

94E860-VB Datasheet

N-Channel 60V (D-S) MOSFET

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A) ^{a, e}	Q_g (Typ)
60	0.0023 at $V_{GS} = 10$ V	100	61nC
	0.0032 at $V_{GS} = 4.5$ V	90	

FEATURES

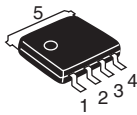
- Trench Power MOSFET
- 100 % R_g and UIS Tested
- Compliant to RoHS Directive 2011/65/EU



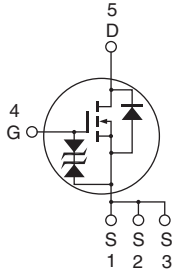
RoHS
COMPLIANT

APPLICATIONS

- OR-ing
- Server
- DC/DC



1, 2, 3 Source
4 Gate
5 Drain



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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	60	V
Gate-Source Voltage	V_{GS}	± 20	
Continuous Drain Current ($T_J = 175^\circ\text{C}$)	I_D	$T_C = 25^\circ\text{C}$	A
		$T_C = 70^\circ\text{C}$	
		$T_A = 25^\circ\text{C}$	
		$T_A = 70^\circ\text{C}$	
Pulsed Drain Current	I_{DM}	275	mJ
Avalanche Current Pulse	I_{AS}	39	
Single Pulse Avalanche Energy	E_{AS}	94.8	
Continuous Source-Drain Diode Current	I_S	$T_C = 25^\circ\text{C}$	A
		$T_A = 25^\circ\text{C}$	
Maximum Power Dissipation	P_D	$T_C = 25^\circ\text{C}$	W
		$T_C = 70^\circ\text{C}$	
		$T_A = 25^\circ\text{C}$	
		$T_A = 70^\circ\text{C}$	
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to 175	$^\circ\text{C}$

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typ.	Max.	Unit
Maximum Junction-to-Ambient ^{b, d}	R_{thJA}	32	40	$^\circ\text{C/W}$
Maximum Junction-to-Case	R_{thJC}	0.5	0.6	

Notes:

a. Based on $T_C = 25^\circ\text{C}$.

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

c. $t = 10$ sec.

d. Maximum under steady state conditions is 90°C/W .

e. Calculated based on maximum junction temperature. Package limitation current is 90 A.

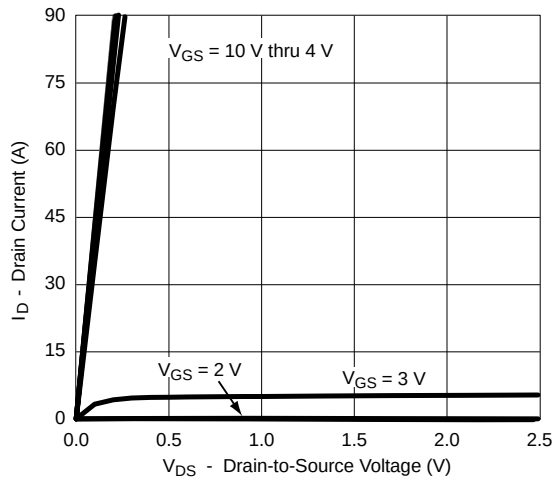
SPECIFICATIONS (T _J = 25 °C, unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} = 0 V, I _D = 250 μA	60			V
V _{DS} Temperature Coefficient	ΔV _{DS} /T _J	I _D = 250 μA		35		mV/°C
V _{GS(th)} Temperature Coefficient	ΔV _{GS(th)} /T _J			- 7.5		
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	1.5		2.5	V
Gate-Source Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 20 V			± 100	nA
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 30 V, V _{GS} = 0 V			1	μA
		V _{DS} = 30 V, V _{GS} = 0 V, T _J = 55 °C			10	
On-State Drain Current ^a	I _{D(on)}	V _{DS} ≥ 5 V, V _{GS} = 10 V	100			A
Drain-Source On-State Resistance ^a	R _{DS(on)}	V _{GS} = 10 V, I _D = 38.8 A		0.0023		Ω
		V _{GS} = 4.5 V, I _D = 37 A		0.0032		
Forward Transconductance ^a	g _{fs}	V _{DS} = 15 V, I _D = 38.8 A		160		S
Dynamic ^b						
Input Capacitance	C _{iss}	V _{DS} = 15 V, V _{GS} = 0 V, f = 1 MHz		5801		pF
Output Capacitance	C _{oss}			1825		
Reverse Transfer Capacitance	C _{rss}			1070		
Total Gate Charge	Q _g	V _{DS} = 15 V, V _{GS} = 10 V, I _D = 38.8 A		92	157	nC
		V _{DS} = 15 V, V _{GS} = 4.5 V, I _D = 28.8 A		61	87	
Gate-Source Charge	Q _{gs}			44		
Gate-Drain Charge	Q _{gd}			29		
Gate Resistance	R _g	f = 1 MHz		1.4	2.1	Ω
Turn-On Delay Time	t _{d(on)}	V _{DD} = 15 V, R _L = 0.625 Ω I _D ≅ 24 A, V _{GEN} = 10 V, R _g = 1 Ω		18	27	ns
Rise Time	t _r			11	17	
Turn-Off Delay Time	t _{d(off)}			70	105	
Fall Time	t _f			10	15	
Turn-On Delay Time	t _{d(on)}	V _{DD} = 15 V, R _L = 0.67 Ω I _D ≅ 22.5 A, V _{GEN} = 4.5 V, R _g = 1 Ω		55	83	
Rise Time	t _r			180	270	
Turn-Off Delay Time	t _{d(off)}			55	83	
Fall Time	t _f			12	18	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C			120	A
Pulse Diode Forward Current ^a	I _{SM}				120	
Body Diode Voltage	V _{SD}	I _S = 22 A		0.8	1.2	V
Body Diode Reverse Recovery Time	t _{rr}	I _F = 20 A, di/dt = 100 A/μs, T _J = 25 °C		52	78	ns
Body Diode Reverse Recovery Charge	Q _{rr}			70.2	105	nC
Reverse Recovery Fall Time	t _a			27		ns
Reverse Recovery Rise Time	t _b			25		

Notes:

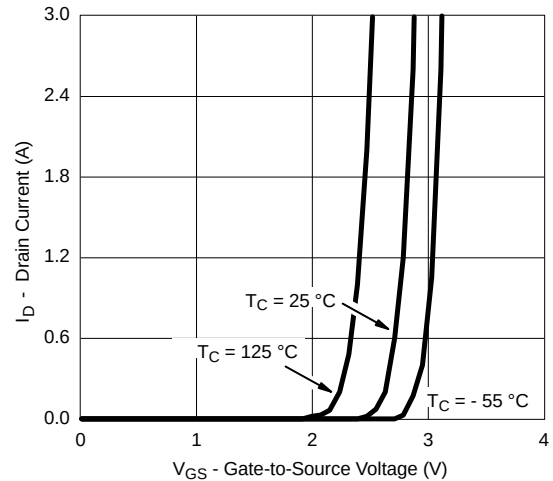
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
 b. Guaranteed by design, not subject to production testing.

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.

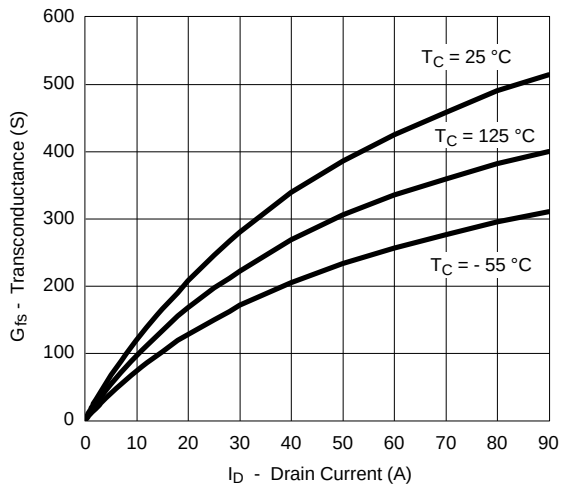
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



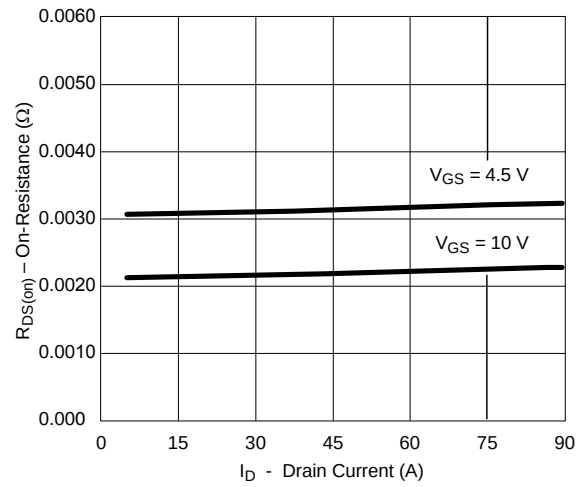
Output Characteristics



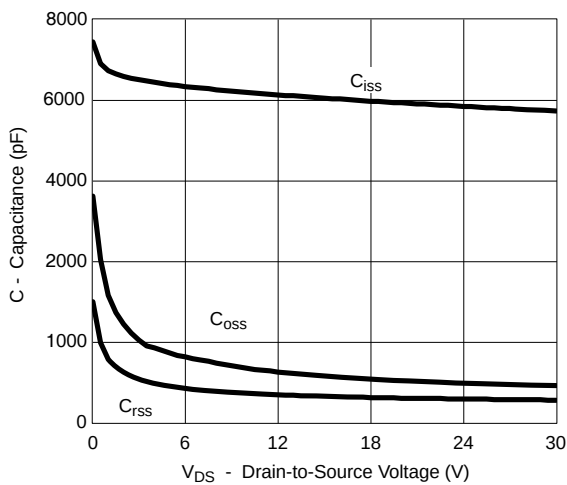
Transfer Characteristics



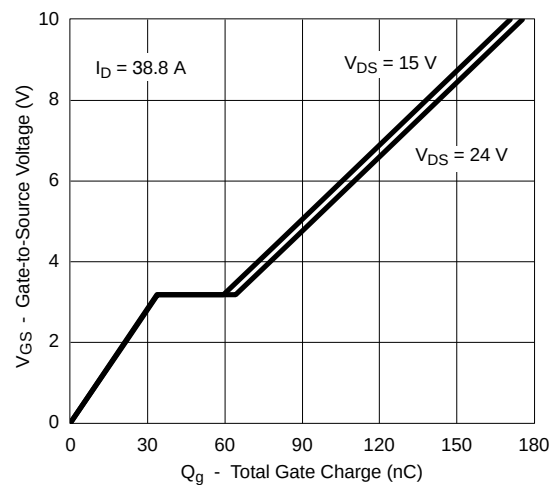
Transconductance



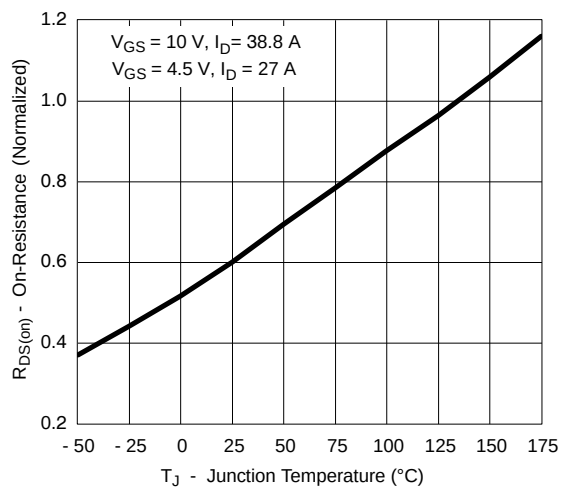
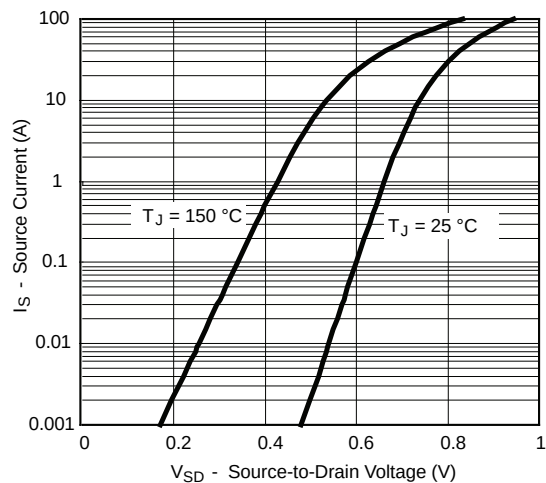
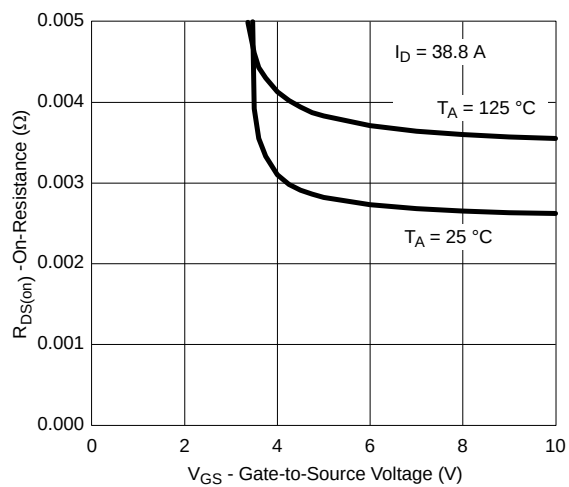
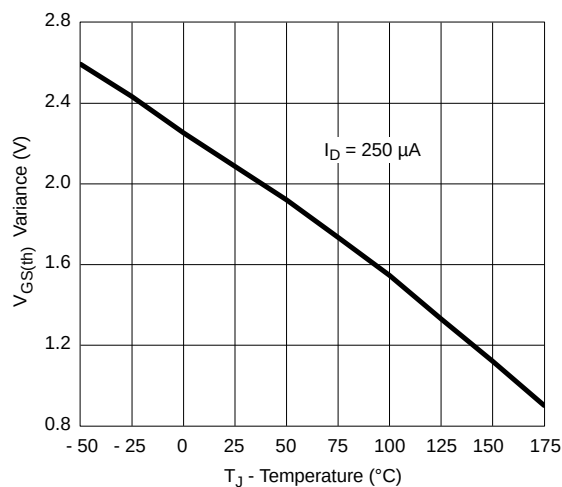
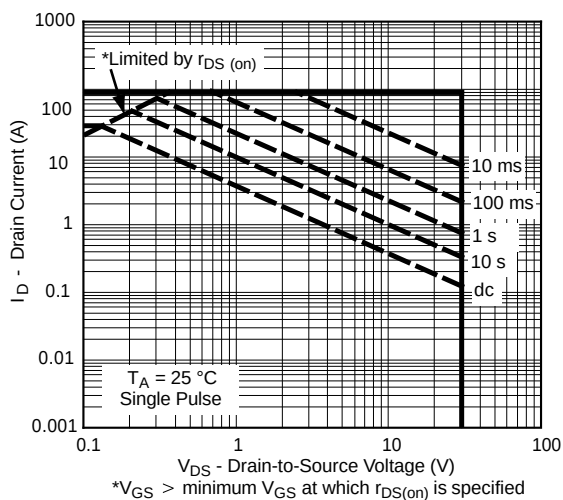
$R_{DS(on)}$ vs. Drain Current



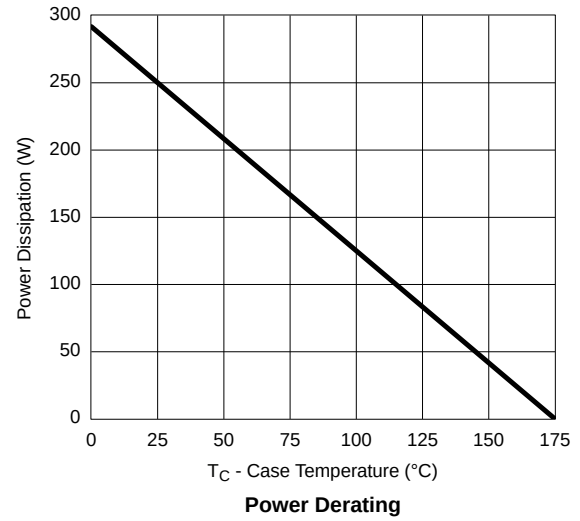
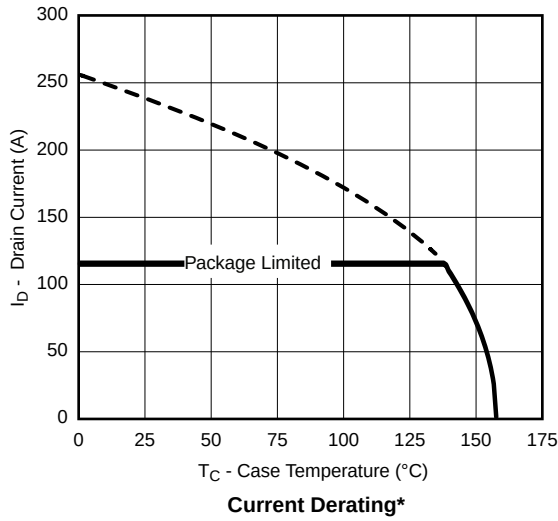
Capacitance



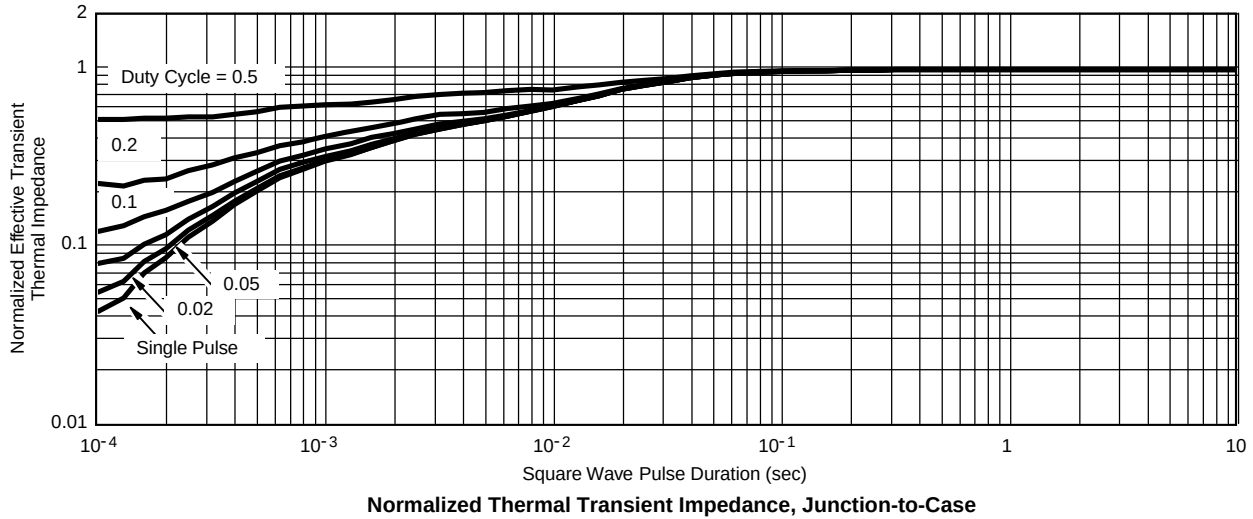
Gate Charge

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

On-Resistance vs. Junction Temperature

Forward Diode Voltage vs. Temperature

 $R_{DS(on)}$ vs. V_{GS} vs. Temperature

Threshold Voltage

Safe Operating Area, Junction-to-Ambient

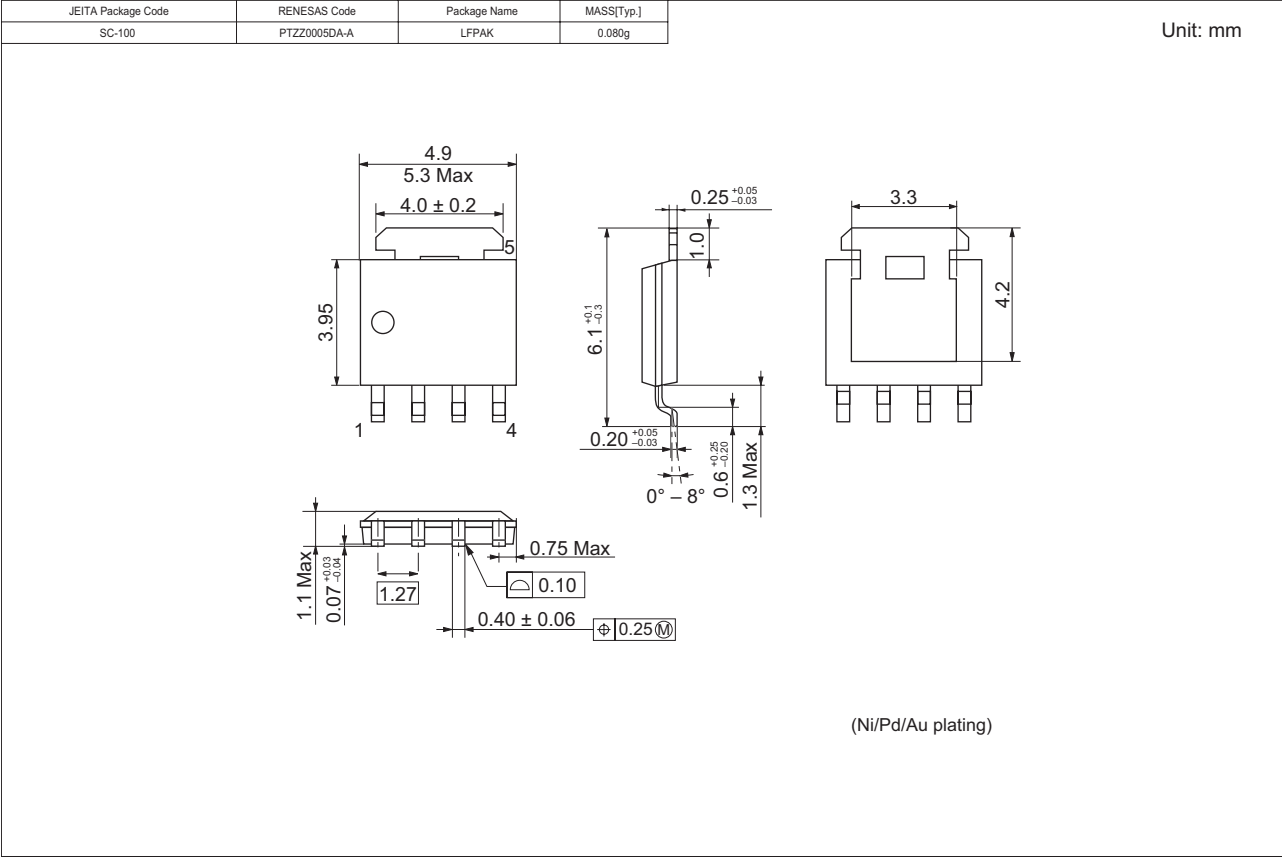
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



*The power dissipation P_D is based on $T_{J(max)} = 175$ °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.



Package Dimensions



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