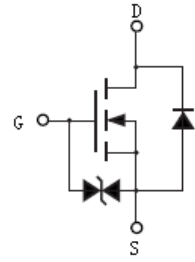


Features

- Low on-resistance
- High-speed switching
- Drive circuits can be simple
- Parallel use is easy
- HBM: JESD22-A114-B: 2

HF

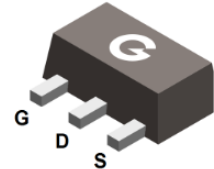


Typical Applications

- N-channel enhancement mode effect transistor
- Switching application

Mechanical Data

- Case: SOT-89
- Molding Compound: UL Flammability Classification Rating 94V-0
- Terminals: Matte Tin-Plated Leads, Solderability-per MIL-STD-202, Method 208



SOT-89

Ordering Information

Part Number	Package	Shipping Quantity	Marking Code
2N7002HE	SOT-89	1000 pcs / Tape & Reel	7002K

Maximum Ratings (@ $T_A = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	60	V
Gate -Source Voltage	V_{GS}	± 20	V
Continuous Drain Current ($T_A = 25^\circ\text{C}$) *1	I_D	400	mA
Continuous Drain Current ($T_A = 70^\circ\text{C}$) *1		320	mA
Pulsed Drain Current ($t_p = 10\mu\text{s}$, $T_A = 25^\circ\text{C}$)	I_{DM}	2000	mA
Single Pulse Avalanche Energy *3	E_{AS}	0.11	mJ
Power Dissipation ($T_A = 25^\circ\text{C}$) *1	P_D	0.5	W
Operating Junction Temperature Range	T_J	$-55 \sim +150$	$^\circ\text{C}$
Storage Temperature Range	T_{STG}	$-55 \sim +150$	$^\circ\text{C}$

Thermal Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal Resistance Junction-to-Air *1	$R_{\theta JA}$	-	-	250	$^\circ\text{C/W}$

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

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
Static Characteristics						
V _{DSS}	Drain-Source Breakdown Voltage	V _{GS} = 0V, I _D = 250μA	60	-	-	V
I _{DSS}	Drain to Source Leakage Current	V _{DS} = 60V, V _{GS} = 0V	-	-	1	μA
I _{GSS}	Gate-body Leakage	V _{GS} = ±20V, V _{DS} = 0V	-	-	±10	μA
On Characteristics						
R _{DS(ON)}	Drain-Source On-resistance *2	V _{GS} = 10V, I _D = 0.5A	-	1.0	2.5	Ω
		V _{GS} = 5V, I _D = 0.05A	-	1.1	3	
		V _{GS} = 4.5V, I _D = 0.5A	-	1.2	4	
V _{GS(TH)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 250μA	1	1.5	2.5	V
Dynamic Characteristics						
C _{ISS}	Input Capacitance	V _{GS} = 0V	-	26.7	-	pF
C _{OSS}	Output Capacitance	V _{DS} = 20V	-	7.1	-	
C _{RSS}	Reverse Transfer Capacitance	f = 1.0MHz	-	2.2	-	
Switching Characteristics						
t _{d(on)}	Turn-on Delay Time *4	V _{DD} = 30V, I _D = 0.2A V _{GS} = 10V, R _G = 25Ω R _L = 150Ω	-	6	-	ns
t _r	Turn-on Rise Time *4		-	5	-	
t _{d(off)}	Turn-Off Delay Time *4		-	25	-	
t _f	Turn-Off Fall Time *4		-	15	-	
Q _G	Total Gate-Charge	V _{DS} = 10V	-	0.44	-	nC
Q _{GS}	Gate to Source Charge	V _{GS} = 4.5V	-	0.14	-	nC
Q _{GD}	Gate to Drain (Miller) Charge	I _D = 0.2A	-	0.2	-	nC
Source-Drain Diode Characteristics						
V _{SD}	Diode Forward Voltage *2	I _S = 0.3A, V _{GS} = 0V	-	0.85	1.2	V

Notes:

- The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper
- The data tested by pulsed, pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$
- The E_{AS} data shows Max. rating. The test condition is $V_{DD} = 30V, V_{GS} = 10V, L = 0.1mH$
- Guaranteed by design, not subject to production

Ratings and Characteristics Curves (@ $T_A = 25^\circ\text{C}$ unless otherwise specified)

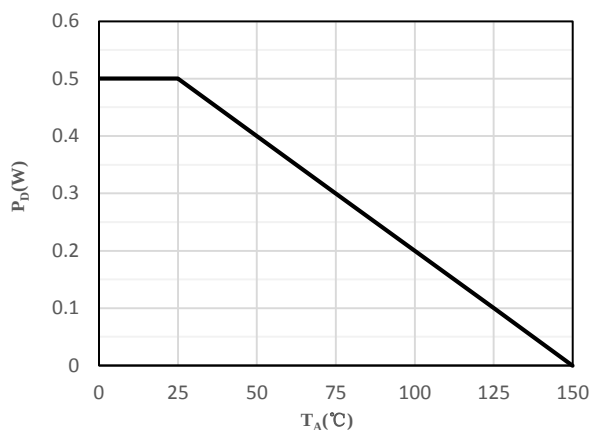


Fig 1 Power Dissipation

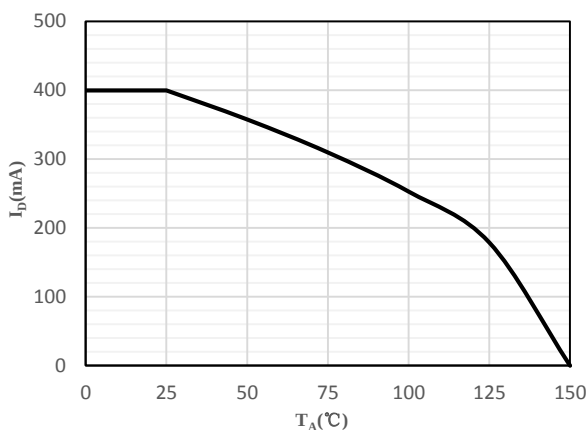


Fig 2 Drain Current

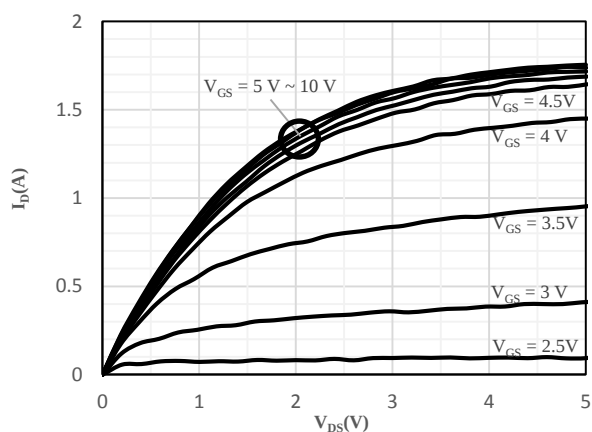


Fig 3 Typical Output Characteristics

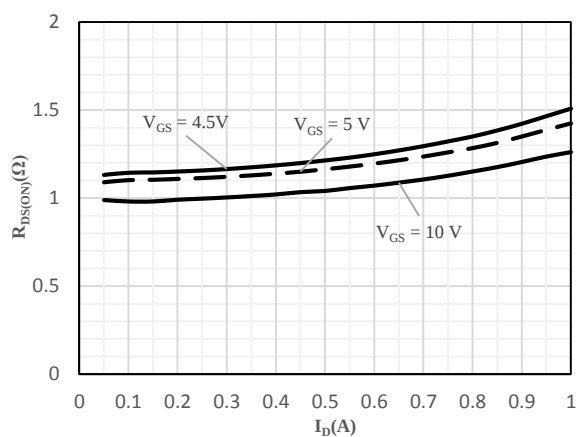


Fig 4 On-Resistance vs. Drain Current and Gate Voltage

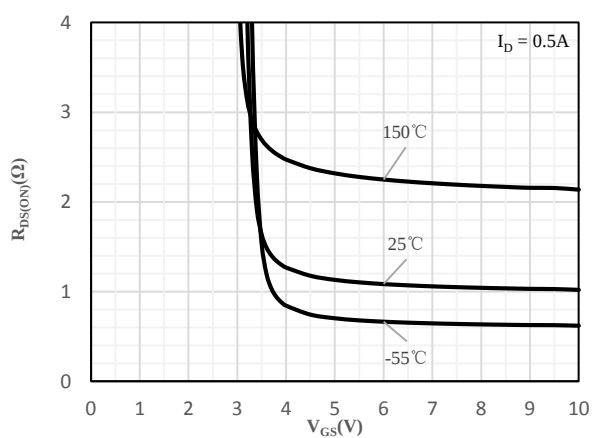


Fig 5 On-Resistance vs. Gate-Source Voltage

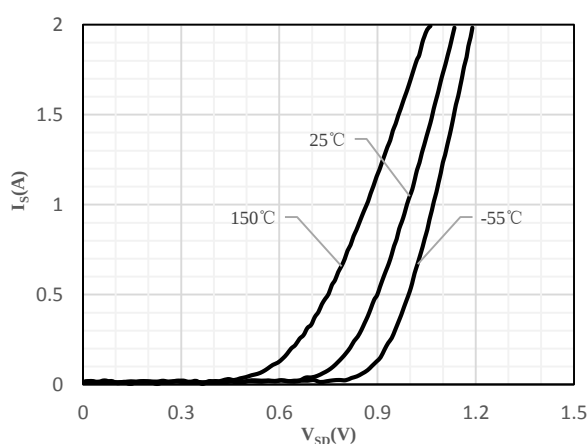


Fig 6 Body-Diode Characteristics

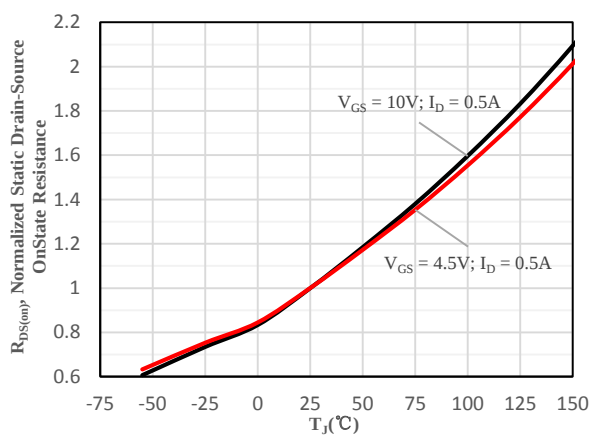


Fig 7 Normalized On-Resistance vs. Junction Temperature

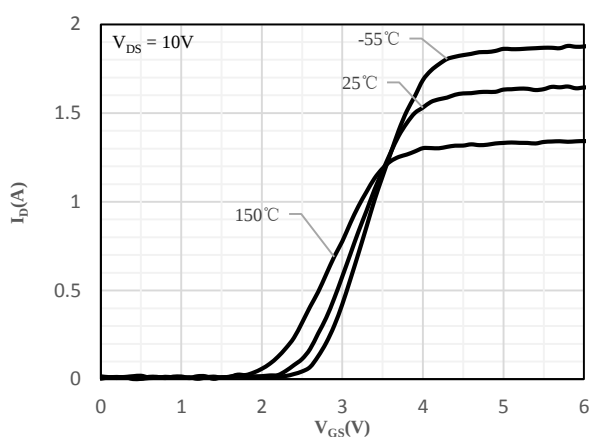


Fig 8 Transfer Characteristics

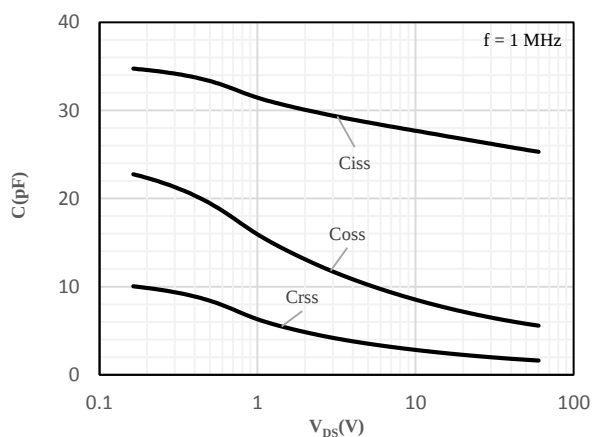


Fig 9 Capacitance Characteristics

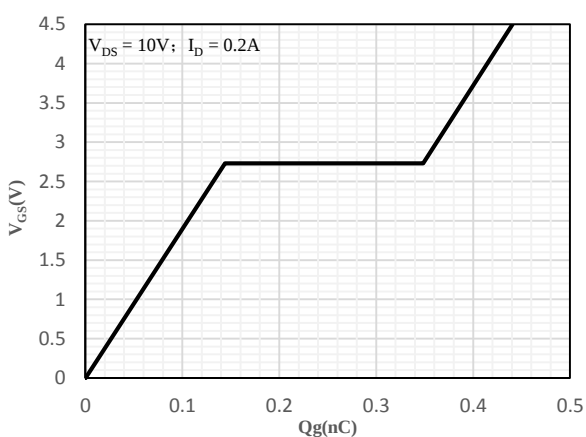


Fig 10 Gate-Charge Characteristics

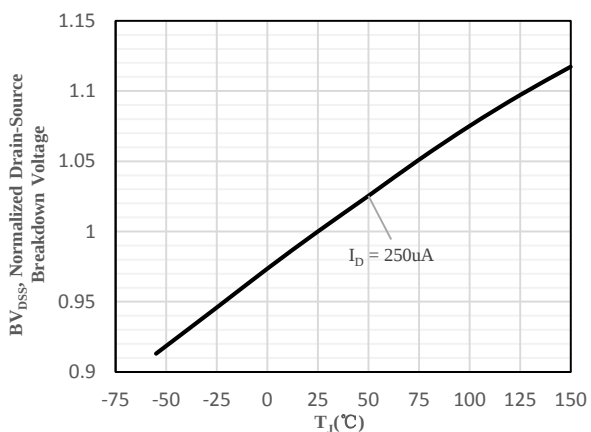


Fig 11 Normalized Breakdown Voltage vs. Junction Temperature

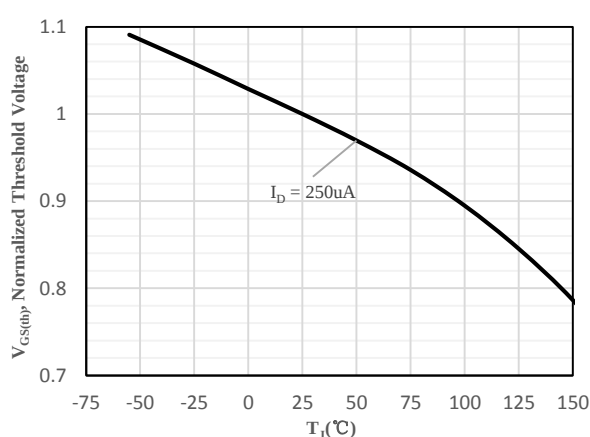
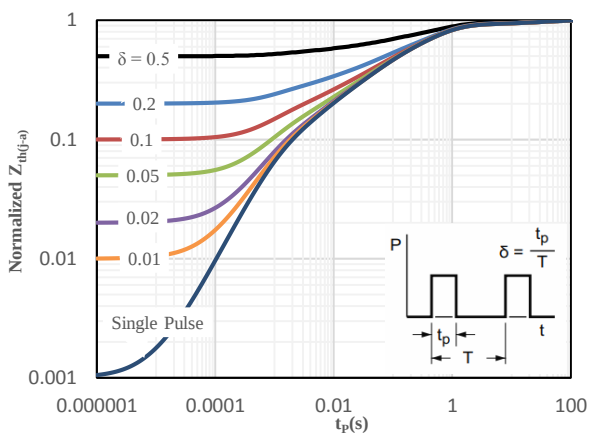
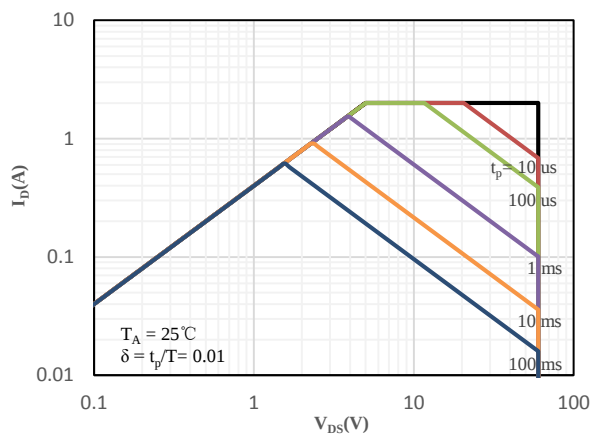
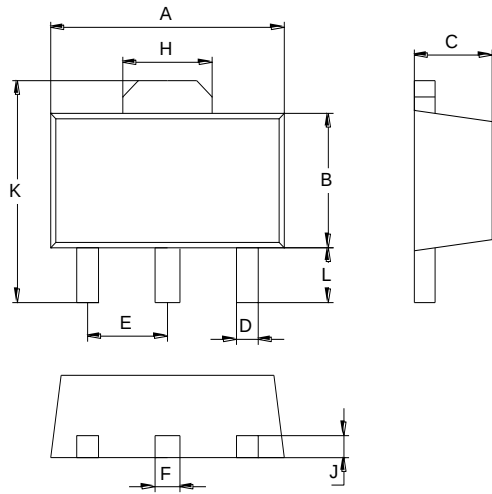


Fig 12 Normalized $V_{GS(th)}$ vs. Junction Temperature



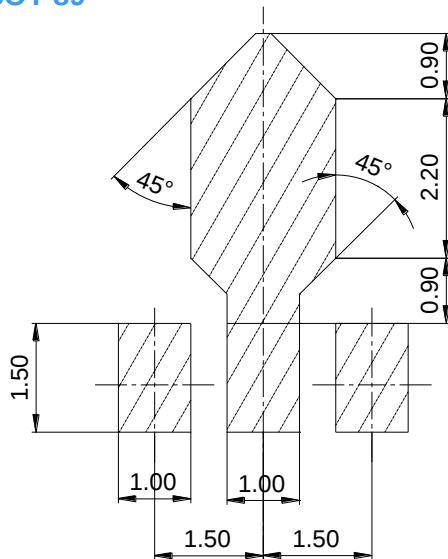
Package Outline Dimensions (Unit: mm)



SOT-89		
Dimension	Min.	Max.
A	4.30	4.70
B	2.25	2.65
C	1.30	1.70
D	0.30	0.50
E	1.40	1.60
F	0.38	0.58
H	1.60	1.80
J	0.30	0.50
L	0.90	1.10
K	3.95	4.35

Mounting Pad Layout (Unit: mm)

SOT-89



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