

NVMFS5A140PLZ

Power MOSFET, Single P-Channel

–40 V, –140 A, 4.2 mΩ

Features

- Small Footprint (5 x 6 mm) for Compact Design
- Low $R_{DS(on)}$ to Minimize Conduction Losses
- NVMFS5A140PLZWF: Wettable Flank Option for Enhanced Optical Inspection
- AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free and are RoHS Compliant

SPECIFICATION MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise noted) (Notes 1, 2, 3)

Symbol	Parameter			Value	Unit
V _{DSS}	Drain to Source Voltage			−40	V
V _{GS}	Gate to Source Voltage			±20	V
I _D	Continuous Drain, Current R _{θJC} , (Notes 1, 3)	Steady State	T _C = 25°C	−140	A
P _D	Power Dissipation R _{θJC} (Note 1)		T _C = 25°C	200	W
I _D	Continuous Drain: Current R _{θJA} (Notes 1, 2, 3)	Steady State	T _A = 25°C	−20	A
P _D	Power Dissipation R _{θJA} (Note 1, 2)		T _A = 25°C	3.8	W
I _{DP}	Pulsed Drain Current	PW ≤ 10 μs, duty cycle ≤ 1%		−560	A
T _J , T _{STG}	Operating Junction and Storage Temperature			−55 to +175	°C
I _S	Source Current (Body Diode)			−140	A
E _{AS}	Single Pulse Drain to Source Avalanche Energy (L= 1.0 mH, I _{L(pk)} = −29 A)			420	mJ
T _L	Lead Temperature for Soldering Purposes (1/8" from case for 10 s)			260	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

THERMAL CHARACTERISTICS

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Junction to Case Steady State	0.75	$^\circ\text{C/W}$
$R_{\theta JA}$	Junction to Ambient Steady State (Note 2)	39	

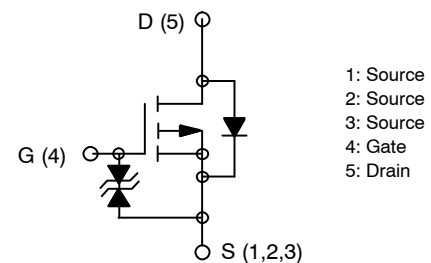
1. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
2. Surface mounted on FR4 board using a 650 mm², 2 oz. Cu pad.
3. Maximum current for pulses as long as 1 second is higher but is dependent on pulse duration and duty cycle.



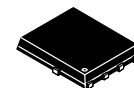
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V_{DS}	$R_{DS(on)}$ MAX	I_D MAX
–40 V	4.2 mΩ @ –10 V	–140 A
	7.2 mΩ @ –4.5 V	

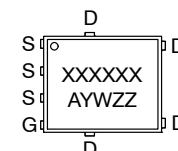


P-CHANNEL MOSFET



DFN5
(SO-8FL)

MARKING DIAGRAM



XXXXXX = Specific Device Code
5A140L(NVMFS5A140PLZ)
140LWF(NVMFS5A140PLZWF)
A = Assembly Location
Y = Year
W = Work Week
ZZ = Lot Traceability

ORDERING INFORMATION

See detailed ordering and shipping information on page 7 of this data sheet.

NVMFS5A140PLZ

ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

$V_{(BR)DSS}$	Drain to Source Breakdown Voltage	$I_D = -1\text{ mA}$, $V_{GS} = 0\text{ V}$	-40			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = -40\text{ V}$, $V_{GS} = 0\text{ V}$	$T_J = 25^\circ\text{C}$		-1.0	μA
			$T_J = 100^\circ\text{C}$ (Note 4)		-100	μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 16\text{ V}$, $V_{DS} = 0\text{ V}$			± 10	μA

ON CHARACTERISTICS (Note 5)

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = -10\text{ V}$, $I_D = -1\text{ mA}$	-1.2		-2.6	V
$R_{DS(on)}$	Drain to Source On Resistance	$V_{GS} = -10\text{ V}$	$I_D = -50\text{ A}$	3.2	4.2	$\text{m}\Omega$
		$V_{GS} = -4.5\text{ V}$	$I_D = -50\text{ A}$	5.0	7.2	
g_{FS}	Forward Transconductance	$V_{DS} = -10\text{ V}$, $I_D = -50\text{ A}$		125		S

CHARGES, CAPACITANCES & GATE RESISTANCE

C_{iss}	Input Capacitance	$V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$ $V_{DS} = -20\text{ V}$,		7400		pF
C_{oss}	Output Capacitance			1030		
C_{rss}	Reverse Transfer Capacitance			720		
$Q_{g(tot)}$	Total Gate Charge	$V_{GS} = -10\text{ V}$, $I_D = -50\text{ A}$ $V_{DS} = -20\text{ V}$,		136		nC
Q_{gs}	Gate to Source Charge			26		
Q_{gd}	Gate to Drain Charge			31		

SWITCHING CHARACTERISTICS (Note 6)

$t_{d(on)}$	Turn-On Delay Time	$V_{DS} = -20\text{ V}$, $I_D = -50\text{ A}$, $V_{GS} = -10\text{ V}$, $R_G = 50\text{ }\Omega$		50		ns
t_r	Rise Time			860		
$t_{d(off)}$	Turn-Off Delay Time			540		
t_f	Fall Time			740		

DRAIN-SOURCE DIODE CHARACTERISTICS

V_{SD}	Forward Diode Voltage	$V_{GS} = 0\text{ V}$, $I_S = -50\text{ A}$		-0.83	-1.5	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0\text{ V}$, $I_S = -50\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$		108		ns
Q_{rr}	Reverse Recovery Charge			236		nC

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

4. The maximum value is specified by design at $T_J = 100^\circ\text{C}$. Product is not tested to this condition in production.

5. Pulse Test: pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.

6. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

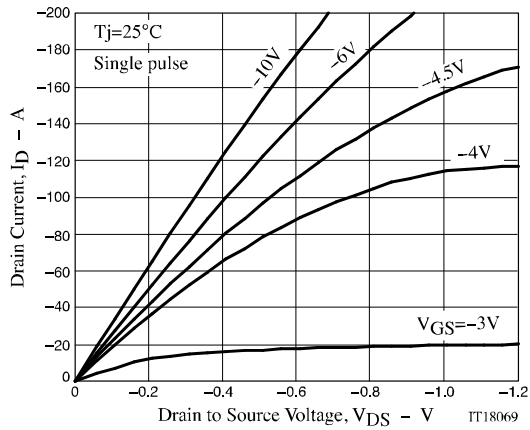


Figure 1. $I_D - V_{DS}$

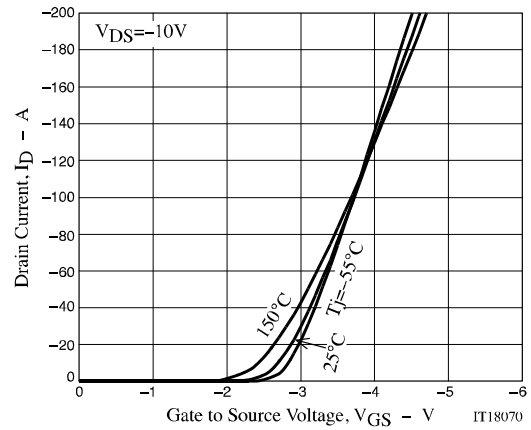


Figure 2. $I_D - V_{GS}$

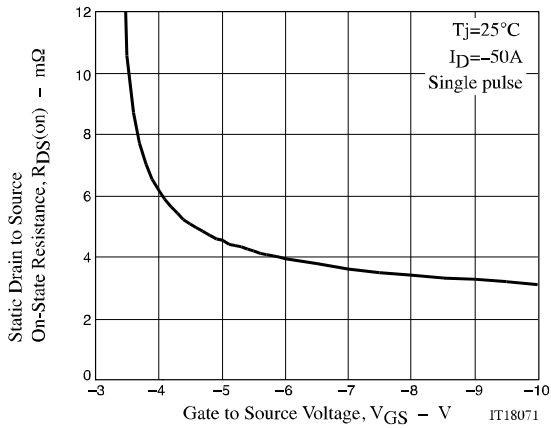


Figure 3. $R_{DS(on)} - V_{GS}$

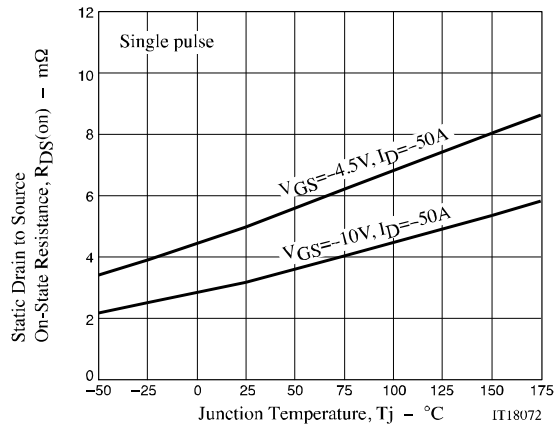


Figure 4. $R_{DS(on)} - T_j$

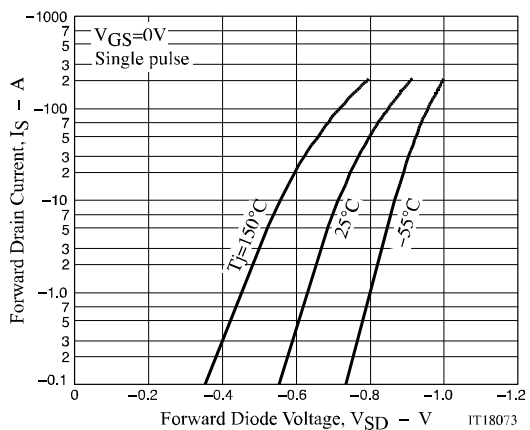


Figure 5. $I_S - V_{SD}$

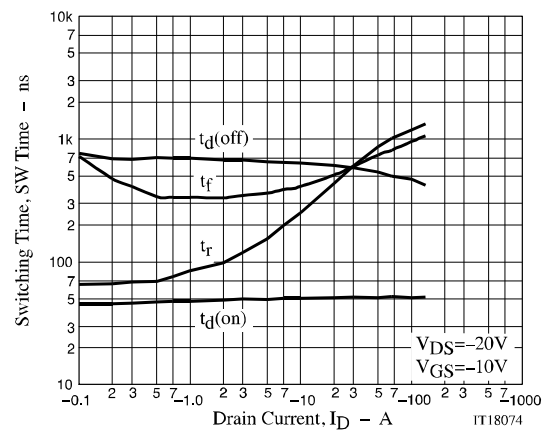


Figure 6. SW Time - I_D

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TYPICAL CHARACTERISTICS

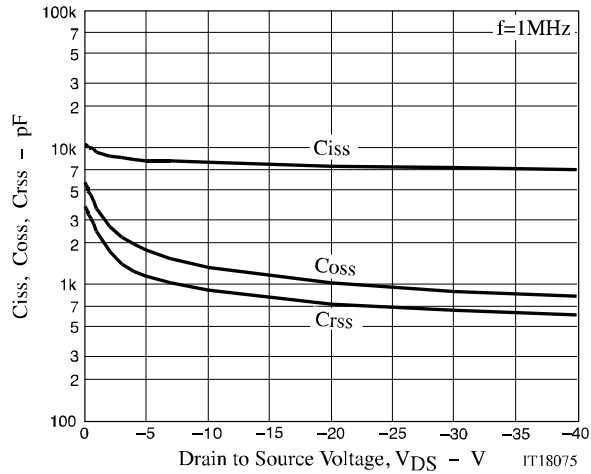


Figure 7. C_{iss} , C_{oss} , C_{rss} - V_{DS}

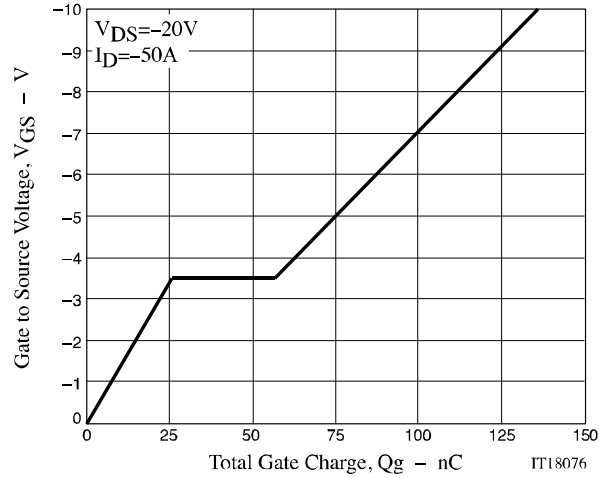


Figure 8. V_{GS} - Q_g

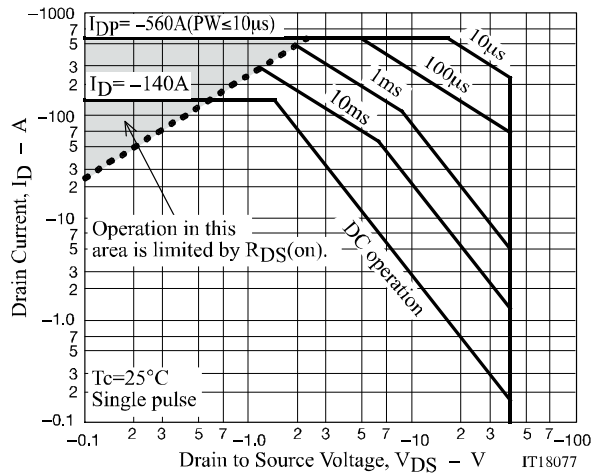


Figure 9. SOA

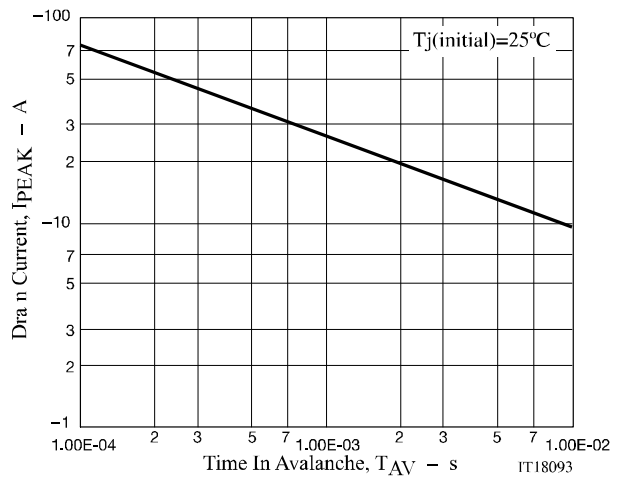


Figure 10. I_{PEAK} - T_{AV}

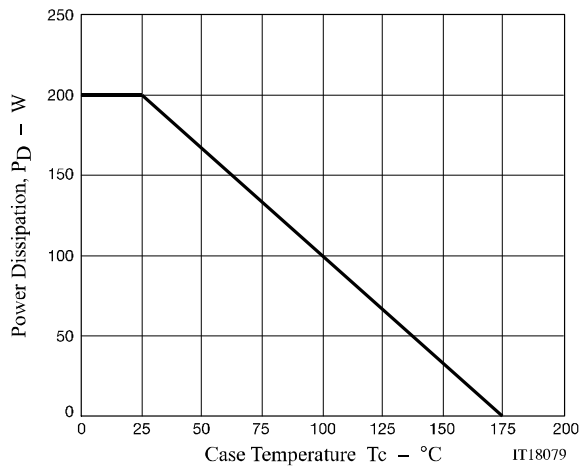


Figure 11. P_D - T_C

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TYPICAL CHARACTERISTICS

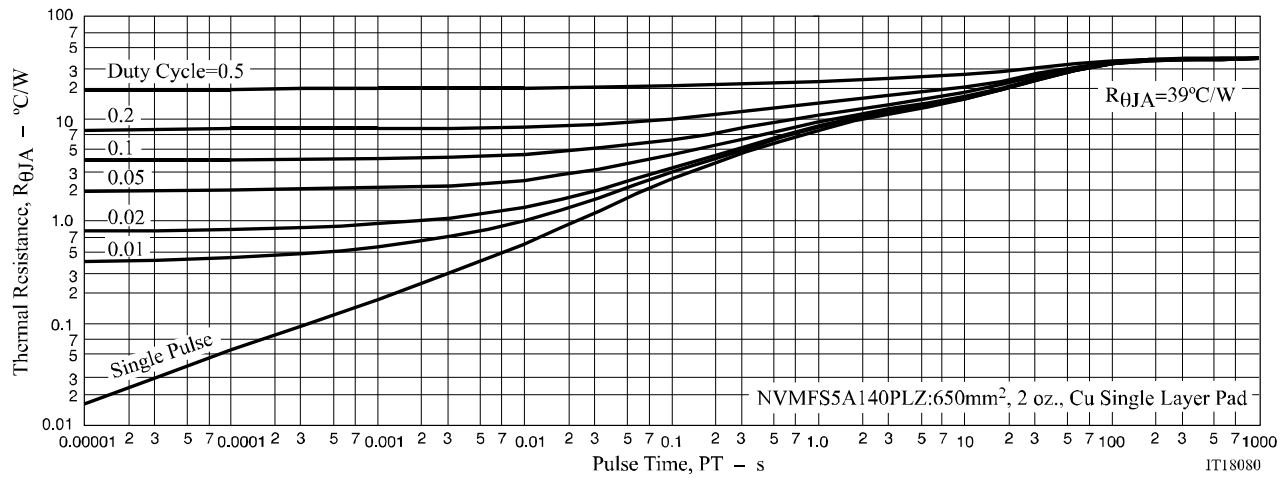
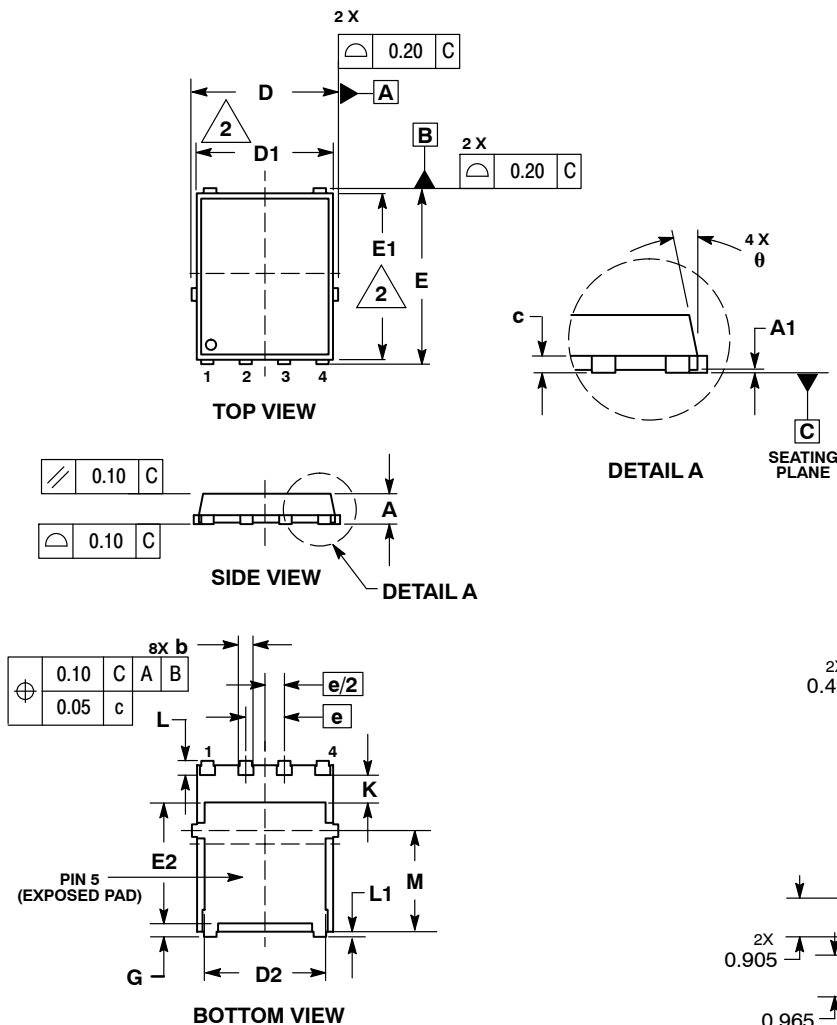


Figure 12. $R_{\theta JA}$ - Pulse Time

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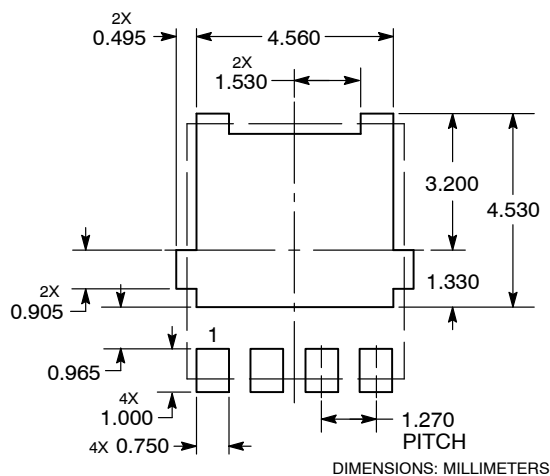
DFN5 5x6, 1.27P
(SO-8FL)
CASE 488AA
ISSUE M



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
 2. CONTROLLING DIMENSION: MILLIMETER.
 3. DIMENSION D1 AND E1 DO NOT INCLUDE MOLD FLASH PROTRUSIONS OR GATE BURRS.

MILLIMETERS			
DIM	MIN	NOM	MAX
A	0.90	1.00	1.10
A1	0.00	---	0.05
b	0.33	0.41	0.51
c	0.23	0.28	0.33
D	5.00	5.15	5.30
D1	4.70	4.90	5.10
D2	3.80	4.00	4.20
E	6.00	6.15	6.30
E1	5.70	5.90	6.10
E2	3.45	3.65	3.85
e	1.27 BSC		
G	0.51	0.575	0.71
K	1.20	1.35	1.50
L	0.51	0.575	0.71
L1	0.125 REF		
M	3.00	3.40	3.80
θ	0 °	---	12 °

RECOMMENDED SOLDERING FOOTPRINT*



NVMFS5A140PLZ

ORDERING INFORMATION

Device	Marking	Package	Shipping (Qty / Packing) [†]
NVMFS5A140PLZT1G	5A140L	DFN5 5x6, 1.27P (SO-8FL) (Pb-Free)	1.500 / Tape & Reel
NVMFS5A140PLZWFT1G	140LWF	DFN5 5x6, 1.27P (SO-8FL) (Pb-Free / Wettable Flanks)	1.500 / Tape & Reel
NVMFS5A140PLZT3G	5A140L	DFN5 5x6, 1.27P (SO-8FL) (Pb-Free)	5.000 / Tape & Reel
NVMFS5A140PLZWFT3G	140LWF	DFN5 5x6, 1.27P (SO-8FL) (Pb-Free / Wettable Flanks)	5.000 / Tape & Reel

[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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Телефон: 8 (812) 309 58 32 (многоканальный)

Факс: 8 (812) 320-02-42

Электронная почта: org@eplast1.ru

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.