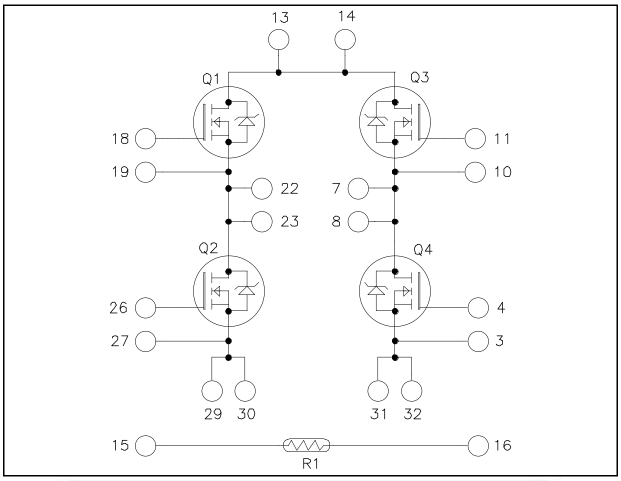
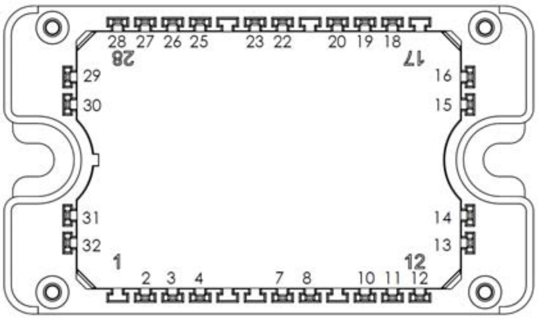
Microsemi Power Matters.

APTM100H45FT3G

Full - Bridge MOSFET Power Module

V_{DSS} = 1000V
R_{DSon} = 450mΩ typ @ Tj = 25°C
I_D = 18A @ Tc = 25°C





All multiple inputs and outputs must be shorted together
Example: 13/14 ; 29/30 ; 22/23 …

Application

- Welding converters
- Switched Mode Power Supplies
- Uninterruptible Power Supplies

Features

- **Power MOS 7® FREDFETs**
  - Low R_{DSon}
  - Low input and Miller capacitance
  - Low gate charge
  - Fast intrinsic reverse diode
  - Avalanche energy rated
  - Very rugged
- Kelvin source for easy drive
- Very low stray inductance
- Internal thermistor for temperature monitoring

Benefits

- Outstanding performance at high frequency operation
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Solderable terminals both for power and signal for easy PCB mounting
- Low profile
- Each leg can be easily paralleled to achieve a phase leg of twice the current capability
- RoHS Compliant

All ratings @ T_j = 25°C unless otherwise specified

Absolute maximum ratings

Symbol	*Parameter*		*Max ratings*	*Unit*
V_{DSS}	Drain - Source Voltage		1000	V
I_D	Continuous Drain Current	T_c = 25°C	18	A
		T_c = 80°C	14	
I_{DM}	Pulsed Drain current		72	
V_{GS}	Gate - Source Voltage		±30	V
R_{DSon}	Drain - Source ON Resistance		540	mΩ
P_D	Power Dissipation	T_c = 25°C	357	W
I_{AR}	Avalanche current (repetitive and non repetitive)		18	A
E_{AR}	Repetitive Avalanche Energy		50	mJ
E_{AS}	Single Pulse Avalanche Energy		2500	

CAUTION: These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed.

Electrical Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
I_{DSS}	Zero Gate Voltage Drain Current	$V_{GS} = 0V, V_{DS} = 1000V$			100	µA
$R_{DS(on)}$	Drain – Source on Resistance	$V_{GS} = 10V, I_D = 9A$		450	540	mΩ
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 2.5mA$	3		5	V
I_{GSS}	Gate – Source Leakage Current	$V_{GS} = \pm30\ V, V_{DS} = 0V$			±150	nA

Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C_{iss}	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 25V$ f = 1MHz		4350		pF
C_{oss}	Output Capacitance			715		
C_{rss}	Reverse Transfer Capacitance			120		
Q_g	Total gate Charge	$V_{GS} = 10V$ $V_{Bus} = 500V$ $I_D = 18A$		154		nC
Q_{gs}	Gate – Source Charge			26		
Q_{gd}	Gate – Drain Charge			97		
$T_{d(on)}$	Turn-on Delay Time	**Inductive switching @ 125°C** $V_{GS} = 15V$ $V_{Bus} = 667V$ $I_D = 18A$ $R_G = 5\Omega$		10		ns
T_r	Rise Time			12		
$T_{d(off)}$	Turn-off Delay Time			121		
T_f	Fall Time			35		
E_{on}	Turn-on Switching Energ	**Inductive switching @ 25°C** $V_{GS} = 15V, V_{Bus} = 667V$ $I_D = 18A, R_G = 5\Omega$		639		µJ
E_{off}	Turn-off Switching Energy			380		
E_{on}	Turn-on Switching Energy	**Inductive switching @ 125°C** $V_{GS} = 15V, V_{Bus} = 667V$ $I_D = 18A, R_G = 5\Omega$		1046		µJ
E_{off}	Turn-off Switching Energy			451		
R_{thJC}	Junction to Case Thermal Resistance				0.35	°C/W

Source - Drain diode ratings and characteristics

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
I_S	Continuous Source current (Body diode)		Tc = 25°C			18	A
			Tc = 80°C			14	
V_{SD}	Diode Forward Voltage	$V_{GS} = 0V, I_S = -18A$				1.3	V
dv/dt	Peak Diode Recovery ❶					18	V/ns
t_{rr}	Reverse Recovery Time	$I_S = -18A$ $V_R = 667V$ $dI_S/dt = 100A/\mu s$	$T_j = 25°C$			340	ns
			$T_j = 125°C$			640	
Q_{rr}	Reverse Recovery Charge		$T_j = 25°C$		1.78		µC
			$T_j = 125°C$		4.47		

❶ dv/dt numbers reflect the limitations of the circuit rather than the device itself.
$I_S \leq -18A$ $di/dt \leq 700A/\mu s$ $V_R \leq V_{DSS}$ $T_j \leq 150°C$

Thermal and package characteristics

Symbol	Characteristic			Min	Max	Unit
V_{ISOL}	RMS Isolation Voltage, any terminal to case t =1 min, 50/60Hz			4000		V
T_J	Operating junction temperature range			-40	150	°C
T_{JOP}	Recommended junction temperature under switching conditions			-40	$T_J$max - 25	°C
T_{STG}	Storage Temperature Range			-40	125	°C
T_C	Operating Case Temperature			-40	125	°C
Torque	Mounting torque	To heatsink	M4	2	3	N.m
Wt	Package Weight				110	g

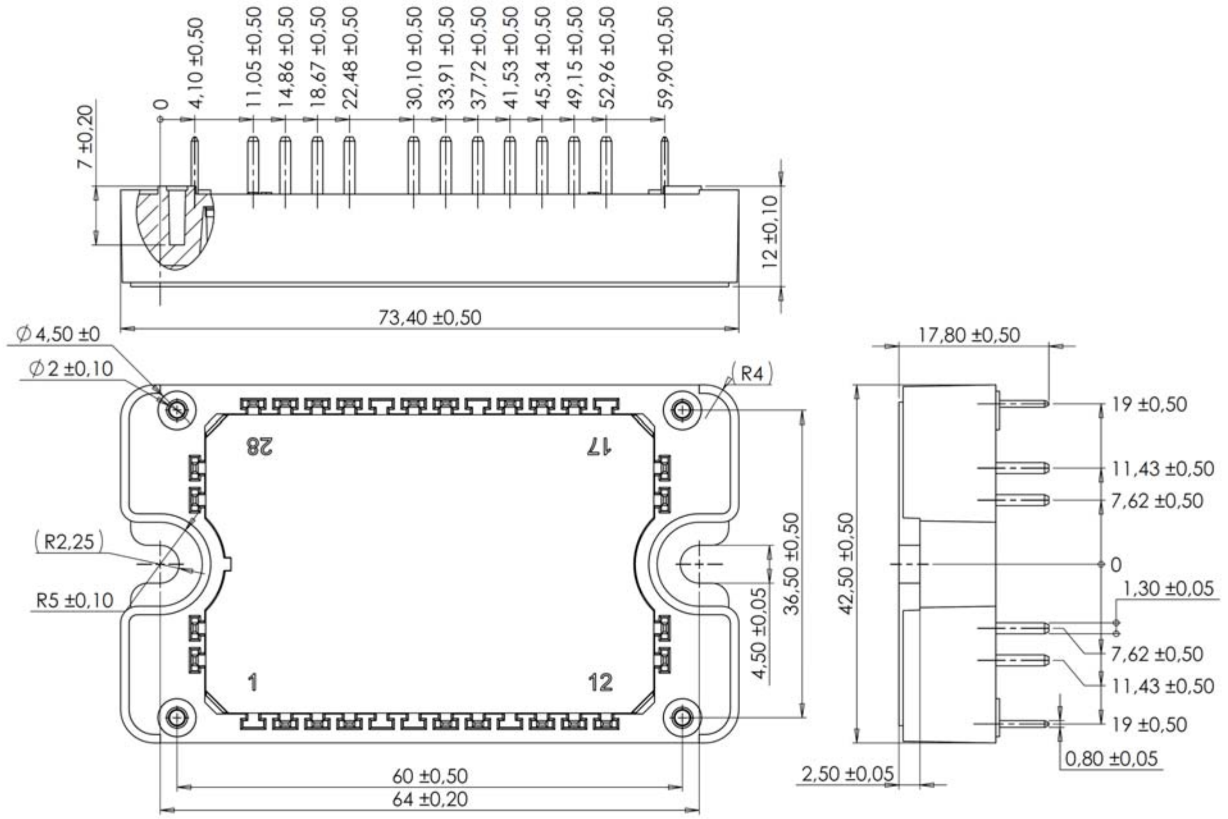
Temperature sensor NTC (see application note APT0406 on www.microsemi.com for more information).

Symbol	Characteristic		Min	Typ	Max	Unit
R_{25}	Resistance @ 25°C			50		kΩ
$\Delta R_{25}/R_{25}$				5		%
$B_{25/85}$	T_{25} = 298.15 K			3952		K
$\Delta B/B$		T_C=100°C		4		%

$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

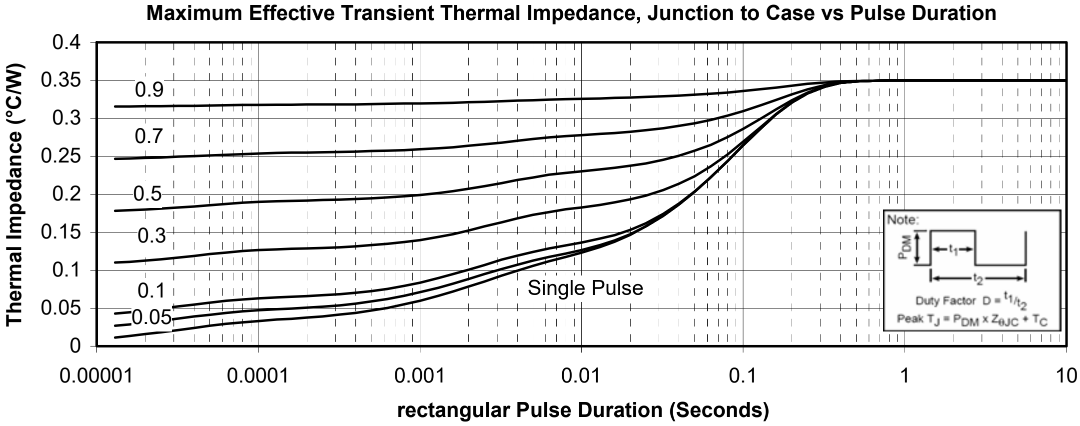
T: Thermistor temperature
R_T: Thermistor value at T

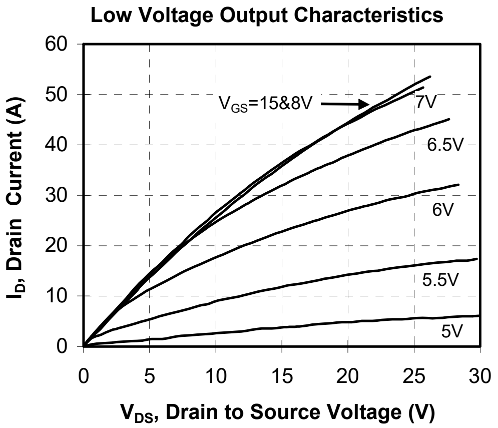
Package outline (dimensions in mm)

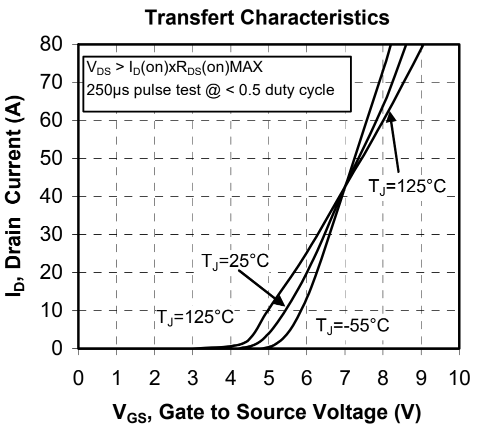


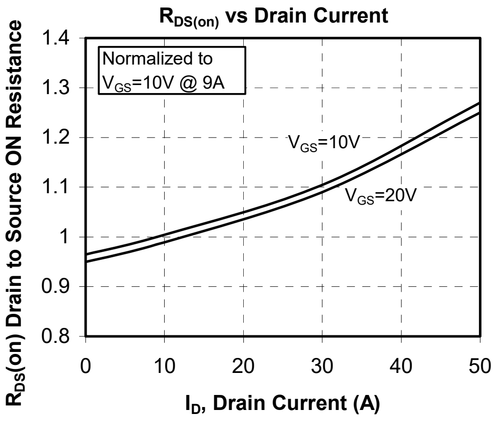
See application note 1906 - Mounting Instructions for SP3F Power Modules on www.microsemi.com

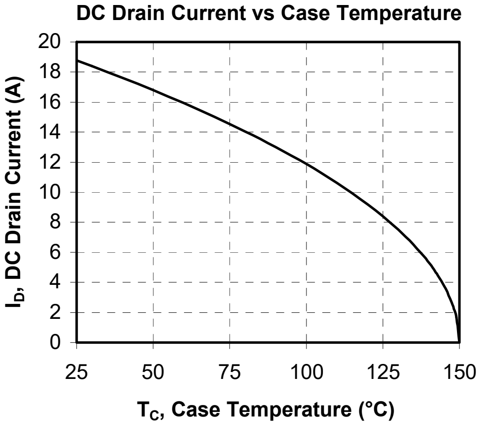
Typical Performance Curve

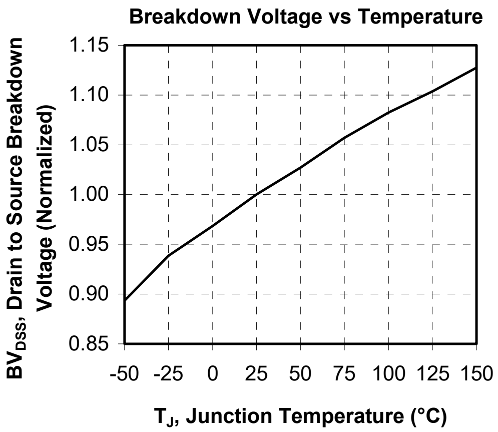


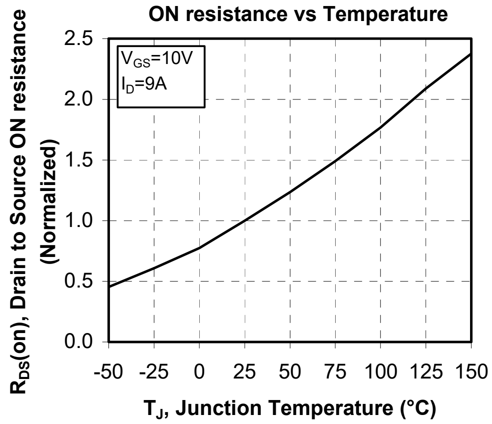


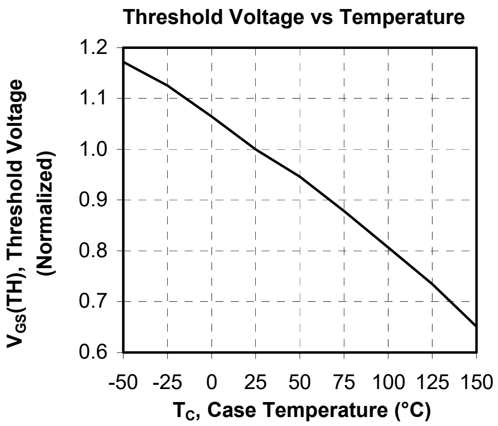


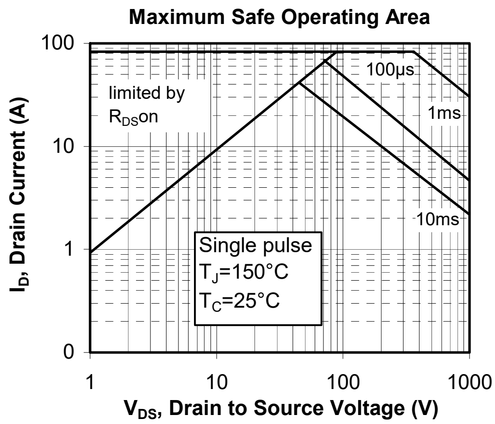


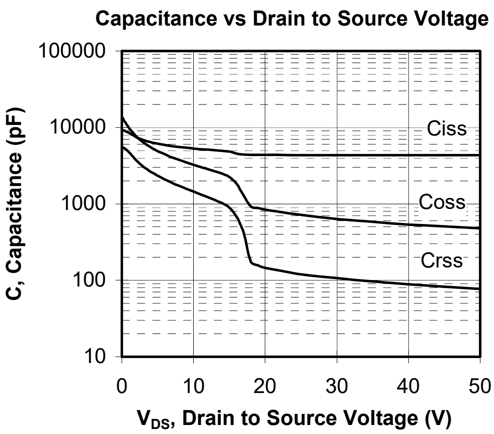


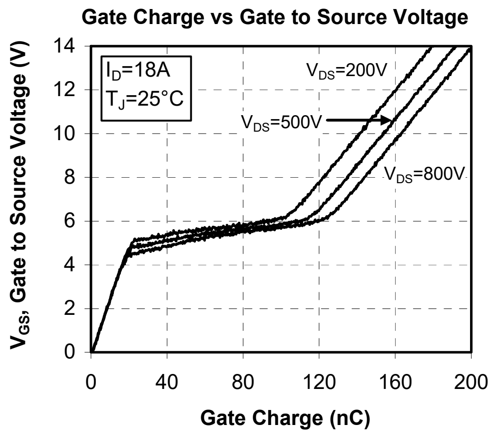

Breakdown Voltage vs Temperature
BVDSS, Drain to Source Breakdown Voltage (Normalized)
1.15
1.10
1.05
1.00
0.95
0.90
0.85
-50 -25 0 25 50 75 100 125 150
TJ, Junction Temperature (°C)


ON resistance vs Temperature
RDS(on), Drain to Source ON resistance (Normalized)
VGS=10V
ID=9A
2.5
2.0
1.5
1.0
0.5
0.0
-50 -25 0 25 50 75 100 125 150
TJ, Junction Temperature (°C)

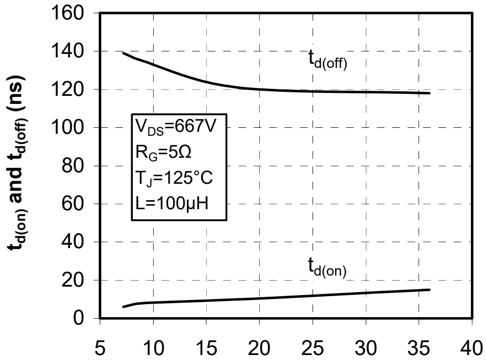

Threshold Voltage vs Temperature
VGS(TH), Threshold Voltage (Normalized)
1.2
1.1
1.0
0.9
0.8
0.7
0.6
-50 -25 0 25 50 75 100 125 150
TC, Case Temperature (°C)


Maximum Safe Operating Area
ID, Drain Current (A)
limited by RDSon
100µs
1ms
10ms
Single pulse
TJ=150°C
TC=25°C
100
10
1
0
1
10
100
1000
VDS, Drain to Source Voltage (V)

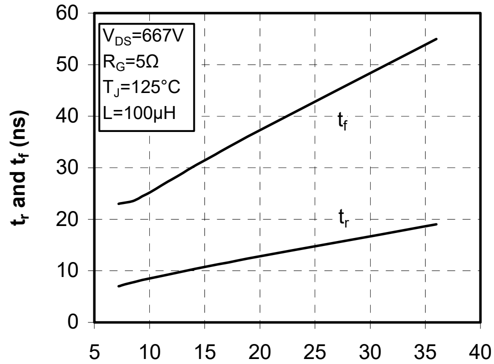

Capacitance vs Drain to Source Voltage
C, Capacitance (pF)
100000
10000
1000
100
10
Ciss
Coss
Crss
0 10 20 30 40 50
VDS, Drain to Source Voltage (V)


Gate Charge vs Gate to Source Voltage
VGS, Gate to Source Voltage (V)
ID=18A
TJ=25°C
VDS=200V
VDS=500V
VDS=800V
14
12
10
8
6
4
2
0
0 40 80 120 160 200
Gate Charge (nC)

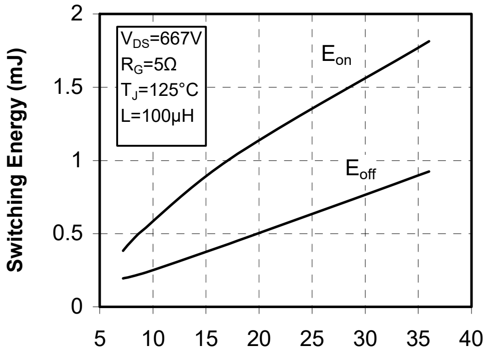
Delay Times vs Current



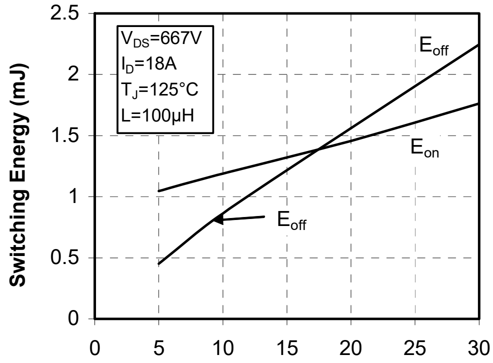
Rise and Fall times vs Current



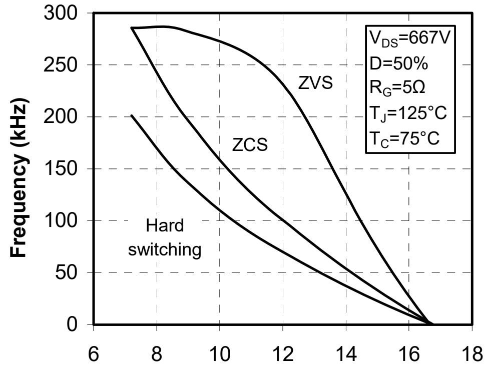
Switching Energy vs Current



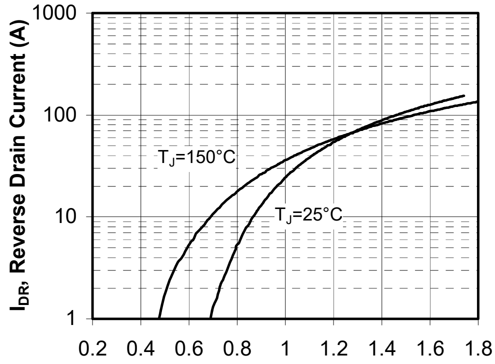
Switching Energy vs Gate Resistance



Operating Frequency vs Drain Current



Source to Drain Diode Forward Voltage



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