

High Temperature Normally-OFF Trench Silicon Carbide Power JFET Enhancement Mode

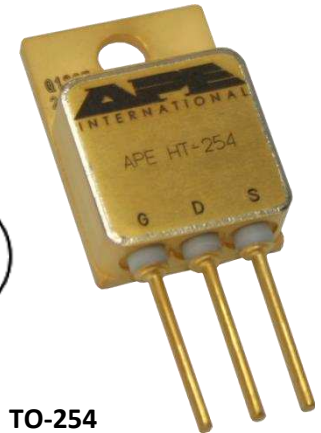
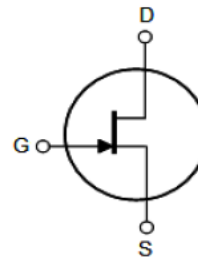
FEATURES

- High temperature: $T_{c(max)} = 225\text{ }^{\circ}\text{C}$, $T_{j(max)} = 225\text{ }^{\circ}\text{C}$
- AS9100:Rev. C-certified manufacturing, traceable throughout value chain
- < 20 ns switching, high system efficiency
- Hermetic seal; flux free, void free packaging
- Backside isolation
- High reliability

1200 V / 38 A / 50 mΩ

APPLICATIONS

- Downhole tools
- High efficiency converters
- Motor drives
- Aerospace: Military & Commercial
- Smart grid/grid-tie distributed generation



TO-254
Package

G D S

COMPANION PARTS

- Silicon Carbide Schottky Diode, APE-HT-0112 & APE HT-0122
- Low-Temperature Single-Channel Gate Driver, APE ITGD1-0022
- Low-Temperature Dual-Channel Gate Driver, APE MTGD2-2012
- High-Temperature Dual-Channel Gate Driver, APE HTGD2-0032

Absolute Maximum Ratings¹

Symbol	Parameter	Condition(s)	Value	Units
V_{DSS}	Drain-source voltage		1200	V
V_{GSS}	Gate-source voltage	AC, $R_{G,ext} = 0.5\ \Omega$, $t_p \leq 200\text{ ns}$	-15 to 15	V
I_D	Continuous drain current ²	$T_c = 125\text{ }^{\circ}\text{C}$	38	A
		$T_c = 150\text{ }^{\circ}\text{C}$	20	
		$T_c = 225\text{ }^{\circ}\text{C}$	12	
I_{DM}	Peak pulsed drain current ²	Pulse width t_p limited; $T_c = 25\text{ }^{\circ}\text{C}$	60	A
E_{AS}	Single-pulse avalanche energy		-	J
E_{AR}	Repetitive avalanche energy		-	J
I_{AR}	Repetitive avalanche current		-	A
P_{tot}	Power dissipation	$T_c = 25\text{ }^{\circ}\text{C}$	TBD ²	W
		$T_c = 100\text{ }^{\circ}\text{C}$	TBD ²	
		$T_c = 225\text{ }^{\circ}\text{C}$	TBD ²	
T_j	Operating junction temperature		-50 to 205	$^{\circ}\text{C}$
T_{stg}	Storage temperature		-50 to 225	$^{\circ}\text{C}$
V_{isol}	Insulation test voltage	AC, 1 min.	TBD	V
		AC, 1 s.	TBD	V

¹ Obtained from SemiSouth Laboratories, Inc. SJEP120R050 Rev. 3.0 datasheet

² As tested for TO-247 package; P/N SJEP120R050

SiC JFET Electrical Characteristics¹

Symbols	Parameter	Condition(s)	Values			Units
			Min.	Typical	Max.	
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0\text{ V}, I_D = 1200\ \mu\text{A}$	1200			V
$V_{GS(th)}$	Gate-source threshold voltage	$V_{DS} = 1\text{ V}, I_D = 70\text{ mA}$	0.75	1.00	1.25	V
I_{DSS}	Zero gate voltage drain current	$V_{DS} = 1200\text{ V}, V_{GS} = 0\text{ V}, T_c = 25\text{ }^\circ\text{C}$		200	1200	μA
		$V_{DS} = 1200\text{ V}, V_{GS} = 0\text{ V}, T_j = 150\text{ }^\circ\text{C}$		600		
		$V_{DS} = 1200\text{ V}, V_{GS} \leq -15\text{ V}, T_c = 25\text{ }^\circ\text{C}$		2		
		$V_{DS} = 1200\text{ V}, V_{GS} \leq -15\text{ V}, T_c = 150\text{ }^\circ\text{C}$		20		
I_{GSS}	Gate-source leakage current	$V_{GS} = -15\text{ V}, V_{DS} = 0\text{ V}$		-0.2	-0.6	mA
		$V_{GS} = -15\text{ V}, V_{DS} = 1200\text{ V}$		-0.2		
$R_{DS(on)}$	Drain-source turn-on resistance	$V_{GS} = 3\text{ V}, I_D = 30\text{ A}, T_c = 25\text{ }^\circ\text{C}$		40	50	m Ω
		$V_{GS} = 3\text{ V}, I_D = 30\text{ A}, T_c = 125\text{ }^\circ\text{C}$		90		
I_{GFWD}	Gate forward current	$V_{GS} = 3\text{ V}$		480		mA
R_G	Internal gate resistance	$f = 1\text{ MHz}, \text{ drain-source shorted}$		4		Ω
$R_{G(on)}$		$V_{GS} > 2.7\text{ V}$		0.2		
C_{iss}	Input capacitance	$V_{DD} = 100\text{ V}$		1420		μF
C_{oss}	Output capacitance			206		
C_{rss}	Reverse transfer capacitance			194		
$C_{o(er)}$	Effective output capacitance, Energy related	$V_{DS} = 0\text{ V to } 600\text{ V}, V_{GS} = 0\text{ V}$		110		
$t_{d(on)}$	Turn-on delay time	$V_{DS} = 600\text{ V}, I_D = 25\text{ A},$ Inductive load, $T_j = 25\text{ }^\circ\text{C}$ $V_{GS} = -15\text{ to } 15\text{ V},$ $R_{G(ext)} = 1\ \Omega, C_{GS} = 4.7\text{ nF}$		TBD		ns
t_{rv}	Rise time			TBD		
$t_{d(off)}$	Turn-off delay time			TBD		
t_{fv}	Fall time			TBD		
E_{on}	Turn-On energy				144	
E_{off}	Turn-Off energy			120		
E_{ts}	Total switching energy			264		
$t_{d(on)}$	Turn-on delay time	$V_{DS} = 600\text{ V}, I_D = 25\text{ A},$ Inductive load, $T_j = 150\text{ }^\circ\text{C}$ $V_{GS} = -15\text{ to } 15\text{ V},$ $R_{G(ext)} = 1\ \Omega, C_{GS} = 4.7\text{ nF}$		TBD		ns
t_{rv}	Rise time			TBD		
$t_{d(off)}$	Turn-off delay time			TBD		
t_{fv}	Fall time			TBD		
E_{on}	Turn-On energy				204	
E_{off}	Turn-Off energy			123		
E_{ts}	Total switching energy			327		

SiC JFET Gate Charge Electrical Characteristics¹

Symbols	Parameter	Condition(s)	Values			Units
			Min.	Typical	Max.	
Q_{gs}	Gate to source charge	$V_{DS} = 600\text{ V}, V_{GS} = 2.5\text{ V}$ $I_D = 15\text{ A}$		4		nC
Q_{gd}	Gate to drain charge			57		nC
Q_g	Gate charge total			70		nC

Thermal Characteristics

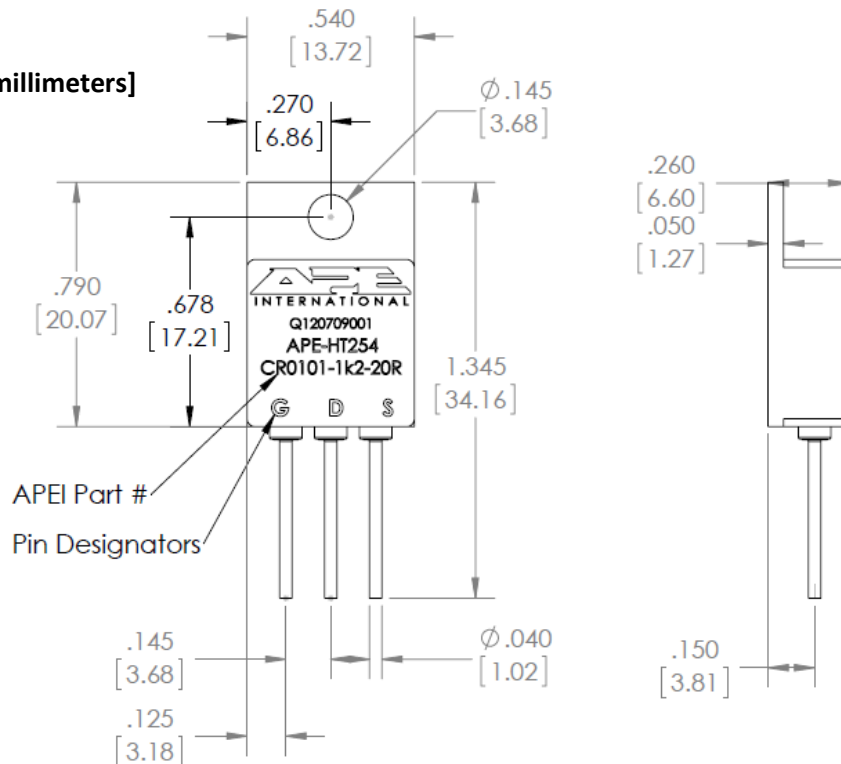
Symbols	Parameter	Condition(s)	Values			Units
			Min.	Typical	Max.	
$R_{\theta(j-c)}$	Thermal resistance junction-case	Calculated at 200 °C		TBD	1.0	°C/W

Mechanical Characteristics

Symbols	Parameter	Condition(s)	Values			Units
			Min.	Typical	Max.	
w	Weight			9.0		g
M_s	Mounting torque	6-32 steel screw, Al heat sink		0.78	1.04	N-m

PACKAGE DIMENSIONS

All dimensions shown are in inches [millimeters]





PRELIMINARY

APE HT-0101

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