N- and P-Channel for Level Shift Load Switch

PRODUCT SUMMARY				
	V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)	Q_g (Typ.)
N-Channel	20	0.225 at V_{GS} = 4.5 V	1.5[a]	1.1 nC
		0.270 at V_{GS} = 2.5 V	1.5[a]	
		0.345 at V_{GS} = 1.8 V	1.5[a]	
		0.960 at V_{GS} = 1.5 V	0.5	
P-Channel	- 12	0.057 at V_{GS} = - 4.5 V	- 4.5[a]	5 nC
		0.077 at V_{GS} = - 2.5 V	- 4.5[a]	
		0.115 at V_{GS} = - 1.8 V	- 4.5[a]	
		0.200 at V_{GS} = - 1.5 V	- 1.5	

FEATURES

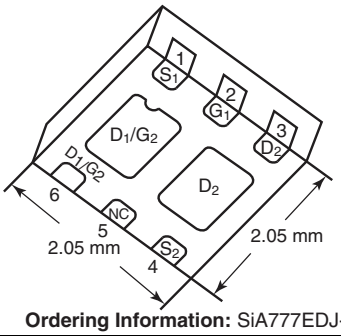
- **Halogen-free According to IEC 61249-2-21 Definition**
- TrenchFET® Power MOSFETs
- Typical ESD Protection: N-Channel 2800 V P-Channel 1900 V
- 100 % R_g Tested
- Compliant to RoHS Directive 2002/95/EC

Pb-free
RoHS COMPLIANT
HALOGEN FREE

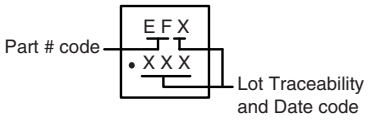
APPLICATIONS

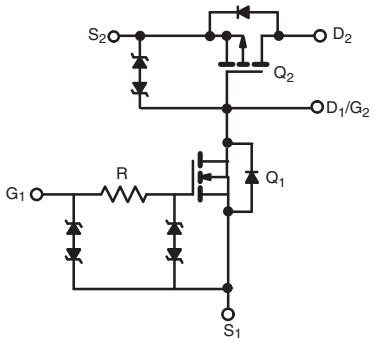
- Load Switch with Level Shift for Portable Devices
  - N-Channel for Level Shift Drive
  - P-Channel for Main Switch

PowerPAK® SC-70-6 Dual



Marking Code





Ordering Information: SiA777EDJ-T1-GE3 (Lead (Pb)-free and Halogen-free)

ABSOLUTE MAXIMUM RATINGS T_A = 25 °C, unless otherwise noted

Parameter		Symbol	N-Channel	P-Channel	Unit
Drain-Source Voltage		V_{DS}	20	- 12	V
Gate-Source Voltage		V_{GS}	± 6	± 8	
Continuous Drain Current (T_J = 150 °C)	T_C = 25 °C	I_D	1.5[a]	- 4.5[a]	A
	T_C = 70 °C		1.5[a]	- 4.5[a]	
	T_A = 25 °C		1.5[a, b, c]	- 4.5[a, b, c]	
	T_A = 70 °C		1.5[a, b, c]	- 3.9[b, c]	
Pulsed Drain Current		I_{DM}	4	- 15	
Source Drain Current Diode Current	T_C = 25 °C	I_S	1.5[a]	- 4.5[a]	
	T_A = 25 °C		1.6[b, c]	- 1.6[b, c]	
Maximum Power Dissipation	T_C = 25 °C	P_D	5	7.8	W
	T_C = 70 °C		3.2	5	
	T_A = 25 °C		1.9[b, c]	1.9[b, c]	
	T_A = 70 °C		1.2[b, c]	1.2[b, c]	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to 150		°C
Soldering Recommendations (Peak Temperature)[d, e]			260		

THERMAL RESISTANCE RATINGS

Parameter		Symbol	N-Channel		P-Channel		Unit
			Typ.	Max.	Typ.	Max.	
Maximum Junction-to-Ambient[b, f]	t ≤ 5 s	R_{thJA}	52	65	52	65	°C/W
Maximum Junction-to-Case (Drain)	Steady State	R_{thJC}	20	25	12.5	16	

Notes:
a. Package limited.
b. Surface mounted on 1" x 1" FR4 board.
c. t = 5 s.
d. See solder profile (www.vishay.com/doc?73257). The PowerPAK SC-70 is a leadless package. The end of the lead terminal is exposed copper (not plated) as a result of the singulation process in manufacturing. A solder fillet at the exposed copper tip cannot be guaranteed and is not required to ensure adequate bottom side solder interconnection.
e. Rework Conditions: manual soldering with a soldering iron is not recommended for leadless components.
f. Maximum under steady state conditions for channel 1 and channel 2 is 110 °C/W.

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	N-Ch	20			V
		V_{GS} = 0 V, I_D = - 250 µA	P-Ch	- 12			
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	I_D = 250 µA	N-Ch		21		mV/°C
		I_D = - 250 µA	P-Ch		- 3		
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$	I_D = 250 µA	N-Ch		- 2.3		
		I_D = - 250 µA	P-Ch		2.3		
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA	N-Ch	0.4		1.0	V
		V_{DS} = V_{GS}, I_D = - 250 µA	P-Ch	- 0.4		- 1	
Gate-Body Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 3 V	N-Ch			± 1	µA
		V_{DS} = 0 V, V_{GS} = ± 4.5 V	P-Ch			± 0.5	
		V_{DS} = 0 V, V_{GS} = ± 6 V	N-Ch			± 1	mA
		V_{DS} = 0 V, V_{GS} = ± 8 V	P-Ch			± 3	
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 20 V, V_{GS} = 0 V	N-Ch			1	µA
		V_{DS} = - 12 V, V_{GS} = 0 V	P-Ch			- 1	
		V_{DS} = 20 V, V_{GS} = 0 V, T_J = 55 °C	N-Ch			10	
		V_{DS} = - 12 V, V_{GS} = 0 V, T_J = 55 °C	P-Ch			- 10	
On-State Drain Current[b]	$I_{D(on)}$	V_{DS} ≥ 5 V, V_{GS} = 4.5 V	N-Ch	4			A
		V_{DS} ≤ - 5 V, V_{GS} = - 4.5 V	P-Ch	- 10			
Drain-Source On-State Resistance[b]	$R_{DS(on)}$	V_{GS} = 4.5 V, I_D = 1.6 A	N-Ch		0.183	0.225	Ω
		V_{GS} = - 4.5 V, I_D = - 3.8 A	P-Ch		0.047	0.057	
		V_{GS} = 2.5 V, I_D = 1.5 A	N-Ch		0.220	0.270	
		V_{GS} = - 2.5 V, I_D = - 3.3 A	P-Ch		0.063	0.077	
		V_{GS} = 1.8 V, I_D = 1.3 A	N-Ch		0.275	0.345	
		V_{GS} = - 1.8 V, I_D = 2.6 A	P-Ch		0.095	0.115	
		V_{GS} = 1.5 V, I_D = 0.3 A	N-Ch		0.320	0.960	
		V_{GS} = - 1.5 V, I_D = 1 A	P-Ch		0.125	0.200	
Forward Transconductance[b]	g_{fs}	V_{DS} = 10 V, I_D = 1.6 A	N-Ch		3.5		S
		V_{DS} = - 10 V, I_D = - 3.8 A	P-Ch		11		
Dynamic[a]							
Total Gate Charge	Q_g	V_{DS} = 10 V, V_{GS} = 5 V, I_D = 1.7 A	N-Ch		1.3	2.2	nC
		V_{DS} = - 6 V, V_{GS} = - 8 V, I_D = - 4.9 A	P-Ch		7.5	12	
		N-Channel V_{DS} = 10 V, V_{GS} = 4.5 V, I_D = 1.7 A	N-Ch		1.1	1.7	
			P-Ch		5	8	
Gate-Source Charge	Q_{gs}		N-Ch		0.2		
		P-Channel V_{DS} = - 6 V, V_{GS} = - 4.5 V, I_D = - 4.9 A	P-Ch		0.6		
Gate-Drain Charge	Q_{gd}		N-Ch		0.1		
			P-Ch		1.8		
Gate Resistance	R_g	f = 1 MHz	N-Ch	40	200	400	Ω
			P-Ch	2	10	20	

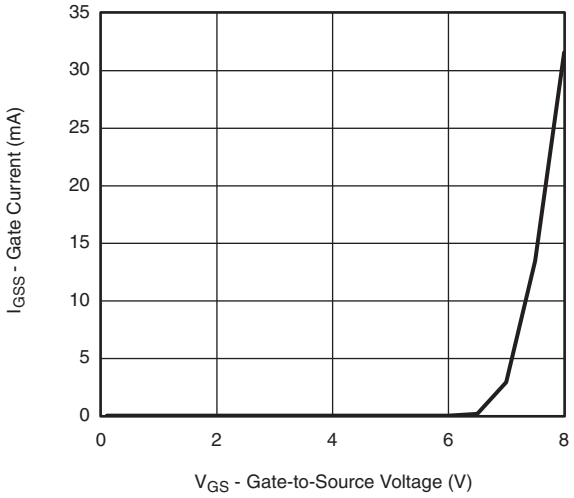
Notes:
a. Guaranteed by design, not subject to production testing.
b. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.

SPECIFICATIONS T_J = 25 °C, unless otherwise noted							
Parameter	**Symbol**	**Test Conditions**		**Min.**	**Typ.**	**Max.**	**Unit**
Dynamic[a]							
Turn-On Delay Time	$t_{d(on)}$	N-Channel V_{DD} = 10 V, R_L = 7.7 Ω $I_D \cong$ 1.3 A, V_{GEN} = 4.5 V, R_g = 1 Ω	N-Ch		20	30	ns
			P-Ch		20	30	
Rise Time	t_r		N-Ch		12	20	
			P-Ch		20	30	
Turn-Off Delay Time	$t_{d(off)}$	P-Channel V_{DD} = - 6 V, R_L = 1.5 Ω $I_D \cong$ - 3.9 A, V_{GEN} = - 4.5 V, R_g = 1 Ω	N-Ch		70	105	
			P-Ch		32	50	
Fall Time	t_f		N-Ch		20	30	
			P-Ch		16	25	
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I_S	T_C = 25 °C	N-Ch			1.5	A
			P-Ch			- 4.5	
Pulse Diode Forward Current[a]	I_{SM}		N-Ch			4	
			P-Ch			- 15	
Body Diode Voltage	V_{SD}	I_S = 1.3 A, V_{GS} = 0 V	N-Ch		0.9	1.2	V
		I_S = - 3.9 A, V_{GS} = 0 V	P-Ch		- 0.8	- 1.2	
Body Diode Reverse Recovery Time	t_{rr}	N-Channel I_F = 1.3 A, dI/dt = 100 A/µs, T_J = 25 °C P-Channel I_F = - 3.9 A, dI/dt = - 100 A/µs, T_J = 25 °C	N-Ch		50	75	ns
			P-Ch		45	70	
Body Diode Reverse Recovery Charge	Q_{rr}		N-Ch		30	45	nC
			P-Ch		25	40	
Reverse Recovery Fall Time	t_a		N-Ch		15		ns
			P-Ch		15		
Reverse Recovery Rise Time	t_b		N-Ch		35		
			P-Ch		30		

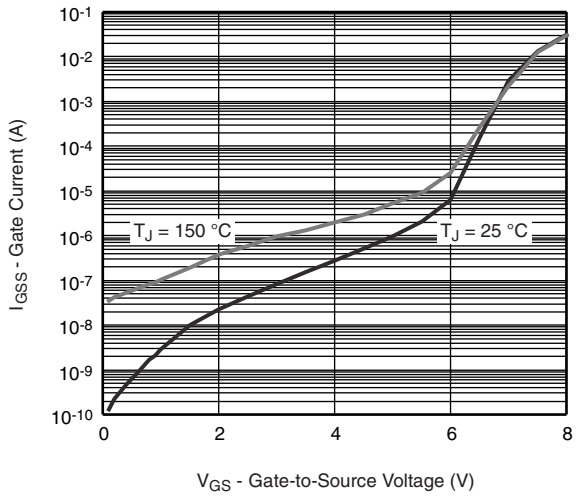
Notes:
a. Guaranteed by design, not subject to production testing.
b. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.

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.

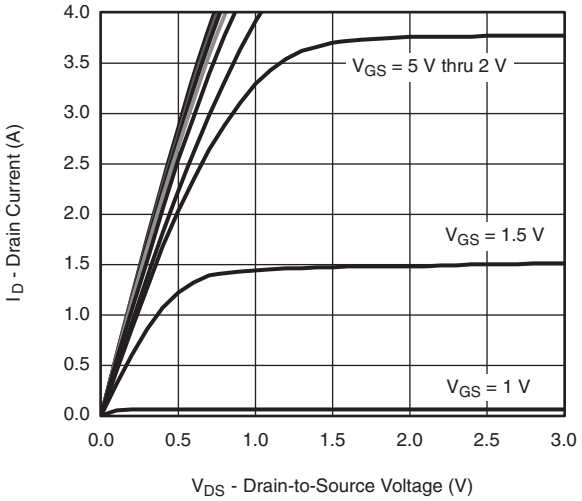
N-CHANNEL TYPICAL CHARACTERISTICS T_A = 25 °C, unless otherwise noted



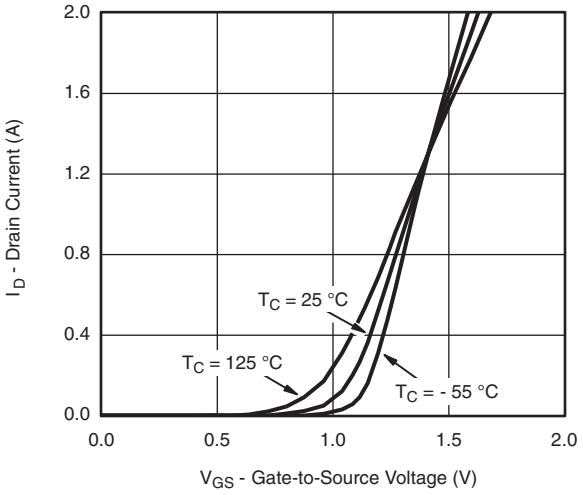
Gate Current vs. Gate-to-Source Voltage



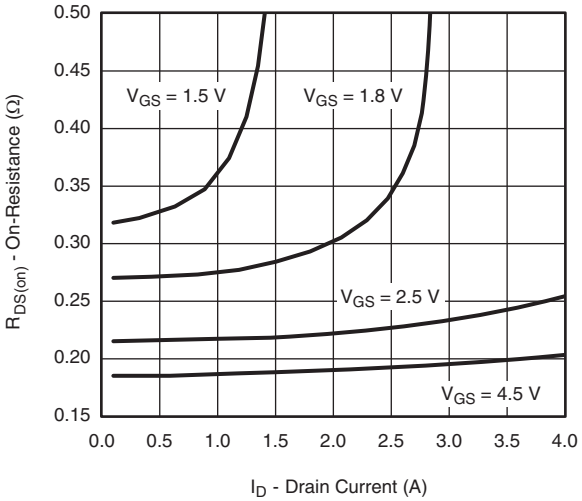
Gate Current vs. Gate-to-Source Voltage



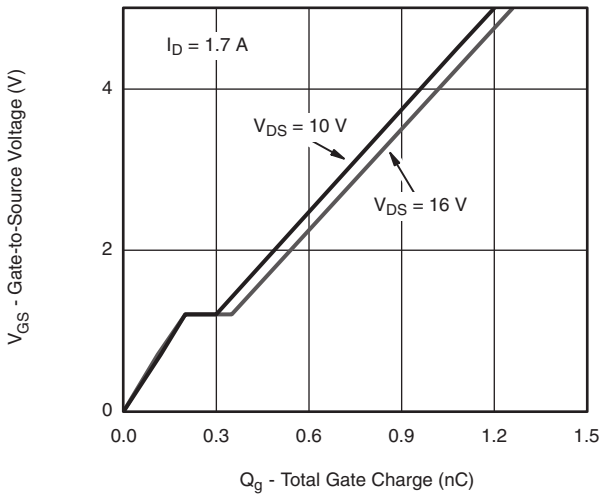
Output Characteristics



Transfer Characteristics

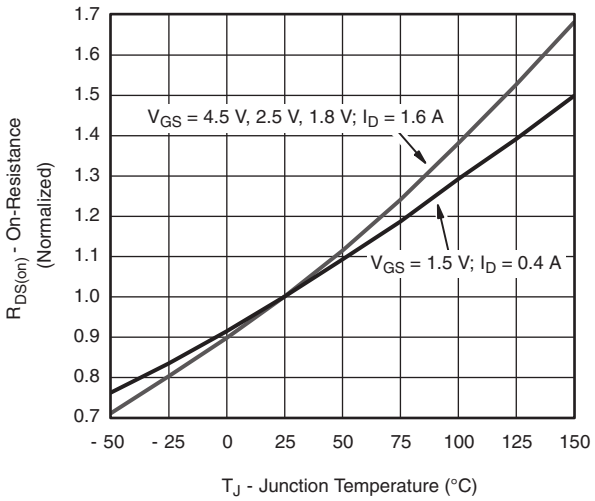


On-Resistance vs. Drain Current

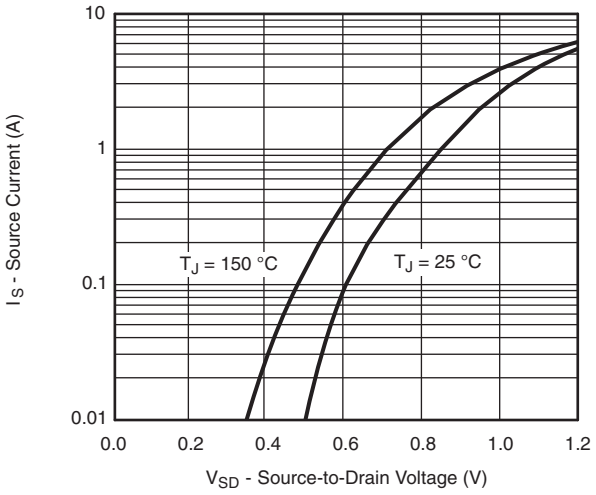


Gate Charge

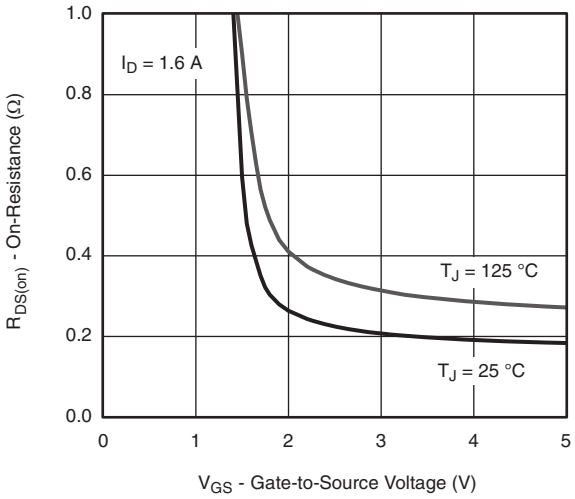
N-CHANNEL TYPICAL CHARACTERISTICS T_A = 25 °C, unless otherwise noted



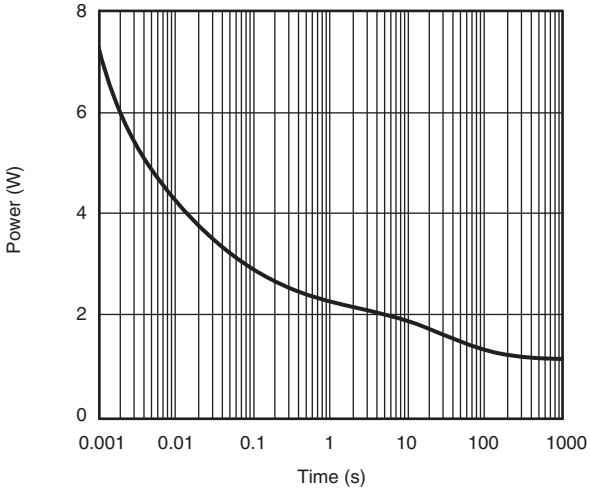
Normalized On-Resistance vs. Junction Temperature



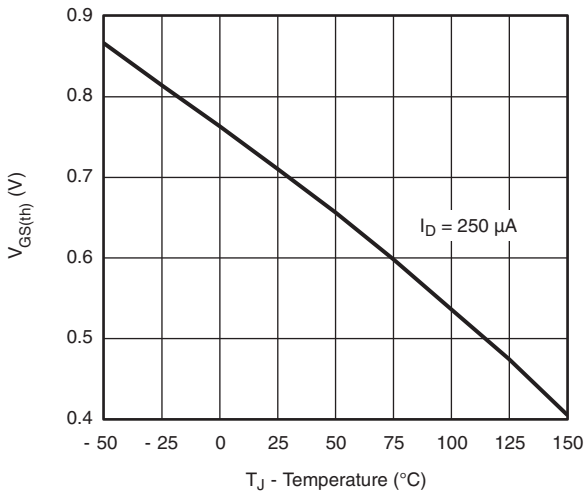
Source-Drain Diode Forward Voltage



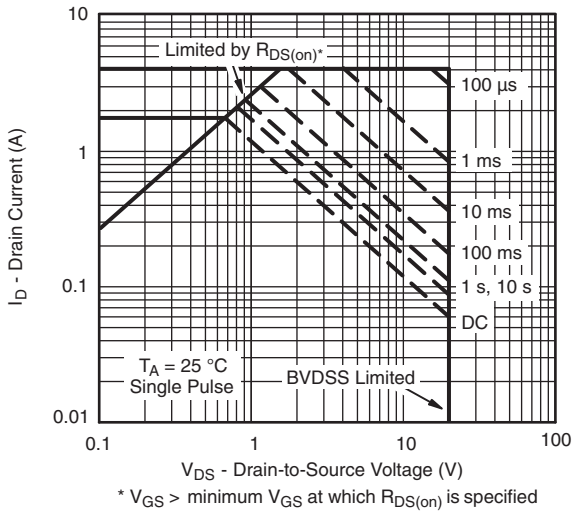
On-Resistance vs. Gate-to-Source Voltage



Single Pulse Power, Junction-to-Ambient



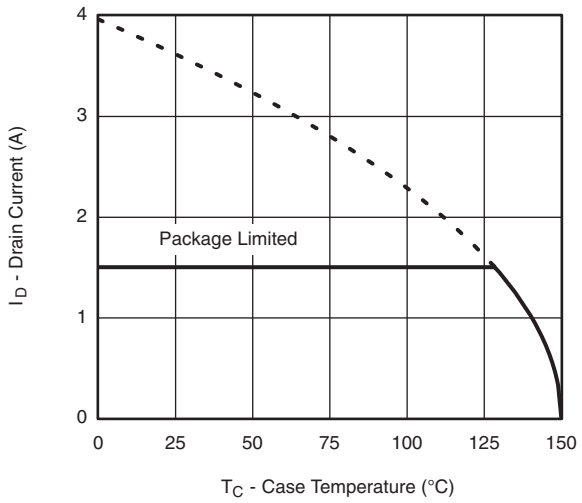
Threshold Voltage



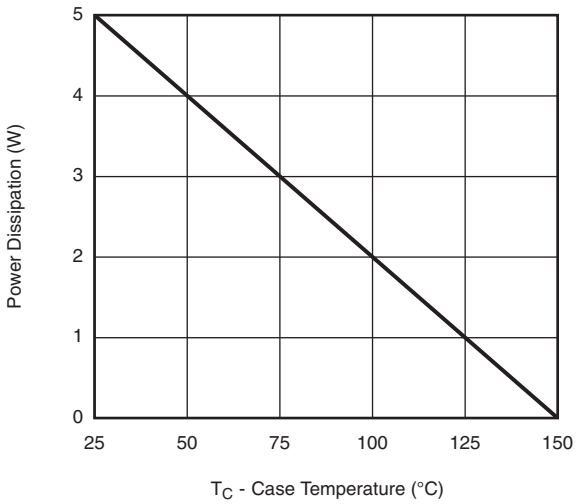
* V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient

N-CHANNEL TYPICAL CHARACTERISTICS T_A = 25 °C, unless otherwise noted



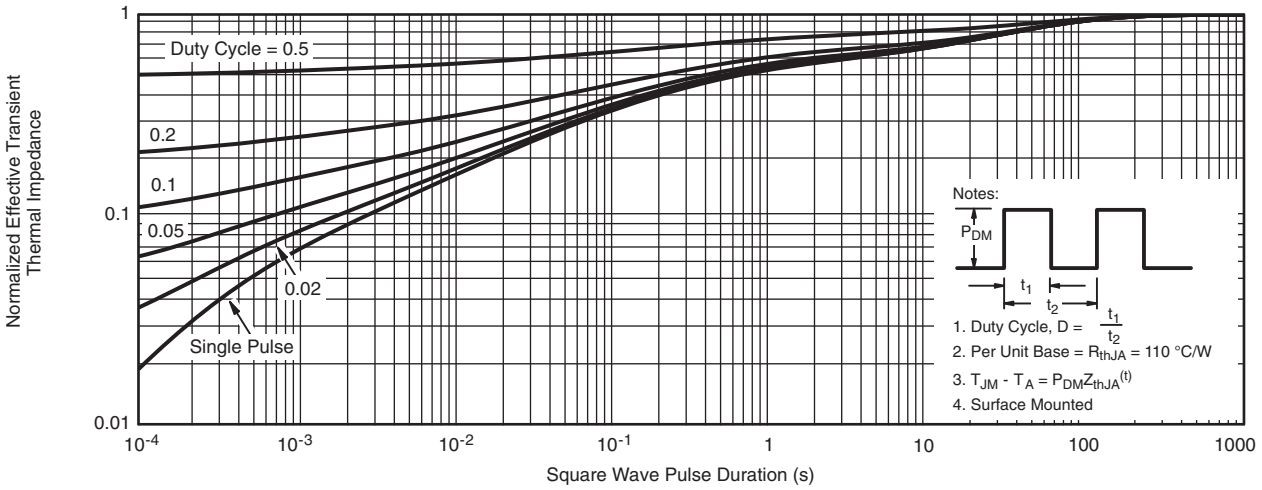
Current Derating*



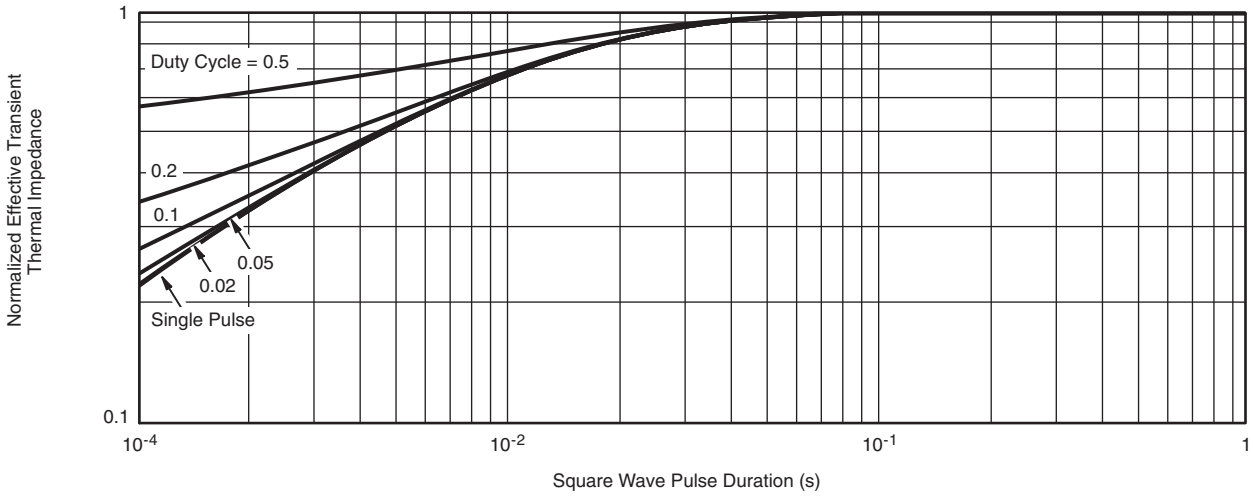
Power Derating

* 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.

N-CHANNEL TYPICAL CHARACTERISTICS T_A = 25 °C, unless otherwise noted

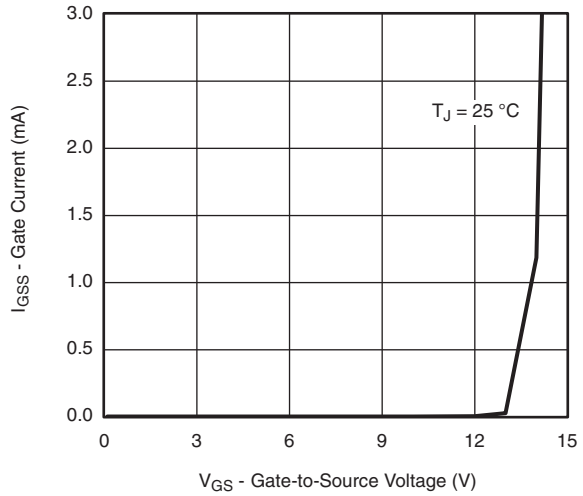


Normalized Thermal Transient Impedance, Junction-to-Ambient

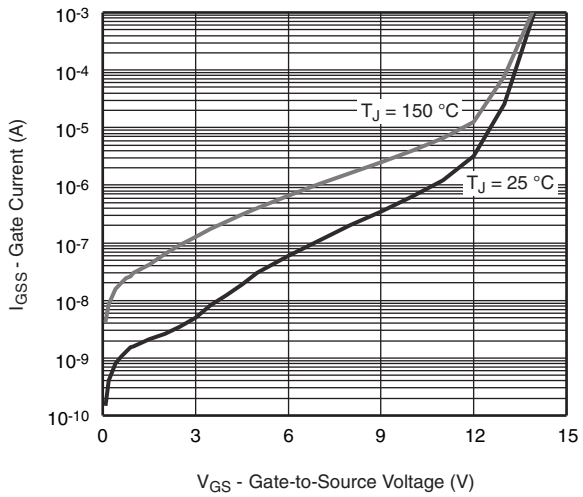


Normalized Thermal Transient Impedance, Junction-to-Case

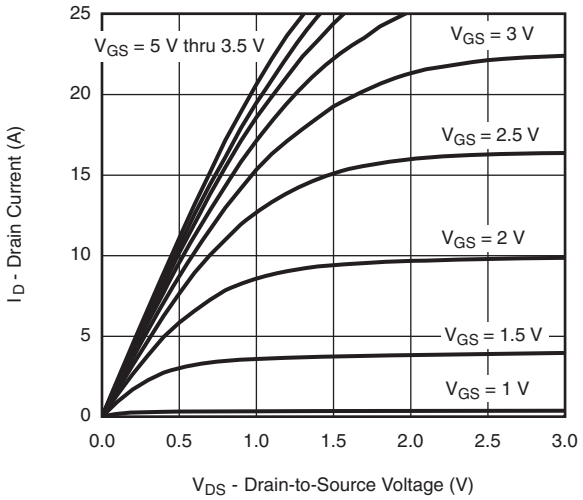
P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



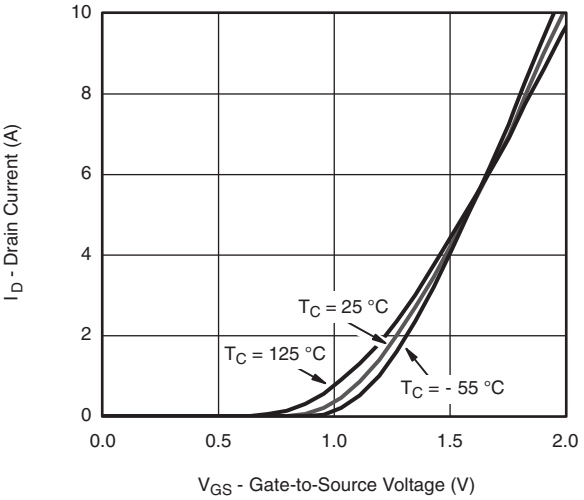
Gate Current vs. Gate-Source Voltage



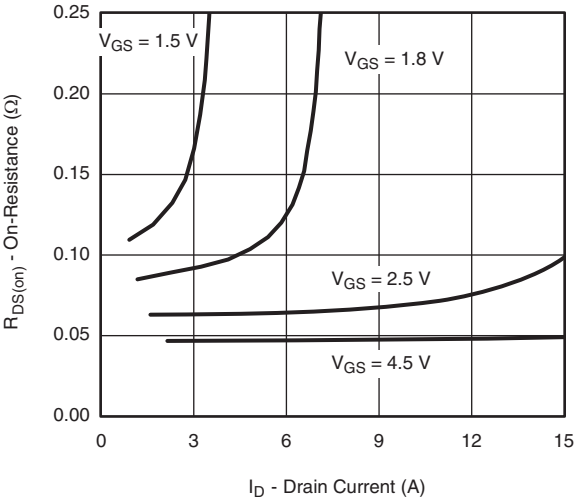
Gate Current vs. Gate-Source Voltage



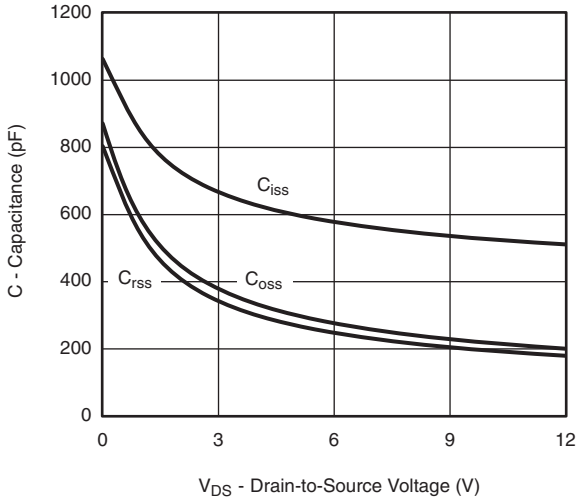
Output Characteristics



Transfer Characteristics

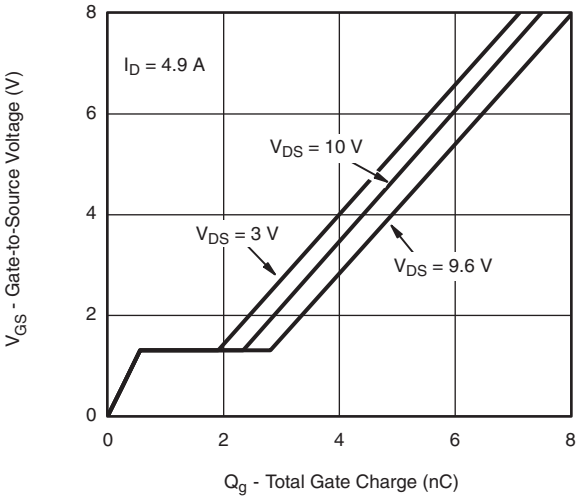


On-Resistance vs. Drain Current and Gate Voltage

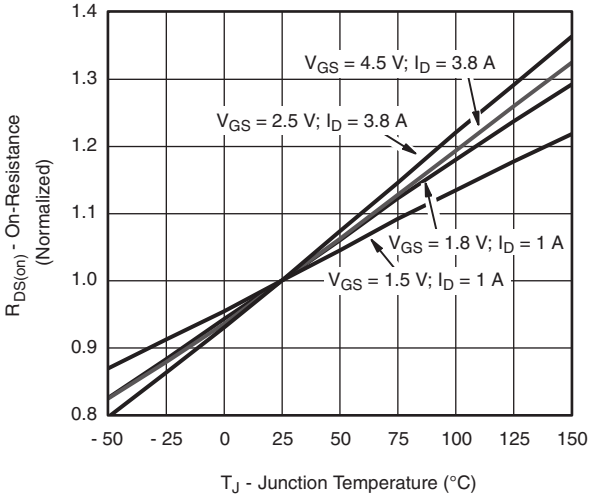


Capacitance

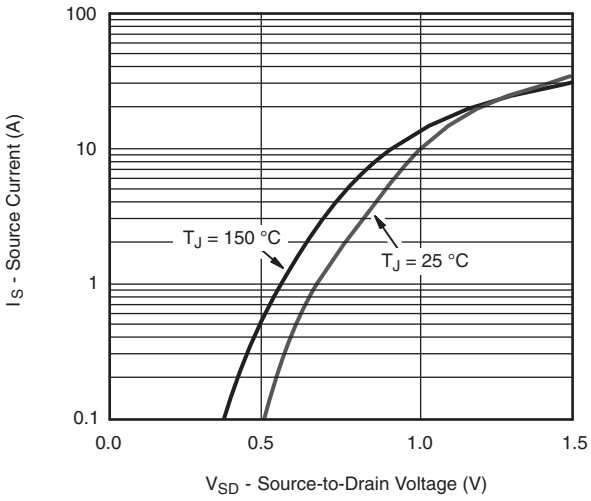
P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



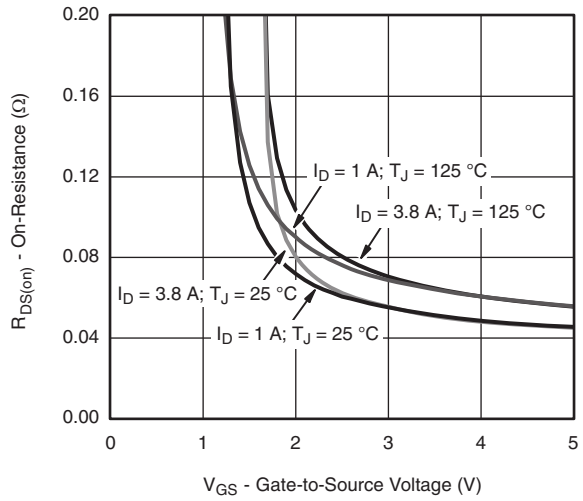
Gate Charge



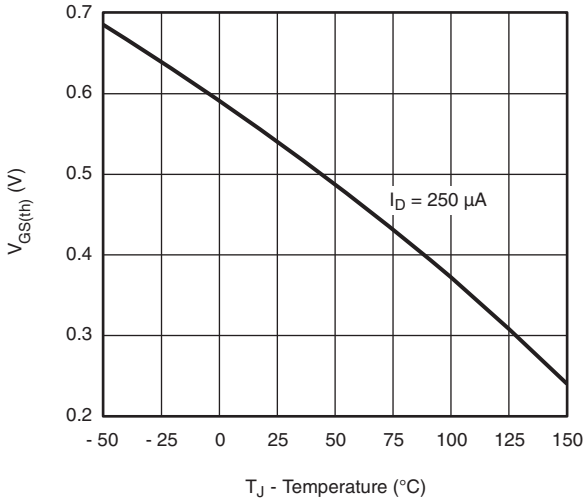
On-Resistance vs. Junction Temperature



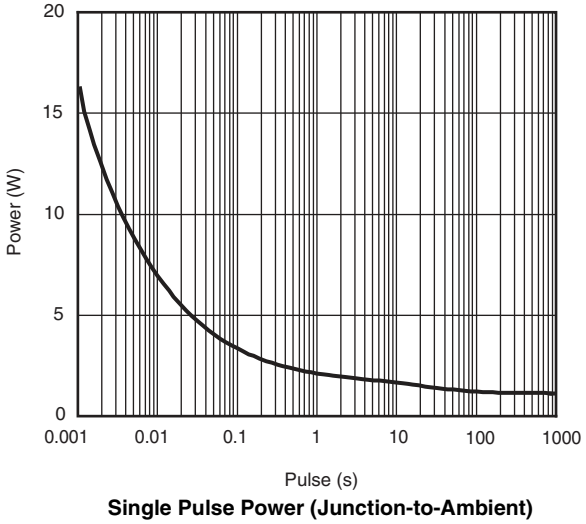
Source-Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage

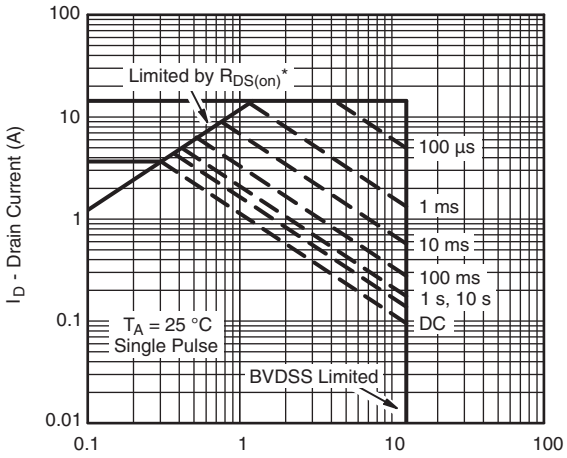


Threshold Voltage

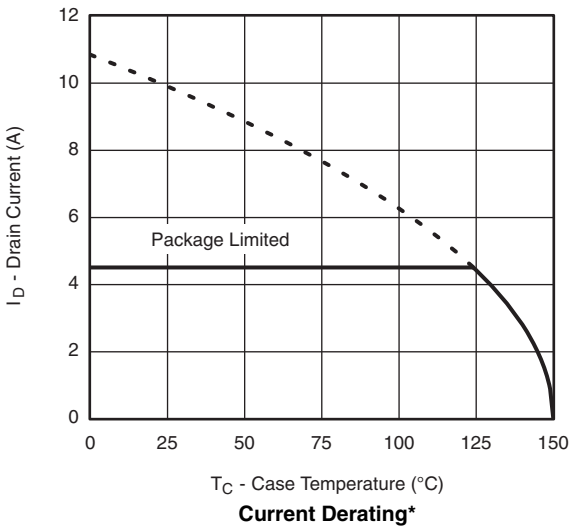


Single Pulse Power (Junction-to-Ambient)

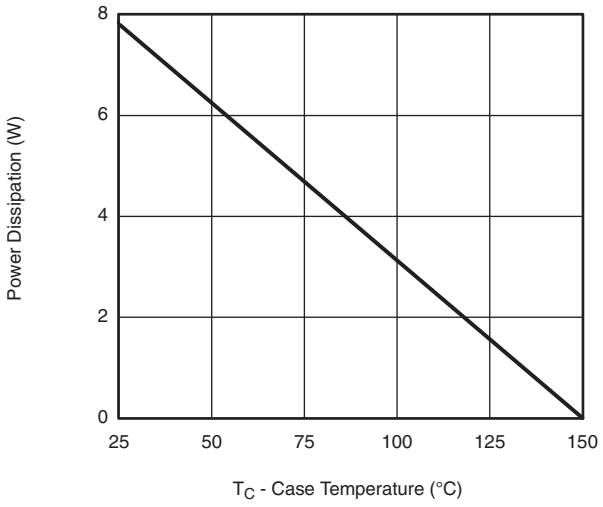
P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Safe Operating Area, Junction-to-Ambient



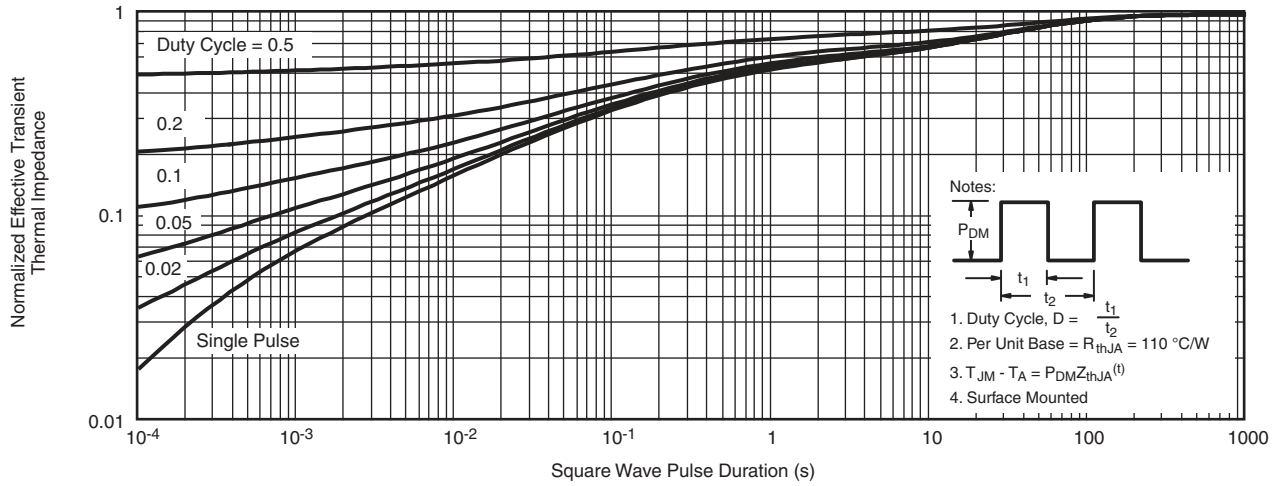
Current Derating*



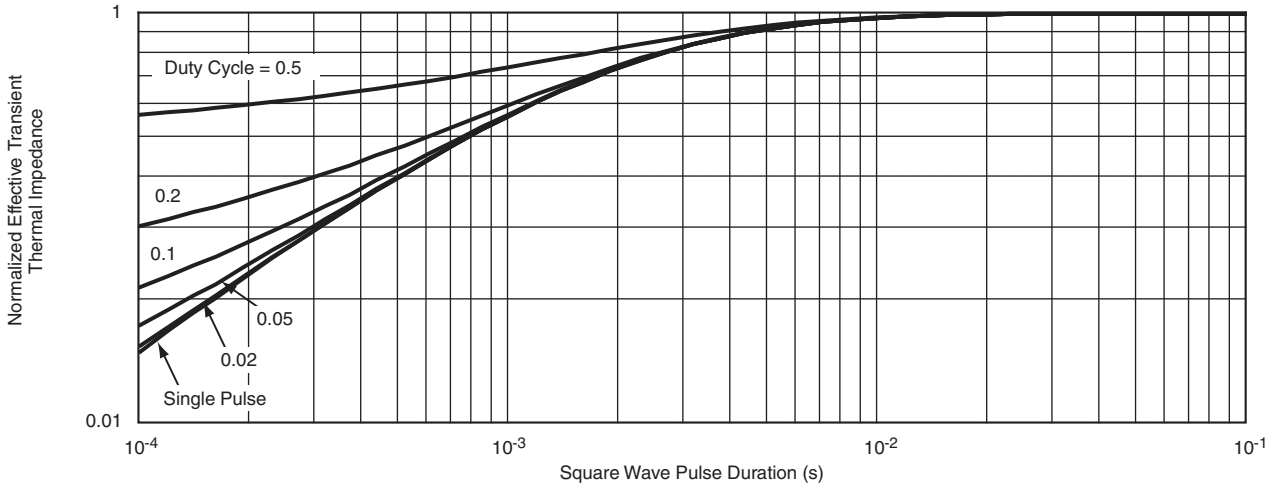
Power Derating

* 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.

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



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case

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