

Dual P-Channel 12 V (D-S) MOSFET

PRODUCT SUMMARY			
V _{DS} (V)	R _{DS(on)} (Ω)	I _D (A)	Q _g (Typ.)
- 12	0.390 at V _{GS} = - 4.5 V	- 1.3 ^a	1.7 nC
	0.535 at V _{GS} = - 2.5 V	- 1.2	
	0.710 at V _{GS} = - 1.8 V	- 1.1	

FEATURES

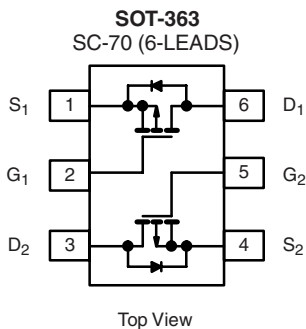
- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET[®] Power MOSFET
- Compliant to RoHS Directive 2002/95/EC



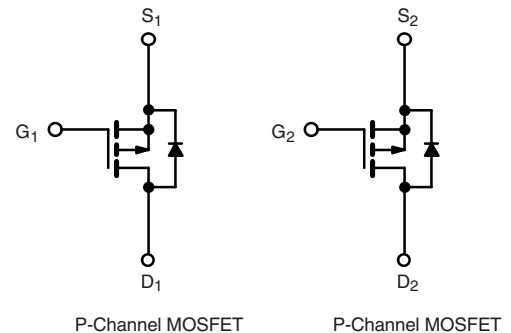
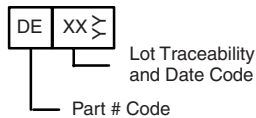
RoHS
COMPLIANT
HALOGEN
FREE
Available

APPLICATIONS

- Load Switch for Portable Devices



Marking Code



Ordering Information: Si1965DH-T1-E3 (Lead (Pb)-free)
Si1965DH-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}	- 12	V	
Gate-Source Voltage	V _{GS}	± 8		
Continuous Drain Current (T _J = 150 °C)	I _D	T _C = 25 °C	- 1.3 ^a	A
		T _C = 70 °C	- 1.2	
		T _A = 25 °C	- 1.14 ^{b, c}	
		T _A = 70 °C	- 0.9 ^{b, c}	
Pulsed Drain Current	I _{DM}	- 3		
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C	- 1	
		T _A = 25 °C	- 0.6 ^{b, c}	
Maximum Power Dissipation	P _D	T _C = 25 °C	1.25	W
		T _C = 70 °C	0.8	
		T _A = 25 °C	0.74 ^{b, c}	
		T _A = 70 °C	0.47 ^{b, c}	
Operating Junction and Storage Temperature Range	T _J , T _{stg}	- 55 to 150	°C	

THERMAL RESISTANCE RATINGS					
Parameter	Symbol	Typical	Maximum	Unit	
Maximum Junction-to-Ambient ^{b, d}	R _{thJA}	130	170	°C/W	
Maximum Junction-to-Foot (Drain)	R _{thJF}	80	100		

Notes:

- Package limited.
- Surface mounted on 1" x 1" FR4 board.
- t = 5 s.
- Maximum under steady state conditions is 220 °C/W.

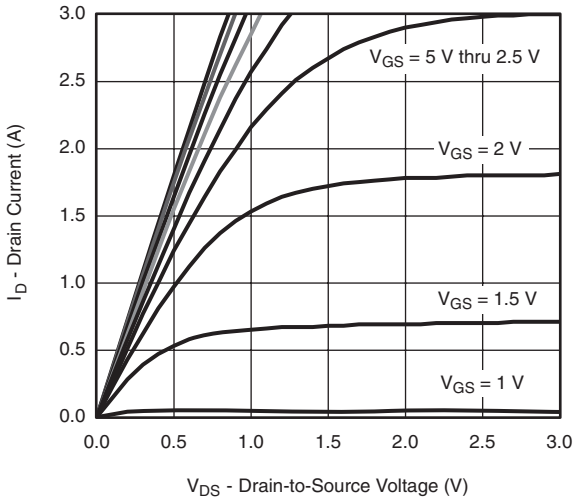
SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	- 12			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = -250\text{ }\mu\text{A}$		- 14		mV/ $^\circ\text{C}$
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$		2			
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	- 0.4		- 1.0	V
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 8\text{ V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -12\text{ V}, V_{GS} = 0\text{ V}$			- 1	μA
		$V_{DS} = -12\text{ V}, V_{GS} = 0\text{ V}, T_J = 85\text{ }^\circ\text{C}$			- 10	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \leq -5\text{ V}, V_{GS} = -4.5\text{ V}$	- 3			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = -4.5\text{ V}, I_D = -1.0\text{ A}$		0.315	0.390	Ω
		$V_{GS} = -2.5\text{ V}, I_D = -0.86\text{ A}$		0.425	0.535	
		$V_{GS} = -1.8\text{ V}, I_D = -0.25\text{ A}$		0.550	0.710	
Forward Transconductance ^a	g_{fs}	$V_{DS} = -6\text{ V}, I_D = -1.0\text{ A}$		2.5		S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{DS} = -6\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		120		μF
Output Capacitance	C_{oss}		41			
Reverse Transfer Capacitance	C_{rss}		25			
Total Gate Charge	Q_g	$V_{DS} = -6\text{ V}, V_{GS} = -8\text{ V}, I_D = -1.1\text{ A}$		2.8	4.2	nC
		$V_{DS} = -6\text{ V}, V_{GS} = -4.5\text{ V}, I_D = -1.1\text{ A}$		1.7	2.6	
Gate-Source Charge	Q_{gs}			0.3		
Gate-Drain Charge	Q_{gd}		0.4			
Gate Resistance	R_g	$f = 1\text{ MHz}$		7.5		Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -6\text{ V}, R_L = 6.7\text{ }\Omega$ $I_D \cong -0.9\text{ A}, V_{GEN} = -4.5\text{ V}, R_g = 1\text{ }\Omega$		12	20	ns
Rise Time	t_r		27	40		
Turn-Off Delay Time	$t_{d(off)}$		15	25		
Fall Time	t_f		10	15		
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -6\text{ V}, R_L = 6.7\text{ }\Omega$ $I_D \cong -0.9\text{ A}, V_{GEN} = -8\text{ V}, R_g = 1\text{ }\Omega$		2	5	
Rise Time	t_r		12	20		
Turn-Off Delay Time	$t_{d(off)}$		12	20		
Fall Time	t_f		10	15		
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^\circ\text{C}$			- 1.0	A
Pulse Diode Forward Current ^a	I_{SM}				- 3.0	
Body Diode Voltage	V_{SD}	$I_S = -0.9\text{ A}$		- 0.8	- 1.2	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = -0.9\text{ A}, dI/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$		20	40	ns
Body Diode Reverse Recovery Charge	Q_{rr}		10	20	nC	
Reverse Recovery Fall Time	t_a		9.5		ns	
Reverse Recovery Rise Time	t_b		11.5			

Notes:

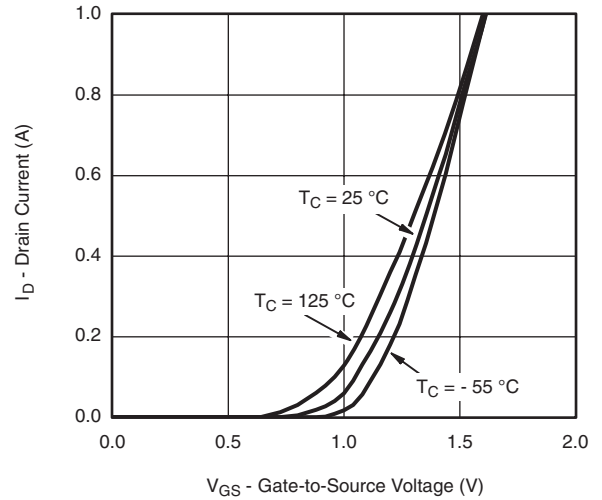
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
b. Guaranteed by design, not subject to production testing.

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.

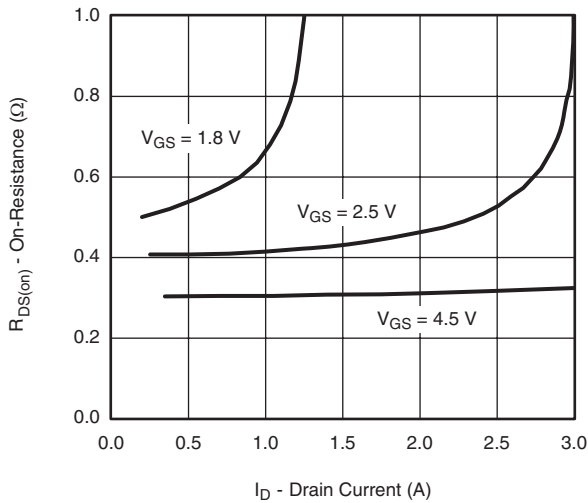
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



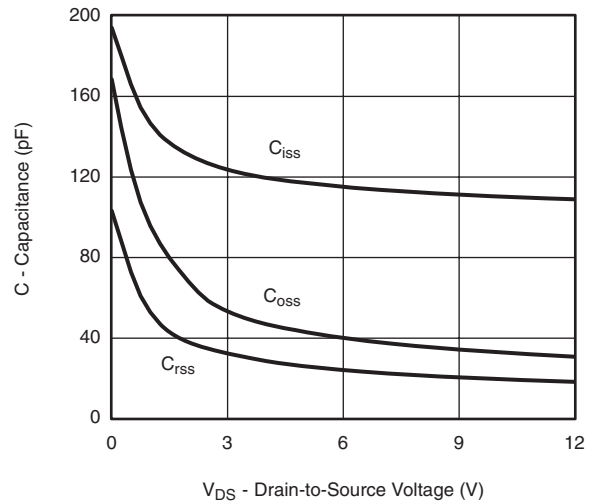
V_{DS} - Drain-to-Source Voltage (V)
Output Characteristics



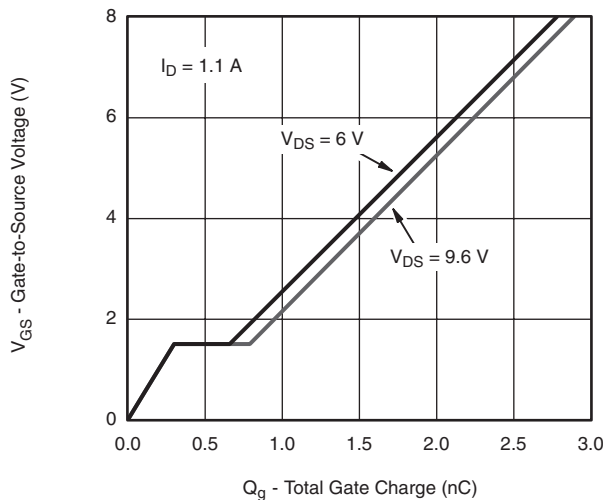
V_{GS} - Gate-to-Source Voltage (V)
Transfer Characteristics



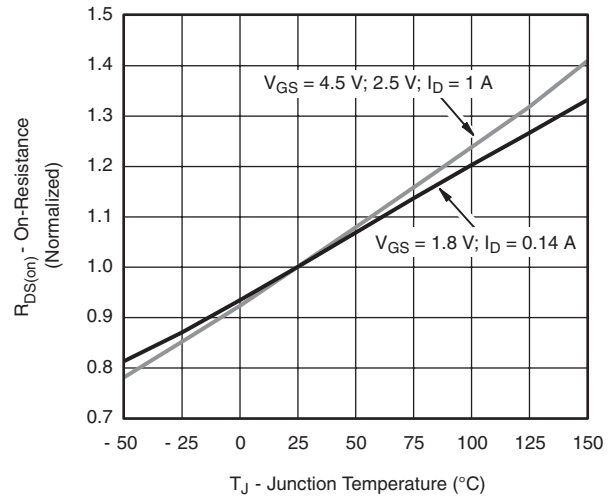
I_D - Drain Current (A)
On-Resistance vs. Drain Current and Gate Voltage



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

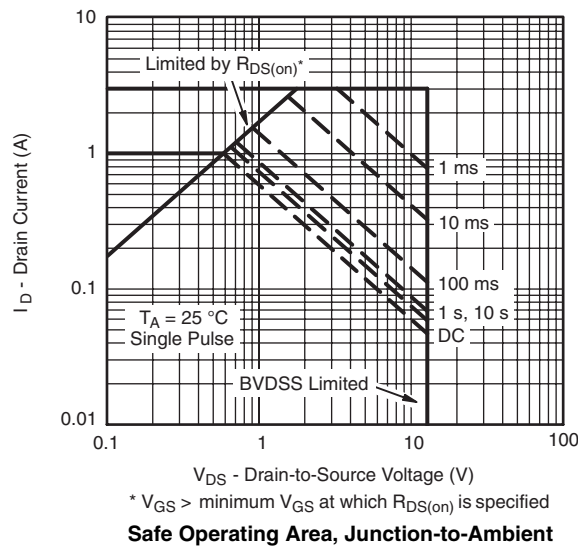
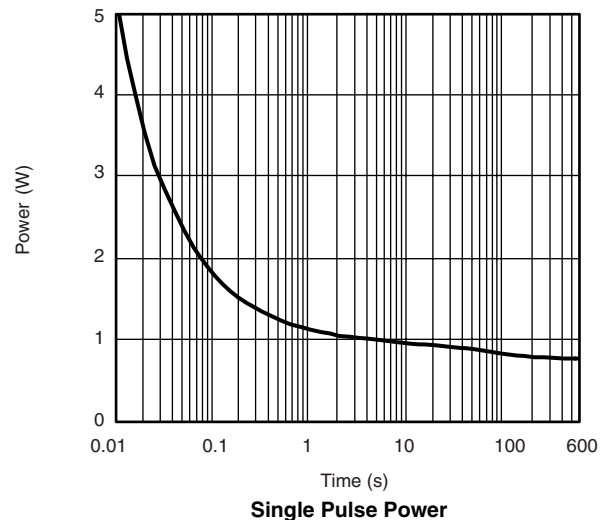
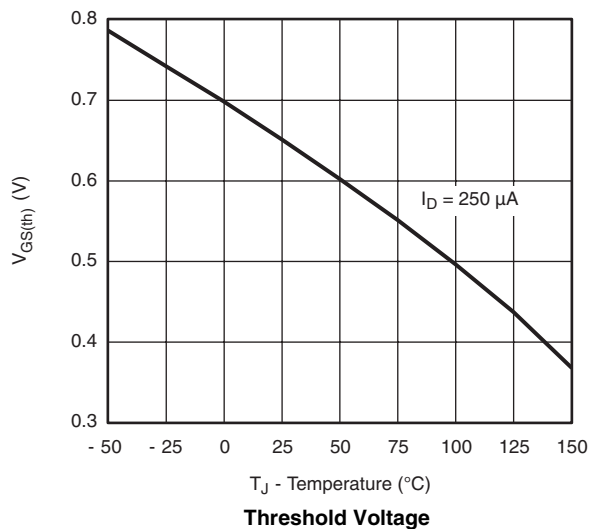
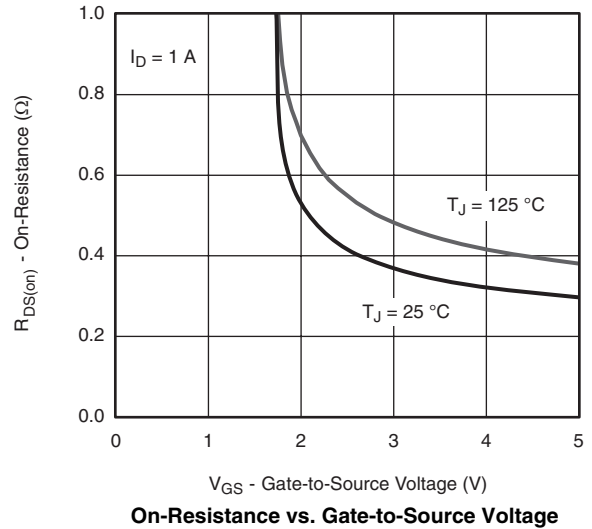
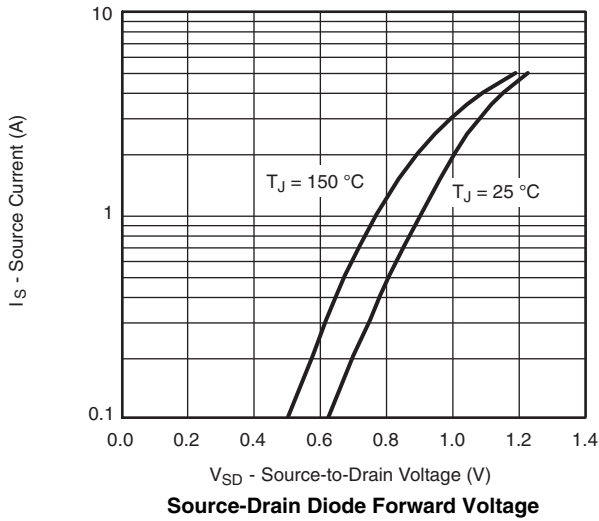


Q_g - Total Gate Charge (nC)
Gate Charge

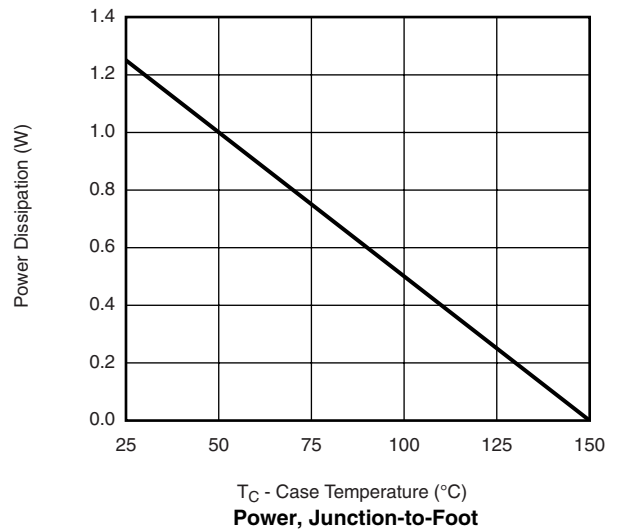
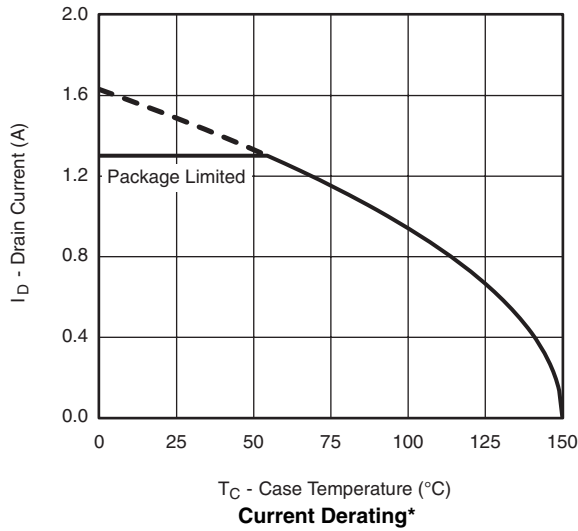


T_J - Junction Temperature ($^{\circ}\text{C}$)
On-Resistance vs. Junction Temperature

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

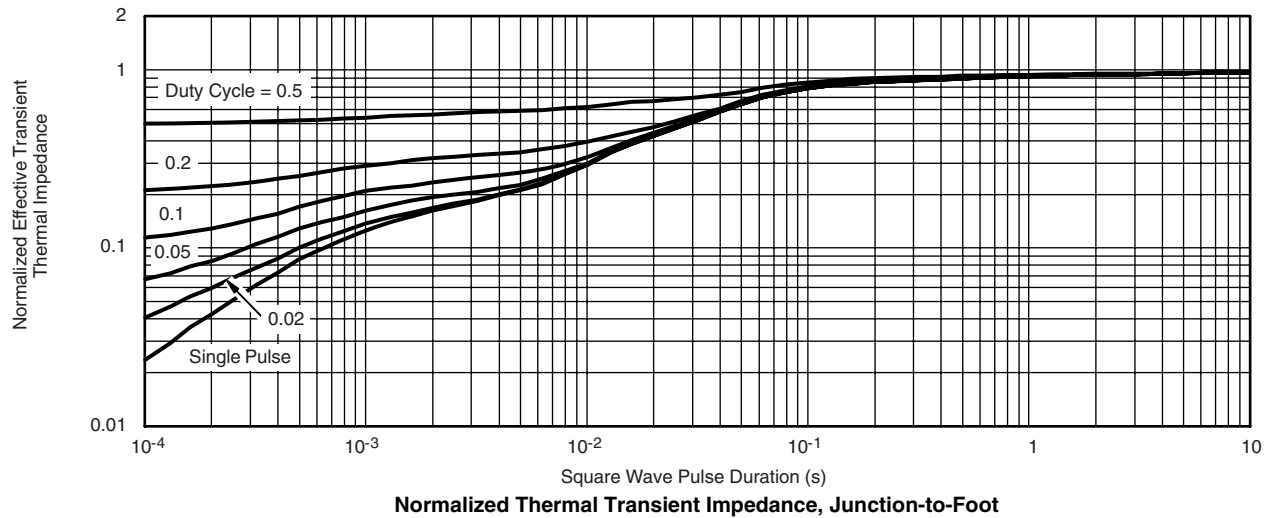
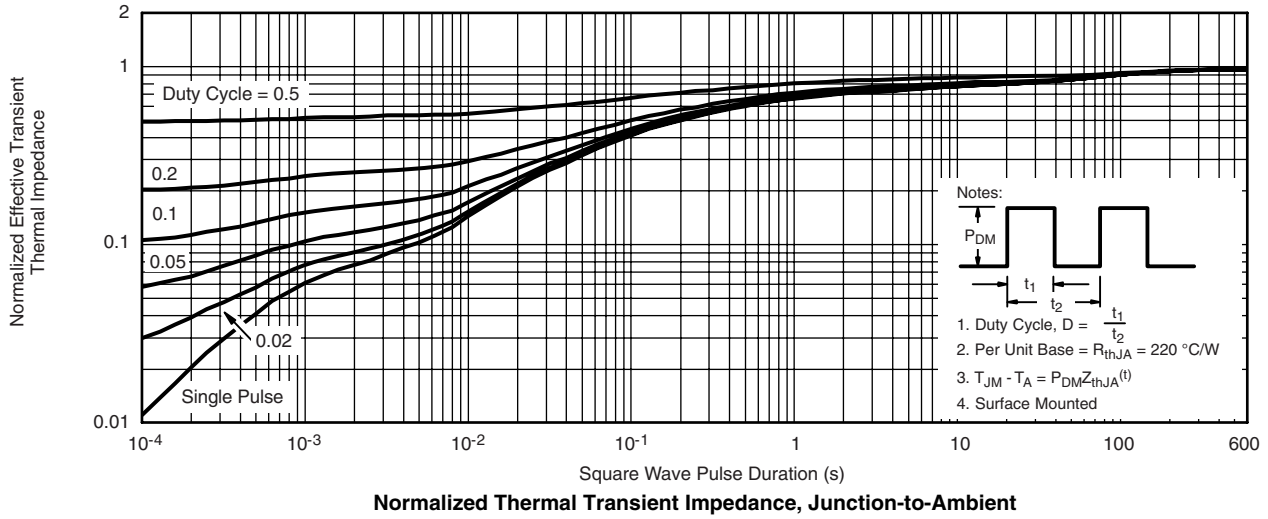


TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



* 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.

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



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