

2SK3402-AZ-VB Datasheet

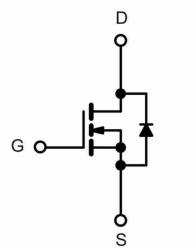
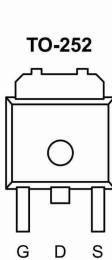
Trench 60V TO252 Single-N MOSFET

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A) ^a
60	0.010 at $V_{GS} = 10$ V	58
	0.013 at $V_{GS} = 4.5$ V	56

FEATURES

- 175 °C Junction Temperature
- TrenchFET® Power MOSFET
- Material categorization:



ABSOLUTE MAXIMUM RATINGS ($T_C = 25$ °C, unless otherwise noted)

Parameter	Symbol	Limit	Unit
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current ($T_J = 175$ °C) ^b	I_D ($T_C = 25$ °C)	58	A
	I_D ($T_C = 100$ °C)	48 ^a	
Pulsed Drain Current	I_{DM}	100	
Continuous Source Current (Diode Conduction)	I_S	50 ^a	
Avalanche Current	I_{AS}	50	
Single Avalanche Energy (Duty Cycle ≤ 1 %)	E_{AS}	125	mJ
Maximum Power Dissipation	P_D ($T_C = 25$ °C)	136	W
	P_D ($T_A = 25$ °C)	3 ^b , 8.3 ^{b, c}	
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55 to 175	°C

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^a	R_{thJA} ($t \leq 10$ sec)	15	18	°C/W
	R_{thJA} (Steady State)	40	50	
Maximum Junction-to-Case	R_{thJC}	0.85	1.1	

Notes:

a. Package limited.

b. Surface mounted on 1" x 1" FR4 board.

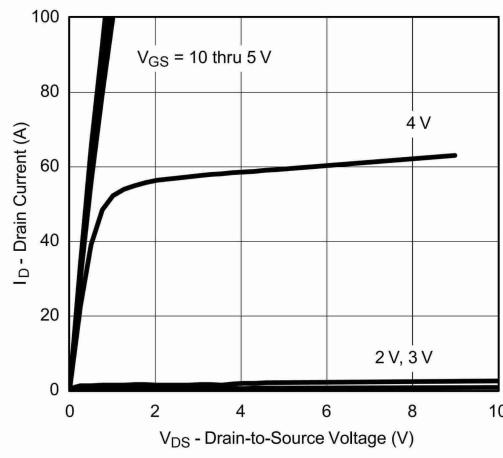
c. $t \leq 10$ s.

SPECIFICATIONS ($T_J = 25^\circ\text{C}$, unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ. ^a	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0 \text{ V}$, $I_D = 250 \mu\text{A}$	60			V
Gate Threshold Voltage	$V_{GS(\text{th})}$	$V_{DS} = V_{GS}$, $I_D = 250 \mu\text{A}$	1	2	3	
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0 \text{ V}$, $V_{GS} = \pm 20 \text{ V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 60 \text{ V}$, $V_{GS} = 0 \text{ V}$		1		
		$V_{DS} = 60 \text{ V}$, $V_{GS} = 0 \text{ V}$, $T_J = 125^\circ\text{C}$		50		μA
		$V_{DS} = 60 \text{ V}$, $V_{GS} = 0 \text{ V}$, $T_J = 175^\circ\text{C}$		250		
On-State Drain Current ^b	$I_{D(\text{on})}$	$V_{DS} = 5 \text{ V}$, $V_{GS} = 10 \text{ V}$	60			A
Drain-Source On-State Resistance ^b	$R_{DS(\text{on})}$	$V_{GS} = 10 \text{ V}$, $I_D = 20 \text{ A}$		0.010		
		$V_{GS} = 10 \text{ V}$, $I_D = 20 \text{ A}$, $T_J = 125^\circ\text{C}$		0.016		Ω
		$V_{GS} = 10 \text{ V}$, $I_D = 20 \text{ A}$, $T_J = 175^\circ\text{C}$		0.020		
		$V_{GS} = 4.5 \text{ V}$, $I_D = 15 \text{ A}$		0.013		
Forward Transconductance ^b	g_{fs}	$V_{DS} = 15 \text{ V}$, $I_D = 20 \text{ A}$		60		S
Dynamic						
Input Capacitance	C_{iss}	$V_{GS} = 0 \text{ V}$, $V_{DS} = 25 \text{ V}$, $f = 1 \text{ MHz}$		2650		
Output Capacitance	C_{oss}			470		pF
Reverse Transfer Capacitance	C_{rss}			225		
Total Gate Charge ^c	Q_g	$V_{DS} = 30 \text{ V}$, $V_{GS} = 10 \text{ V}$, $I_D = 50 \text{ A}$		47	70	
Gate-Source Charge ^c	Q_{gs}			10		nC
Gate-Drain Charge ^c	Q_{gd}			12		
Turn-On Delay Time ^c	$t_{d(\text{on})}$	$V_{DD} = 30 \text{ V}$, $R_L = 0.6 \Omega$ $I_D \geq 50 \text{ A}$, $V_{GEN} = 10 \text{ V}$, $R_g = 2.5 \Omega$		10	20	
Rise Time ^c	t_r			15	25	
Turn-Off Delay Time ^c	$t_{d(\text{off})}$			35	50	
Fall Time ^c	t_f			20	30	ns
Source-Drain Diode Ratings and Characteristics ($T_C = 25^\circ\text{C}$)						
Pulsed Current	I_{SM}				60	A
Diode Forward Voltage	V_{SD}	$I_F = 20 \text{ A}$, $V_{GS} = 0 \text{ V}$		1	1.5	V
Reverse Recovery Time	t_{rr}	$I_F = 20 \text{ A}$, $di/dt = 100 \text{ A}/\mu\text{s}$		45	100	ns

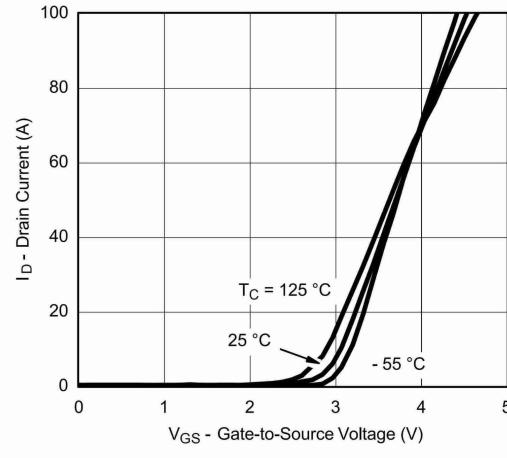
Notes:

a. For design aid only; not subject to production testing.
 b. Pulse test; pulse width $\leq 300 \mu\text{s}$, duty cycle $\leq 2\%$.
 c. Independent of operating temperature.

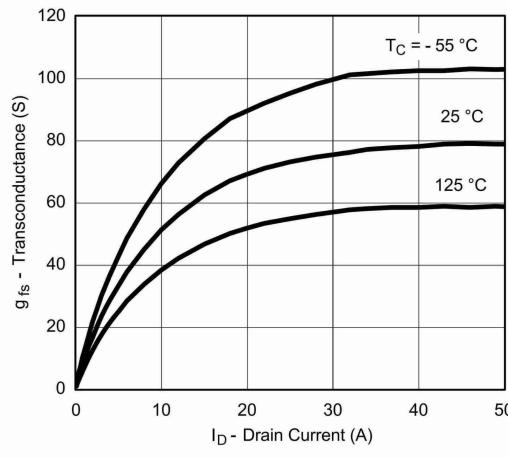
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

TYPICAL CHARACTERISTICS (25 °C unless noted)


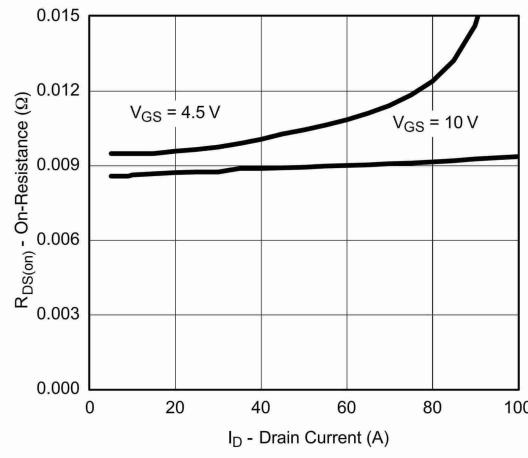
Output Characteristics



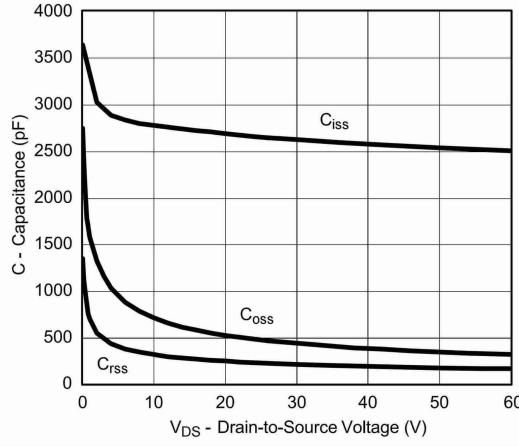
Transfer Characteristics



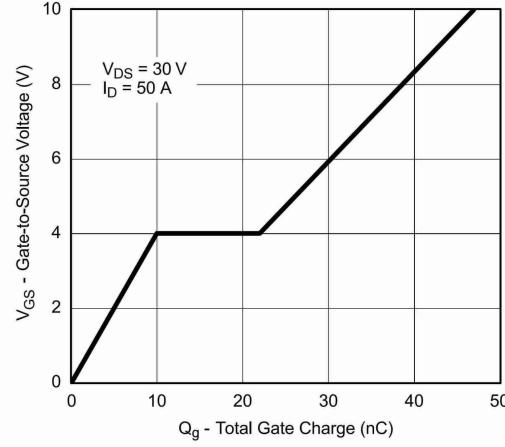
Transconductance



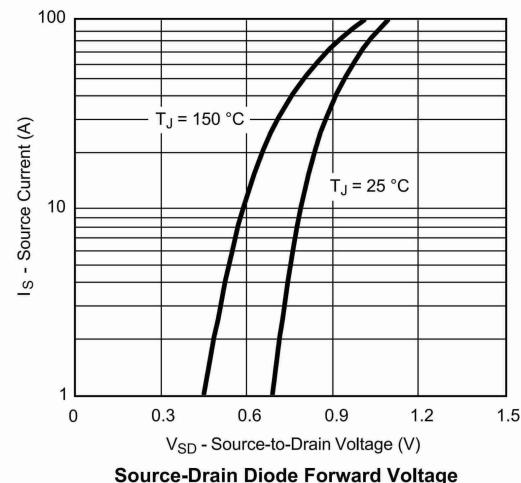
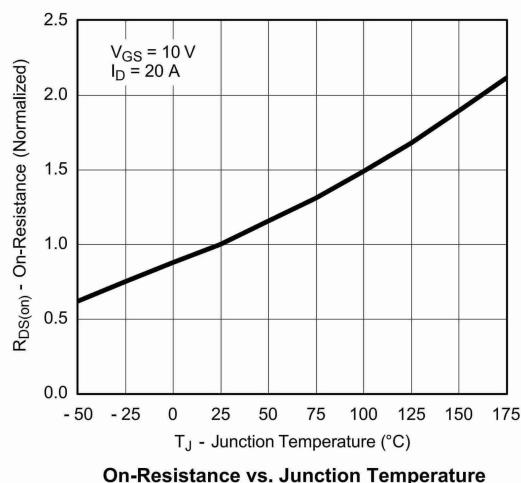
On-Resistance vs. Drain Current



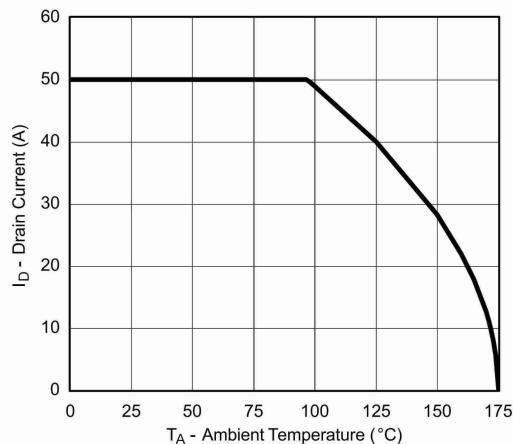
Capacitance



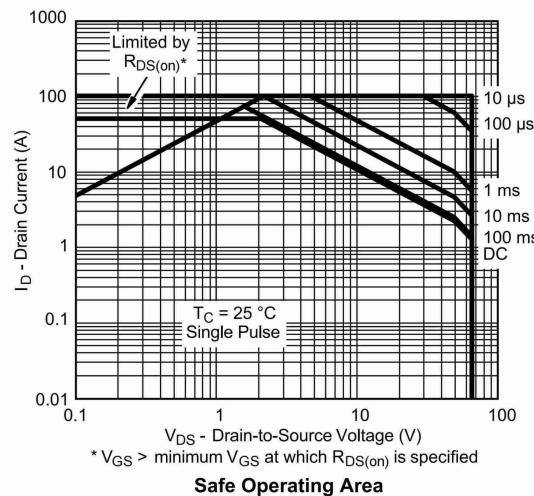
Gate Charge

TYPICAL CHARACTERISTICS (25 °C unless noted)

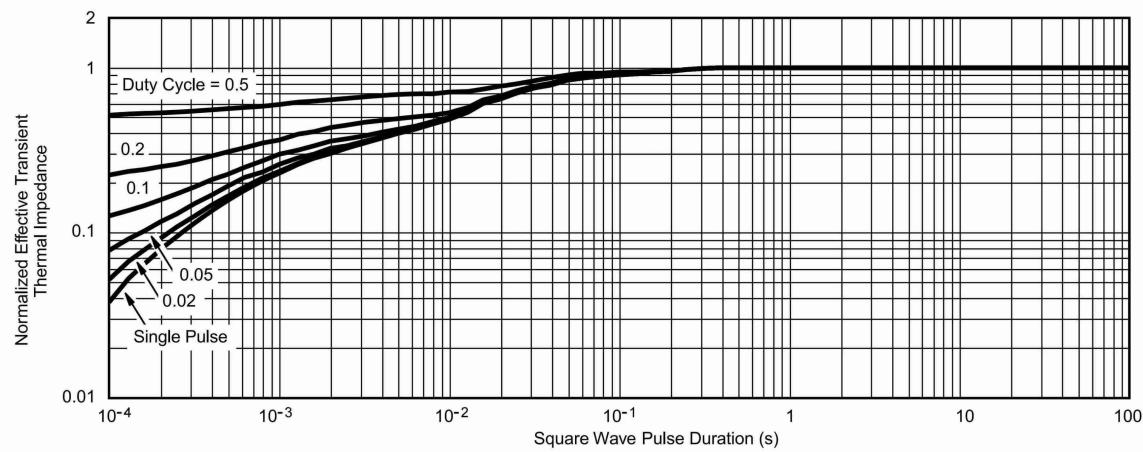
THERMAL RATINGS



Maximum Drain Current vs. Ambient Temperature

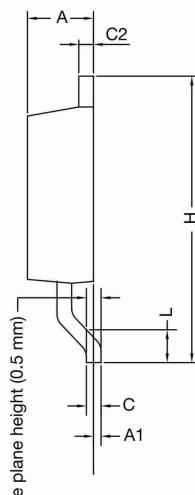
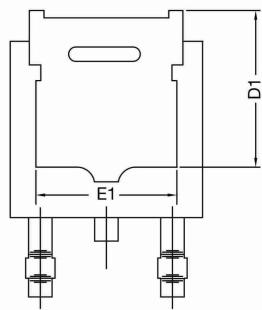
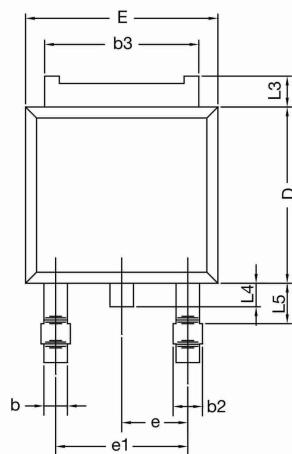


Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case

TO-252AA CASE OUTLINE



DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	2.18	2.38	0.086	0.094
A1	-	0.127	-	0.005
b	0.64	0.88	0.025	0.035
b2	0.76	1.14	0.030	0.045
b3	4.95	5.46	0.195	0.215
C	0.46	0.61	0.018	0.024
C2	0.46	0.89	0.018	0.035
D	5.97	6.22	0.235	0.245
D1	5.21	-	0.205	-
E	6.35	6.73	0.250	0.265
E1	4.32	-	0.170	-
H	9.40	10.41	0.370	0.410
e	2.28 BSC		0.090 BSC	
e1	4.56 BSC		0.180 BSC	
L	1.40	1.78	0.055	0.070
L3	0.89	1.27	0.035	0.050
L4	-	1.02	-	0.040
L5	1.14	1.52	0.045	0.060

ECN: X12-0247-Rev. M, 24-Dec-12
 DWG: 5347

Note

- Dimension L3 is for reference only.

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