

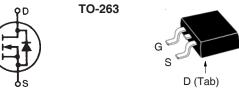
## **Trench Gate Power MOSFET**

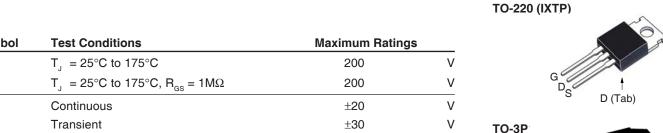
# IXTA86N20T IXTP86N20T IXTQ86N20T

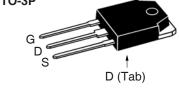
200V 86A I<sub>D25</sub>  $33m\Omega$  $\mathbf{R}_{\mathrm{DS(on)}}$ 

N-Channel Enhancement Mode Avalance Rated









G = Gate	D	=	Drain
S = Source	Tab	=	Drain

G = Gate	D	= Drair
S = Source	Tab	= Drair

#### **Features**

- High Current Handling Capability
- Avalanche Rated
- Fast Intrinsic rectifier
- Low R<sub>DS(on)</sub>

#### **Advantages**

- Easy to Mount
- Space Savings
- High Power Density

### **Applications**

- DC-DC Converters
- Battery Chargers
- Switch-Mode and Resonant-Mode **Power Supplies**
- DC Choppers
- AC Motor Drives
- Uninterruptible Power Supplies
- High Speed Power Switching Applications

Symbol	Test Conditions	Maximum	Ratings
V <sub>DSS</sub>	$T_{_{\rm J}} = 25^{\circ}\text{C to } 175^{\circ}\text{C}$	200	V
$\mathbf{V}_{DGR}$	$T_{_{\rm J}}$ = 25°C to 175°C, $R_{_{\rm GS}}$ = 1M $\Omega$	200	V
V <sub>GSS</sub>	Continuous	±20	V
V <sub>GSM</sub>	Transient	±30	V
I <sub>D25</sub>	T <sub>C</sub> = 25°C	86	Α
I <sub>DM</sub>	$T_{\rm C} = 25^{\circ}$ C, Pulse Width Limited by $T_{\rm JM}$	260	Α
I <sub>A</sub>	T <sub>C</sub> = 25°C	10	Α
E <sub>AS</sub>	$T_{c} = 25^{\circ}C$	1	J
P <sub>D</sub>	$T_{c} = 25^{\circ}C$	550	W
dv/dt	$I_{_{\mathrm{S}}} \leq I_{_{\mathrm{DM}}},  V_{_{\mathrm{DD}}} \leq V_{_{\mathrm{DSS}}},  T_{_{\mathrm{J}}} \leq 150^{\circ}\mathrm{C}$	3	V/ns
T <sub>J</sub>		-55 +175	°C
$\mathbf{T}_{JM}$		175	°C
T <sub>stg</sub>		-55 +175	°C
$T_L$	Maximum Lead Temperature for Solder	ring 300	°C
T <sub>SOLD</sub>	1.6 mm (0.062in.) from Case for 10s	260	°C
F <sub>c</sub> M <sub>d</sub>	Mounting Force (TO-263) Mounting Torque (TO-220 & TO-3P)	1065 / 2.214.6 1.13 / 10	N/lb Nm/lb.in
Weight	TO-263 TO-220 TO-3P	2.5 3.0 5.5	g g g

Symbol (T <sub>J</sub> = 25°C	<b>Test Conditions</b> , Unless Otherwise Specified)	Chara Min.	cteristic Typ.	Values Max	
BV <sub>DSS</sub>	$V_{GS} = 0V, I_{D} = 250\mu A$	200			V
V <sub>GS(th)</sub>	$V_{DS} = V_{GS}, I_{D} = 1 \text{mA}$	3.0		5.0	V
I <sub>GSS</sub>	$V_{GS} = \pm 20V, V_{DS} = 0V$			±200	nA
DSS	$V_{DS} = V_{DSS}, V_{GS} = 0V$ $T_{J} = 125^{\circ}C$			1 250	μ <b>Α</b> μ <b>Α</b>
R <sub>DS(on)</sub>	$V_{GS} = 10V, I_{D} = 0.5 \bullet I_{D25}, Note 1$			33	mΩ



Symbol	Test Conditions	Char	acteristic	<b>Values</b>
$(T_J = 25^{\circ}C, Unless Otherwise Specified)$ Min.				Max
g <sub>fs</sub>	$V_{DS} = 10V, I_{D} = 0.5 \bullet I_{D25}, Note 1$	46	78	S
C <sub>iss</sub>			4500	pF
C <sub>oss</sub>	$V_{GS} = 0V, V_{DS} = 25V, f = 1MHz$		550	pF
C <sub>rss</sub>			73	pF
t <sub>d(on)</sub>	Resistive Switching Times		22	ns
t, (	_		24	ns
t <sub>d(off)</sub>	$V_{gs} = 10V, V_{DS} = 0.5 \cdot V_{DSS}, I_{D} = 0.5 \cdot I_{D25}$		52	ns
t,	$R_{\rm G} = 3.3\Omega$ (External)		29	ns
Q <sub>g(on)</sub>			90	nC
Q <sub>gs</sub>	$V_{gs} = 10V, V_{DS} = 0.5 \cdot V_{DSS}, I_{D} = 0.5 \cdot I_{D25}$		30	nC
$Q_{gd}$			23	nC
R <sub>thJC</sub>				0.27 °C/W
R <sub>thCS</sub>	TO-220		0.50	°C/W
	TO-3P		0.25	°C/W

#### Source-Drain Diode

Symbol Test Conditions			Characteristic Values			
$(T_J = 25^{\circ}C,$	Unless Otherwise Specified)	Min.	Тур.	Max		
I <sub>s</sub>	$V_{GS} = 0V$			86	Α	
I <sub>sm</sub>	Repetitive, pulse Width Limited by $T_{_{JM}}$			260	A	
V <sub>SD</sub>	$I_F = I_S$ , $V_{GS} = 0V$ , Note 1			1.5	V	
t <sub>rr</sub>	$I_{_{\rm F}} = 25 {\rm A, \ -di/dt} = 100 {\rm A/\mu s, V}_{_{\rm R}} = 100 {\rm V}$		140		ns	

Note 1. Pulse test,  $t \le 300 \mu s$ , duty cycle,  $d \le 2\%$ .



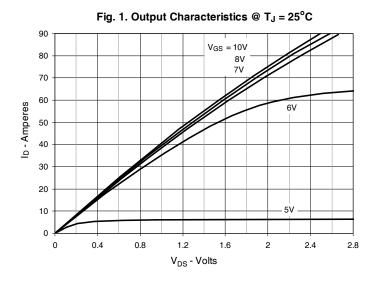
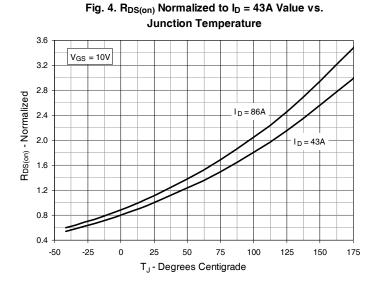
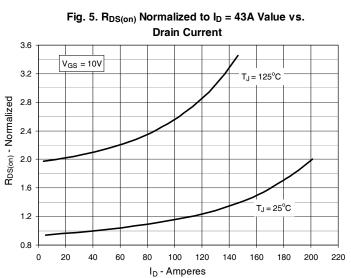
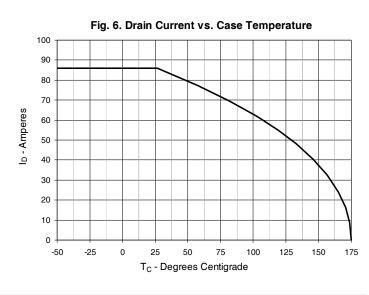


Fig. 2. Extended Output Characteristics@ T<sub>J</sub> = 25°C V<sub>GS</sub> = 10V 8V 140 - Amberes 100 - 100 80  $V_{\rm DS}$  - Volts

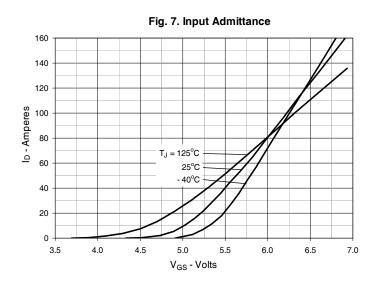
Fig. 3. Output Characteristics @ T<sub>J</sub> = 125°C V<sub>GS</sub> = 10V 8V 6V ID - Amperes 5V V<sub>DS</sub> - Volts

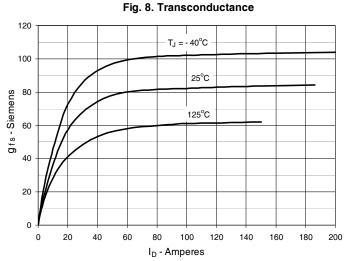


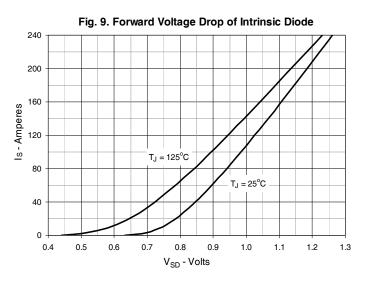


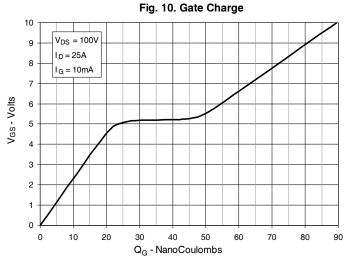


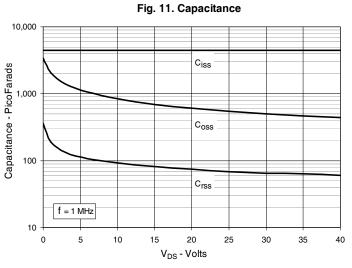


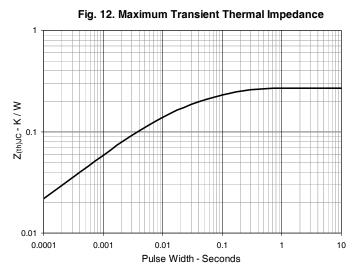












IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.



Fig. 13. Resistive Turn-on Rise Time vs. Junction Temperature

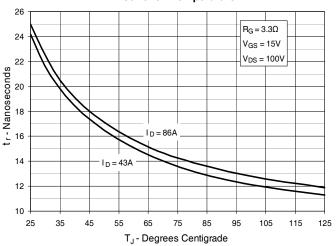


Fig. 14. Resistive Turn-on Rise Time vs.

Drain Current

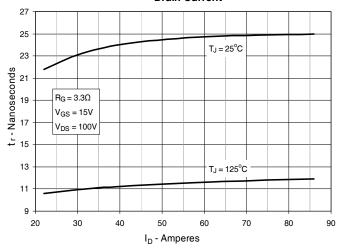


Fig. 15. Resistive Turn-on Switching Times vs.
Gate Resistance

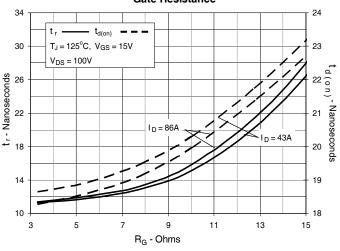


Fig. 16. Resistive Turn-off Switching Times vs.
Junction Temperature

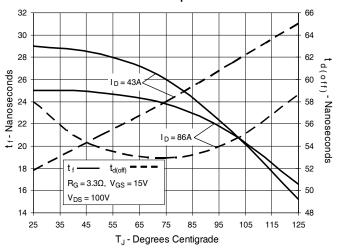


Fig. 17. Resistive Turn-off Switching Times vs.

Drain Current

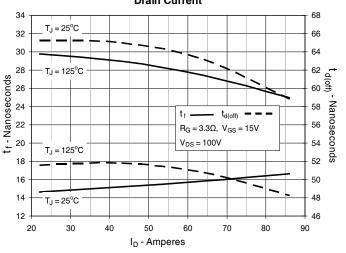
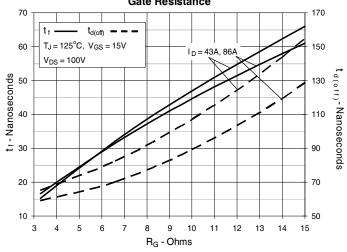
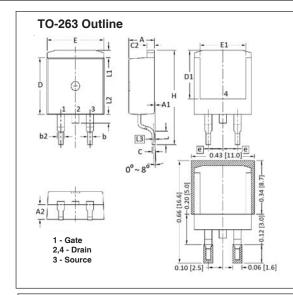


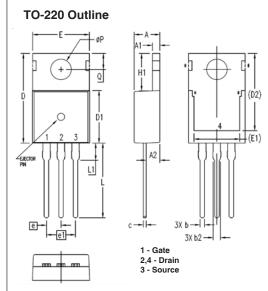
Fig. 18. Resistive Turn-off Switching Times vs.
Gate Resistance



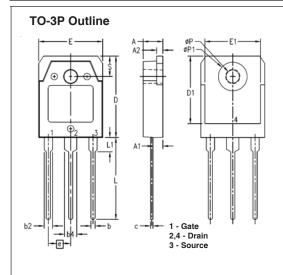




SYM	INCH	HES	MILLIN	<b>METER</b>
SIM	MIN	MAX	MIN	MAX
Α	.170	.185	4.30	4.70
A1	.000	.008	0.00	0.20
A2	.091	.098	2.30	2.50
b	.028	.035	0.70	0.90
b2	.046	.060	1.18	1.52
С	.018	.024	0.45	0.60
C2	.049	.060	1.25	1.52
D	.340	.370	8.63	9.40
D1	.300	.327	7.62	8.30
E	.380	.410	9.65	10.41
E1	.270	.330	6.86	8.38
е	.100	BSC	2.54	BSC
Н	.580	.620	14.73	15.75
L	.075	.105	1.91	2.67
L1	.039	.060	1.00	1.52
L2	_	.070	_	1.77
L3	.010 BSC			BSC



SYM	INCHES MILLIMETERS			ETERS
2114	MIN	MAX	MIN	MAX
Α	.169	.185	4.30	4.70
A1	.047	.055	1.20	1.40
A2	.079	.106	2.00	2.70
b	.024	.039	0.60	1.00
b2	.045	.057	1.15	1.45
С	.014	.026	0.35	0.65
D	.587	.626	14.90	15.90
D1	.335	.370	8.50	9.40
(D2)	.500	.531	12.70	13.50
E	.382	.406	9.70	10.30
(E1)	.283	.323	7.20	8.20
е	.100 BSC		2.54	BSC
e1	.200	.200 BSC		BSC
H1	.244	.268	6.20	6.80
L	.492	.547	12.50	13.90
L1	.110	.154	2.80	3.90
ØΡ	.134	.150	3.40	3.80
Q	.106	.126	2.70	3.20



MIN         MAX         MIN         MAX           A         .181         .197         4.60         5.00           A1         .087         1.02         2.20         2.60           A2         .057         .065         1.45         1.65           b         .031         .047         0.80         1.20           b2         .071         .087         1.80         2.20           b4         .110         .126         2.80         3.20           c         .022         .031         0.55         0.80           D         .776         .791         19.70         20.10           D1         .640         .680         16.26         17.27           E         .606         .622         15.40         15.80           E1         .531         .539         13.50         13.70           e         .215 BSC         5.45 BSC           L         .779         .795         19.80         20.20           L1         .130         .146         3.30         3.70           ØP         .122         .134         3.10         3.40           ØP1         .272         .280<	CVM	INCHES		MILLIMETERS	
A1         .087         1.02         2.20         2.60           A2         .057         .065         1.45         1.65           b         .031         .047         0.80         1.20           b2         .071         .087         1.80         2.20           b4         .110         .126         2.80         3.20           c         .022         .031         0.55         0.80           D         .776         .791         19.70         20.10           D1         .640         .680         16.26         17.27           E         .606         .622         15.40         15.80           E1         .531         .539         13.50         13.70           e         .215 BSC         5.45 BSC           L         .779         .795         19.80         20.20           L1         .130         .146         3.30         3.70           ØP         .122         .134         3.10         3.40           ØP1         .272         .280         6.90         7.10	SYM	MIN	MAX	MIN	MAX
A2         .057         .065         1.45         1.65           b         .031         .047         0.80         1.20           b2         .071         .087         1.80         2.20           b4         .110         .126         2.80         3.20           c         .022         .031         0.55         0.80           D         .776         .791         19.70         20.10           D1         .640         .680         16.26         17.27           E         .606         .622         15.40         15.80           E1         .531         .539         13.50         13.70           e         .215 BSC         5.45 BSC           L         .779         .795         19.80         20.20           L1         .130         .146         3.30         3.70           ØP         .122         .134         3.10         3.40           ØP1         .272         .280         6.90         7.10	Α	.181	.197	4.60	5.00
b         .031         .047         0.80         1.20           b2         .071         .087         1.80         2.20           b4         .110         .126         2.80         3.20           c         .022         .031         0.55         0.80           D         .776         .791         19.70         20.10           D1         .640         .680         16.26         17.27           E         .606         .622         15.40         15.80           E1         .531         .539         13.50         13.70           e         .215 BSC         5.45 BSC           L         .779         .795         19.80         20.20           L1         .130         .146         3.30         3.70           ØP         .122         .134         3.10         3.40           ØP1         .272         .280         6.90         7.10	A1	.087	1.02	2.20	2.60
b2         .071         .087         1.80         2.20           b4         .110         .126         2.80         3.20           c         .022         .031         0.55         0.80           D         .776         .791         19.70         20.10           D1         .640         .680         16.26         17.27           E         .606         .622         15.40         15.80           E1         .531         .539         13.50         13.70           e         .215 BSC         5.45 BSC           L         .779         .795         19.80         20.20           L1         .130         .146         3.30         3.70           ØP         .122         .134         3.10         3.40           ØP1         .272         .280         6.90         7.10	A2	.057		1.45	
b4         .110         .126         2.80         3.20           c         .022         .031         0.55         0.80           D         .776         .791         19.70         20.10           D1         .640         .680         16.26         17.27           E         .606         .622         15.40         15.80           E1         .531         .539         13.50         13.70           e         .215 BSC         5.45 BSC           L         .779         .795         19.80         20.20           L1         .130         .146         3.30         3.70           ØP         .122         .134         3.10         3.40           ØP1         .272         .280         6.90         7.10	b	.031	.047	0.80	
c         .022         .031         0.55         0.80           D         .776         .791         19.70         20.10           D1         .640         .680         16.26         17.27           E         .606         .622         15.40         15.80           E1         .531         .539         13.50         13.70           e         .215 BSC         5.45 BSC           L         .779         .795         19.80         20.20           L1         .130         .146         3.30         3.70           ØP         .122         .134         3.10         3.40           ØP1         .272         .280         6.90         7.10		.071	.087	1.80	2.20
D         .776         .791         19,70         20,10           D1         .640         .680         16,26         17,27           E         .606         .622         15,40         15,80           E1         .531         .539         13,50         13,70           e         .215 BSC         5,45 BSC           L         .779         .795         19,80         20,20           L1         .130         .146         3,30         3,70           ØP         .122         .134         3,10         3,40           ØP1         .272         .280         6,90         7,10	b4	.110	.126	2.80	3.20
D1     .640     .680     16.26     17.27       E     .606     .622     15.40     15.80       E1     .531     .539     13.50     13.70       e     .215 BSC     5.45 BSC       L     .779     .795     19.80     20.20       L1     .130     .146     3.30     3.70       ØP     .122     .134     3.10     3.40       ØP1     .272     .280     6.90     7.10		.022	.031	0.55	0.80
E     .606     .622     15.40     15.80       E1     .531     .539     13.50     13.70       e     .215 BSC     5.45 BSC       L     .779     .795     19.80     20.20       L1     .130     .146     3.30     3.70       ØP     .122     .134     3.10     3.40       ØP1     .272     .280     6.90     7.10	D	.776	.791	19.70	20.10
E1     .531     .539     13.50     13.70       e     .215 BSC     5.45 BSC       L     .779     .795     19.80     20.20       L1     .130     .146     3.30     3.70       ØP     .122     .134     3.10     3.40       ØP1     .272     .280     6.90     7.10	D1	.640	.680	16.26	17.27
e     .215 BSC     5.45 BSC       L     .779     .795     19.80     20.20       L1     .130     .146     3.30     3.70       ØP     .122     .134     3.10     3.40       ØP1     .272     .280     6.90     7.10	E	.606	.622	15.40	15.80
e     .215 BSC     5.45 BSC       L     .779     .795     19.80     20.20       L1     .130     .146     3.30     3.70       ØP     .122     .134     3.10     3.40       ØP1     .272     .280     6.90     7.10	E1	.531	.539	13.50	13.70
L1     .130     .146     3.30     3.70       ØP     .122     .134     3.10     3.40       ØP1     .272     .280     6.90     7.10		.215		5,45	BSC
ØP         .122         .134         3.10         3.40           ØP1         .272         .280         6.90         7.10	L	.779	.795	19.80	20.20
ØP1 .272 .280 6.90 7.10	L1	.130	.146	3.30	3.70
	ØΡ	.122	.134	3.10	3.40
S .189 .205 4.80 5.20	øP1	.272	.280	6.90	7.10
	S	.189	.205	4.80	5.20

