application
- Surface Mount device

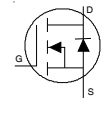

**SOT-23**

**MECHANICAL DATA**

- Case: SOT-23
- Case Material: Molded Plastic. UL flammability
- Classification Rating: 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Weight: 0.008 grams (approximate)

**MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$  unless otherwise noted)**

Symbol	Parameter	Max.	Units
$V_{DS}$	Drain-Source Voltage	30	V
$I_D @ T_A = 25^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10V$	3.4	A
$I_D @ T_A = 70^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10V$	2.7	
$I_{DM}$	Pulsed Drain Current	17	
$P_D @ T_A = 25^\circ\text{C}$	Maximum Power Dissipation	1.3	W
$P_D @ T_A = 70^\circ\text{C}$	Maximum Power Dissipation	0.8	
	Linear Derating Factor	0.01	
$V_{GS}$	Gate-to-Source Voltage	$\pm 12$	V
$T_J, T_{STG}$	Junction and Storage Temperature Range	-55 to + 150	$^\circ\text{C}$
$R_{\theta JA}$	Junction-to-Ambient <sup>③</sup>	100	$^\circ\text{C/W}$
$R_{\theta JA}$	Junction-to-Ambient ( $t < 10s$ )	99	

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

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	30	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.02	—	V/ $^\circ\text{C}$	Reference to $25^\circ\text{C}, I_D = 1mA$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	46	63	m $\Omega$	$V_{GS} = 4.5V, I_D = 3.4A$ <sup>②</sup>
		—	59	80		$V_{GS} = 2.5V, I_D = 2.7A$ <sup>②</sup>
$V_{GS(th)}$	Gate Threshold Voltage	0.5	0.8	1.1	V	$V_{DS} = V_{GS}, I_D = 10\mu A$
$I_{DSS}$	Drain-to-Source Leakage Current	—	—	1.0	$\mu A$	$V_{DS} = 24V, V_{GS} = 0V$
		—	—	150		$V_{DS} = 24V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
$I_{GSS}$	Gate-to-Source Forward Leakage	—	—	100	nA	$V_{GS} = 12V$
	Gate-to-Source Reverse Leakage	—	—	-100		$V_{GS} = -12V$
$R_G$	Internal Gate Resistance	—	3.9	—	$\Omega$	
$g_{fs}$	Forward Transconductance	9.5	—	—	S	$V_{DS} = 10V, I_D = 3.4A$
$Q_g$	Total Gate Charge	—	2.9	—	nC	$I_D = 3.4A$
$Q_{gs}$	Gate-to-Source Charge	—	0.13	—		$V_{DS} = 15V$
$Q_{gd}$	Gate-to-Drain ("Miller") Charge	—	1.1	—		$V_{GS} = 4.5V$ <sup>②</sup>
$t_{d(on)}$	Turn-On Delay Time	—	3.3	—	ns	$V_{DD} = 15V$ <sup>②</sup>
$t_r$	Rise Time	—	4.0	—		$I_D = 1.0A$
$t_{d(off)}$	Turn-Off Delay Time	—	12	—		$R_G = 6.8\Omega$
$t_f$	Fall Time	—	4.9	—		$V_{GS} = 4.5V$
$C_{iss}$	Input Capacitance	—	270	—	pF	$V_{GS} = 0V$
$C_{oss}$	Output Capacitance	—	32	—		$V_{DS} = 24V$
$C_{rss}$	Reverse Transfer Capacitance	—	21	—		$f = 1.0MHz$
$I_S$	Continuous Source Current (Body Diode)	—	—	1.3	A	MOSFET symbol showing the integral reverse p-n junction diode.
$I_{SM}$	Pulsed Source Current (Body Diode) <sup>①</sup>	—	—	17		
$V_{SD}$	Diode Forward Voltage	—	—	1.2	V	$T_J = 25^\circ\text{C}, I_S = 3.4A, V_{GS} = 0V$ <sup>②</sup>
$t_{rr}$	Reverse Recovery Time	—	8.8	13	ns	$T_J = 25^\circ\text{C}, V_R = 24V, I_F = 1.3A$
$Q_{rr}$	Reverse Recovery Charge	—	2.7	4.1	nC	$di/dt = 100A/\mu s$ <sup>②</sup>

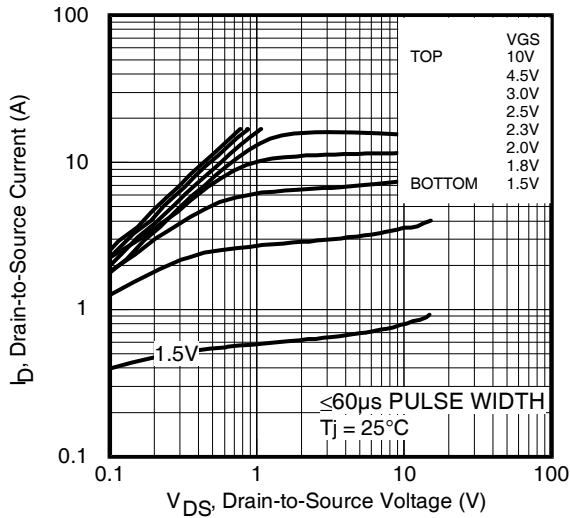
Notes: <sup>①</sup> Repetitive rating; pulse width limited by max. junction temperature.

<sup>②</sup> Pulse width  $\leq 400\mu s$ ; duty cycle  $\leq 2\%$ .

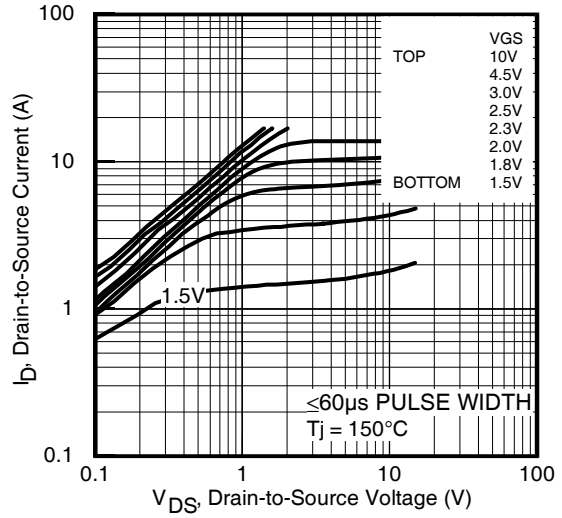
<sup>③</sup> Surface mounted on 1 in square Cu board.

N-Channel Power MOSFET

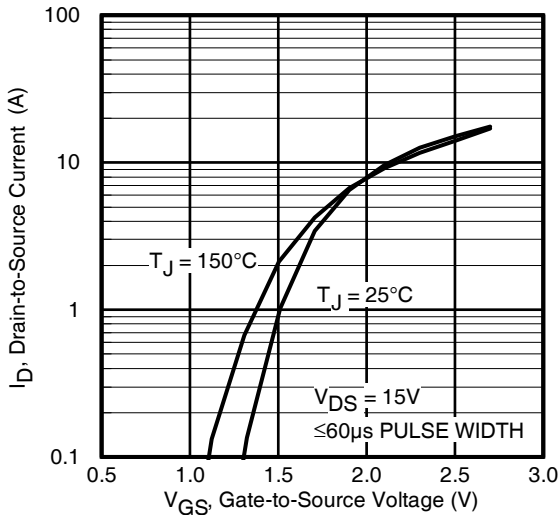
Typical Characteristics



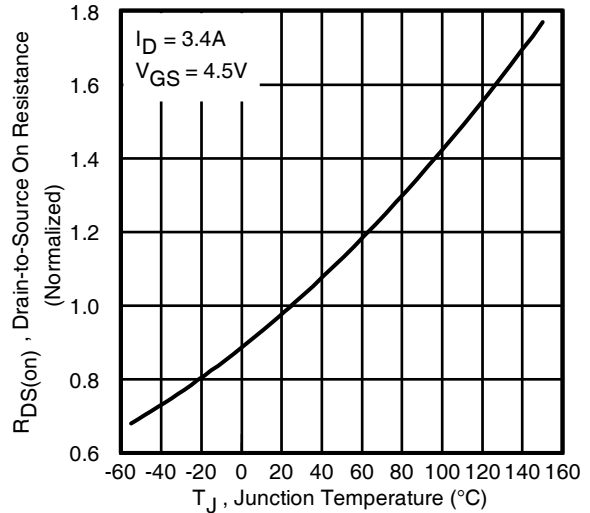
**Fig 1.** Typical Output Characteristics



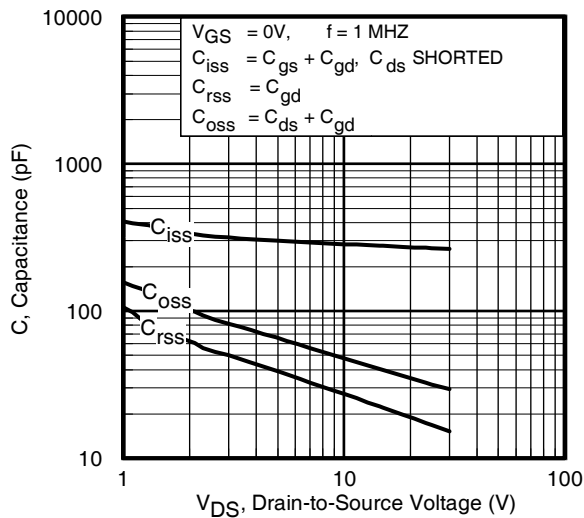
**Fig 2.** Typical Output Characteristics



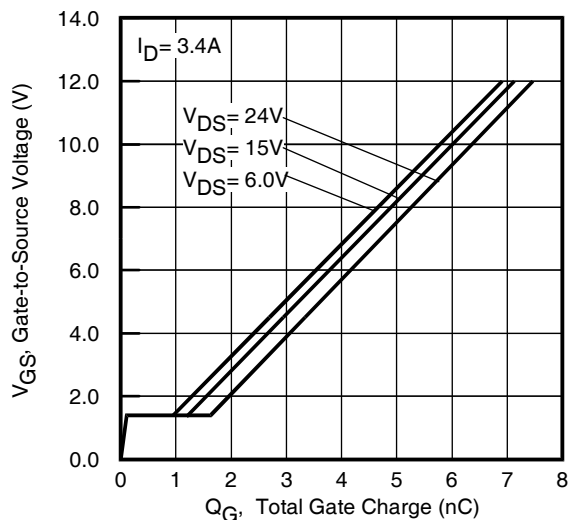
**Fig 3.** Typical Transfer Characteristics



**Fig 4.** Normalized On-Resistance vs. Temperature

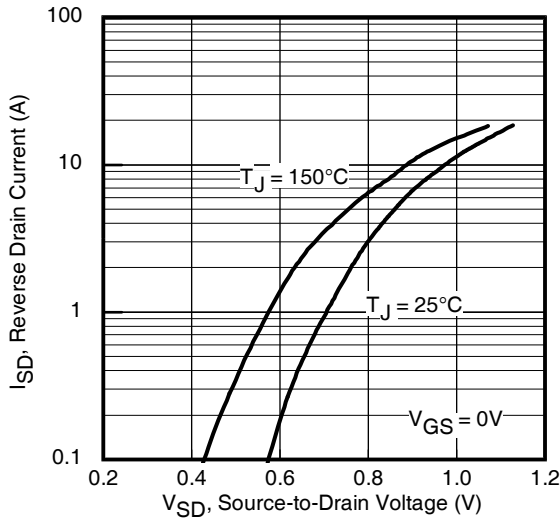


**Fig 5.** Typical Capacitance vs. Drain-to-Source Voltage

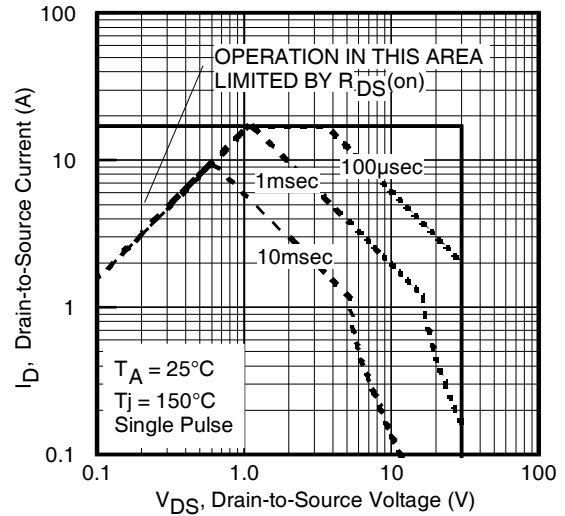


**Fig 6.** Typical Gate Charge vs. Gate-to-Source Voltage

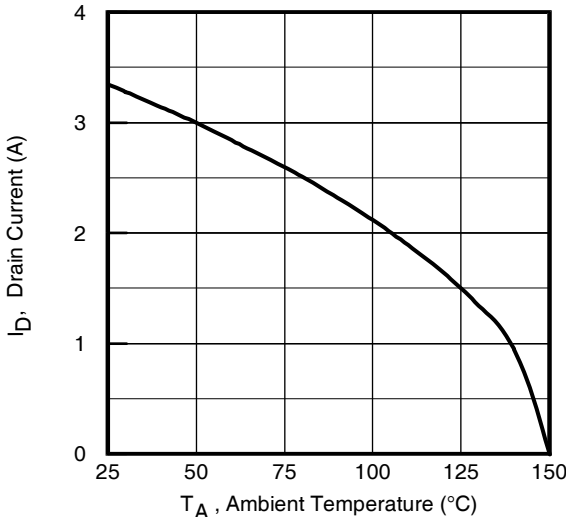
N-Channel Power MOSFET



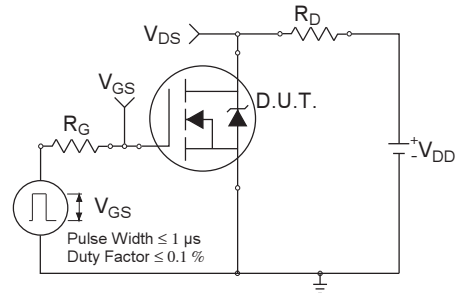
**Fig 7.** Typical Source-Drain Diode Forward Voltage



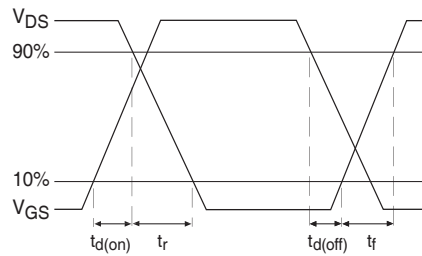
**Fig 8.** Maximum Safe Operating Area



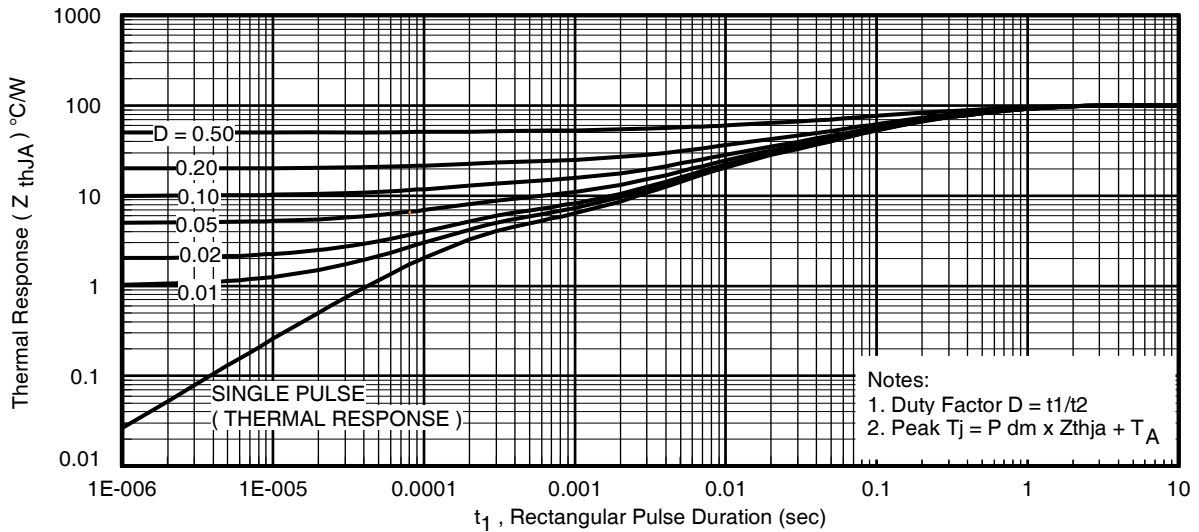
**Fig 9.** Maximum Drain Current vs. Ambient Temperature



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

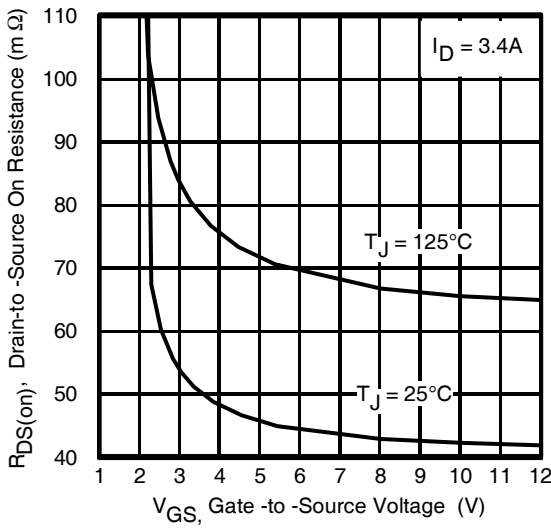


**Fig 10b.** Switching Time Waveforms

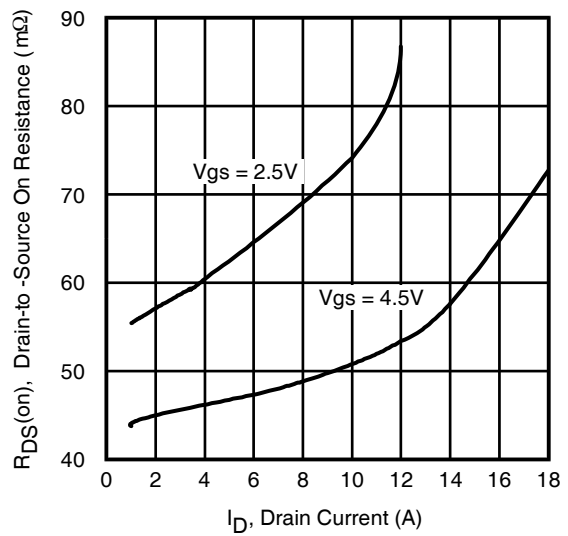


**Fig 11.** Typical Effective Transient Thermal Impedance, Junction-to-Ambient

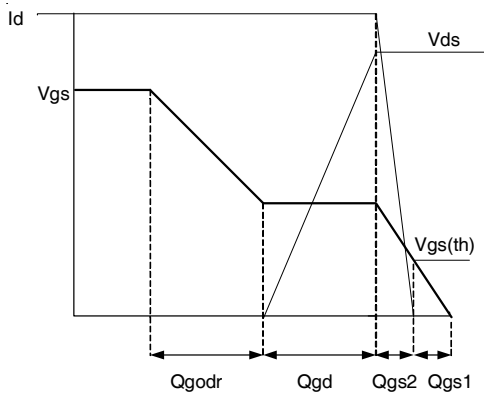
N-Channel Power MOSFET



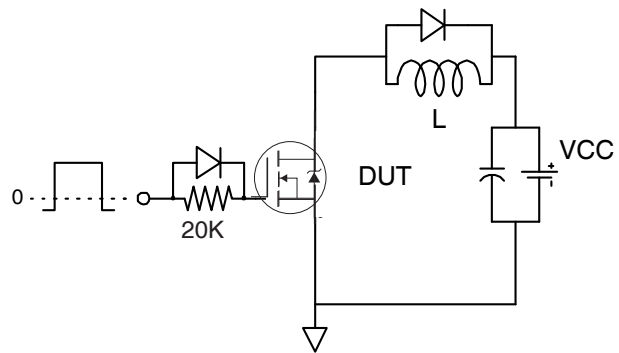
**Fig 12.** Typical On-Resistance vs. Gate Voltage



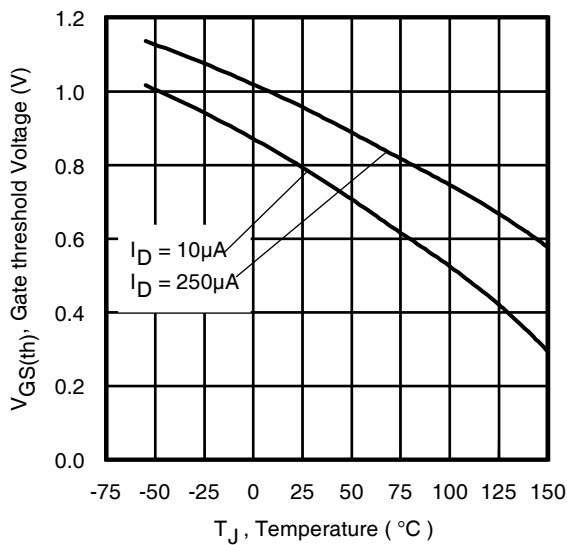
**Fig 13.** Typical On-Resistance vs. Drain Current



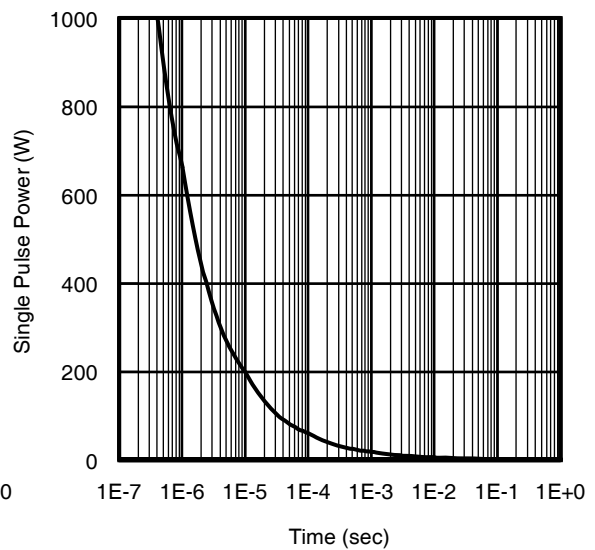
**Fig 14a.** Basic Gate Charge Waveform



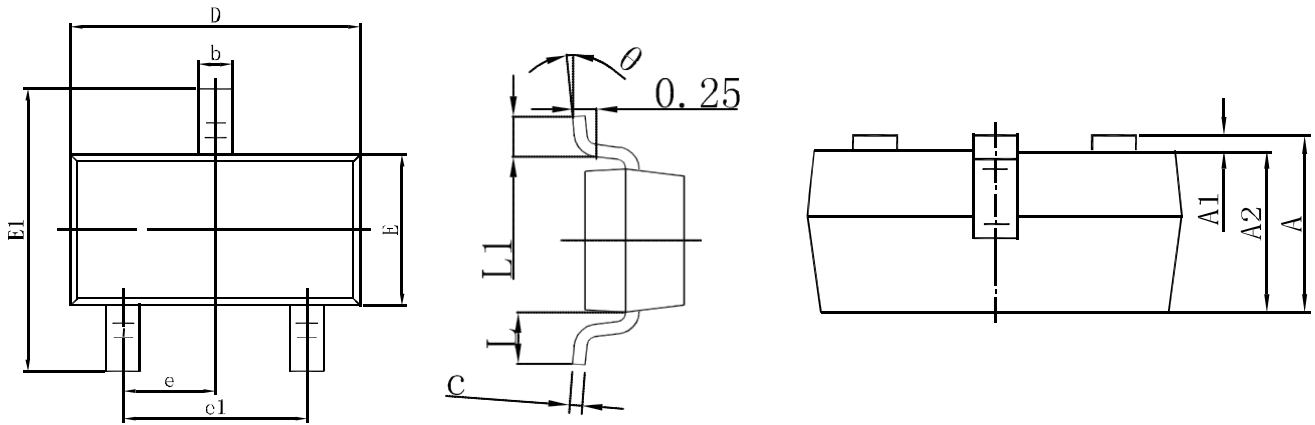
**Fig 14b.** Gate Charge Test Circuit



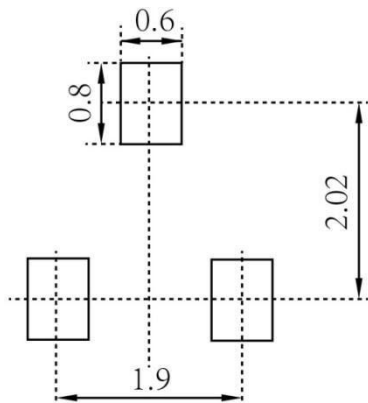
**Fig 15.** Typical Threshold Voltage vs. Junction Temperature



**Fig 16.** Typical Power vs. Time

**N-Channel Power MOSFET**
**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
$\theta$	0°	8°	0°	8°

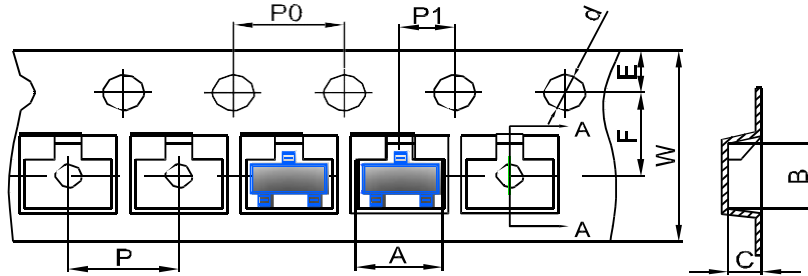
**SOT-23 Suggested Pad Layout**

**Note:**

1. Controlling dimension: in millimeters
2. General tolerance:  $\pm 0.05\text{mm}$
3. The pad layout is for reference purposes only

N-Channel Power MOSFET

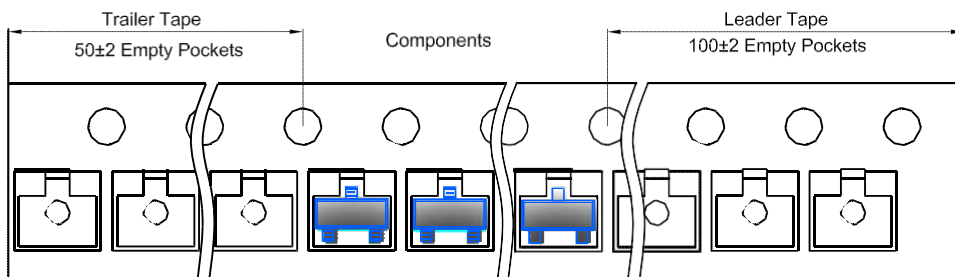
**SOT-23 Tape and Reel**

**SOT-23 Embossed Carrier Tape**

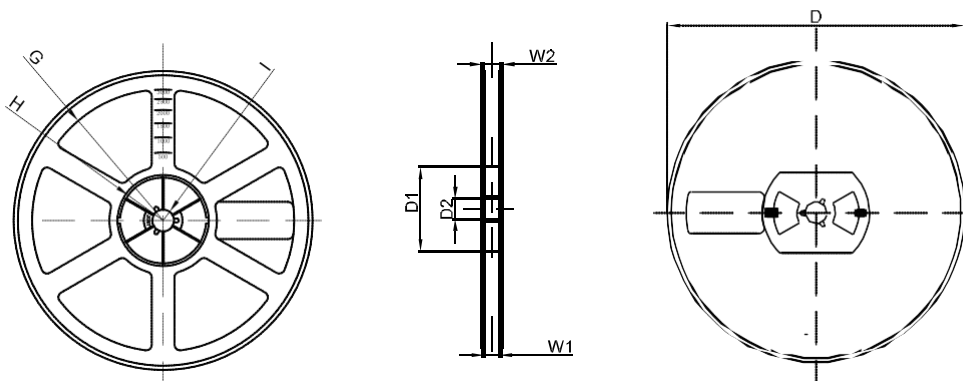


DIMENSIONS ARE IN MILLIMETER										
TYPE	A	B	C	d	E	F	P0	P	P1	W
SOT-23	3.15	2.77	1.22	Ø1.50	1.75	3.50	4.00	4.00	2.00	8.00
TOLERANCE	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1

**SOT-23 Tape Leader and Trailer**



**SOT-23 Reel**



DIMENSIONS ARE IN MILLIMETER								
REEL OPTION	D	D1	D2	G	H	I	W1	W2
7" DIA	Ø178	54.40	13.00	R78	R25.60	R6.50	9.50	12.30
TOLERANCE	±2	±1	±1	±1	±1	±1	±1	±1