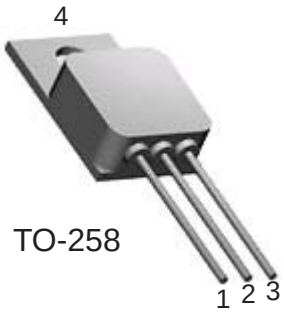
Normally-OFF Trench Silicon Carbide Power JFET

Product Summary		
BV_{DS}	1200	V
$RDS_{(ON)max}$	0.063	Ω
$E_{TS,typ}$	440	µJ

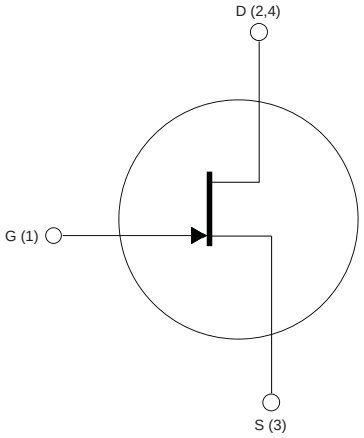
FEATURES:

SemiSouth Die Inside

- Hermetic TO-258 Packaging
- 200°C Maximum Operating Temperature (for 260°C Contact Factory)
- Available Screening:
  - MIL-PRF-19500 Equivalent
  - Space Level
  - MIL-STD-750 Methods & Conditions
- Inherent Radiation Tolerance >100K TID
- Positive Temperature Coefficient for Ease of Paralleling
- Compatible with Standard Gate Driver ICs
- Temperature Independent Switching Behavior
- Extremely Fast Switching
- 1200 Volt Drain-Source Blocking Voltage
- $RDS_{(on)max}$ of 0.063 Ω
- Voltage Controlled
- Low Gate Charge
- Low Intrinsic Capacitance



TO-258



Internal Schematic

Non-isolated tab version shown. For isolated tab version, tab (4) is No Connect.

APPLICATIONS:

- Satellite Solar Inverters
- Mil Spec Power Supplies
  - Switch Mode
  - Uninterrupted
- Jet Engine Electronics
- Down-hole Electronics (Motor / Compressor Control)

MAXIMUM RATINGS

Parameter	Symbol	Conditions	Value	Unit
Continuous Drain Current	$I_{D, Tj=125}$	T_j = 125 °C	30	A
	$I_{D, Tj=175}$	T_j = 175 °C	20	
Pulsed Drain Current (1)	I_{DM}	T_c = 25 °C	60	A
Short Circuit Withstand Time	t_{SC}	V_{DD} < 800 V, T_C < 125 °C	50	µS
Power Dissipation	P_D	T_c = 25 °C	250	W
Gate-Source Voltage	V_{GS}	Static	-15 to +3	V
		AC(2)	-15 to +15	V
Operating and Storage Temperature	T_j, $T_{j,stg}$		-55 to +200*	°C
Lead Temperature for Soldering	T_{sold}	1/8" from case < 10 s	260	°C

(1) Limited by pulse width

(2) Rg_{EXT} =0.5 ohm, t_p < 200ns

*Contact factory for 260°C

THERMAL CHARACTERISTICS

Parameter	Symbol	Value		Unit
		Typ	Max	
Thermal Resistance, junction-to-case	$R_{th,JC}$	-	TBD	°C / W
Thermal Resistance, junction-to-ambient	$R_{th,JA}$	-	TBD	

For more products and information, please visit our website at www.micross.com

ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Off Characteristics						
Drain-Source Blocking Voltage	BV_{DS}	V_{GS} = 0 V, I_D = 600 µA	1200	-	-	V
Total Drain Leakage Current	I_{DSS}	V_{DS} = 1200 V, V_{GS} = 0 V, Tj = 25°C	-	200	1200	µA
		V_{DS} = 1200 V, V_{GS} = 0 V, Tj = 175°C	-	600	2000	
		V_{DS} = 1200 V, V_{GS} = -15 V, Tj = 25°C	-	2	-	
		V_{DS} = 1200 V, V_{GS} = -15 V, Tj = 175°C	-	20	-	
Total Gate Reverse Leakage	I_{GSS}	V_{GS} = -15 V, V_{DS} = 0V	-	-0.2	-0.6	mA
		V_{GS} = -15 V, V_{DS} = 1200V	-	-0.2	-	
On Characteristics						
Drain-Source On-resistance	$R_{DS(on)}$	I_D = 12 A, V_{GS} = 3 V, Tj = 25 °C	-	0.045	0.063	Ω
		I_D = 12 A, V_{GS} = 3 V, Tj = 125 °C	-	0.11	-	
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = 1 V, I_D = 34 mA	1.15	1.4	1.75	V
Gate Forward Current	I_{GFWD}	V_{GS} = 3 V	-	400	-	mA
Gate Resistance	R_G	f = 1 MHz, drain-source shorted	-	4	-	Ω
	$R_{G(on)}$	V_{GS} >2.7V; See Figure 5	-	0.25	-	Ω
Dynamic Characteristics						
Input Capacitance	C_{iss}	V_{DD} = 100 V	-	1220	-	pF
Output Capacitance	C_{oss}		-	180	-	
Reverse Transfer Capacitance	C_{rss}		-	169	-	
Effective Output Capacitance, energy related	$C_{o(er)}$	V_{DS} = 0 V to 480 V, V_{GS} = 0 V	-	100	-	
Switching Characteristics						
Turn-On Delay	t_{on}	V_{DS} = 600 V, I_D = 24 A, Inductive Load, T_J = 25°C, Gate Driver = +15V, -10V, Rg_{EXT} = 2.5ohm, See Figure 15 for typical gate drive / inductive load switching circuit.	-	15	-	ns
Rise Time	t_r		-	12	-	
Turn-Off Delay	t_{off}		-	35	-	
Fall Time	t_f		-	30	-	
Turn-On Energy	E_{on}		-	160	-	µJ
Turn-Off Energy	E_{off}		-	280	-	
Total Switching Energy	E_{ts}		-	440	-	
Turn-On Delay	t_{on}	V_{DS} = 600 V, I_D = 24 A, Inductive Load, T_J = 150°C, Gate Driver = +15V, -10V, Rg_{EXT} = 2.5ohm, See Figure 15 for typical gate drive / inductive load switching circuit.	-	15	-	ns
Rise Time	t_r		-	15	-	
Turn-Off Delay	t_{off}		-	35	-	
Fall Time	t_f		-	30	-	
Turn-On Energy	E_{on}		-	180	-	µJ
Turn-Off Energy	E_{off}		-	280	-	
Total Switching Energy	E_{ts}		-	460	-	
Total Gate Charge	Q_g	V_{DS} = 600 V, I_D = 10 A, V_{GS} = + 2.5 V	-	60	-	nC
Gate-Source Charge	Q_{gs}		-	2	-	
Gate-Drain Charge	Q_{gd}		-	49	-	

Figure 1. Typical Output Characteristics
$I_D = f(V_{DS})$; T_j = 25 °C; parameter: V_{GS}

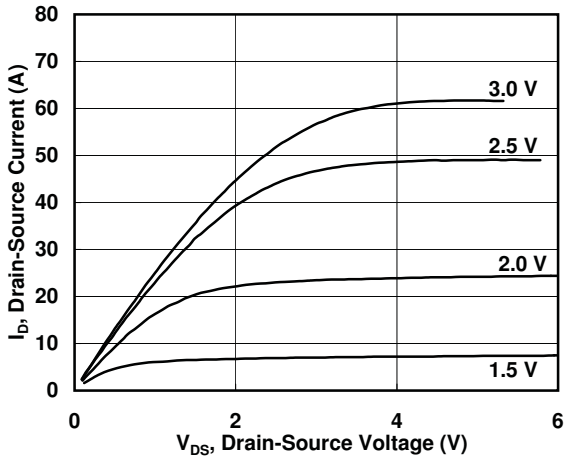


Figure 2. Typical Output Characteristics
$I_D = f(V_{DS})$; T_j = 125 °C; parameter: V_{GS}

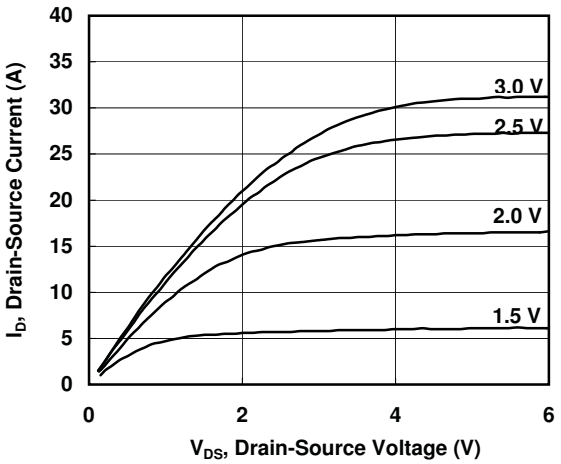


Figure 3. Typical Output Characteristics
$I_D = f(V_{DS})$; T_j = 175°C; parameter: V_{GS}

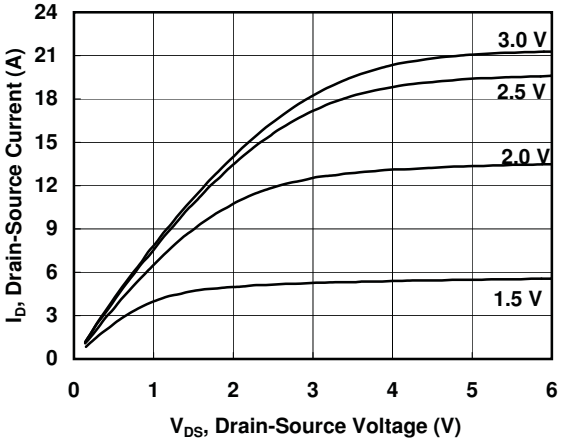


Figure 4. Typical Transfer Characteristics
$I_D = f(V_{GS})$; V_{DS} = 5V

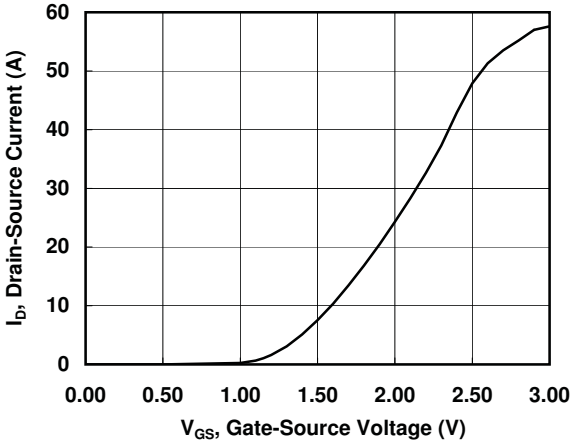


Figure 5. Gate-Source Current
$I_{GS} = f(V_{GS})$; parameter: T_j

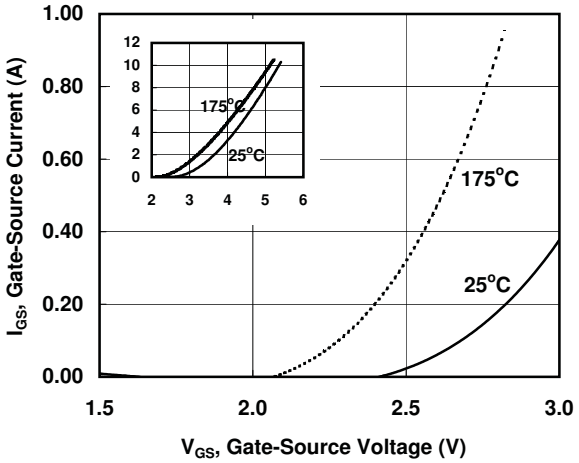


Figure 6. Drain-Source On-resistance
$R_{DS(on)} = f(I_D)$; V_{GS} = 3.0; parameter: T_j

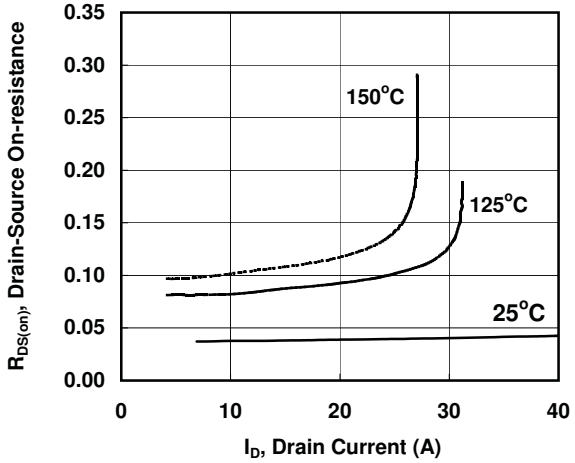


Figure 7. Drain-Source On-resistance
$R_{DS(ON)} = f(T_j)$; parameter: I_{GS}

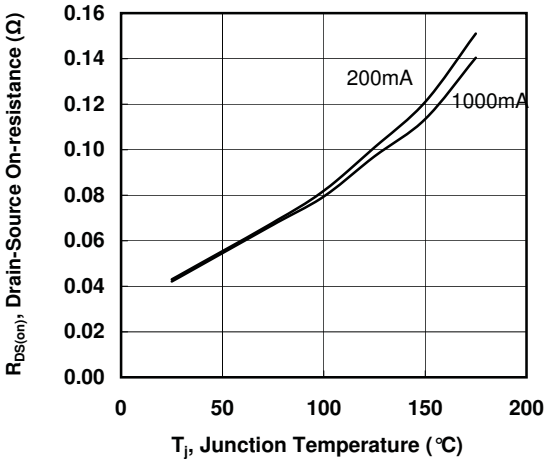


Figure 8. Drain-Source On-resistance
$R_{DS(ON)} = f(I_{GS})$; $T_j = 25^oC$

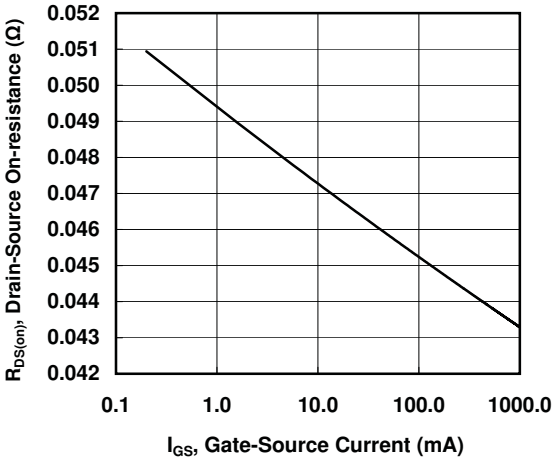


Figure 9. Typical Capacitance
$C = f(V_{DS})$; V_{GS} = 0 V; f = 1 MHz

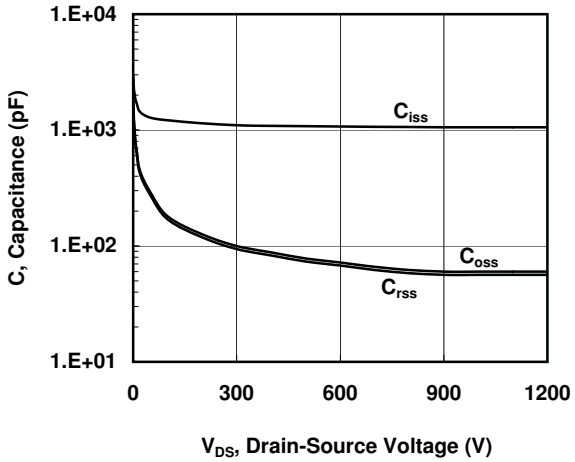


Figure 10. Gate Charge
$Q_g = f(V_{GS})$; V_{DS} = 600V; I_D = 5A, $T_j = 25^oC$

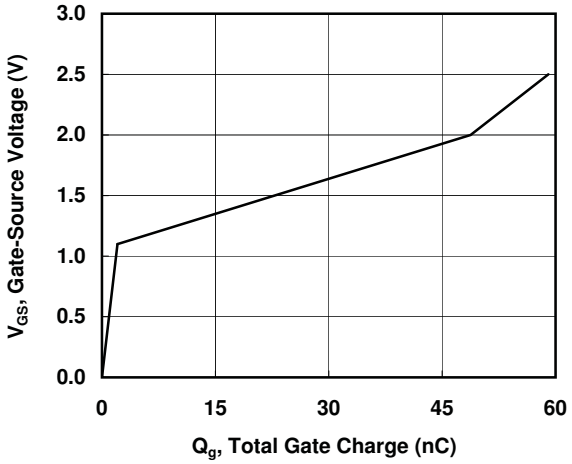


Figure 11. Gate Threshold Voltage
$V_{th} = f(T_j)$

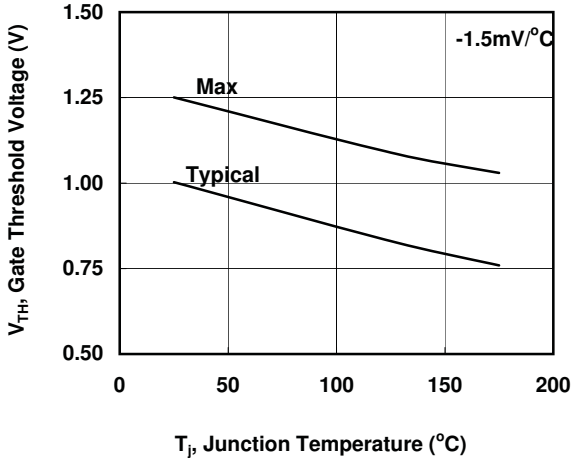


Figure 12. Drain-Source Leakage
$I_D = f(V_{DS})$; V_{GS} = 0V; parameter: T_j

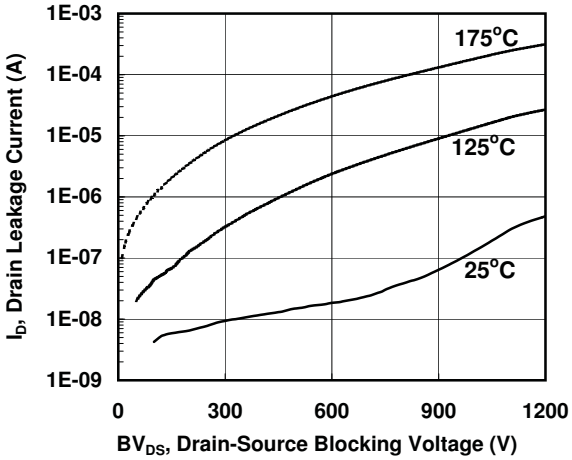


Figure 13. Switching Energy Losses
$E_s = f(I_D)$; V_{DS} = 600V; V_{GD} = +15V/-10V, R_{GEXT} = 2.5ohm

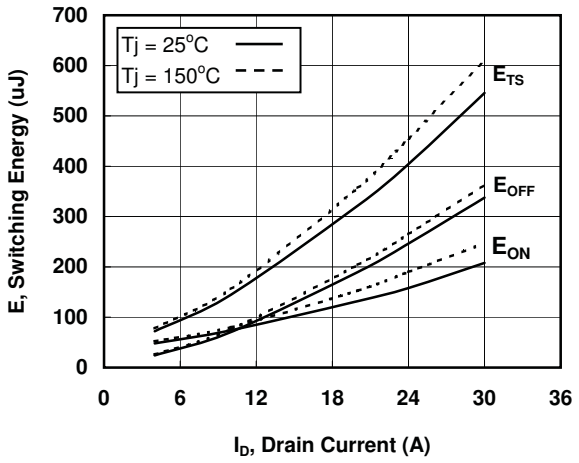


Figure 14. Switching Energy Losses
$E_S = f(R_{GEXT})$; V_{DS} = 600V; I_D = 24A, V_{GD} = +15V/-10V

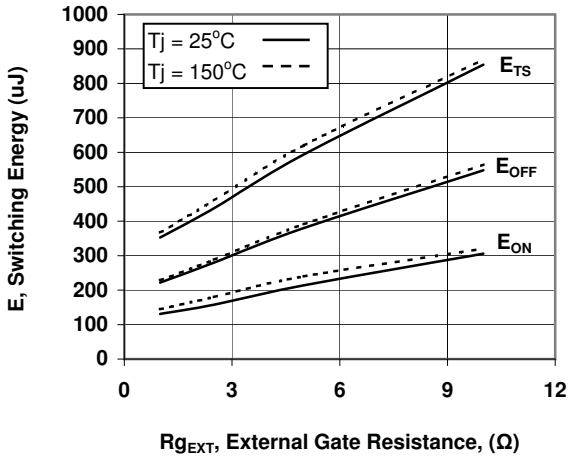
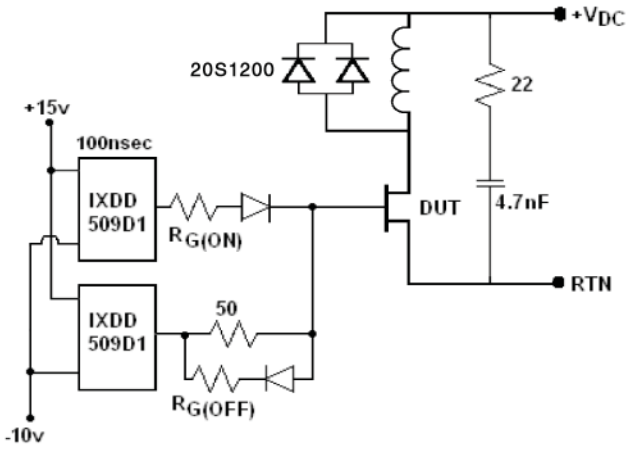
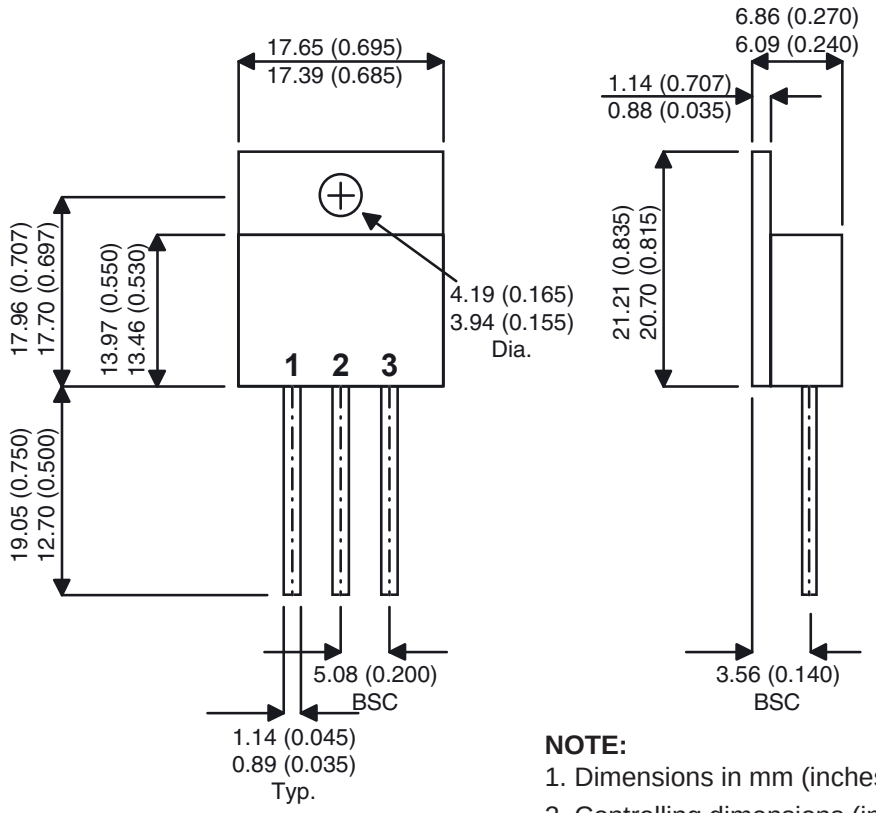


Figure 15. Inductive Load Switching Circuit



MECHANICAL DRAWING



NOTE:
1. Dimensions in mm (inches)
2. Controlling dimensions (inches)

ORDERING INFORMATION

Base Part Number	Configuration	Package		Junction Temp. Range	Processing
ASJE1200R063	Blank= Non-isolated Tab	M=TO-258	-	EL	Blank
	S= Isolated Tab			EX	/V
					/S

Temp Ranges: EL= Elevated Temp. Range, -55°C to 200°C (T_J)

EX= Extreme Temp. Range, -55°C to 260°C (T_J) (Consult factory)

Processing: Blank = Commercial / Standard Processing

MIL-PRF-19500 Equivalent Screening Available per SCD

/V= JANTX MIL-PRF-19500 Equivalent (future standard offering)

/S= JANS MIL-PRF-19500 Equivalent (future standard offering)

Example Part Numbers: ASJE1200R063M-EL

ASJE1200R063SM-EX

SemiSouth has commercial plastic versions of this product available. Please refer to the SemiSouth website http://www.semisouth.com/products/products.html for datasheet specifications and ordering information. The SemiSouth part number is SJEP120R063 and is supplied in a TO-247 plastic package.

DOCUMENT TITLE
Normally-OFF Trench Silicon Carbide Power JFET

Rev #	History	Release Date	Status
0.0	Initial Release	December 2010	Advance Information
0.1	Replaced TO-257 package with TO-258 package	June 2011	Advance Information