

RBE039N15R1SZQ4-VB Datasheet

N-Channel 150 V (D-S) MOSFET

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω) MAX.	I_D (A)	Q_g (TYP.)
150	0.0028 at $V_{GS} = 10$ V	240	160 nC

FEATURES

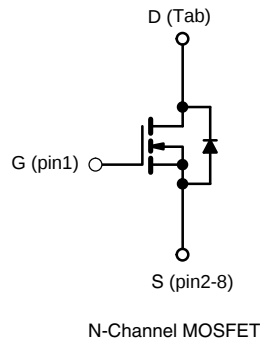
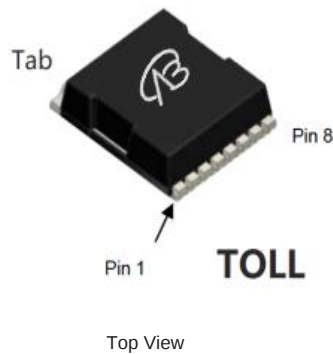
- SGT technology Power MOSFET
- Maximum 175°C junction temperature
- 100 % R_g and UIS tested



RoHS
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APPLICATIONS

- Power supplies:
 - Uninterruptible power supplies
 - AC/DC switch-mode power supplies
 - Lighting
- Synchronous rectification
- DC/DC converter
- Motor drive switch
- DC/AC inverter
- Solar micro inverter
- Class D audio amplifier



ABSOLUTE MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$, unless otherwise noted)

PARAMETER		SYMBOL	LIMIT	UNIT
Drain-Source Voltage		V_{DS}	150	V
Gate-Source Voltage		V_{GS}	± 20	
Continuous Drain Current ($T_J = 150^\circ\text{C}$)	$T_C = 25^\circ\text{C}$	I_D	240	A
	$T_C = 100^\circ\text{C}$		144	
Pulsed Drain Current ($t = 100 \mu\text{s}$)		I_{DM}	960	
Avalanche Current	$L = 0.5 \text{ mH}$	I_{AS}	100	
Single Avalanche Energy ^a		E_{AS}	2500	mJ
Maximum Power Dissipation ^a	$T_C = 25^\circ\text{C}$	P_D	535 ^b	W
	$T_C = 100^\circ\text{C}$		267.8 ^b	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	-55 to +175	$^\circ\text{C}$

THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	LIMIT	UNIT
Junction-to-Ambient (PCB Mount) ^c	R_{thJA}	62	$^\circ\text{C/W}$
Junction-to-Case (Drain)	R_{thJC}	0.28	

Notes

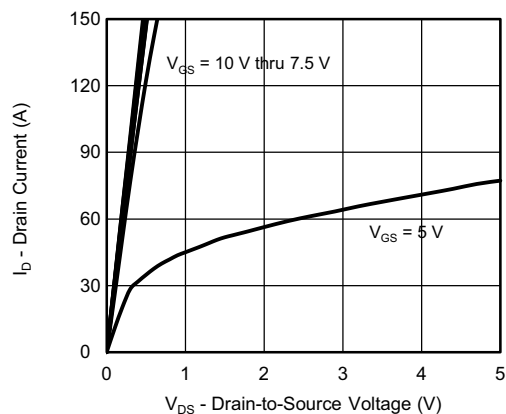
- Duty cycle $\leq 1\%$.
- See SOA curve for voltage derating.
- When mounted on 1" square PCB (FR4 material).

SPECIFICATIONS (T _J = 25 °C, unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} = 0 V, I _D = 250 μA	150	-	-	V
Gate Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	2	3	4	
Gate-Body Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 20 V	-	-	± 250	nA
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 120 V, V _{GS} = 0 V	-	-	1	μA
		V _{DS} = 120 V, V _{GS} = 0 V, T _J = 125 °C	-	-	100	
		V _{DS} = 120 V, V _{GS} = 0 V, T _J = 150°C	-	-	5	mA
On-State Drain Current ^a	I _{D(on)}	V _{DS} ≥ 10 V, V _{GS} = 10 V	90	-	-	A
Drain-Source On-State Resistance ^a	R _{DS(on)}	V _{GS} = 10 V, I _D = 100 A	-	0.0028	-	Ω
		V _{GS} = 7.5 V, I _D = 80 A	-	0.0032	-	
Forward Transconductance ^a	g _{fs}	V _{DS} = 15 V, I _D = 80 A	-	90	-	S
Dynamic ^b						
Input Capacitance	C _{iss}	V _{GS} = 0 V, V _{DS} = 75V, f = 1 MHz	-	8000	-	pF
Output Capacitance	C _{oss}		-	300	-	
Reverse Transfer Capacitance	C _{rss}		-	32	-	
Total Gate Charge ^c	Q _g	V _{DS} = 7.5 V, V _{GS} = 10 V, I _D = 20 A	-	160	-	nC
Gate-Source Charge ^c	Q _{gs}		-	30	-	
Gate-Drain Charge ^c	Q _{gd}		-	25	35	
Gate Resistance	R _g	f = 1 MHz	-	0.9	1.2	Ω
Turn-On Delay Time ^c	t _{d(on)}	V _{DD} = 75 V, R _L = 1.66 Ω I _D ≅ 50 A, V _{GEN} = 10 V, R _g = 1 Ω	-	40	-	ns
Rise Time ^c	t _r		-	100	-	
Turn-Off Delay Time ^c	t _{d(off)}		-	75	-	
Fall Time ^c	t _f		-	55	-	
Drain-Source Body Diode Ratings and Characteristics ^b (T _C = 25 °C)						
Pulsed Current (t = 100 μs)	I _{SM}		-	-	960	A
Forward Voltage ^a	V _{SD}	I _F = 500 A, V _{GS} = 0 V	-	0.84	1.3	V
Reverse Recovery Time	t _{rr}	I _F = 50 A, di/dt = 100 A/μs	-	85	120	ns
Peak Reverse Recovery Charge	I _{RM(REC)}		-	11	20	A
Reverse Recovery Charge	Q _{rr}		-	0.8	1.0	μC

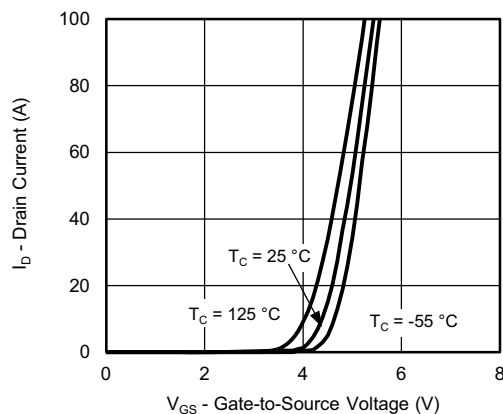
Notes

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

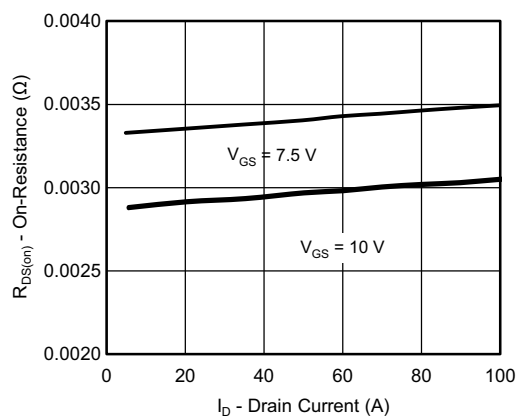
TYPICAL CHARACTERISTICS ($T_C = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)



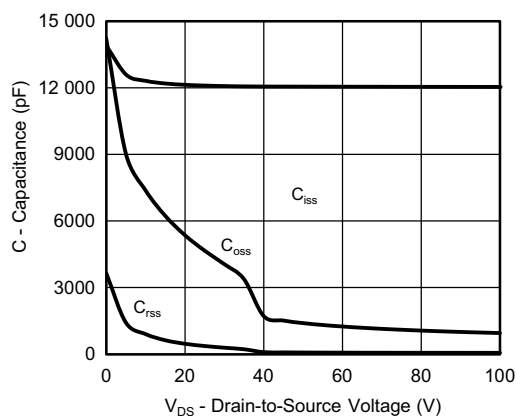
Output Characteristics



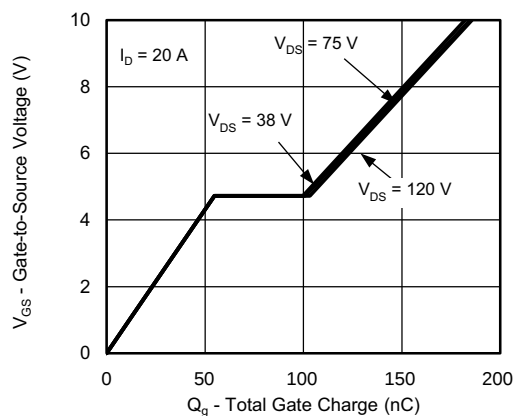
Transfer Characteristics



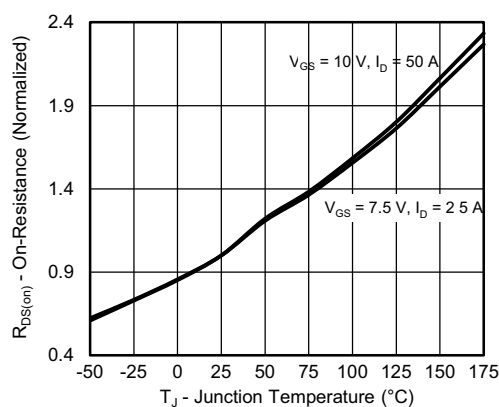
On-Resistance vs. Drain Current and Gate Voltage



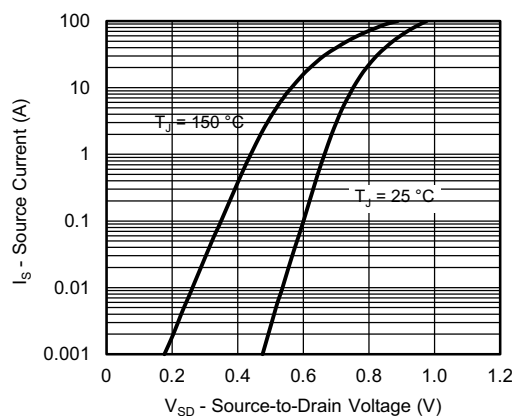
Capacitance



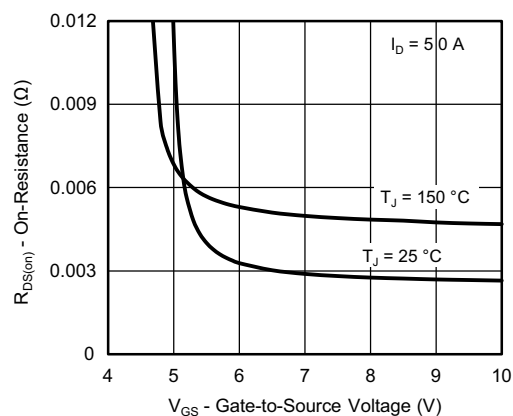
Gate Charge



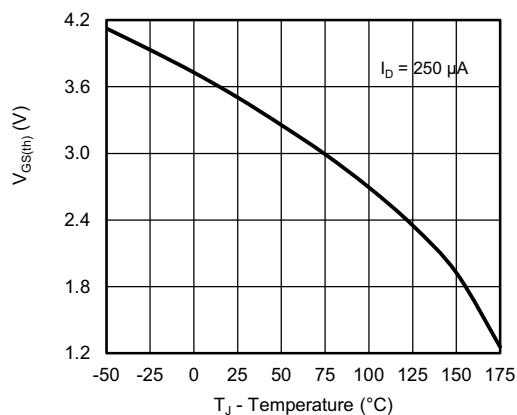
On-Resistance vs. Junction Temperature



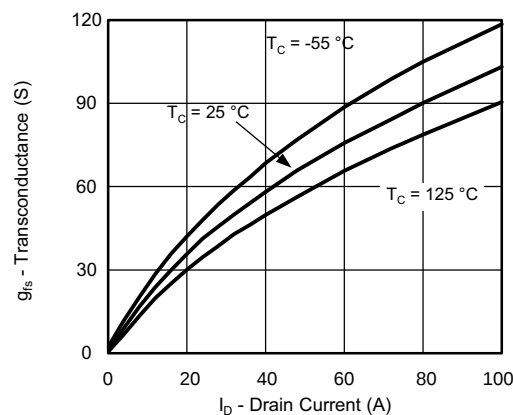
Source-Drain Diode Forward Voltage



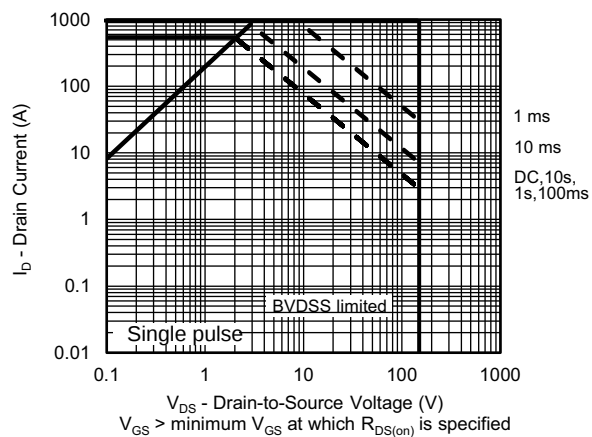
On-Resistance vs. Gate-to-Source Voltage



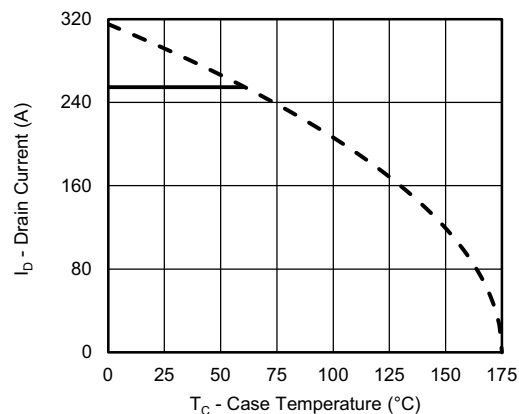
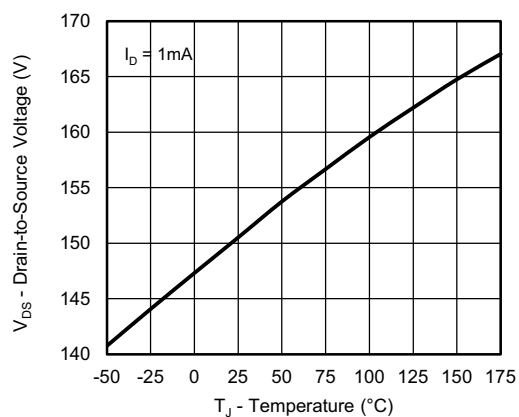
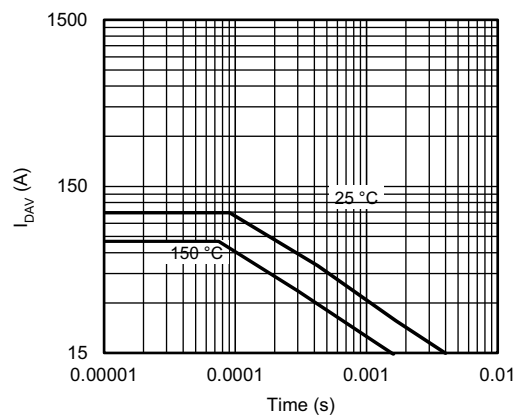
Threshold Voltage



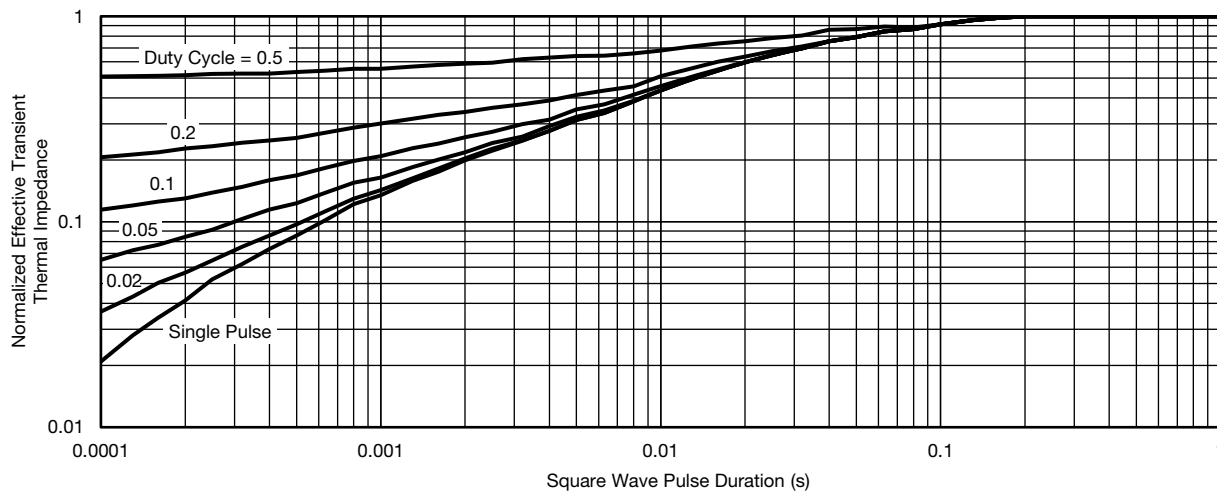
Transconductance



Safe Operating Area, Junction-to-Ambient

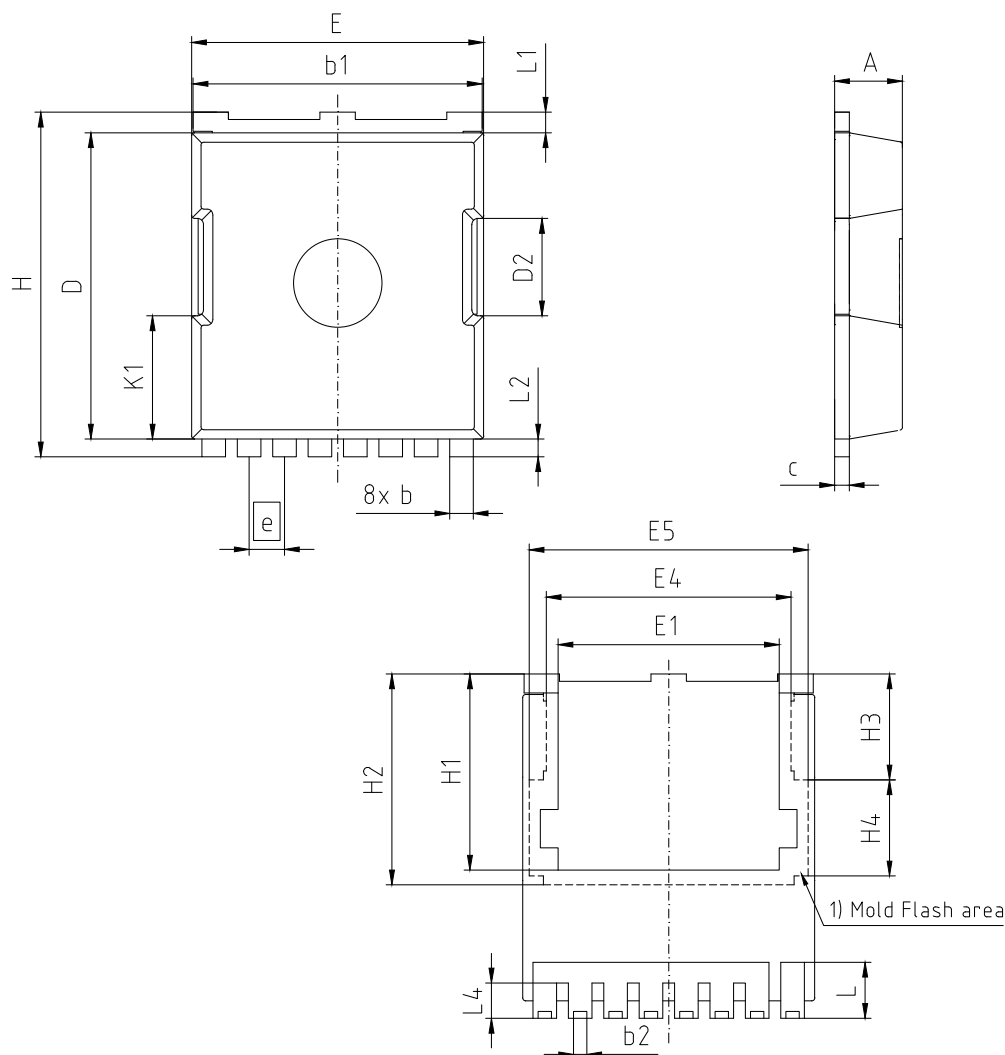
**Current Derating ^a****Drain Source Breakdown vs. Junction Temperature** **I_{DAV} vs. Time****Note**

- a. The power dissipation P_D is based on T_J max. = 25 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

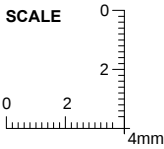
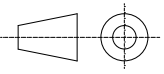
THERMAL RATINGS ($T_C = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)**Normalized Thermal Transient Impedance, Junction-to-Case****Note**

- The characteristics shown in the two graphs
 - Normalized Transient Thermal Impedance Junction to Ambient ($25\text{ }^{\circ}\text{C}$)
 - Normalized Transient Thermal Impedance Junction to Case ($25\text{ }^{\circ}\text{C}$)
- are given for general guidelines only to enable the user to get a "ball park" indication of part capabilities. The data are extracted from single pulse transient thermal impedance characteristics which are developed from empirical measurements. The latter is valid for the part mounted on printed circuit board - FR4, size 1" x 1" x 0.062", double sided with 2 oz. copper, 100 % on both sides. The part capabilities can widely vary depending on actual application parameters and operating conditions.

Package Outlines



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.20	2.40	0.087	0.094
b	0.70	0.90	0.028	0.035
b1	9.70	9.90	0.382	0.390
b2	0.42	0.50	0.017	0.020
c	0.40	0.60	0.016	0.024
D	10.28	10.58	0.405	0.416
D2	3.30		0.130	
E	9.70	10.10	0.382	0.398
E1	7.50		0.295	
E4	8.50		0.335	
E5	9.46		0.372	
e	1.20 (BSC)		0.047 (BSC)	
H	11.48	11.88	0.452	0.468
H1	6.55	6.75	0.258	0.266
H2	7.15		0.281	
H3	3.59		0.141	
H4	3.26		0.128	
N	8		8	
K1	4.18		0.165	
L	1.60	2.10	0.063	0.083
L1	0.70		0.028	
L2	0.60		0.024	
L4	1.00	1.30	0.039	0.051

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