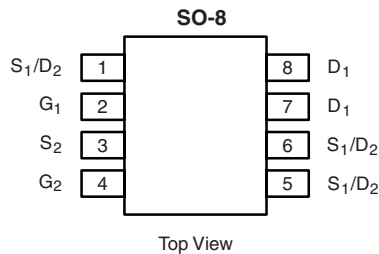


Dual N-Channel 25-V (D-S) MOSFET with Schottky Diode

PRODUCT SUMMARY				
	V _{DS} (V)	R _{DS(on)} (Ω)	I _D (A) ^{a, e}	Q _g (Typ.)
Channel-1	25	0.023 at V _{GS} = 10 V	8.0	5.5
		0.028 at V _{GS} = 4.5 V	8.0	
Channel-2	25	0.023 at V _{GS} = 10 V	8.0	5.5
		0.028 at V _{GS} = 4.5 V	8.0	

SCHOTTKY PRODUCT SUMMARY		
V _{DS} (V)	V _{SD} (V) Diode Forward Voltage	I _F (A) ^a
25	0.43 V at 1.0 A	2.3



Ordering Information: Si4670DY-T1-E3 (Lead (Pb)-free)
Si4670DY-T1-GE3 (Lead (Pb)-free and Halogen-free)

FEATURES

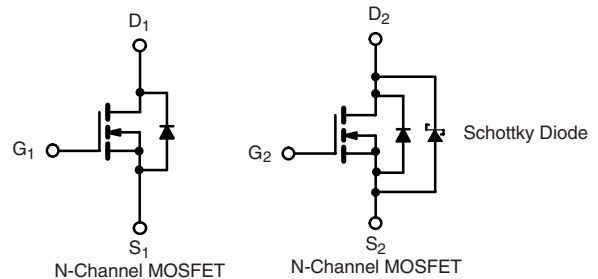
- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET[®] Power MOSFET
- PWM Optimized
- Compliant to RoHS Directive 2002/95/EC



RoHS
COMPLIANT
HALOGEN
FREE
Available

APPLICATIONS

- Synchronous Buck Converter
- Game Machine
- Notebook



ABSOLUTE MAXIMUM RATINGS T _A = 25 °C, unless otherwise noted					
Parameter	Symbol	Channel-1	Channel-2	Unit	
Drain-Source Voltage	V _{DS}	25	25	V	
Gate-Source Voltage	V _{GS}	± 16	± 16		
Continuous Drain Current (T _J = 150 °C)	I _D	T _C = 25 °C	8.0 ^e	8.0 ^e	A
		T _C = 70 °C	7	7	
		T _A = 25 °C	7 ^{b, c}	7 ^{b, c}	
		T _A = 70 °C	5.6 ^{b, c}	5.6 ^{b, c}	
Pulsed Drain Current (10 μs Pulse Width)	I _{DM}	30	30		
Source-Drain Current Diode Current	I _S	T _C = 25 °C	2.3	2.3	
		T _A = 25 °C	1.5 ^{b, c}	1.5 ^{b, c}	
Maximum Power Dissipation	P _D	T _C = 25 °C	2.8	2.8	W
		T _C = 70 °C	1.8	1.8	
		T _A = 25 °C	1.8 ^{b, c}	1.8 ^{b, c}	
		T _A = 70 °C	1.1 ^{b, c}	1.1 ^{b, c}	
Operating Junction and Storage Temperature Range	T _J , T _{stg}	- 55 to 150		°C	

THERMAL RESISTANCE RATINGS						
Parameter	Symbol	Channel-1		Channel-2		Unit
		Typ.	Max.	Typ.	Max.	
Maximum Junction-to-Ambient ^{b, d}	R _{thJA}	57	70	57	70	°C/W
Maximum Junction-to-Foot (Drain)	R _{thJF}	36	44	36	44	

- Notes:
- Based on T_C = 25 °C.
 - Surface Mounted on 1" x 1" FR4 board.
 - t = 10 s.
 - Maximum under Steady State conditions is 110 °C/W (Channel-1 and Channel-2).
 - Package limited.

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}	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	Ch-1	25			V	
		$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	Ch-2	25				
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\ \mu\text{A}$	Ch-1		25		mV/ $^\circ\text{C}$	
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$	$I_D = 250\ \mu\text{A}$	Ch-1		- 4.7			
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	Ch-1	1		2.2	V	
		$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	Ch-2	1		2.2		
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 16\text{ V}$	Ch-1			100	nA	
		$V_{DS} = 0\text{ V}, V_{GS} = \pm 16\text{ V}$	Ch-2			100		
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V}$	Ch-1			0.001	mA	
		$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V}$	Ch-2		0.07	0.5		
		$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V}, T_J = 100^\circ\text{C}$	Ch-1			0.025		
		$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V}, T_J = 100^\circ\text{C}$	Ch-2		5	20		
On-State Drain Current ^b	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$	Ch-1	20			A	
		$V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$	Ch-2	20				
Drain-Source On-State Resistance ^b	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 7\text{ A}$	Ch-1		0.019	0.023	Ω	
		$V_{GS} = 10\text{ V}, I_D = 7\text{ A}$	Ch-2		0.019	0.023		
		$V_{GS} = 4.5\text{ V}, I_D = 6.3\text{ A}$	Ch-1		0.023	0.028		
		$V_{GS} = 4.5\text{ V}, I_D = 6.3\text{ A}$	Ch-2		0.023	0.028		
Forward Transconductance ^b	g_{fs}	$V_{DS} = 10\text{ V}, I_D = 7\text{ A}$	Ch-1		23		S	
		$V_{DS} = 10\text{ V}, I_D = 7\text{ A}$	Ch-2		23			
Dynamic^a								
Input Capacitance	C_{iss}	Channel-1 $V_{DS} = 13\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	Ch-1		680		pF	
			Ch-2		680			
Output Capacitance	C_{oss}		Channel-2 $V_{DS} = 13\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	Ch-1		120		
				Ch-2		180		
Reverse Transfer Capacitance	C_{rss}	Ch-1			55			
		Ch-2			70			
Total Gate Charge	Q_g	$V_{DS} = 13\text{ V}, V_{GS} = 10\text{ V}, I_D = 7\text{ A}$	Ch-1		12	18	nC	
			Ch-2		12	18		
		Channel-1 $V_{DS} = 13\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 7\text{ A}$	Ch-1		5.5	8.5		
			Ch-2		5.5	8.5		
Gate-Source Charge	Q_{gs}	Channel-2 $V_{DS} = 13\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 7\text{ A}$	Ch-1		2			
Ch-2			2					
Gate-Drain Charge	Q_{gd}	Ch-1		1.5				
		Ch-2		1.5				
Gate Resistance	R_g	$f = 1\text{ MHz}$	Ch-1		2.5		Ω	
			Ch-2		3.2			

Notes:

a. Guaranteed by design, not subject to production testing.

b. Pulse test; pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.



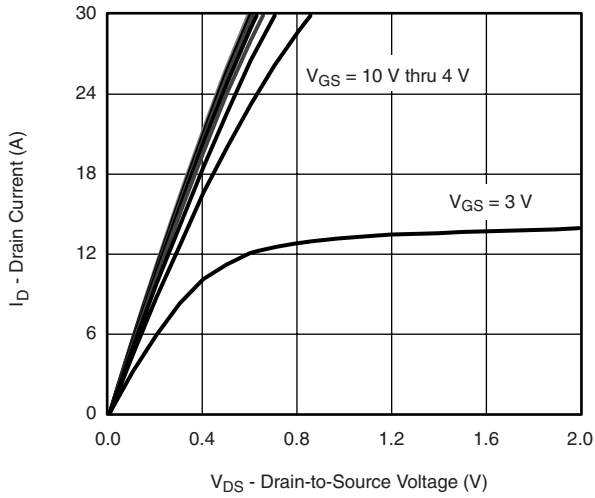
SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted							
Parameter	Symbol	Test Conditions	Min.	Typ. ^a	Max.	Unit	
Dynamic^a							
Turn-On Delay Time	$t_{d(on)}$	Channel-1 $V_{DD} = 13\text{ V}$, $R_L = 2.3\ \Omega$ $I_D \cong 5.6\text{ A}$, $V_{GEN} = 4.5\text{ V}$, $R_g = 1\ \Omega$	Ch-1		15	25	ns
			Ch-2		15	25	
Rise Time	t_r		Ch-1		50	75	
			Ch-2		50	75	
Turn-Off Delay Time	$t_{d(off)}$	Channel-2 $V_{DD} = 13\text{ V}$, $R_L = 2.3\ \Omega$ $I_D \cong 5.6\text{ A}$, $V_{GEN} = 4.5\text{ V}$, $R_g = 1\ \Omega$	Ch-1		20	30	
			Ch-2		20	30	
Fall Time	t_f		Ch-1		10	15	
			Ch-2		10	15	
Turn-On Delay Time	$t_{d(on)}$	Channel-1 $V_{DD} = 13\text{ V}$, $R_L = 2.3\ \Omega$ $I_D \cong 5.6\text{ A}$, $V_{GEN} = 10\text{ V}$, $R_g = 1\ \Omega$	Ch-1		10	15	
			Ch-2		10	15	
Rise Time	t_r		Ch-1		12	20	
			Ch-2		12	20	
Turn-Off Delay Time	$t_{d(off)}$	Channel-2 $V_{DD} = 13\text{ V}$, $R_L = 2.3\ \Omega$ $I_D \cong 5.6\text{ A}$, $V_{GEN} = 10\text{ V}$, $R_g = 1\ \Omega$	Ch-1		15	25	
			Ch-2		15	25	
Fall Time	t_f		Ch-1		10	15	
			Ch-2		10	15	
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^\circ\text{C}$	Ch-1			2.3	A
			Ch-2			2.3	
Pulse Diode Forward Current ^a	I_{SM}		Ch-1			30	
			Ch-2			30	
Body Diode Voltage	V_{SD}	$I_S = 5.6\text{ A}$	Ch-1		0.8	1.2	V
		$I_S = 1\text{ A}$	Ch-2		0.37	0.43	
Body Diode Reverse Recovery Time	t_{rr}	Channel-1 $I_F = 5.6\text{ A}$, $dI/dt = 100\text{ A}/\mu\text{s}$, $T_J = 25\text{ }^\circ\text{C}$	Ch-1		15	30	ns
			Ch-2		15	30	
Body Diode Reverse Recovery Charge	Q_{rr}	Channel-2 $I_F = 5.6\text{ A}$, $dI/dt = 100\text{ A}/\mu\text{s}$, $T_J = 25\text{ }^\circ\text{C}$	Ch-1		8	16	nC
			Ch-2		8	16	
Reverse Recovery Fall Time	t_a		Ch-1		8.5		ns
			Ch-2		8.5		
Reverse Recovery Rise Time	t_b		Ch-1		6.5		
			Ch-2		6.5		

Notes:

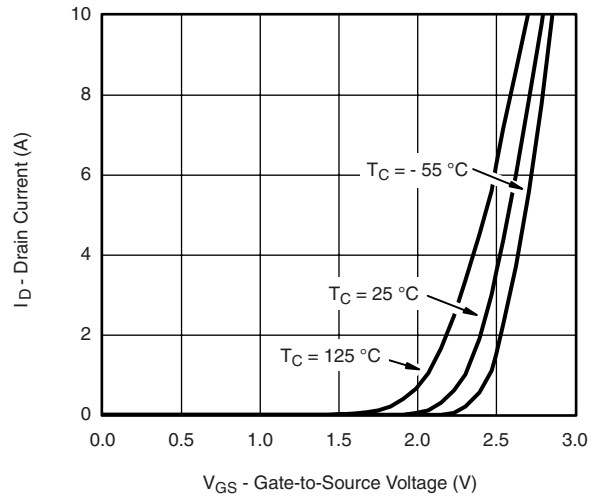
- a. Guaranteed by design, not subject to production testing.
- b. Pulse test; pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.

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.

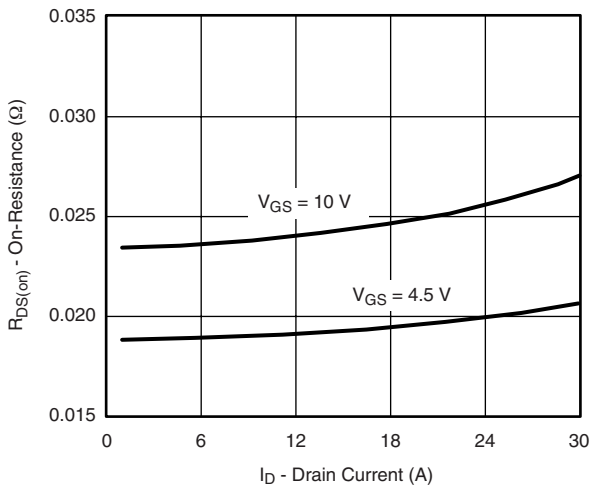
CHANNEL-1 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



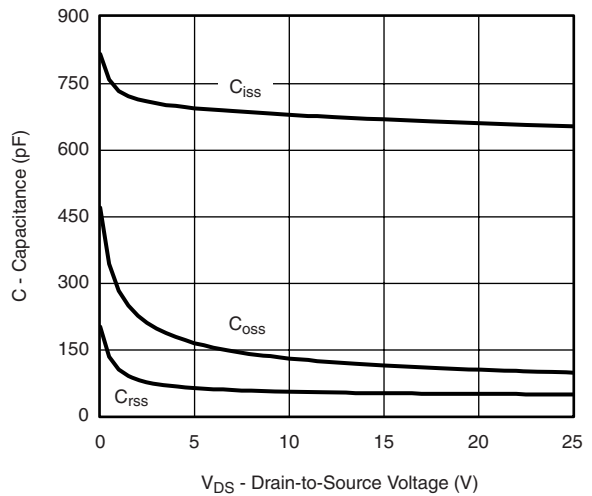
Output Characteristics



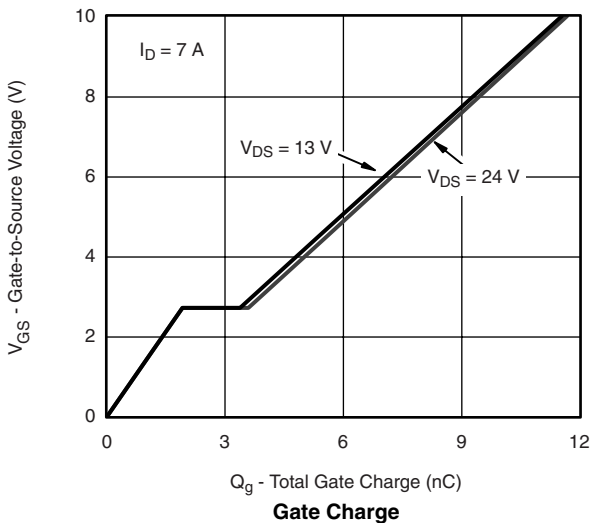
Transfer Characteristics



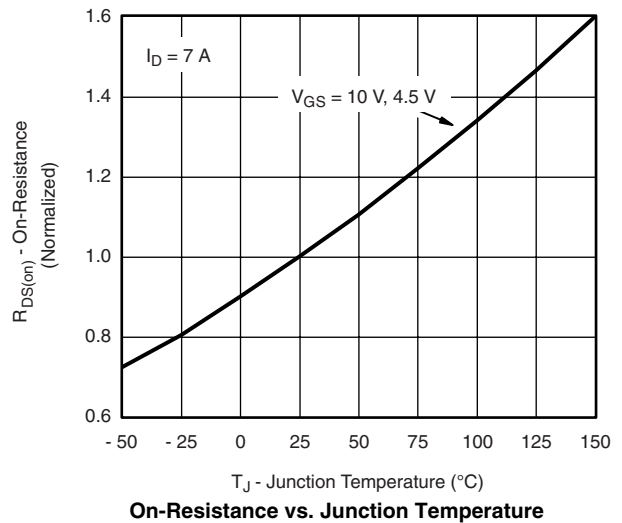
On-Resistance vs. Drain Current



Capacitance

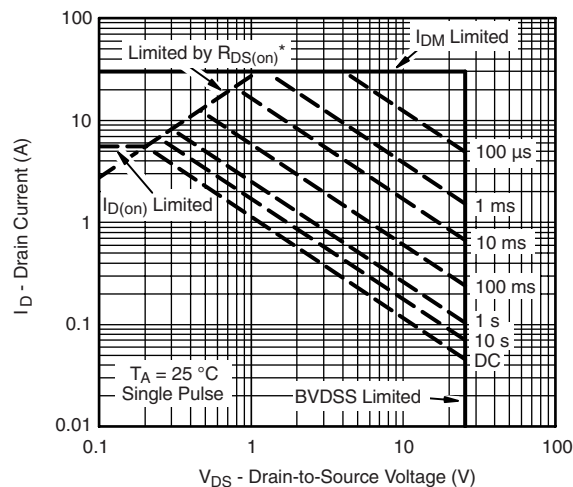
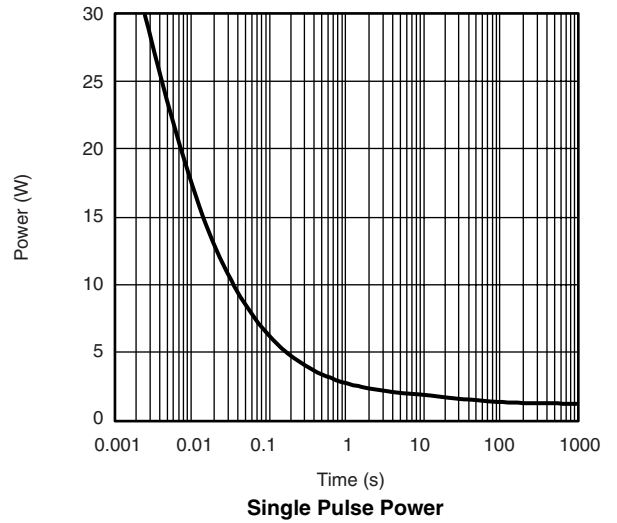
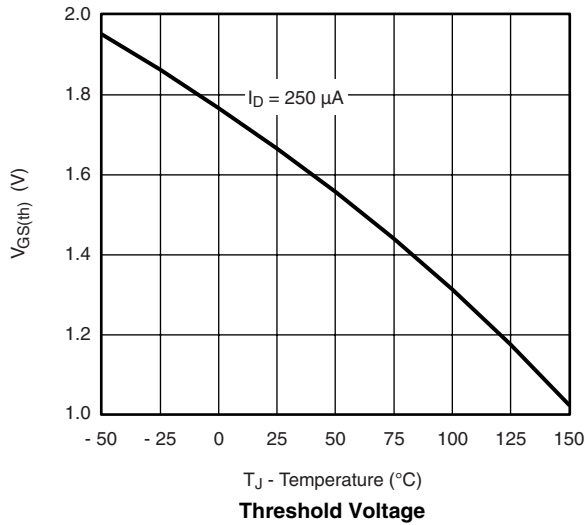
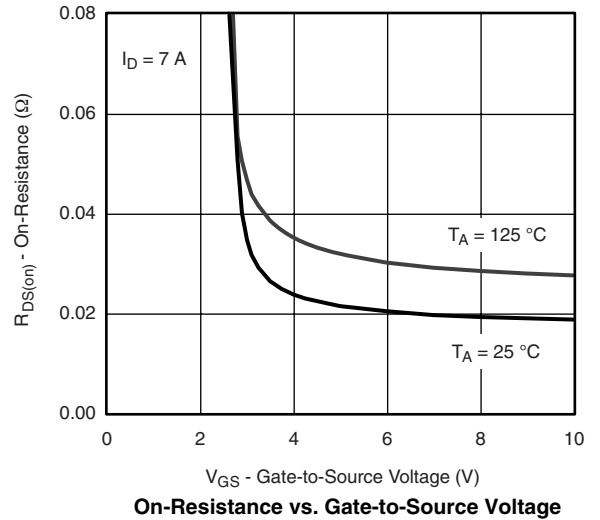
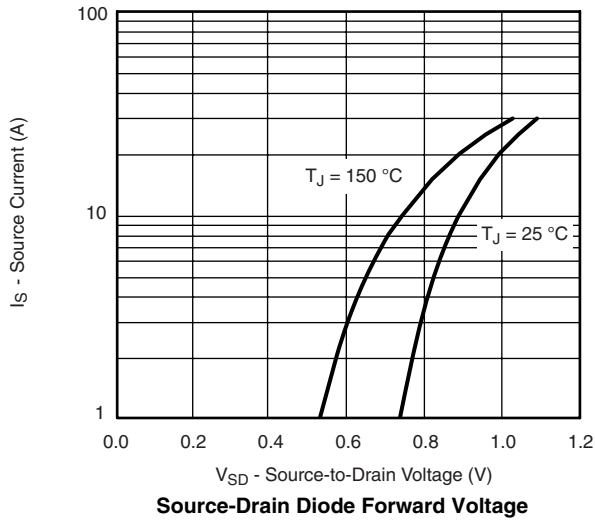


Gate Charge



On-Resistance vs. Junction Temperature

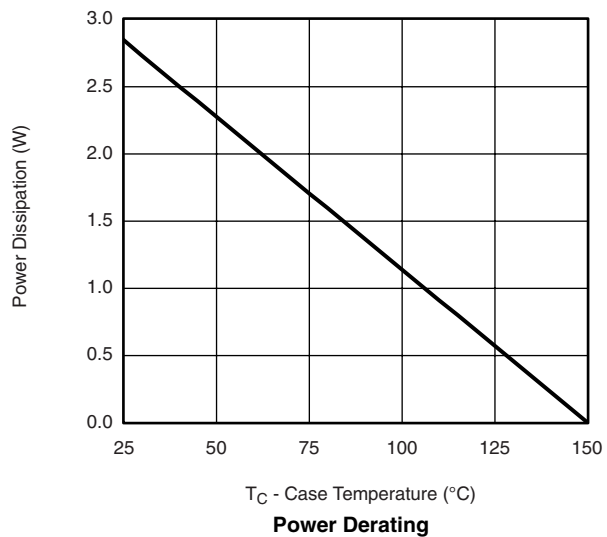
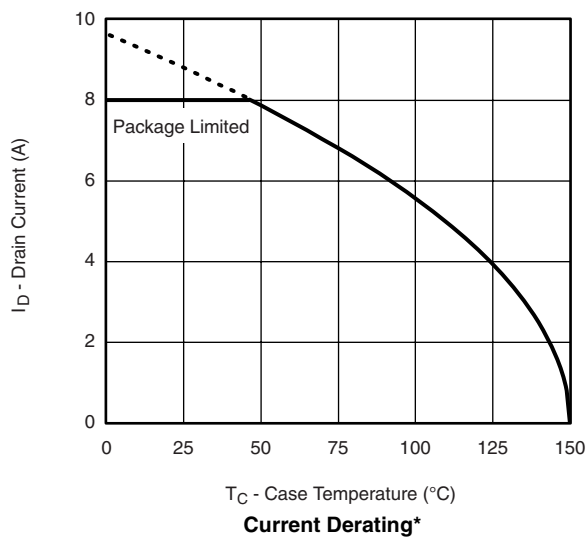
CHANNEL-1 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



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

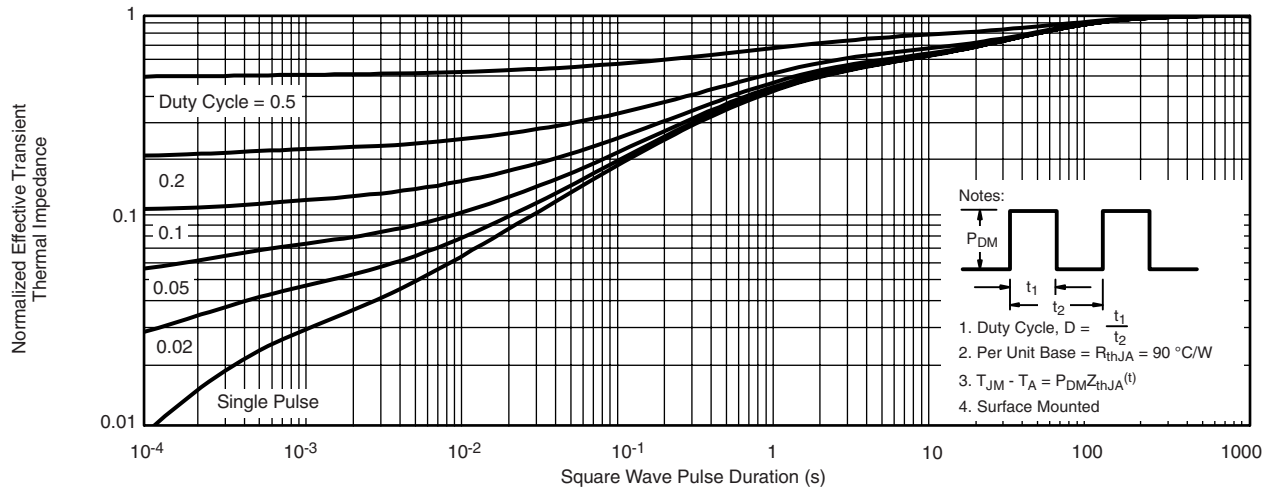
Safe Operating Area, Junction-to-Ambient

CHANNEL-1 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

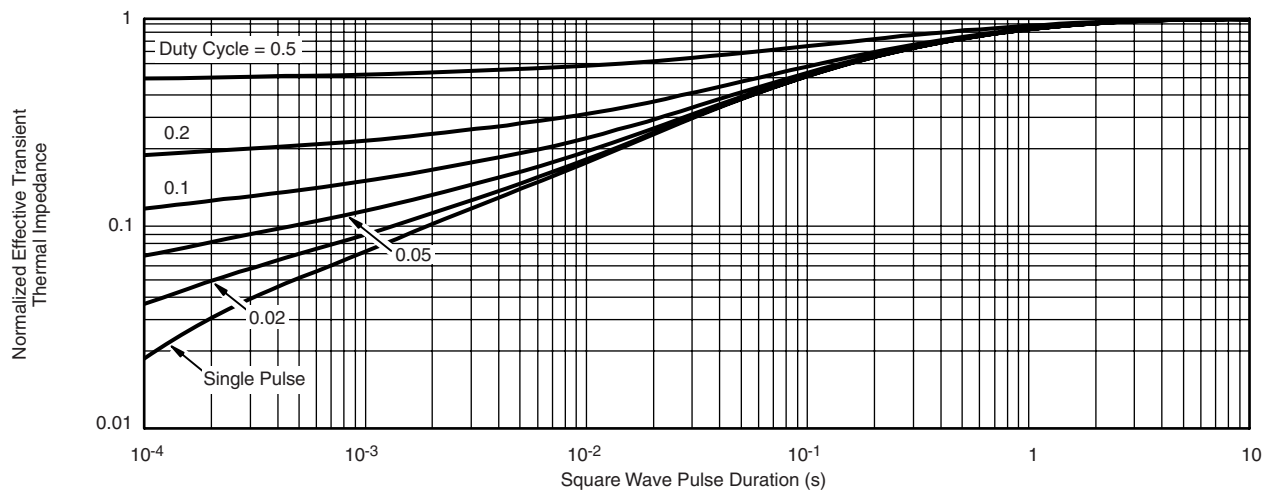


* The power dissipation P_D is based on $T_{J(max)} = 150$ °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

CHANNEL-1 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

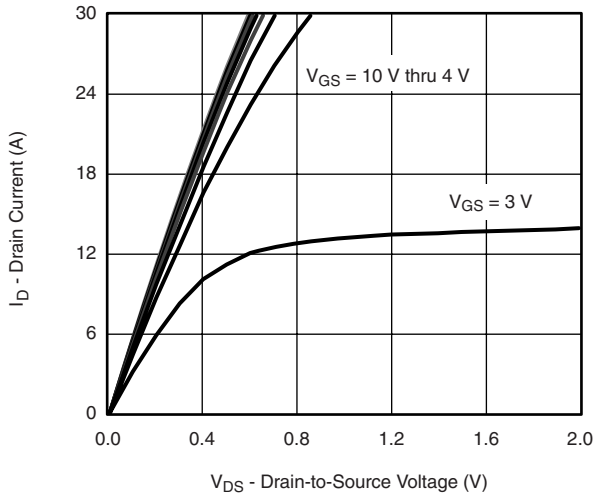


Normalized Thermal Transient Impedance, Junction-to-Ambient

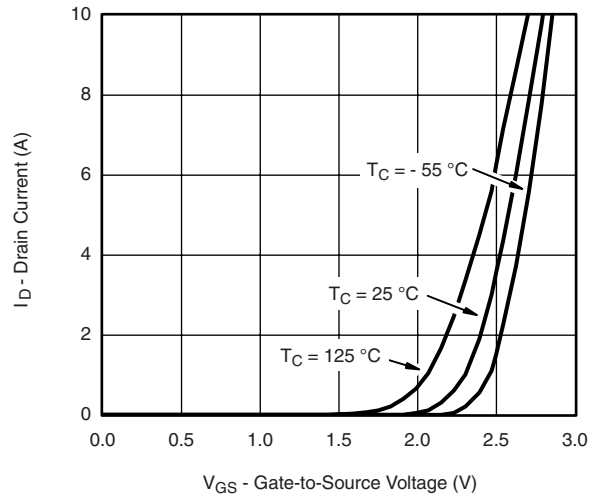


Normalized Thermal Transient Impedance, Junction-to-Foot

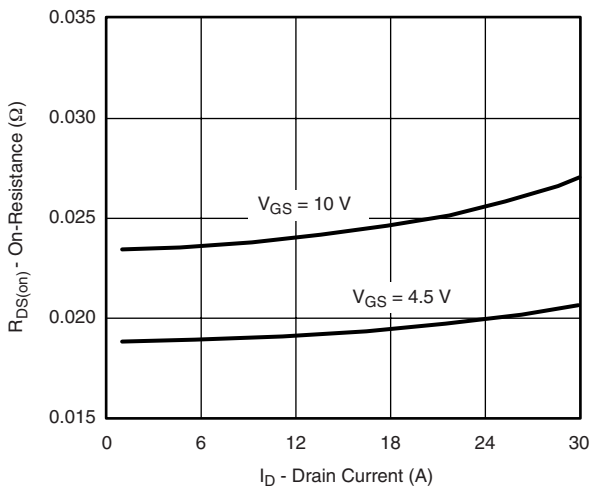
CHANNEL-2 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



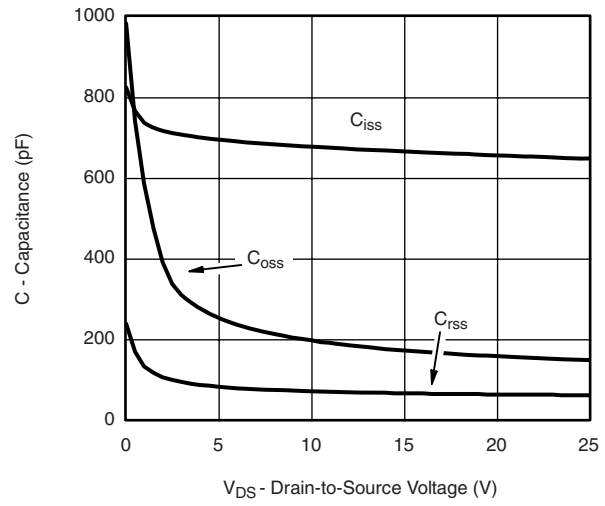
Output Characteristics



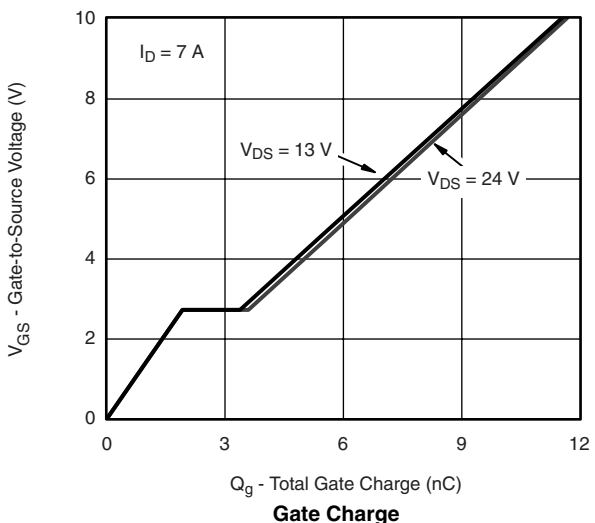
Transfer Characteristics



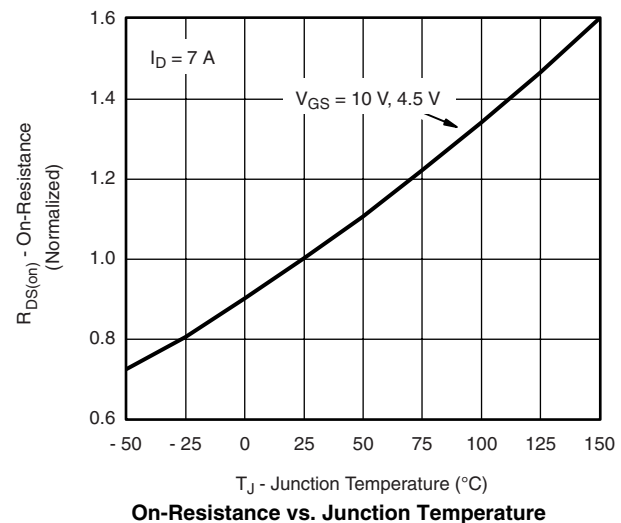
On-Resistance vs. Drain Current



Capacitance

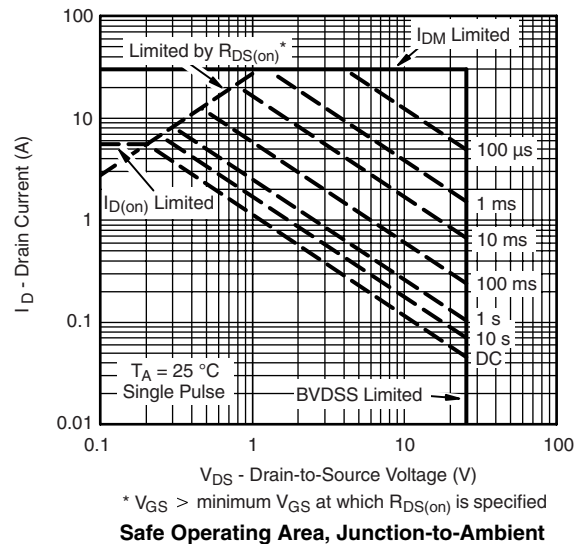
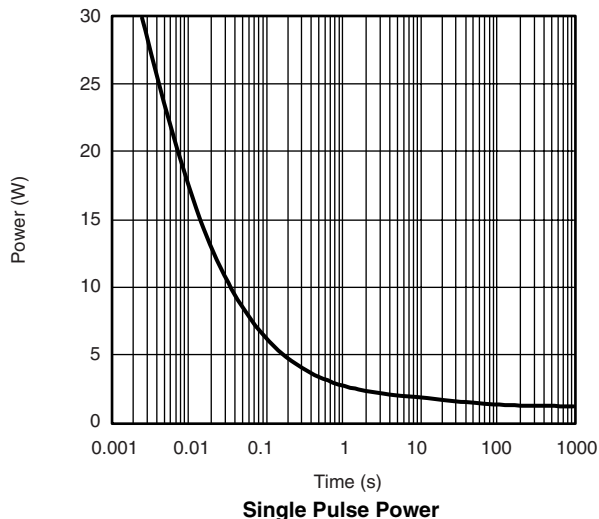
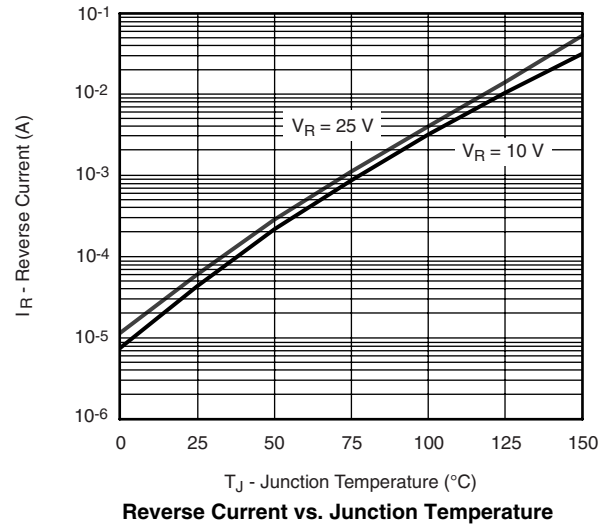
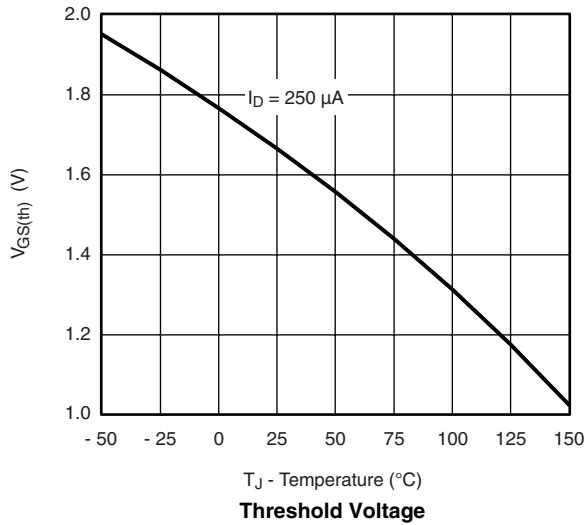
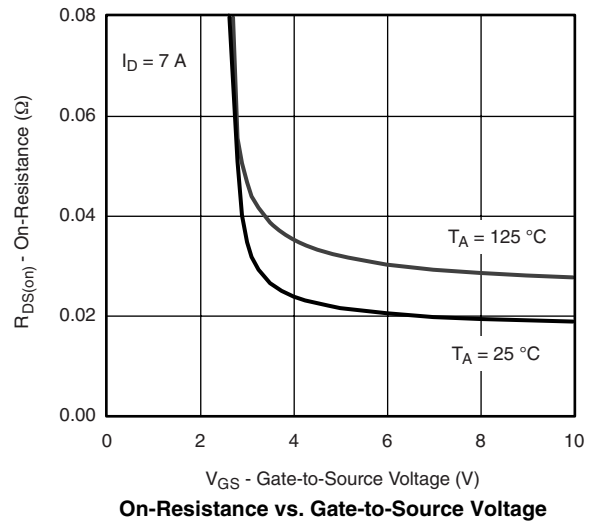
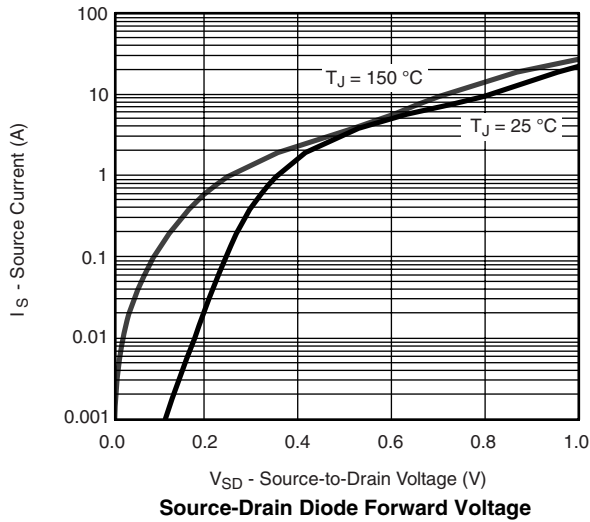


Gate Charge

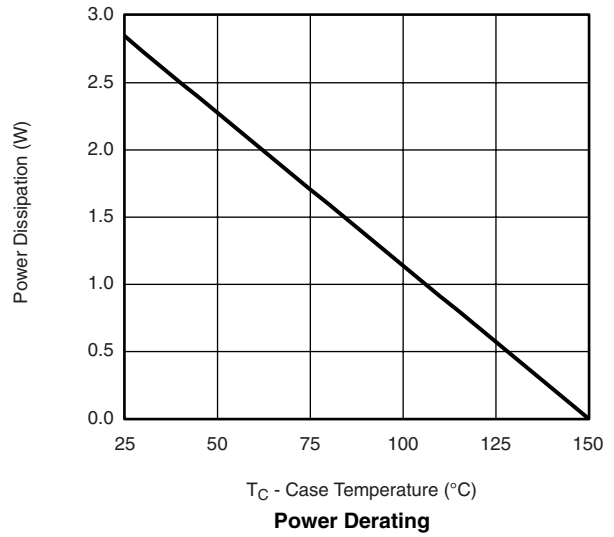
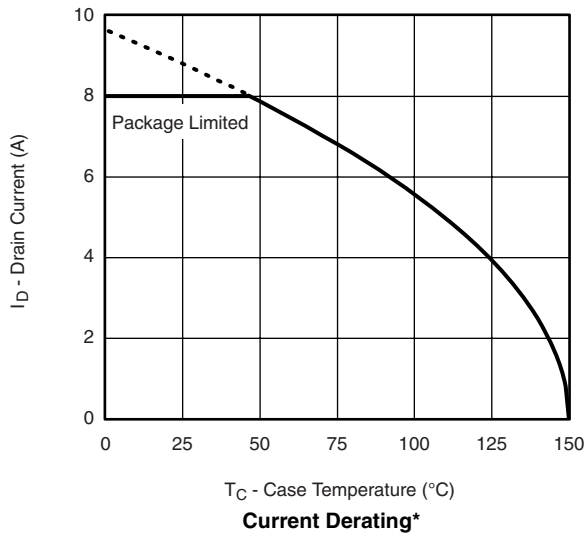


On-Resistance vs. Junction Temperature

CHANNEL-2 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

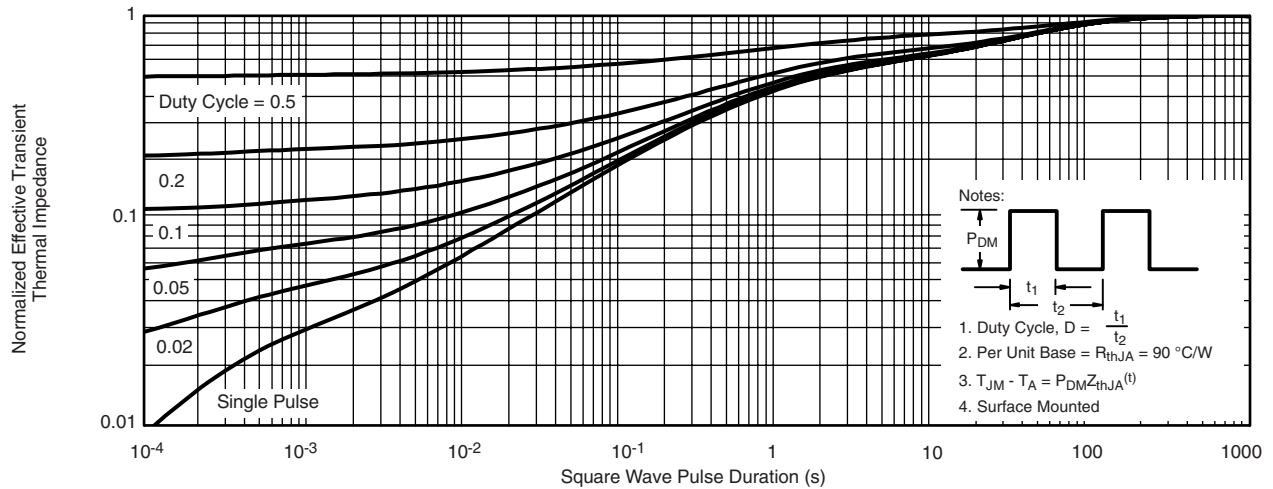


CHANNEL-2 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

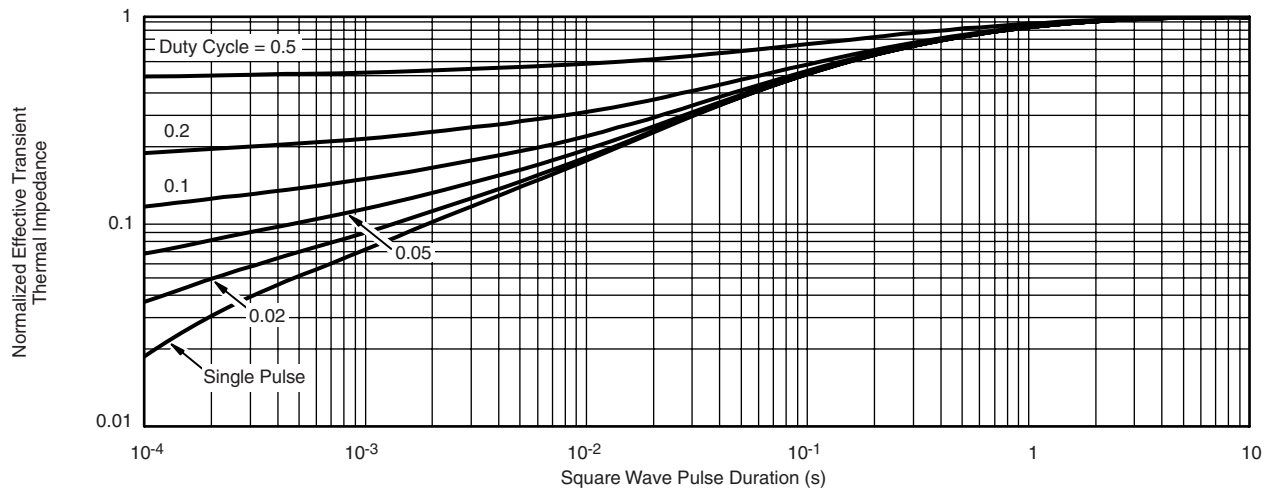


* The power dissipation P_D is based on $T_{J(max)} = 150$ °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

CHANNEL-2 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Foot

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SOIC (NARROW): 8-LEAD

JEDEC Part Number: MS-012



DIM	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	1.35	1.75	0.053	0.069
A ₁	0.10	0.20	0.004	0.008
B	0.35	0.51	0.014	0.020
C	0.19	0.25	0.0075	0.010
D	4.80	5.00	0.189	0.196
E	3.80	4.00	0.150	0.157
e	1.27 BSC		0.050 BSC	
H	5.80	6.20	0.228	0.244
h	0.25	0.50	0.010	0.020
L	0.50	0.93	0.020	0.037
q	0°	8°	0°	8°
S	0.44	0.64	0.018	0.026
ECN: C-06527-Rev. I, 11-Sep-06				
DWG: 5498				

RECOMMENDED MINIMUM PADS FOR SO-8



Recommended Minimum Pads
Dimensions in Inches/(mm)

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