P-Channel Logic Level Enhancement Mode Field Effect Transistor

PRODUCT SUMMARY

V_{DSS}	I_D	$R_{DS(ON)}$ (mΩ) Max
- 40V	- 65A	9.5 @ V_{GS} = -10V
		12.5 @ V_{GS} = -4.5V

FEATURES

- Super high dense cell design for extremely low RDS(ON).
- High power and current handling capability.
- TO-220 & TO-263 package.

STB SERIES
TO-263(DD-PAK)

STP SERIES
TO-220

ABSOLUTE MAXIMUM RATINGS (T$_A$=25°C unless otherwise noted)

Parameter		Symbol	Limit	Unit
Drain-Source Voltage		V_{DS}	-40	V
Gate-Source Voltage		V_{GS}	±20	V
Drain Current-Continuous [a] @ Tc	25°C	I_D	-65	A
	70°C		-52	A
-Pulsed [b]		I_{DM}	-160	A
Drain-Source Diode Forward Current [a]		I_S	-65	A
Maximum Power Dissipation [a]	Tc= 25°C	P_D	75	W
	Tc=70°C		52.5	
Operating Junction and Storage Temperature Range		T_J, T_{STG}	-65 to 175	$^\circ$C

THERMAL CHARACTERISTICS

Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	2	$^\circ$C/W
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	62.5	$^\circ$C/W

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P-Channel ELECTRICAL CHARACTERISTICS

ELECTRICAL CHARACTERISTICS (T_A=25$°$C unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ[C]	Max	Unit
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V, I_D=250uA	-40			V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=-32V, V_{GS}= 0V			-1	uA
Gate-Body Leakage	I_{GSS}	V_{GS}=±20V, V_{DS}=0V			±100	nA
ON CHARACTERISTICS [b]						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=-250uA	-1.0	-1.8	-3.0	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=-10V, I_D=-24A		7.5	9.5	m ohm
		V_{GS}=-4.5V, I_D=-12A		10	12.5	m ohm
Forward Transconductance	g_{FS}	V_{DS}=-10V, I_D=-10A		25		S
DYNAMIC CHARACTERISTICS [c]						
Input Capacitance	C_{ISS}	V_{DS}=-20V, V_{GS} = 0V f=1.0MHz		4210		pF
Output Capacitance	C_{OSS}			650		pF
Reverse Transfer Capacitance	C_{RSS}			380		pF
SWITCHING CHARACTERISTICS [c]						
Turn-On Delay Time	$t_{D(ON)}$	V_{DD} = -24V I_D = -24 A V_{GS} = -10V R_{GEN} = 3.3 ohm		68		ns
Rise Time	t_r			105		ns
Turn-Off Delay Time	$t_{D(OFF)}$			230		ns
Fall Time	t_f			96		ns
Total Gate Charge	Q_g	VDS=-24V, ID=-24A,VGS=-10V		94		nC
		VDS=-24V, ID=-24A,VGS=-4.5V		48		nC
Gate-Source Charge	Q_{gs}	V_{DS}=-24V, I_D=-24A V_{GS}=-10V		9.5		nC
Gate-Drain Charge	Q_{gd}			25.2		nC

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ELECTRICAL CHARACTERISTICS (T_A=25°C unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
DRAIN-SOURCE DIODE CHARACTERISTICS [a]						
Diode Forward Voltage	V_{SD}	V_{GS} = 0V, Is = -10A		-0.91	-1.3	V

Notes
a. Pulse Test: Pulse Width ≤ 300us, Duty Cycle ≤ 2%.
b. Guaranteed by design, not subject to production testing.
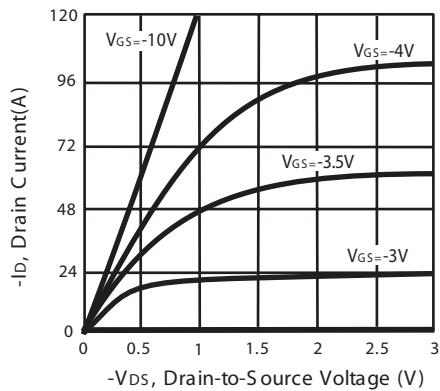

Figure 1. Output Characteristics
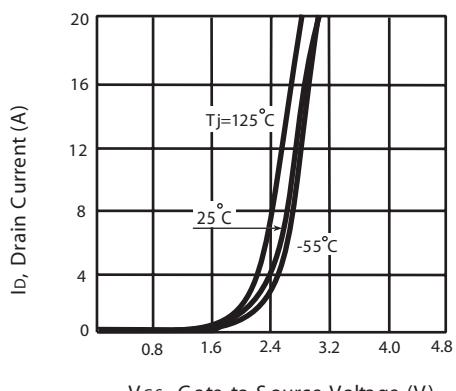
Figure 2. Transfer Characteristics
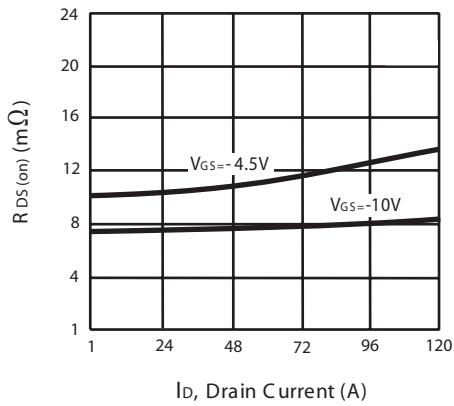

Figure 3. On-Resistance vs. Drain Current and Gate Voltage
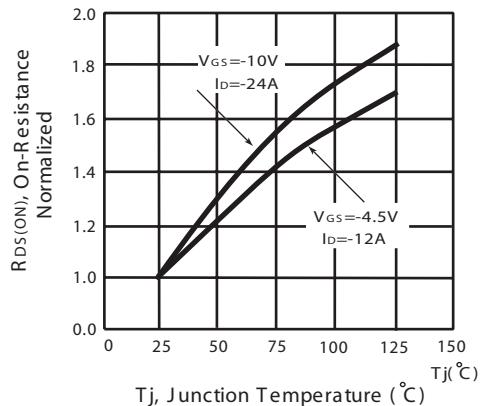
Figure 4. On-Resistance Variation with Drain Current and Temperature

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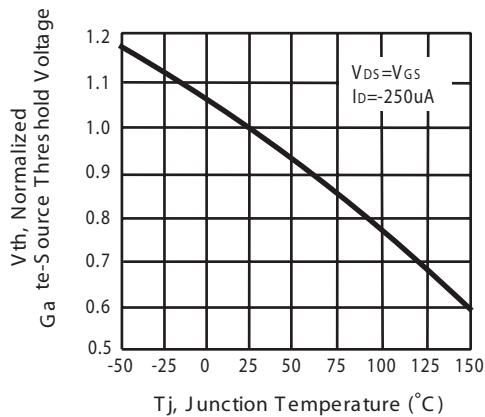
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Figure 5. Gate Threshold Variation
with Temperature

$V_{DS}=V_{GS}$
$I_D=-250uA$

Vth, Normalized
Gate-Source Threshold Voltage

Tj, Junction Temperature (°C)
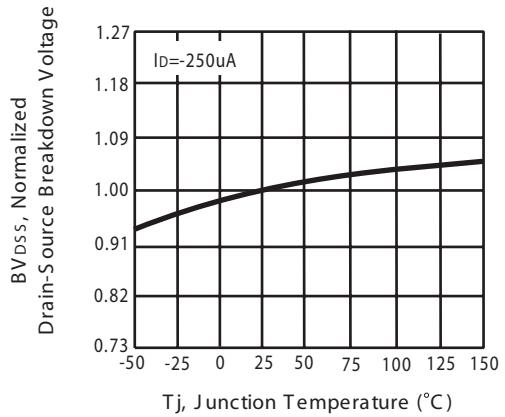
Figure 6. Breakdown Voltage Variation
with Temperature

$I_D=-250uA$

BV$_{DSS}$, Normalized
Drain-Source Breakdown Voltage

Tj, Junction Temperature (°C)
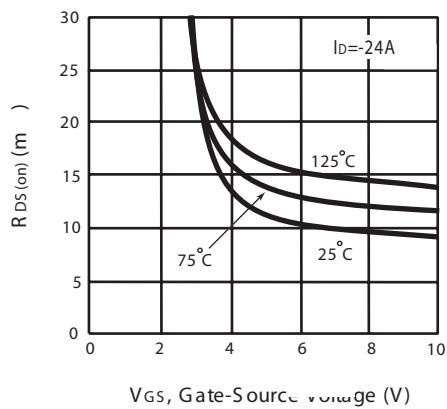
Figure 7. On-Resistance vs.
Gate-Source Voltage

$I_D=-24A$

$R_{DS(on)}$ (m)

125°C

75°C

25°C

V_{GS}, Gate-Source Voltage (V)
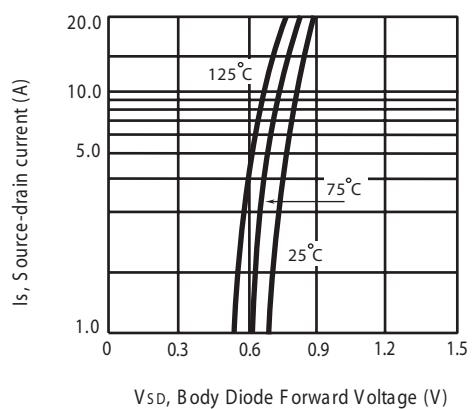
Figure 8. Body Diode Forward Voltage
Variation with Source Current

Is, Source-drain current (A)

125°C

75°C

25°C

V_{SD}, Body Diode Forward Voltage (V)
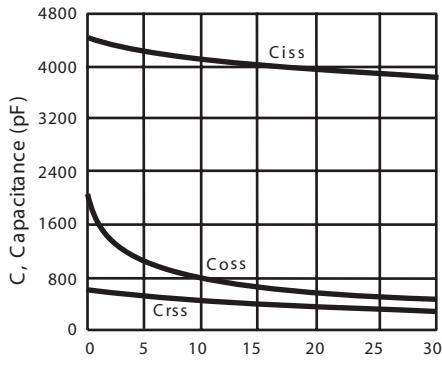
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Figure 9. Capacitance
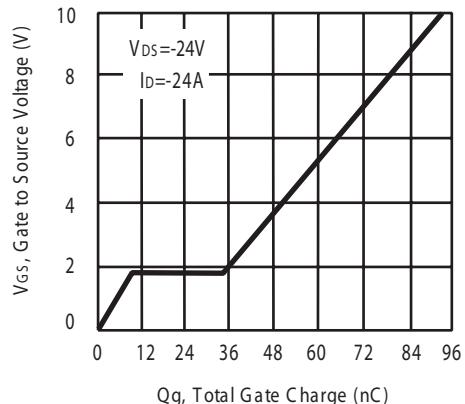
Figure 10. Gate Charge
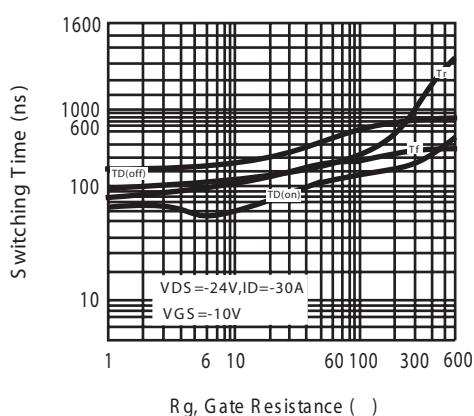
Figure 11. switching characteristics
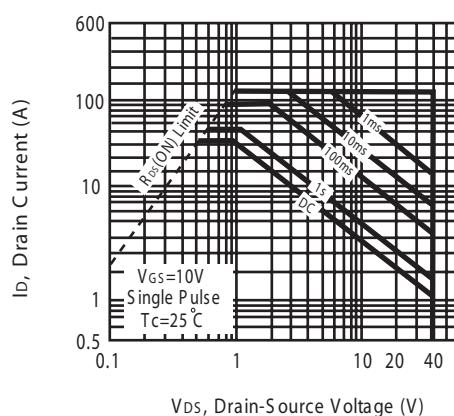
Figure 12. Maximum Safe Operating Area

1. $R_{\theta JC}(t) = r(t) * R_{\theta JC}$
2. $R_{\theta JC}$ = See Datasheet
3. $T_{JM} - T_C = P * R_{\theta JC}(t)$
4. Duty Cycle, D=t1/t2
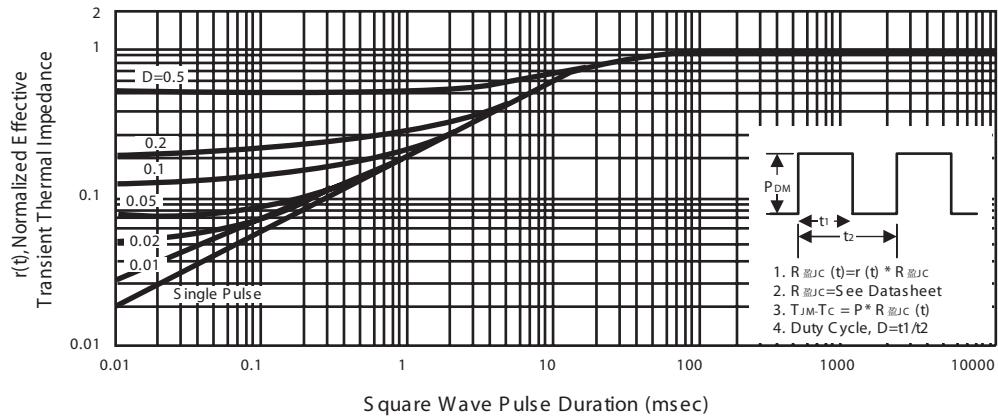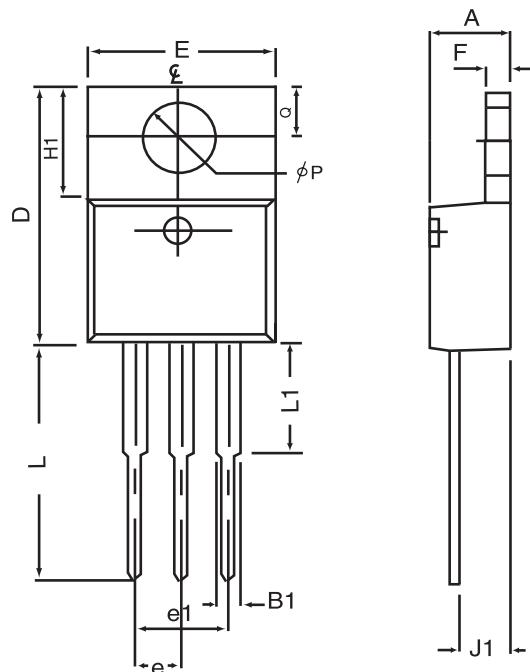
Figure 13. Normalized Thermal Transient Impedance Curve

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PACKAGE OUTLINE DIMENSIONS

TO-220
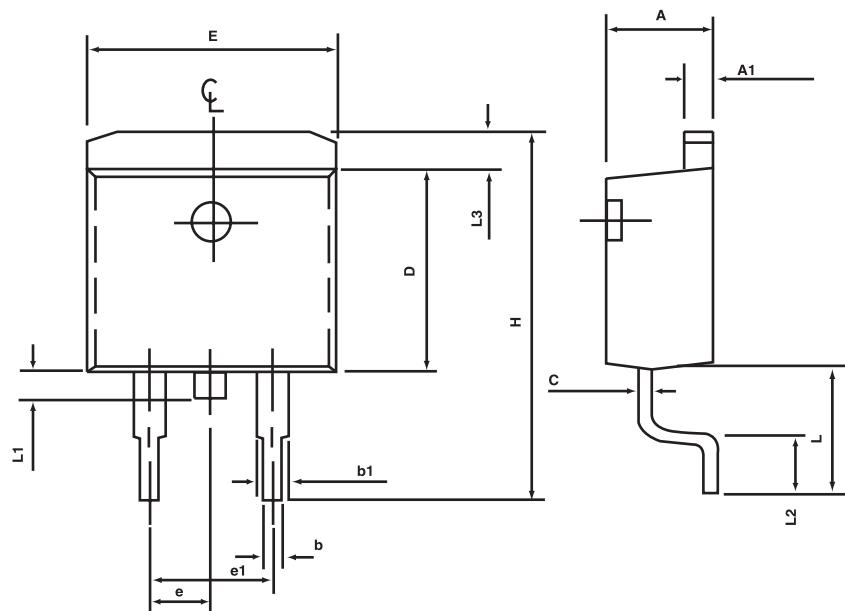
SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.32	4.80	0.170	0.189
B1	1.27	1.65	0.050	0.630
D	14.6	16.00	0.575	0.610
E	9.70	10.41	0.382	0.410
e	2.34	2.74	0.092	0.108
e1	4.68	5.48	0.184	0.216
F	1.14	1.40	0.045	0.055
H1	5.97	6.73	0.235	0.265
J1	2.20	2.79	0.087	0.110
L	12.88	14.22	0.507	0.560
L1	3.00	6.35	0.120	0.250
φP	3.50	3.94	0.138	0.155
Q	2.54	3.05	0.100	0.120

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PACKAGE OUTLINE DIMENSIONS

TO-263AB

SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.30	4.70	0.169	0.185
A1	1.22	1.32	0.048	0.055
b	0.69	0.94	0.027	0.037
b1	1.22	1.40	0.048	0.055
C	0.36	0.56	0.014	0.022
D	8.64	9.652	0.340	0.380
E	9.70	10.54	0.382	0.415
e	2.29	2.79	0.090	0.110
e1	4.83	5.33	0.190	0.210
H	14.60	15.78	0.575	0.625
L	4.70	5.84	0.185	0.230
L1	1.20	1.778	0.047	0.070
L2	2.24	2.84	0.088	0.111
L3	1.40 MAX		0.055 MAX	