

P-Channel 1.8 V (G-S) MOSFET

PRODUCT SUMMARY			
V _{DS} (V)	R _{DS(on)} (Ω)	I _D (A) ^c	Q _g (Typ.)
- 8	0.112 at V _{GS} = - 4.5 V	- 1.6	3.67 nC
	0.160 at V _{GS} = - 2.5 V	- 1.6	
	0.210 at V _{GS} = - 1.8 V	- 1.6	

FEATURES

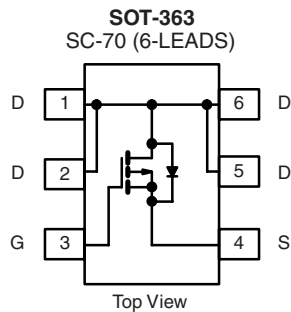
- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET[®] Power MOSFET
- Compliant to RoHS Directive 2002/95/EC



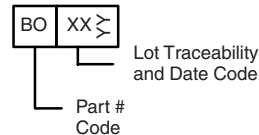
RoHS
COMPLIANT
HALOGEN
FREE
Available

APPLICATIONS

- Load Switch for Portable Devices



Marking Code



Ordering Information: Si1405BDH-T1-E3 (Lead (Pb)-free)
Si1405BDH-T1-GE3 (Lead (Pb)-free and Halogen-free)

ABSOLUTE MAXIMUM RATINGS T _A = 25 °C, unless otherwise noted				
Parameter	Symbol	Limit	Unit	
Drain-Source Voltage	V _{DS}	- 8	V	
Gate-Source Voltage	V _{GS}	± 8		
Continuous Drain Current (T _J = 150 °C) ^{a, b}	T _C = 25 °C	- 1.6 ^c	A	
	T _C = 70 °C	- 1.6 ^c		
	T _A = 25 °C	- 1.6 ^{a, b, c}		
	T _A = 70 °C	- 1.6 ^{a, b, c}		
Pulsed Drain Current (10 μs Pulse Width)	I _{DM}	- 8 ^c		
Continuous Source-Drain Diode Current ^{a, b}	T _C = 25 °C	- 1.6 ^c		
	T _A = 25 °C	- 1.47 ^{a, b}		
Maximum Power Dissipation ^{a, b}	T _C = 25 °C	2.27	W	
	T _C = 70 °C	1.45		
	T _A = 25 °C	1.47 ^{a, b}		
	T _A = 70 °C	0.95 ^{a, b}		
Operating Junction and Storage Temperature Range	T _J , T _{stg}	- 55 to 150	°C	
Soldering Recommendations (Peak Temperature) ^{c, d}		260		

THERMAL RESISTANCE RATINGS				
Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^{a, d}	R _{thJA}	70	85	°C/W
Maximum Junction-to-Foot (Drain)	R _{thJF}	44	55	

Notes:

- Surface mounted on 1" x 1" FR4 board.
- t = 5 s.
- Package limited.
- Maximum under steady state conditions is 125 °C/W.

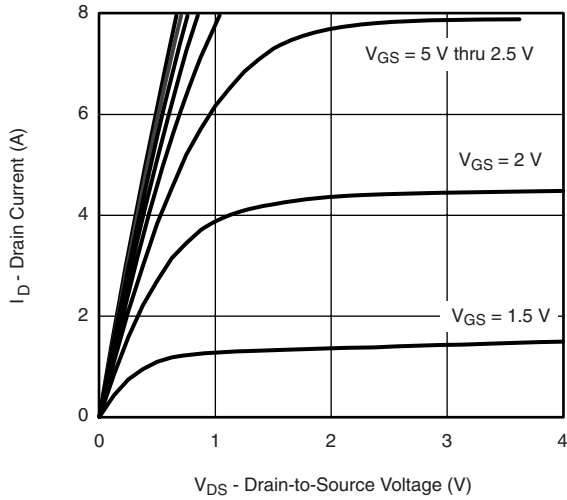
SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	- 8			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = -250\text{ }\mu\text{A}$		- 5.4		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			1.98		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	- 0.45		- 0.95	V
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = -8\text{ V}$			- 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -8\text{ V}, V_{GS} = 0\text{ V}$			- 1	μA
		$V_{DS} = -8\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$			- 10	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \leq 5\text{ V}, V_{GS} = -4.5\text{ V}$	- 8			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = -4.5\text{ V}, I_D = -2.8\text{ A}$		0.091	0.112	Ω
		$V_{GS} = -2.5\text{ V}, I_D = -2.3\text{ A}$		0.132	0.160	
		$V_{GS} = -1.8\text{ V}, I_D = -0.5\text{ A}$		0.171	0.205	
Forward Transconductance ^a	g_{fs}	$V_{DS} = -4\text{ V}, I_D = -2.8\text{ A}$		4.8		S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{DS} = -4\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		305		μF
Output Capacitance	C_{oss}			108		
Reverse Transfer Capacitance	C_{rss}			66		
Total Gate Charge	Q_g	$V_{DS} = -4\text{ V}, V_{GS} = -4.5\text{ V}, I_D = -2.8\text{ A}$		3.67	5.5	nC
Gate-Source Charge	Q_{gs}			0.61		
Gate-Drain Charge	Q_{gd}			0.98		
Gate Resistance	R_g	$f = 1\text{ MHz}$		6.3		Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -4\text{ V}, R_L = 1.78\text{ }\Omega$ $I_D \cong -2.25\text{ A}, V_{GEN} = -4.5\text{ V}, R_g = 1\text{ }\Omega$		10	15	ns
Rise Time	t_r			26	39	
Turn-Off Delay Time	$t_{d(off)}$			16	24	
Fall Time	t_f			7	10.5	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^\circ\text{C}$			- 1.6	A
Pulse Diode Forward Current	I_{SM}				- 8	
Body Diode Voltage	V_{SD}	$I_S = 1.4\text{ A}, V_{GS} = 0\text{ V}$		- 0.8	- 1.2	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = -1.4\text{ A}, dI/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$		23	35	ns
Body Diode Reverse Recovery Charge	Q_{rr}			5.8	8.7	nC
Reverse Recovery Fall Time	t_a			6		ns
Reverse Recovery Rise Time	t_b			17		

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.

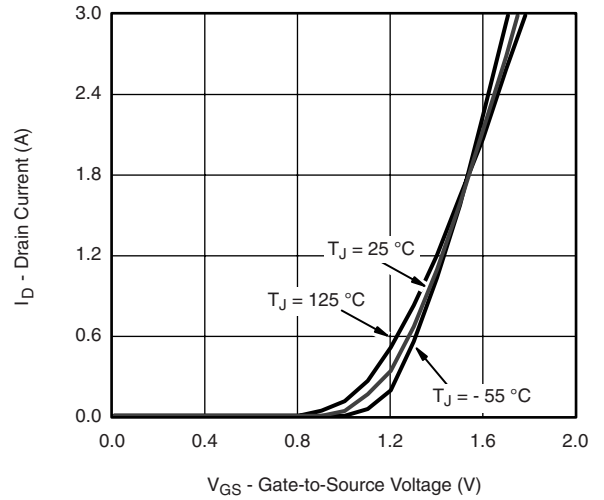
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



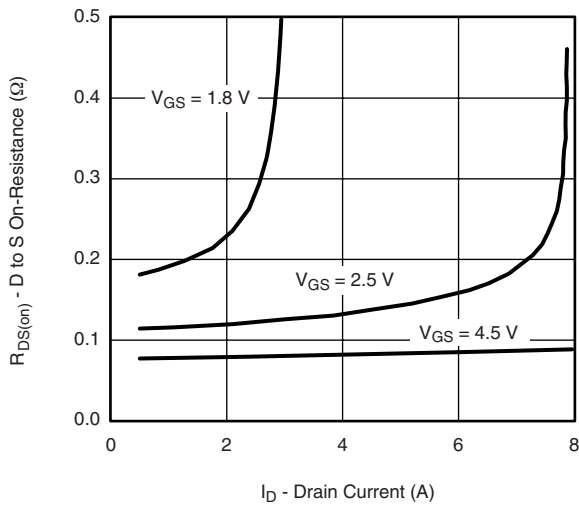
$V_{GS} = 5\text{ V thru } 2.5\text{ V}$
 $V_{GS} = 2\text{ V}$
 $V_{GS} = 1.5\text{ V}$

I_D - Drain Current (A)
 V_{DS} - Drain-to-Source Voltage (V)
Output Characteristics



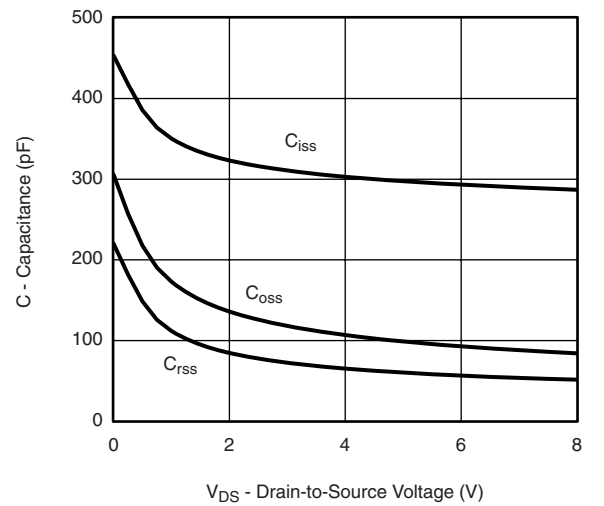
$T_J = 25\text{ }^\circ\text{C}$
 $T_J = 125\text{ }^\circ\text{C}$
 $T_J = -55\text{ }^\circ\text{C}$

I_D - Drain Current (A)
 V_{GS} - Gate-to-Source Voltage (V)
Transfer Characteristics



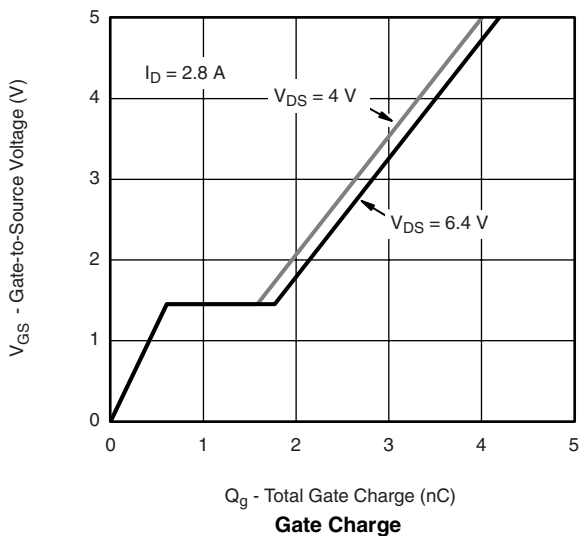
$V_{GS} = 1.8\text{ V}$
 $V_{GS} = 2.5\text{ V}$
 $V_{GS} = 4.5\text{ V}$

$R_{DS(on)}$ - D to S On-Resistance (Ω)
 I_D - Drain Current (A)
On-Resistance vs. Drain Current and Gate Voltage



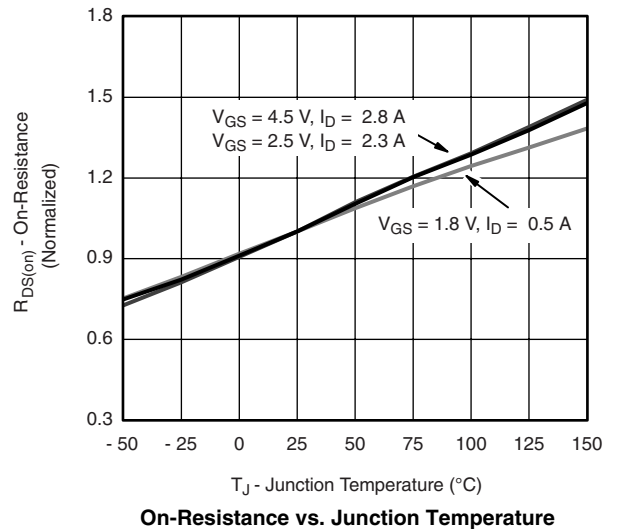
C_{iss}
 C_{oss}
 C_{rss}

C - Capacitance (pF)
 V_{DS} - Drain-to-Source Voltage (V)
Capacitance



$I_D = 2.8\text{ A}$
 $V_{DS} = 4\text{ V}$
 $V_{DS} = 6.4\text{ V}$

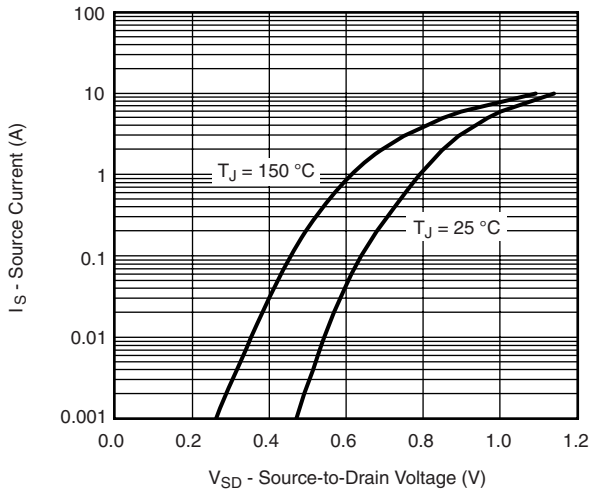
V_{GS} - Gate-to-Source Voltage (V)
 Q_g - Total Gate Charge (nC)
Gate Charge



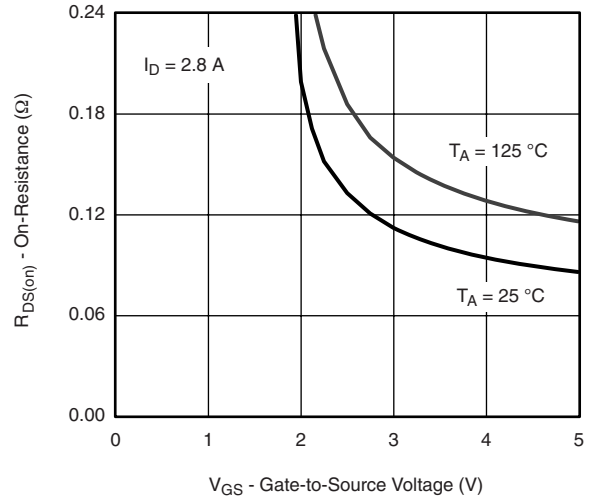
$V_{GS} = 4.5\text{ V}, I_D = 2.8\text{ A}$
 $V_{GS} = 2.5\text{ V}, I_D = 2.3\text{ A}$
 $V_{GS} = 1.8\text{ V}, I_D = 0.5\text{ A}$

$R_{DS(on)}$ - On-Resistance (Normalized)
 T_J - Junction Temperature ($^\circ\text{C}$)
On-Resistance vs. Junction Temperature

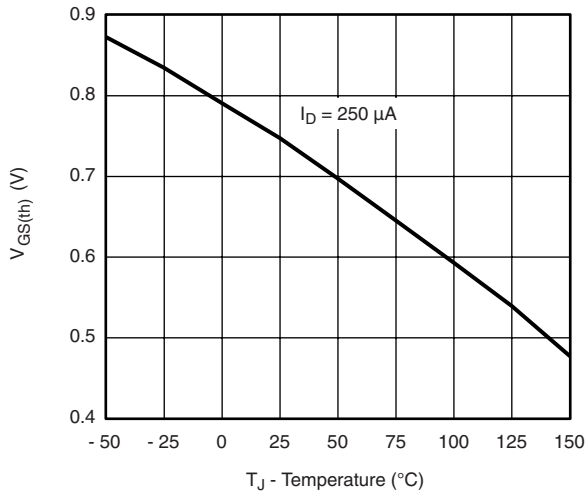
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



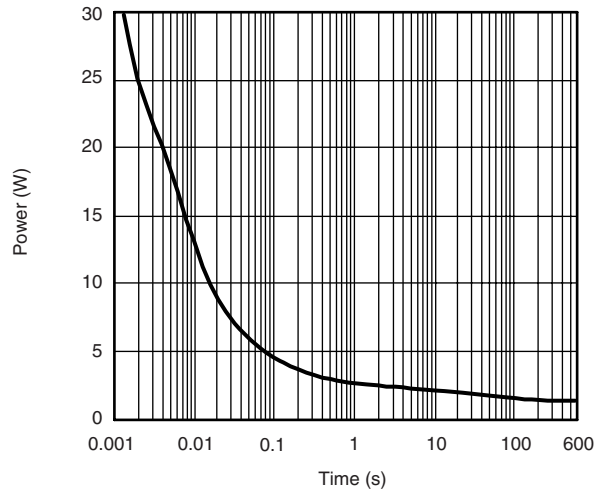
Source-Drain Diode Forward Voltage



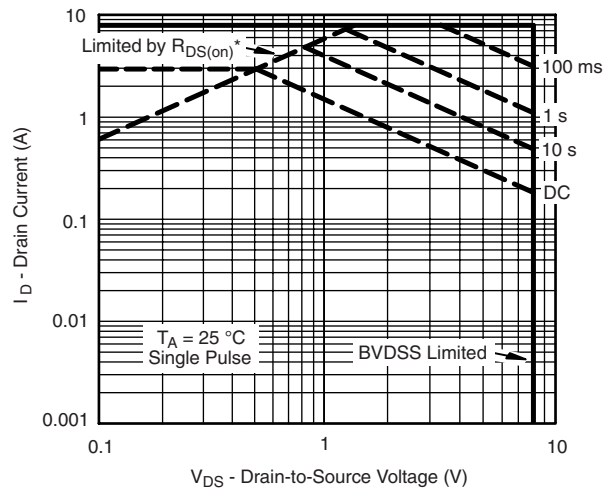
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



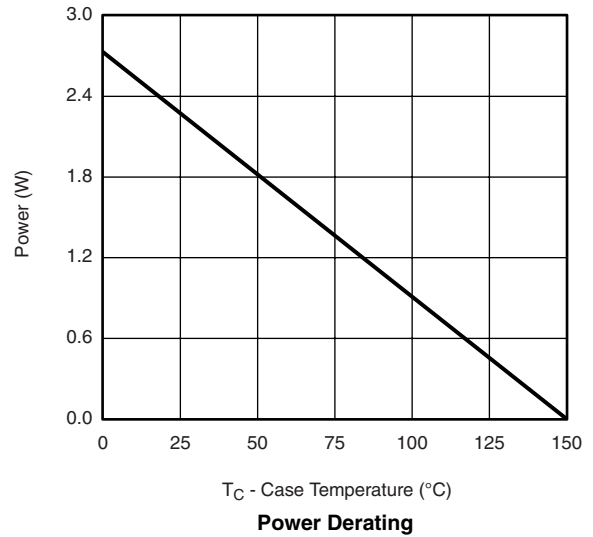
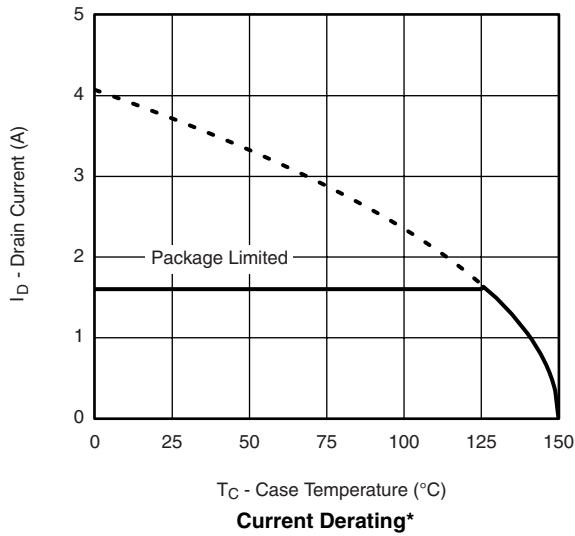
Single Pulse Power, Junction-to-Ambient



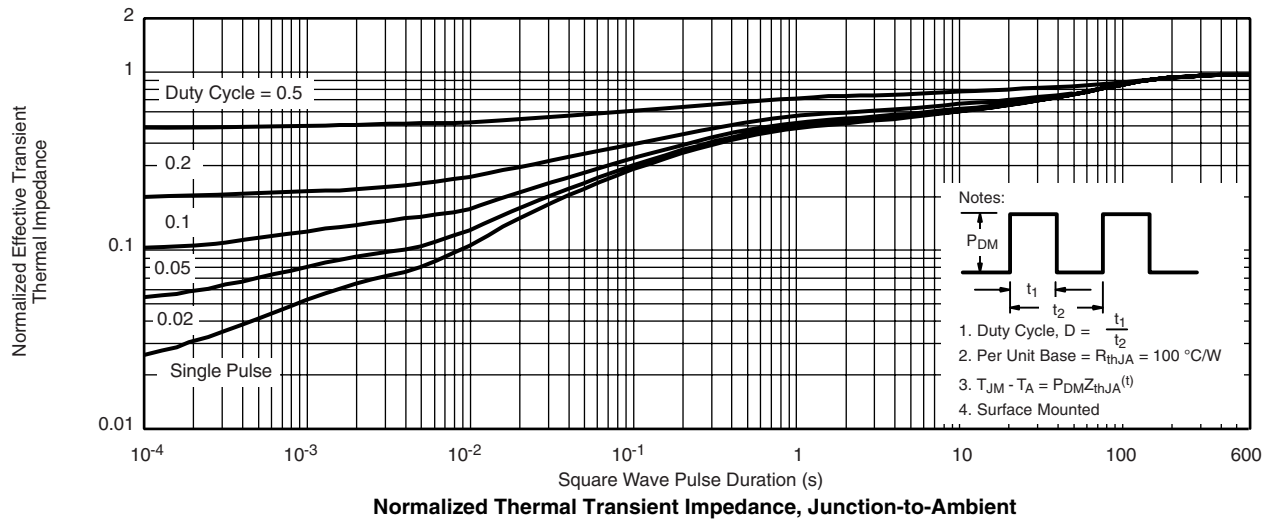
* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



* The power dissipation P_D is based on $T_{J(max)} = 150$ °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.



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